GɑTEFLIX

QUANTITATIVE APTITUDE

For

CIVIL ENGINEERING
COMPUTER SCIENCE ENGINEERING
ELECTRICAL ENGINEERING
INSTRUMENTATION ENGINEERING
ELECTRONICS & COMMUNICATION ENGINEERING
MECHANICAL ENGINEERING

QUANTITATIVE APTITUDE

SYLLABUS

Numbers, Linear Equations, Ratio, Proportion & Variation, Percentage, Profit–Loss and Partnership, Simple & Compound Interest, Average-Mixture-Alligation, Time and Work, Pipes & Cisterns, Time, Speed & Distance, Permutation and Combination, Probability, Geometry & Mensuration

ANALYSIS OF GATE PAPERS

Exam Year	1 Mark Ques.	2 Mark Ques.	Total
2010	0	3	6
2011	1	2	5
2012	1	3	7
2013	0	4	8
2014 Set-1	2	2	6
2014 Set-2	2	2	6
2014 Set-3	2	2	6
2015 Set-1	1	2	5
2015 Set-2	2	1	4
2015 Set-3	3	2	7
2016 Set-1	1	2	5
2016 Set-2	1	2	5
2016 Set-3	0	3	6
2017 Set-1	1	2	5
2017 Set-2	1	3	7
2018 Set-1	1	3	7
2018 Set-2	1	3	7

CONTENT

1 NUMBERS

CLASSIFICATION OF NUMBERS

All the numbers that we see or use on a regular basis can be classified as given in the chart below.
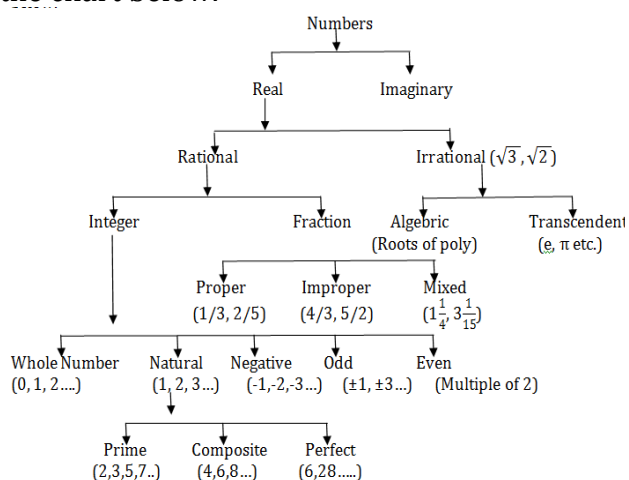
REAL NUMBERS

Real numbers represent actual physical quantities in a meaningful way for e. g. length, height, density etc. Real numbers can be further divided into subgroups. For example, rational/irrational, odd/even, prime/composite etc.

NATURAL OR COUNTING NUMBERS

To count objects we use counting numbers like 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. The set of positive counting numbers is called natural numbers. These are also at times called positive integers. $N = \{1, 2, 3, 4 \dots \}$

WHOLE NUMBERS

The set of natural numbers taken along with 0, gives us the set of Whole Numbers. Thus, the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 ..... represent the set of whole numbers. $W = \{0, 1, 2, 3, 4 \dots \}$

INTEGERS

All the counting numbers (positive and negative) including zero are called integers. For example
-100, -99, -50, -40, 0, 13, 17 are all integers. $I / Z = \{0, \pm 1, \pm 2, \pm 3 \dots \}$

RATIONAL NUMBERS

This is the set of real numbers that can be written in the form $\frac{a}{b}$, where a and b are integers and b is not equal to zero (b ≠ 0). All integers and all fractions are rational numbers including the finite decimal numbers (i.e. terminating). The numbers -4, $\frac{2}{3}, \frac{50}{7},$ $-\frac{10}{3},$ $-\frac{1}{4},$ 0, 145 $\left(\text{also represented as } \frac{145}{1} \right)$ and $\frac{15}{1}$ are examples of rational numbers.

$$Q = \left\{ \frac{a}{b} : a, b \in I \ \& \ b \neq 0 \right\}$$

IRRATIONAL NUMBERS

The numbers which are not rational are called irrational numbers, such as $\sqrt{2}, \pi$. These numbers give an approximate answer in terms of decimals. Also the digits after the decimal are non-terminating and non-recurring. Thus,
$\sqrt{2} = 1.4142135 \dots, \pi = 3.141592 \dots \text{etc.}$

EVEN NUMBERS

The set of Even Numbers is the set of integers which are divisible by 2. E.g. 2, 4, 6, 8, 10... Even numbers are expressed in the form 2n, where n is an integer. Thus 0, -2, -6 etc. are also even numbers.

ODD NUMBERS
The set of odd Numbers is the set of integers which are not divisible by 2. E.g. 1,

3, 5, 7, 9... Odd numbers are expressed in the form (2n-1), where n is an integer (not necessarily prime). Thus, -1, -3, -9 etc. are all odd numbers.

Note:
1) The smallest natural number is 1.
2) The smallest whole number is 0.

PRIME NUMBERS

A natural number which does not have any other factor besides itself and unity is a prime number. For example 2, 3, 5, 7, 11, 13 etc. The set of such numbers is the set of prime numbers.

Note:
1) 1 is neither prime nor composite.
2) The only even prime number is 2.
3) Two numbers are said to be relatively prime to each other or **co-prime** when their HCF is 1 e.g. (i) 9 and 28, (ii) 3 and 5, (iii) 14 and 29 etc.
4) If a number has no prime factor equal to or less than its square root, then the number is prime. This is a test to judge whether a number is prime or not.

COMPOSITE NUMBERS

The **set of Composite Numbers** is the set of natural numbers which have other factors also, besides itself and unity. E.g. 8, 72, 39 etc.

Alternatively, we might say that a natural number (except 1) which is not prime is a composite number.

GRAPHICAL REPRESENTATION OF REAL NUMBERS

It is often useful to represent real numbers by points on a line. To do this, we choose a point on the line to represent the real number zero and call this point the origin. The positive integers +1, +2, +3,... are then associated with points on the line at distance 1, 2, 3, ... units respectively to the

right of the origin (see the figure), while the negative integers -1, -2, -3, ... are associated with points on the line at distances 1, 2, 3, ... units respectively to the left of the origin.
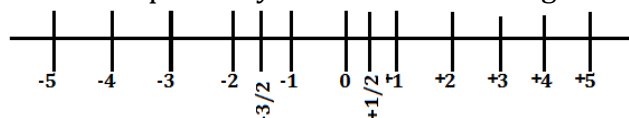
The rational number 1/2 is represented on this scale by a point P halfway between 0 and +1. The negative number -3/2 or $-1\frac{1}{2}$ is represented by a point R, $1\frac{1}{2}$ units to the left of the origin. There is one and only one point on the number line corresponding to each real number and conversely, to every point on the line, there corresponds one and only one real number.

The position of real numbers on a line establishes an order to the real number system. If a point A lies to the right of another point B on the line we say that the numbers corresponding to A is greater than the number corresponding to B or that the number corresponding to B is less or greater than the number corresponding to A. The symbols for "greater than" and "less than" are > and < respectively. These symbols are called "inequality signs".

Thus since 5 is to the right of 3, 5 is greater than 3(5 > 3), we may also say 3 is less than 5(3 < 5). Similarly, since -6 is to the left of -4, -6 is smaller than -4, $(-6 < -4)$, we may also write $(-4 > -6)$.

OTHER SPECIAL NUMBERS

PERFECT NUMBERS

If the sum of the divisors of N excluding N itself but including unity is equal to N, then N is called a perfect number. e.g. 6, 28 etc.
6=1+2+3, where 1,2 & 3 are divisors of 6
28 = 1+2+4+7+14

FIBONACCI NUMBERS

Fibonacci numbers form a sequence in which each term is the sum of the two

terms immediately preceding it. It is named for its discoverer, Leonardo Fibonacci (Leonardo Pisano). The Fibonacci sequence that has 1 as its first term is 1, 1, 2, 3, 5, 8, 13, 21, 34, 55 ... These numbers are referred to as Fibonacci numbers. The defining property can be symbolically represented as $t_{r+2} = t_r + t_{r+1}$.

Example:

If $X_1=1$ and $X_{n+1}=2X_n+5$

Where n=1,2..., then what is the value of X_{100}?

1) $\left(5 \times 2^{99} - 6\right)$

2) $\left(5 \times 2^{99} + 6\right)$

3) $\left(6 \times 2^{99} + 5\right)$

4) $\left(6 \times 2^{99} - 5\right)$

Solution:

$X_1=1$, $X_2=2X_1+5=7$, $X_3=2X_2+5=19$

Sequence is 1,7,19,... It satisfies Option 4.

$\therefore X_{100} = \left(6 \times 2^{99} - 5\right)$.

Hence Ans. (4)

DIVISIBILITY TESTS

Following are important divisibility tests.

1. **Divisible by** : 2
   Test : The unit's digit should be even or 0 (i.e. in the given number at the units place we should have 2, 4, 6, 8, 0)
   Examples :
   26, 48 etc.
   $6 \div 2 = 3, 8 \div 2 = 4$

2. **Divisible by** : 3
   Test : The sum of the digits of the number should be divisible by 3.
   Examples :
   12729
   $\left(1+2+7+2+9 = 21\right)$
   $21 \div 3 = 7$

3. **Divisible by** : 4
   Test : The number formed by the last two digits (units' and tens') of the given number should be divisible by 4.
   Examples :

21964
$64 \div 4 = 16$

4. **Divisible by** : 5
   Test : The units' digit should be 0 or 5.
   Examples :
   1835, 15440
   Last digits are 5 and 0 respectively

5. **Divisible by** : 6
   Test : The sum of the digits of the number should be divisible by 3 and the number should be even.
   Examples :
   1272
   $\left(1+2+7+2 = 12\right)$
   $12 \div 3 = 4$, Number is even

6. **Divisible by** : 8
   Test : The number formed by the last three digits (units', tens' and hundreds') of the given number should be divisible by 8.
   Examples :
   52672
   $672 \div 8 = 84$

7. **Divisible by** : 9
   Test : The sum of the digits of the number should be divisible by 9.
   Examples :
   127296
   $\left(1+2+7+2+9+6 = 27\right)$
   $27 \div 9 = 3$

8. **Divisible by** : 10
   Test : The units' digit should be 0.
   Examples :
   3220
   Units' digit is zero.

9. **Divisible by** : 11
   Test : The difference between the sums of the digits in the even and odd places should be zero or a multiple of 11.
   Examples :
   $\left(5+0+3 = 4+4 = 8\right)$, Hence difference is zero.

10. **Divisible by** : 12

Test : The sum of the digits of the number should be divisible by 3 and the number should also be divisible by 4.

Examples :

1728

$$(1+7+2+8=18)$$

$$18 \div 3 = 6$$

also $28 \div 4 = 7$

11. **Divisible by** : 15

Test : The sum of the digits of the number should be divisible by 3 & units' digit of the number should be 0 or 5.

Examples :

810645

$$(8+1+0+6+4+5=24)$$

$$24 \div 3 = 8$$

also last digit is 5.

12. **Divisible by** : 16

Test : The number formed by the last Four digits (units', tens', hundreds' and thousands') of the given number should be divisible by 16.

Examples :

$$8320 \div 16 = 520$$

13. **Divisible by** : 25

Test : The last two digits of the number should be 25, 50, 75 or 00.

Examples :

1125, 975, 15500, 50

The last two digits are as required.

14. **Divisible by** : 125

Test : The last three digits of the number should be 125, 250, 375, 500, 625, 750, 875 or 000.

Examples :

1125, 1875, 15500, 35625, 76375, 22250, 49750, 50000

The last three digits are as required.

SOME OTHER IMPORTANT TESTS

DIVISIBILITY TEST FOR 7

The test holds good only for numbers with more than three digits and is applied as follows.

1) Group the numbers in sets of three from the units' digit.
2) Add the odd groups and the even groups separately.
3) The difference of the odd and the even groups should be either 0 or divisible by 7.

Example: Is 85437954 divisible by 7?

Solution:

85 437 954

Adding up the first and the third sets, we get $85 + 954 = 1039$

Now their difference is $1039 - 437 = 602$

Since, $602 \div 7 = 86$, hence the number is divisible by 7.

DIVISIBLE TEST FOR 13

The test holds good only for numbers with more than three digits.

The test to be applied is as follows

1) Group the numbers in sets of three from the unit's digit.
2) Add the odd groups and the even groups separately.
3) The difference of the odd and the even groups should be either 0 or divisible by 13.

Example: Is 136999005 divisible by 13?

Solution:

136 999 005

Adding up the first and the third sets, we get

$$136 + 5 = 141$$

Now their difference is $\quad 999 - 141 = 858$.

Since, $858 \div 13 = 66$, so the number is divisible by 13.

Example: Find X & Y when

1) 15X8351Y is divisible by 72.
2) 2856354XY is divisible by 99.

Solution:

1) Since $72 = 8 \times 9$, so the number must be divisible both 8 and 9.

⇒ The last three digits of the number should be divisible by 8. Hence 51Y/8 must be an integer (last 3 digits), i.e. Y=2. Now,

the given number should also be divisible by 9.

$\Rightarrow 1+5+X+8+3+5+1+2 = 25+X$

should be divisible by 9.

Thus X=2.

Hence the number is 15283512.

2) $99 = 9\times11$. Hence the number should be divisible by 9 and 11 both.

$\Rightarrow 33+X+Y$ (sum of the digits) should be divisible by 9.

$\Rightarrow (2+5+3+4+Y)-(8+6+5+X)$

$= 0$ or ±11 or $\pm22\ldots$

$\Rightarrow 14+Y-19+X = 0$ or ±11

Or ... Solving the equations Y - X – 5 = -11 and 33 + X + Y = 45, we get X = 9 and Y = 3. Hence the number is 285635493.

CONVERSION OF A PURE RECURRING DECIMAL INTO FRACTION

Rule: Write the recurring figures only once in the numerator and take as many nines in the denominator as the number of repeating figures.

1) $0.\overline{6} = 6/9 = 2/3$.

2) $16.\overline{.} = 16+0.\overline{6} = 16+6/9 = 16+2/3 = 50/3$

TO CONVERT A MIXED RECURRING DECIMAL INTO FRACTION

Rule: In the numerator, write the difference between the number formed by all the digits after decimal point (taking repeated digits only once) and that formed by the digits which are not repeated.

In the denominator, write the number formed by as many nines as there are repeating digits followed by as many zeroes as in the number of non repeating digits.

1) $0.1\overline{7} = (17-1)/90 = 16/90 = 8/45$

2) $0.12\overline{54} = (1254-12)/9900 = 69/550$

3) $2.5\overline{36} = 2+(536-13)/900 = 2\dfrac{161}{300}$

A quick summary

1) $0.\overline{12345} = 12345/99999$

2) $0.1\overline{2345} = (12345-1)/99990$

3) $0.12\overline{345} = (12345-12)/99900$

4) $0.123\overline{45} = (12345-123)/99000$

5) $0.1234\overline{5} = (12345-1234)/90000$

6) $0.12345 - 12345/100000$

Example:

Let D be a decimal of the form, $D = 0.a_1a_2a_1a_2a_1a_2\ldots\ldots$, where digits a_1 & a_2 lie between 0 and 9. Then which of the following numbers necessarily produces an integer, when multiplied by D?

1) 18   2) 108
3) 198   4) 208

Solution:

It is recurring decimal and can be written as $D = 0.\overline{a_1a_2}$. To convert this to fraction, we can write it as $a_1a_2/99$. Thus when the number is multiplied by 99 or a multiple of it, we shall necessarily get an integer. Of the given options, only (3) is a multiple of 99, hence Ans. (3)

EXPONENTS

Laws

1) $a^m \times a^n = a^{m+n}$

For example, $2^3 \times 2^4 = 2^{3+4} = 2^7$

2) $a^m/a^n = a^{m-n} = 1/a^{n-m}$ (if $a \neq 0$)

For example, $\dfrac{3^5}{3^2} = 3^{5-2} = 3^3, \dfrac{3^4}{3^6} = \dfrac{1}{3^{6-4}} = \dfrac{1}{3^2}$

3) $\left(a^m\right)^n = a^{mn}$

For example, $\left(4^2\right)^3 = 4^6, \left(3^4\right)^2 = 3^8$

4) $a^{-m} = 1/a^m$

For example, $\dfrac{1}{3^2} = 3^{-2}$

5) $a^0 = 1$

(Any number with zero exponents is equal to 1)

6) $\left(a\times b\right)^m = a^m \times b^m$

For example, $\left(4\times5\right)^2 = 4^2 \times 5^2$

7) $\left(a\div b\right)^m = a^m \div b^m$ (if $b \neq 0$)

For example, $\left(\dfrac{5}{2}\right)^3 = \dfrac{5^3}{2^3}$

8) $\sqrt[m]{a} = a^{1/m}$

For example, $\sqrt[3]{27} = 27^{1/3} = 3$

9) $a^{p/q} = \sqrt[q]{a^p}$

For example, $\sqrt[3]{8^2} = 8^{2/3}$

Example: Simplify $\dfrac{\left(3^4\right)^3 \times \left(3^2\right)^4}{\left(-3\right)^{15} \times \left(3\right)^4}$

Solution:

$$\frac{\left(3^4\right)^3 \times \left(3^2\right)^4}{\left(-3\right)^{15} \times \left(3\right)^4} = \frac{3^{12} \times 3^8}{-3^{15} \times 3^4} = \frac{3^{20}}{3^{19}} = -3^1 = -3$$

PRIME FACTORS

A composite number can be uniquely expressed as a product of prime factors. For example,

$12 = 2 \times 6 = 2 \times 2 \times 3 = 2^2 \times 3^1$

$20 = 4 \times 5 = 2 \times 2 \times 5 = 2^2 \times 5^1$

$124 = 2 \times 62 = 2 \times 2 \times 31 = 2^2 \times 31$ etc.

Every composite number can be expressed in a similar manner in terms of its prime factors.

NUMBER OF FACTORS

The number of factors of a given composite number N (including 1 and the number itself) which can be resolved into its prime factors as

$N = a^m \times b^n \times c^p \ldots$

Where a, b, c are prime numbers, are

$(1+m)(1+n)(1+p)\ldots$

Example: Find the total number of factors of 240.

Solution:

$240 = 2 \times 2 \times 2 \times 2 \times 3 \times 5 = 2^4 \times 3^1 \times 5^1$

Comparing with the standard format for the number N, we obtain

$a = 2, b = 3, c = 5, m = 4, n = 1, p = 1$

∴ the total number of factors of this number including 1 and itself are

$= (1+m)(1+n)(1+p)\ldots$

$= (1+4) \times (1+1) \times (1+1) = 5 \times 2 \times 2 = 20$

Factors of 240 = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30, 40, 48, 60, 80, 120, 240

(Total 20 in number)

SUM OF FACTORS

The sum of factors of the number N (as defined above) is given by the formula

$$\frac{\left(a^{m+1} - 1\right)\left(b^{n+1} - 1\right)\left(c^{p+1} - 1\right)\ldots}{(a-1)(b-1)(c-1)\ldots}$$

Where a, b, c...., m, n, p... retain the same meaning.

Example:

Find the sum of all the factors of 240.

Solution: The sum by the above formula

$$= \frac{\left(2^5 - 1\right)\left(3^2 - 1\right)\left(5^2 - 1\right)\ldots}{(2-1)(3-1)(5-1)\ldots} = \frac{31 \times 8 \times 24}{1 \times 2 \times 4} = 744$$

Sum will be

1 + 2 + 3 + 4 + 5 + 6 + 8 + 10 + 12 + 15 + 16 + 20 + 24 + 30 + 40 + 48 + 60 + 80 + 120 + 240 = 744

The number of ways in which a composite number N may be resolved into two factors

$$= \frac{1}{2}(p+1)(q+1)(r+1)\ldots \text{ if } N = a^p b^q c^r \text{ is not a}$$

perfect square and

$$= \frac{1}{2}\left[(p+1)(q+1)(r+1)\ldots + 1\right]$$

if N is a perfect square.

The number of ways in which a composite number can be resolved into two factors which are prime to each other.

If $N = a^p b^q c^r \ldots$ then the number of ways of resolving N into two factors prime to each

other is $= \frac{1}{2}(1+1)(1+1)(1+1)\ldots = 2^{n-1}$

where n is the number of different prime factors of N.

If P is a prime number, the coefficient of every term in the expansion of $(a + b)^p$ except the first and the last is divisible by P.

Example: In how many ways can the number 7056 be resolved into two factors?

Solution:

$N = 7056 = 3^2 \times 2^4 \times 7^2 = 3^p \times 2^q \times 7^r$

Note: N is perfect square. Number of ways in which it can be resolved into two factors

$= 1/2\{(p+1)(q+1)(r+1) + 1\}$

$$=\frac{1}{2}2\{(2+1)(4+1)(2+1)+1\}=\frac{1}{2}\times46=23$$

Example: Find the number of ways in which N=2778300 can be resolved into the factors prime to each other.

Solution:

$N = 2^2 \times 3^4 \times 5^2 \times 7^3$

The required number is the same as the number of ways of resolving $2\times3\times5\times7$ into two factors which is equal to $1/2(1+1)(1+1)(1+1)(1+1)=2^3=8$.

HCF OF NUMBERS

It is the **highest common factor** of two or more given numbers. It is also called GCF (greatest common factor).

e.g. HCF of 10 and 15=5, HCF of 55 and 200=5, HCF of 64 and 36=4 etc.

Example: Find the HCF of 88, 24 and 124.

Solution:

$88 = 2\times44 = 2\times2\times22 = 2\times2\times2\times11 = 2^3\times11^1$

$24 = 2\times12 = 2\times2\times6 = 2\times2\times2\times3 = 2^3\times3^1$

$124 = 2\times62 = 2\times2\times31 = 2^3\times31^1$

$\Rightarrow \text{HCF} = 2^2 = 4$

DIVISION METHOD TO FIND HCF

By division method, we start with the two numbers and proceed as shown below, till the remainder becomes zero.

Example: Find the HCF of 12 and 48.

Solution:

```
12)48(4
   48
   00
```

HCF =12.

Here, when the remainder is not zero, divide the previous divisor with that remainder and proceed in the same way until you get the remainder as zero. The last divisor is the required HCF.

Example: Find the HCF of 10 and 25.

Solution:

```
10)25(2
   20
   5)10(2
     10
     00
```

HCF =5.

If there are more than two numbers, we will repeat the whole process with the HCF obtained from two numbers as the divisor and so on. The last divisor will then be the required HCF of the numbers.

Example: Find the HCF of 10, 25 and 30.

Solution:

We can find the HCF of 10 and 25 i.e. 5. Now we have to find the HCF of 5 and 30 which is 5. So, the HCF of 10, 25 and 30 is 5.

Note: If we have to find the greatest number that will exactly divide p, q and r, then required number = HCF of p, q and r.

Example: Find the greatest number that will exactly divide 65, 52 and 78.

Solution:

Required number = HCF of 65, 52 and 78 = 13

If we have to find the greatest number that will divide p, q and r leaving remainders a, b and c respectively, then the required number

= HCF of (p - a), (q - b) and (r - c)

Example: Find the greatest number that will exactly divide 65, 52 and 78 leaving remainders 5, 2 and 8 respectively.

Solution: Required number

= HCF of (65 - 5), (52 - 2) and (78 - 8) = HCF of 60,50 and 70 =10.

If we have to find the greatest number that will divide p, q and r leaving remainders the same remainder in each case, then required number = HCF of the absolute values of
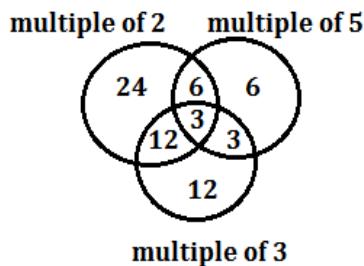
(p - q), (q - r) and (r - p).

Example: Find the greatest number that will divide 65, 81 and 145 leaving the same remainder in each case.

Solution: Required number
 = HCF of (81-65),(145-81) and (145-65)
= HCF of 16,64 and 80=16

Example: How many numbers below 90 and other than unity exist, such that the HCF of that number and 90 is unity?
Solution:

$90 = 3^2 \times 2 \times 5$

multiple of 2   multiple of 5

multiple of 3

Numbers of multiples of 2 = 45
Numbers of multiples of 3 = 30
Numbers of multiples of 5 = 8
Numbers of multiples of 2 & 5 = 9
Numbers of multiples of 2 & 3 = 15
Numbers of multiples of 3 & 5 = 6
Numbers of multiples of 2,3 & 5 = 3
$\therefore$ Total $= (24+6+12)+(12+3+6+3)$

$= 42 + 24 = 66$

$\therefore$ 24 numbers (including unity) compared with 90 have only '1' as common factor. Hence required result is 24-1=23.

Example: A riot hit state was deployed with 3 different regiments of black commandos, each having 115, 161 and 253 commandos respectively. Each regiment has commandos domicile of one particular state only and each regiment came from different states. The Commander-in-Charge further plans to split the regiments into smaller groups but in such a way that all groups have same number of commandos and each group has commandos belonging to a particular state only. What is the minimum number of groups that can be formed?
Solution:
$115 = 23 \times 5; 161 = 23 \times 7; 233 = 23 \times 11$
$\therefore HCF = 23$
Hence minimum number of groups that can be formed = 23.

LCM OF NUMBERS

Lowest common multiple of two or more numbers is the smallest number which is exactly divisible by all of them.
e.g. LCM of $5, 7, 10 = 70$,
LCM of $2, 4, 5 = 20$,
LCM of $11, 10, 3 = 330$.

FACTORIZATION METHOD TO FIND LCM

To find the LCM of the given numbers, first resolve all the numbers into their prime factors and then the LCM is the product of highest powers of all the prime factors.

Example: Find the LCM 40, 120 and 380.
Solution:
$40 = 4 \times 10 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5^1$;
$120 = 4 \times 30 = 2 \times 2 \times 2 \times 5 \times 3 = 2^3 \times 5^1 \times 3^1$;
$380 = 2 \times 190 = 2 \times 2 \times 95 = 2 \times 2 \times 5 \times 19 = 2^2 \times 5^1 \times 19^1$

$\Rightarrow$ Required LCM $= 2^3 \times 5^1 \times 3^1 \times 19^1 = 2280$

DIVISION METHOD TO FIND LCM

Write the given numbers separately. Then divide by 2 and write the result below the numbers divisible by 2. If it is not divisible by 2 then try with 3, 5, 7…. Etc. Leave the others (those not divisible) untouched. Do the same for all steps till you get 1 as the remainder in each column.

Example: Find the LCM 6, 10, 15, 24 and 39.
Solution:

2	6	10	15	24	39
2	3	5	15	12	39
2	3	5	15	6	39
3	3	5	15	3	39
5	1	5	5	1	13
13	1	1	1	1	13
					1

LCM $= 2 \times 2 \times 2 \times 3 \times 5 \times 13 = 1560$
Note: If we have to find the least number which is exactly divisible by p, q and r, then the required number = LCM of p, q and r.

Example: Find the least number that is exactly divisible by 6, 5 and 7.

Solution: Required number = LCM of 6, 5 and 7 = 210.

If we have to find the least number which when divided by p, q and r leaves the remainders a, b and c respectively, then if it is observed that (p-a)=(q-b)=(r-c)=K(say), then the required number =(LCM of p,q and r)-(K)

Example: Find the least number which when divided by 6, 7 and 9 leaves the remainders 1, 2 and 4 respectively.

Solution:
Here, (6-1) = (7-2) = (9-4) = 5
Required number =(LCM of 6,7 and 9)-5
= 126 – 5 = 121.

If we have to find the least number which when divided by p, q and r leaves the same remainder 'a' each case, then required number
=(LCM of p,q and r) + a.

Example: Find the least number which when divided by 15, 20 and 30 leaves the remainders 5 in each case.

Solution:
Required number = (LCM of 15,20 and 30) + 5.
= 60 + 5 = 65.

Note:
LCM × HCF=product of two numbers. (Valid only for "two")

Example: Find the LCM of 25 and 35 if their HCF is 5.

Solution:
$$LCM = \frac{Product\ of\ the\ number}{HCF} = \frac{25 \times 35}{5} = 175$$

Example: By using the rule that LCM = Product of two numbers ÷ HCF, find LCM of 26 and 442.

Solution: HCF of the two can be found as
26 = 13 × 2, 442 = 2 × 17 × 13 ⟹ HCF = 26⟹ LCM = 26 × 442/26 = 442

HCF & LCM OF DECIMALS

Example: Calculate the HCF and LCM of 0.6, 0.9, 1.5, 1.2 and 3.

Solution: The numbers can be written as 0.6, 0.9, 1.5, 1.2 and 3.0
Consider them as 6,9,15,12,30 ⟹ HCF=3
⟹Required HCF=0.3 and LCM=180.
⟹Required LCM=18.0

Note: If the first number in the above example had been 0.61, then the equivalent integers would have been 61, 90, 150, 120 and 300 etc.

HCF & LCM OF FRACTIONS

HCF of fractions = HCF of numerators ÷ LCM of denominators
LCM of fractions = LCM of numerators ÷ HCF of denominators

Example: Find the HCF and LCM of : $\frac{5}{16}, \frac{3}{4}$ and $\frac{7}{15}$.

Solution:
$$HCF = \frac{(HCF\ of\ 5,3,7)}{(LCM\ of\ 16,4,15)} = \frac{1}{240}$$
$$LCM = \frac{(LCM\ of\ 5,3,7)}{(HCF\ of\ 16,4,15)} = \frac{105}{1} = 105$$

CYCLICITY OF UNIT DIGIT

The concept of cyclicity is used to identify the unit digit of any power. The unit digit in any operation depends on only the unit digit of the numbers used.

For instance the units digit of different powers
of 2 are as given below:

2^1	2^2	2^3	2^4	2^5	2^6
2	4	8	6	2	4

As can be seen from the above table the units digit of 2^5 is same as 2^1, and that of 2^6 is same as that of 2^2 which implies that the units digit of 2 is getting repeated after a cycle of 4. Similarly the units digit of 3 for different powers of 3 are 3,9,7,1,3,9,7 and 1. Similarly different numbers have different cyclicity which can be used to ascertain the units digit of bigger numbers.

LINEAR EQUATIONS

An equation where the maximum power of any variable is unity (one) is a **linear equation**. A linear equation is of the form:
AX + BY + C = O
Where A and B are co-efficient and C is a constant

The equation is called **LINEAR** because the graph of the equation on the X-Y Cartesian plane is a straight line. The sets of values of X & Y satisfying any equation(s) are called its solution(s).

Consider the equation $2x + y = 4$. Now, if we substitute $x = -2$ in the equation, we obtain 2. (-2) + y = 4 or-4 + y = 4 or y = 8. Hence (-2, 8) is a solution. If we substitute $x = 3$ in the equation, we obtain 2.3 + y = 4 or 6 + y = 4 or y =-2. Hence (3, -2) is a solution. The following table lists six possible values for x and the corresponding values for y, i.e. six solutions of the equation.

X	-2	-1	0	1	2	3
y	8	6	4	2	0	-2

If we plot the solutions of the equation $2x + y = 4$ which appear in the table above then we see that they all lie on the same line. We call this line the graph of the equation since it corresponds precisely to the solution set of the equation.
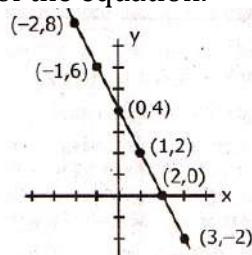
TWO LINEAR EQUATIONS IN TWO UNKNOWNS

We now consider a system of two linear equations, in two unknowns x and y:
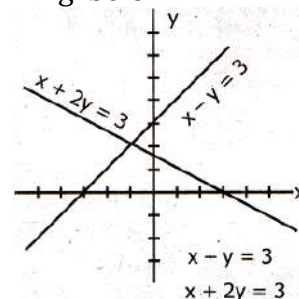$$a_1 x + b_1 y = c_1$$
$$a_2 x + b_2 y = c_2$$

A pair of numbers which satisfies both equations is called a simultaneous solution of the given equations or a solution of the system of equations. There are three cases which can be described geometrically. (Here we assume that the coefficients of x and y in each equation are not both zero.)

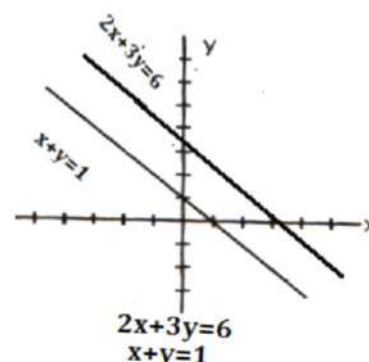1) **The system has exactly one solution:** Here the lines corresponding to the linear equations intersect in one point as shown in fig. below.

The system $a_1 X + b_1 Y = c_1$ and $a_2 X + b_2 Y = c_2$ has a unique solution, if $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$.

2) **The system has no solution:** Here the lines corresponding to the linear equations are parallel as shown in fig. below.
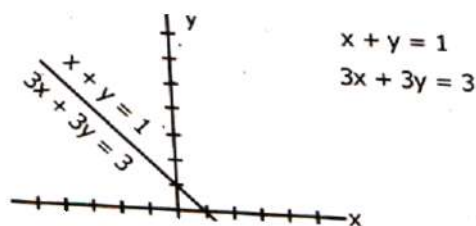

The system $a_1 X + b_1 Y = c_1 \, \& \, a_2 X + b_2 Y = c_2$ has no solution if $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$.

3) **The system has an infinite number of solution:** Here the lines corresponding

to the linear equations coincide as shown in fig. below.

The system $a_1X + b_1Y = c_1$ & $a_2X + b_2Y = c_2$ has infinitely many solution if $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$

SYSTEM OF LINEAR EQUATIONS

Consistent System: A system (of 2 or 3 or more equations taken together) of linear equations is said to be consistent, if it has at least one solution.

Inconsistent System: A system of simultaneous linear equations is said to be inconsistent, if it has no solutions at all.

e.g. X + Y = 9; 3X + 3Y = 8

Clearly there are no values of X & Y which simultaneously satisfy the given equations. So the system is inconsistent.

Example: Find k for which the system 6x - 2y = 3, kx – y = 2 has a unique solution.

Solution: The given system will have a unique solution

if $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$ i.e. $\dfrac{6}{k} \neq \dfrac{-2}{-1}$ or $k \neq 3$.

Example: What is the value of k for which the system x + 2y = 3, 5x + ky =-7 is consistent?

Solution: The given system will be inconsistent if

$\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$ i.e.

if $\dfrac{1}{5} = \dfrac{2}{k} \neq \dfrac{3}{-7}$. Hence, $k = 10$.

SIMULTANEOUS EQUATIONS INVOLVING THREE UNKNOWN QUANTITIES

Method of solving: Suppose we are given three equations containing three unknown quantities X, Y and Z. Mark these equations (1), (2) and (3). Now, from any two equations say (1) and (2), try to eliminate (or get rid of) one unknown quantity, say Z, i.e., to say, multiply (1) and (2) by such suitable number which will make the coefficients of Z in (1) and (2) equal; then add or subtract to cancel Z. Mark this equation (4). After this, take any two equations, say (2) and (3), and from this, eliminate Z in a similar way. Mark this equation (5). Now, solving (4) and (5) by any of the methods given previously, we will find X and Y. Substituting the value of X and Y in any of the equations (1), (2) and (3), we will get the value of Z.

Example: Solve X+Y+Z=6, 2X+2Y+3Z=13, 3X+4Y+5Z=22

Solution:

We have X + Y + Z = 6 ... (1)
2X + 2Y + 3Z = 13 ... (2)
3X + 4Y + 5Z = 22 ... (3)

Multiply (1) by 3 and subtract (2) and we have

3(X + Y + Z) - (2X + 2Y + 3Z) = 18 - 13

or X + Y = 5 ... (4)

Again, multiply (1) by 5 and subtract (3), then

5(X + Y + Z) - (3X + 4Y + 5Z) = 30 - 22

or 2X + Y = 8 ... (5)

Subtracting (4) from (5), we have X = 3. Hence, from (4), Y = 2.

Substituting these values of X and Y in (1), we have 3+2+Z=6 or Z=1.

3 RATIO, PROPORTION & VARIATION

RATIO

The comparison between two quantities of the same kind of unit is the ratio of one quantity to another. Two quantities of different kinds cannot be compared. Thus, there is no relation between 20 rupees and 20 men. The ratio of a and b is usually written as $a : b$ or $\dfrac{a}{b}$.

ANTECEDENT AND CONSEQUENT

In the ratio a : b, a is called the antecedent (the first term) and b is called the consequent (the second term)

Note:

The ratio of two numbers a and b, written as a : b, is the fraction $\dfrac{a}{b}$ provided $b \neq 0$. Ratio is always reduced to its simplest form. Thus $a : b = \dfrac{a}{b}, b \neq 0$. if $a = b \neq 0$, the ratio is 1 : 1 or 1/1=1

1) The ratio of $4 \text{ to } 6 = 4 : 6 = \dfrac{4}{6} = \dfrac{2}{3}$

2) $\dfrac{2}{3} : \dfrac{4}{5} = \dfrac{2/3}{4/5} = \dfrac{4}{6}$

3) $5x : \dfrac{3y}{4} = \dfrac{5x}{3y/4} = \dfrac{20x}{3y}$

COMPOUNDED RATIO

When two or more ratios are multiplied term wise, the ratio thus obtained is called their compounded ratio. For the ratios a : b and c : d, the compounded ratio is ac : bd.

Example: What is the compounded ratio, for 2 : 3 and 4 : 5?
Solution: The compounded ratio is 2×4:3×5 or 8:15.

DUPLICATE RATIO

It is the compounded ratio of two equal ratios. Thus the duplicate ratio of $a : b$ is a^2 / b^2 or $a^2 : b^2$

Example: Find the duplicate ratio of 4: 5.
Solution: The duplicate ratio of 4 : 5 is 16:25.

TRIPLICATE RATIO

It is the compounded ratio of three equal ratios. Thus the triplicate ratio of $a : b$ is a^3 / b^3 or $a^3 : b^3$

Example: Find the triplicate ratio of 4: 5.
Solution: The triplicate ratio of 4:5 is 64:125.

SUB-DUPLICATE RATIO

For any ratio a : b its sub-duplicate ratio is defined as $\sqrt{a} : \sqrt{b}$.

Example: Find the sub-duplicate ratio of16:25.
Solution: Sub-duplicate ratio of 16:25 is $\sqrt{16} : \sqrt{25}$, i.e. 4 :5.

SUB-TRIPLICATE RATIO

For any ratio a : b, its sub-triplicate ratio is defined as $\sqrt[3]{a} : \sqrt[3]{b}$.

Example: Find the sub-triplicate ratio of 27:64.
Solution: Sub-triplicate ratio of 27:64 is $\sqrt[3]{27} : \sqrt[3]{64}$ i.e. 3 :4.

COMPARING RATIOS

To compare two ratios, we express them as fractions and then compare.

Example: Which is greater 3:4 or 4 : 5?
Solution:
$3 : 4 = \dfrac{3}{4}$ and $4 : 5 = \dfrac{4}{5}$.

$$\frac{3}{4} = \frac{3\times 5}{4\times 5} = \frac{15}{20}$$

$$\frac{4}{5} = \frac{4\times 4}{5\times 4} = \frac{16}{20}$$

Since $\frac{16}{20} > \frac{15}{20} = $ or, $\frac{4}{5} > \frac{3}{4}$,

So, 4 : 5 > 3 : 4 .

Note: A ratio is said to be in its simplest form if the HCF of the antecedent and the consequent is 1.

Example: Divide 2400 in the ratio 3 : 5.
Solution:
The first part is 3 units and the second part is 5 units. The total of both the parts = 3 units + 5 units = 8 units.
Here, 8 units = 2400,
So, 1 unit = 2400/8 = 300.
The first part = 3 units = 3 × 300 =900.
The second part = 5 units = 5 × 300 =1500.

Example: A sum of money is divided between Vinod and Lokesh in the ratio of 3:7. Vinod gets Rs. 240. What does Lokesh get?
Solution:
Vinod gets 3 units = Rs. 240.
So, 1 unit = 240/3 = 80.
Therefore, 7 units = 7 × 80 =560.
Thus, Lokesh gets Rs. 560.

PROBLEMS LEADING TO THE APPLICATION OF RATIOS

Example: The ratio of the number of boys to the number of girls in a school of 1638 is 5: 2. If the number of girls increased by 60, then what must be the decrease in the number of boys to make the new ratio of boys to girls as 4 : 3?
Solution:

Number of boys $= \frac{5}{7} \times 1638 = 1170$

Number of girls $= \frac{2}{7} \times 1638 = 468$

Number of girls after increase
$= 468 + 60 = 528$
Total number of boys as per new ratio

$= 528 \times \frac{4}{3} = 704$

∴ The number of boys to be decreased
=1170-704=466.

Example: If a : b = 3 : 4 and b : c = 6 : 13, then find a : b : c .
Solution: The best way to solve such questions is to make b common in the two ratios.
Thus, we can write a : b = 9 : 12 and b : c = 12 : 26. Now that b is equal in both the ratios, we can write the same as
a : b : c
9 : 12
12 : 26
Thus, we can write $a : b : c$ = 9 : 12 : 26.
Using formula directly, we can get
a: b: c=(3×6): (4×6) : (4×13)=9: 12: 26

PROPORTION

A statement expressing the equality of two ratios is called a proportion, i.e. if
$a : b = c : d$

Or $\frac{a}{b} = \frac{c}{d}$ then a, b, c & d are said to be in proportion. Here a and d are called the **extremes** and b and c are called the **means.** Also d is called the fourth proportional to a, b and c. Thus, we can write a : b = c : d,
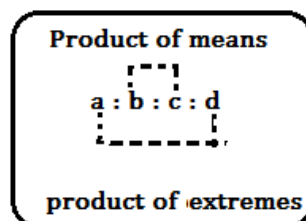a is the **first proportional,**
b is the **second proportional,**
c is the **third proportional,**
d is the **fourth proportional.**
For example, 5:10= 22 : 44 is in proportion. Each quantity in a proportion is called a term. The first and the last terms are known as the extremes while the second and the third term are called the means. For the four quantities to be in proportion,

Product of means
a : b : c : d
product of extremes

Product of means = Product of extremes.

CONTINUED PROPORTION

Three or more quantities are said to be in continued proportion, when the ratio of the first and the second is equal to ratio of the second and the third and so on. Thus a, b, c are in continued proportion if

$$a : b :: b : c \quad \text{i.e., } \frac{a}{b} = \frac{b}{c}.$$

Similarly, a, b, c, d, … are in continued proportion if,

$$a : b :: b : c :: c : d \dots, \quad \text{i.e., } \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = \dots,$$

Proportions are equations and can be transformed using procedures for equations. Some of the transformed equations are used frequently and are called the **laws of proportion.**

If a : b = c : d, then

ad = bc {Product of extremes = Product of means}

1) $\frac{b}{a} = \frac{d}{c}$ (Invertendo)

2) $\frac{a}{c} = \frac{b}{d}$ (Alternendo)

3) $\frac{a+b}{b} = \frac{c+d}{d}$ (Componendo)

4) $\frac{a-b}{b} = \frac{c-d}{d}$ (Dividendo)

5) $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ (Componendo & Dividendo)

In the proportion a : b = b : c, c is called the **third proportional** to a and b, and b is called a **mean proportional** between a and c. Thus, $b^2 = ac$. This is known as **continued proportion.**

Example: Find the fourth proportional to $12a^2, 9a^2b$ and $6ab^2$.

Solution: Let x be the fourth proportional, then

$$\frac{12a^2}{9a^2b} = \frac{6ab^2}{x} \Rightarrow x = \frac{6ab^2 \cdot 9a^2b}{12a^2} = \frac{9}{2}ab^3$$

Example: Find the mean proportional between $9a^2b$ and $25b^3$.

Solution: Let x be the mean proportional.

$$\therefore \frac{9a^2b}{x} = \frac{x}{25b^3} \Rightarrow x^2 = 9a^2b \cdot 25b^3 \Rightarrow x = \pm 15ab^2$$

VARIATION

Most of us would still remember statements like "The distance travelled varies directly as the speed of the vehicle." These and similar statements have precise mathematical meanings and they represent a specific type of function called **variation functions.**

The three general types of variation functions are direct variation, inverse variation and joint variation.

DIRECT VARIATION

If two quantities X & Y are related such that any increase or decrease in 'Y' produces a proportionate increase or decrease in 'X' or vice versa, then the two quantities are said to be in direct proportion.

X is directly proportional to Y is written as $X \propto Y$ or $X = KY$.

In other words $X : Y = X / Y = K$. Here K is a constant whose value for a particular variation is same.

Consider $X_1 = KY_1$ and $X_2 = KY_2$, dividing the two we get $\frac{X_1}{X_2} = \frac{Y_1}{Y_2}$.

Thus, the chances of your success in the test are directly proportional to the number of hours of sincere work devoted every day.

Example: If $X \propto Y$ and $x = 9$ when $y = 30$, then find the relation between x and y. Find x when $y = 7\frac{1}{2}$ and y when x = 6.

Solution:

Let $x = ky$, then $9 = k(30)$, $k = \dfrac{3}{10}$, i.e. $x = \dfrac{3}{10}y$.

When $y = 7\dfrac{1}{2}$, $x = \dfrac{3}{10}\left(7\dfrac{1}{2}\right) = 2\dfrac{1}{4}$.

When $x = 6$, $x = \dfrac{3}{10}y$ $\therefore y = 20$.

Example: Different sizes of the car have different models. The weight of a car model varies directly as the cube of its length. The weight of a car model of length 3 cm is 10 gm. What is the weight of a car model of length 12 cm?

Solution: Let W gm be the weight of a car model and L cm be its length.

$\therefore W \propto L^3$ or $W = kL^3$ (where k is a constant)

$\Rightarrow 10 = k(3)^3$. $\Rightarrow k = \dfrac{10}{27}$ i.e. $W = \dfrac{10}{27}L^3$

When $L = 12$, $W = \dfrac{10}{27}(12)^3 = 640$ gm.

∴ The required weight is 640 gm.

INVERSE VARIATION

Here two quantities X & Y are related such that, any increase in X would lead to a decrease in Y or any decrease in X would lead to an increase in Y. Thus the quantities X & Y are said to be inversely related and X is inversely proportional to Y is written as $X \propto 1/Y$ or $X = k/Y$ or $XY = k$ (Constant)

Thus, $X_1Y_1 = X_2Y_2$

Or the product of two quantities remains constant.

Thus, the chances that you will be able to cheat in a test are inversely proportional to the smartness of the invigilator.

Example: If y varies inversely as x, and $y = 3$ when $x = 2$, then find x when $y = 21$.

Solution:

$y \propto \dfrac{1}{x}$ or $y = \dfrac{k}{x}$ (where k is a constant)

then $3 = \dfrac{k}{2}$, $k = 6$ i.e. $y = \dfrac{6}{x}$

When $y = 21$, $21 = \dfrac{6}{x}$, $x = \dfrac{2}{7}$

JOINT VARIATION

a) A varies jointly as B and C and is denoted by $A \propto BC$ Or $A = kBC$ (where k is a constant).

b) A varies directly as B and inversely as C and is denoted by $A \propto \dfrac{B}{C}$ Or $A = \dfrac{kB}{C}$ (where k is a constant).

c) If A varies as B when C is constant, and if A varies as C when B is constant then A varies as BC when B and C both vary. $\therefore A \propto BC$ Or $A = kBC$ (where k is a constant).

Example Given, a varies as b when c is constant, and as c^2 when b is constant. If $a = 770$, then b=15 & c=7, and when c=3 & a=132 find b.

Solution:

As $a \propto bc^2$ or $a = kbc^2$ (where k is a constant)

$\therefore 770 = k(15)(7)^2$

$\Rightarrow k = \dfrac{22}{21}$ i.e. $a = \dfrac{22}{21}bc^2$. When $c = 3$, $a = 132$

$\therefore 132 = \dfrac{22}{21}(b)(3)^2$ $\therefore b = 14$

Note:

1) If $A \propto B$ and $B \propto C$, then $A \propto C$

2) If $A \propto C$ and $B \propto C$, then $(A \pm B) \propto C$ $\sqrt{(AB)} \propto C$.

3) If $A \propto BC$, then $A/C \propto B$ and $A/B \propto C$.

4) If $A \propto B$ and $C \propto D$, then $AC \propto BD$.

5) If $A \propto B$, then $A^n \propto B^n$.

6 If $A \propto B$ and $A \propto C$, then $A \propto (B - C)$ and $A \propto (B + C)$

7) If $A \propto B$, then $AP \propto BP$ where P is any quantity, constant or variable.

4 PERCENTAGE

PERCENTAGE

"Percent" implies "for every hundred". This concept is developed to make the comparison of fractions easier by equalizing the denominators of all fractions to hundred.

For example, 7/11 as percentage is represented as

$$\frac{7}{11} = \frac{7 \times 100}{11 \times 100} = \frac{(7 \times 100)/11}{100} = \frac{63.63}{100} = 63.63\%$$

Percentage can also be represented as decimal fractions. In such a case it is effectively equivalent to the proportion of the original quantity

For example, 20 % is the same as $\frac{20}{100}$, i.e.

0.2 Since any ratio is also basically a division, each ratio can also be expressed as a percentage. The terms "ratio" and percentage "can be used interchangeably along with the corresponding mention of the denominator being taken as 100

For example: a ratio of $\frac{1}{2}$ can be converted

to a percentage figure as $\frac{1}{2} = \frac{1 \times 50}{2 \times 50} = \frac{50}{100} = 50\%$

Any percentage can be expressed as a decimal fraction by dividing the percentage figure by 100 and conversely, any decimal fraction can be converted to percentage by multiplying it by 100.

Expressing a percentage value as a fraction:

$$X\% = x \text{ out } 100 = \frac{x}{100}$$

So, 75% = 75 out of $100 = \frac{75}{100} = \frac{3}{4}$

Any percentage can be expressed as a decimal fraction by dividing the percentage figure by 100

EXPRESSING DECIMAL AS A PERCENTAGE

Any decimal fraction can be converted into a percentage by multiplying it by 100:

$$0.5 = \frac{0.5 \times 100}{100} = \frac{50}{100} = 50\%$$

Note:
1) When two numbers x and y are given, then one number can be expressed as a percentage of the other, in the following way.

X as a percentage of $y = \frac{x}{y} \times 100$

Y as a percentage of $x = \frac{y}{x} \times 100$

2) x % of y = y% of x

PERCENTAGE INCREASE or DECREASE of a quantity is the ratio expressed in percentage of the actual **INCREASE** or **DECREASE** of the quantity to the original amount of the quantity i.e.,

PERCENTAGE INCREASE

$$= \frac{\text{Actual in crease}}{\text{Original quanity}} \times 100$$

PERCENTAGE DECREASE

$$= \frac{\text{Actual decrease}}{\text{Original quanity}} \times 100$$

For example: If the production of rice went up from 2150 MT in 2005 to 300 MT in 2006 , then the percentage increase in rice production from 2005 to 2006 is calculated as follows:

Actual increase = 300-250 = 50MT
Percentage increase:

$$= \frac{\text{Actual increase from 2005 to 2006}}{\text{Actual production of rice in 2005}} \times 100$$

$$= \frac{50}{250} \times 100 = 20\%$$

1) If the increase on a value of 350 is 15% the new quantity is 1.15 × 350 = 402.5 (where 1.15=1+0.15, 0.15 being the decimal equivalent of 15 %)

2) If the production in 2005 is given as 400 MT and the increase from 2004 to 2005 is given to be 25% then the production in 2004 will be equal to 400/1.25=320 MT (where 1.25=1+0.25, 0.25 being the decimal equivalent of 25%)

3) Similarly, if there is a decrease of 12% on a quantity of 225, then the new quantity will be equal to 225×0.88 (where 0.88=1-0.12, 0.12 being the decimal equivalent of 12%).If the production in 2005 is given as 400MT and it is a decrease of 13% from 2004, then the production in 2004 will be equal to 400/0.87 (where 0.87=1-0.13, 0.13 being the decimal equivalent of 13%).

On the basis of percentage increase, we can write down how many times the old value gives the new value. For example, if the percentage increase is 100%,we can conclude that the new value is 2 times the old value and if the percentage increase is 300% then the new value is 4 times the old value. If the percentage increase is 450% then the new value is 5.5 times the old value. In general if the percentage increase is p% then the new value is $\left(\dfrac{p}{100}+1\right)$ times the old value.

Conversely, if we know how many times the old value gives the new value, we can find out the percentage increase in the old value to get the new value. For example, if the new value is 3 times the old value, the percentage increase in the old value to get the new value is 200%. If the new value is 4.25 times the old value, then the percentage increase is 325%. In general if the new value is k times the old value, then the percentage increase is $(k-1)\times 100\,\%$

WORKED OUT EXAMPLES

Q.1 If 45% of a certain number is 990, then find the value of 54% of that number.

Solution:

Let the number be x

Given, $\dfrac{45}{100}x = 990$

$\Rightarrow x = 2200$

$\therefore$ required value $= \dfrac{54}{100}x = 1188$

Q.2 The ratio of the monthly salaries of A in December 2004 and in January 2005 was $3\dfrac{3}{5}:4\dfrac{1}{2}$. Find the percentage increase in his salary.

Solution:

The ratio of the monthly salaries

$3\dfrac{3}{5}:4\dfrac{1}{2} = \dfrac{18}{5}:\dfrac{9}{2}(18)(2):(9)(5)=4:5$

Let the monthly salary of A in December 2004 =4x

His monthly salary in January 2005 would be=5x. Required percentage increase on his salary

$= \dfrac{5x-4x}{4x}(100)\% = 25\%$

Q.3 There are three numbers. The first and the second numbers are 50% less and 60% less respectively than the third. What percentage of the first number is the second?

Solution:

Let the third number be 100

First number $= 100\left(1-\dfrac{50}{100}\right)=50$

Second number $= 100\left(1-\dfrac{60}{100}\right)=40$

$\therefore$ it is $\dfrac{40}{50}$ th i.e. $\dfrac{4}{5}$ th or 80% of the first number.

Q.4 Ram got 30% in a test and failed by 10 marks .If the pass marks in the test was 70, find the maximum marks in it

Solution:

Let the maximum mark in the test be M.

Ram's mark $= \dfrac{30}{100}M$

Pass mark $= \dfrac{30}{100}M + 10$

$\dfrac{30}{100}M + 10 = 70$ i.e., $M = 200$

Area of rectangle

$= 1.14l \times 1.08b = (1.2312)lb$

Increase in area $= 1.2312lb - lb$

i.e., 0.2312 lb

$\therefore$ Percentage increase $= \dfrac{23.12}{100}lb$

i.e., 23.12%

Q.5 The price of an article is decreased by 20%. By what percentage must the consumption of it be increased in order to retain the expenditure on it?

Solution:

Let the initial price be Rs. 100/gm

Let the initial consumption be 1 gm

Initial expenditure =Rs. 100

New price $= 100\left(1 - \dfrac{20}{100}\right)$

$= Rs.\,80\,/\,gm$

New expenditure =Rs 100

$\therefore$ New consumption $= \dfrac{100}{80}gm$

$= \dfrac{5}{4}gm$

$\therefore$ Consumption must increase by

$\dfrac{\left(\dfrac{5}{4} - 1\right)100\%}{1} = 25\%$

Q.6 The length of a rectangle increases by 14% and the breadth by 8%. What is the consequent percentage increase in area?

Solution:

Let length and breadth of the rectangle be l and b

Area of rectangle =lb

Length is increased by 14%

$\therefore$ New length $= l \times l \times \dfrac{14}{100} = (1 + 0.14l) = 1.14l$

Breadth is increased by 8%

$\therefore$ New breadth $= b + 8\%\,b$

$= b + 0.08\,b = (1.08)b$

PROFIT -LOSS

Suppose a shopkeeper buys an article from a manufacturer. The price at which he buys the article is called the cost price of the article. We write C.P. for cost price.

The shopkeeper sells the article at a price which is generally more than its cost price. The amount for which he sells the article is known as the selling price. We write S.P. for selling price.

The excess of the selling price over the cost price of an article is called the profit or the gain. So,

Gain or Profit = Selling Price – Cost Price

Sometimes, the shopkeeper has to sell the article for a price which is less than its cost price. In this case, the excess of the cost price over the selling price is called the loss. So,

Loss = Cost price – Selling price

Profit or Gain = S. P. – C. P.

Loss = C. P. – S. P.

Profit and loss are always calculated with C. P. as the base.

Marked Price (M.P.): The price at which the article is marked. If the article is sold at this price, then the selling price (S.P.) is equal to marked price (M.P.). But generally some discounts might be available on the marked price, and then marked price less discount will be equal to the selling price.
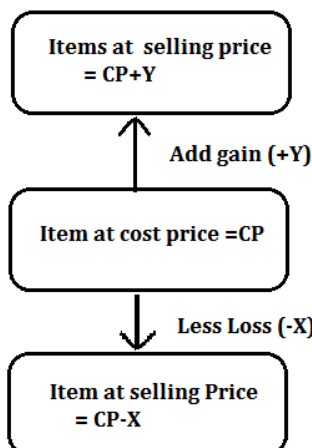
$$1) \ \text{Gain\%} = \frac{\text{Gain}}{\text{CP}} \times 100\% = \frac{Y}{\text{CP}} \times 100\%$$

$$2) \ \text{Loss\%} = \frac{\text{Loss}}{\text{CP}} \times 100\% = \frac{X}{\text{CP}} \times 100\%$$

$$3) \ \text{SP} = \text{CP} \times \frac{100 + \text{Gain\%}}{100} \ \text{or} \ \text{CP} \times \frac{100 - \text{Loss\%}}{100}$$

$$4) \ \text{CP} = \text{SP} \times \frac{100}{100 + \text{Gain\%}} \ \text{or} \ \text{SP} \times \frac{100}{100 - \text{Loss\%}}$$

Note: If C.P. of both the items is same and the percentage loss and gain are equal, then net loss or profit is zero.

Example: Two shirts were having a cost price of Rs. 200 each. One was sold at a profit of 15% and the other was sold at a loss of 15%. Find the net profit or loss.

Solution:

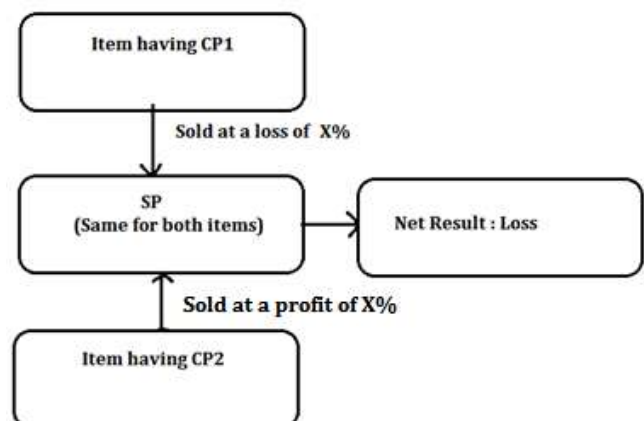$$\text{SP}_1 = 200 \times \frac{(100 + 15)}{100} = \text{Rs.230.}$$

$$\text{SP}_2 = 200 \times \frac{(100 - 15)}{100} = \text{Rs.170.}$$

Total S.P. received $= \text{S.P}_1 + \text{S.P}_2$

$= 230 + 170 = \text{Rs.400.}$

Total C.P. $= 200 + 200 = 400.$

Net result: No profit, No Loss.

Note: If two items are **SOLD,** each at rupees S, one at a gain of X% and other at a loss of X%, then the net result is always a loss.

Example: Two articles were sold at Rs. 100 each. After selling it was realized that on one, a profit of 10% was made, and on the other, a loss of 10% was made. What is the net result?

Solution:

Item 1   Item 2
Selling Price Rs. 100 Rs. 100
Profit %   10 -
Loss %   -10
Cost Price   100/1.1 100/0.9
= 90.90   = 111.11
Total S. P. received = 100+100=Rs. 200
Total C. P. = 90.90+111.11 = Rs. 202.01

$$\text{Loss}\% = \frac{200-202.01}{202.01} \times 100$$

$$= \frac{-2.01}{202.01} \times 100 \approx -1\%$$

The same calculation can be done by a very simple formula

$$\text{Loss}\% = \frac{X^2}{100} \text{ and Value of loss} = \frac{2X^2 S}{100^2 - X^2}.$$

Where X is the percentage profit and loss made on each of the items and S is the common selling price received on both. In case of discounts being offered, the price on which the discount was offered is known as the marked price and the price that is finally received is known as the selling price.

Example: A merchant purchases an item for Rs. 500. He marks the item at a price of Rs. 700 but allows a discount of 10% on cash payment. What is the total profit in terms of amount and percentage made by the merchant?

Solution:
C.P. = Rs. 500, M. P. = Rs. 700.

Hence $\text{S.P.} = 700\left(1 - \frac{10}{100}\right) = \text{Rs.630}$.

Thus, profit = Rs. 630 - Rs. 500 = Rs. 130.
Profit %=(130/500)×100=26%.
If a trader uses a false scale for selling his goods, then the overall gain made by him in this process will be

$$\text{Gain}\% = \left[\frac{\text{Error}}{\text{True Value} - \text{Error}} \times 100\right]$$

Example: A milkman claims to sell milk at the cost price but uses a measure of 800 ml instead of a litre. Find the net profit made by him.
Solution: Using the formula given above

$$\text{Gain}\% = \left[\frac{200}{1000-200} \times 100\right] = \frac{200}{800} \times 100 = 25$$

If a tradesman defrauds (by means of a false balance or otherwise) to the tune of X% in buying and also defrauds to the tune of X% in selling, his overall percentage gain will be $\left[\frac{(100+\text{commongain}\%)^2}{100} - 100\right]\%$

Example: A trader defrauds the seller by 10% when he purchases goods from him, and while selling the same to a customer, he defrauds once again by 10%. Find the net gain made by the trader.
Solution: The required answer is

$$\left[\frac{(100+10)^2}{100} - 100\right]\% = \frac{12100}{100} - 100 = 121 - 100 = 21\%$$

If a tradesman defrauds (by means of a false balance or otherwise) to the tune of X% in buying and also defrauds to the tune of Y% in selling, his overall percentage gain will be $\left[\frac{(100+X\%)(100+Y\%)}{100} - 100\right]\%$

Example: A milkman defrauds by means of a false measure to the tune of 20% in buying and also defrauds to the tune of 25% in selling. Find his overall % gain.
Solution: The milkman defrauds 20% in buying and also defrauds 25% in selling, so his overall % gain will be

$$\left[\frac{(100+20\%)(100+25\%)}{100} - 100\right]\% = 50\%$$

If selling price of X articles is equal to the cost price of Y articles, then the net profit percentage is given by $\frac{Y-X}{X} \times 100$

Example: The cost price of 20 pens is equal to the selling price of 25 pens. What is the net loss percentage?
Solution: Here, cost price of 20 pens = selling price of 25 pens. So the net loss percentage $= \frac{20-25}{25} \times 100 = -20\%$.
Here minus sign indicates the loss.

Example: Bhuvan, a fruit seller bought bananas at the rate of Rs. 5 a dozen. He sold 2 bananas for Rs.1. Find his net profit percentage?

Solution: Here, cost price of a dozen= Rs. 5. Also, selling price of 10 bananas = Rs. 5. Since, selling price of 10 bananas is equal to the cost price of 12 bananas, so the net profit percentage $= \dfrac{12-10}{10} \times 100 = 20\%$

PARTNERSHIP

In case of the partnership business (where more than one person is involved in the business), if the period of investment is the same for each partner, then the profit or loss is divided in the ratio of their investments.

If X and Y are partners in a business, then

$\dfrac{\text{Investment of X}}{\text{Investment of Y}} = \dfrac{\text{Profit of X}}{\text{Profit of Y}}$ or

$\dfrac{\text{Investment of X}}{\text{Investment of Y}} = \dfrac{\text{Loss of X}}{\text{Loss of Y}}$

Example: A and B together invested Rs. 12000 in a business. At the end of the year, out of a total profit of Rs. 1800, A's share was Rs. 750. What was the investment of A?

Solution: Since profits are shared in the ratio of their investments

$\therefore \dfrac{\text{A's investment}}{\text{B's investment}} = \dfrac{\text{Profit share of A}}{\text{Profit share of B}}$

(Money invested by A & B for the same period)

$= \dfrac{750}{1800-750} = \dfrac{750}{1050} = \dfrac{5}{7}$

$\therefore$ Investment of $A = \dfrac{5}{5+7} \times 12000 = \text{Rs.5000}$

Example: In a business A, B and C invested Rs.380, Rs. 400 & Rs. 420 respectively. Divide a new profit of Rs. 180 among the partners.

Solution:

A's Profit: B's Profit: C's Profit

= A's investment: B's investment: C's investment

=A's investment: B's investment: C's investment

=380:400:420 =19:20:21

Profit share of $A = \dfrac{19}{60} \times 180 = \text{Rs.}57.$

Profit share of $B = \dfrac{20}{60} \times 180 = \text{Rs.}60.$

Profit share of $C = \dfrac{21}{60} \times 180 = \text{Rs.}63.$

Example: If the partners invest different amounts and for different period of time, then the profits at the end of the year are shared in the ratio of products of (Investment x time period) calculated for each partner.

A started a business with a capital of Rs. 10000. Four months later, B joined him with a capital of Rs. 5000. What is the share of A in a total profit of Rs. 2000 at the end of the year?

Solution:

$\dfrac{\text{Profit of A}}{\text{Profit of B}} = \dfrac{\text{Amount} \times \text{No.of months}}{\text{Amount} \times \text{No.of months}}$

$= \dfrac{10000 \times 12}{5000 \times 8} = \dfrac{3}{1}.$

$\therefore$ profit share of $A = \dfrac{3}{3+1} \times 2000 = \text{Rs.}1500.$

Example: A, B and C enter into a partnership. A contributes Rs. 320 for 4 months, B contributes Rs. 510 for 3 months and C contributes Rs. 270 for 5 months. If the total profit is Rs. 208, then find the profit share of each of the partners.

Solution:

A's Profit : B's Profit : C's Profit

$= 320 \times 4 : 510 \times 3 : 270 \times 5$

$= 1280 : 1530 : 1350 = 128 : 153 : 135$

$\therefore$ profit of $A = \dfrac{128}{128+153+135} \times 208$

$= \dfrac{128}{416} \times 208 = \text{Rs.}64$

$\therefore$ profit of $B = \dfrac{153}{128+153+135} \times 208$

$= \dfrac{153}{416} \times 208 = \text{Rs.}76.50$

$\therefore$ profit of $C = \dfrac{135}{128+153+135} \times 208$

$= \dfrac{135}{416} \times 208 = \text{Rs.}67.50$

6 SIMPLE & COMPOUND INTEREST

If I borrow a certain sum of money for a certain period from a money lender, I am expected to pay a certain extra sum of money at a fixed rate for the use of the money borrowed. The extra sum thus paid is called **Interest.** The money borrowed is named the **Principle** and sum of interest & principle together is called the **AMOUNT.**
The interest expressed as a percentage of the principle for a period of one year is called the Rate percent per annum. The words per annum are generally omitted. When we say Rate=5%", we mean 5% per annum.

SIMPLE INTEREST (S.I.)

When the interest is paid as it falls due, i. e. at the end of every period (e.g. yearly, half yearly or quarterly), the principle is said to be lent or borrowed at **Simple Interest.**
If
P = Principle,
R = Rate per annum,
T = Time in years,
SI = Simple Interest,
A = Amount

$$SI = \frac{PRT}{100}$$

$$A = P + SI = P\left[1 + \frac{RT}{100}\right]$$

Example: If Rs. 650 amounts to Rs. 790 in 4 years, then what sum of money will it amount to in 7 years at the same rate of interest?
Solution:

$$SI = Rs.\left(790 - 650\right) = Rs.140. \ Also, S.I. = \frac{PRT}{100}$$

$$\Rightarrow 140 = \frac{650 \times \left(R\right) \times \left(4\right)}{100} \Rightarrow R = \frac{140 \times 100}{650 \times 4} = \frac{70}{13}$$

$$Amount = P\left[1 + \frac{RT}{100}\right] = 650\left[1 + \frac{70 \times 7}{13 \times 100}\right]$$

$$= 650\left[1 + \frac{490}{1300}\right] = Rs.895.$$

Short cut: You can see that Rs. 140 is earned in 4 years
$\Rightarrow$ Rs.35 is earned in 1 year $\Rightarrow$ Rs.35 $\times$ 7
= Rs. 245 will be earned in 7 years etc.

COMPOUND INTEREST (C. I.)

When the interest, as it becomes due, is added to the principle and the interest for the next period is calculated on the new principle, then the money is said to be lent or borrowed at **Compound Interest.**
$\Rightarrow$First year's Principle + First year's Interest= Second year' s principle .
If P = Principle,
A = Amount in n years,
R = Rate of Interest per annum, then

$$A = P\left[1 + \frac{R}{100}\right]^{n}, \text{ interest payable annually}$$

$$A = P\left[1 + \frac{R'}{100}\right]^{n'}$$

interest payable half-yearly where

$$R' = \frac{R}{2}, n' = 2n$$

$$A = P\left[1 + \frac{R}{400}\right]^{4n}, \text{ interest payable quarterly}$$

$$\left[1 + \frac{R}{400}\right] \text{ is the yearly growth factor;}$$

$$\left[1 - \frac{R}{400}\right] \text{ is the yearly decay factor or}$$

depreciation factor.

Note:

1) When time is fraction of a year, say $4\frac{3}{4}$, years then,

$$Amount = P\left[1 + \frac{R}{400}\right]^{4} \times \left[1 + \frac{\frac{3}{4}R}{100}\right]$$

2) $CI = \text{Amount} - \text{Prinicipal} = P\left[\left(1+\dfrac{R}{400}\right)^n - 1\right]$

3) When Rates are different for different years, say $R_1, R_2, R_3\%$ for $1^{st}, 2^{nd}$ & 3rd years respectively, then,

$\text{Amount} = P\left[1+\dfrac{R_1}{100}\right]\left[1+\dfrac{R_2}{100}\right]\left[1+\dfrac{R_3}{100}\right]$

In general, interest is considered to be SIMPLE unless otherwise stated.

Example: A certain sum of money at C.I. amounts to Rs. 811.25 in 2 years and to Rs. 843.65 in 3 years. Find the sum of money.

Solution:

Since, $A = P\left[1+\dfrac{R}{100}\right]^n$

$\Rightarrow 811.25 = P\left[1+\dfrac{R}{100}\right]^2 \qquad$ ... (1) and

$\Rightarrow 843.65 = P\left[1+\dfrac{R}{100}\right]^3 \qquad$ ... (2)

On dividing (2) by (1), we get:

$\dfrac{843.65}{811.25} = 1+\dfrac{R}{100}$

$\Rightarrow 1.04 = 1+\dfrac{R}{100} \Rightarrow R = 4$

Now, putting R = 4 into (1), we get

$\Rightarrow 811.25 = P\left[1+\dfrac{4}{100}\right]^2 \Rightarrow P = 750$

$\Rightarrow$The sum of money is Rs.750

EQUAL ANNUAL INSTALLMENT TO PAY THE DEBT (BORROWED) AMOUNT

Let, the value of each equal annual installment = Rs. a.
Rate of interest = R% p.a.
Number of installments per year = n.
Number of years = T.
$\therefore$Total number of installments = n× T.
Borrowed amount = B. Then,

$a\left[\dfrac{100}{100+R}+\left(\dfrac{100}{100+R}\right)^2 \ldots+\left(\dfrac{100}{100+R}\right)^{n\times T}\right] = B$

Example: What annual installment will be required to repay a borrowed amount of Rs.1,32,400 in 3 years at 10% per annum compounded annually?

Solution: Let each annual installment be Rs. a.
By using the formula,

$132400 = a\left[\dfrac{100}{100+10}+\left(\dfrac{100}{100+10}\right)^2+\left(\dfrac{100}{100+10}\right)^3\right]$

$\Rightarrow 132400 = a\left[\dfrac{10}{11}+\left(\dfrac{10}{11}\right)^2+\left(\dfrac{10}{11}\right)^3\right]$

$\Rightarrow 132400 = a\times\dfrac{10}{11}\left[1+\dfrac{10}{11}+\dfrac{100}{121}\right]$

$\Rightarrow 132400 = a\times\dfrac{10}{11}\times\dfrac{331}{121}$

$\Rightarrow a = 132400\times\dfrac{11}{10}\times\dfrac{121}{331}$

$\Rightarrow a = Rs.53,240$

Example: A loan of Rs. 2000 is to be paid back in 3 equal annual installments. How much is each Installment to the nearest whole rupee, if the interest is compounded annually at $12\dfrac{1}{2}\%$ p.a.?

Solution:

$2000 = a\left\{100/112.5+(100/112.5)^2+(100/112.5)^3\right\}$

$= Rs.840(\text{approx})$

AVERAGE

The average of a number is the central tendency of a set of numbers. In other words, it is an estimate of where the centre point of a set of numbers lies. The basic formula for the average of n numbers $x_n, x_2, x_3, \ldots \ldots x_n$ is

$A_n = (x_1 + x_2 + x_3 + \ldots + x_n)/n =$ (Total of set of n numbers)/n

This also means $A_n \times n$ =total of the set of numbers.

The average is always calculated for a set of numbers.

Concept of weighted average: When we have two or more groups whose individual averages are known, then to find the combined average of all the elements of all the groups we use weighted average $A_1, A_2 \ldots A_k$ and having $n_1, n_2 \ldots \ldots n_k$ elements then the average is given by the formula:

$$A_W = \frac{n_1 A_1 + n_2 A_2 + n_3 A_3 + \ldots + n_k A_k}{n_1 + n_2 + n_3 + \ldots + n_k}$$

Another Meaning of Averages: The average [also known as arithmetic mean (AM)] of a set of numbers can also be defined as the number by which we can replace each and every number of the set without changing the total of the set of numbers.

Properties of Average (AM): The properties of average [arithmetic mean]can be elucidated by the following examples:

Example: The average of 4 numbers 12, 13, 17 and 18 is:
Solution:
Required average = (12+13+17+18)/4
=60/4=15

This means that if each of the 4 numbers of the set were replaced by 15 each, there would be no change in the total.

This is an important way to look at averages. In fact, whenever you come across any situation where the average of a group of 'n' numbers is given, you should visualize that there are 'n' numbers, each of whose value is the average of the group. This view is a very important way to visualize averages.

This can be visualize as

$12 \rightarrow +3 \rightarrow 15$

$13 \rightarrow +2 \rightarrow 15$

$17 \rightarrow -2 \rightarrow 15$

$18 \rightarrow -3 \rightarrow 15$

$\overline{60 \rightarrow +0 \rightarrow 6}$

MIXTURE-ALLIGATION

The problems on this topic generally involve the theory of ratio and proportion and at times basics of percentages and profit and loss.

TYPES OF MIXTURE

There are two types of mixtures:

1) **Simple Mixture:** When two different ingredients are mixed together, it is known as a simple mixture.
2) **Compound Mixture:** When two or more simple mixture are mixed together to form another mixture, it is known as a compound mixture.

ALLIGATION RULE

This rule enables us to find the proportion in which two or more ingredients at the given prices must be mixed to produce a mixture at a given price.

Statement: The rules states that for different quantities of different costs, the ratio of the quantities are inversely proportional to the difference in their costs from the mean cost (value or strength).

The CP of the item that is cheaper is given by $CP_{Cheaper}$. The CP of the item that is costlier (dearer) is given be CP_{dearer} The C.P of unit quantity of the final mixture is called the MEAN PRICE and is given by

$$CP_{meanprice.} \frac{Quantity_{cheaper}}{Quantity_{dearer}} = \frac{CP_{dearer} - CP_{meanprice}}{CP_{meanprice} - CP_{cheaper}}$$

APPLICATION OF THE RULE

1) The Alligation Rule is used to find the mean value of a mixture when the price of two or more ingredients which are mixed together and the proportion in which they are mixed are given.
2) It is also used to find the proportion in which the ingredients at given prices must be mixed to produce a mixture at a given price.

Example: In what ratio should tea @ 35 per kg be mixed with tea @27 per kg so that mixture may cost Rs .30 per kg?

Solution:

$$\frac{Quantity\,of\,cheaper}{Quantity\,of\,dearer} = \frac{35 - 30}{30 - 27} = \frac{5}{3}$$

Hence the two should be mixed in the ratio 3:5 , the above ratio calculated is 3:5 and not 5:3, i.e. tea at 35 per kg to have 3 parts and tea at 27 per kg to have 5 parts. This may be checked mentally by the following simple rule: "If mean price is closer to cheaper C.P, then quantity of cheaper will be more and vice versa."

Example: In what ratio should two different types of mixtures containing milk and water in the ratio of 5:1 and 2:1 respectively be mixed to obtain a final mixture containing milk and water in the ratio 3:1?

Solution: Strength of milk in mixture 1=5/6 (because there are 5 parts of milk

for every 1 part of water. Hence there are 5 parts of milk for a total of 6 parts of the mixture). Strength of milk in mixture 2=2/3 (because there are 2 parts of milk for every 1 part of water. Hence there are 2 parts of milk for total of 3 parts of the mixture).

Strength of milk in the final mixture required =3/4 (because there are 3 parts of milk for every 1 part of water .Hence there are 3 parts of milk for a total of 4 parts of the mixture). As we can see, the mixture 1 is strong in milk as the dearer mixture, mixture 2 as the cheaper mixture and the final mixture as the mean mixture.

$$\frac{Quantity\,of\,cheaper}{Quantity\,of\,dearer} = \frac{\frac{5}{6} - \frac{3}{4}}{\frac{3}{4} - \frac{2}{3}} = \frac{1}{1}.$$

Hence, both the types of mixtures will have to be mixed in the ratio of 1:1.

Two mixtures of same ingredients mixed (Compound mixture)

Mixture 1 has ingredients (A and B) in a : b.
Mixture 2 has same ingredients (A and B) in x: y.

$$\Rightarrow \frac{quantity\,of\,ingredient\,A}{quantity\,of\,ingerdient\,B} = \frac{X}{Y}.$$

Now 'M' unit of Mixture 1 and 'N' units of Mixture 2 are mixed to form a resultant mixture with ingredients (A and B) in the ratio $q_A : q_B$.

Case 1:

When q_A and q_B are to be found out. By alligation rule in the resultant mixture,

$$\frac{Quantity\,of\,ingredient\,A}{quantity\,of\,ingredient\,B} = \frac{q_A}{q_B} = \frac{M \times \left(\frac{a}{a+b}\right) + N \times \left(\frac{x}{x+y}\right)}{M \times \left(\frac{b}{a+b}\right) + N \times \left(\frac{y}{x+y}\right)}$$

Then, amount of ingredient A in the resultant mixture $= \frac{q_A}{(q_A + q_B)} \times (M + N)$

Amount of ingredient B in the resultant mixture $= \frac{q_A}{(q_A + q_B)} \times (M + N)$

Case 2:

When M and N are to be found out (i.e. amount of mixtures)
Consider the quantity of any ingredients (Say, A) in all the three mixtures, i.e. quantity of ingredients a in

Mix 1 = $\dfrac{a}{a+b}$, i.e a out of (a+b)

Mix 2 = $\dfrac{x}{x+y}$, in the resultant mix =

$\dfrac{q_a}{q_A + q_B}$

By allegation rule we get , in the resultant mixture,

$$\dfrac{\text{Quantity of 1st mixture}}{\text{Quantity of 2nd mixture}} = \dfrac{Q_1}{Q_2} = \dfrac{\left(\dfrac{x}{x+y}\right) - \left(\dfrac{q_A}{q_A + q_b}\right)}{\left(\dfrac{q_A}{q_A + q_B}\right) - \left(\dfrac{a}{a+b}\right)}$$

Then, amount of 1st mixture in the resultant

mixture $= \dfrac{Q_1}{(Q_1 + Q_2)} \times (M+N)$

Amount of 2nd mixture in the resultant

mixture $= \dfrac{Q_2}{(Q_1 + Q_2)} \times (M+N)$

Example: A tea merchant buys two kinds of tea, the price of the first kind being twice that of the second. He sells the mixture at Rs.14/kg there by making a profit of 40%. If the ratio of the first to second kind of tea in the mixture is 2:3, then find the cost price of each kind of tea.

Solution:

The cost of mixture $= \dfrac{14 \times 100}{140} = Rs.\,10\,kg.$

Ratio in which the cheaper and dearer is mixed =3:2.
Let the price of cheaper tea be Rs. x/kg and dearer tea be rs.2x/kg.

∴ Applying the allegation rule, we get

$\dfrac{3}{2} = \dfrac{2x - 10}{10 - x}$

∴ $30 - 3x = 4x - 20$

∴ $7c = 50$

∴ $x = \dfrac{1}{7}$ and cost of dearer tea = Rs. $14\dfrac{2}{7}$

8 | TIME AND WORK, PIPES & CISTERNS

WORK & TIME

In most of the problems based on Work and Time, either the amount of time taken to finish a given job or the amount of work done is to be calculated.

Unless otherwise specified, the amount of work done is generally taken as unity (1). Also, if it is given that a person X can finish a job in D days, then it implies that X alone can do the job in D days.

If a man can do a piece of work in N days (or hours or any other unit of time), then the work done by him in one day will be **1/N** of the total work.

Example: Anish can finish a piece of work by himself in 14 days. Then calculate the amount of work done by him in 1 day and 11 days.

Solution: The amount of work done by Anish, working alone in 14 days = 1 unit of work. So, the amount of work done by Anish, working alone in 1 day = 1/14 unit of work and in 11 days = 11/14 units of work.

Note: If A is twice as good a workman as B, then A will take half the time B takes to finish a piece of work.

Example: Suresh can finish a piece of work by himself in 42 days. Mahesh, who is $\frac{1}{5}$ times more efficient as Suresh, requires X days to finish the work by working all by himself. Then what is the value of X?

Solution: Suresh, working alone 42 days = 1 unit of work.

Mahesh is 1/5 time more efficient than Suresh. So Mahesh is 6/5 times as efficient as Suresh. Hence Mahesh should require 5/6th of the time, the time taken by Suresh. Therefore time taken by Mahesh $= 5/6 \times 42$ = 35 days.

MEASUREMENT OF WORK

Work can be measured by many units. Some of them are

1) Man-Days

A certain number of men working for a certain number of days.

Example: 5 men can finish a piece of work in 13 days. This implies that the work is of $5 \times 13 = 65$ Man-days, i.e. if one man alone works to finish the given work then he is going to take 65 days to finish it and if 65 men work together, then the work would be finished in 1 day.

2) Man-Hours

A certain number of men working for a certain number of hours.

Example: 3 men can finish a piece of work in 13 hours. This implies that the work is of $3 \times 13 = 39$ Man-hours, i.e. if one man alone works to finish the given work then he is going to take 39 hours to finish it and if 39 men work together, then the work would be finished in 1 hour.

Some others are, Man-minutes, Machine-hours etc.

Note: If A, B and C can finish a piece of work in X, Y and Z days respectively, while working alone and together they require M days to finish the work, then the amount of work done by A is M/X, B is M/Y & C is M/Z.

CONCEPT OF WORK EQUIVALENCE

In order to solve certain types of questions, there is a very logical method that can be used.

This is the WORK EQUIVALENCE method which works on a simple premise-make the

LHS equal to the RHS on the basis of SAME UNITS in terms of which work can be measured.

Example: A group of soldiers can completely destroy an enemy bunker in 7 days. However 12 soldiers fell ill. The remaining now can do the job in 10 days. Find the original group strength.

Solution: Here, first of all, let us see how WORK can be defined. It is obvious that work can be measured a "destruction of the enemy bunkers."

In the first case, let us say that there were S numbers of soldiers in the group. So they had to work for 7 days for the work which we call W.

$$\Rightarrow S \times 7 = W \qquad \dots (1)$$

Now 12 fell ill and the remaining did the work in 10 days. Hence the new equations

$$(S-12) \times 10 = W \qquad \dots (2)$$

Just compare the two equations to get the answer.

$$S \times 7 = (S-12) \times 10$$
$$\Rightarrow 7S = 10S - 120$$
$$\Rightarrow 120 = 3S$$
$$\Rightarrow S = 40 \, \text{soldiers}.$$

Hence, there were 40 soldiers in the group initially.

Example: A group of 20 cows can graze field 3 acres in size in 10 days. How many cows can graze a field twice as large in 8 days?

Solution: Here, first of all, let us see how WORK can be defined. It is obvious that work can be measured as "acres grazed". In the first case, there were 20 cows in the group.

They had to work for 10 days to do the work which we call W (which = 3).

$$\Rightarrow 20 \times 10 = 3 \qquad \dots (1)$$

Do not be worried about the numerical values on either side. The point is that logically this equation is consistent as the LHS indicates "Cowdays" and the RHS indicates "Acres", both of which are correct ways of measuring work done.

Now the field is twice as large. Hence the new equation is

$$\Rightarrow C \times 8 = 6 \qquad \dots (2)$$

Just divide (2) by (1) to get the answer.

$$8C / 200 = 6 / 3$$
$$\Rightarrow 8C = 2 \times 200$$
$$\Rightarrow C = 400 / 8 = 50 \, \text{cows}.$$

Hence, there were 50 cows in the second group.

PIPES AND CISTERNS

The same principle of Time & Work is employed to solve the problems on Pipes & Cisterns. The only difference being that in this case, the work done is in terms of filling or emptying a cistern (tank) and the time taken is the time taken by a pipe or a leak (crack) to fill or empty a cistern respectively.

Unless otherwise specified, the amount of work done, i.e., filling or emptying a cistern is generally taken as unity (One-1). Also, if it is given that a pipe can fill a cistern in 10 min, then it implies that the pipe **alone** can fill the cistern in 10 min.

Generally, the time taken to fill a cistern is taken as positive and the time taken to empty a cistern is taken as negative.

A pipe connected with a cistern is called an inlet pipe or an outlet pipe, accordingly as it fills it or empties it respectively.

SOME IMPORTANT FORMULAE

If an inlet pipe can fill a cistern in X hours, the part filled in 1 hour is $\frac{1}{X}$.
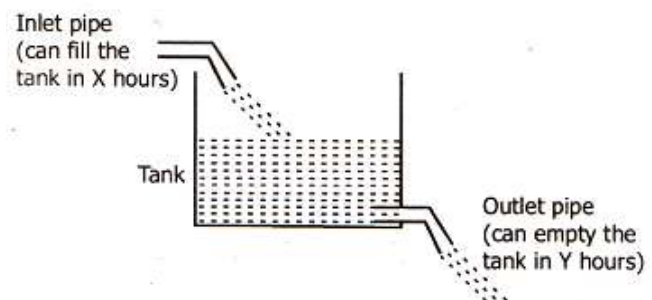
If an inlet pipe can fill a tank in X hours and an outlet pipe empties the full tank in Y

hours, then the new part filled in 1 hour when both the pipes are opened $= \dfrac{1}{X} - \dfrac{1}{Y}$.

$\Rightarrow$ In 1 hour, the part filled (or emptied) $= \dfrac{1}{X} - \dfrac{1}{Y}$.

Time required to fill or empty the tank $= \dfrac{X \times Y}{X \sim Y}$ hours.

$(X \sim Y \text{ indicates} [X - Y] \text{or} [Y - X], \text{whichever is positive})$

Note: If X > Y, then an empty tank can never be filled. Similarly if X < Y, then a full tank can never be emptied.

Example: If an inlet pipe can fill a tank in 4 hours and an outlet pipe empties the full tank in 5 hours, then what is the net part filled in 1 hour when both the pipes are opened?

Solution: The net part filled in 1 hour when both the pipes are opened = (1/4)-(1/5) = (1/20).

So, time required to fill the tank = 1/(1/20) = 20 hrs.

Example: An inlet pipe can fill the tank in 6 hours and an outlet pipe can empty the tank in 4 hours. When the tank is full and both the pipes are open, find the new part emptied in 1 hour.

Solution: The net part emptied in 1 hour $= \dfrac{1}{4} - \dfrac{1}{6} = \dfrac{1}{12}$.

{∴Time required to empty the full tank is 12 hours.}

Two pipes A and B can fill a cistern in X and Y hours respectively, while working alone. If both the pipes are opened together, then the time taken to fill the cistern will be $\dfrac{X \times Y}{X + Y}$.

Example: Two pipes A and B can fill a cistern in 4 and 5 hours respectively, while working alone. If both the pipes are opened together, then find the time taken to fill the cistern.

Solution: Pipe A can fill the cistern in 4 hours and Pipe B can fill the cistern in 5 hours.

When the pipes are opened together, the time taken to fill the cistern will be $\dfrac{4 \times 5}{4 + 5} = \dfrac{20}{9}$ hrs.

Three pipes A, B and C can fill a cistern in X, Y and Z hours respectively, while working alone. If all the three pipes are opened together, the time taken to fill the cistern will be $\dfrac{X \times Y \times Z}{XY + YZ + ZX}$.

Example: Three pipes A, B and C can fill a cistern in 10, 12 and 15 hours respectively, while working alone. If all the three pipes are opened together, then find the time taken to fill the cistern.

Solution: The pipes can fill the cistern in 10, 12 and 15 hours respectively.

When the three pipes are opened together, the time taken to fill the cistern $= \dfrac{10 \times 12 \times 15}{10 \times 12 + 12 \times 15 + 10 \times 15} = 4\text{hrs}$.

9 TIME, SPEED & DISTANCE

SPEED

If the location of an object changes with time then it is said to be in motion. A bus running on a road, an ant crawling on a floor, etc. all are examples of objects in motion because the locations of these objects keep on changing w.r.t. their surroundings.

Let an object move from a point A to the point B through any path, then the actual length of the path followed by the object is called the distance travelled by the object. The rate at which any moving body covers a particular distance is called its speed.

$$\text{Speed} = \frac{\text{Distance travelled}}{\text{Time taken}},$$

if the distance is constant, $\text{Speed} \propto \dfrac{1}{\text{Time}}$

if the time is constant, $\text{Distance} \propto \text{Speed}$
if the speed is constant, $\text{Distance} \propto \text{Time}$.

We can say that for constant distance travelled, speed is inversely proportional to the time taken. This can be explained by a simple example. To cover a distance of 100km, if a person goes at the speed of 25 kmph, he will require 4 hours to complete the journey and travelling at a speed of 50 kmph, 2 hours will be required.

UNITS OF MEASUREMENT

Time is measured in seconds (s), minutes (min) or hours (hr). Distance is usually measured in meters (m), kilometers (km), miles, yards or feet.

Speed is usually measured in meters per second (mps), kilometers per hour(kmph) or miles per hour (mph).

CONVERSION OF UNITS

1 hour = 60 minutes = 60×60 seconds.

1 kilometre = 1000 meters.
1 kilometre = 0.6214 mile.
1 mile = 1.609 kilometre.
i.e.8 kilometers ≈5 miles.
1 yard = 3 feet.

$$1\,\text{km}/\text{hr} = \frac{5}{18}\,\text{m}/\text{sec}$$

To convert kmph to m/s we multiply by 5/18

$$1\frac{\text{m}}{\text{sec}} = \frac{18}{5}\,\text{km}/\text{hr}.$$

To convert m/s to kmph we multiply by 18/5

$$1\frac{\text{km}}{\text{hr}} \approx \frac{5\text{miles}}{8\text{hr}}$$

$$1\frac{\text{miles}}{\text{hr}} = \frac{22}{15}\frac{\text{ft}}{\text{sec}}$$

Note: If a man changes his speed in the ratio m:n, then the ratio of time taken becomes n:m

Example: Walking at 5/6 of his usual rate, a boy reaches his school 12 min late. Then find his usual time taken to reach the school.

Solution: If the boy is walking at 5/6th of his usual speed, then the time taken should become 6/5 times the original time required. Thus, we can say that the boy is going to require 1/5th more/extra time as compared to the usual time required

$$\left(\text{as } \frac{6}{5}\text{T} - 1\text{T} = \frac{1}{5}\text{T}\right)$$

Thus, $\dfrac{1}{5}\text{T} \rightarrow 12\,\text{min}$

$1\text{T} \rightarrow \text{X}$
Solve to get X = 60 min.

Example: Walking at $\dfrac{13}{11}$ th of his usual rate, a boy takes 3 min less to reach his

school. Then find his usual time taken to reach the school.

Solution: If the boy is walking $\dfrac{13}{11}$ th of his usual speed, then the time taken should become $\dfrac{11}{13}$ times the original time required. Thus, we can say that the boy is going to required $\dfrac{2}{13}$ th less time as compared to the standard time required

Thus, $\dfrac{2}{13}T \to 3\,\text{min}$

$1T \to X$

Solve to get X = 39/2=19.5 minutes.

If three men cover the same distance with speeds in the ratio a : b : c, the times taken by these three will be respectively in the ratio 1/a : 1/b : 1/c.

AVERAGE SPEED

If A goes from X to Y at U kmph and comes back from Y to X at V kmph, then Average speed during the whole journey.

$\dfrac{2UV}{U+V}\,\text{kmph.}$

The average speed is not (U+V)/2, but it is given by

$$\text{Average speed} = \dfrac{\text{Total Distance Covered}}{\text{Total Time Taken}}$$

Note: If two person (or vehicles or trains) start at the same time from two point A & B towards each other and after crossing, they take X and Y hours in reaching B & A respectively, then

$$= \dfrac{\text{Speed of first}}{\text{Speed of second}} = \sqrt{\dfrac{Y}{X}}$$

Example: A man starts from B to K, another from K to B at the same time. After passing each other they complete their journeys in $3\dfrac{1}{3}$ and $4\dfrac{4}{5}$ hours, respectively. If the speed of the first is 12 kmph, then find the speed of the second man.

Solution:

$$\dfrac{\text{1st man's speed}}{\text{2nd man's speed}} = \sqrt{\dfrac{Y}{X}} = \sqrt{\dfrac{4\dfrac{4}{5}}{3\dfrac{1}{3}}} = \sqrt{\dfrac{24}{5}\times\dfrac{3}{10}} = \sqrt{\dfrac{36}{25}} = \dfrac{6}{5}$$

$\therefore \dfrac{12}{\text{2nd man's speed}} = \dfrac{6}{5}$

$\therefore \text{2nd man's speed} = \dfrac{60}{6} = 10\,\text{kmph.}$

Note: If a person/moving body moves at a average speed of V_1 kmph to cover a distance of D km without stopping and moves at a average speed of V_2 kmph to cover the same distance with stoppages, then the stoppage time per hour is given by $\dfrac{V_1 - V_2}{V_1}$.

Example: A train travels at a speed of 60 kmph between two stations A and B, 240 km apart, when it does not stop between any other stations between them. But it goes at an average speed of 40 kmph when it stops. What is the average soppage time per hour of the train?

Solution: Time take, when it does not stop = 240/60 = 4hrs.

Time take, when it stops = 240/40 = 6hrs.

Total stoppage time = 2 hrs.

Average stoppage time per hour = 2/6 = 1/3 hrs.

Short-cut: Using the formula directly,

We get $\dfrac{60-40}{60} = \dfrac{20}{30} = \dfrac{1}{3}$ hrs.

RELATIVE SPEED

Suppose two trains A and B are moving with same speed in the same direction on two parallel tracks. To an observer sitting in train A, the train B appears to be stationary. This observation is expressed by saying that the relative speed of train A is zero w.r.t. train B and the relative speed of the train B is zero w.r.t. train A.

It is only due to the relative motion that to an observer sitting in a moving train, the trees and the telephone poles along the

railway track appear to the moving in the backward direction. If another train moving in the opposite direction, crosses the train under consideration, it does so with enormous speed, much larger than its actual speed. It is also due to the relative speed.

The relative speed of a body A w.r.t. a body B is the rate of change of position of body A w.r.t. body B. The relative speed of a body A w.r.t. another body B when both are in motion, can be determined by adding to the speed of A as well as to the speed of B.

Note:

1) The time taken by a train L meters long, travelling at a speed of X m/sec in passing asignal post or a telegraph pole (or a standing man) is the same as the time taken by the train to cover a distance of L meters i.e. its own length because the length of the pole is nearly zero with respect to the length of the train though its height may be significant.
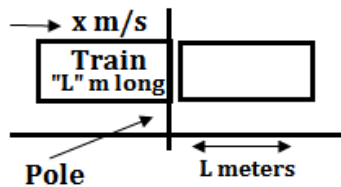
Thus, $T = \dfrac{L}{X}$ seconds

2) The time taken by a train "L_1" meters long, travelling at a speed of X m/sec in passing a stationary object (a bridge or a tunnel or a train at rest or a platform) of length "L_2" meters is the same as the time taken by the train to cover a distance of $(L_1 + L_2)$ meters.
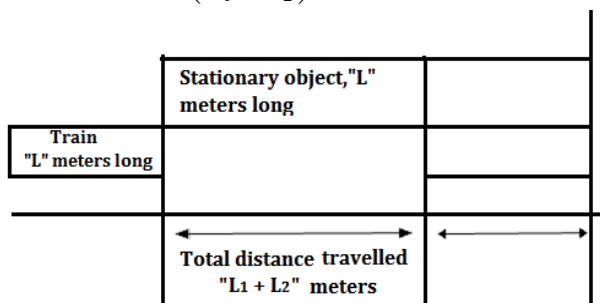
$$T = \frac{L_1 + L_2}{X} \text{ seconds}$$

3) If two trains of lengths L_1 and L_2 meters respectively, are moving in the same direction with a speed of X and Y m/sec (where X > Y), then (X-Y)m/sec is called **Relative Speed** and time taken by faster train to pass the slower train

$$= \frac{L_1 + L_2}{X - Y} \text{ seconds.}$$

4) If two trains of lengths L_1 and L_2 meters respectively, are moving in opposite directions (towards each other or away from each other) with a speed of X and Y m/sec, then (X +Y)m/sec is called **Relative Speed** and time taken by the trains to pass each other.

$$= \frac{L_1 + L_2}{X + Y} \text{ seconds.}$$

5) If a man running at a speed X m/sec in the same direction in which a train of length L meters is running at a speed Y m/sec, then (Y - X)m/sec is called the speed of the train relative to man. Then the time taken by the train to cross the man.

$$= \frac{L}{Y - X} \text{ seconds.}$$

6) If a man running at a speed X m/sec in a direction opposite to that in which a train of length L meters is running with a speed Y m/sec, then X + Y is called the speed of the train relative to man. Then the time taken by the train to cross the man.

$$= \frac{L}{Y + X} \text{ seconds.}$$

7) If two trains or moving bodies are crossing each other such that
Length of the first train or object = L_1 meters,
Length of the second train or object = L_2 meters,
Time taken by the two when crossing each other in opposite direction = X sec,
Time taken by the two when crossing each other in same direction = Y sec,
Then speed of the faster train

$$= \frac{L_1 + L_2}{2}\left(\frac{1}{X} + \frac{1}{Y}\right);$$

Speed of the slower train $= \frac{L_1 + L_2}{2}\left(\frac{1}{X} - \frac{1}{Y}\right).$

Example: A train, 110 m long, travels at 60 kmph. How long does it take to cross
1) a telegraph post?
2) a man running at 6 kmph in the same direction?
3) a man running at 6 kmph in the opposite direction?
4) a platform 240 m long?
5) another train 170 m long, standing on another parallel track?
6) another train 170 m long, running at 54 kmph in same direction?
7) another train 170 metre long, running at 80 kmph in opposite direction?

Solution:

Since $1\text{kmph} = \frac{5}{18}\,\text{m/s}$

$\therefore$ Speed of train $= 60\text{kmph} = 60 \times \frac{5}{18}\,\text{m/s}.$

1) The telegraph post is a stationary object, so, the time taken by the train is the same as the time taken by the train to cover a distance equal to its own length.

Required time $= \dfrac{110+0}{60 \times \dfrac{5}{18}} = 6.6$ seconds.

2) The man is moving is same direction, so length to be covered = Length of the train and relative speed = speed of train – speed of man.

So, required time $= \dfrac{110}{(60-6) \times \dfrac{5}{18}}$

$= \dfrac{110}{15} = 7.33\,\text{sec}$

3) The man is moving on opposite direction, so length to be covered = Length of the train and relative speed = speed of train – speed of man.

So, required time $= \dfrac{110}{(60+6) \times \dfrac{5}{18}}$

$= \dfrac{110 \times 18}{33} = 6\,\text{sec}$

4) The platform is stationary of length 240 m. Length to be covered=Length of the train + Length of the platform=110+240=350 m and relative speed = speed of train.

So, required time $= \dfrac{350}{60 \times \dfrac{5}{18}}$

$= \dfrac{350 \times 18}{300} = 21\,\text{sec}$

5) Another train is stationary.
Length to be covered = Length of the train + Length of the other train
=110 + 170 = 280 m and relative speed = 60 kmph.

So, required time $= \dfrac{280}{60 \times \dfrac{5}{18}}$

$= \dfrac{280 \times 18}{300} = 16.8$ sec

6) Another train is moving in same direction.
Length to be covered = Length of the train + Length of the other train
=110 + 170 = 280 m and relative speed = 60 – 54 = 6 kmph.

So, required time $= \dfrac{280}{6 \times \dfrac{5}{18}}$

$= \dfrac{280 \times 3}{5} = 168$ sec

7) Here, another train is moving in opposite direction.
Length to be covered = Length of the train + Length of the other train
=110 + 170 = 280 m and relative speed = 60 + 80 = 140 kmph.

So, required time $= \dfrac{280}{140 \times \dfrac{5}{18}}$

$= \dfrac{280 \times 18}{140 \times 5} = 7.2$ sec

Example: Two trains 110 m and 88 m long respectively are running in same direction. The first runs at the rate of 35.2 kmph and the second at the rate of 44 kmph. How long will they take to cross each other?

Solution: It is clear that the trains will cross each other when they have travelled a distance equal to the sum of their lengths = 110 + 88 = 198 m. Since they are moving in the same direction, we can find the relative Speed = 44 – 35.2 =8.8 km/hr.

$\Rightarrow$ Time required = distance/speed

$$= \frac{198}{8.8} \times \frac{18}{5} \text{ second} = 81 \text{sec}.$$

Example: A train in motion, 66 m long overtakes a train 88 m long travelling @ 30 kmph in the opposite direction in 0.168 min. The speed of the first train is

(1) 60 kmph   (2) 25 kmph
(3) 45 kmph   (4) 36 kmph

Solution:

$$30 \text{kmph} = \frac{30 \times 5}{18} \times 8.33 \text{m/sec}.$$

Let the speed of the first train be x m/sec.
Now total distance = 66 + 88 = 154 m.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\Rightarrow 0.168 \times 60 = \frac{154}{8.33 + x} \Rightarrow 10.08(8.33 + x) = 154.$$

$$\Rightarrow x = 6.95 \text{m/sec sec} = 25 \text{kmph}.$$

Ans. (2)

Example: A train travelling with constant speed crossed a 96 m long platform in 12 sec and another 141 m long platform in 15 sec. Find the length and speed of the train.

Solution: If X be the length of train in meters and Y be the speed of the train in m/s, then

(X + 96)/Y = 12, (X + 141)/Y = 15
Solve to get X = 84, Y = 15.
15 m/sec = 15×18/5 = 54 kmph.
Hence the required answer is 84m & 54kmph.

BOATS AND STREAMS

A FEW IMPORTANT TERMINOLOGIES

The following terms will be used often while discussing boats and streams.

STREAM: It implies that the water in the river is moving or flowing.

UPSTREAM: Going against the flow of the river.

DOWNSTREAM: Going with the flow of the river.

STILL WATER: It implies that the speed of water is zero (generally in a lake).
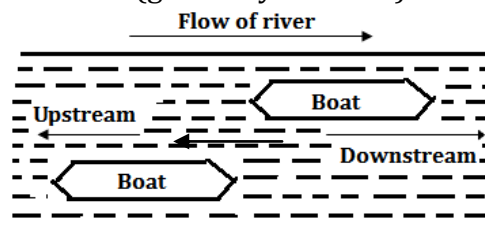
DOWNSTREAM (WITH THE STREAM) ROWING

It indicates that the stream favors the man's rowing (or boating). i.e. direction of rowing and direction of flow (stream) is same.

UPSTREAM (AGAINST THE STREAM) ROWING

It indicates that the stream flows against the man's rowing (or boating) i.e. direction of rowing and direction of stream (current) are opposite.

Note: Let the speed of a boat (or man) in still water be X m/sec and the speed of the stream (or current) be Y m/sec.

Speed of boat with the stream (or Downstream of D/S)= (X + Y) m/sec.
Speed of boat against the stream (or Upstream or U/S)= (X - Y) m/sec.
Speed of man/boat in still water

Speed of the stream $Y = \dfrac{(X+Y)-(X-Y)}{2}$

$$= \frac{\text{Downstream} - \text{Upstream}}{2}$$

Example: A boat is rowed down a river 28 km in 4 hours and up a river 12 km in 6

hours. Find the speed of the boat and the river.

Solution:

Downstream speed is $\dfrac{28}{4} = 7$ kmph,

Upstream speed is $\dfrac{12}{6} = 2$ kmph,

Speed of Boat $= \dfrac{1}{2}$ [downstream + upstream speed]

$= \dfrac{1}{2}(7+2) = 4.5$ kmph.

Speed of current $= \dfrac{1}{2}$ [downstream-upstream speed]

$= \dfrac{1}{2}(7-2) = \dfrac{5}{2} = 2.5$ kmph.

Example: A man rows 18 km down a river in 4 hours with the stream and returns in 12 hours. Find his speed and also the speed of the stream.

Solution:
Speed with the stream = 18/4 = 4.5 kmph.
$\Rightarrow$Speed against the stream = 18/12
= 1.5 kmph.
$\Rightarrow$Speed of the stream = 1/2{(4.5-1.5) }
= 1.5 kmph.
and speed of the man = 4.5 – 1.5 = 3 kmph.
If a man capable of rowing at the speed of X m/sec in still water, rows the same distance up and down a stream flowing at a rate of Y m/sec, then his average speed throughout the journey is

$= \dfrac{\text{Speed Upstream} \times \text{Speed Downstream}}{\text{Man's rate in still water}}$

$= \dfrac{(X-Y)(X+Z)}{X}$

Note: When downstream distance = upstream distance, then

$\dfrac{\text{Man's rate in still water}}{\text{Speed of stream}} = \dfrac{t_{up} + t_{down}}{t_{up} - t_{down}}$

Average speed for total journey (UP + DOWN)

$= \dfrac{\text{Upstream Rate} \times \text{Downstream rate}}{\text{Man's rate in still water}}$

Total Journey time $(t_{up} + t_{down})$

$\dfrac{\text{Man's rate in still water} \times \text{Total dis}\tan ce}{\text{Upstream Rate} \times \text{Downstream rate}}$

Example: A man rows 10 km upstream and back again to the starting point in 55 min. If the speed of stream is 2 kmph, then find the speed of rowing in still water.

Solution: Let x be the speed of rowing in still water.
y=speed of stream=2 kmph.

Total time $T = \dfrac{55}{60}$ h.

Hence,

$\text{Total Time} = \dfrac{\text{Speed in still water} \times \text{Total dis}\tan ce}{\text{Upstream Rate} \times \text{Downstream rate}}$

$\Rightarrow \dfrac{55}{60} = \dfrac{x \times 2 \times 10}{(x+2)(x-2)} \Rightarrow \dfrac{55}{60}(x^2 - 2^2) = 2 \times x \times 10$

$\Rightarrow 11x^2 - 240x - 44 = 0 \Rightarrow (x-22)(11x+2) = 0$

$\therefore$ x=22, since (-)ve value of x is not admissible.
Total Distance = Downstream distance + Upstream distance = 2 x any one side distance.

Example: A man who can swim 48 m/min in still water swims 200m against the current and 200 m with the current. If the difference between these two times is 10 min, then find the speed of the current in m per min.

Solution: Let the speed of stream be x kmph. The equation becomes

$\dfrac{200}{48-x} - \dfrac{200}{48+x} = 10$

$\Rightarrow 200(48+x) - 200(48-x) = 10\left[48x^2 - 2^2\right]$

$\Rightarrow x^2 + 40x - 2304 = 0$

On solving it we get x = 32 and x = -72 (not acceptable) i.e. speed of stream is 32 m/min.

LINEAR AND CIRCULAR RACES

The terms given below are commonly used in this topic, and a clear understanding will

help the student get a good grip on the subject.

1) **RACE:** A contest of speed between participants is called a race.
2) **STARTING POINT:** The point from where a race begins is called the starting point.
3) **RACE COURSE:** It means the path or ground on which races are run.
4) **FINISHING POINT:** The point where the race finishes is called the winning post or finishing point or a goal.
5) **DEAD HEAT RACE:** A race in which no one is the winner because all the runners reach the winning post at the same time, is called a dead heat race.
6) **WINNER:** The person who first reaches the finishing point is called the winner.
7) **WINNER'S TIME:** The time taken by the winner to complete the race is called winner's time. If A and B both start from the same place, then winner's distance = Length of the race.
8) **LOSER'S TIME:** The time taken by the loser to complete the race is called loser's time.

LINEAR RACES

Suppose A & B are two contestants in race. If before the start of the race, A is at the starting point and B is ahead of A by 10 meters, then A is said to have given B a start of 10 meters. To cover a race of 300 meters in this case, A will have to cover a distance of 300 meters and B will have to cover (300-10) = 290 meters only.

Suppose A & B are two contestants in race. At the end of the race, if A is at the finishing point and B is x meters away from the finishing point, and then A is said to have beaten B by x meters in a race.

1) **A gives B a start of x meters** implies that, if the distance between the starting point and finishing point is L meters, A covers L meters while B covers L – x meters.
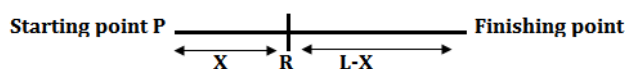
From the figure given above, it is clear that A starts at point P, but B starts at R at the same moment. For example in a 100 meters race, A gives B a start of 10 meters means, while A run 100 meters, B runs 90 meters.

2) **A beats B by x meters** implies that, if the distance between the starting point and finishing point is L meters, A wins the race by covering L meters while B covers L – x meters only.
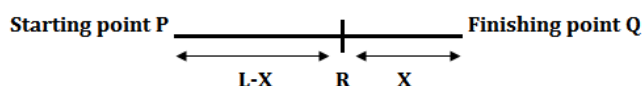
3) **A gives B a start of t seconds**, implies that A starts the race t seconds after B starts from the starting point.
4) **A beats B by t seconds**, implies that, A and B start together from the starting point, but A reaches the finishing point t seconds before B reaches.
5) **Start distance** is the distance between the two contestants at start if they are not starting from the same position.
6) If A & B are starting from the same point, A beats B by 'x' meters or 't' seconds means, B runs 'x' meters in 't' seconds.

Example: In a km race, A beats B by 40 meters or 7 seconds. Find A's time over the course.

Solution: Here B runs 40 meters in 7 seconds.

$\therefore$ B runs 1000m in $\dfrac{1000 \times 7}{40} = 175$ seconds.

Hence, A's time over the course –(175 - 7) =168 sec

Short-cut:

By formula,

$$\dfrac{\text{Winner's time}}{\text{Loser's distance}} = \dfrac{\text{Beat time+Start time}}{\text{Beat distance+Start distance}}$$

$\therefore$ A's time $= \dfrac{7}{40} \times 960 = 168$ seconds.

If a race ends in a dead heat, then beat time = 0 and beat distance = 0.

CIRCULAR RACES

When two or more persons start from the same place at the same time and travel round a circle in the same direction or in opposite directions, then they will be first together at the starting point again after an interval of time which is the LCM of the times in which each of them makes one complete round.

Example: A and B walk around a circular path of circumference 1200 meters. A walks @ 150 m/min and B @ 70 m/min. If they start from the same point and walk in the same direction, then when will they be first together again at the starting point?

Solution: Time for 1 round by A = 1200/150 = 8 minutes and for B
= 1200/70 = 120/7 minutes.
⇒ Time taken to meet again at the starting point
=LCM of 8 and 120/7 = 120 minutes = 2 hrs.
They will be first together again after an interval of time which is the LCM of the times in which one of the persons gains one complete round over each of the others.

Example: Assuming the data given in previous example, when will they be together again anywhere else on the course.
Solution: Now, in 1 minute, A gains over B(150 - 70)=80 meters.
To gain 1200 meters over B, A will take 1200/80×1=15 min.
They will be first together again after an interval of time which is required to complete a round with the relative speed.

Example: Assuming the data given in previous example, when will they be together supposing they walk in opposite directions?
Solution:
Relative speed =150+70=220 m/min.
So, they will be together after 1200/220 = 60/11 minutes.

We hope that the concept of circular race is clear to you. If not, please go through the following example. It will help you to understand the concept thoroughly.

Example: Along with A and B, C is also running across the circular track at the rate of 130 m/min in the same direction. When will all the three people meet (use data of previous example)
1) at the starting point?
2) at any other point on the track?
3) At what distance (nearest) from the starting point do the three meet?
Solution:
1) Time for 1 round by A = 8 min.
   Time for 1 round by B = 120/7 min.
   Time for 1 round by C = 120/13 min.
   So, all he three people will meet at the starting point after the time.
   = The LCM of 8, 120/7 and 120/13 i.e. 120 minutes.
2) A gains 80 meters per minute over B.
   So, they will met every 1200/80 = 15 min
   A gains 20 meters per minute over C.
   So they will meet every 1200/20 = 60 min
   So, all the three people will meet after the time which is equal to the LCM of 15 and 60 i.e. after 60 minutes or 1 hour.
3) They are meeting after 60 minutes from the sart.
   Distance covered by A in 60 minutes
   = 150×60=9000m=600m from the starting point.
   Distance covered by B in 60 minutes
   = 70×60=4200 m=600m from the starting point.
   Distance covered by C in 60 minutes
   = 130×60=7800m=600m from the starting point.
   So, the three people will meet at 600 m from the starting point.

Example: Now, if we assume that C starts running in the opposite direction, then the three will once again meet at the starting point after the same time interval. But can

they meet anywhere else? If Yes, after what time interval and what minimum distance from the starting point?

Solution: C starts running in the opposite direction, as shown in the figure below.
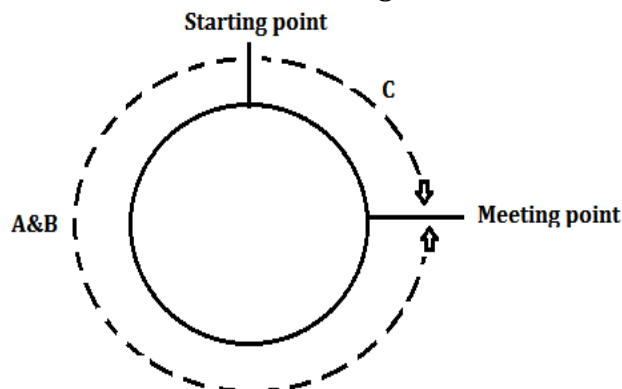
The three will once again meet at the starting point after the same time interval i.e. 2 hours.

Now A & C will meet after 1200/280=30/7 minutes from the starting point. B & C will meet after 1200/200=6 minutes from the starting point.

So, in this case the three people will meet after the time which is equal to the LCM of 30/7 and 6 i.e. after 30 minutes from the starting point.

Distance covered by A in 30 minutes =150×30=4500m=900m from the starting point.

Distance covered by B in 30 minutes =70×30=2100m=900m from the starting point.

Distance covered by C in 30 minutes =130×30=3900m=300m from the starting point.

The minimum distance at which they will meet = 300 m from the starting point.

Note: Throughout this chapter, units of quantities have a crucial importance. e.g. while solving a problem if we take distance in meters, we should take speed in m/sec and time in seconds. If proper units are not used and conversions not effected, then you'll find yourself in trouble.

SOME IMPORTANT POINTS

1) Two persons starting at the same time and from the same point along a circular path will be together again for the first time, when the faster gains one complete round over the other. Time taken by faster person to complete one round over the other

$$= \frac{\text{Length of race course}}{\text{Relative speed}}$$

2) Three persons starting at the same time and from the same point along a circular path will be together again for the first time after the start at a time which is the LCM of the time taken by the fastest to gain a complete round each over the other two.

A overtakes B at $= \frac{1}{n}$ th of xth round

means, when A has completed $\left(x - \frac{1}{n}\right)$ rounds, B has completed $\left[(x-1) - \frac{1}{n}\right]$ rounds.

Also

$$\frac{\text{A's speed}}{\text{B's speed}} = \frac{\text{Rounds completed by A in a given time}}{\text{Rounds completed by B in the same time}}$$

e.g., A overtakes B in the middle of the 4th round implies,

When A has completed $3\frac{1}{2}$ rounds, B has completed $2\frac{1}{2}$ rounds.

Therefore, $\dfrac{\text{A's speed}}{\text{B's speed}} = \dfrac{3\frac{1}{2}}{2\frac{1}{2}} = 7:5.$

10 PERMUTATION AND COMBINATION

PERMUTATIONS & COMBINATIONS

Permutations and Combinations is one of the important areas in many exams because of two reasons. The first is that solving question in this area is a measure of students' reasoning ability. Secondly, solving problems in areas like Probability requires thorough knowledge of Permutations and Combinations.

Before discussing Permutations and Combinations. Let us look at what is called the "Fundamental Rule ".

"If one operation can be performed in 'm' different ways and (when it has been performed in any one of these ways), a second operation then can be performed in different' ways, the number of ways of performing the two operations simultaneously will be $m \times n$"

This can be extended to any number of operations.

If there are three cities A,B and C such that there are 3 roads connecting A and B and 4 roads connecting B and C, then the number of ways one can travel from A to C via b is 3 × 4 i.e., 12

This is very important principle and we will be using it extensively in Permutations and Combinations. Since we use it very extensively, we do not explicitly state every time that the result is obtained by using the Fundamental Rule but directly write down the result.

PERMUTATIONS

Each of the arrangements which can be made by taking some or all of a number of items is called a Permutation. Permutation implies" arrangement" or that "order of the items" is important. The permutations of three items a, b and c taken two at a time are ab, ac, ca, cb, and bc .Since the order in which the items are taken is important , ab

and ba are counted as two different permutations. The words "Permutation" and "arrangement" are synonymous and can be interchanged.

The number of permutations of n things taking r at a time is denoted by ^nP_r (and read as "^nP_r")

COMBINATIONS

Each of the groups or selections which can be made by taking some or all of a number of items is called Combination. In combinations, the order in which the items are taken is not considered as long as the specific things are included. The combinations of three items a, b and c taken two at a time are ab, bc, and ca. Here , ab and ba are not considered separately because the order in which a and b are taken is not important but it is only required that a combination including a and b is what is to be counted. The words "combination" and "selections" are synonymous.

The number of combinations of n things taking r at a time is denoted by ^nC_r (and read as "^nC_r")

NUMBER OF LINEAR PERMUTATIONS OF 'N' DISSIMILAR ITEMS TAKEN 'R' AT TIME WITHOUT REPETITION(^NP_R)

Consider r boxes each of which can hold one item. When all the r boxes are filled, what we have is an arrangement of r items taken from the given n items taken from the given n items without repetition, Hence the number of ways in which we can fill in the r boxes by taking things from the given n things is equal to the number of permutations of n things taking r at a time Boxes
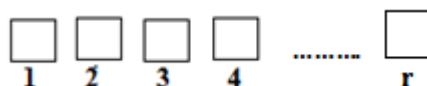
The first box can be filled in in n ways (because any one of the n items can be used to fill this box.) Having filled the first box, to fill the second box we now have only (n-1) items; any one of these items can be used to fill the second box and hence the second box can be filled in (n-1) ways. Similarly, the third box in (n-2) ways and so on. The rth box can be filled in (n-r(n-r) ways. i.e. [n-r+1] ways. Hence, from the Fundamental Rule , all the r boxes together can be filled in n (n-1) (n-2)....(n-r+1)

So ^nP_r=n(n-1)(n-2) ....[n-(r+1)]

This can be simplified by multiplying and dividing the right hand side by (n-r)(n-r-1).....3,2.1 giving us

^nP_r =n(n-1)(n-2).....[n-(r-1)]

$$= \frac{n(n-1(n-2)\ldots[n-(r-1)\cdot(n-r)\ldots3.2.1}{(n-r)\ldots32.1} = \frac{n!}{(n-r)!}$$

The number of permutations of n distinct items taking r items at a time is

$$^nP_r = \frac{n!}{(n-r)!}$$

If we take n items at a time, then we get ^nP_n. From a discussion similar to that we had for filling in the r boxes above, we can conclude that ^nP_n is equal to n!

The first box can be filed in in n ways, the second one in (n-1) ways the third one in (n-2) ways and so on then the nth box in 1 way hence all the n boxes can be filled in n(n-1)(n-2) ...3.2.1 ways i.e., n! ways

Hence ,^nP_n=n!

But if we substitute r=n in the of formula for ^nP_r then we get $^nP_n = \frac{n!}{0!}$ since we already found that ^nP_n =n! we can conclude that 0!=1

Number of combinations ^nC_r be x . Consider one of these x combinations .Since this is a combination , the order of the r items is not important . If we now impose the condition that order is required for these r items , we can get r! arrangements from this one combination. So each combination can given rise to r ! permutations and combinations will thus give rise to x.r! permutations . But since these are all

permutations of n things taken r at a time , this must be equal to ^nP_r

So, $xr!= {}^nP_r = \frac{n!}{(n-r)!}$ Hence, x= ^nC_r

$$= \frac{n!}{(n-r)!r!}$$

$$^nC_r = \frac{n!}{!(n-r)!}$$

The number of combinations of n dissimilar things taken all at a time is 1.Out of n things on lying on a table, If we select r things and remove them from the table, we are left with (n-r) things on the table –that is whenever r things are selected out of n things we automatically have another selection of (n-r) things on the table. Hence, the number of ways of making combinations taking r out of n things is the same as selecting (n-r) things out of n given things i.e.,

$^nC_r = {}^nC_{n-r}$

When we looked at ^nP_r we imposed two constraints which we will now release one by one and see how to find out the number of permutations.

Number of arrangements of n items of which p are of one type q are of the second type and the rest are distinct. When the items are all not distinct, then we cannot talk of a general formula for ^nP_r for any r but we can talk of only ^nP_n (which is given below). If we want to find out ^nP_r for a specific value of r in a given problem, we have to work on a case to case basis (this has been explained in one of the solved examples.

The number of ways in which n things may be arranged taking them all at a time when p of the things are exactly liked one kind q of them exactly like another kind r of them exactly like a third kind and the rest all distinct is

$$\frac{n!}{p!q!r!}$$

Number of arrangements of n distinct items where each item can be used any

number of time (i.e., repetition allowed) You are advised to apply the basic reasoning given while deriving the formula for ^nP_r to arrive at this result also The first box can be filled in in n ways (even though the first box is filled with one item, the same item can be used for filling the second box also because repetition is allowed); the third box can also be filled in n ways and so on ...the rth box can be filled in n ways .Now all the r boxes together can filled in {n.n.n.n... r times} ways i.e., **n^r ways**

The number of permutation of n things , taken r at a time when each item may be repeated once, twice, ... Up to r times in any arrangement is **n^r.** What is important is not this formula by itself but the reasoning involved. So, even while solving problems this type, you will be better off if you go from the basic reasoning and not just apply this formula.

TOTAL NUMBER OF COMBINATIONS

Out of n given items, the number of ways of selecting **one or more** items is where we can select 1 or 2 or 3 and so no n items is at a time hence the number of ways is

$^nC_1+ {}^nC_2+ {}^nC_3+....+ {}^nC_n$ This is called "the total number of combinations " and is equal to $2^n -1$ where n is the number of items.

The same can be reasoned out in the following manner also.

There are n items to select from .Let each of these be represented by a box.
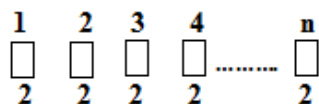
No of ways of dealing with the boxes. The first box can be dealt with in two ways. In any combination that we consider, this box is either included. Or not included. These are the two ways of dealing with the first box. Similarly, the second box can be dealt with in two ways. By the Fundamental Rule , the number of ways of dealing with all the boxes together in 2.2.2......n times ways. i.e., in 2^n ways. But out of these , there is one combination where we "do not include the

first box , do not include the second box, do not include the third box and so on, do not include the nth box." That means, no box is included. But this is not allowed because we have to select one or more of the items (i.e., at least one items) Hence this combination of no box being included is to be subtracted from the 2^n ways to give the result of Number of ways of selecting one or more items from n given items is $2^n -1$

Dividing given items into groups

Dividing (p +q) items into two groups of p and q items respectively. Out of (p +q) items if we select p items (which can be done in $^{(p+q)}C_p$ ways), then we will be left with q items, ie., we have two groups of p and q items respectively . So, the number of ways of dividing (p + q) items into two groups of p and q items respectively is equal to $^{p+q}C_p$ which is equal to $\dfrac{(p+q)!}{p!.q!}$

THE NUMBER OF WAYS OF DIVIDING (P+Q) ITEM INTO TWO GROUPS OF P AND Q ITEMS RESPECTIVELY IS $\dfrac{(p+q)!}{p!.q!}$

If p=q, i.e., if we have to divide the given items into two EQUAL groups, then two cases arise

1) when the two groups have distinct identity and

2) when the two groups do not have distinct identity.
   In the first case, we just have to substitute p=q in the above formula whch then becomes

THE NUMBER OF WAYS OF DIVIDING 2P ITEMS INTO TWO EQUAL GROUPS OF P EACH IS $\dfrac{(2p)!}{(p!)^2}$

WHERE THE TWO GROUPS HAVE DISTINCT IDENTITY.

In the second case, where the two groups do not have distinct identity. We have to

divide the above result by 2! i.e., it then becomes

THE NUMBER OF WAYS DIVIDING 2P ITEMS INTO TWO EQUAL GROUPS OF P EACH IS $\dfrac{(2p)!}{2!(p!)^2}$ WHERE THE TWO GROUPS DO NOT HAVE DISTINCT IDENTITY.

When n distinct things are arranged in a straight line taking all the n items we get n! Permutations. .However if these n items are arranged in a circular manner, then the number of arrangements will not v be n! But it will be less than that. This is because in a straight line manner, if we have an arrangement ABCDE and if we move every item one place to the right (in cyclic order), the new arrangement that we get EABCD is not the same as ABCDE in a circular fashion, by shifting every item by one place in the clockwise direction, we still get the same arrangement ABCDE. So, if we now take n! as the number of permutations, we will be counting the same arrangement more than once.

The number of arrangements in circular fashion can be found out by first fixing the position of one item .Then the remaining (n-1) items can be arranged in (n-1) ! ways. Now even if we move these (n-1) items by one place in the clockwise direction, then the arrangement that we get will not be the same as the initial arrangement because one item is fixed and it does not move

Hence, the number of ways in which n distinct things can be arranged in a circular arrangement is (n-1)! If we take the case of five persons A,B,C,D and E sitting around a table , then the two arrangements ABCDE (in clockwise , direction) and AEDCB (the same order but in anticlockwise direction) will be different and distinct. Here we say that the clockwise and anticlockwise arrangements are different. However, if we consider the circular arrangements of necklace made of five precious stones A, B,

C, D and E the two arrangements talked of above will be the same because we take one arrangement. Here, we take one arrangement and turn the necklace around (front to back)) then we get the other arrangement . Here we say that there is no difference between the clockwise and anticlockwise arrangements. In this case the number of arrangements will be half of what it is in the case where the clockwise and anticlockwise arrangement s are different. The number of circular arrangements of n distinct items is (n-1)!. if there is a difference between clockwise and anticlockwise arrangements and (n-1)!/2 if there is no difference between clockwise and anticlockwise arrangements and (n-1)!/2if there is no difference between clockwise and anticlockwise arrangements.

THE NUMBER OF DIAGONALS IN AN N – SIDED REGULAR POLYGON

An n-sided regular polygon has n vertices. Joining any two vertices we get a line of the polygon which are $^nC_2$ lines , n of them are sides. Hence diagonals are $^nC_2 - n = \dfrac{n(n-3)}{2}$

The following points are useful in solving theproblems .
1) $^nC_0 = {}^nC_n = 1$
2) $^nC_1 = {}^nC_{n-1} = n$
3) $^nC_r = {}^nC_{n-r}$
4)if $^nC_r = {}^nC_s$ then r=s r n=r+s
5) $^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

Q.1 Find the number of 4 –digit numbers that can be formed using the digits 0.2,5,7,9,6 where a digit can be repeated more than once.

Solution:
Among the given digits 0,2,5,7,9,6 zero cannot be in thousands place 2,5,7,9,6 are to be used for the thousands place of a four digit number, which can be done in 5 ways
Since the repetition of digits is allowed, for each of the hundreds

tens and the units place, all the given digits can be used which can be done in 6(6)(6) (6) or 216 ways $\therefore$ the total number of 4 digit numbers that can be formed is 5(216) or 1080

Q.2 If $^nP_4 = 7920$, then find $^nC_4$

Solution:

$$^nP_4 = n(n-4)(n-2)(n-3)$$
$$= 10(4)(198)$$
$$= 8(9)(10)(11)$$
$$\therefore n = 11$$

$$\therefore {}^n P_4 = {}^{11} C_4 = {}^n P_4 \left(\frac{1}{4!}\right)$$

$$= \frac{1}{4!} 7920 = 330$$

Q.3 In how many ways can the letters of the word RECRUDESCENCE be arranged?

Solution:

The given word contains 4E's, 2R's, 3C's, 1U, 1D, 1S, 1N. Here the total numbers of letters = 13

$\therefore$ Number of arrangements $\dfrac{13!}{4!2!3!}$

Q.4 Find the number of ways in which six boys and five girls can be seated in a row such that each girls has a boy sitting on either side?

Solution :

There are 6 boys and 5 girls Possible seating arrangement : BGBGBGBGBGB

$\therefore$ Total number of sitting arrangements = 5!6!

Q.5 Find the number of ways of drawing four cards, all of different suits from pack of 52 playing cards? (Diamonds, spades, hearts and clubs are the suits in a pack)

Solution :

A pack of 52 cards contains 4 different suits. Number of ways of drawing four cards each $= {}^{13}C_1 . {}^{13}C_1 . {}^{13}C_1 . {}^{13}C_1 = 13^4$

% PROBABILITY

Probability is an important topic for the entrance exams. This is a topic that you will require in your management courses also. Hence, the basic concepts that we are going to learn should be understood thoroughly because their usefulness goes beyond the entrance exams. While discussing the basics of probability, we will look at the meanings of a few terms but the emphasis will not be on studying the scientific definition of the terms.

The word Probability is used, in a broad sense , to indicate a vague possibility that something might happen. It is also used synonymously with chance. Deterministic and Probabilistic Phenomena If the result is not unique and can be one of the several possible outcomes, such an experiment is called a random experiment. Random experiment is of probabilistic nature. For example, when we throw a die, we may get, as the outcome, any integer from 1 to 6. Hence, this can be termed as a random experiment. Biased and unbiased Experiments When we throw a die, if there is any reason to believe that one of the numbers will turn up more frequently (or the likelihood of getting one or more numbers is more than that of the other numbers), we say it is a biased die. If all the six numbers are equally likely, then we call it an unbiased die. Similarly, a coin also can be termed as an unbiased or a biased coin depending on whether the heads and tails are equally likely or not. We will be mostly looking at unbiased experiments. Hence, unless otherwise specified, in the discussion that follows, a coin or a die is to be treated as unbiased. The basic outcome of an experiment is termed as occurrences. Hence, if we throw a die there are 6 occurrences. If we toss a coin there are 2 occurrences. Events are defined as a collection of one or more occurrences. For example, if we throw a die we can

define the following 6 events.

Getting a 1	getting a 2
Getting a 3	getting a 4
Getting a 5	getting a 6

Here, each of these events has one occurrence. Consider the following two events when a die is thrown.
1) Getting an even number
2) Getting an odd number

Each of these 2 events has 3 occurrences. So, in this case, we say that out of a total of 6 occurrences in the experiments, 3 are favorable to the event of "getting an odd number" and 3 occurrences are favorable to the event of "getting an even number'.

1) Equally Likely Events
   Two events are said to be equally likely when there is no reason to expect any one rather than the other.
   For example, when a die is thrown, any number from 1 to 6 may show up. In this trial ,the six events are equally likely.
2) Compound Events
   When two or more events are in relation with each other, they are known as Compound Events.
   For example, when a die is thrown two times, the events of getting 3 in the first throw and 5 in the second throw is a compound event.

DEFINITION OF PROBABILITY

If in an experiment, there are 'n' occurrences out of which 'm' occurrences are favorable to a particular event E, then the probability of the event A [written as P(E)] is defined as P(E)=m/n.
For the events E, the non-occurrences of the event is denoted by $\overline{E}$. Out of a total of n occurrences, if m occurrences are favourable to the event E, it means that (n-m) occurrences are favorable to the event $\overline{E}$.

Hence, the probability of the event $\overline{E}$ will be $P(\overline{E}) = \dfrac{n-m}{n}$ (Complementry event).

We can also see that P($\overline{E}$)+P(E) = 1. In some problems, when we are asked to find out the probability of an event $\overline{E}$, it becomes easier to calculate the probablity of E and subtract that probability from 1 to get P($\overline{E}$).(which we will seen in some of the examples)

Note:
1) Probablity [P(E)] of the happening of an event E is known as the probability of success and the probability [P$\overline{E}$] of the non-happening of the event is the probability of failure.
2) If P(E)=1,the event is called a certain event and if P(E)=0 the event is called an impossible event.
3) Instead of saying that the chance of happening of an event is m/n, we can also say that the odds in favour of the event are m to (n-m). Similarly, if m/n is the probability of the occurrences of an event, since (n-m)/n is the probability of non-occurrences of the event, we can also say that the odds against the events are (n-m) to m.

   Let us define 4 different sets of events when a die is thrown as given below:
   Set 1: Getting a 1 ; getting a 2; getting a 3; getting a 4; getting a 5; getting a 6.`
   Set 2: Getting an even number; getting an odd number.
   Set 3: Getting a number > 3, getting a number<3.
   Set 4: Getting a number≥3, getting a number ≤3.

a) If we compare the 1st and 3rd set of events, one main difference is that the events of set 1 include all possible occurrences of the experiments without leaving any occurrences, whereas, the events of set 3 do not cover all the possible occurrences of the experiments (because the occurrences of getting a 3 is not covered either one of the two events in set 3).

Events that together cover all the possible occurrences of an experiment are termed as COLLECTIVELY EXHAUSTIVE events. The events of set 2 and 4 are also collectively exhausted events.

b) If we compare the events of set 1 and set 4 , the main difference is that in the events of set 1 no occurrences appears in more than one event whereas , in the events of set 4 some occurrences appear in more than one event (in this case , the occurrences 3 appears in both the events of set 4).
   If the occurrences of one events precluded the possibility of the occurrences of any other events are called MUTUALLY EXCLUSIVE events.
   So, in a set of mutually exclusive events, any occurrences of the experiments cannot come into more than one event.
   As is clear, set 2 and set 3 are also mutually exclusive events.
   So, set 1 and 2 are both mutually exclusive and collectively exhaustive.

c) If we have a set of events which are both mutually exclusive and collectively exhaustive, then the sum of the probability of such events will be equal to 1.
   The two events we discussed above are mutually exclusive and collectively exhaustive as per the definition we just looked at.

ADDITION THEOREM ON PROBABLITY

If there are two sets A and B , we know that the number of elements in A∪B is given by n(A∪ B)=n(A)+n(B)-n(A∩ B).
A similar relationship exists in Probablity Theory (called as the Addition Theorem of Probability) as P(A∪B)=P(A)+P(B)-P(A∩B), where A and B are two events.
If A and B are mutually exclusive events (i.e, A and B are disjoint sets), then P(A∩B)=0

Note:
1) If there are two mutually exclusive events A & B, then P(A∪B)=P(A)+P(B).
2) Independent Events
   Two events E_1 and E_2 are said to be independent, if the occurrences or non-occurrences of the event E_2 is not affected by the occurrences or non-occurrences of the events E_1.
3) If A and B are two independent events, then P(A∩ B)= P(A)P(B)

We will now take up some more examples and work them out. In problems on probability, there are four categories of items involved in the experiments dice, coins, pack of cards and different colored balls. We will take up examples on all varieties.

WORKED OUT EXAMPLES:

1) If dice is rolled, then find the probability of getting a number divisible by 2.
Solution:
   When a dice is rolled n(S)=6
   Favorable outcomes are {2,4,6} i.e, 3
   ∴Required probability = 3/6 =1/2

2) When a dice is rolled, what is the probability of getting a composite number?
Solution:
   Number of favorable outcomes=2({4,6})
   Total outcomes = 6

   ∴Required probability $= \dfrac{2}{6} = \dfrac{1}{3}$

3) When two coins are tossed together, find the probability of getting exactly two tails?
Solution:
   Number of favorable outcomes =1(TT)
   Total outcomes =4(HH,HT,TH,TT)

   ∴Required probability $= \dfrac{1}{4}$

4) If two dice are tossed, the probability that the sum is 8 is
Solution:

Two dice are rolled; the number of possibilities is 36.
The favorable cases are (2,6), (6,2), (3,5), (5,3), (4,4)

∴Required probability = $\dfrac{5}{36}$

5) Suppose, seven coins are tossed then the probability of getting atleast one head is
Solution:
   Probablity of getting at least one head =1-(probability of getting no heads).
   $= 1 - \dfrac{1}{2^7} = 1 - \dfrac{1}{128} = \dfrac{127}{128}$

6) A and B play a game where each is asked to selected a number from 1 to 8.If both of them select the same number, then they win a prize. Find the probability that they will not win the prize.
Solution:
   The total number of ways of selecting numbers for both A and B is = 8(8)=64
   They win the prize if they select same numbers.
   The total possibilities are 8, i.e. (1,1), (2,2), (3,3), (4,4), (5,5), (6,6), (7,7), (8,8)
   ∴Probablity of winning Prizes $= \dfrac{8}{64} = \dfrac{1}{8}$

   The probability of not getting a prize
   $= 1 - \dfrac{1}{8} = \dfrac{7}{8}$.

%& GEOMETRY & MENSURATION

STRAIGHTR LINE

Parallel lines: - Two straight lines are parallel if they lie on the same plane and do not intersect however far produced.

Transversal :- It is a straight line that intersects two parallel lines. When a transversal two parallel lines then
1) Corresponding angles are equal , ? (that is : For the figure below)
2) Alternate interior angles are equal , that is (Refer figure below.) 4=6;5=3
3) Alternate exciter or angles are equal, that is 2=8;1=7
4) Interior angles on the same side of transversal add up to 180°, that is
   4 + 5 = 33 + 6= 180°
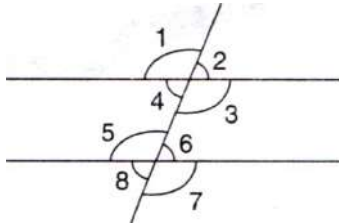
POLYGONS

Polygons are plane figures formed by a closed series of rectilinear (straight) segments.

Example:
Triangle, Rectangles.
Polygons can broadly be divided into two types:
a) Regular polygons: Polygons with all the sides and angles equal.
b) Irregular polygons: Polygons in which all the sides or angles are not of the same measure.

TRIANGLES (Δ)

A triangle I a polygon having three sides.
Sum of all the angles of a triangle =180°

Types:
1) Acute angle triangle: Triangles with all three angles acute (less than 90°)
2) Obtuse angle triangle: Triangles with one of the angles obtuse (more than 90°)
   Note: We cannot have more than one obtuse angle triangle.
3) Right angle triangle: Triangle with one of the angles equal to 90°
4) Equilateral triangle: Triangle with all sides equal. All the angles in such a triangle measure 60°
5) Isosceles triangle: Triangle with two of its sides equal and consequently the angles opposite the equal sides are also equal.
6) Scalene Triangles: Triangle with none of the sides equal to any other side.

PROPERTIES (GENERAL)

1) Sum of the length of any two sides of a triangle has to be always greater than the third side.
2) Difference between the lengths of any two sides of a triangle has to be always lesser than the third side.
3) Side opposite to the greatest angle will be the greatest and the side opposite to the smallest angle the smallest.
4) The exterior angle is equal to the sum of two interior angles not adjacent to it.
   $\angle ACD = \angle BCE = \angle A + \angle B$
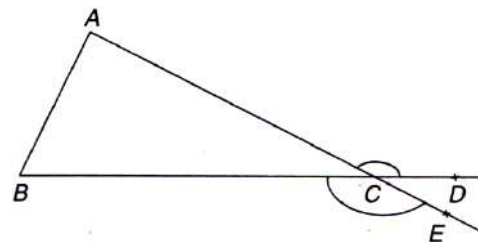
AREA:

1) Area=1/2 base × height or 1/2bh.
   Height =Perpendicular distance between the base and vertex opposite to it

2) Area $= \sqrt{s(s-a)(s-b)(s-c)}$ (Heros's formula)

Where $S = \dfrac{a+b+c}{2}$ (a, b and c being the length of the sides

3) Area $= r \times S$ (where r is in radius)
4) Area $= 1/2 \times$ product of two sides $\times$ sine of the included angle.
   $= 1/2\ ac \sin B$
   $= 1/2\ ab \sin B$
   $= 1/2\ bc \sin B$
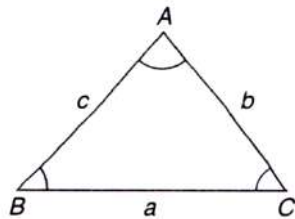
5) Area $= abc/4R$
   Where R = circum radius

CONGRUENCY OF TRIANGLES

Two triangles are congruent if all the sides of one are equal to the corresponding sides of another, It follows that all the angles of one are equal to the corresponding angles of another. The notation for congruency is $\cong$

Q.1 **SAS congruency**: If two sides and an included angle of one triangle are equal to two sides and an included angle of another, the two triangles are congruent. (See figure below.)
Here,
AB=PQ
BC=QR
And ∠B=∠Q
So ΔABC ≅ ΔPQR
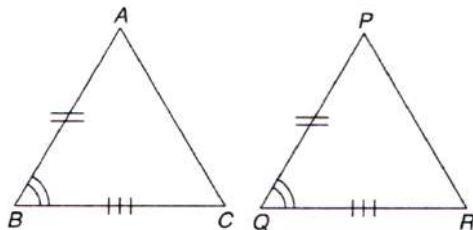
Q.2 **ASA congruency**: If two angles and the included side of one triangle is equal to two angles and the included side of another, the triangles are congruent.
(See figure below.)
Here,
∠A=∠P
∠B=∠Q
And AB=PQ
So ΔABC ≅ ΔPQR
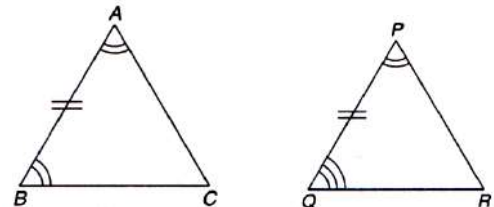
Q.3 **AAS congruency**: If two angles and side opposite to one of the angle is equal to the corresponding angles and the side of another triangle , the triangles are congruent. In the figure below:
∠A=∠P
∠B=∠Q
And AC=PR
So ΔABC ≅ ΔPQR
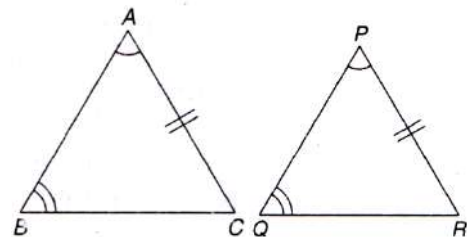
Q.4 **SSS congruency**: If three sides of one triangle are equal to three sides of another triangle, the two triangles are congruent. In the figure below:
AB=PQ
BC=QR
AC=PR
∴ ΔABC ≅ ΔPQR
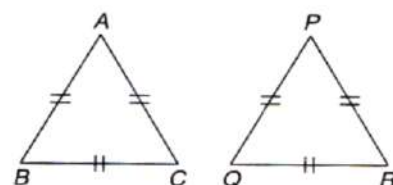
Q.5 **SSA congruency** : If two sides and the angle opposite the greater side

of one triangle are equal to the two sides and the angle opposite to the greater side of another triangle, then the triangles are congruent. The congruency doesn't hold if the equal angles lie opposite the shorter side. In the figure below, if the below, if
AB=PQ
AC=PR
∠B=∠Q
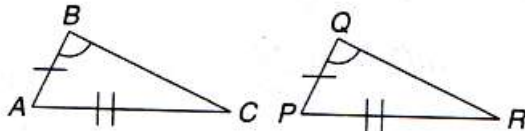
Then the triangles are congruent.
i.e., ΔABC ≅ΔPQR

SIMILARITY OF TRIANGLES

Similarity of triangles is a special case where if either of the conditions of similarity of polygons holds if either of the conditions of similarity of polygons holds, the other will hold automatically.

TYPE OF SIMILARITY

1) **AAA similarity:** If in two triangles corresponding angles are equal, that is the two triangles are equiangular then triangles are similar. Corollary (AA similarity) If two angles of another triangle then the two triangles are similar. The reason being, the third angle becomes equal automatically.

2) **SSS similarity:** If the corresponding sides of two triangles are proportional then they are similar. For ΔABC to be similar to ΔPQR, AB/PQ = BC/QR = AC/PR, must hold true.

3) **SAS similarity:** If in two triangles, one pair of corresponding sides are proportional and the included angles are equal then the two triangles are similar. .
ΔABC ~ΔPQR
If   AB/BC=PQ/QR and ∠B=∠Q

EQUILATEAL TRIANGLES (OF SIDE A)

1) $h = \dfrac{a\sqrt{3}}{2}$ $\left(\therefore \sin 60 = \sqrt{3}/2 = h/\text{side} \right)$

2) $\text{Area} = 1/2(\text{base}) \times (\text{height})$

$= \dfrac{1}{2} \times a \times \dfrac{a\sqrt{3}}{4} = a^2$
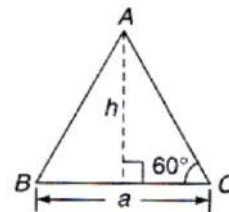
3) R (circum radius) $= \dfrac{2h}{3} = \dfrac{a}{\sqrt{3}}$

4) R (in radius) $= \dfrac{h}{3} = \dfrac{a}{2\sqrt{3}}$

PROPERTIES

1) The in centre and circum centre lies at a point that divides the height in the ratio2:1
2) The circum radius is always twice the in radius . [R =2r]
3) Among all the triangles that can be formed with a given perimeter, the equilateral triangle will have the maximum area.
4) An equilateral triangles in a circle will have the maximum area compared to other triangles inside the same circle.

ISOSCELES TRIANGLE

$\text{Area} = \dfrac{b}{4}\sqrt{4a^2 - b^2}$

In an isosceles triangle, the angles opposite to the equal sides are equal.
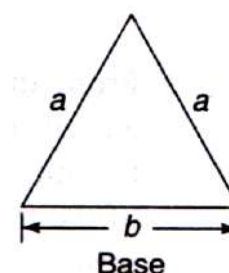
RIGHT- ANGLED TRIANGLE

PYTHAGORAS THEOREM

In the case of a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides, In the figure below, for triangle ABC, $a^2 = b^2 + c^2$
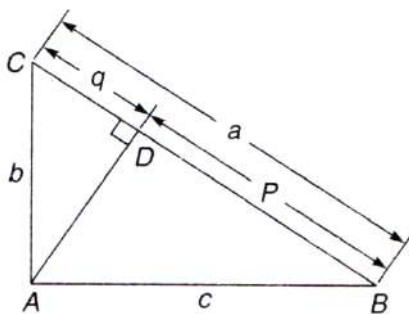
Area =1/2 (product of perpendicular sides)

$R \text{ (circumradius) } = \dfrac{\text{hypotenuse}}{2}$

Area =rs

(Where r=in radius and s=(a+b+c)/2 where a, b, and c are sides of the triangle)

$\Rightarrow$ 1/2 bc =r (a + b + c)/2

r =(bc)/(a + b + c)/2

In the triangle ABC,

ΔABC ~ΔDBA~ΔDAC

1) ΔABC ~ΔDBA
   ∴AB/BC=DB/BA
   $\Rightarrow AB^2 = DB \times BC$
   $\Rightarrow c^2 = pa$

2) ΔABC ~ΔDAC
   AC/BC=DC/AC
   $\Rightarrow AC^2 = DC \times BC$
   $\Rightarrow b^2 = qa$

3) ΔDBA ~ΔDAC
   $DA/DB = DC/DA$
   $\Rightarrow DA^2 = DB \times DC$
   $\Rightarrow AD^2 = pq$

IMPORTANT TERMS WITH RESPECT TO A TRIANGLE

1. **Median:** A line joining the mid- point of a side of triangle to the opposite vertex is called a medium. In the figure the three medias are PG, QF and RE where

G,E and F are mi- point of their respective sides

1) A median divides a triangle into two parts of equal area.
2) The point where the three medians of a triangle meet is called the centroid of the triangle.
3) The centroid of a triangle divides each median in the ratio 2:1
   i.e., PC: CG=2:1 =QC: CF =RC: CE
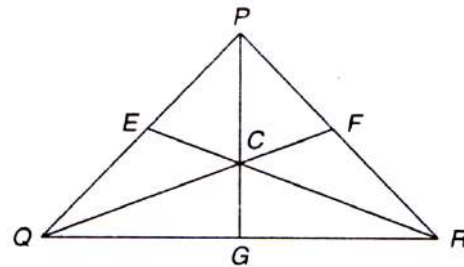
IMPORTANT FORMULA WITH RESPECT TO A MEDIAN

$\rightarrow 2 \times (\text{median})^2 + (1/2 \text{ the third side})^2 = $ Sum of the squares of other two sides

$\Rightarrow 2(PG)^2 + 2 \times \left(\dfrac{QR}{2}\right)^2$

2. **Altitude/ Height:** A perpendicular drawn from any vertex to the opposite side is called the altitude (In the figure, AD BF and CE are the altitudes of the triangles)

1) All the altitudes of a triangle met at a point called the orthocenter of the triangle.
2) The angle made by any side at the orthocenter and the vertical angle make a supplementary pair (i.e., they both add up to 180°).In the figure below:
 $\angle A + \angle BOC = 180° = \angle C + \angle AOB$
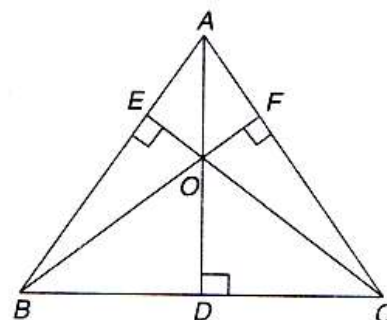
3. **Perpendicular Bisectors:** A line that is a perpendicular to a side and bisects it is the perpendicular bisector of the side.
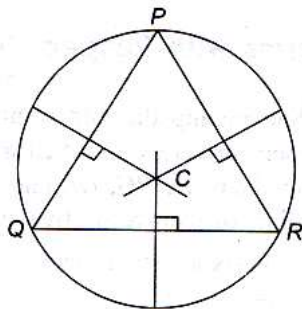
1) The point at which the perpendicular bisectors of the sides meet is called the curcumcentre of the triangle.
2) The circumcentre is the centre of the circle that circumscribes the triangle. There can be only one such circle.
3) Angle formed by any side at the circumcetre is two times the vertical angle opposite to the side. This is the property of the circle whereby angles formed the property of the circle whereby angles formed by an arc at the centre are twice that of the angle formed y the same are in the opposite are . Here we can view this as:
   ∠QCR = 2QPR (When we consider are QR and it's opposite arc QPR)

4. **In center:**
1) The lines bisecting the interior angles of a triangle are the angle bisectors of that triangle.
2) The angle bisectors meet at a point called the in centre of the triangle.
3) The in centre is equidistant from all the sides of the triangle.
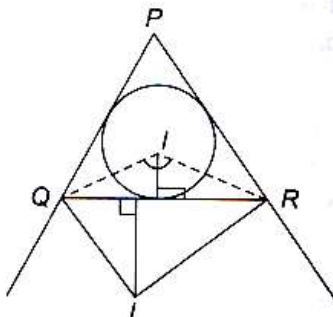
4) From the in centre with a perpendicular drawn to any of the sides as the radius, a circle can be drawn touching all the three sides. This is called the in circle of the triangle .The radius of the circle is known as in radius.
5) The angle formed by any side at the in centre is always a right angle more than half the angle opposite to the side. This can be illustrated as $\angle QIR = 90 + 1/2\angle P$
6) If QI and RI be the angle bisectors of exterior angles at Q and R then, QIR=90+1/2∠P

TYPES OF QUADRILATERALS

1. Parallelogram

A parallelogram is a quadrilateral with opposite sides parallel (as shown in the figure below)
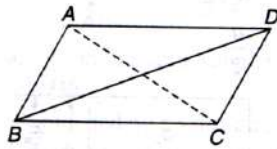1) Area =Base (b)× Height (h)
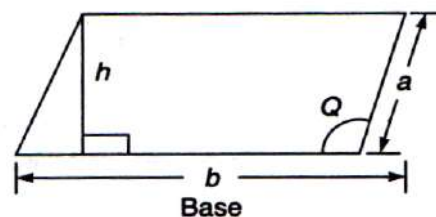
2) Area = product of any two adjacent sides × sine of the included angle.
3) perimeter =2(a+b)
where a and b are any two adjacent sides.

PROPERTIES

1) Diagonals of a parallelogram bisect each other.
2) Bisectors of the angles of a parallel gram form a rectangle.
3) A parallelogram inscribed in a circle is a rectangle.
4) A parallelogram circumscribed about a circle is a rhombus.
5) The opposite angles I a parallelogram are equal.
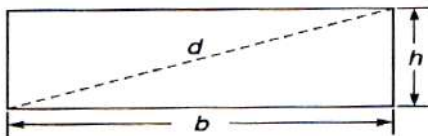6) The sum of the squares of the diagonals is equal to the sum of the squares of the four sides in the figure:
$$AC^2 + BD^2 = AB^2 + BC^2 + CD^2 + AD^2$$
$$= 2(AB^2 + BC^2)$$

2. Rectangles:

A rectangles is a parallelogram with all angles 90°

1) Area=Base× Height =b×h

Note: Base and height are also referred to as the length and the breadth in a rectangle.

2) Diagonal $(d) = \sqrt{b^2 + h^2} \rightarrow$ buy Pythagoras theorem

PROPERTIES OF A RECTANGLE

A parallelogram having all the sides equal is a rhombus.

1) Area=1/2 × product of diagonals × since of the angles between them.
$= 1/2 \times d_1 \times d_2 \sin 90°$ (diagonals in a rhombus intersect at right angles)
$= 1/2 \times d_1 \times d_2$ (since $\sin 90° = 1$)

2) Area = Product of adjacent sides × sine of the angle between them.

3) Diagonals bisect each other at right angles.

4) All rhombuses are parallelograms by the reverse is not true.

5) A rhombus may or may not be a square but all square are rhombus.

3. Square:

A square is a rectangle with adjacent sides equal or a rhombus with each angle 90°

1) Area =base × height = a^2

2) Area=1/2 (diagonal)$^2 = \dfrac{1}{2} d^2$ (square s a rhombus too)

3) Perimeter = 4a (a=side of the square)

4) Diagonal $= \sqrt{2}$
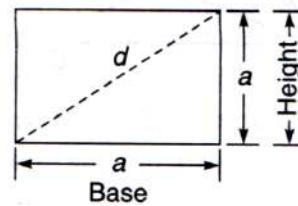
5) inradius $= \dfrac{a}{2}$

PROPERTIES

1) Diagonals are equal and bisect each other at right angles.

2) Side is the diameter of the inscribed circle.

3) Diagonal is the diameter of the circumscribing circle
$\Rightarrow$ Diameter $= a\sqrt{2}$
circumradius $= a / \sqrt{2}$
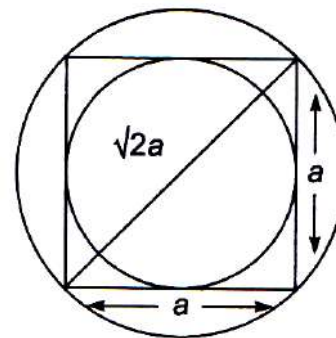
4. Trapezium:
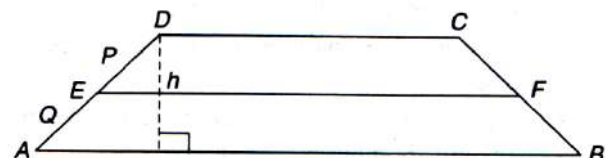
A trapezium is a quadrilateral with only two sides parallel to each other.

1) Area=1/2×sum of paralleo sides×height
=1/2 (AB+DC) × h. For the figure below.

2) Median=1/2× sum of the parallel sides
*(median is the line equaidstant from the parallel sides)
For any line EF parallel to AB

$$EF = \frac{\left\{ \left[P \times (AB)\right] + \left[Q \times (DC)\right] \right\}}{AD}$$

PROPERTIES

1) If the non- parallel sides are equal then diagonals will be equal too.

CIRCLES

1) Area $= \pi r^2$
2) Circumference $= 2\pi r = (r = \text{radius})$
3) Area$= 1/2 \times$ circumference $\times$ r

ARC

It is a part of the circumference of the circle. The bigger one is called the major arc and the smaller one the minor arc.

1) Length $\left(\text{ArcXY}\right) = \dfrac{\theta}{360} \times 2\pi r$
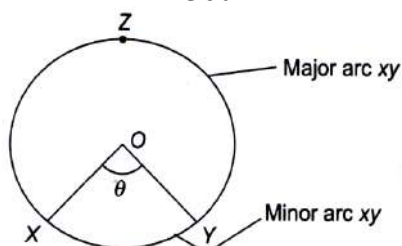
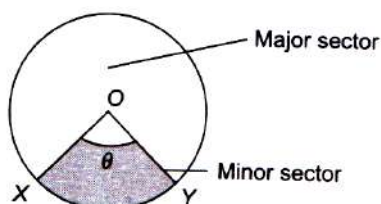2) Sector of a circle is a part of the area of a circle between two radii

3) Area of a sector $= \dfrac{\theta}{360} \times \pi r^2$

(where θ is the angle between tow radii)
$=(1/2)$r×length (arc xy)
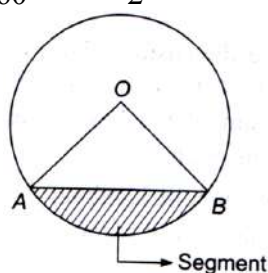$(\because \pi r\theta/180 = \text{length arc xy})$
$= \dfrac{1}{2} \times r \times \dfrac{\pi r\theta}{360}$

4) **Segment:** A sector minus the triangle formed by the two radii is called the segment of the circle.
Area = Area of the sector–Area
$\Delta OAB = \dfrac{\theta}{360} \times \pi r^2 - \dfrac{1}{2} \times r^2 \sin\theta$

5) Perimeter of segment =length of the arc+ of segment AB
$= \dfrac{\theta}{360} \times 2\pi r + 2r\sin\left(\dfrac{\theta}{2}\right)$
$= \dfrac{\pi r\theta}{180} + 2r\sin\left(\dfrac{\theta}{2}\right)$

6) **Congruency:**
Two circles can be congruent if and only if they have equal radii.

PROPERTIES

1) The perpendicular from the centre of circle to a chord bisects the chord. The converse is also true.
2) The perpendicular bisectors of two chords of a circle intersect at its centre.
3) There can be one and only one circle passing through three of more non-colieanr points.
4) If two circles intersect in two points then the line through the centers is the perpendicular bisector of the common chord.
5) If two chords of a circle are equal ,then the centre of the circle lies on the angle bisector of the two chords.
6) Equal chords of a circle or congruent calicles are equidistant from the centre.
7) Equidistant chords from the centre of a circle are equal to each other in terms of their length .
8) The degree measure of an arc of a circle is twice the angle subtended by it at any point on the alternate segment of the circle. This can be clearly seen in the following figure:
With respect to the arc AB,∠AOB=2∠ACB
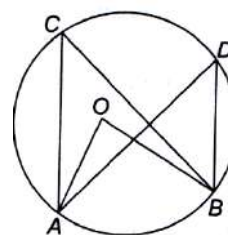
9) Any two angles in the same segment are equal .Thus ∠ACB=∠ADB
10) The angle subtended by a semi –circle is right angle. Conversely, the arc of a

circle subtending a right angle at any point of the circle in its alternate segment is a semi-circle.

11) Any angle subtended by a minor arc in the alternate segment is acute, and any angle subtended by a major arc in the alternate segment is obtuse. In the figure below.
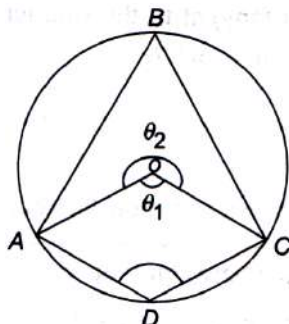
$\angle ABC$ is acute and

$\angle ADC$=obtuse

Also $\quad \theta_1 = 2\angle B$

And $\quad \theta_2 = 2\angle D$

$\therefore \theta_1 + \theta_2 = 2(\angle B + \angle D)$

$= 360° = 2(\angle B + \angle D)$

Or $\angle B + \angle D = 180°$

Or sum of opposite angles of a cyclic quadrilateral is 180°

MENSURATION

The following formulae hold true in the area of menstruation:

1. CUBOID

A cuboids is a three is a three dimensional box . It volume is defined by the vitue of it's length l breadth b and height h. It can be visualized as a room which has its length, breadth and height different form each other.

1. Total surface area of a cuboids =2(lb+bh+lh)

2. Volume of cuboids = lbh

2. CUBE OF SIDE 'S'

A cube is cuboids which has all its edges equal i.e. length =breadth =height =s

1) Total surface area of a cube $= 6s^2$

2) Volume of the cube $= s^3$

3. PRISM

A prism is a solid which can have any polygon at both its ends. It's dimensions are defined by the dimensions of the polygon at it's ends and its height.

1) Lateral surface area of a tight prism = perimeter of base* height

2) Volume of a right prism = area of base * height

3) Whole surface of a right prism= Lateral surface of the prism + area of the two plane ends.

4. CYLINDER

Is a solid which has both its ends in the form of a circle .Its dimensions are defined in the form of the radius of the base (r) and the height h. A gas cylinder is a close approximation of a cylinder.

1) Curved surface of a right cylinder=2πrh where r is the radius of the base and h the height.

2) Whole surface of a right circular cylinder $= 2\pi rh + 2\pi r^2$

3) Volume of a right circular cylinder $= \pi r^2 h$

5. PYRAMID

A pyramid is a solid which can have any polygon as its base and its edges converge to a single apex. Its dimensions are defined by the dimensions of the polygon at its base and the length of its lateral edges which lead to the apes. The Egyptian pyramids are example of pyramids.

1) Slant surface of a pyramid=1/2* Perimeter of the base* slant height

2) Whole surface of a pyramid = Slant surface + area of the base

3) Volume of a pyramid $= \dfrac{\text{area of the base} *}{3}$ height

6. CONE

A cone is a solid which has a circle at irs base and a slanting lateral surface that converges art the apex. Its dimensions are defined by the radius of the base ?(r) the height (h) and the slant height (I) A structure similar to a cone is used in ice cream cones

1) Curved surface of a cone $=\pi rl$ where l is the height

2) Whole surface of a cone $= \pi rl + \pi r^2$

3) Volume of a o cone $= \dfrac{\pi r^2 h}{3}$

7. SPHERE

Is a solid in the form of a ball with radius r.

1) Surface Area of a sphere $= 4\pi r^2$

2) Volume of a sphere $= \dfrac{4}{3}\pi r^3$

DATA INTERPRETATION

INTRODUCTION

Data can be organized in a number of ways so that larger volume of data can be presented in a more compact and precise form. Data thus presented has to be deciphered correctly by the user of the data. This of deciphering the data from its compactly presented form is called Data Interpretation.

REPRESENTATION OF DATA

Numerical data can be presented in one or more of the following ways
1) Data Table
2) Pie Chart
3) Line Graph
4) Bar Chart
5) Others

The "Others" category covers miscellaneous form like descriptive case format etc. customized for the situation. Data can also be presented by using a combination of two or more of the above forms.

While some data can be presented in many different forms, some other may be amenable to be presented only in few ways. In real life situation, the style of data presentation is based on the end-objective. In certain situation data has to be presented as a combination of two or more forms of data presentation.

Let us understand each of the above form of data presentation with an example.

DATA TABLE

Here data is presented in the form of table. Where any type of data can be presented in tabular form, that too is a very accurate manner , interpreting the data in table form becomes more difficult and time consuming than the other modes, all of which are basically pictorial or graphical in presentation.

Year	A		Year	B	
	Appeared	Qualified		Appeared	Qualified
2002	250	720	2002	1750	460
2003	2750	810	2003	1860	490
2004	3000	890	2004	2000	520
2005	3250	910	2005	2100	640
2006	3720	1050	2006	2400	830

Year	C		Year	D	
	Appeared	Qualified		Appeared	Qualified
2002	100	120	2002	800	120
2003	1120	200	2003	1000	220
2004	1250	300	2004	1200	300
2005	1500	600	2005	1210	340
2006	1650	780	2006	1440	480

Year	E	
	Appeared	Qualified
2002	2000	370
2003	2200	420
2004	2500	510
2005	2750	680
2006	3440	960

Data tables can be of a number of types. They can be of a single –table variety or combination of tables. One such example of table is given above.

The above table shown the number of students appeared and qualified in an entrance test from five districts A,B,C,D and E of a state.

From the above table, we can obtain the following data;
1) Total number of students appeared and qualified from the given districts in each of the years.
2) Percentage increase in the number of students appeared or qualified in the district over the years.
3) Average number of students appeared or qualified
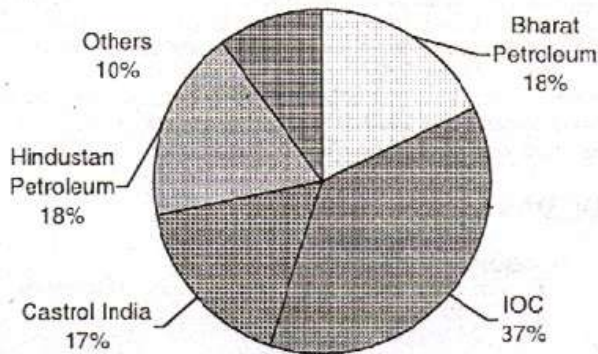
PIE-CHARTS

This is probably the simplest of all pictorial forms of data presentation. Here, total

quantity to be shown is distributed over one complete circle or 360 degree. In pie-charts, data is essentially presented shares of various elements as proportion and percentage of the total quantity. Each element or group in a pie-chart is represented in the terms of quantity (or value, as the case may be) or as the angle made by the sector representing the elements or as a proportion of the total or as a percentage of the total.

Chart 1 gives distribution of sales of different companies.

CHART – 1

Total sales : ₹6,000 crores

From the above pie chart, we can calculate the following;

1) Total sales of each of the companies.
2) Sales of a company as a percentage of the other.
3) Conversion of these percentage values into angles for each zone.

Pie-chart are also very frequently used in combination with other forms of data or along with other pie-charts.

TWO- DIMENSIONAL GRAPHS

This is essentially used for continuous data but can also be used for depicting discrete data provided we understand the limitation. Also known as Cartesian Graphs, they represent variation of the one parameter with respect to another parameter each shown on a different axis. These types of graphs are useful in studying the rate of change or understanding the trends through extrapolations.

These graphs can be of various types and a few of them are shown below:
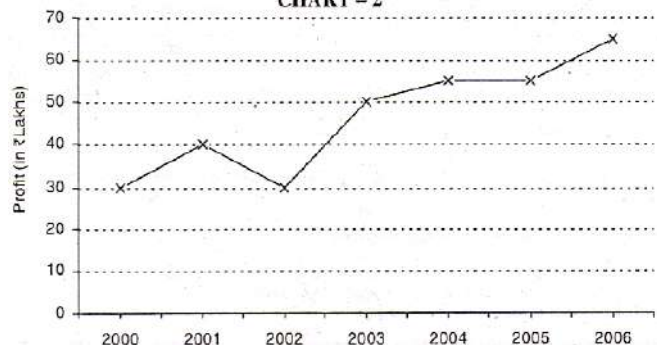
The graphs in Chart 2 shown the changes in the profit of the company during a period time. One can find out trends and the growth in the profit over the years.
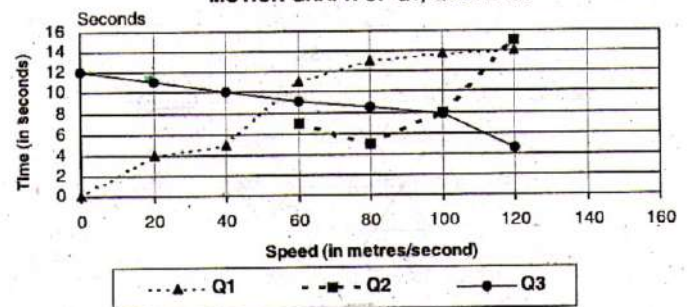

Chart 3 presents another type of two-dimensional graph which is mostly used to depict scientific data like speed, velocity, vectors etc. In the graph speed trends of three bodies Q1, Q2, Q3 is given along with their actual path of motion.

BAR CHART

This is a type of graph used mostly to depict data in a discrete way. They are accurate and comparison of variable is very convenient.
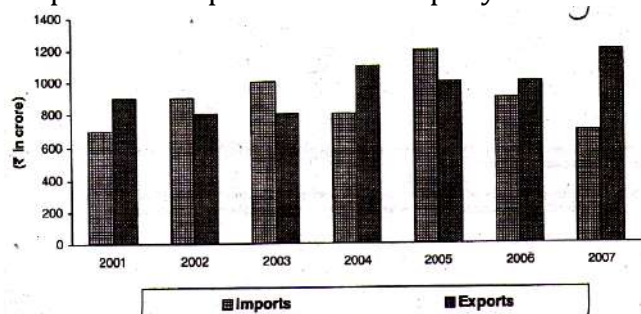
CHART-4

Import and Export of XYZ Company

Chart 4 shows import and export of a company over different years. From this graph we can obtain the following:

1) Percentage contributes of imports or exports to the company's total trade for different years.
2) Relative increases or decreases in the shares of imports or exports
3) Percentage growth/average annual growth in imports or exports during given period.

THREE-DIMENSIONAL GRAPH

The data in a triangular graph are given on each side of the triangle. Each point represents three different values, one each in each direction.

CHART 5

Students	Percentage					
A	82	66	59	76	62	65
B	76	72	65	84	74	75
C	56	78	71	66	86	70
D	64	80	68	72	66	80
E	48	68	83	88	56	60
F	60	74	79	64	80	85
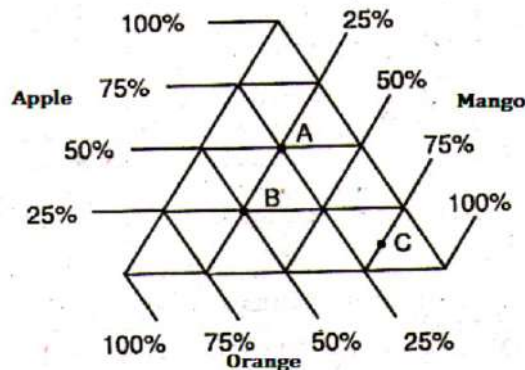
The graph in chart 5 represents the percentage of people who like the three Fruit-Apple, Mango and Orange in three cities A, B and C. For example, in city B 25% like Mango, 50% like Orange and 25% like Apple.

GATE QUESTIONS

Q.1 25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is
a) 2   b) 17
c) 13   d) 3
[CS, CE, EC, EE, IN, ME-GATE-2010]

Q.2 If 137 + 276 = 435 how much is 731 +672?
a) 534   b) 1403
c) 1623   d) 1531
[CS, CE, EC, EE, IN, ME-GATE-2010]

Q.3 5 skilled workers can build a wall in 20 days; 8 semiskilled workers can build a wall in 25 days; 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled, 6 semiskilled and 5 unskilled workers, how long will it take to build the wall?
a) 20 days   b) 18 days
c) 16 days   d) 15 days
[CS, CE, EC, EE, IN, ME-GATE-2010]

Q.4 Given digits 2, 2, 3, 3, 3, 4, 4, 4, 4 how many distinct 4 digit numbers greater than 3000 can be formed?
a) 50   b) 51
c) 52   d) 54
[CS,CE,EC,EE,IN,ME-GATE-2010]

Q.5 There are two candidates P and Q in an election. During the campaign 40% of the voters promised to vote for P, and rest for Q. However, on the day of election 15% of the voters went back on their promise to vote for P and instead voted for Q 25% of the voters went back on their promise to vote for Q and instead voted for P. Suppose, P lost by 2 votes, then what was the total number of voters?

a) 100   b) 110
c) 90   d) 95
[CS,CE,EC,EE,IN,ME-GATE-2011]

Q.6 The fuel consumed by a motorcycle during a journey while travelling at various speeds is indicated in the graph below
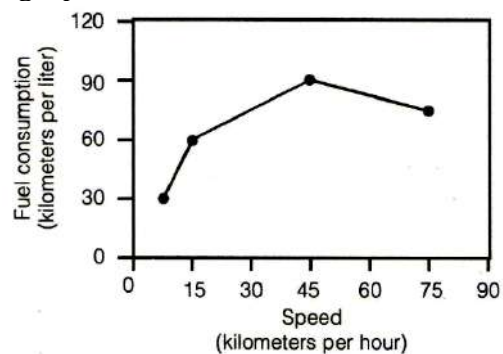
The distance covered during four laps of the journey are listed in the table below

Lap	Distance (kilometers)	Average speed (kilometers per hour)
P	15	15
Q	75	45
R	40	75
S	10	10

From the given data, we can conclude that the fuel consumed per kilometer was least during the lap
a) P   b) Q
c) R   d) S
[CS,CE,EC,EE,IN,ME-GATE-2011]

Q.7 Three friends, R, S and T shared toffee from a bowl. R took 1/3rd of the toffees, but returned to the bowl. S took 1/4th of what was left but returned three toffees to the bowl. T took half of the remainder but returned two back into the bowl. If the bowl had 17 toffees left, how many toffees were originally there in the bowl?
a) 38   b) 31
c) 48   d) 41
[CS,CE,EC,EE,IN,ME-GATE-2011]

Q.8 Given that $f(y)=|y|/y$, and q is any non-zero real number, the value of I f(q) - f (-q) I is

a) 0   b) -1

c) 1   d) 2

[CS,CE,EC,EE,IN,ME-GATE-2011]

Q.9 P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure below

(Probability that microbe will overcome human immunity system)

A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

a) P   b) Q

c) R   d) S

[CS,CE,EC,EE,IN,ME-2011]

Q.10 The variable cost (V) of manufacturing a product varies according to the equation V= 4q, where q is the quantity produced. The fixed cost (F) of production of same product reduces with q according to the equation F = 100/q. How many units should be produced to minimize the total cost (V+F)?

a) 5   b) 4

c) 7   d) 6

[CS,CE,EC,EE,IN,ME-GATE-2011]

Q.11 A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the orders. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of the 5th day?

a) 4   b) 5

c) 6   d) 7

[CS,ME-GATE-2011]

Q.12 A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time.

How much spirit is now left in the container?

a) 7.58 litres   b) 7.84 litres

c) 7 litres   d) 7.29 litres

[CS,CE,EC,EE,IN,ME-GATE-2011]

Q.13 The sum of n terms of the series 4 + 44 + 444 + ... is

a) $(4/81) [10^{n+1}-9n-1]$

b) $(4/81) [10^{n-1}- 9n - 1]$

c) $(4/81) [10^{n+1}-9n-10]$

d) $(4/81) [10^n - 9n -10]$

[EC, IN, EE-GATE-2012]

Q.14 If $(1.001)^{1269}= 3.52$ $(1.001)^{2062}=7.85$ then $(1.001)^{3321}$

a) 2.23   b) 4.33

c) 11.37   d) 27.64

[EC, IN, EE-GATE-2012]

Q.15 The data given in the following table summarizes the monthly budget of an average household.

Category	Amount
Food	4000
Clothing	1200
Rent	2000
Savings	1500
Others	1800

The approximate percentage of the monthly budget NOT spent on savings is

a) 10% b) 14%
c) 81% d) 86%

[EC, IN, EE-GATE-2012]

Q.16 A and B friends. They decide to meet between 1 PM and 2 PM on a given day. There is a condition that whoever arrives first will not wait for the other for more than 15 minutes. The probability that they will meet on that day is

a) 1/4 b) 1/16
c) 7/16 d) 9/16

[EC, IN, EE-GATE-2012]

Q.17 Raju has 14 currency notes in his pocket consisting of only Rs. 20 notes and Rs. 10 notes. The total money value of the notes is Rs. 230. The number of Rs. 10 notes that Raju has is

a) 5 b) 6
c) 9 d) 10

[EC, IN, EE-GATE-2012]

Q.18 There are eight bags of rice looking alike, sevenof which have equal and one is slightly heavier. The weighing balance is of unlimited capacity. Using this balance the minimum number of weighting required to identify the heavier bag is

a) 2 b) 3
c) 4 d) 8

[EC, IN, EE-GATE-2012]

Q.19 The cost function for a product in a firm is given by $5q^2$, where q is the amount of production. The firm can sell the product at a market price of Rs.50 per unit. The number of units to be produced by the firm such that the profit is maximized is

a)5 b) 10
c) 15 d) 25

[CE,CS,ME-GATE-2012]

Q.20 A political party orders an arch for the entrance to the ground in which the annual convention is being held. The profile of the arch follows the equation $y = 2x — 0.1x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is

a) 8 meters b) 10 meters
c) 12 meters d) 14 meters

[CE,CS,ME-GATE-2012]

Q.21 Which of the following assertions are CORRECT?
P: Adding 7 to each entry in a list adds 7 to the mean of the list
Q: Adding 7 to each entry in a list adds 7 to the standard deviation of the list
R: Doubling each entry in a list doubles the mean of the list
S: Doubling each entry in a list leaves the standard deviation of the list unchanged

a)P, Q b) Q, R
c) P, R d) R, S

[CE,ME-GATE-2012]

Q.22 An automobile plant contracted to buy shock absorbers from two suppliers X and Y. X supplies 60% and Y supplies 40% of the shock absorbers. All shock absorbers are subjected to a quality test. The ones that pass the quality test are considered reliable Of X's shock absorbers, 96% are reliable. Of Y's shock absorbers, 72% are reliable. The probability that a randomly chosen shock absorber, which is found to be reliable, is made by Y is

a)0.288 b) 0.334
c) 0.667 d) 0.720

[CE,CS,ME-GATE-2012]

Q.23 In the summer of 2012, in New Delhi, the mean temperature of Monday to Wednesday was 41°C and of Tuesday to Thursday was 43°C. If the temperature on Thursday was 15% higher than that of Monday, then the temperature in 0C on Thursday was
a) 40 b) 43
c) 46 d) 49
[EC, IN, EE-GATE-2013]

Q.24 A car travels 8 km in the first quarter of an hour, 6 km in the second quarter and 16km in the third quarter. The average speed of the car in km per hour over the entire journey is
a) 30 b) 36
c) 40 d) 24
[EC, IN, EE-GATE-2013]

Q.25 Find the sum to n terms of the series 10 + 84 + 734 +...
a) $\dfrac{9\left(9^{n}+1\right)}{10}+1$ b) $\dfrac{9\left(9^{n}-1\right)}{8}+1$
c) $\dfrac{9\left(9^{n}-1\right)}{8}+n$ d) $\dfrac{9\left(9^{n}-1\right)}{8}+n^{2}$
[EC, IN, EE-GATE-2013]

Q.26 The set of values of p for which the roots of the equation $3x^2+2x+p(p-1)=0$ are of opposite sign is
a) $(-\infty, 0)$ b) $(0, 1)$
c) $(1, \infty)$ d) $(0, \infty)$
[EC, IN, EE-GATE-2013]

Q.27 What is the chance that a leap year, selected at random, will contain 53 Sundays?
a) $\dfrac{2}{7}$ b) $\dfrac{3}{7}$
c) $\dfrac{1}{7}$ d) $\dfrac{5}{7}$
[EC, IN, EE-GATE-2013]

Q.28 If $|4x-7|=5$ then the value of $2|x|-|-x|$ is
a) $2,\dfrac{1}{3}$ b) $\dfrac{1}{2}, 3$
c) $\dfrac{2}{3}, \dfrac{1}{3}$ d) $\dfrac{2}{9}, 3$
[CE-GATE-2013]

Q.29 A number much greater than 75 and smaller than 117 is
a) 91 b) 93
c) 89 d) 96
[CE-GATE-2013]

Q.30 x and y are two positive real numbers, such that equation
$2x + y \le 6; x + 2y \pounds 8$
For which values of (x, y), the function f (x, y) = 3x + 6y will give maximum value
a) 4 / 3, 10 / 3 b) 8 / 3, 20 / 3
c) 8 / 3, 10 / 3 d) 4 / 3, 20 / 3
[CE-GATE-2013]

Q.31 A firm is selling it product at Rs. 60/unit. The total cost of production is Rs. 100 and firm is earning total profit of Rs. 500. Later, the total cost increased by 30%. By what percentage the price should be increased to maintain the same profit level
a) 5 b) 15
c) 10 d) 30
[CE-GATE-2013]

Q.32 Which one of the following increased by same percentage in year 2010-2011?

	2010	2011
Raw material	5200	6240
Power & fuel	7000	9450
Salary & wages	9000	12600
Plants & machinery	20000	25000
Advertising	15000	19500
Research & development	22000	26400

a) Raw material and salary &wages
b) Salary and wages and advertising
c) Power and fuel and advertising
d) Raw material and research and development

[CE-GATE-2013]

Q.33 Out of all the 2-digit integers between 1 and 100, a 2-digit number has to be selected at random. What is the probability that the selected number is not divisible by 7?
a) 13/90   b) 12/90
c) 78/90   d) 77/90

[CS,ME-GATE-2013]

Q.34 A tourist covers half of his journey by train at 60 km/h, half of the remainder by bus at 30 km/h and the rest by cycle at 10 km/h. The average of the tourist in km/h during his entire journey is
a) 36   b) 30
c) 24   d) 18

[CS,ME-GATE-2013]

Q.35 Find the sum of the expression
$$\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\ldots+\frac{1}{\sqrt{80}+\sqrt{81}}$$
a) 7   b) 8
c) 9   d) 10

[CS,ME-GATE-2013]

Q.36 The current erection cost of a structure is Rs. 13,200. If the labour wages per day increase by 1/5 of the current wages and the working hours decrease by 1/24 of the current period, then the new cost of erection in Rs. is
a) 16,500   b) 15,180
c) 11,000   d) 10,120

[CS,ME-GATE-2013]

Q.37 What will be the maximum sum of 44,.42, 40,
a) 502   b) 504
c) 506   d) 500

[ME-GATE-2013]

Q.38 The roots of $ax^2 + bx + c = 0$ are real and positive a, b and c are real. Then $ax^2 + b|x| + c = 0 = 0$ has
a) No roots   b) 2 real roots
c) 3 real roots   d) 4 real roots

[EE,CS-GATE-2014-Set-1]

Q.39 Round-trip tickets to a tourist destination are eligible for a discount of 10% on the total fare. In addition, groups of 4 or more get a discount of 5% on the total fare. If the one way single person fare is Rs 100, a group of 5 tourists purchasing round-trip tickets will be charged Rs _____.

[EE,CS-GATE-2014-Set-1]

Q.40 In a survey, 300 respondents were asked whether they own a vehicle or not. If yes, they were further asked to mention whether they own a car or scooter or both. Their responses are tabulated below. What percent of respondents do not own a scooter?

		Men	Women
Own vehicle	Car	40	34
	Scooter	30	20
	Both	60	46
Do not own vehicle		20	50

[EE,CS-GATE-2014-Set-1]

Q.41 When a point inside of a tetrahedron (a solid with four triangular surfaces) is connected by straight lines to its corners, how many (new) internal planes are created with these lines?___

[EE,CS-GATE-2014-Set-1]

**Q.42** What is the average of all multiples of 10 from 2 to 198?
a) 90   b) 100
c) 110   d) 120

[EE,CS-GATE-2014-Set-2]

Q.43 The value of $\sqrt{12+\sqrt{12+\sqrt{12+\ldots}}}$ is
    a) 3.464   b) 3.932
    c) 4.000   d) 4.444
      [EE,CS-GATE-2014-Set-2]

Q.44 If x is real and $\left|x^2-2x+3\right|=11$ then possible values of $\left|-x^3+x^2-x\right|$ include
    a) 2, 4   b) 2, 14
    c) 4, 52   d) 14
      [EE,CS-GATE-2014-Set-2]

Q.45 The ratio of male to female students in a college for five years is plotted in the following line graph. If the number of female students doubled in 2009, by what percent did the number of male students increase in 2009?
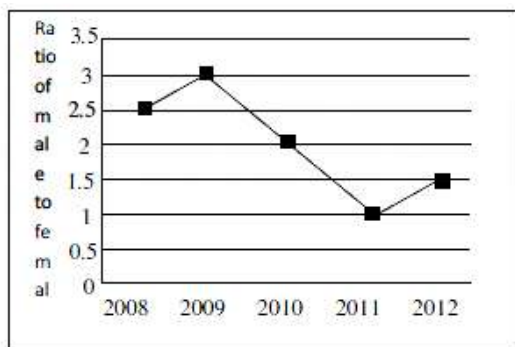
[EE,CS-GATE-2014-Set-2]

Q.46 The table below has question-wise data on the performance of students in an examination. The marks for each question are also listed. There is no negative or partial marking in the examination.

Q. No	Marks	Answered Correctly	Answered Wrongly	Not Attempted
1	2	21	17	6
2	3	15	27	2
3	2	23	18	3

What is the average of the marks obtained by the class in the examination?
    a) 1.34   b) 1.74
    c) 3.02   d) 3.91
      [EE,CS-GATE-2014-Set-3]

Q.47 The Gross Domestic Product (GDP) in Rupees grew at 7% during 2012-2013. For international comparison, the GDP is compared in US Dollars (USD) after conversion based on the market exchange rate. During the period 2012-2013 the exchange rate for the USD increased from Rs. 50/USD to Rs. 60/ USD. India's GDP in USD during the period 2012-2013
    a) Increased by 5 %
    b) Decreased by 13%
    c) Decreased by 20%
    d) Decreased by 11%
      [EE,CS-GATE-2014-Set-3]

Q.48 The ratio of male to female students in a college for five years is plotted in the following line graph. If the number of female students in 2011 and 2012 is equal, what is the ratio of male students in 2012 to male students in 2011?
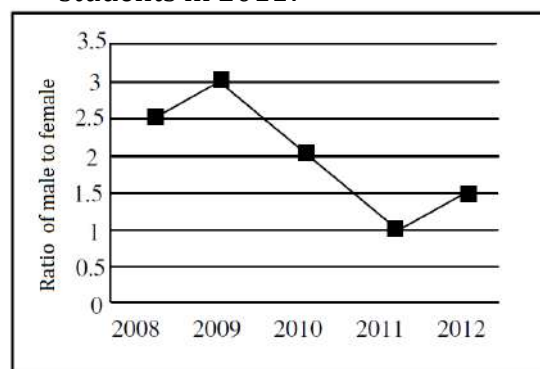
    a) 1:1   b) 2:1
    c) 1.5:1   d) 2.5:1
      [EE,CS-GATE-2014-Set-3]

Q.49 Consider the equation: $(7526)_8-(Y)_8=(4364)_8$, where $(X)_N$ stands for X to the base N. Find Y.
    a) 1634   b) 1737
    c) 3142   d) 3162
      [EE-GATE-2014-Set-3]

Q.50 For submitting tax returns, all resident males with annual income below Rs 10 lakh should fill up Form P and all resident females with income below Rs8 lakh should fill up Form Q. All people with incomes

above Rs 10 lakh should fill up Form R, except non residents with income above Rs 15 lakhs, who should fill up Form S. All others should fill Form T. An example of a person who should fill Form T is

a) A resident male with annual income Rs 9 lakh
b) A resident female with annual income Rs 9 lakh
c) A non-resident male with annual income Rs 16 lakh
d) A non-resident female with annual income Rs 16 lakh

[EC-GATE-2014-1]

Q.51 A train that is 280 metres long, travelling at a uniform speed, crosses a platform in 60 seconds and passes a man standing on the platform in 20 seconds. What is the length of the platform in metres?

[EC-GATE-2014-1]

Q.52 The exports and imports (in crores of Rs.) of a country from 2000 to 2007 are given in the following bar chart. If the trade deficit is defined as excess of imports over exports, in which year is the trade deficit 1/5th of the exports?
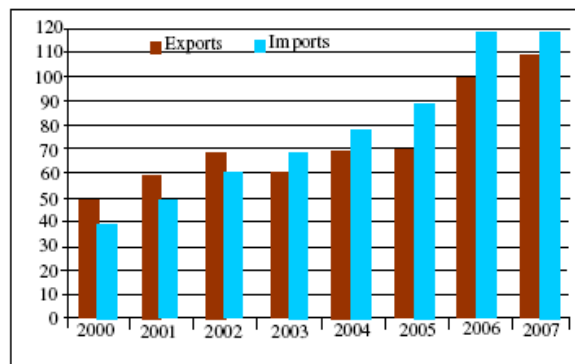
a) 2005   b) 2004
c) 2007   d) 2006

[EC,CE,CS-GATE-2014-1]

Q.53 You are given three coins: one has heads on both faces, the second has tails on both faces, and the third has a head on one face and a tail on the other. You choose a coin at random and toss it, and it comes up heads. The probability that the other face is tails is

a) 1/4   b) 1/3
c) 1/2   d) 2/3

[EC-GATE-2014-1]

Q.54 A regular die has six sides with numbers 1 to 6 marked on its sides. If a very large number of throws show the following frequencies of occurrence: 1→0.167; 2→0.167; 3→0.152; 4→0.166; 5 →0.168; 6→ 0.180. We call this die

a) Irregular   b) biased
c) Gaussian   d) insufficient

[EC-GATE-2014-2]

Q.55 The sum of eight consecutive odd numbers is 656. The average of four consecutive even numbers is 87. What is the sum of the smallest odd number & second largest even number?

[EC-GATE-2014-2]

Q.56 The total exports and revenues from the exports of a country are given in the two charts shown below. The pie chart for exports shows the quantity of each item exported as a percentage of the total quantity of exports. The pie chart for the revenues shows the percentage of the total revenue generated through export of each item. The total quantity of exports of all the items is 500 thousand tonnes and the total revenues are 250 crore rupees. Which item among the following has generated the maximum revenue per kg?
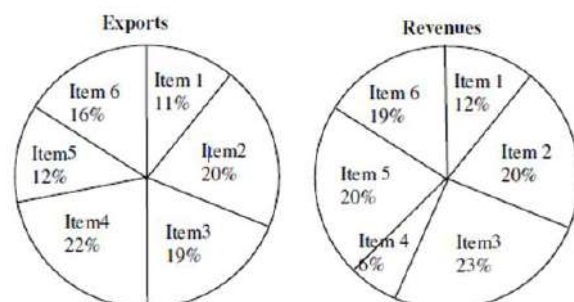
a) Item 2   b) Item 3
c) Item: 6   d) Item 5
[EC,CE, ME-GATE-2014-2]

Q.57 It takes 30 minutes to empty a half-full tank by draining it at a constant rate. It is decided to simultaneously pump water into the half-full tank while draining it. What is the rate at which water has to be pumped in so that it gets fully filled in 10 minutes?
a) 4 times the draining rate
b) 3 times the draining rate
c) 2.5 times the draining rate
d) 2 times the draining rate
[EC, ME-GATE-2014-2]

Q.58 A man can row at 8 km per hour in still water. If it takes him thrice as long to row upstream, as to row downstream, then find the stream velocity in km per hour.
[EC, ME-GATE-2014-3]

Q.59 A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy, plant & machinery and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs. 4,50,000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. If the company registered a profit of Rs. 10 lakhs in 2012, at what price (in Rs.) was each air purifier sold?
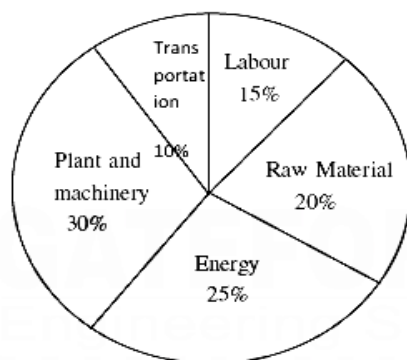
[EC, ME-GATE-2014-3]

Q.60 A batch of one hundred bulbs is inspected by testing four randomly chosen bulbs. The batch is rejected if even one of the bulbs is defective. A batch typically has five defective bulbs. The probability that the current batch is accepted is_____
[EC, ME-GATE-2014-3]

Q.61 Let f (x, y) = $x^n y^m$ = P. If x is doubled and y is halved, the new value of f is
a) 2^{n-m} P   b) 2^{m-n} P
c) 2(n-m) P   d) 2(m-n)P
[EC, ME-GATE-2014-4]

Q.62 In a sequence of 12 consecutive odd numbers, the sum of the first 5 numbers is 425. What is the sum of the last 5 numbers in the sequence?
[EC-GATE-2014-4]

Q.63 Find the next term in the sequence: 13M, 17Q, 19S, __
a) 21W   b) 21V
c) 23W   d) 23V
[EC-GATE-2014-4]

Q.64 Industrial consumption of power doubled from 2000-2001 to 2010-2011. Find the annual rate of increase in percent assuming it to be uniform over the years.
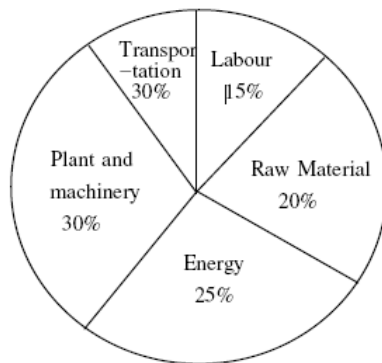a) 5.6   b) 7.2
c) 10.0   d) 12.2
[EC, ME-GATE-2014-4]

Q.65 A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy, plant & machinery, and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs. 4,50,000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. What is

Q.73 The population of a new city is 5 million and is growing at 20% annually. How many years would it take to double at this growth rate?
a) 3-4 years   b) 4-5 years
c) 5-6 years   d) 6-7 years
[CE-GATE-2014(2)]

Q.74 10% of the population in a town is HIV+. A new diagnostic kit for HIV detection is available; this kit correctly identifies HIV+ individuals 95% of the time, and HIV— individuals 89% of the time. A particular patient is tested using this kit and is found to be positive. The probability that the individual is actually positive is _____
[CE-GATE-2014(2)]

Q.75 If $(z+1/z)^2 = 98$, compute $(z^2 + 1/z^2)$
[CS-GATE-2014(1)]

Q.76 The statistics of runs scored in a series by four batsmen are provided in the following table. Who is the most consistent batsman of these four?

Batsman	Average	Standard Deviation
K	31.2	5.21
L	46.0	6.35
M	54.4	6.22
N	17.9	5.90

a) K   b) L
c) M   d) N
[ME-GATE-2014(1)]

Q.77 A regular die has six sides with numbers 1 to 6 marked on its sides. If a very large number of throws show the following frequencies of occurrence:
1→0.167; 2→0.167; 3→0.152; 4→0.166; 5→0.168; 6→0.180. We call this die
a) Irregular   b) biased
c) Gaussian   d) insufficient
[ME-GATE-2014]

Q.78 In a sequence of 12 consecutive odd numbers, the sum of the first 5 numbers is 425. What is the sum of the last 5 numbers in the sequence?
[ME-GATE-2014(4)]

Q.79 A train that is 280 meterslong travelling at a uniform speed crosses a platform in 60 seconds and passes a man standing on the platform in 20 seconds. What is the length of the platform in meters?
[ME-GATE-2014]

Q.80 You are given three coins: one has heads on both faces, the second has tails on both faces, and the third has a head on one face and a tail on the other. You choose a coin at random and toss it, and it comes up heads. The probability that the other face is tails is
a) 1/4   b) 1/3
c) 1/2   d) 2/3
[ME-GATE-2014]

Q.81 The sum of eight consecutive odd numbers is 656. The average of four consecutive even numbers is 87. What is the sum of the smallest odd number and second largest even number?
[ME-GATE-2014(2)]

Q.82 The probabilities that a student passes in Mathematics, Physics and Chemistry are m,p& c respectively. Of these subjects, the student has 75% chance of passing in at least one, a 50% chance of passing in at least two and a 40% chance of passing in exactly two. Following relations are drawn in m, p, and c:
(I) p + m + c = 27/20
(II) p + m + c = 13/20
(III) (p) x (m) x (c) = 1/10
a) Only relation I is true
b) Only relation II is true
c) Relations II and III are true.
d) Relations I and III are true.

[EE,CS-GATE-2015-Set-1]

Q.83 The number of students in a class who have answered correctly, wrongly, or not attempted each question in an exam, are listed in the table below. The marks for each question are also listed. There is no negative or partial marking.

Q No	Marks	Answered Correctly	Answered Wrongly	Not Attempted
1	2	21	17	6
2	3	15	27	2
3	1	11	29	4
4	2	23	18	3
5	5	31	12	1

What is the average of the marks obtained by the class in the examination?
a) 2.290   b) 2.970
c) 6.795   d) 8.795

[EE,CS-GATE-2015-Set-1]

Q.84 Consider a function $f(x) = 1 - |x|$ on $-1 \le x \le 1$. The value of x at which the function attains a maximum, and the maximum value of function are:
a) 0,-1   b) -1,0
c) 0, 1   d) -1, 2

[EE,CS-GATE-2015-Set-2]

Q.85 If p,q,r,s are distinct integers such that:
f (p, q, r, s) = max (p, q, r, s)
g (p, q, r, s) = min (p, q, r, s)
h (p , q, r, s) =remainder of (p×q)/(r×s) if (p×q)>(r×s) or remainder of (r×s)/(p×q) if (r×s)>(p×q)
Also a function fgh (p, q, r, s) = f (p, q, r, s) ×g (p, q, r, s) ×h (p, q, r, s)
Also the same operations are valid with two variable function of the form f (p, q).
What is the value of fg (h (2,5,7,3),4,6, 8)?

[EE,CS-GATE-2015-Set-2]

Q.86 In a triangle PQR, PS is the angle bisector of ∠QPR and ∠QPS = 60°. What is the length of PS?
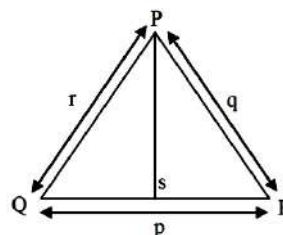
a) $\dfrac{(q+r)}{qr}$ b) $\dfrac{qr}{(q+r)}$

c) $\sqrt{(q^2+r^2)}$ d) $\dfrac{(q+r)^2}{qr}$

[EE,CS-GATE-2015-Set-2]

Q.87 If $\log_x (5/7) = -1/3$, then the value of x is
a) 343/125   b) 125/343
c) -25/49   d) -49/25

[EC-GATE-2015-1]

Q.88 Operators□, $\square$ and → are defined by $a\square b = \dfrac{a-b}{a+b}$; $a\square b = \dfrac{a+b}{a-b}$; a → b =ab.
Find the value of $(66\ \square 6) \to (66\ \square 6)$
a) -2   b)-1
c)1   d) 2

[EC-GATE-2015-1]

Q.89 An electric bus has onboard instruments that report the total electricity consumed since the start of the trip as well as the total distance covered. During a single day of operation, the bus travels on stretches M, N, 0 and P, in that order. The cumulative distances traveled and the corresponding electricity consumption are shown in the Table below

Stretch	Cumulative distance(km)	Electricity used (kWh)
M	20	12
N	45	25
0	75	45
P	100	57

The stretch where the electricity consumption per km is minimum is
a) M   b) N
c) 0   d) P

[EC-GATE-2015-2, ME-GATE-2015-1]

Q.90 Ram and Ramesh appeared in an interview for two vacancies in the same department. The probability of Ram's selection is 1/6 and that of Ramesh is 1/8. What is the probability that only one of them will be selected?
a) 47/48
b) 1/4
c) 13/48
d) 35/48
[EC-GATE-2015-2]

Q.91 If $a^2 + b^2 + c^2 = 1$, then ab + bc + ac lies in the interval
a) [1, 2/3]
b) [-1/2, 1]
c) [-1, 1/2]
d) [2,-4]
[EC-GATE-2015-2, ME-GATE-2015-1]

Q.92 A tiger is 50 leaps of its own behind a deer. The tiger takes 5 leaps per minute to the deer's 4. If the tiger and the deer cover 8 meter and 5 metre per leap respectively. What distance in meters will be tiger have to run before it catches the deer?
[EC-GATE-2015-2, ME-GATE-2015(1)]

Q.93 If x>y>I, which of the following must be true?
(i) ln x >ln y
(ii) $e^x>e^y$
(iii) $y^x>x^y$
(iv) cos x > cos y
a) (i) and (ii)
b) (i) and (iii)
c) (iii) and (iv)
d) (ii) and (iv)
[EC-GATE-2015-3, ME-GATE-2015-2]

Q.94 Ms. X will be in Bagdogra from 01/05/2014 to 20/05/2014 and from 22/05/2014 to 31/05/2014. On the morning of 21/05/2014, she will reach Kochi via Mumbai Which one of the statements below is logically valid and can be inferred from the above sentences?
a) Ms. X will be in Kochi for one day, only in May
b) Ms. X will be in Kochi for only one day in May
c) Ms. X will be only in Kochi for one day in May

d) Only Ms. X will be in Kochi for one day in May.
[EC-GATE-2015-3]

Q.95 log tan 1° + log tan 2° +..... + log tan 89° is ....
a) 1
b) $1/\sqrt{2}$
c) 0
d) —1
[EC-GATE-2015-3, ME-GATE-2015-1]

Q.96 From a circular sheet of paper of radius 30cm, a sector of 10% area is removed. If the remaining part is used to make a conical surface, then the ratio of the radius and height of the cone is ____.
[EC-GATE-2015-3, ME-GATE-2015-2]

Q.97 A function f(x) is linear and has a value of 29 at x = -2 and 39 at x = 3. Find its value at x= 5.
a)59
b) 45
c) 43
d) 35
[CE-GATE-2015(1)]

Q.98 The exports and imports (in crores of Rs.) of a country from the year 2000 to 2007 are given in the following bar chart. In which year is the combined percentage increase in imports and exports the highest?
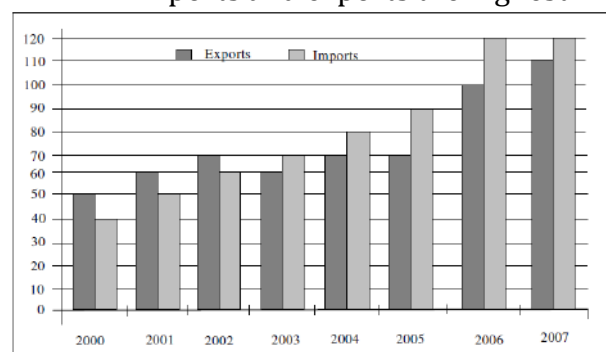
[ME,CE,CS-GATE-2015(1)]

Q.99 Choose the most appropriate equation for the function drawn as a thick line, in the plot below.
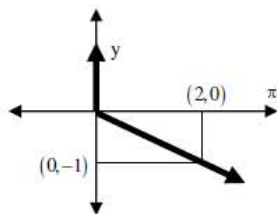
a) $x = y - |y|$ b) $x = -(y - |y|)$

c) $x = y + |y|$ d) $x = -(y + |y|)$

[CE,CS-GATE-2015(1)]

Q.100 Four cards are randomly selected from a pack of 52 cards. If the first two cards are kings, what is the probability that the third card is a king?

a) 4/52

b) 2/50

c) (1/52) x (1/52)

d) (1/52) x (1/52) x (1/50)

[CE-GATE-2015(2)]

Q.101 How many four digit numbers can be formed with the 10 digits 0, 1, 2, 9 if no number can start with 0 and if repetitions are not allowed?

[CE-GATE-2015(2)]

Q.102 Read the following table giving sales data of five types of batteries for years 2006 to 2012

Year	Type I	Type II	Type III	Type IV	Type V
2006	75	144	114	102	108
2007	90	126	102	84	126
2008	96	114	75	105	135
2009	105	90	150	90	75
2010	90	75	135	75	90
2011	105	60	165	45	120
2012	115	85	160	100	145

Out of the following, which type of battery achieved highest growth between the years 2006 and 2012?

a) Type V   b) Type III

c) Type II   d) Type I

[CE-GATE-2015(2)]

Q.103 Given set A = {2, 3, 4, 5} and Set B = {11, 12, 13, 14, 15}, two numbers are randomly selected, one from each set. What is probability that the sum of the two numbers equals 16?

a) 0.20   b) 0.25

c) 0.30   d) 0.33

[CS-GATE-2015(1)]

Q.104 The pie chart below has the breakup of the number of students from different departments in an engineering college for the year 2012. The proportion of male to female students in each department is 5:4. There are 40 males in Electrical Engineering. What is the difference between numbers of female students in the civil department and the female students in the Mechanical department?
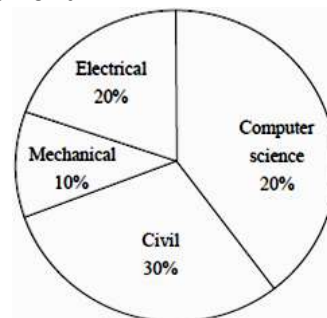
[CS-GATE-2015(1)]

Q.105 If the list of letters, P, R, S, T, U is an arithmetic sequence, which of the following are also in arithmetic sequence?

I. 2P, 2R, 2S, 2T, 2U

II. P−3, R−3,S−3,T−3,U−3

III. P^2, R^2, S^2,T^2, U^2

a) I only   b) I and II

c) II and III   d) I and III

[CS-GATE-2015(2)]

Q.106 Four branches of a company are located at M.N.O and P. M is north of N at a distance of 4km: P is south of O at a distance of 2 km:N is southeast of O by 1 km. What is the distance between M and P in km?

a) 5.34   b) 6.74

c) 28.5   d) 45.49

[CS-GATE-2015(2)]

Q.107 A function f(x) is linear and has a value of 29 at x = -2 and 39 at x = 3. Find its value at x = 5.
a) 59
b) 45
c) 43
d) 35
[CS-GATE-2015(3)]

Q.108 Ram and Ramesh appeared in an interview for two vacancies in the same department. The probability of Ram's selection is 1/6 and that of Ramesh is 1/8. What is the probability that only one of them will be selected?
a) $\dfrac{47}{48}$
d) $\dfrac{1}{4}$
c) $\dfrac{13}{18}$
d) $\dfrac{35}{48}$
[ME-GATE-2015(1)]

Q.109 Find the missing sequence in the letter series below:
A, CD, GHI, ?, UVWXY
a) LMN
b) MNO
c) MNOP
d) NOPQ
[ME-GATE-2015(2)]

Q.110 Five teams have to compete in a league, with every team playing every other team exactly c, once, before going to the next round. How may matches will have to be held to complete the league round of matches?
a) 20
b) 10
c) 8
d) 5
[ME-GATE-2015(3)]

Q.111 A coin is tossed thrice. Let X be the event that head occurs in each of the first two tosses. Let Y be the event that a tail occurs on the third toss. Let Z be the event that two tails occurs in three tosses. Based on the above information, which one of the following statements is TRUE?
a) Xand Yare not independent
b) Yand Zare dependent
c) Yand Zare independent

d) Xand Zindependent
[ME-GATE-2015(3)]

Q.112 Right triangle PQR is to be constructed in the xy-plane so that the right angle is at P and line PR is parallel to the- axis. The x and y coordinates of P, Q, and R is to be integers that satisfy the inequalities: -4≤x≤5 and 6≤y≤16. How many different triangles could be constructed with these properties?
a) 110
b) 1,100
c) 9,900
d) 10,000
[ME-GATE-2015(3)]

Q.113 the given figure angle Q is a right angle, PS: QS = 3:1, RTQT= 5:2 and PU: UR =1:1. If area of triangle QTS is 20 cm, then the area of triangle POR in cm² is____.
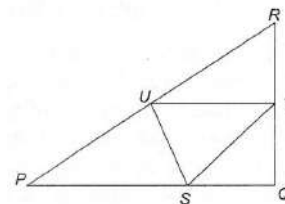
[ME-GATE-2015(3)]

Q.114 In a quadratic function, the value of the product of the roots (α, β) is 4. Find the value of $\dfrac{\alpha^n + \beta^n}{\alpha^{-n} + \beta^{-n}}$
a) n^4
b) 4^n
c) 2^{2n-1}
d) 4^{n-1}
[EE,CS-GATE-2016-Set-1]

Q.115 Chose the correct expression for f(x) given in the graph.
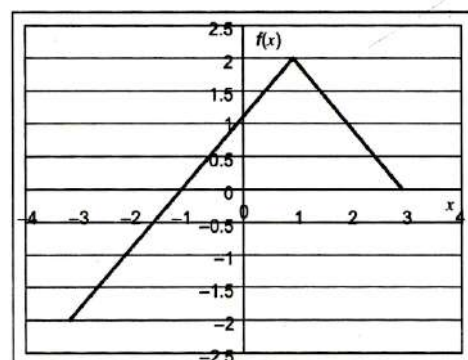
a) f(x)=1-|x-1| b) f(x)=1+|x-1|
c) f(x)=2-|x-1| d) f(x)=2+|x-1|
[EE-GATE-2016-Set-1]

Q.116 If is|9y-6|=3, then $y^2 - \dfrac{4y}{3}$ _____.

  a) 1/3   b) 2/3
  c) -1/3   d) -2/3
[EE-GATE-2016-Set-2]

Q.117 Shaquille O' Neal is a 60% career free throw shooter, meaning that he successfully makes 60 free throws out of 100 attempts on average. What is the probability that he will successfully make exactly 6 free throws in 10 attempts?
  a) 0.2508   b) 0.2816
  c) 0.2934   d) 0.6000
[EE-GATE-2016-Set-2]

Q.118 The numeral in the units position of $211^{870}+146^{127}\times3^{424}$ is ____.
[EE-GATE-2016-Set-2]

Q.119 In a huge pile of apples and oranges, both ripe and unripe mixed together, 15% are unripe fruits. Of the unripe fruits, 45% are apples. Of the ripe ones, 66% are oranges. If the pile contains a total of 5692000 fruits, how many of the mare apples?
  a) 2029198   b) 2467482
  c) 2789080   d) 3577422
[EC, ME-GATE-2016-1]

Q.120 Michael lives 10 km away from where I live. Ahmed lives 5 km away and Susan lives 7 km away from where I live. Arun is farther away than Ahmed but closer than Susan from where I live. From the information provided here, what is one possible distance (in km) at which I live from Arun's place?
  a) 3.00   b) 4.99
  c) 6.02   d) 7.01
[EC-GATE-2016-1]

Q.121 A person moving through a tuberculosis prone zone has a 50% probability of becoming infected. However, only 30% of infected people develop the disease. What percentage of people moving through a tuberculosis prone zone remains infected but does not show symptoms of disease?
  a) 15   b) 33
  c) 35   d) 37
[EC, ME-GATE-2016-1]

Q.122 If $q^{-a}=\dfrac{1}{r}$ and $r^{-b}=\dfrac{1}{s}$ and $S^{-c}=\dfrac{1}{q}$, the value of abc is _____.
  a) $(rqs)^{-1}$ b) 0
  c) 1   d) r+q+s
[EC, ME-GATE-2016-1]

Q.123 P, Q, R and S are working on a project. Q can finish the task in 25 days, working alone for 12 hours a day. R can finish the task in 50 days, working alone for 12 hours per day. Q worked 12 hours a day but took sick leave in the beginning for two days. R worked 18 hours a day on all days. What is the ratio of work done by Q and R after 7 days from the start of the project?
  a) 10:11   b) 11:10
  c) 20:21   d) 21:20
[EC, ME-GATE-2016-1]

Q.124 Given (9inches)$^{1/2}$= (0.25 yards)$^{1/2}$, which one of the following statements is TRUE?
  a) 3 inches = 0.5 yards
  b) 9 inches = 1.5 yards
  c) 9 inches = 0.25 yards
  d) 81 inches = 0.0625 yards
[EC-GATE-2016-2, ME-GATE-2016-3]

Q.125 S, M, E and F are working in shifts in a team to finish a project. M works with twice the efficiency of others but for half as many days as E worked. S and M have 6 hours shifts in a day, whereas E and F have 12 hours shifts. What is the ratio contribution of M to contribution of E in the project?

a) 1:1   b) 1:2
c) 1:4   d) 2:1
[EC-GATE-2016-2, ME-GATE-2016-3]

Q.126 The Venn diagram shows the preference of the student population for leisure activities.
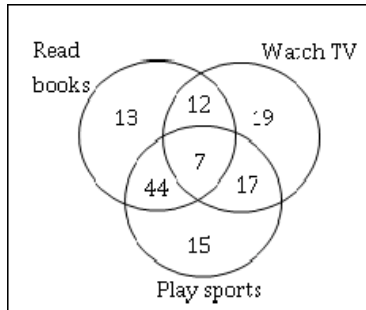
From the data given, the number of students who like to read books or play sports is _____
a) 44   b) 51
c) 79   d) 108
[EC-GATE-2016-2, ME-GATE-2016-3]

Q.127 Two and a quarter hours back, when seen in a mirror, the reflection of a wall clock without number markings seemed to show 1:30. What is the actual current time shown by the clock?
a) 8:15   b) 11:15
c) 12:15   d) 12:45
[EC-GATE-2016-2]

Q.128 A wire of length 340 mm is to be cut into two parts. One of the parts is to be made into a square and the other into a rectangle where sides are in the ratio of 1:2. What is the length of the side of the square (in mm) such that the combined area of the square and the rectangle is a MINIMUM?
a) 30   b) 40
c) 120   d) 180
[EC-GATE-2016-2, ME-GATE-2016-3]

Q.129 It takes 10 s and 15 s, respectively, for two trains travelling at different constant speeds to completely pass a telegraph post. The length of the first train is 120 m and that of the second train is 150 m. The

magnitude of the difference in the speeds of the two trains (in m/s) is
a) 2.0   b) 10.0
c) 12.0   d) 22.0
[IN, EC-GATE-2016-3]

Q.130 The velocity V of a vehicle along a straight line is measured in m/s and plotted as shown with respect to time in seconds. At the end of the 7 seconds, how much will the odometer reading increase by (in m)?
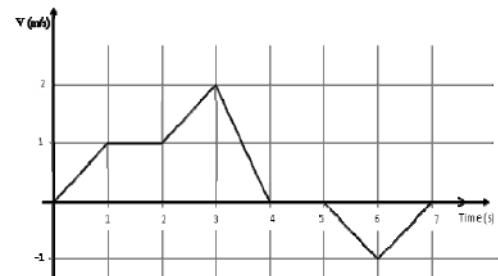
a) 0   b) 3
c) 4   d) 5
[IN, EC-GATE-2016-3]

Q.131 Find the area bounded by the lines 3x+2y=14, 2x-3y=5 in the first quadrant.
a) 14.95   b) 15.25
c) 15.70   d) 20.35
[IN, EC-GATE-2016-3]

Q.132 A straight line is fit to a data set (In x, y). This line intercepts the abscissa at In x = 0.1 and has a slope of -0.02. What is the value of y at x = 5 from the fit?
a) -0.030   b) -0.014
c) 0.014   d) 0.030
[IN, EC-GATE-2016-3]

Q.133 A cube is built using 64 cubic blocks of side one unit. After it is built, one cubic block is removed from every corner of the cube. The resulting surface area of the body (in square units) after the removal is _____.
a)56   b) 64
c) 72   d) 96
[CE,CS-GATE-2016(1)]

Q.134 A shaving set company sells 4 different types of razors, Elegance,

Smooth, Soft& Executive. Elegance sells at Rs. 48, Smooth at Rs. 63, Soft at Rs. 78 and Executive at Rs. 173 per piece. The table below shows the numbers of each razor sold in each quarter of a year.

Quarter/Product	Elegance	Smooth	Soft	Executive
Q1	27300	20009	17602	9999
Q2	25222	19392	18445	8942
Q3	28976	22429	19544	10234
Q4	21012	18229	16595	10109

Which product contributes the greatest fraction to the revenue of the company in that year?
a) Elegance b) Executive
c) Smooth d) Soft
[CE,CS-GATE-2016(1)]

Q.135 If $f(x) = 2x^7 + 3x-5$, which of the following is a factor of $f(x)$?
a) $(x^3 +8)$ b) $(x-1)$
c) $(2x-5)$ d) $(x+1)$
[CE,CS-GATE-2016(1)]

Q.136 In a process, the number of cycles to failure decreases exponentially with an increase in load. At a load of 80 units, it takes 100 cycles for failure. When the load is halved, it takes 10000 cycles for failure. The load for which the failure will happen in 5000 cycles is _____.
a) 40.00 b) 43.25
c) 60.01 d) 92.02
[CE,CS-GATE-2016(1)]

Q.137 (x % of y) + (y % of x) is equivalent to_____.
a) 2 % of xy
b) 2%of(xy/100)
c) xy % of 100
d) 100 % of xy
[CE-GATE-2016(2)]

Q.138 The sum of the digits of a two digit number is 12. If the new number formed by reversing the digits is greater than the number by 54, find the original number.
a) 39 b) 57
c) 66 d) 93
[CE-GATE-2016(2)]

Q.139 Two finance companies, P and Q, declared fixed annual rates of interest on the amounts invested with them. The rates of interest offered by these companies may differ from year to year. Year-wise annual rates of interest offered by these companies are shown by the line graph provided below
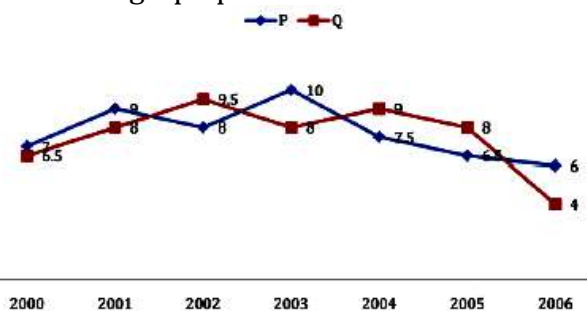
If the amounts invested in the companies, P and Q, in 2006 are in the ratio 8:9, then the amounts received after one year as interests from companies P and Q would be in the ratio:
a) 2:3 b) 3:4
c) 6:7 d) 4:3
[CE-GATE-2016(2)]

Q.140 A square pyramid has a base perimeter x, and the slant height is half of the perimeter. What is the lateral surface area of the pyramid?
a) x^2 b) $0.75x^2$
c) $0.50x^2$ d) $0.25 x^2$
[CE-GATE-2016(2)]

Q.141 Ananth takes 6 hours and Bharath takes 4 hours to read a book. Both started reading copies of the book at the same time. After how many hours is the number of pages to be read by Ananth, twice that to be read by Bharath? Assume Ananth and Bharath read all the pages with constant pace.
a) 1 b) 2
c) 3 d) 4

[CE-GATE-2016(2)]

Q.142 Among 150 faculty members in an institute, 55 are connected with each other through Facebook and 85 are connected through WhatsApp. 30 faculty members do not have Facebook or WhatsApp accounts. The number of faculty members connected only through Facebook accounts is _____.

a) 35   b) 45

c) 65   d) 90

[CS-GATE-2016(2)]

Q.143 In a 2×4 rectangle grid shown below, each cell is a rectangle. How many rectangles can be observed in the grid?

a) 21   b) 27

c) 30   d) 36
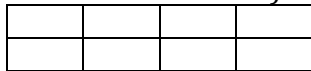
[CS-GATE-2016(2)]

Q.144 The volume of a sphere of diameter 1 unit is _____than the volume of a cube of side 1unit.

a) least   b) less

c) lesser   d) low

[ME-GATE-2016(2)]

Q.145 A window is made up of a square portion and an equilateral triangle portion above it. The base of the triangular portion coincides with the upper side of the square. If the perimeter of the window is 6 m, the area of the window in m2 is_____.

a) 1.43   b) 2.06

c) 2.68   d) 2.88

[ME-GATE-2016(2)]

Q.146 Students taking an exam are divided into two groups, P and Q such that each group has the same number of students. The performance of each of the students in a test was evaluated out of 200 marks. It was observed that the mean of group P was 105, while that of group Q was 85. The standard deviation of group P was 25, while that of group Q was 5. Assuming that the marks were distributed on a normal distribution, which of the following statements will have the highest probability of being TRUE?

a) No student in group 0 scored less marks than any student in group P

b) No student in group P scored less marks than any student in group Q.

c) Most students of group 0 scored marks in a narrower range than students in group P.

d) The median of the marks of group P is 100.

[ME-GATE-2016(2)]

Q.147 The binary operation $\square$ is defined as a$\square$b = ab + (a + b), where a and bare any two real numbers. The value of the identity element of this operation, defined as the number x such that a$\square$x = a, for any a, is

a) 0   b) 1

c) 2   d) 10

[ME-GATE-2016(2)]

Q.148. Which of the following curves represents theFunction

$$y = \ln\left(\left|e^{\left[\sin(|x|)\right]}\right|\right) \text{ for } |x| < 2\pi?$$

Here, x represents the abscissa and y represents the ordinate.

a)
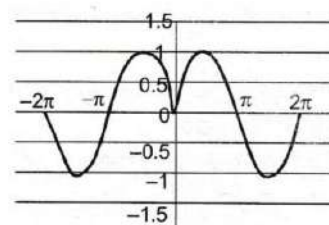
b)
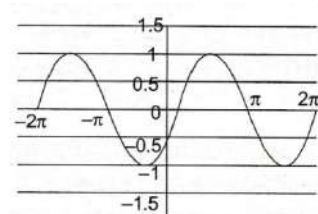
c)
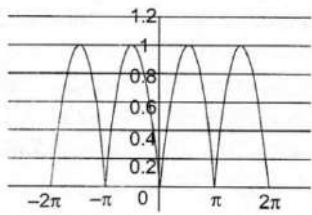
d)
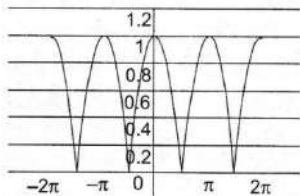
[ME-GATE-2016(2)]

Q.149 The probability that a k-digit number does NOT contain the digits 0, 5 or 9 is
a) 0.3^k b) 0.6^k
c) 0.7^k d) 0.9^k

[CS-EE-GATE-2017(1)]

Q.150 Find the smallest number y such that that y x 162 is a perfect cube.
a) 24   b) 27
c) 32   d) 36

[CS-EE-GATE-2017(1)]

Q.151 A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot. If in a flood, the water level rises to 525 m, which of the villages P, Q, R, S, T get submerged?
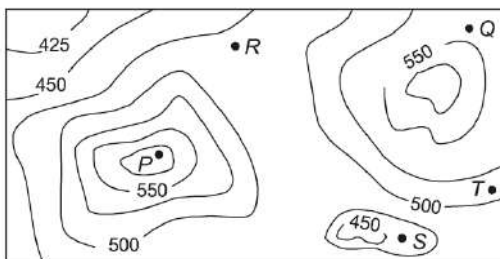
a) P, Q   b) P, Q, T
c) R, S, T   d) Q, R, S

[CS-EE-GATE-2017(1)]

Q.152 The expression $\dfrac{(x+y)-|x-y|}{2}$ is equal to
a) the maximum of x and y
b) the minimum of x and y
c) 1
d) none of the above

[CS-EE-GATE-2017(1)]

Q.153 A test has twenty questions worth 100 marks in total. There are two types of questions. Multiple choice questions are worth 3 marks each and essay questions are worth 11 marks each. How many multiple choice questions does the exam have?
a) 12   b) 15
c) 18   d) 19

[CS-EE-GATE-2017(2)]

Q.154 There are 3 red socks. 4 green socks and 3 blue socks. You choose 2 socks. The probability that they are of the same colour is
a) 1/5   b) 7/30
c) 1/4   d) 4/15

[CS-EE-GATE-2017(2)]

Q.155 X is a 30 digit number starting with the digit 4 followed by the digit 7
 Then the number X3 will have
a) 90 digits   b) 91 digits
c) 92 digits   d) 93 digits

[CS-EE-GATE-2017(2)]

Q.156 There are three boxes. One contains apples, another contains oranges and the last one contains both apples and oranges. All three are known to be incorrectly labelled.
If you are permitted to open just one box and then pull out and inspect only one fruit, which box would you open to determine the contents of all three boxes?
a) The box labelled 'Apples'
b) The box labelled 'Apples & Oranges'
c) The box labelled 'Oranges'
d) Cannot be determined

Q.157 The number of roots of $e^x + 0.5x^2 - 2 = 0$ in the range [-5, 5] is
a) 0   b) 1
c) 2   d) 3

Q.158 An air pressure contour line joins locations in a region having the same atmospheric pressure. The following is an air pressure contour plot is a geographical region. Contour lines are shown at 0.05 bar intervals in this plot.

If the possibility of a thunderstorm is given by how fast air pressure rises or drops over a region, which of the following regions is most likely to have a thunderstorm?
a) P   b) Q
c) R   d) S

Q.159 The following sequence of numbers is arranged in increasing order: 1, x, x, x, y, y, 9, 16, 18. Given that the mean and median are equal and are also equal to twice the mode, the value of y is
a) 5   b) 6
c) 7   d) 8

Q.160 If the radius of a right circular cone is increased by 50%, its volume increases by
a) 75%   b) 100%
c) 125%   d) 237.5%

Q.161 Two machines M1 and M2 are able to execute any of four jobs, P, Q, R and S. The machines can perform one job on one object at a time, Jobs P, Q, R and S take 30 minutes, 20 minutes, 60 minutes and 15 minutes each respectively. There are 10 objects each requiring exactly 1 job. Job P is to be performed on 2 objects, Job Q on 3 objects, Job R on 1 object and Job S on 4 objects. What is the minimum time needed to complete all the jobs?
a) 2 hours   b) 2.5 hours
c) 3 hours   d) 3.5 hours

Q.162 The bar graph below shows the output of five carpenters over one month, each of whom made different items of furniture; chairs, tables and beds.

Consider the following statements:
i) The number of beds made by carpenter C2 is exactly the same as the number of tables made by carpenter C3.
ii) The total number of chairs made by all carpenters is less than the total number of tables.

Which one of the following is true?
a) Only (i)
b) Only (ii)
c) Both (i) and (ii)
d) Neither (i) nor (ii)

Q.163 The last digit of $(2171)^7 + (2172)^9 + (2173)^{11} + (2174)^{13}$ is

a) 2   b) 4
c) 6   d) 8

[CE-GATE-2017(1)]

Q.164 Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the top faces of the dice is a perfect square is

a) 1/9   b) 2/9
c)   d) 4

[CE-IN-GATE-2017(2)]

Q.165 Four cards lie on a table. Each card has a number printed on one side and a colour on the other. The faces visible on the cards are 2, 3, red and blue. Proposition: If a card has an even value on one side, then its opposite face is red. The cards which MUST be turned over to verify the above proposition are

a) 2, red   b) 2, 3, red
c) 2, blue   d) 2, red, blue

[CE-In-GATE-2017(2)]

Q.166 What is the value of x when

$$81x\left(\frac{16}{25}\right)^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144?$$

a) 1   b)-1
c) -2   d) cannot be determined

[CE-IN-GATE-2017(2)]

Q.167 Budhan covers a distance of 19 km in 2 hours by cycling one fourth of the time and walking the rest. The next day he cycles (at the same speed as before) for half the time and walks the rest (at the same speed as before) and covers 26 km in 2 hours. The speed in km/h at which Budhan walks is

a) 1   b) 4
c) 5   d) 6

[CE-IN-GATE-2017(2)]

Q.168 In the summer, water consumption is known to decrease overall by 25%. A Water Board official states that in the summer household consumptiondecreasesby 20%, while other consumption increases by 70%. Which of the following statements is correct?

a) The ratio of household to other consumption is 8/17.
b) The ratio of household to other consumption is 1/17.
c) The ratio of household to other consumption is 17/8.
d) There are errors in the official's statement.

[EC-GATE-2017(1)]

Q.169 40% of deaths on city roads may be attributed to drunken driving. The number of degrees needed to represent this as a slice of a pie chart is

a) 120   b) 144
c) 160   d) 212

[EC-GATE-2017(1)]

Q.170 Trucks (10 m long) and cars (5 m long) go on a single lane bridge. There must be a gap of at least 20 m after each truck and a gap of at least 15 m after each car. Trucks and cars travel at a speed of 36 km/h. If cars and trucks go alternately. What is the maximum number of vehicles that can use the bridge in one hour? 3

a) 1440   b) 1200
c) 720   d) 600

[EC-GATE-2017(1)]

Q.171 A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot.
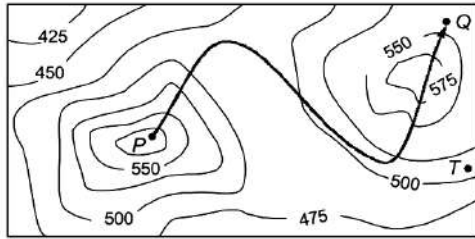
The path from P to 0 is best described by
a) Up-Down-Up-Down
b) Down-Up-Down-Up
c) Down-Up-Down
d) Up-Down-Up

[EC-GATE-2017(1)]

Q.172 There are 3 Indians and 3 Chinese in a group of 6 people. How many subgroups of this group can we choose so that every subgroup has at least one Indian?
a) 56　　　　　b) 52
c) 48　　　　　d) 44

[EC-GATE-2017(1)]

Q.173 A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot.
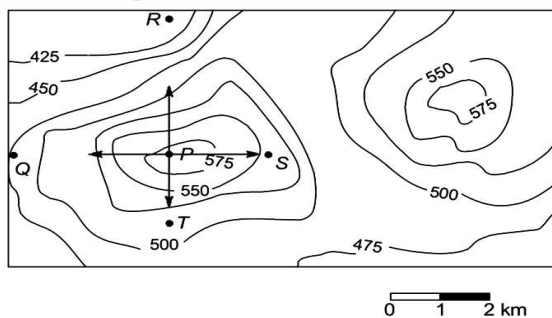
Which of the following is the steepest path leaving from P?
a) P to Q　　　　b) P to R
c) P to S　　　　d) P to T

[EC-GATE-2017(2)]

Q.174 1200 men and 500 women can build a bridge in 2 weeks, 900 men and 250 women will take 3 weeks to build the same bridge. How many men will be needed to build the bridge in one week?
a) 3000　　　　b) 3300
c) 3600　　　　d) 3900

[EC-GATE-2017(2)]

Q.175 The number of 3-digit numbers such that the digit 1 is never to the immediate right of 2 is
a) 781　　　b) 791
c) 881　　　d) 891

[EC-GATE-2017(2)]

Q.176 A right-angled cone (with base radius 5 cm and height 12 cm), as shown in the figure below, is rolled on the ground keeping the point P fixed until the point Q (at the base of the cone, as shown) touches the ground again.
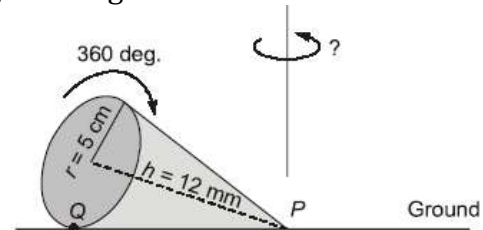
By what angle (in radians) about P does the cone travel?
a) $\dfrac{5\pi}{12}$　　　　b) $\dfrac{5\pi}{24}$
c) $\dfrac{24\pi}{5}$　　　　d) $\dfrac{10\pi}{13}$

[ME-GATE-2017(1)]

Q.177 P, Q, and R talk about S's car collection, P states that S has at least 3 cars. Q believes that S has less than 3 cars, R indicates that to his knowledge. S has at least one car. Only one of P, Q and R is right. The number of cars owned by S is
a) 0　　b) 1
c) 3　　d) Cannot be determined

[ME-GATE-2017(1)]

Q.178 In a company with 100 employees, 45 earn Rs. 20000 per month, 25 earn Rs. 30000, 20 earn Rs. 40000, 8 earn Rs. 60000, and 2 earn Rs. 150000. The median of the salaries is

a) Rs. 20000　　　b) Rs. 30000
c) Rs. 32300　　　d) Rs. 40000
[ME-GATE-2017(1)]

Q.179 What is the sum of the missing digits in the subtraction problem below?

$$5\;.........$$
$$\underline{-48\_89}$$
$$1111$$

a) 8　　b) 10
c) 11　　d) Cannot be determined
[ME-GATE-2017(1)]

Q.180 Let S_1 be the plane figure consting of the points (x,y) given by the inequalities $|x-1|\leq2$ and $|y+2|\leq3$. Let S_2 be the plane figure given by the inequalities $x-y\geq-2$, $y\geq1$, and $x\leq3$. Let S be the union of S_1 and S_2. The area of S is

a) 26　　　　　b) 28
c) 32　　　　　d) 34
[ME-GATE-2017(1)]

Q.181 The growth of bacteria (lactobacillus) in milk leads to curd formation. A minimum bacterial population density of 0.8 (in suitable) is needed to form curd. In the graph below, the population density of lactobacillus in 1 litre of milk is plotted as a functionof time, at two different temperature, 25°C and 37°C.
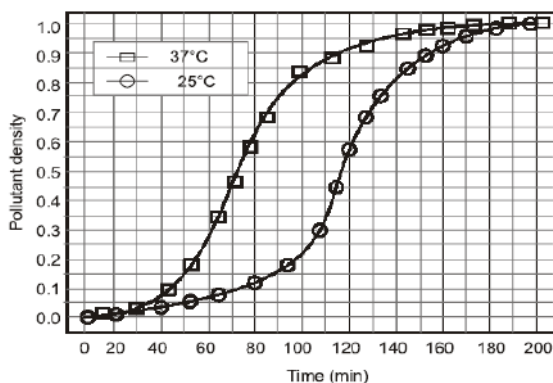
Consider the following statements based on the data shown above:

i. The growth in bacterial population stops earlier at 37°C as compared to 25°C
ii. The time taken for curd formation at 25°C is twice the time taken at 37°C.

Which one of the following options is correct?

a) only i　　　b) only ii
c) both i and ii　　d) neither i nor ii
[ME-GATE-2017(1)]

Q.182 If a and b are integers and a - b is even, which of the following must always be even?

a) ab　　　　　　b) $a^2 + b^2 + 1$
c) $a^2 + b + 1$　　　d) ab - b
[ME-GATE-2017(2)]

Q.183 A couple has 2 children. The probability that both children are boys if the older one is a boy is

a) 1/4　　b) 1/3
c) 1/2　　d) 1
[ME-GATE-2017(2)]

Q.184 In the graph below, the concentration of a particular pollutant in a lake is plottedover (alternate) days of a monthin winter (average temperature 10°C) and a month in summer (average temperature 30°C)
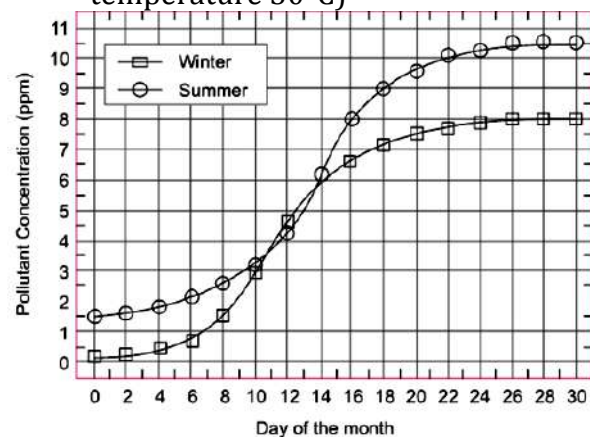
Consider the following statements based on the data shown above:

i. Over the given month, the difference between the maximum and the minimum

pollutant concentrations is the same in both winter & summer.

ii. There are at least four days in the summer month such that the pollutant concentrations on those days are within 1 ppm of the pollutant concentrations on the corresponding days in the winter month. Which one of the following options is correct?
a) only i   b) only ii
c) both i and ii   d) Neither i nor ii
[ME-GATE-2017(2)]

Q.185 X bullocks and Y tractors take 8 days to plough a field. If we halve the number of bullocks and double the number of tractors, it takes 5 days to plough the same field. How many days will it take X bullocks alone to plough the field?
a) 30   c) 40
b) 35   d) 45
[ME-GATE-2017(2)]

Q.186 Hama's age is 5 years more than twice Hari's age. Suresh's age is 13 years less than 10 times Hari's age. If Suresh is 3 times as old as Hema, how old is Hema?
a) 14   b) 17   c) 18 d) 19
[CE-GATE-2018(1)]

Q.187 The temperature T in a room varies as a function of the outside temperature $T0$ and the number of persons in the room p, according to the relation $T = K(\Theta p + T0)$, where Θ and K are constants. What would be the value of Θ given the following data?

$T0$	p	T
25	2	32.4
30	5	42.0

a) 0.8   b) 1.0
c) 2.0   d) 10.0
[CE-GATE-2018(1)]

Q.188 A fruit seller sold a basket of fruits at 12.5% loss. Had he sold it for Rs. 108 more, he would have made a 10% gain. What is the loss in Rupees incurred by the fruit seller?
a) 48   b) 52
c) 60   d) 108
[CE-GATE-2018(1)]

Q.189 The price of a wire made of a super alloy material is proportional to the square of its length. The price of 10 m length of the wire is Rs. 1600. What would be the total price (in Rs.) of two wires of lengths 4 m and 6m?
a) 768   b) 832
c) 1440   d) 1600
[CE-GATE-2018(1)]

Q.190 Consider a sequence of numbers $a1$, $a2$, $a3$, $\cdots$, an where $an = 1/n - 1/n+2$, for each integer $n > 0$. What is the sum of the first 50 terms?
a) $(1 + 1/2) - 1/50$
b) $(1 + 1/2) + 1/50$
c) $(1 + 1/2) - (1/51 + 1/52)$
d) $1 - (1/51 + 1/52)$
[CE-GATE-2018(1)]

Q.191 Each of the letters arranged as below represents a unique integer from 1 to 9. The letters are positioned in the figure such that $(A \times B \times C)$, $(B \times G \times E)$ and $(D \times E \times F)$ are equal.
Which integer among the following choices cannot be represented by the letters A, B, C, D, E, F or G?

a) 4   b)5   c) 6   d) 9
[CE-GATE-2018(1)]

Q.192 $a + a + a + \cdots$ n times$= a^2b$ and $b + b + b + \cdots + m$ times$= ab^2$ where a, b, n and m are natural numbers. What is the value of $(m + m + m + \cdots$ n times$)(n + n + n + \cdots m$ times$)$?
a) $2a^2b^2$ b) a^4b^4

c) $(a + b)$ d) $a^2 + b$

[CE-GATE-2018(2)]

Q.193 For non-negative integers, a, b, c, what would be the value of $a + b + c$ if $\log a + \log b + \log c = 0$?
a) 3   b) 1
c) 0   d) −1

[CE-GATE-2018(2)]

Q.194 In manufacturing industries, loss is usually taken to be proportional to the square of the deviation from a target. If the loss is Rs. 4900 for a deviation of 7 units, what would be the loss in Rupees for a deviation of 4 units from the target?
a) 400   b) 1200
c) 1600   d) 2800

[CE-GATE-2018(2)]

Q.195 A faulty wall clock is known to gain 15 minutes every 24 hours. It is synchronized to the correct time at 9 AM on 11th July. What will be the correct time to the nearest minute when the clock shows 2 PM on 15th July of the same year?
a) 12:45 PM   b) 12:58 PM
c) 1:00 PM   d) 2:00 PM

[CE-GATE-2018(2)]

Q.196 The annual average rainfall in a tropical city is 1000 mm. On a particular rainy day (24-hour period), the cumulative rainfall experienced by the city is shown in the graph. Over the 24-hour period, 50% of the rainfall falling on a rooftop, which had an obstruction free area of 50 m², was harvested into a tank. What is the total volume of water collected in the tank in liters?
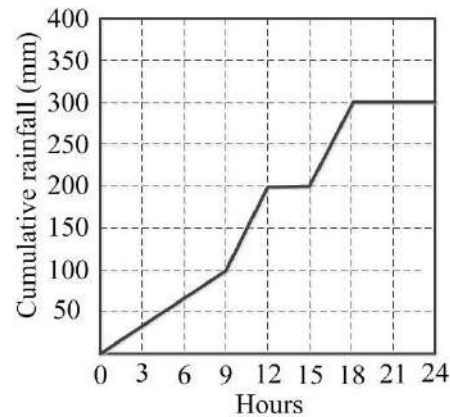
a) 25,000   b) 18,750
c) 7,500   d) 3,125

[CE-GATE-2018(2)]

Q.197 Given that $\log P/(y-z) = \log Q/(z-x) = \log R/(x-y) = 10$ for $x \neq y \neq z$, what is the value of the product PQR?
a) 0   b) 1
c) xyz d) $10xyz$

[CE-GATE-2018(2)]

Q.198 Seven machines take 7 minutes to make 7 identical toys. At the same rate, how many minutes would it take for 100 machines to make 100 toys?
a) 1   b) 7
c) 100   d) 700

[ME-GATE-2018(1)]

Q.199 A number consists of two digits. The sum of the digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number?
a) 63   b) 72   c) 81   d) 90

[ME-GATE-2018(1)]

Q.200 A rectangle becomes a square when its length and breadth are reduced by 10 m and 5 m, respectively. During this process, the rectangle loses 650 m² of area. What is the area of the original rectangle in square meters?
a) 1125   b) 2250
c) 2924   d) 4500

[ME-GATE-2018(1)]

Q.201 Given that a and b are integers and a + a^2b^3 is odd, which one of the following statements is correct?
a) a and b are both odd
b) a and bare both even
c) a is even and b is odd
d) a is odd and b is even
[ME-GATE-2018(1)]

Q.202 From the time the front of a train enters a platform, it takes 25 seconds for the back of the train to leave the platform, while travelling at a constant speed of 54 km/h. At the same speed, it takes 14 seconds to pass a man running at 9 km/h in the same directions as the train. What is the length of the train and that of the platform in meters, respectively?

a) 210 and 140
b) 162.5 and 187.5
c) 245 and 130
d) 175 and 200
[ME-GATE-2018(1)]

Q.203 For integers a, b and c, what would be the minimum and maximum values respectively of a + b + c if $\log|a| + \log|b| + \log|c| = 0$
a) –3 and 3   b) –1 and 1
c) –1 and 3   d) 1 and 3
[ME-GATE-2018(1)]

Q.204 A wire would enclose an area of 1936 m , if it is bent into a square. The wire is cut into two pieces. The longer piece is thrice as long as the shorter piece. The long and the short pieces are bent into a square and a circle, respectively. Which of the following choices is closes to the sum of the areas enclosed by the two pieces in square meters.
a)1096   b) 1111
c) 1243   d) 2486
[ME-GATE-2018(2)]

Q.205 A house has a number which needs to be identified. The following three statements are given that can help in identifying the house member. i. If the house number is a multiple of 3m then it is number from 50 to 59. ii. If the house numbers NOT a multiple of 4, then it is a number from 60 to 69. iii. If the house number is NOT a multiple of 6, then it is a number from 70 to 79. What is the house number?

a)54   b) 65
c) 66   d) 76
[ME-GATE-2018(2)]

Q.206 An unbiased coin is tossed six times in a row and four different such trials are conducted. One trial implies six tosses of the coin. If H stands for head and T stands for tail, the following are the observations from the four trials. (1) HTHTHT (2) TTHHHT (3) HTTHHT (4) HHHT_ _ Which statement describing the last two coin tosses of the fourth trial has the highest probability of being correct?
a)Two T will occur
b) One H and one T will occur
c) Two H will occur
d) One H will be followed by one T.
[ME-GATE-2018(2)]

Q.207 A contract is to be completed in 52 days and 125 identical robots were employed each operational for 7 hours a day. After 39 days, five-seventh of the work was completed. How many additional robots would be required to complete the work on time, if each robot is now operational for 8 hours a day?
a) 50   b) 89
c) 146   d) 175
[ME-GATE-2018(2)]

Q.208 The perimeters of a circle, a square and an equilateral triangle are equal.

Which one of the following statements is true?
a) The circle has the largest area
b) The square has the largest area.
c) The equilateral triangle has the largest area.
d) All the three shapes have the same area.

[ME-GATE-2018(2)]

Q.209 What is the value of 1+ 1/4 +1/64+ 1/256................

a) 2   b) 7/ 4
c) 3/ 2   d) 4/ 3

[EC-GATE-2018]

Q.210 If the number 715?423 is divisible by 3 (? Denotes the missing digit in the thousands place), then the smallest whole number in the place of ?is _____.
a)0   b) 2
c) 5   d) 6

[EC-GATE-2018]

Q.211 A cab was involved in a hit and run accident at night. You are given the following data about the cabs in the city and the accident.
(i) 85% of cabs in the city are green and the remaining cabs are blue.
(ii) A witness indentified the cab involved in the accident as blue.
(iii) It is known that a witness can correctly identify the cab colour only 80% of the time. Which of the following is closest to the probability that the accident was caused by a blue cab?
a)12%   b) 15%
c) 41%   d) 80%

[EC-GATE-2018]

Q.212 Leila aspires to buy a car Rs. 10,00,000 after 5 years. What is the minimum amount in Rupees that she should deposit now in a bank which offers 10% annual rate of interest, if the interest was compounded annually?
a)5,00,000   b) 6,21,000
c) 6,66,667   d) 7,50,000

[EC-GATE-2018]

Q.213 Two alloys A and B contain gold and copper in the ratios of 2:3 and 3:7 by mass, respectively. Equal masses of alloys A and B are melted to make an alloy C. The ratio of gold to copper in alloy C is ____.
a)5:10   b) 7:13
c) 6:11   d) 9:13

[EC-GATE-2018]

Q.214 Arrange the following three-dimensional objects in the descending order of their volumes: (1) A cuboid with dimensions 10 cm, 8 cm and 6 cm
(2) A cube of side 8 cm
(3)A cylinder with base radius 7 cm and height 7 cm
(4)A sphere of radius 7 cm
a) (i), (ii), (iii), (iv)
b) (ii), (i), (iv), (iii)
c) (iii), (ii), (i), (iv)
d) (iv), (iii), (ii), (i)

[IN-GATE-2018]

Q.215 The area of an equilateral triangle is $\sqrt{3}$. What is the perimeter of the triangle?
a) 2   b) 4
c) 6   d) 8

[IN-GATE-2018]

Q.216 An automobile travels from city A to city B and returns to city A by the same route. The speed of the vehicle during the onward and return journeys were constant at 60 km/h and 90 km/h, respectively. What is the average in km/h for the entire journey?
a)72   b) 73
c) 74   d) 75

[IN-GATE-2018]

Q.217 A set of 4 parallel lines intersect with another set of 5 parallel lines. How many parallelograms are formed?
a)20 b) 48
c) 60 d) 72
[IN-GATE-2018]

Q.218 An e-mail password must contain three characters. The password has to contain one numeral from 0 to 9, one upper and one lower case character from the English alphabet. How many distinct passwords are possible?
a) 6,760 b) 13,520
c) 40,560 d) 1,05,456
[EE-GATE-2018]

Q.219 A class of twelve children has two more boys than girls. A group of three children are randomly picked from this class to accompany the teacher on a field trip. What is the probability that the group accompanying the teacher contains more girls than boys?
a)4/11 b) 325/ 864
c) 525 /864 d) 5 /12
[EE-GATE-2018]

Q.220 A designer uses marbles of four different colours for his designs. The cost of each marble is the same, irrespective of the colour. The table below shows the percentage of marbles of each colour used in the current design. The cost of each marble increased by 25%. Therefore, the designer decided to reduce equal numbers of marbles of each colour to keep the total cost unchanged. What is the percentage of blue marbles in the new design?

Blue	Black	Red	Yellow
40%	25%	20%	15%

a)35.75 b)40.25
c) 43.75 d) 46.25
[EE-GATE-2018]

ANSWER KEY:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
(d)	(c)	(d)	(b)	(a)	(b)	(c)	(d)	(d)	(a)	(c)	(d)	(c)	(d)
15	16	17	18	19	20	21	22	23	24	25	26	27	28
(d)	(c)	(a)	(a)	(a)	(b)	(c)	(b)	(c)	(c)	(d)	(b)	(a)	(b)
29	30	31	32	33	34	35	36	37	38	39	40	41	42
(d)	(a)	(a)	(d)	(d)	(c)	(b)	(b)	(c)	(d)	850	48	6	(b)
43	44	45	46	47	48	49	50	51	52	53	54	55	56
(c)	(d)	140	(c)	(d)	(c)	(c)	(b)	560	(d)	(b)	(b)	163	(d)
57	58	59	60	61	62	63	64	65	66	67	68	69	70
(a)	4	20000	0.81	(a)	495	(c)	(b)	22%	(b)	(c)	1300	180	(d)
71	72	73	74	75	76	77	78	79	80	81	82	83	84
(b)	25	(a)	0.489	96	(a)	(b)	495	560	(b)	163	(a)	(b)	(c)
85	86	87	88	89	90	91	92	93	94	95	96	97	98
1	(b)	(a)	(c)	(d)	(b)	(b)	800	(a)	(b)	(c)	2.064	(c)	2006
99	100	101	102	103	104	105	106	107	108	109	110	111	112
(b)	(b)	4536	(d)	(a)	32	(b)	(a)	(c)	(b)	(c)	(b)	(b)	(c)
113	114	115	116	117	118	119	120	121	122	123	124	125	126
280	(b)	(c)	(c)	(a)	7	(a)	(c)	(c)	(c)	(c)	(c)	(b)	(d)
127	128	129	130	131	132	133	134	135	136	137	138	139	140
(d)	(b)	(a)	(d)	(b)	(a)	(d)	(b)	(b)	(b)	(a)	(a)	(d)	(d)
141	142	143	144	145	146	147	148	149	150	151	152	153	154
(c)	(a)	(c)	(c)	(b)	(c)	(a)	(a)	(c)	(d)	(c)	(b)	(b)	(d)
155	156	157	158	159	160	161	162	163	164	165	166	167	168
(a)	(b)	(c)	(c)	(d)	(c)	(a)	(c)	(b)	(b)	(c)	(b)	(d)	(d)
169	170	171	172	173	174	175	176	177	178	179	180	181	182
(b)	(a)	(c)	(a)	(b)	(c)	(c)	(d)	(a)	(b)	(d)	(c)	(a)	(d)
183	184	185	186	187	188	189	190	191	192	193	194	195	196
(c)	(b)	(a)	(d)	(b)	(c)	(b)	(c)	(b)	(b)	(d)	(a)	(c)	(b)
197	198	199	200	201	202	203	204	205	206	207	208	209	210
(c)	(b)	(b)	(b)	(b)	(d)	(d)	(a)	(c)	(d)	(d)	*	(a)	(d)
211	212	213	214	215	216	217	218	219	220				
(b)	(c)	(b)	(b)	(a)	(a)	(c)	(c)	(a)	(c)				

EXPLANATIONS

Q.1 **(d)**
Using the set theory formula
n(A) : Number of people who play hockey = 15
n(B) : Number of people who play football = 17
n(A∩B): Persons who play both hockey and football =10
n(A∪B): Persons who play either hockey or football or both
Using the formula
n(A∪B)=n(A)+n(B)-n(A∩B)
n(A∪B)=15 +17 -10 = 22
Thus people who play neither hockey nor football
= 25 - 22 = 3

Q.2 **(c)**
7 and 6 added is becoming five means the given two numbers are added on base 8.

$(137)_8$
$+(276)_8$
$\overline{(435)_8}$

Hence we have to add the another two given set of numbers also on base 8.

$(731)_8$
$+(672)_8$
$\overline{(1623)_8}$

Hence the overall problem was based on identifying base which was 8 and adding number on base 8.

Q.3 **(d)**
Per day work or rate of 5 skilled workers $=\dfrac{1}{20}$

⇒ Per day work or rate of one skill worker

$=\dfrac{1}{5\times20}=\dfrac{1}{100}$

Similarly Per day work or rate of 8 semiskilled workers = $\dfrac{1}{25}$

⇒ Per day work or rate of one semi-skill worker

$=\dfrac{1}{8\times25}=\dfrac{1}{200}$

And per day work or rate of 10 unskilled workers

$=\dfrac{1}{30}$

⇒Per day work or rate of one semi-skill worker

$=\dfrac{1}{10\times30}=\dfrac{1}{300}$

Thus total per day work of 2 skilled, 6 semiskilled and 5 unskilled workers

$=\dfrac{2}{100}+\dfrac{6}{200}+\dfrac{5}{300}=\dfrac{12+18+10}{600}$

$=\dfrac{40}{600}=\dfrac{1}{15}$

So total 15 days are required to build the wall.

Q.4 **(b)**
As the number is greater than 3000. So thousand's place can be their 3 or 4.
Let's consider the following two cases
Case (I)
When thousand's place is 3.
3   a   b   c
If there is no restriction on number of two's, three'sand four's. Then each of a, b, c can be filled with 2 or 3 or 4 each in 3 ways.
So 3×3×3=27 numbers are there. Out of which 3222, 3333 are invalid as 2 can be twice & three thrice only so number of such valid numbers beginning with 3 are 27-2 =25

Case (II)

When thousand's place is 4

4   a   b   c

Without restriction on number of 2's, 3's and 4's a, b, c (as explained in case I) can be filled in 27 ways.

Out of these 27 numbers,

4 2 2 2 is only invalid as two have to be used twice only.

So valid numbers are 27 - 1 = 26.

Total numbers from Case (I) & Case (II) 25 + 26 = 51.

Q.5 (a)

Let there be overall 'x' candidates. On the day of election 15% of $0.4x = 0.06x$ wentfrom P's side to Q's side and 25% of $0.6x = 0.15x$ went from Q's side to P's side.

Now, after transfer 'p' has $0.4x - 0.06x + 0.15x = 0.49x$

And after transfer 'q' has $0.6x - 0.15x + 0.06x = 0.51x$

Given, in the question that P lost by 2 votes

Q - P = 2 votes

$0.51x - 0.49 = 0.02x = 2$ votes

Hence, (x = 100)

Total number of votes are 100.

Q.6 (b)

(by Fuel consumed per km will we least will be when mileage (kilometres per litres) mentioned on 'y' axis of graph will be maximum irrespective of number of kilometres travelled.

From the graph ('y' axis) we can observe that mileage (kilometers per litres) is maximum when vehicle is driven at 45 kilometers per hour. Hence the stretch which 'Q' covered at 45 kmph, mileage was highest and fuel consumption per kilometer was lowest.

Q.7 (c)

The question can be done orally as R took $1/3^{rd}$ of to fees initially. Hence total number of toffees has to be multiple of 3. There is only one option (c) as 48 which is multiple of 3.

Alternate Solution

Using options:

If we use options for option (c), if total number of tofees are 48. Rtook 1/3rd if 48 and returned 4. So R has 16 - 4 = 12 tofees. Out of left over 36 tofees S took 1/4th of 36 and returned 3. So, S has 9-3 = 6 and remaining 30 will be left in bowl.

Now T took 1/2 of 30 and returned two back. So, the bowl has 17 left. *Always solve such questions by options.

Q.8 (d)

$$f(y) = \frac{|Y|}{y}$$

As we know,

$$|y| = \begin{cases} y & y \geq 0 \\ -y & y < 0 \end{cases} \qquad ......(i)$$

So from (i),

$$f(y) = \frac{y}{y} = 1 \qquad \text{If } y \geq 0$$

$$f(y) = \frac{-y}{y} = -1 \qquad \text{If } y<0$$

Hence, $|f(q)-f(-q)| = |1 - (-1)| = 2$

Q.9 (d)

By observation of the table, we can say S

	P	Q	R	S
Requirement	800	600	300	200
Potency	0.4	0.5	0.4	0.8

Q.10 (a)

$(V+F) = (4q+100/q)$

Checking with all options and see that q=5 give the minimum value.

Q.11 (c)

Let each truck carry 100 units.

n = normal

e = excess/pending

2800 = 4n + e

3000 = 10n + e

Solve these two equations we get

$$n = \frac{100}{3}, e = \frac{8000}{3}$$

$$5\,\text{days} \Rightarrow 500x = \frac{5 \cdot 100}{3} + \frac{8000}{3}$$

$$\Rightarrow 500x = \frac{8500}{3} 17 \Rightarrow x > 5$$

Minimum possible = 6

Q.12 (d)

$$10 \left(\frac{10-1}{10} \right)^3 = 10 \left(\frac{9}{10} \right)^3 = \frac{729}{1000}$$

$$\therefore \quad \frac{729}{1000} \times 1 = 7.29\,\text{litres}$$

Q.13 (c)

4 + 44 + 444 ....

If we see first term of series = 4

Hence, sum upto 1st term is also = 4

Put, n= 1 (first term) only option (c) satisfies.

$$\frac{4}{81} \left[10^{n+1} - 9n - 10 \right] = \frac{4}{81} \left[10^{1+1} - 9 \times 1 - 10 \right]$$

$$= \frac{4}{81} \times 81 = 4$$

Hence, option (c) is correct answer. Always solve these questions by putting values.

Q.14 (d)

$$(1.001)^{1259} = 3.52 \text{ and } (1.001)^{2062} = 7.85$$

$$(1.001)^{1259} \times (1.001) = (1.001)^{3321}$$

$$\downarrow \qquad \downarrow \qquad \downarrow$$

$$3.52 \quad \times \quad 7.85$$

$$= (1.001)^{3321} \left(\text{as } a^m \times a^n = a^{m+n} \right)$$

Hence $(1.001)^{3321} = 27.632 = 27.64$

Q.15 (d)

Category	Amount
Food	4000
Clothing	1200
Rent	2000
Savings	1500
Others	1800
Total	10500

So total expenses are 10,500.

Expenses excluding savings are 9,000.

Hence required percentage

$$= \frac{9,000}{10,500} \times 100$$

$$= 85.714\% \approx 86\%$$

Q.16 (c)

Probability that A & B will meet will be given by the graphical representation where shaded region represents favorable area unfavorable favorable favorable area
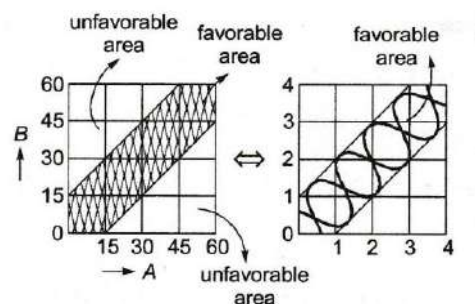
Required probability $= \dfrac{\text{fabourable area}}{\text{total area}}$

$$= \frac{7}{16}$$

Q.17 (a)

Let the number of Rs. 20 notes be 'a' and Rs. 10 notes be 'b' respectively.

So, a + b = 14

20 a + 10 b = 230

on solving a = 9, b = 5

Hence number of Rs.10 notes are 5.

Q.18 (a)

Divide 8 bags into three parts.

3, 3 and 2 respectively. Now two cases arises.

Case (i):

Firstly, if we compare the 3, 3 bags on pans of a balance. We can identify on which side is the lighter bag placed. And then we will need only one more weighing for identifying faulty bag. So only two weighings are required.

Case (ii):

Secondly, if the 3, 3 compared bags are equal, then to be sure faulty bag is one among the reaming two bags. So one more weighing is required to find out faulty bag from these two bags. Hence overall two weightings are required. Thus in either cases only two weightings are required.

SOLUTION:2

NO OF BAGES	TRIAL	
1 TO 3	1	
4 TO 9	2	
10 TO 27	3	
28 TO 81	4	And so on.

Q.19 (a)

Total cost = $5q^2$
Sp of 1 unit = Rs.50
So, total sp = 50 q
P = Profit = SP - CP = $50q - 5q^2$
To maximize P,

$$\frac{dp}{dq} = 50 - 10q = 0$$

q = 5 units

Q.20 (b)

$y = 2x - 0.1x^2$

$$\frac{dy}{dx} = 2 - 0.2x \ dx$$

$$\frac{d^2y}{dx^2} < 0 \therefore y \text{ maximizes at } 2 - 0.2x = 0$$

$\Rightarrow \quad x = 10$

$\therefore \quad y = 20 - 10 = 10m$

Q.21 (c)

(P) Consider the example,
Let entry be 1,2,3,4;

So, mean = $\frac{1+2+3+4}{4} = 2.5$

Add 7 to all entry 8,9,10,11

Mean = $\frac{2+4+6+8}{4} = 5 = 2 \times 2.5$

Q.22 (b)

	x	y
Supply	60%	40%
Reliable	96%	72%
Overall	0.576	0.288

$\therefore P(X) = \dfrac{0.288}{0.576+0.288} = 0.334$

Q.23 (c)

$\dfrac{M+Tue+W}{3} = 41$

$\Rightarrow M + Tue + W = 123 \qquad ...(i)$

$\dfrac{Tue+W+Th}{3} = 43$

$\Rightarrow Tue + W + Th = 129 . \qquad ..(ii)$

From eq. (ii)- eq. (i)
Th-M=6
Also Th=1.15 M
1.15 M-M=6
$\Rightarrow \quad 0.15 M=6$
$\Rightarrow \quad M=40$
Th=1.15 m
$\Rightarrow \quad Th=1.15\times40$
$\Rightarrow \quad Th= 46$

Q.24 (c)

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$\frac{\text{Total distance}}{\text{Total time}} = \frac{(8+6+16)km}{\left(\dfrac{1}{4}+\dfrac{1}{4}+\dfrac{1}{4}\right)hr}$$

$$\frac{30km}{\dfrac{3}{4}hr} = 40 \ km/hr$$

Q.25 (d)

S = 10 + 84+ 73+ ..
S = $(9+1)+(9^2+3)+(9^3+5)...$
S = $\{9+9^2 +9^3+...9^n\}+\{1+3+5...(2n-1)\}$

$$S = \frac{9(9^n-1)}{(9-1)} + n^2$$

$$\left(\begin{array}{l} \text{As } a + ar + ar^2 ....ar^{n-1} \\ = \dfrac{a(r^n-1)}{(r-1)} \text{ for } r > 1 \end{array} \right)$$

$$\left(\begin{array}{l}\text{and } 1 + 3 + 5\ldots\ldots\ldots(2n-1)= n^2 \\ \text{Sum of odd natural numbers } = n^2\end{array}\right)$$

So $S = \dfrac{9(9^n -1)}{8}+n^2$

Q.26 (b)

$3x^2 + 2x + p(p - 1) = 0$

If roots are of opposite signs product of the roots will be negative.

$C/A < 0$

$P(p-1)/3 < 0$

$P(p- 1) < 0$

$0 < p < 1$

$P \in (0, 1)$

Q.27 (a)

Every leap year will have 366 days.

1 leap year = 366 days

= 52 x 7 + 2 days

Every leap year will have 52 complete weeks. For 53rd Saturday there are two favourable cases from 7 possible cases

Fri	Sat	
Sat	Sun	→ 2 favourable cases
Sun	Mon	
Mon	Tue	
Tue	Wed	
Wed	Thu	
Thu	Fri	

Required probability = $\dfrac{2}{7}$

Q.28 (b)

$|4x - 7| = 5$; $4x - 7 = 5$ or

$4x - 7 = -5 \Longrightarrow x = 3$ or 0.5

$\therefore 2|x|-|-x| = 2 \times 3 - 3 = 3$

Or $2|x|-|-x|= 2\times\dfrac{1}{2}-\dfrac{1}{2}=\dfrac{1}{2}$

Q.29 (d)

$x-75 = 117-x$

$2x=192$

$X=96$

Q.30 (a)

$2x + y \le 6$; $x + 2y \le 8$

$x \le 1.33$; $y \le 3.33$; option b) and c) are rejected because $x \not> 1.33$

Option d) is rejected $x \not> 10 / 3$

Q.31 (a)

Q.32 (d)

% increase in raw material

$= \dfrac{6240-5200}{5200}\times 100 = 20\%$

(% increase research and development)

$= \dfrac{26400-22000}{22000}\times 100 = 20\%$

Q.33 (d)

The number of 2 digit multiples of 7 = 13

$\therefore$ Probability of choosing a number

Not divisible by 7 $= \dfrac{90-13}{90}=\dfrac{77}{90}$

Q.34 (c)

Let the total distance covered be 'D'

Now,

Average speed $= \dfrac{D}{\text{Total time taken}}$

$= \dfrac{D}{\left(\dfrac{D}{2}{60}+\dfrac{D}{4}{30}+\dfrac{D}{4}{10}\right)} = \dfrac{1}{\dfrac{1}{120}+\dfrac{1}{120}+\dfrac{1}{40}}$

$= \dfrac{120}{5} = 24\,\text{km}/\text{hr}$

Q.35 (b)

The expression can be written as

$\dfrac{1}{\sqrt{1}+\sqrt{2}}+\dfrac{1}{\sqrt{2}+\sqrt{3}}+\dfrac{1}{\sqrt{3}+\sqrt{4}}+\ldots+\dfrac{1}{\sqrt{80}+\sqrt{81}}$

$= \dfrac{\sqrt{2}-\sqrt{1}}{(\sqrt{2})^2-(\sqrt{1})^2}+\dfrac{\sqrt{3}-\sqrt{2}}{(\sqrt{3})^2-(\sqrt{2})^2}+\dfrac{\sqrt{4}-\sqrt{3}}{(\sqrt{4})^2-(\sqrt{3})^2}$

$+\ldots+\dfrac{\sqrt{81}-\sqrt{80}}{(\sqrt{81})^2-(\sqrt{80})^2}$

$= \sqrt{81}-\sqrt{1}=8$

Q.36 (b)

Let 'W' be the labour wages, and 'T' be the working hours.

Now, total cost is a function of W x T
Increase in wages = 20%
∴ Revised wages = 1.2 W

Decrease in labour time $=\left(\dfrac{100}{24}\right)\%$

∴ Revised time $=\left(1-\dfrac{1}{24}\right)T=\dfrac{23}{24}T$

∴ Revised Total cos t $=1.2 \times \dfrac{23}{24}WT$

$=1.15WT=1.15 \times 13200 =15180$

Q.37 (C)

For sum to be maximum, we will consider only positive terms
$44+42+........2$
or $2+4+6.......42+44$
$2[1+2+3.....22]$
$=\dfrac{2[22\times 23]}{2}=506$

Alternatively:
Sum of even natural numbers
$2+4+6...44=n(n+1)$
$22\times 23=506$

Q.38 (d)

$ax^2+bx+c=0$
for roots to be real & +ve
$b^2-4ac>0$
This will have 2 real positive roots.
$ax^2+b|x|+c=0$

This can be written as;
ax^2-bx+c
Discriminant $= b^2-4ac>0$
ax^2-bx+c
$(-b)^2-4ac \Rightarrow b^2-4ac$

Is also >0. This will have real roots
$\Rightarrow$ These will have 4 real roots.

SOLUTION:2
The second equation has both positive and negative values of roots of the first equation
So, second equation has 4 real roots.

Q.39 (850)

One way force =100
Two way fare per person=200
5 persons=1000/-
Total discount applicable =10+5=15%

Discount amount = $\dfrac{15}{100}\times 1000 =150$
Amount to be paid=1000-150=850

Q.40 (48)

Total respondents=300
Those who don't have scooter
$\Rightarrow$ Men= 40+20=60

Women = $34+50=\dfrac{84}{144}$

$\% =\dfrac{144}{300}\times 100 =48\%$

Q.41 (6)

The Tetrahedron has 4 triangular surfaces with 4 vertices/corners (say A,B,C and D) as can be seen here.
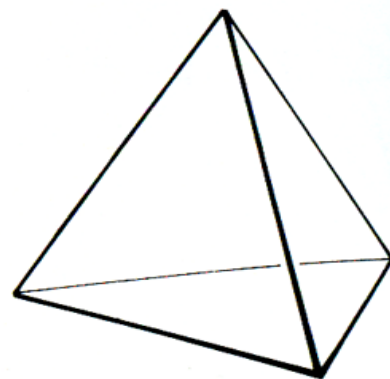
Now if you take a point inside a tetrahedron (suppose O) and connect it with any two of its corners which are nothing but vertices (suppose A and B), you will get 1 internal plane as OAB.

So we can see from here that, no of new internal planes = no of different pair of corners or vertices

like (A, C) or (A,D) or (B,C) or (B,D) or (C,D), hence total possible pair of corners

are 6. Therefore 6 new internal planes possible.

We could also calculate the possible corners by using combinations formula,
which is nCr, i.e. no of ways to select a combination of r things from a given set of n things.
here n = 4 (as total 4 vertices, A,B,C and   D)
and r =2 (as we need two corners at a   time)
Thus, $^4C_2 = 6$

Q.42 **(b)**

10, 20, 30,....................190
Average = (10+190)/2
= 200/2
= 100

Q.43 **(c)**

let $= \sqrt{12+\sqrt{12+\sqrt{12+\ldots}}} = y$
$\Rightarrow \sqrt{12+y} = y$
$\Rightarrow 12+y = y^2$
$\Rightarrow (y-4)(y+3)=0$
$\Rightarrow y=4, y=-3$

Q.44 **(d)**

$x^2 - 2x + 3 = 11$
$\Rightarrow (x-4)(x+2) = 0 \Rightarrow x = 4, x = -2$
Values of $\left|-x^3 + x^2 - x\right|$

For x = 4
Value = 52
for x =-2
Value =14

Q.45 **(140)**

$\dfrac{m}{f} = 3$ $\dfrac{m}{f} = 2.5m = 2.5f$
$\dfrac{m'}{2f} = 3$

m'=6f
$= \dfrac{m' - m}{m}$

$\% \uparrow = \dfrac{3.5f}{2.5f} \times 100$
$= \dfrac{7}{8} = 1.4$
$\boxed{\% \uparrow = 140\%}$

Q46 **(c)**
Total question
44×2=88
44×3=132
144 = 88
132   308
Total marks obtained=(21×2) + (15×3) + (23×2) =133
Total Number of students=44
Average $= \dfrac{133}{44} = 3.02$

Q.47 **(d)**
Per 100 Rs final value 107 Rs

$\Rightarrow$ Per $\dfrac{100}{50}$ Dollars final value $\dfrac{107}{60}$

for 100 dollars___?

$= \dfrac{100 \times 50}{100} \times \dfrac{107}{60} = 89.16$
Decreased by 11%.

Q.48 **(c)**
Take number of female students in 2011=100
$\therefore$ Number of male in 2011=100
No. of female in 2012=100
No. of male in 2012=150
Ratio $= \dfrac{150}{100} = 1.5 : 1$

Q.49 **(c)**
$(7526)_8 - (y)_8 = (4364)_8$
$= (7526)_8 - (4364)_8$
$= (7526 - 4364)_8$
$= (3142)_8$

Q.50 (b)
A resident female with annual income Rs. 9 Lakh should satisfy eligibility for filling form T. So answer is option B is answer. Option A, C , D corresponds to filling form P, S, D respectively.

Q.51
Let the length of platform is x and velocity of train is v.
Distance = Vel. × time
$(280 + x) = V \times 60$ (i)
$280 = V \times 20$ (ii)
From equation (i) and (ii), we get
x = 560 m

Q.52 (d)
Deficit should be equal to (1/5)th of exports which is possible in 2006

$$\text{Deficit} = \frac{\text{Imports} - \text{Exports}}{\text{Exports}}$$

$$= \frac{120 - 100}{100} = \frac{20}{100} = \frac{1}{5}$$

Q.53 (b)
As one of the face is already shown as head os the possibility of second coin is not there (because second coin has both tail). Now sample space will contain now events (H, H, T). So the probability for another face as tail will be 1/3.

Q.54 (b)
As the numbers appearing on the faces are not equally likely because their probability of occurrence over a large number of throws are different (as given) so we can term it to be biased die.

Q.55
Let eight consecutive odd numbers be
a , a + 2,.......................... a + 14
and four consecutive over numbers be
b, b + 2, b + 4, b + 6

Given (a)+(a+2),......+(a+14)= 656
8a + 56 = 656
a = 75
Also given
(b)+(b+2)+(b+4)+(b+6)= 87×4=348
4b + 12 = 348
b = 84
Sum of smallest odd no (a) and second largest even no (b+4) will be
= (a) + (b + 4)
= 75 + (84 + 4) = 163

Q.56 (d)
For maximum revenue per kg. Let us solve throughoptions

A. Item 2= $\dfrac{20\% \text{ of } 250}{20\% \text{ of } 500}=0.5$

B. Item 3= $\dfrac{23\% \text{ of } 250}{19\% \text{ of } 500}=0.6$

C. Item 6= $\dfrac{19\% \text{ of } 250}{16\% \text{ of } 500}=0.59$

D. Item 5= $\dfrac{20\% \text{ of } 250}{12\% \text{ of } 500}=0.83$

Clearly item 4 is largest.

Q.57 (a)
Drainage pipe drains half of the tank in 30 minutes or full tank is 68 minutes. Now the tank have to be filled in 10 minutes (when both drainage and filling pipes are in action)Drainage pipe would drained 1/6th of capacity of tank in 10 minutes. So filling pipe have to fill 1/2 of capacity of 1/6 of capacity more i.e. 2/3rd of the tank in 10 minutes. or complete tank is 15 minutes. That's why the filling tank should have rate 4 times the draining rate.
Alternatively :
Drainage pipe can drain complete tank in 60 min. Let the filling pipe can fill the tank in 'x' min. Now both are operational and tank is half filled. Also
Remaining half needs to get filled in 10 minute.

$$10\left[\frac{1}{x} - \frac{1}{60}\right] = \frac{1}{2}$$

$x = 15$ minutes

So filling pipe needs to have rate be four times drainage pipe's rate.

Q.58 4

Let the velocity of stream is 'V time taken during downstream is 't' and distance is 'x'.

$$t = \frac{x}{8 + V} \qquad \text{....(i)}$$

During upstream

$$3t = \frac{x}{8 - V} \qquad \text{....(ii)}$$

Dividing equation (ii) by (i), we get
V= 4 m/s

Q.59 20,000

Since,

15% = 4,50,000

$$100\% = \frac{4,50,000 \times 100}{15} = 30,00,000$$

Selling price of purifier

$$= \frac{30,00,000 + 10,00\,000}{200} = 20,000$$

Q.60 0.81

Probability of bulb being defective

$$= \frac{5}{100}$$

= 0.05

Probability of bulb being non defective

= 1 - 0.05 = 0.95

Probability that the batch is accepted

= None of the four bulb being defective

= $(0.95)^4$= 0.81450625 ≈ 0.81

Q.61 (a)

$$f(x, y) = (2x)^n \times \left(\frac{y}{n}\right)^m = 2^{n-m} \times P$$

Q.62 (495)

Let the 12 consecutive odd numbers be

a,a+2,a+4,a+6, ... a + 22

Sum of first five

(a)+(a+2)+(a+4)+(a+6)+(a+8)=425

5a+20=425= a = 81

Sum of last five

(a+14)+(a+16)+(a+18)+(a+20)+(a+22)=5a + 90 = 5 x 81 + 90 = 495

Q.63 (c)

13M, 17Q, 19S

Among options only W is correct as W is 23rd letter in English language.

Q.64 (b)

The value doubled over 10 years

$$A = P\left(\frac{1 + R}{100}\right)^n$$

$$2P = P\left(1 + \frac{R}{100}\right)^{10}$$

R >> 7.2

Alternatively:

Simple growth rate for a quantity to double it 10 years will be 10%. For compounded growth rate have to be less than 10. Among options 7.2 (Ans.(b)) is correct as ((a) (5.6)) will be very much less than 10. ((c) (10)), ((d) (12)) cannot be answer as compounded growth rate have to be less than 10.

Q.65

In 2012, total cost

$$= \frac{4,50,000 \times 100}{15} = 30,00,000$$

Cost of raw material in 2012

$$= 30,00,000 \times \frac{20}{100} = 6,00,000$$

Cost of raw material in 2013

$$= 600000 + 600000 \times \frac{30}{100} = 7,80,000$$

other expenditure in 2012

= 3000000 - 600000 = 2400000

Increased cost of other expenditure in 2013

$$= 2400000 + 2400000 \times \frac{20}{100} = 2880000$$

Total cost in 2013
= 2880000 + 780000 = 3660000
% increase in total cost in 2013
$$= \frac{3660000 - 3000000}{3000000} \times 100 = 22\%$$

Q.66 (b)
Overall there will be 5! = 120 numbers. Digit /will appear at unity, tens, hundred, thousand and ten thousand place 4! times each. So sum received due to all 1's will be 4!×(1+10+100+1000+10000)=4!×1 111
Similarly sum received due to all 3's 4!×(3+30+300+3000+30000)=4!×3 333
Similarly for digits 3, 4 and 5
So, overall sum received due to all digits
=4! ×1111 [1 + 3 + 5 + 7 + 9]
= 24 × 1111 [25] = 66666600

Q.67 (c)
$$y = 5x^2 + 3, \frac{dy}{dx} = 10x$$
Slope of tan gent = $\left(\frac{dy}{dx} \right)_{x=0, y=3}$
= 10×0 = 0
Slope=0⟹ tangent is parallel to x-axis.

Q.68 (1300)
Fixed cost = Rs. 50000
Variable cost = Rs. 800Q
Q = Daily production is tones
For 100 tonnes of production daily,
total cost of production = $\frac{130000}{100}$
= Rs. 1300.

Q.69 (180)
Let the angles of quadrilateral are 3x, 4x, 5x, 6x
So, 3x+4x+5x+6x = 360 x = 20
Smallest angle of quadrilateral
= 3x20 = 60°
Smallest angle of triangle

$$= \frac{2}{3} \times 60° = 40°$$
Largest angle of triangle = 2×40° = 60° Three angles of triangle are
40°, 60°, 80°
Largest angle of quadrilateral is 120° Sum (2nd largest angle of triangle + largest angle of quadrilateral)
= 60°+120°=180°.

Q.70 (d)
Let number of people in country y = 100
So, number of people in country x = 300
Total number of people taller than 6ft in both the countries =
$$300 \times \frac{1}{100} + 100 \times \frac{2}{100} = 5$$
% of people taller than 6ft in both the countries = $\frac{5}{400} 100\% = 1.25\%$.

Q.71 (b)
In the question the monthly average rainfall chart for 50 years has been given. Let us check the options.
(i) On average, it rains more in July than in December ⟹ correct.
(ii)Every year, the amount of rainfall in August is more than that in January. ⟹ may not be correct because average rainfall is given in the question.
(iii)July rainfall can be estimated with better confidence than February rainfall. ⟹From chart it is clear the gap between 5 percentileand 95 percentile from averageis higher in February than that inJuly correct.
(iv)In August at least 500 mm rainfall May not be correct, because its 50 year average.
So correct option b) (i) and (iii).

Q.72 (25)

$$P = 0.04 = \frac{4}{100}$$

For 1 earth quake

$$\frac{100}{4} \; P = 1 \text{ earth quake}$$

25 years

⎫ Reverse probability

Q.73 **(a)**

$$\frac{20}{140} \times 8$$

After 1 year

P = 6

2 year = 7.2

After 3 = $\frac{20}{100} \times 1.2 = 8.65$

After 4 year = $\frac{20}{100} \times 8.65 = 10$

Time will be in between 3-4 years.

Q.74 **(0.489)**

Let total population = 100

HIV + patients = 10

For the patient to be +Ve, should be either +Ve and test is showing +Ve or the patient should be — Ve but rest is showing +Ve

$$\Rightarrow \frac{0.1 \times 0.95}{0.1 \times 0.95 + 0.9 \times 0.11} = 0.489$$

Q.75 **(96)**

Expanding

$$z^2 + \frac{1}{z^2} + 2.z.\frac{1}{z} = 98 \Rightarrow z^2 + \frac{1}{z^2} = 96$$

Q.76 **(a)**

As batsman K have lowest standard deviation, he is the most consistent batsmen of these four.

Q.77 **(b)**

As the numbers appearing on the faces are not equally likely because their probability of occurrence over a large number of throws are different (as given) so we can term it to be biased die.

Q.78 **(495) Sol.**

Let the 12 consecutive odd numbers be

$a, a+2, a+4, a+6...a+22$

Sum of first five

$(a)+(a+2)+(a+4)+$

$(a+6)+(a+8) = 425$

$5a+20 = 425 \Rightarrow a = 81$

Sum of last five

$(a+14)+(a+16)+(a+18)+$

$(a+20)+(a+22)$

$5a+90 = 5 \times 81 + 90 = 495$

Q.79 **(560)**

$(280+l) = V*60$

Where, V = 280/20 = 14 m/s

and l = 560 m.

Q.80 **(b)**

As one of the face is already shown as head os the possibility of second coin is not there (because second coin has both tail). Now sample space will contain now events (H, H, T). So the probability for another face as tail will be 1/3.

Q.81 **(163)**

Let eight consecutive odd numbers be

a, a+2 ……a + 14

and four consecutive over numbers be

b, b+2, b + 14, b + 16

Given (a) + (a + 2),....+(a + 14)= 656

$8a+56 = 656$

$a = 75$

Also given

$(b)+(b+2)+(b+4)+(b+6) = 87 \times 4$

$= 348$

$4b+12 = 348$

$b = 84$

Sum of smallest odd no (a) and second largest even no (b + 4) will be

$= (a) + (b+4)$

$= 75 + (84+4) = 163$

Q.82 (a)
P(at least two) – p(exat 2)
= 0.5 −0.4 = 0.1
0.75 = p + m + c + 0.1−(0.5 +0.11× 2)
∴ p + mc = 0.65 + 0.7 = 1.35 $= \dfrac{27}{20}$

Q.83 (b)
$= \dfrac{21 \times 2 + 15 \times 3 + 11 \times 11 \times 1 + 23 \times 2 + 31 \times 5}{21 + 15 + 11 + 23 + 31}$
$= 2.970$

Q.84 (c)
For -1≤x≤1,0≤|x|≤1. f(x) will be maximum when |x| is minimum, i.e. |x|=0⇒x0
∴Maximum value of f (x)=1-0=1

Q.85 (1)

Q.86 (b)

Q.87 (a)
If $x^a = m$

$a \log x = \log m$ then $a = \dfrac{\log m}{\log x}$

$a = \log_x^m$

$\log_x \left(\dfrac{5}{7} \right) = -\dfrac{1}{3}$

$\Rightarrow \quad (x)^{-1/3} = \dfrac{5}{7}$

$\Rightarrow \quad x = \left(\dfrac{7}{5} \right)^3$

$\Rightarrow \quad x = \dfrac{343}{125}$

Q.88 (c)
$(66 \, \square \, 6) \rightarrow (66 \, \diamond \, 6)$
$\left(\dfrac{66-6}{66+6} \right) \times \left(\dfrac{66+6}{66-6} \right) = 1$

Q.89 (d)

Following chart can be drawn from commulative chart:

Stretch	Distance	Electricity used	
M	20	12	10/20=0.6
N	45	25	13/25=0.52
O	75	45	20/30=0.66
P	100	57	12/25=0.48

Hence, minimum for P.

Q.90 (b)
Required probability
$\dfrac{1}{6} \times \left(\dfrac{7}{8} \right) + \dfrac{1}{8} \times \left(\dfrac{5}{6} \right) = \dfrac{12}{48} = \dfrac{1}{4}$

Q.91 (b)
We know,
$(a+b+c)^2 = a^2 + b^2 + c^2 + 2[ab + bc + ca]$
$(a + b + c)^2 - 1 = 2[ab + bc + ca]$ [as $a^2 + b^2 + c^2 = 1$]
For ab+ bc+ca to be min. (a+b+c)=0
Min. (ab + bc + ca) = $-\dfrac{1}{2}$ [an putting a + b + c = 0]
Only option (b) has min. value as $-\dfrac{1}{2}$

Q.92 (800)
Tiger is 50 leap of its own behind deer. Given tiger's one leap is 8 m. So initial separation of Tiger and deer = 50×8 = 400m/min
Tiger goes 5 leap in a minute which is equal to 5×8 = 40 m/min.
Deer goes 4 leap in a minute which is equal to 4×5 = 20 m/min.
Now relative distance of 400 m have to be covered with (40-20)=20 m/min.

Required time $= \dfrac{400 \text{ m}}{(40-20) \text{ m} / \text{min}}$

$\dfrac{(\text{Distance})}{\text{Relative speed}} = 20$ min.

So distance travelled by Tiger
$\dfrac{40 \text{ m}}{\text{min}} \times 20 \text{min} = 800$ m

Q.93 (a)
If 1 <y < x so logx > logy a as well e^x >e^y other two will not always be true.

Q.94 (b)

Q.95 (c)
logtan1°+logtan2°+.... + log tan89°
= log(tan1°×tan2° ×..... tan89°)
As [logm + logn = log mn]
=log(tan1°×tan2°.....tan(90°-2°))
tan(90°-1°)
=log(tan1°×tan2°×...tan45°×cot44...cot2°cot1°) = log(tan45°)
= log(1) = 0
As tan(90° - 0) = cot 0 and
tan1° × cot1° = tan2° ×cot2° = ...1

Q.96 2.064
The shade of part of circular sheet is folded to form a cone (Figure below).
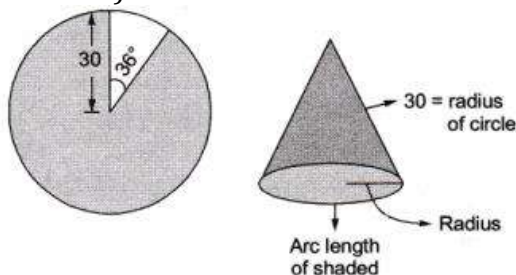
$2\pi R' = \dfrac{9}{10} 2 \times 30 \quad R' = 27$

$h = \sqrt{30^2 - 27^2} = \sqrt{900 - 729}$
$= \sqrt{171}$

Required ratio $\dfrac{R'}{h}$

$= \dfrac{27}{\sqrt{171}} = 2.064$

Q.97 (c)
f(x)= 2x + 33

Q.98 (2006)
Increase in exports in 2006
$= \dfrac{100 - 70}{70} = 42.8\%$
Increase in imports in 2006

$= \dfrac{120 - 90}{90} = 33.3\%$
which is more than any other year

Q.99 (b)

Q.100 (b)
There are 4 kings in a pack of 52 cards. If 2 cards are selected and both are kings, remaining cards will be 50 out of which 2 will be kings.

Q.101 (4536)
In thousands place, 9 digits except 0 can be placed
In hundreds place, 9 digits can be placed (including 0, excluding the one used in thousands place)
In tens place, 8 digits can be placed (excluding the ones used in thousands and hundreds place)
In ones place, 7 digits can be placed (excluding the one used in thousands, hundreds and tens place) Total number of combinations = 9×9×8×7= 4536

Q.102 (d)
Type-I achieved a growth of 53% in the period which is higher than any other type of battery

Q.103 (a)
45 20 Total mass
$\left.\begin{array}{l} 5,11 \\ 4,12 \\ 3,13 \\ 2,14 \end{array}\right\}$ 4favorable

$\dfrac{4}{20} = \dfrac{1}{5} = 0.2$

Q.104 (32)
Electrical male students =40
∴ Electrical Female students
$= \dfrac{4}{5} \times 40 = 32$
∴ Total no.of Student = 40 + 32 = 72

Mechanical Strength is10%=20+16 =36

Civil Strength is 30% = 50 + 48 = 98

Difference of civil female to mechanical female = 48−16 =32

Q.105 (b)

Let us take the numbers as 3, 4, 5, 6, 7 **n=1** & they are in arithmetic sequence

I. 6, 8,10,12,14 **n=2** and they are in arithmetic sequence

II. 0, 1, 2, 3, 4 **n=1** and they are in arithmetic sequence

III. 9, 16, 25, 36, 49 **n=7,9,11,13** they are not in an arithmetic sequence

Q.106 (a)
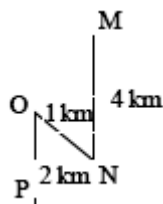
Q.107 (c)

f(x) = 2x+33

Q.108 (b)

Required probability

$$= \frac{1}{6} \times \left(\frac{7}{8}\right) + \frac{1}{8} \times \left(\frac{5}{6}\right)$$

$$= \frac{12}{48} = \frac{1}{4}$$

Q.109 (c)

A, CD, GHI? UVWXY

Series is as follows: Write first letter A, leave aside nearby one B, writer next two CD. Leave aside net two EF. Write next three GHI leave aside next JKL then we have to write MNOP.

Q.110 (b)

Total number of matches

$$= {}^5C_2 = \frac{5 \times 4}{2} = 10.$$

Q.111 (b)

Ambiguous question both A and B seem to be correct but question is ambiguous. Probably GATE will mark answer (b).

Q.112 (c)

There are 10 options for X and 11 options for Y

Point P: There are a total of 110 options (10 x 11)

Point R: Since the Y value will stay the same, we have 9 options for X (-1 because a point is already taken for P)

Point Q: Since the X value will stay the same, we have 10 options for Y (-1 because a point is already taken for Q)

110 x 10 x 9 = 9,900

Q.113 (280) Sol
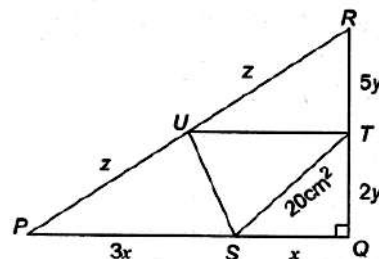
$$\text{Area}\Delta QTS = \frac{1}{2}SQ \times QT$$

$$20 = \frac{1}{2} \times x \times 2y \times 1$$

$$\Rightarrow \quad xy = 20$$

$$\Delta = \frac{1}{2}bh$$

Now Area for

$$\Delta PQR = \frac{1}{2}PQ \times QR \times \sin 90^\circ$$

$$= \frac{1}{2} \times 4x \times 7y$$

$$= 14xy = 280\text{cm}^2$$

Q.114 (b)

Given $\alpha\beta = 4$

$$\frac{\alpha^n + \beta^n}{\alpha^{-n} + \beta^{-n}} = \frac{\alpha^n + \beta^n}{\dfrac{1}{\alpha^n} + \dfrac{1}{\beta^n}}$$

$$= \frac{\left(\alpha^n + \beta^n\right)\alpha^n\beta^n}{\left(\alpha^n + \beta^n\right)}$$

$$= \left(\alpha\beta\right)^n = 4^n$$

Q.115 (c)

Q.116 (c)

$$|9y - 6| = 3$$

$$\Rightarrow (9y - 6 = 3) \text{ or } (9y - 6 = -3)$$

$$\Rightarrow [y = 1]\left[y = \frac{1}{3}\right]\left[y^2 - \frac{4y}{3}\right]$$

Put $\left[y = \frac{1}{3}\right], \left(\frac{1}{3}\right)^2 - \frac{4}{3} \times \frac{1}{3} = -\frac{1}{3}$ or

$$y^2 - \frac{4y}{3}$$

Put $y = 1, 1^2 - \frac{4}{3} = -\frac{1}{3}$

Q.117 (a)

Probability of free throw=0.6
Probability of NOT free throw =1-0.6=0.4
So required probability of exactly 6 throws in 10 attempts will be given by
$${}^{10}C_6 (0.6)^6 \times (0.4)^4 = 0.2508$$

Q.118

Unit digit of $211^{870} + 146^{127} \times 3^{424}$ is
$1 + 6 \times 1 = 7$

Q.119 (a)

Total fruits
(5692000)

Ripe (85%)   Unripe (15%)

(45%) apples   (55%) oranges   (34%) apples   (66%) oranges
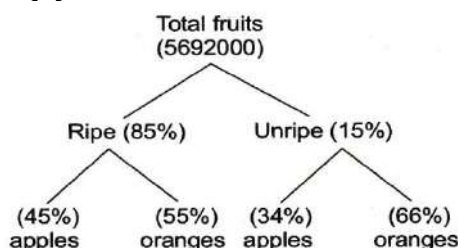
Total number of apples = Ripe apples + apples
$= (0.85 \times 0.45 + 0.15 \times 0.34)569200$
$= 2029198$

Q.120 (c)

Following line with respective distances can be drawn

Total = 10 kms

5 km Ahmad   Arun   Susan   Michael

7 km
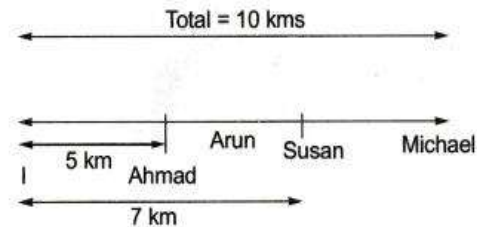
Arun can reside anywhere between Ahmed an Susan i.e. between 5 km and 7 km from $5 < 6.02 < 7$

Q.121 (c)

The required probability
$$0.5 \times 0.7 = 0.35 \approx \frac{35}{100} = 35\%$$

Q.122 (c)

$q^a = r$, $r^b = s$, $s^c = q$
$\Rightarrow a.\log q = \log r$,
$b.\log r = \log s$,
$c.\log s = \log q$

So $a \times b \times c = \dfrac{\log r}{\log q} \times \dfrac{\log s}{\log r} \times \dfrac{\log q}{\log s} = 1$

Q.123 (c)

Q can do work in 25×12 = 300 hrs
R can do work in 50 × 12 = 600 hrs
So we can say Q is twice efficient as R
Now Q worked only for 5 days at a rateof 12 hrs/day. So for 60 units of his work (Total work for 0 i.e. 300 hrs) he will do only $\frac{1}{5}$ of work

$$\left(\frac{60}{300} = \frac{1}{5}\right)$$

While R worked for all 7 days at a rate of 18 hrs/day
So he will do 18×7 = 126 of his work (Total work for 600 hrs)

He will do $\left(\dfrac{126}{600}=0.21\right)$ of his work

So required ratio $\left(\dfrac{1}{5}:\dfrac{126}{600}\right)$=120:126

20 : 21

Q.124 (c) 1 yard = 36 inches

So 0.25 yard = 9 inches

Q.125 (b)

Works with twice efficiency as E but worked for half as many days. So in this respect they will do equal work if their shifts would have been for same timings. But Vs shift is for hrs, while E's shift for 12 hrs. Hence E will do twice the work as M.

Ratio of contribution of M:E in work, 1:2

Q.126 (d)
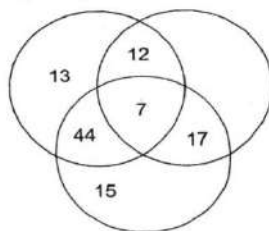
The number of student who like to read books or play sports have been shown

= 13 + 12 + 44 + 7 + 15 + 17 = 108

Q.127 (d)
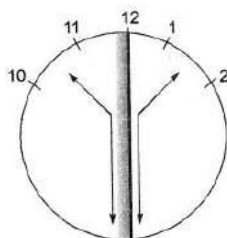
Mirror image of 1 : 20 is 10 : 30
10:30 was the time two and quarter hour back so time now will be 12 : 45

Q.128 (b)

Q.129 (a)

Q.130 (d)

The odometer reading increases from starting point to end point
Magnitude of area of the given diagram = Odometer reading
Magnitude of area of the velocity and time graph per second

1 sec $\Rightarrow$ triangle = $\dfrac{1}{2}\times 1\times 1=\dfrac{1}{2}$

2nd sec $\Rightarrow$ square = 1×1 = 1

3rd sec $\Rightarrow$ square + triangle =

$1+1+\dfrac{1}{2}\times 1\times 1=1\dfrac{1}{2}$

4th sec $\Rightarrow$ triangle = $\dfrac{1}{2}\times 1\times 2=1$

5th sec $\Rightarrow$ straight line = 0

6th sec $\Rightarrow$ triangle = $\dfrac{1}{2}\times 1\times 1=\dfrac{1}{2}$

7th sec $\Rightarrow$ triangle = $\dfrac{1}{2}\times 1\times 1=\dfrac{1}{2}$

Total Odometer reading at 7 seconds

$=\dfrac{1}{2}+1+1\dfrac{1}{2}+1+0+\dfrac{1}{2}+\dfrac{1}{2}=5$

Q.131 (b)
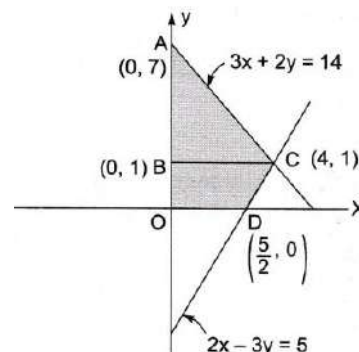
Required area = Area of ΔABC + Area of trapezoid BCDO

$=\dfrac{1}{2}\times 4\times 6+\dfrac{1}{2}\times\left(4+2.5\right)\times 1$

= 12 + 3.25 = 15.25 sq. units

Q.132 (a)

Straight line equation y = mx + c
m = slope = -0.02
(In x, y)
If

In x = X, then set $\begin{matrix}(x, \; y)\\ \downarrow \;\; \downarrow\\ 0.1 \;\; 0\end{matrix}$

y= mX + C

o= -0.02 × 0.1 +C

C=0.002

y= mX + C

y=-0.02 x logx + C

at x =5

y= -0.02 × log 5 + 0.002

=-0.030

Q.133 (d)

Four blocks are needed for each direction(totally 3 directions) to build a bigger cube containing 64 blocks. So area of one side of the bigger cube

= 4× 4 =16units

There are 6 faces so total area= 6×16 = 96units

When cubes at the corners are removed they introduce new surfaces equal to exposes surfaces so the area of the bigger cube does not change from 96

Q.134 (b)

Q.135 (b)

from the option (b substitute x=1 in

$2x^7 +3x -5 = 0$

$2(1)^7 +3(1)-5= 0$; 5-5=0

So (x –1) is a factor of f (x)

Q.136 (b)

From the data given we assume

$$load = \frac{exponent}{\log(cycles)}$$

$$80 = \frac{x}{\log\log(10000)} \Rightarrow x=160$$

$$40 = \frac{x}{\log(10000)} \Rightarrow x = 160$$

$$load = \frac{160}{\log 5000} = 43.25$$

Q.137 (a)

$$x\% \text{ of } y = \frac{x}{100} y = \frac{xy}{100}$$

$$y\% \text{ of } x = \frac{y}{100} y = \frac{xy}{100}$$

$$(x\% \text{ of } y)+(y\% \text{ of } x)= \frac{2}{100} xy = 2\% \text{ of}$$

xy

Q.138 (a)

Let the original number be xy

y---unit digit of xy

x + y = 12........ (1)

10y + x = 10x + y – 54

9x - 9y = -54............. (2)

Solving (1) & (2) we get, x=3 and y =9

So the number is 39.

Q.139 (d)

let the deposited money in the company P is 8x

And the deposited money in the company Q is 9x

Interest after one year from the company P= $8x\left(\dfrac{6}{100}\right)$

Interest after one year from the company Q.$9x\left(\dfrac{4}{100}\right)$

Ratio of Interest = $\dfrac{\dfrac{8x \times 6}{100}}{\dfrac{9x \times 4}{100}} = \dfrac{4}{3}$

Q.140 (d)

Lateral surface area of the square pyramid

$A = a \sqrt{a^2 + 4h^2}$

4a → perimeter

h → height

ℓ → slanting height

$$\ell^2 = \left(\frac{a}{2}\right)^2 + h^2 \Rightarrow h^2 = \left(\ell^2 - \frac{a^2}{2}\right)$$

$$A = a\sqrt{a^2 + 4\left(\ell^2 - \frac{a^2}{2}\right)} = a2\ell$$

Q.141 (c)

Ananth covers 1/6 of the book in hour

Bharath covers 1/4 of the book in 1 hour

$$\frac{\left(\frac{1}{6}\right)X}{\left(\frac{1}{4}\right)} = 2$$

$$\Rightarrow \frac{x}{6} = \frac{4}{2} = \frac{1}{2}$$

$$\Rightarrow x = \frac{6}{2} = 3 \text{ hours}$$

Q.142 (a)
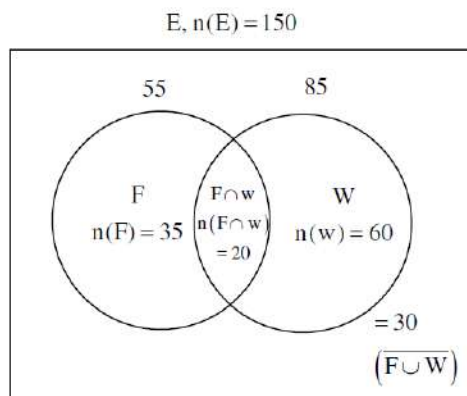
E, n(E) = 150

F→Facebook,   W→WhatsApp,
E→Total   faculties

given

$n(E) = 150, n\left(\overline{F \cup W}\right) = 30$

$n(F \cup W) = n(E) - N\left(\overline{F \cup W}\right) = 150 - 30$

n(F∪W)= 120

n(f∪w) = n(f) + [n(w) – n(F∩w)]

120 = n(F) + 85

n(F) = 120 – 85 = 35

55 = n(F) + n(F∩W)

n(F∩w) = 55 – n(F) = 55 – 35 = 20

n(w) = 85 – 20 = 65

Q.143 (c)

1: (AEOK)

2: (AEJF), (FJOK)

4: (ABLK), (BCML), (CDNM), (DEON)

2:ACMK,ADNK|2:ECMD,EBLO|2:ACHF, ADIF

2: ECHJ, EBGJ |2: FHMK, FINK| 2: JHMD, JGLO

1: BDNL |2: BDIG, GINL

8: ABGF, BCHJ, CDIH, EDI, FGLK, GHML, HINM

Total= 1+2+4+2+2+2+2+2+2+1+2+8=30
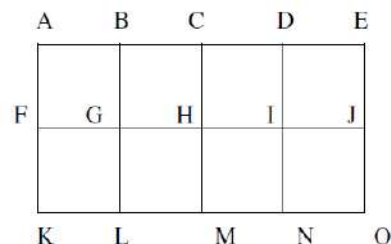
Q.144 (c)

Q.145 (b)

Following figure can be drawn:
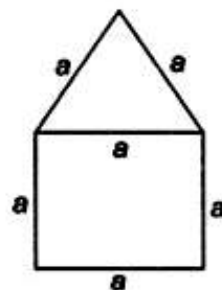
Perimeter of window

5a = 6m

a = 1.2m

Complete area for
 window =Area of square + Area of equi

$$\Delta = (1.2)^2 + \frac{\sqrt{3}}{4}(1.2)^2 \approx 2.06 m^2$$

Q.146 (c)

Lesser standard deviation for group Q will mean that the observation sin group Q are closer and hence narrower is the range of marks scored in group Q as compared to group P. Other options (a, (b), (d) remains unconfined.

Q.147 (a)

Use options only $(A) \to 0$, satisfies

$a \square b = ab - (a + b)$

$a \square b = a \times 0 + (a + 0) = a$

Given $\square x = a$ which satisfied for
$(x = 0)$

Q.148 (a) $y = \ln\left|e^{\sin|x|}\right| = \sin|x|$

Let $f(x) = \sin|x|$

Here, $f(-x) = f(x)$

So, it is symmetric about y axis and curve of $y = f(x), x < 0$ will be mirror image of $y = f(x), x > 0$

Q.149 (c)

K digits

Each digit can be filled in 7 ways as 0, 5 and 9 is not allowed, so each of these

Places can be filled by 1, 2, 3, 4, 6, 7,

8 so required probability is $\left(\dfrac{7}{10}\right)^k$ or

0.7^k

$\dfrac{fC}{TC} = \dfrac{7^k}{10^k} = 0.7^k$

Q.150 (d)

$y \times 162 = $ Perfect cube

Option

$y = 24 \Rightarrow 2^3 \times 3(2 \times 81) \neq$ Not perfect cube

$y = 27 \Rightarrow 3^3 \times (2 \times 3^4) \neq$ Not perfect cube

$y = 32 \Rightarrow 2^5 \times 2 \times 3^4 \neq$ Not perfect cube

$y = 36 \Rightarrow 2^2 \times 3^2 \times 2 \times 3^4$

$= 2^3 \times 3^6 = (2 \times 3^2)^3$

Hence the answer is, $y = 36$

Q.151 (c)

P will not get submerged as it is @ 550. So P is not present in correct option. Hence (i) and (ii) option are option are incorrect. Now compare Q and T . As T is between 500 and 525. T will get submerged. Hence ans (c) as among option C and D. T is present in only option (c).

Q.152 (b)

$$\dfrac{(x+y) - |x-y|}{2} \qquad \text{...(i)}$$

If $x > y$ $\qquad |x - y| = x - y;$

If $x < y$ $\qquad |x - y| = y - x$

Now if $x > y$, above expression (i) becomes

$$\dfrac{(x+y) - (x-y)}{2} = \dfrac{2y}{2}$$

$= y = $ minimum of (x, y) as $x > y$

Now if $x < y$;

$$\dfrac{x + y - (y - x)}{2} = \dfrac{2x}{2} = x = \text{minimum}$$

of (x, y) as $x < y$

Therefore correct answer is option (b).

Alternate solution :

Use easy values,

$x = 1$ and $y = -2$

Now, $\dfrac{(1-2) - |1 - (-2)|}{2} = -2$

or $\qquad x = 2$ and $y = -1$

$$\dfrac{(2-1) - |2 - (-1)|}{2} = \dfrac{1-3}{2} = -1$$

Which is minimum of (x, y).

Therefore, correct answer is option (b).

Q.153 (b)

Q.154 (d)

Q.155 (a)

Q.156 (b)

Q.157 (c)

Q.158 (c)

Q.159 (d)

1, x, x, x, y, y, 9, 16, 18

Mean $= \dfrac{1 + 3x + 2y + 9 + 16 + 18}{9}$

$$= \frac{3x + 2y + 44}{9} \qquad \text{...(i)}$$

Median $\Rightarrow$ As number of terms are odd

i.e. 9, so median will be middle i.e.y.

Mode $\Rightarrow$ Number showing maximum frequency of repetition.

So mode is x .

Given $\Rightarrow$ Mean = Median = 2 Mode

$\Rightarrow y = 2x$

From equation (i) and (ii), we get

$x = 4, y = 8$

Value of y is 8

Q.160 (c)

$$V = \frac{1}{3}\pi(R)^2 H$$

$$V' = \frac{1}{3}\pi(1.5R)^2 H$$

$$= \frac{1}{3}\pi 2.25 R^2 H = 2.25 V$$

Hence increase 125% as

$$\left[\frac{2.25V - V}{V}\right] \times 100 = 125\%$$

Q.161 (a)

P	30 min ×	2 = 60 min	
Q	20 min ×	3 = 60 min	
R	60 min ×	1 = 60 min	
S	15 min ×	4 = 60 min	
M_1	P	Q	= 2 hrs
M_2	R	S	= 2 hrs

Q.162 (c)

Clearly we can see from graph both (i) and (ii) are correct

Q.163 (b)

$(2171)^7 + (2172)^9 + (2173)^{11} + (2174)^{13}$

Unit digit

$(1)^{any} + (2)^{4n+1} + (3)^{4n+3} + (4)^{4n+5}$

1 + 2 + 7 + 4 = 14

Q.164 (b)

Sample space = 6 × 6 = 36 events = Total chances

Product of numbers on 2 dice have to perfect square = Favourable chances

$(1,1)(2,2)(3,3)(4,4)(5,5)(6,6)(1,4)(4,1)$

$\Rightarrow$ events

$$\text{Pr obability} = \frac{\text{Favourable chance}}{\text{Total chance}}$$

$$= \frac{8}{36} = \frac{2}{9}$$

Q.165 (c)

In order t verify proposition we have to turn to card 2 and blue from given four cards as proposition says it has even an one side opposite is a red. Vice-verse might or might not be true so, (c) as all other option are eliminated.

Q.166 (b)

$$\text{Put}(x = -1)\frac{81\left[\frac{16}{25}\right]^1}{\left[\frac{3}{5}\right]^2} = \frac{\dfrac{3^4 \times 2^4}{5^2}}{\dfrac{3^2}{5^2}}$$

$$= 3^2 \times 2^2 = 144$$

On putting $(x = -1)$

$\Rightarrow \quad$ LHS = RHS

Hence option (b) is correct.

Q.167 (d)

Let cycling speed = C

and walking = W

$$C\left(\frac{1}{2}\right) + W\left(\frac{3}{2}\right) = 19 \qquad \text{...(i)}$$

$$C + W = 26 \qquad \text{...(ii)}$$

On Solving eq. (i) and (ii) We get,

$W = 6 \, km/hr$

Q.168 (d)

Let H is household consumption and P be other consumption.

$H \times 0.8 + P \times 1.7 = (H + P) \times 0.75$

(According to given condition)

∴ from here ratio is negative.

Q.169 (b)

$$40\% \text{ of } 360^\circ = \frac{40}{100} \times 360^\circ = 144^\circ$$

So, the angle subtended on pie chart will be $= 144^\circ$

Q.170 (a)

Length of Truck+ gap required $=10+20 = 30$ m

Length of Car + gap required $= 5+15 = 20$ m

Alternative pairs of Truck and Car needs

$30+20=50$m

Let 'n' be the number of repetition of (Truck + Car) in 1 hour (3600 secs)

Given speed = 36 km/hr = 10 m/sec

$$\frac{50 \text{ m} \times \text{n}}{3600 \text{ secs}} = 36 \text{ km/hr}$$

$$\frac{50 \text{ n}}{3600} \text{ m/sec} = 10 \text{ m/sec}$$

$$\text{n} = \frac{36000}{50} = 720 \left(\text{Truck} + \text{Cars}\right)$$

So, 720 (Truck + Cars) passes = 720 × 2 = 1440 vehicles

Q.171 (c)

Contour lines can be observed to cross region with height

550 - 500 - 575 - 550
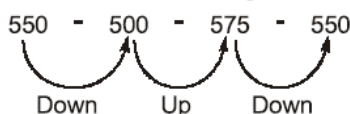
Down — Up — Down

Down-Up-Down satisfies.

Q.172 (a)

Subgroup containing only Indians

$$=^3 C_1 +^3 C_2 +^3 C_3 = 3+3+1=7$$

Subgroups containing one Indian and rest Chinese

$$=^3 C_1 \left[^3 C_1 +^3 C_2 +^3 C_3\right]$$

$$=3\left[3+3+1\right]=21$$

Subgroup containing two Indian and remaining Chinese

$$=^3 C_2 \left[^3 C_1 +^3 C_2 +^3 C_3\right]=21$$

Subgroup containing two Indian and remaining Chinese

$$=^3 C_3 \left[^3 C_1 +^3 C_2 +^3 C_3\right]=7$$

Total number of subgroups = 7 + 21 + 21 + 7 = 56.

Q.173 (b)

The steepest path will be the path which is deepest from level. So, P to R is the steepest path.

Q.174 (c)

Let a man can build the bridge in x weeks and woman can build the bridge in y weeks.

So, $\quad \dfrac{1200}{x}+\dfrac{500}{y}=\dfrac{1}{2}$

$$\frac{900}{x}+\frac{250}{y}=\frac{1}{3}$$

By equation (i) and (ii), we get

x = 3600 and y = 3000

⟹ A man build the bridge in 3600 weeks.

Q.175 (c)

Total number of three digit number are $=9\times10\times10=900$

Number with 2 is immediate right of 1 are

= 1	2	x	+	x	1	2	=19
1	10		+	9	1	1	
1×1	×				×	×	

So number with 2 is not immediate right of 1 are

$=900-19=881$

Q.176 (d)

Distance travelled by cone in one rotation

$$=2\pi r = 2\pi\left(5\right)=10\pi$$

⟹ Point Q touches ground again after going (10π) distance

2π order to make complete revolution now slant height will be acting as a radius

$R = \sqrt{5^2 + 12^2} = 13$ (Radius of larger complete revolution)

$2\pi R = 2\pi \times 13 = (26\pi)$

Now this one rotation angle inscribed in radians will be (i) (ii)

$\dfrac{10\pi}{20\pi} \times 2\pi$ radians $= \dfrac{10\pi}{13}$ radians

Q.177 (a)

P says → S has atleast 3 Cars
Q says → S has less than 3 Cars
R says → S has atleast 1 Car
Solve by options

A(0) P ×	B (1) P ×	C (3) ✓
Q ✓	Q ✓	Q ×
R ×	R ✓	R ✓

As given in question only has to be right so answer is 0 (car).

Q.178 (b)

45 P → 20 K
25 p → 30 K
20 p → 40 K
8 p → 60 K
2 p → 150 K

Median will be arithmetic mean 50th and 51st term, so both are in 30 K bracket. So average or arithmetic mean of,

$\dfrac{30000 + 30000}{2} = Rs.30000$

Q.179 (d)

The following Two possibiles exists.

```
    5 0 1 0 0              5 0 0 0 0
   – 4 8 9 8 9            – 4 8 8 8 9
   _____    and    _____
     0 1 1 1 1              0 1 1 1 1
```

Sum $= 1 + 9 = 10$ Sum $= 0 + 8 = 8$

Q.180 (c)

$|x-1| \le 2$ $|y+2| \le 3$ $x-y \ge -2$

$x \le 3$ $y \le 1$

$x \ge -1$ $-5 \le y$

Total area = Area of rectangle ABCD +Area of ΔABE

$= 4 \times 6 + \dfrac{1}{2}(4 \times 4) = 32$
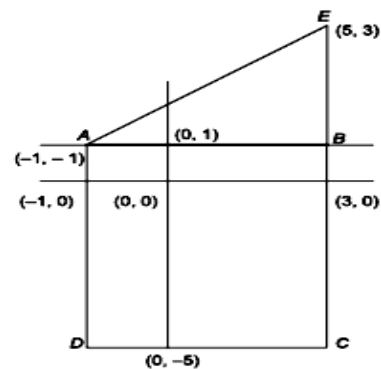
Q.181 (a)

We can see graph only (i) follows.

Q.182 (d)

Q.183 (c)

Q.184 (b)

Q.185 (a)

x → Bullocks
y → Tractors

$(x+y)8 = \left(\dfrac{x}{2} + 2y\right)5$

$8x + 8y = \dfrac{5x}{2} + 10y$

⇒ 5.5x = 2y or y = 2.75x

Now, x bullocks are alone working or 'd' days.

x × d = (x + y)8
x × d = (x + 2.75x)8
x × d = 3.75x ×8
d = 30 days

Q.186 (d)

Option (a) hema's age=14 so we get hari's age is in fraction which is not possible.
Option (b) hema's age=17, hari's age= (17-5)/2=6,
Suresh age=(10*6)-13=47,which is not three times of hema's age.
Option (c) eliminated same reason of option a
Option (d) hema's age=19, hari's age= (19-5)/2=7,

Suresh age= (10*7)-13=57, which is three times of hema's age.
So answer is (d)

Q.187 (b)
Make liner equation with help of values, ASSUME θ=k
32.4= K (2M+25)
42.0= K (5M+30)
Solve the equation we will gate k=1
So answer is B

Q.188 (c)
22.5 % is = 108
12.5% is = how much
Ans: (108*12.5)/22.5=60

Q.189 (b)
Length of wire: 10, 4, 6
Price of wire: 100, 16, 36 (proportional to the square of its length)
So 100 is =1600
16+36 is = how much
Answer: (1600*52)/100=832

Q.190 (c)
Sum of series will be
(1-1/3)+ (1/2-1/4) + (1/3-1/5)+ (1/4-1/6)+....... (1/48-1/50)+ (1/49-1/51) + (1/50-1/52)
We will left with
(1 +1/2) – (1/51+1/52)
Answer: C

Q.191 (b)
As per given condition,
$(A \times B \times C) = (B \times G \times E)$
$(A \times C) = (G \times E)$
if A=5, either G or E has to be 5. But 5 can be considered only once as all number is unique. It can be concluded that none of the number A, B, C, D, E, F or G is 5. ∴

Q.192 (b)
$a + a + a + \cdots$ n times= $a^2 b$
na= $a^2 b$
n=ab ....(1)

$b + b + b + \cdots + m$ times= ab^2
mb= ab^2
m=ab ....(2)
$(m + m + m + \cdots$ n times) $(n + n + n + \cdots m$ times)
=(mn)(mn)=$a^4 b^4$

Q.193 (d)
9c3=9×8×7/3×2×1=84

Q.194 (a)
$\log a + \log b + \log c = 0$
logabc=0
abc=1
a=b=c=1
a+b+c=3

Q.195 (c)
Given Loss α (deviation)^2
Loss =K(deviation)^2
4900=K(49)
K=100
For a deviation of 4 units,
Loss=100×4^2=1600

Q.196 (b)
Clock is gaining 15 min. in every 24 hours
Gaining per hour minutes=15/24
No. of hours from 11th July 9am to 15th July 2pm =101
Total time gain=101×(15/24)=63 mins
correct time =2pm- 3 min = 12.58 pm

Q.197 (c)
Cumulative rain fall = 300mm = 0.3m
50%of rain fall=0.3/2= 0.15m
Total volume of water collected in tank=50× 0.15=7.5m^3= 7500 liter

Q.198 (b)
logP=10(y-z)
logQ=10(Z-X)
logR=10(X-Y)
logP+logQ+logR=10(Y-Z+Z-X+X-Y)
Log PQR=0
PQR=1

Q.199 (b)

$(7×7)/7 = (100× T)/100$

T=7 MINUTE

Q.200 (b)

Let number be 'XY'

X+Y=9 ....(1)

XY-45=YX

10X+Y-45=10Y+X

X-Y=5 ....(2)

Solving 1 and 2

X=7,Y=2

SO ANSWER IS 72.

Q.201 (b)

Area of rectangle = $(x+10) (x+5) = x^2 +15x+50$ ...(1)

Area of square = x^2 ... (2)

By the given condition,

$(x^2+15x+50)-(x^2)=650$

15x +50 =650

x=40

So, area of rectangle is 2250.

Q.202 (d)

By verifying options Let us consider a=1, b=2

$a + a^2b^3$

$=1+ (1^2 2^3)$

=9 i.e., odd

Only this condition is valid.

Q.203 (d)

Let Train length x

Platform length y

Distance=speed × time

(x + y)= (54×5/18) × (25) =375

X=(54-9)5/18 × 14=175

Y=200

Q.204 (a)

log| a| + log | b| + log | c|=0

| a| × | b| × | c|=1

A=+ 1 and -1, b= +1 and -1, c= +1 and -1 (a,b,c are integers)

Minimum value= -1- 1- 1= -3

Maximum value =1+1 +1= 3

Q.205 (c)

Given that, a wire bent over square has area of 1936m²Let us assume that, the side of square as 'x'.

Then x²=1936

x = 44meters.

∴ Length of wire= perimeter of square

= =4x =176m

Again given a+ b= 176 such that a =3b

B= 44 a = 132

Given 'a' is bent over square and 'b' bent over circle

4x' =a= 132

x'=33

Area of square 33× 33 =1089 ....(1)

2 πr= b

r =7 area=154 ....(2)

From (1) & (2) sum of area 's= 1089 +154= 1243m

Q.206 (d)

By condition 1

Possible numbers are 51,54,57

By condition 2

Possible numbers are 61,62,63,65,66,67,69

By condition 3

Possible numbers are 70,71,73,74,75,76,77,79

66 is multiple of 3 and it does not belong to 50 to 59. So it will not be the answer.

54 is multiple of 3 and 6 . But it is not the multiple of 4.

So according to second condition it cannot be the answer.

Because 65 is not the multiple of 6. So condition 3 is not satisfied. So it can not be the answer

For 76. All three conditions are satisfied. So it is the answer.

Q.207 (d)

For remaining last two tosses possible cases are, HH HT THTT

Out of 4 possible cases one head and T will have the highest probability of occurrence.

Q.208 *

Marks given to all

Q.209 (a)

Perimeters of a circle= perimeters of a square = perimeters of an equilateral triangle
Area of a circle > area of a square > area of an equilateral triangle

Q.210 (d)

sum of infinite geometric series
$=a/(1-r)=1/(1-1/40 =1/(3/4)=4/3$

Q.211 (b)

We know that, if the sum of the digits is a multiple of 3 then the number is divisible by 3
$\therefore$ 7 +1+ 5+ x+ 4+ 2+ 3= 22+ x
where 'x' is the missing digit
If x=0; then 22 is not multiple of 3
If x=2; then 24 is a multiple of 3

Q.212 (c)

P [Green cab] = P[G] = 85%, P [Blue cab] =P[B] = 15%
Let A denote that a witness can correctly identify the cab colour as blue. Given   P(A/B)= 80% , P(A/G)= 20%
By Baye's theorem we have
P(B/A)=[P (B) P(A/ B)]/[P(B) P(A/ B) +P(G) P(A/ G)]
= (15% ×80%) /(15%× 80% +85% ×20%)=0.41=41%

Q.213 (b)

Let Principal = x,Time period = 5 years,R=10% per year
After 5 years, Amount = P + Interest =10,000,00
Principal =x = 2
By compound interest, we have
Amount= P $(1+10/100)^5$
$10,000,00= P (1+10/100)^5$

P=6,21,000

Q.214 (b)

A=2×(2:3)=4:6, B=3:7,
ANSWER:(4+3): (6+7)=7:13

Q.215 (a)

Volume of cuboid = lbh
= 10 ×8 ×6= 480cm
Volume of cube $a^3 = 8^3$ =512cm
Volume of cylinder = $\pi r^2 h$ = 1077.57
Volume of sphere = 4 /3 πr^3= 1436.76

Q.216 (a)

In this case, Avg speed
= 2×60 ×90/(60 +90) =72

Q.217 (c)

In this case, Number of parallelograms formed $4c_2 \times 5c_2$=60

Q.218 (c)

Number   of   different passwords=26C1*26C1*3!=40560

Q.219 (a)

Total children = 12 Here boys are two more than girls hence, Boy (B) = 7 and Girl (G) = 5 Now three children are randomly picked.
Hence, Total combination for that, 12C3 = 220
Now in the group, if girls are more than boys, then we have possible combinations:
(i)   2   Girls,   1   Boy $\rightarrow$ N1=5C2*7C1=70
(ii)   3   Girls,   0   Boy$\rightarrow$ N2=5C3*7C0=10
Hence,   the   probability   (P) (70+10)/220
SO ANS IS A.

Q.220 (c)

Assume a total of 100 marbles
each of cost 1 unit Blue paper = 40
Black paper = 25
Red paper = 20
Yellow paper = 15

Let x marbles are reduced from each type & cost of each marble is 1.25

Total cost should remain 100

$(40-X)1.25 + (25-X)1.25 + (20-X)1.25 + (15-X)1.25 = 100$

$X = 5$

Blue = 35   Black = 20   Red = 15

Yellow = 10

% Blue = (35/80)* 100 = 43.75%

Hence, the correct option is (C).

ASSIGNMENT QUESTIONS

Q.1 The last digit of the number obtain by multiplying the number $81 \times 82 \times 83 \times 84 \times 85 \times 86 \times 87 \times 88 \times 89$ will be
a) 0   b) 9
c) 7   d) 2

Q.2 The sum of the digit of two digit numbers is 10, while when the digits are reversed; the number decreased by 54. Find the changed number.
a) 28   b) 19
c) 37   d) 46

Q.3 When we multiply a two digit number by the sum of its digits, 405 is achieved. If you multiply the number written in the reversed order of the same digits by the sum of the digits, we get 486. Find the number.
a) 81   b) 45
c) 36   d) 54

Q.4 If A381 is divisible by 11, find the value of smallest natural number A.
a) 5   b) 6
c) 7   d) 9

Q.5 Find the ratio between LCM and HCF of 5, 15 and 20.
a) 8:1   b) 14:3
c) 12:2   d) 12:1

Q.6 Find the LCM of $5/2, 8/9, 11/14$.
a) 280   b) 360
c) 420   d) None of these

Q.7 Find the unit digit of the expression $25^{6251} + 36^{528} + 73^{54}$.
a) 4   b) 0
c) 6   d) 5

Q.8 Find the unit digit of the expression $55^{725} + 73^{5810} + 22^{853}$.
a) 4   b) 0
c) 6   d) 5

Q.9 Find the units digit of the expression $11^1 \times 12^2 \times 13^3 \times 14^4 \times 15^5 \times 16^6$.
a) 4   b) 3
c) 7   d) 0

Q.10 Find the number of zeros at the end of 1090!
a) 270   b) 268
c) 269   d) 271

Q.11 The sides of the pentagonal field are 1737m, 2160m, 2358m, 1422m and 2214m respectively. Find the greatest length of the tape by which the five sides can be measured completely.
a) 7   b) 13
c) 11   d) 9

Q.12 Four bell ring at an intervals of 6,8,12 and 18 second. They start ringing together at 12'o clock. After how many seconds will they ring together again?
a) 72   b) 84
c) 60   d) 48

Q.13 The sum of three consecutive odd numbers and three consecutive even numbers together is 231. Also, the smallest odd number is 11 less than the smallest even number. What is the sum of the largest odd number and the largest even number?
a) 81   b) 83
c) 74   d) Can't be determined

Q.14 The product of two consecutive even numbers is 3248. Which is the largest number?
a) 58   b) 62
c) 56   d) 60

Q.15 The sum of five consecutive odd number is 575. What is the sum of the next set of the consecutive odd numbers?
a) 615　　　　　b) 635
c) 595　　　　　d) None of these

Q.16 Which of the following smallest number should be added to 41116 to make it? exactly divisible by 8?
a) 8　　　　　b) 5
c) 4　　　　　d) 12

Q.17 There are two numbers such that the sum of twice the first number and thrice the second number is 100 and sum of thrice the first number and twice the second number is 120. Which is the largest number?
a) 32　　　　　b) 12
c) 14　　　　　d) 35

Q.18 The number obtained by interchanging the digits of a two-digit number is lesser than the original number by 54. If the sum of the two-digit number is 10, then what is the original number?
a) 28　　　b) 39
c) 82　　　d) Can't be Determined

Q.19 Rachita enters a shop to buy ice-creams, cookies and pastries. She has to buy at least 9 units of each. She buys more cookies than ice-creams and more pastries than cookies. She picks up a total of 32 items. How many cookies?
a) Either 12 or 13
b) Either 11 or 12
c) Either 10 or 11
d) Either 9 or 11

Q.20 The product of two numbers is 330 and their sum is 37. Which is the smaller one of there numbers?
a) 20　　　　　b) 12
c) 22　　　　　d) 15

Q.21 Which of the following can be the number divisible by 24?

a) 4,32,15,604　　　b) 25,61,284
c)13,62,480　　　d) All of these

Q.22 The sum of the squares of the digits constituting a positive two digit number is 13. If we subtract 9 from this number, we shall get a number written by the same digit in reversed order. Find the number.
a) 12　　　　　b) 32
c) 42　　　　　d) 52

Q.23 The product of the natural number and the number formed by interchanging the digits is 2430. Find the numbers.
a) 54 and 45　　　b) 56 and 65
c)53 and 35　　　d) 85 and 58

Q.24 Find the pair of natural numbers who se LCM is 78 and HCF is 13.
a) 58 and 13 or 16 ad 29
b) 68 and 23 or 36 and 49
c) 18 and 73 or 56 and 93
d) 78 and 13 or 26 and 39

Q.25 A boy watches an inning of sachin and acts according to the number of runs he sees. The details are given below
1 run Place an orange in the basket
2 runs Place a mango in the basket
3 runs Place a pear in the basket
4 runs Remove a pear and a mango from the basket
One fine day, at the start of the match, the basket is empty. The sequence of runs scored by sachin in that innings are given as 1 1 2 3 2 4 1 1 2 3 4 2 3 2 3 4 1 1 2 1 3 1 4. At the end of above innings, how many more oranges were there compared to mangoes inside the basket? (The basket was empty initially)
a) 4　　　　　b) 5
c) 6　　　　　d) 7

Q.26 A test has 80 questions. There is one mark for correct answer, while there is a negative penalty of -1/2

for a wrong answer and -1/4 for an unattempted question. What is the number of question answered correctly, if the student has scored a net total of 34.5 marks.
a) 45   b) 48
c) 54   d) None of these

Q.27 Three mangoes, four guavas and five watermelons cost Rs. 750. Ten watermelon, six mangoes and nine guavas cost Rs.1580.What is the cost of six mangoes, ten watermelon and four guavas.
a) 1280   b) 1180
c) 1080   d) cannot be determine

Q.28 A man sold 38 pieces of clothing combining in the form of shirts, trousers and ties. If he sold atleast 11pieces of each item and he sold more shirts than trousers and more trousers than ties, then the number of ties that he must have sold is:
a) Exactly 11
b) Atleast 11
c) Atleast 12
d) cannot be determine

Q.29 Find the least number, which must be subtracted from 7147 to make it a perfect square.
a) 86   b) 89
c) 91   d) 93

Q.30 A milkman produces three kind of milk. On a particular day, he has 170 lit, 102 lit and 374 lit of the three kind of milk. He wants to bottle them in the bottles of equal sizes so that each of the three varieties of milk would be completely bottled. How many bottle sizes are possible such that the bottle size in terms of liters is an integer?
a) 1   b) 2
c) 4   d) 34

Q.31 Find the number of zeros at the end of 1400!

a) 347   b) 336
c) 349   d) 348

Q.32 The highest power of 3 that completely divides 40! Is?
a) 18   b) 15
c) 16   d) 17

Q.33 What is the sum of all even numbers between 1 and 100 (both included)?
a) 2450   b) 2500
c) 2600   d) 2550

Q.34 The least number which can be added to763 so that it is completely divisible by 57 is?
a) 35   b) 22
c) 15   d) 25

Q.35 The least number which can be subtracted from 8441 so that it is completely divisible by 57 is ?
a) 3   b) 4
c) 5   d) 6

Q.36 How many number between 200 and 400 are divisible by 13?
a) 14   b) 15
c) 16   d) 17

Q.37 A boy was trying to find $5/8^{th}$ of a number. Unfortunately, he found out $8/5^{th}$ of a number and realized that the difference between the answer he got and the correct answer is 39. What was the number?
a) 38   b) 39
c) 40   d) 52

Q.38 The sum of the two numbers is equal to thrice their difference. If the smaller of the numbers is 10 find the other number.
a) 15   b) 20
c) 40   d) None of these

Q.39 $4^{11}+4^{12}+14^{13}+14^{14}+14^{15}$ is divisible by which of the following?
a) 11   b) 31
c) 341   d) None of these

Q.40 The product of two numbers is 7168 and their HCF is 16. How many pairs of numbers are possible such that the above conditions are satisfied?
a) 2   b) 3
c) 4   d) 6

Q.41 Gabbar Singh Purchased 60 kgs of cereals (rice & wheat) for Rs 700. The cost per Kg of Rice is Rs 15 & that of Wheat is Rs 10. Find the quantity of rice & wheat each?
a) 25Kg, 35Kg   b) 15 Kg, 45 Kg
c) 10 Kg, 50Kg   d) None of these

Q.42 The sum of the digits of a two digit number is 9. The digit at the tens place is 4 less than $1/6^{th}$ of the number. Find the number?
a) 45   b) 54
c) 90   d) None of these

Q.43 A two digit number is 4 times sum of its digits. If 27 were added to the number, it becomes 7 times the sum of digits. Find the number?
a) 36   b) 24
c) 32   d) None of these

Q.44 Rajiv has 26 coins in his purse. Coins are either 20 paisa or 50 paisa. The value of all the coins put together is Rs 10. Find the number of 20 paisa coins in his purse?
a) 12   b) 8
c) 10   d) None of these

Q.45 A traveler may claim Rs 15 for each Km of travel by taxi & Rs 5 for each Km travelled by bus. If in one week he claimed Rs 500 for travelling 80kms. How many kms did he travel by taxi?
a) 20kms   b) 10kms
c) 15kms   d) None of these

Q.46 A two digit number is equal to thrice the sum of its digits. The difference between the number obtained by interchanging the digits & the original number is 45. Find the number?
a) 72   b) 27
c) 35   d) None of these

Q.47 If 5 students are shifted from A to B than there will be equal number of students in both the rooms A & B. But if 5 students from room B is shifted to room A then the resulting number of students in room A is double the number students in room B. Find the total number of student?
a) 60   b) 35
c) 25   d) None of these

Q.48 If a certain two digit number is divided by the sum of its digits, the quotient is 2 & the remainder is 8. If the digits are interchanged & the resulting number is divided by the sum of its digits, the quotient is 8 and remainder is 2. Find the number?
a) 46   b) 64
c) 28   d) None of these

Q.49 Ravi has a total of Rs 29 in 5 – rupee & 2 rupee denominations. The number of 5 rupee notes is one-half of 1 less than the number of two rupee notes. How many 5 – rupee & 2 – rupee notes are there with Ravi?
a) 7, 3   b) 3, 7
c) 2, 5   d) None of these

Q.50 In a certain farm, there are some horses & chickens. The head count is 36 & no of legs of horses & chicken equal to 84. Find the number of horses & chickens each?
a) 6, 30   b) 25, 11
c) 30, 6   d) 16, 20

Q.51 Rs 3783 is divided into two parts such that the simple interest on 1st for 3 months at 4.5% is equal to that

on 2nd for 7 months 2.25%. Find sum lent at 4.5%?
a) Rs. 2037   b) Rs. 1746
c) Rs. 1982   d) Rs. 2563

Q.52 The sum of two numbers is 45. The difference of their squares is 675. Find the numbers?
a) 20, 25   b) 15, 30
c) 10, 35   d) 12, 13

Q.53 Two men Chandu & Dinu start on holiday together. Chandu with Rs. 38 & Dinu with Rs 26. During the holiday Dinu spends Rs 4 more than Chandu and when holidays end Chandu has 5 times as much money as Dinu. How much has each spent?
a) 18, 22   b) 20, 24
c) 16, 20   d) 18, 24

Q.54 A fraction is such that the numerator is five less than the denominator. Also four times the numerator is one more than the denominator. Find the fraction.
a) 4/9   b) 3/8
c) 2/7   d) 7/12

Q.55 A two –digit number is such that the sum of the number and the number formed by interchanging its digits is 99. If the difference between the number and number formed by interchanging the digits is 27, find the number.
a) 36   b) 63
c) 36(or) 63   d) 96

Q.56 A three –digit number is such that the sum of its digits is 17. The middle digit of the number is 6. If 297 is subtracted from the number, the hundred's digit and the unit's digit of the number are interchanged. Find the number.
a) 863   b) 962
c) 562   d) 764

Q.57 A three –digit number is such that the ten's digit is half the hundred's digit. The units digit is two less than the ten's digit. If the number formed by interchanging the units digit and the hundred's digit is 594 less than the original, find the number.
a) 631   b) 842
c) 420   d) 756

Q.58 The average age of A, B and C is 28 years. The sum of the ages of A and B is equal to four –third the age of C. Sixteen years from now, B's age will be half the sum of the age of A and C. What is the present age of A?
a) 28yrs   b) 20yrs
c) 36yrs   d) 24yrs

Q.59 The average age of an uncle, his niece and his nephew is 12 years. Two years from now, the age of niece will be one–third age of her Uncle. Find the age of the nephew, if the nephew is two years elder than the niece.
a) 6yrs   b) 8 yrs
c) 10yrs   d) 22yrs

Q.60 Kalyani and Sravani have some chocolates with each of them. If Kalyani gives Sravani four chocolates Sravani will have twice the number of chocolate as Kalyani. Instead if Sravani gives kalyani two chocolates, both of them will have equal number of chocolates with them. How many chocolates did Kalyani and Sravani have initially?
a) 18, 24   b) 14, 16
c) 16, 20   d) 20, 24

Q.61 If $\dfrac{(11x-2y)}{(3x+9y)}=\dfrac{2}{3}$ then what is the value of $\dfrac{\left(x^2+y^2\right)}{\left(y^2-x^2\right)}$?
a) 5/13   b) 13/5
c) 13/145   d) 145/17

Q.62 Find the following:

A) Duplicate ratio of 9:16
a) 3:4   b) 81:256
c) 27:64   d)9:16

B) Triplicate ratio of 7:5
a) $\sqrt[3]{7}:\sqrt[3]{5}$ b) 49:25
c) 343:125   d) $\sqrt{7}:\sqrt{5}$

C) Sub-duplicate ratio of 729:49
a) 81:343   b) 64:243
c) 49:729   d) 27:7

D) Sub-triplicate ratio of 1728:1331
a) 144:121   b) 11:12
c)12:11   d) 1331:1728

Q.63 Find a:e, if a:b=2:3, b:c=6:7, c:d=14:25 and d:e=1:2.
a) 14:25   b) 6:25
c)12:25   d) 4:25

Q.64 The ratio of passed to failed students in a school is 7:1. If the total number of Students in the school are 7200, and then what is the number of failed students?(Each student has taken the examination)
a) 900   b) 1200
c) 1140   d) Cannot be determined

Q.65 40% of a number is equal to three-fourth of another number. What is the ratio between first and second number?
a) 15 : 8   b) 12 : 19
c) 14 : 17   d) Cannot be determined

Q.66 A sum of money is divided among A, B, C and D in the ratio 2: 7: 11: 12. If share of B and D together is Rs. 6650, then what is the difference between the amounts of A and D?
a) Rs. 3600 b) Rs. 3500
c) Rs. 3800 d) Cannot be determined

Q.67 A purse contains equal number of 50 paise and 25 paise coins. If they are all worth Rs.45. find the number of each coin.

a) 60   b) 45
c) 30   d) Cannot be determined

Q.68 A sum of money is divided among A, B, C and D in the share 3: 4: 9: 10. If the share of C is Rs. 2580 more than share of B. What is the total amount of money of A and D together?
a) Rs. 5676   b) Rs. 619
c) Rs. 6708   d) Rs. 7224

Q.69 20 boys and 25 girls from a group of social workers. During their membership drive, the same number of boys and girls joined the group (i.e. if 7 boys joined, 7 girls joined). How many members does the group have now, if the ratio of boys to girls is 7 : 8?
a) 65   b) 60
c) 75   d) 70

Q.70 One-fourth of 60% of a number is equal to two-fifth of 20% of another number. What is the ratio of first and second number?
a) 14 : 7   b) 8 : 13
c) 5 : 9   d) none of these

Q.71 The ratio of length and breadth of a rectangular plot is 8 : 5 respectively. If breadth is 60 m less than the length, what is the perimeter of the rectangular plot?
a) 260 m   b) 1600 m
c) 500 m   d) none of these

Q.72 Amit, sumit and Vinit divide an amount of Rs. 2800 amongst themselves in the ratio 5 : 6 : 3 respectively. If an amount of Rs. 200 is added to their share what would be the ratio of their shares of the amount?
a) 8: 9: 6   b) 6: 7: 4
c) 7 : 8 : 5   d) 4: 5: 2

Q.73 The ratio of three positive numbers is 4:3:2 the sum of the product of

the numbers, taken two at a time, is 234. What are the numbers?
a) 14, 12, 10   b) 8, 6, 4
c) 16,12,8   d) 12, 9, 6

Q.74 The ages of three people A, B and C are such that twice the age of A is equal to thrice of age of B. The sum of the ages of A and B is equal to twice the age of C.If A is twelve years older to C, what is the age of B?(in year)
a) 42   b) 60
c) 48   d) 72

Q.75 The ratio of the sums lent on simple interest at 10% and 15% rate of interest respectively is 4:5 What is the ratio of interest obtained for a period of two years on the respective sums at the given rates?
a) 8:15   b) 4:3
c) 8:5   d) 12:5

Q.76 The volume of a cube varies with cube of its edge. The volume of a cube of edge 2 units is 80 cubic units. What is the edge of a cube (in units) of volume 3430 cubic units?
a) 21   b) $\sqrt{7}$
c) 14   d) 7

Q.77 Three-fifth of a number is equal to 85% of another number. What is the ratio of the first number to second?
a) 12 : 7   b) 12 : 17
c) 7 : 12   d) 17 : 12

Q.78 In a school, the ratio of boys to girls is 4:5. When 100 girls leave the school the ratio becomes 6:7. How many boys are there in the school?
a) 1600   b) 1500
c) 1300   d) None of these

Q.79 A certain amount is distributed among A, B and C in the ratio 4:7:9. What is the difference between shares of B and A?

a) 5000   b) 500
c) 50   d) Cannot be determined

Q.80 A varies directly with B when C is constant and inversely with C when B is constant When A=26. B=65 and C=30 . Find A when B= 84 and C=42.
a) 24   b) 36
c) 14   d) 32

Q.81 The monthly expenditure on transport of Raju is the sum of two parts. One part is fixed and the other part varies directly with the distance he travels in that month. In a month in which he travelled400 km. his total expenditure was Rs. 1600. His total expenditure in a month in which he traveled 800 km was Rs. 2200.Find his total expenditure in a month in which he traveled 900 km.
a) Rs2400   b) Rs.2520
c) Rs.2610   d) Rs.2350

Q.82 Amar wrote exams in four subjects:- Physics, Chemistry, Biology and Social studies. The ratio of the marks he got in these exams was 2:3:4:5. He got an aggregate of 70% in these exams. Each exam had the same maximum mark in how many of the exams did he get more than 50%?
a) 1   b) 2
c) 3   d) 4

Q.83 A father distributed a certain number of marbles among his three sons i.e. P, Q and R For every 5 marbles that P received, Q received 4 marbles. For every 3 marbles that Q received, R received 2 marbles. P received 9 marbles more than Q. Find the number of marbles R received.
a) 18   b) 20
c) 24   d) 16

Q.84 When a body at rest was pushed, the force applied on it varies directly

with the acceleration with which it moves. It moved with an acceleration of 8m/sec² as a result of 20N applied on it. With what acceleration would it have moved if a force of 5 N was applied on it (in m/ sec²)?

a) 4   b) 2
c) 3.6   d) 2.4

Q.85 Rs. 730 were divided among A,B,C, in such a way that if A gets Rs. 3, then B gets Rs.4 and if B gets Rs. 3.50 ,then C gets Rs. 3 The share of B exceeds that of C by

a) Rs. 30   b) Rs.40
c) Rs.70   d) Rs.210

Q.86 The ratio of the incomes of A and B as also those of B and C are as 3:2. If one third of A's income exceeds a fourth of C's income by Rs. 500, then B's income (in Rs.) is

a) 750   b) 1500
c) 500   d) 1000

Q.87 Three substances X, Y, and Z are mixed together, their volumes are proportional to 4, 3 and 2 respectively and the weights of equal volumes are proportional to 5, 4 and 3 respectively. What is the weight of each substance if the weight of the mixture is 114 (in kg)?

a) 50, 40, 24   b) 60, 36, 18
c) 48, 36, 30   d) 60, 45, 30

Q.88 Divide Rs.500 among A,B,C and D so that A and B together get thrice as much as C and D together , B gets for our times of what C gets and C gets 1.5 times as much as D. Now the value of what B gets is

a) 300   b) 75
c) 125   d) 150

Q.89 The ratio between two numbers is 3:4 and their LCM is 180.The first number is:

a) 60   b) 45
c) 15   d) 20

Q.90 A and B are two alloys of argentums and brass prepared by mixing metals in proportions 7:2 and 7:11 respectively. If equal quantities of the two alloys are melted to form a third alloy C, proportion of argentums and brass in C' will be:

a) 5:9   b) 5:7
c) 7:5   d) 9:5

Q.91 The student in three batches at Vista Mind the ratio 2:3:5. If 20 students are increased in each batch, the ratio changes to 4:5:7. The total number of students in the three batches before the increases was

a) 10   b) 90
c) 100   d) 150

Q.92 A dishonest milkman mixed 1 liter of water for every 3 liters of milk and thus made up 36 liters of milk .If he now adds 15 liters of milk to the mixture, find the ratio of milk and water in the new mixture.

a) 12:5   b) 14:3
c) 7:2   d) 9:4

Q.93 At constant temperature, pressure of a definite mass of gas is inversely proportional to the volume, if the pressure is reduced by 20%. Find the respective change in volume.

a) -16.66%   b) +25%
c) -25%   d) +16.66%

Q.94 What number must be taken from each term of the fraction 27/35 that it may become 2:3?

a) 9   b) 10
c) 11   d) None of these

Q.95 A cask contains 12 gallons of mixture of wine and water in the ratio 3:1. How much of the mixture must be drawn off and water substituted, so that wine and water in the case may become half and half.

a) 3liters   b) 5 liters
c) 6 liters   d) None of these

Q.96 The duration of a railway journey varies as the distance and inversely as the velocity, the velocity varies directly as the square root of the quantity of coal used, and inversely as the number carriage in the train. In a journey of 50km in half an hour with 18carriages, 100 kg of coal is required .How much coal will be consumed in journey of 42 km in 28 minutes with 16 carriages.
a) 64kg
b) 49kg
c) 25kg
d) 36kg

Q.97 A factory employ skilled workers unskilled workers and clerks in the proportion 8:5:1, and the wages of a skilled worker, an unskilled worker and a clerk are in the ratio 5:2:3.When 20 unskilled workers are employed , the total daily wages of all amount to Rs. 318. The wages paid to each category of workers are
a) Rs.240.Rs.60, Rs.18
b) Rs.200, Rs.90, Rs.28
c) Rs.150, Rs108, Rs60
d) Rs, 250, Rs.50, Rs18

Q.98 In a co-educational school there are 15 more girls than boys. If the number of girls is increased by 10% and the number of boys is also increased by 16% there would be 9 more girls than boys. What is the number of students in the school?
a) 140
b) 125
c) 265
d) 255

Q.99 In Ramnagar Colony, the ratio of school going children to non-school going children is 5:4 .If in the next year, the number of non-school going children in increased by 20%, making it 35,400 what is the new ratio of school going children to non-school going children ?
a) 4:5
b) 3:2
c) 25:24
d) None of these

Q.100 A precious stone weighing 35grams worth Rs. 12250 is accidentally dropped and gets broken into two pieces having weights in the ratio of 2:5 if the price varies as the square of the weight then find the loss incurred.
a) Rs.5750
c) Rs.6000
c) Rs.5500
d) Rs.5000

Q.101 If A's salary is 25% more than of B, then how many per cent is B's salary less than of A?
a) $16\frac{2}{3}\%$
b) 20 %
c) $12\frac{1}{3}\%$
d) 15%

Q.102 If A's salary is 20% less than that of B, then how many percent is B's salary more than that of A?
a) 18%
b) 16%
c) 20%
d) 25%

Q.103 If the price of sugar is increased by 10%, by how much per cent must the consumption be diminished so as not to increase the expenditure?
a) $11\frac{1}{9}\%$
b) $12\frac{1}{3}\%$
c) $9\frac{1}{11}\%$
d) $14\frac{1}{7}\%$

Q.104 If the price of a tea falls by 12% by how much per cent must a house holder increases its consumption be diminished so as not to decrease its expenditure on tea?
a) $15\frac{2}{5}\%$
b) $11\frac{1}{3}\%$
c) $13\frac{7}{11}\%$
d) $9\frac{1}{3}\%$

Q.105 The value of machine depreciates at the rate of 10 % per annum. If its present value is Rs. 148000, what will be its worth after 2 yr?
a) Rs.119880
b) Rs.105440
c) Rs.126320
d) Rs.137530

Q.106 The value of machine depreciates at the rate of 10 % per annum. If its

present value is Rs. 162000, what was the value of machine 2yr ago?
a) Rs. 200000   b) Rs. 210000
c) Rs. 220000   d) Rs.240000

Q.107 Due to a reduction of 5% in prices of sugar, a man is able to buy 1 kg more for Rs. 95. Find the original rate of Asugar.
a) Rs.6.50   b) Rs.6
c) Rs. 5.50   d) Rs.5

Q.108 A number is decrease by 25% and then increased by 25%. The number so obtained is 8 less than the original number. What was the original number?
a) 146   b) 135
c) 158   d) None of these

Q.109 A number is increased by 20% and then again by 10%. By what percent should the increased number be reduced so as to get back the original number?
a) $6\dfrac{4}{3}\%$ b) $11\dfrac{5}{6}\%$
c) $18\dfrac{9}{17}\%$ d) $24\dfrac{8}{33}\%$

Q.110 Sonu invested 10% more than Mona. Mona invested 10% less than Raghu. If the sum of their investment is Rs. 5780. How much amount did Raghu invest?
a) Rs.2010   b) Rs. 2000
c) Rs.2100   d) Rs. 2210

Q.111 Rita invested 25% more than Sunil, Sunil invested 30% less than Abhinav who invested Rs. 6000. What is the respective ratio between the amount that Rita invested and the total amount invested by all of them together?
a) 35 :104   b) 13 :29
c) 101 :36   d) 35 :103

Q.112 Rahul spends 50% of his monthly income on household items, 20% of his monthly income on buying clothes, 5% of his monthly income on medicines and the remaining amount of Rs 11250 he saves. What is Rahul's monthly income?
a) Rs.38200   b) Rs.34000
c) Rs.41600   d) Rs. 45000

Q.113 Prena decided to donate 15% of her salary to an orphanage. On the day of donation she changed her mind and donated Rs. 1896, which was 80% of what she had decided earlier. How much is Prena's salary?
a) Rs.18500
b) Rs.10250
c) Rs. 15800
d)Cannot be determine

Q.114 Mr. Moore spent 20% of his monthly income on food and 15% on children's education. 40% of the remaining he spent on entertainment and transport together and 30% on medical. He is left with an amount of Rs. 8775. After all these expenditures what is Mr. Moore's monthly income?
a) Rs.40000   b) Rs.35000
c) Rs.42000   d) None of these

Q.115 Asha's monthly income is 60% of Deepak's monthly income and 120% of Maya's monthly income .What is Maya's monthly income if Deepak's monthly income is Rs.78000?
a) Rs. 39000
b) Rs.42000
c) Rs.36000
d) Cannot be determined

Q.116 In a mixture of milk and water the proportion of water by weight was 75% If in 60 g of mixture 15g water was added ,what would be the percentage of water ?(Weight in gram)
a) 75%   b) 88%
c) 90%   d) None of these

Q.117 In a class of 65 students and 4 teachers, each student got sweets that are 20% of the total number of

students and each teacher got sweets that are 40% of the total number of students. How many sweets were there?
a) 845   b) 897
c) 949   d) 104

Q.118 In a colleges election fought between two candidates, one candidate got 55% of the total valid votes. 15% of the votes were invalid. If the total votes were 15,200. What is the number of valid votes the other candidate got?
a) 7106   b) 6840
c) 8360   d) 5814

Q.119 Two numbers are less than the third number by 50% & 54% respectively. By how much percent is the second number less than the first number?
a) 13   b) 10
c) 12   d) none of these

Q.120 The income of A is 150% of the income of B and income of C is 120% of the income of A. If the total income of A, B and C is together is Rs. 86,000. What is C's share?
a) Rs.30000   b) Rs.32000
c) Rs.36000   d) Rs.20000

Q.121 The height of a triangle is increased by 40%.What can be the maximum percentage increase in length of the base so that the increase in area is restricted to a maximum of 60%?
a) 50%   b) 20%
c) 14.28%   d) 25%

Q.122 The price of sugar is reduced by 25% but in spite of the decrease, Aayush ends up increasing his expenditure on sugar by 20% .What is the percentage change in his monthly consumption of sugar?
a) +60%   b) -10%
c) +33.33%   d) 50%

Q.123 At an election, the candidate who got 56% of the votes cast won by 144 vote's .Find the total number of voters on the voting list if 80% people cast their vote and there were no invalid votes.
a) 360   b) 720
c) 1800   d) 1500

Q.124 In a class, 25% of the students were absent for an exam. 30% failed by 20 marks and 10% just passed because of grace marks of 5. Find the average score of the class if the remaining students scored an average of 60 marks and the pass marks are 33 (counting the final score of the candidates)
a) 37.266   b) 37.6
c) 37.8   d) 36.93

Q.125 Vicky's salary is 75%more than Ashu's Vicky got a raise of 40%on his salary while Ashu got a rise of 25% on his salary .By what percent is Vicky's salary more than Ashu's ?
a) 96%   b) 51.1%
c) 90%   d) 52.1%

Q.126 On a shelf, the first row contains 25%more books than the second row and the third row contains 25% less books than the second row. If the total number of books contained in all the rows is 600, then find the number of books in the first row.
a) 250   b) 225
c) 300   d) None of these

Q.127 In the recent, climate conference in New York , out of 700 men, 500women, 800 children present inside the building premises, 20% of the men, 40% of the women and 10% of the children were Indians. Find the percentage of people who were not Indian.
a) 73%   b) 77%
c) 79%   d) 83%

Q.128 A man buys a truck for Rs.2,50,000. The annual repair cost comes to 2.0% of the price of purchase

Besides, he has to pay an annual tax of Rs. 2000. At what monthly rent must he rent out the truck to get a return of 15% on his net investment of the first year?
a) Rs.3350
b) Rs. 2500
c) Rs.4000
d) Rs. 3212.50

Q.129 In an examination, 80% students passed in physics, 70% in Chemistry while 15% failed in both the subjects. If 325 students passed in both the subjects. Find the total number of students who appeared in the examination.
a) 500
b) 400
c) 300
d) 600

Q.130 The entrance ticket at the theatre in Nagpur is worth Rs. 250. When the price of the ticket was lowered, the sale of tickets increased by 50% while the collection recorded a decrease of 17.5%. Find the reduction in the ticket price.
a) Rs. 150
b) Rs.112.5
c) Rs.105
d) Rs. 120

Q.131 A machine depreciates in value each year at the rate of 10% of its previous value. However, every second year there is some maintenance work so that in that particular year, depreciation is only 5% of its previous value. If at the end of the fourth year, the value of the machine stands at Rs. 1,46,205 then find the value of machine at the start of the first year.
a) Rs. 1,90,000
b) Rs. 2,00,000
c) Rs. 1,95,000
d) Rs.2,10,000

Q.132 Meena's project report consists of 25 pages each of 60 lines with 75 characters on each line. In case the number of lines is reduced to 55 but the number of characters is increased to 90per lines, what is the percentage change in the number of pages? (Assume the number of pages to be a whole number).

a) +10%
b)+5%
c) -8%
d)-10%

Q.133 In the university examination last year, Rajesh scored 65% in English and 82% in History. What is the minimum percent he should score in Sociology, which is out of 50marks (if English and History were for 100 marks each), If he aims at getting 78% overall?
a) 94%
b) 92%
c) 98%
d) 96%

Q.134 King Dashratha, at his eleventh hour, called his three queens and distributed his gold in the following way: He gave 50% of his wealth to his First wife, 50% of the rest to his second wife and again 50% of the rest to his third wife. If their combined share is worth 1, 30,900 kilograms of gold, find the quantity of gold King Dashratha was having initially?
a)1,50,000kg
b)1,49,600 kg
c)1,51,600kg
d)1,52,600 kg

Q.135 The population of New Found land increase with a uniform rate of 8% per annum, but due to immigration, there is a further increase of population by 1% (however, this 1% increase in population is to be calculated on the population after the 8% increase and not on the previous year's population). Find what will be the percentage increase in population after 2 years.
a)18.984
b) 18.081
c) 18.24
d) 17.91

Q.136 If the length, breadth and height of a cube are decreased, decreased and increased by 5%, 5% and 20% respectively. Then what will be the impact on the surface area of the cube (in percentage terms)
a) 7.25%
b) 5%
c) 8.33%
d) 20.75%

Q.137 A's salary is first increased by 25% and then decreased by 20% .The result is the same as B' salary increased by 20% and the reduced by 25% .Find the ratio of B's salary to that of A's
a) 4:3
b) 11:10
c) 10:9
d) 12:11

Q.138 A person saves 6% of his income. Two years later, his income shoots up by 15% but his saving remains the same. Find the hike in his expenditure.
a) 15.95%
b) 15%
c) 14.8%
d) 15.5%

Q.139 A and B have between them Rs. 1200. A spends 12% of his money while B spends 20% of his money. They are then left with a sum that constitutes 85% of the whole sum. Find what amount is left with A.
a) Rs. 750
b) Rs. 800
c) Rs. 700
d) Rs 660

Q.140 In a town consisting of three localities A,B, and C the population of the three localities A,B, and C are in the ratio 9:8:3. In locality A, 80% of the people are literate, in locality B 30% of the people are illiterate. If 90% people in locality C are literate, find the percentage literacy in that town.
a) 61.5%
b) 78%
c) 75%
d) None of these

Q.141 A shopkeeper bought 72 orange for Rs. 324. He sold 50 of them at Rs. 6 each and the remaining at Rs. 165. Find his profit
a) Rs. 121
b) Rs. 151
c) Rs. 111
d) None of these

Q.142 A man sold an article at a loss of 20%. If he sells the article for Rs. 45 more he would have got a profit of 10%. The cost price of the article is
a) Rs. 150
b) Rs. 140

c) Rs. 120
d) Rs. 100

Q.143 One –third of a consignment was sold at a profit of 8% and the rest at a loss of 1%. If there was an overall profit of Rs 320, the value of the consignment was
a) Rs. 14000
b) Rs.16000
c) Rs 18000
d) Rs. 20000

Q.144 The total cost price of two articles is Rs.900. One is sold at a profit of 20% and other at a loss of 25%.There is no loss or gain in the whole transaction. The cost price of the watch on which the shopkeeper loses is
a) Rs. 400
b) Rs. 500
c) Rs.450
d) Rs. 540

Q.145 A fair price shopkeeper takes 15% profit on his goods. He lost 25% goods during theft. His loss per cent is
a) 12.45%
b) 13.25%
c) 13.75%
d) 14.50%

Q.146 The price of an article is increased by 20% and then two successive discounts of 10% each is allowed. Ultimately the price of the article is
a) Increased by 2.8%
b) decreased by 2.8%
c) no change
d) Decrease by 1.5%

Q.147 A shopkeeper bought 30 kg of wheat at the rate of Rs.45 per kg. He sold forty percent of the total quantity at the rate of Rs. 50 per kg. Approximately at what price per kg should he sell the remaining quantity to make 25% overall profit?
a) Rs. 54
b) Rs.52
c) Rs.50
d) Rs. 60

Q.148 Naresh purchased a TV set for Rs. 11250 after getting discount of 10%

on the labeled price. He spent Rs. 150 on transport and Rs. 800 on installation. At what price should it be sold so that profit earned would be 15% if no discount was offered?
a) Rs.12937.50   b) Rs.14030
c) Rs.13450   d) Rs. 15467.50

Q.149 The profit earned after selling an article for Rs. 1754 is the same as the loss incurred after selling the article for Rs. 1492. What is the cost price of the article?
a) Rs.1623   b) Rs.1523
c) Rs.1689   d) Rs.1589

Q.150 Pratik sold a music system to Kartik at 20% gain and Kartik sold it to Swastik at 40% gain. If Swastik paid Rs. 10500 for the music system, what amount did Partik pay for the same?
a) Rs.8240 b) Rs.7500
c) Rs.6250 d) Cannot be determined

Q.151 A man sells two cows at the same price. One at 15% profit and other at 15% loss. What is his overall profit or loss percentage?
a) No profit, No loss b) 2.25% profit
c) 15% profit   d) 2.25% loss

Q.152 The cost price of 35 articles is equal to the selling price of 21 articles. What is the profit or loss percentage of the trader?
a) 60%   b) 25% loss
c) $66\frac{2}{3}$%profit   d) 40%loss

Q.153 By selling an article at 9/13th of its selling price, a trader gets a loss of 10% . What will be the profit percentage of the trader, if the article is sold at its actual selling price?
a) 30%   b) 13%
c) 40%   d) 27%

Q.154 After giving three successive discounts of 15%, 20% and 5%

respectively, an article is sold for Rs. 1,292. What is the marked price of the particle?
a) Rs. 2,400   b) Rs 1, 600
c) Rs. 2,000   d) Rs. 3,000

Q.155 A, B and C started a business with investment of Rs 8000, Rs 20000 and Rs 32000. What is the share of B in the total profit of Rs. 5400 at the end of 1 yr?
a) Rs 2880   b) Rs 720
c) Rs 1800   d) Rs 1650

Q.156 A, B and C enter into a partnership by investing Rs 15000, Rs 21000 and Rs 27000 respectively. At the end of 8months B receives Rs 1260 as his share, Find the share of A.
a) Rs 600   b) Rs 1620
c) Rs1080   d) None of these

Q.157 A & B Started a business with investments of Rs 42000 and Rs 63000 respectively. After 4 months B withdraws from the business. At the end of a year they got Rs 9600 as total profit. Find the share of B.
a) Rs 5600   b) Rs 2800
c) Rs 3200   d) Rs 6400

Q.158 A, B and C enter into a partnership with the ratio of capitals as 3:5:8. If at the end of the year the ratio of their profits is 6:15:4, find the ratio of their period of investments.
a) 2:3:2   b) 2:3:1
c) 4:6:1   d) 3:2:12

Q.159 Om, Jai and Jagdish invest Rs.80,000, Rs 64,000 and Rs. 48,000 respectively in a partnership firm. If at the end of one year, Jagdish earns a profit of Rs. 10,800. Then what is the total profit earned by the firm?
a) Rs.54,000   b) Rs.43,200
c) Rs. 25,920   d) Rs. 32,400

Q.160 A, B and C started a business by investing Rs 45000, Rs. 55000 and

Rs 60000 respectively. At the end of a year, they got a total a profit of Rs 11200. Find how much B gets more than A in the profit?
a) Rs 700
b) Rs 750
c) Rs 710
d) Rs 780

Q.161 A shopkeeper bought 240 chocolates at Rs. 9 per dozen. If he sold all of them at Rs. 1 each, what was his profit per cent?

a) $66\dfrac{1}{6}\%$
b) $33\dfrac{1}{3}\%$
c) 24%
d) 27%

Q.162 The marked price of a table is Rs. 1200, which is 20% above the cost price. It is sold at a discount of 10% on the market price. Find profit per cent.
a) 10%
b) 8%
c) 7.5%
d) 6%

Q.163 A dozen pairs of gloves quoted at Rs. 80 are available at a discount of 10%.Find how many pairs of gloves can be bought for Rs. 24
a) 4
b) 5
c) 6
d) 8

Q.164 A whole –seller allows discount of 20% on the list price to a retailer. The retailer sells at 5% discount on the list price. If the customer paid Rs. 38 for an article, what profit is made by the retailer?
a) Rs.10
b) Rs. 8
c) Rs. 6
d) Rs. 12

Q.165 A owns a house worth Rs. 10,000. He sells it to B at a profit of 15% after some time; B sells it back to A at 15% loss. Find A's loss or gain percent.
a) 2.25%gain
b) 6.25%gain
c) 17.64%gain
d) 17.25%gain

Q.166 A makes an article for Rs. 120 and sells it to B at a profit of 25%, B sells it to C who sells it for Rs. 198, making a profit of 10% what profit percent did B make?

a) 25%
b) 20%
c) 16.66%
d) 15%

Q.167 A man sells an article at 5% above its cost price. If he had bought it at 5% less than what he paid for it and sold it for Rs. 2 less. He would have gained 10%. Find the cost price of the article.
a) Rs. 500
b) Rs.360
c) Rs. 425
d) Rs. 400

Q.168 A shopkeeper allows discount of 12.5% on the marked price of a certain article and makes a profit of 20%. If the article cost the shopkeeper Rs. 210, what price must be marked on the article?
a) Rs. 280
b) Rs. 288
c) Rs.300
d) None of these

Q.169 Find the selling price of goods if two salesmen claim to make 25% profit each one calculating it on cast price while another on the selling price, the difference in the profits earned being Rs. 100 and selling price being the same in both the cases.
a) Rs.2000
b) Rs. 1600
c) Rs.2400
d) Rs. 2500

Q.170 A dealer marks articles at a price that gives him a profit of 30%. 6% of the consignment of goods was lost in a fire in his premises, 24% was spoiled and had to be sold at half the cost price. If the remainder was sold at the marked prices what percentage profit or loss did the dealer at make on that consignment?
a) 2%
b) 2.5%
c) 3%
d) 6.2%

Q.171 A book was sold for a certain sum and there was a loss of 20% .Had it been sold for Rs. 12 more, there would have been a gain of 30% What would be the profit if the book were sold for ?
a) No profit, no loss
b) 20%
c) 10%
d) 25%

Q.172 A rickshaw dealer buys 30 rickshaws for Rs. 4725 of these, 8 are four –seats and the rest are two seaters. At what price must he sell the four seater so that if he sells the two-seaters at 3/4 the of this price, he makes a profit of 40% on his outlay?
a) Rs. 180   b) Rs. 270
c) Rs. 360   d) Rs. 450

Q.173 Raghav bought 25 washing machine and microwave ovens for Rs. 2,05,000 He sold 80% of the washing machines and 12 microwave ovens from profit of Rs. 40,000 Each washing machine was marked up by20% over cost and each microwave oven was sold at a profit of Rs. 2,000 The remaining washing machines and 3 microwave ovens could not be sold. What is Raghav's overall profit /loss?
a) Rs. 1000 profit
b) Rs. 2500 loss
c) Rs. 1000 loss
d) cannot be determined

Q.174 Sambhu buys rice at Rs. 10/kg and puts a price tag on it so as to earn a profit of 20% However, his faulty balance shows 1000 gm when it is actually 800 gm. What is his actual gain percentage?
a) 50%   b) 40%
c) 18%   d) 10%

Q.175 A sells to B goods at five-thirds the rate of profit at which B has decided to sell it to C. On other hand, sells it to D at one –third the rate of profit it at which B sold it to C. If D gives Rs. 2145 to C at 10% profit, how much did A buy it for?
a) Rs. 1000   b) Rs. 2000
c) Rs.1500   d) Rs. 1800

Q.176 Sridhar and Vijay start a business with investments of Rs. 60,000 and Rs. 100,000 respectively. At the end of six months Sridhar increase his capital by two–thirds and Vijay withdraws 40%of his capital .What is the ratio of their profits at the end of the year?
a) 2:1   b) 2:3
c)1:2   d) 1:1

Q.177 Guha and Tara start a partnership firm with initial investments of Rs. 500 and Rs. 6,000 respectively. Guha invests Rs. 500 at the end of every month and Tara withdraws Rs.500 at the end of every month .What is the share of Tara out of a total out of a total profit of Rs. 3000 at the end of one year?
a) Rs. 1,500   b) Rs. 1,000
c) Rs. 2,000   d) Rs. 1,800

Q.178 Kumbha and Mesha start a business with initial investments of Rs. 2,400 and Rs. 4,800 respectively. At the end of every three months, Kumbha invests Rs.1200 and Mesha withdraws Rs. 800 at the beginning of every three months. What is the share of Mesha in the total profit of Rs.2,600 at the end of one year?
a) Rs. 1,400   b) Rs. 1,600
c) Rs. 1,200   d) Rs. 1,000

Q.179 Anand, Sanjay and Manish start a business with investments of Rs. 90,000, Rs. 60,000 and Rs.45,000 respectively. Anand and Sanjay leave the business after a few months at the same time At the end of the year , they share the profits in the ratio 3:2:3 .How many months before the end of the year did Anand leave the business?
a) 2   b) 3
c) 4   d) 8

Q.180 Malika and Amritha invest Rs. 78,000 and Rs. 65,000 respectively to start a business At the end of the

year, they share the profit equally since Malika did not stay in the business for the entire year. After how many months did Malika leaves the business?

a) 8   b) 6
c) 10   d) 12

Q.181 Find the simple interest on Rs. 7200 at 8% per annum for 10 months.
a) Rs. 480   b) Rs. 420
c) Rs. 450   d) Rs.410

Q.182 Find the simple interest on a principle of Rs. 16000 in $2\frac{1}{2}$ yr at $8\frac{1}{2}\%$
a) Rs. 2860   b) Rs. 3400
c) Rs. 1840   d) Rs. 4200

Q.183 The simple interest earned on a certain sum is Rs 1560 at the rate 8% per annum in 2 yr, find the sum.
a) Rs. 9630   b) Rs. 9140
c) Rs 9750   d) Rs. 9810

Q.184 In what rate will a sum double itself at 8% per annum simple interest?
a) 12 yr   b) 10 yr
c) $12\frac{1}{2}$ yr   d) $10\frac{1}{2}$ yr

Q.185 In what time would Rs. 5000 amount to Rs 5800 at 8% per annum simple interest?
a) 1yr   b) 5 yr
c) 4yr   d) 2 yr

Q.186 A borrows Rs. 9000 at the rate of 12% per annum simple interest and B borrows Rs. 12000 at the rate of 8% per annum simple interest . In how many years will their amount of debts be equal?
a) 20yr   b) 22yr
c) 18yr   d) None of these

Q.187 A person invests money in two different schemes for 5 yr and 8yr at 12% & 10 % simple interest respectively. At the completion of each scheme he gets the same interest. The ratio of his investment is
a) 1:3   b) 4:3
c) 1:2   d) Cannot be determined

Q.188 A borrowed Rs.4800 from B at 9% per annum SI for 3yr. He then added some more money to the borrowed sum and lent it to C for the same period at 12% per annum rate of interest .If A gains Rs. 720 in the whole transaction ,how money did he add from his side?
a) Rs.500   b) Rs.740
c) Rs. 640   d) Rs.800

Q.189 Calculate the compound interest on Rs 6750 for 3yr at $6\frac{2}{3}\%$ per annum.
a) Rs.1645   b) Rs. 1442
c) Rs. 2415   d) Rs. 2142

Q.190 In what time will Rs. 15625 amount to 17576 at 8% compound interest per annum, interest being compounded half-yearly?
a) 3yr   b) 2 yr
c) 1 yr   d) $\frac{1}{2}$ yr

Q.191 Calculate the compound interest on Rs. 3200 for 2yr. The rate of interest for year being 8% per annum and 10% per annum for the second year.
a) Rs.611.20   b) Rs.600.40
c) Rs.601.60   d) Rs. 605.20

Q.192 Find the compound interest on Rs. 12450 for 9 months at 12% per annum compounded quarterly.
a) Rs. 1154.45   b) Rs. 1125.18
c) Rs. 1198.72   d) Rs. 1164. 32

Q.193 The difference between simple interest and compound interest on Rs. 1500 for 1yr at 8% per annum reckoned half-yearly is
a) Rs. 2.15   b) Rs.2.75
c) Rs. 2.40   d) Rs. 2.90

Q.194 If the simple interest on a sum of money for 2 yr at 8% per annum is Rs. 120, what will be the Compound interest on the same sum at the same rate for the same time?
a) Rs. 124.80   b) Rs. 110.20
c) Rs. 145.15   d) Rs. 136.25

Q.195 The effective annual rate of interest, corresponding to a nominal rate of 4% per annum payable half-yearly is
a) 4.04%   b) 4.06%
c) 4.09%   d) 4.12%

Q.196 What would be the compound interest accrued on an amount of Rs. 45400 at the end of 2yr at the rate of 15% per annum?
a) Rs. 16411.5   b) Rs. 14461.5
c) Rs. 16461.5   d) Rs. 14641.5

Q.197 A man gets a simple interest of Rs. 1000 on a certain principle at the rate 5% per annum in 4yr. What compound interest will the man get on twice the principle in 2yr at the same rate?
a) Rs. 1050   b) Rs.1005
c) Rs. 11025   d) None of these

Q.198 Sonika invested an amount of Rs. 5800 for 2yr.At what rate of compound interest Will she get an amount of Rs. 594.5 at the end of 2yr?
a) 5%per annum b) 4% per annum
c) 6% per annum d) 8% per annum

Q.199 What will be the compound interest accrued on an amount of Rs. 10000@ 20% per annum in 2yr, if the interest is compounded half-yearly?
a) Rs. 4400   b) Rs. 4600
c) Rs. 4641   d) Rs. 4680

Q.200 The simple interest accrued on an amount of Rs. 25000 at the end of 3yr is Rs.7500. What would be the compound interest accrued in the same amount at the same rate in the same period?
a) Rs. 7750   b) Rs. 8275
c) Rs. 8500   d) Rs. 8250

Q.201 A sum amounts to Rs.12480 in five years and to Rs.13728 in eight years at simple interest. What is the sum?
a) Rs.9800   b) Rs.10, 400
c) Rs.10, 200   d) 9,600

Q.202 A certain sum is lent at 4% p.a. for the first four years, 8% p.a. for the next three years and 5% p.a. for the remaining period. If for a period of nine years, the simple interest obtained is Rs.8500, find the sum.
a) Rs.25500   b) Rs.18000
c) Rs.12750   d) Rs.17000

Q.203 If a sum was Rs.12000 more than it actually was, the simple interest on it for 2 years would be Rs.3600 more than it actually was. Find the annual rate of interest.
a) 20%   b) 15%
c) 10%   d) 25%

Q.204 A sum was lent at 15% p.a. simple interest for x years amounted to Rs.18125. When the same sum was lent at 20% p.a. simple interest for (x +2) years it amounted to Rs.25000, find the sum.
a) Rs.13500   b) Rs.9500
c) Rs.12500   d) Rs.12000

Q.205 Saketh borrows a sum of Rs.64000 at 5% p.a. compounded annually. At the end of one year, he repays a certain amount and he repays the balance amount of Rs.35700 at the end of the second year. What amount did he repay at the end of the first year?
a) Rs.34000   b) 37200
c) Rs.33200   d) 35700

Q.206 At compound interest, interest being compounded annually, the amount after n years is 4 times the principle. In how many years will the amount be 16 times the principle?
a) 3n   b) n^2
c) 4n   d) 2n

Q.207 A sum invested at compound interest, with interest being compounded annually amounts to Rs.70246.40 in three years. Find the sum.
a) Rs.50000   b) 48000
c) Rs.52000   d) 54000

Q.208 The value of a machine depreciates at the rate of 10% p.a. every year. What was the value of the machine two years ago, if its present value is Rs.24300?
a) Rs.90000   b) Rs.36000
c) Rs.34714.20   d) Rs.30000

Q.209 The compound interest and the simple interest on a certain sum for two years are Rs.1653.60 and Rs.1560 respectively. Find the sum and the rate of interest.
a)Rs.7800, 10% p.a.
b)Rs.7800, 15% p.a.
c)Rs.6500, 10% p.a.
d)Rs.6500, 12% p.a.

Q.210 A man invested Rs.8000 and, after paying 10% of the first year's interest as income tax, he had Rs.900 of the interest left. Calculate the rate percent at which interest was paid.
a) 10%   b) 12.5%
c) 12%   d) 5%

Q.211 A bank pays 10% p.a. as interest on its deposits while it charges 12% p.a. as interest from its borrowers. If at the end of the year, the bank earns Rs.2.4 crore at S.I in this transaction, then how much money was transacted in business?
a) Rs.120 crore   b) Rs.240 crore
c) Rs.480 crore   d) Rs.200 crore

Q.212 Ranjan purchased a Maruti van for Rs.196000 and the rate of depreciation is $14\frac{2}{7}$% per annum. Find the value of the van after two years.
a) Rs.140000   b) Rs.144000
c) Rs.150000   d) Rs.160000

Q.213 At what percentage per annum, will Rs.10000 amount to 17280 in three years? (Compound Interest being reckoned)
a) 20%   b) 14%
c) 24%   d) 11%

Q.214 What will be the simple interest on Rs.700 at 9% per annum for the period from February 5, 1994 to April 18, 1994?
a) Rs.12.60   b) Rs.11.30
c) Rs.15   d) Rs.13

Q.215 A sum was invested at simple interest at a certain interest for 2 years. It would have fetched Rs.60 more had it been invested at 2% higher rate. What was the sum?
a) Rs.1500   b) Rs.1300
c) Rs.2500   d) Rs.1000

Q.216 Raju lent Rs.400 to Ajay for 2 years, and Rs.100 to Manoj for 4 years and received together from both Rs.60 as interest. Find the rate of interest, simple interest being calculated.
a) 5%   b) 6%
c) 8%   d) 9%

Q.217 A sum of money becomes 7/4 of itself in 6 years at a certain rate of simple interest. Find the rate of interest.
a) 12%   b) 12.5%
c) 8%   d) 14%

Q.218 Sanjay borrowed Rs.900 at 4% p.a. and Rs.1100 at 5% p.a. for the same duration. He had to pay Rs.364 in all as interest. What is the time period in years?
a) 5 years   b) 3 years
c) 2 years   d) 4 years

Q.219 Three persons Amar, Akbar and Anthony invested different amounts in a fixed deposit scheme for one year at the rate of 12% per annum and earned a total interest of Rs.3240 at the end of the year. If the amount invested by Akbar is Rs.5000 more than the amount invested by Amar and the amount invested by Anthony is Rs.2000 more than the amount invested by Akbar, what is the amount invested by Akbar?
a) Rs.12000   b) Rs.10000
c) Rs. 7000   d) Rs.5000

Q.220 What is the amount of equal installment, if a sum of Rs.1428 due 2 years hence has to be completely repaid in 2 equal annual installments starting next year.
a) 700   b) 800
c) 650   d) cannot be determine

Q.221 Find the average of 12.5 11.6, 13.2, 15.6 and 9.8.
a) 12.54   b) 12.52
c) 12.15   d) 12.51

Q.222 Find the average of first 40 natural numbers.
a) 20.2   b) 20.8
c) 20.5   d) 20.9

Q.223 Find the average of the first 12 multiples of 12.
a) 82   b) 86
c) 79   d) 78

Q.224 The average of 55 items is 29. If 2 is added to each number of the series. , the new average is
a) 31.5   b) 31.4
c) 31   d) 30.5

Q.225 The average of 24 numbers is 18. If each item of the series is multiplied by 3, the new average is
a) 54   b) 62
c) 57   d) cannot be determined

Q.226 If the average of five consecutive numbers is 27, find the smallest number.
a) 23   b) 24
c) 26   d) 25

Q.227 If the sum 11 consecutive odd numbers is 253, find the first term.
a) 15   b) 11
c) 13   d) 17

Q.228 Find the average of the first six odd multiple of 5.
a) 30   b) 32
c) 28   d) 26

Q.229 If the average of 6 observations is 42 and another 6 observation is 45. Find the average of all the 12 observations?
a) 44   b) 44.5
c) 43   d) 43.5

Q.230 Rajesh bought 75 items for Rs 1215 from one shop and 60 items for Rs 1080 from another shop. What is the average price he paid per item?
a) Rs 21   b) Rs 15
c) Rs 19   d) Rs 17

Q.231 If $11a + 11b = 33$, what is the average of a and b?
a) 3   b) 2
c) 1.5   d) cannot be determined

Q.232 The sum of five numbers is 350. The average of the first two numbers is 65.5 and the average of the last two numbers is 72.5. What is the third number?
a) 71   b) 68
c) 72   d) 74

Q.233 The average of four consecutive odd numbers A, B, C and D is 34. What is the product of B and C?
a) 1221   b) 1155
c) 1295   d) cannot be determined

Q.234 In what ratio must rice at Rs 9.30 per Kg be mixed with rice at Rs 10.80 per Kg so that the mixture is worth Rs 10 per Kg?
a) 6 : 5
b) 8 : 7
b) c) 3 : 7
d) 6 : 1

Q.235 The milk and water in two vessels A and B are in the ratio 4:3 and 2:3 respectively. In what ratio the liquids in both the vessels are mixed to obtain a new mixture in vessel consisting half milk and half water?
a) 8 : 3
b) 7 : 5
b) c) 4 : 3
d) 2 : 3

Q.236 Two vessels A and B contain spirit and water mixed in the ratio 5:2 and 7:6 respectively. Find the ratio in which these mixture be mixed to obtain a new mixture in vessel C containing spirit and water in the ratio 8:5?
a) 1 : 7
b) 2 : 9
c) 7 : 9
d) 3 : 8

Q.237 How many kilograms of sugar costing Rs. 9 per kg must be mixed with 27kg of sugar costing Rs.7 per kg so that there may be gain of 10% by selling the mixture at Rs.9.24 per kg?
a) 60 kg
b) 63 Kg
c) 50 kg
d) 77 kg

Q.238 One quantity of wheat at Rs 9.30 per Kg is mixed with another quality at a certain rate in the ratio 8:7. If the mixture so formed be worth Rs 10 per Kg, what is the rate per Kg of the second quantity of wheat?
a) Rs. 12.47
b) Rs. 10.80
c) Rs. 15.17
d) Rs. 47.66

Q.239 How many kgs of Basmati rice costing Rs.42/kg should a shopkeeper mix with 25 kgs of ordinary rice costing Rs.24 per kg so that he makes a profit of 25% on selling the mixture at Rs.40/kg?
a) 20 kg
b) 12.5 kg
c) 16 kg
d) 200 kg

Q.240 How many liters of water should be added to a 30 liters mixture of milk and water containing milk and water in the ratio of 7: 3 such that the resultant mixture has 40% water in it?
a) 7 lit.
b) 10 lit.
c) 5 lit.
d) 8 lit.

Q.241 The average age of 254 students and the principal is 15 years. When the principal's age is excluded, the average age decreases by 1year. What is the age of the principal?
a)38
b)40
c)39
d)37

Q.242 The average weight of 3 men A, B and C is 84kg. Another man D joins the groups and the average now becomes 80kg. If another man E, whose weight is 3 kg more than that of D, replaces A then the average weight of B, C, D and E becomes 78kg.The weight f A is
a) 70kg
b) 72kg
c) 79kg
d) 78kg

Q.243 The average monthly expenditure of a family was 2750 for the 3 months, Rs.3150 for next three months and Rs. 6750 for the next three months. Find the average income of the family for the 9 months, if they save Rs. 650 per month.
a) 4866.66
b) 5123.33
c) 4666.66
d) 4216.66

Q.244 The average age of 8 people in a committee is increased by 2 years when two men aged 35 years and 45 years are substituted by two women. Find the average age of the two women.
a) 48
b) 45
c) 51
d) 42

Q.245 The average weight of a class of 29 students is 40kg. If the weight of the teacher be included, the average rises by 500 gm. What is the weight of the teacher?
a) 40.5 kg   b) 50.5kg
c) 45kg   d) 55kg

Q.246 If we take four numbers, the average of the first three is 16 and that of the last three is 15. If the last number is 18, the first number is
a) 20   b) 21
c) 23   d) 25

Q.247 In a family of 8 males and a few ladies, the average monthly consumption of grain per head is 10.8 kg. If the average monthly consumption per head be 15 kg in the case of males and 6 kg in the case of females in the family, find the number of females in the family.
a) 8   b) 7
c) 9   d) 15

Q.248 The average of 13 papers is 40.The average of the first 7 papers is 42 and of the last seven papers is 35. Find the marks obtained in the 7th paper.
a)23   b)38
c)19   d)39

Q.249 The average weight of 6 person is increased by2.5 kg when one of them whose weight is 50kg is replaced by a new man. The weight of the new man is
a) 65kg   b) 75kg
c) 76kg   d) 60kg

Q.250 In a management entrance test, a student scores 2 marks for every correct answer and loses 0.5 marks for every wrong answer. A student attempts all the 100 questions and scores 120 marks. The number of questions he answered correctly was
a) 50   b) 45
c) 60   d) 68

Q.251 Two types of oils having the rates of Rs4 /kg and Rs. 5 /kg respectively are mixed in order to reduce a mixture having the rate of Rs. 4.60/kg. What should be the amount of the second type of oil if the amount of the first type of oil in the mixture is 40 kg?
a) 75kg   b) 50kg
c) 60kg   d) 40kg

Q.252 How many kilograms of sugar worth Rs. 3.60 per kg should be mixed with 8kg of sugar worth Rs. 4.20per kg, such that by selling the mixture at Rs. 4.40kg there may be a gain of 10%?
a) 6kg   b) 3kg
c) 2kg   d) 4kg

Q.253 A mixture of 125 gallons of wine and water contains 20% water. How much water must be added to the mixture in order to increase the percentage of water to 25% of the new mixture?
a) 10gals   b) 8.5gals
c) 8gals   d) 8.33gals

Q.254 400 student took a mock exam in Delhi.60% of the boys and 80% of the girls cleared the cut off in the examination. If the total percentage of students qualifying is 65%, how many girls appeared in the examination?
a) 100   b) 120
c)150   d) 300

Q.255 A dishonest milkman purchased milk at Rs.10 per liter and mixed 5 liters of water in it by selling the mixture at the rate of Rs. 10 per liter he earns a profit of 25%. The quantity of the amount of the mixture that he had was:
a) 15litres   b) 20litres
c) 25litres   d) 30litres

Q.256 In what ratio should water be mixed with soda costing Rs. 12 per liter so

as to make a profit of 25% by selling the diluted liquid at Rs.13.75 per liter?

a) 10:1   b) 11:1
c) 1:11   d) 12:1

Q.257 A mixture of 70 liters of alcohol and water contains 10% of water .How much water must be added to the above mixture to make the water 12.5% of the resulting mixture?

a) 1liter   b) 1.5liter
c) 2liters   d) 2.5liters

Q.258 A man buys milk at Rs. 8.5 per liter and dilutes it with water. He sells the mixture at the same rate and thus gains 11.11%.Find the quantity of water mixed by him in every liter of milk

a) 0.111 liters   b) 0.909 liters
c) 0.1liters   d) 0.125 liters

Q.259 There are two mixtures of honey and water, the quantity of honey in them being 25% and 75% of the mixture, if 2 gallons of the first are mixed with three gallons of the second, what will be the ratio of honey to water in the new mixture?

a) 11:2   b) 11:9
c) 9:11   d) 2:11

Q.260 Two vessels contains spirit and water mixed respectively in the ratio of 1:3 and 3:5 Find the ratio in which these are to be mixed to get a new mixture in which the ratio of spirit to water is 1:2.

a) 2:1   b) 3:1
c) 1:2   d) 1:3

Q.261 A, B and C can complete a piece of work in6 days, 8 days and 12 days respectively. Working together they will complete the work in how many days?

a) $1\dfrac{1}{8}$ b) $1\dfrac{2}{5}$

c) $2\dfrac{2}{3}$ d) $2\dfrac{3}{2}$

Q.262 A man can do a work in 16 days and B the same work in 12 days. With the help of C, the work is completed in 6 days. C can do the work alone in

a) 36 days   b) 48 days
c) 39 days   d) 45 days

Q.263 A takes twice as much time as B to do a work. Working together the work is completed in 8 days. A can do the work alone in

a) 24 days   b) 12 days
c) 16 days   d) 28 days

Q.264 Rekha can do a piece of work in 40 days. Surekha is 25% more efficient than Rekha. The number of days taken by Surekha to do the same piece of work is

a) 24 days   b) 28 days
c) 32 days   d) 35 days

Q.265 A can do work in 12 days and B in 15 days. If they work on it together for 6 days, then the fraction of the work that is left is

a) $\dfrac{1}{4}$ b) $\dfrac{1}{5}$

c) $\dfrac{1}{10}$ d) $\dfrac{1}{12}$

Q.266 A can do a work in 24 days and B can do the same work in 15 days. B worked on it for 5 days & left the job. In howmany days, A alone can finish the remaining work?

a) 12 days   b) 16 days
c) 18 days   d) 20 days

Q.267 A can do a work in 48 days, B in 18 days & C in 36days. B and C start the work, but are forced to leave after 2days .The remaining work was done by A in

a) 21 days   b) 24 days
c) 36 days   d) none of these

Q.268 A does $\dfrac{4}{5}$ of a work in 24 days. He then, calls in B and they together

finish the remaining work in 2days. How long B alone would take to do the whole work?
a) 30 days   b) 24 days
c) 18 days   d) 15 days

Q.269 A and B together can do a piece of work in 16 days. A having worked for 8 days, B finished the remaining work alone in 32 days. In how many days, shall B finish the whole work alone?
a) 42 days   b) 48 days
c) 51 days   d) 54 days

Q.270 If a can do $\frac{1}{4}$ of the work in 4 days and B can do $\frac{1}{8}$ of the work in 3 days. How much will A get if both work together and are paid Rs 4500 in all?
a) Rs 1800   b) Rs 2400
c) Rs 2700   d) Rs 2900

Q.271 A alone can complete a work in 12 days & B alone in 48 days. Starting with B, they work on alternate days. The total work will be completed in
a) 18 days   b) 19 days
c) $19\frac{1}{2}$ days   d)Data insufficient

Q.272 4 men and 6 women finish a job in 8 days. While 3 men and 7 women finish it in 10 days. 25 women working together will finish it in how many days?
a) 20 days   b) 18 days
c) 16 days   d) 12 days

Q.273 1 woman or 2 men or 3 boys can do a piece of work in 55 days. Then the same piece of work will be done by 1 man 1 women and 1 boy how many days?
a) 18 days   b) 30 days
c) 32 days   d) 16 days

Q.274 48 workers can reap a field in 9days. If the work is to be 3 completed in 6

days, the extra-workers required are
a) 36   b) 32
c) 24   d) 22

Q.275 6 men can complete a piece of work in 12 days. 8 women can complete the same piece of work in 18 days whereas 18 children can complete the piece of work in 10 days. 4 men, 12 women and 20 children work together for 2 days. If only men were to complete the remaining work in 1 day, how many men would be required totally?
a) 36   b) 24
c) 18   d) Can't determined

Q.276 8 men and 4 women together can complete a piece of work in 6 days. The work done by men in one day is double the work done by a woman in one day. If 8 men and 4 women started working and after 2 days 4 men left and 4 new women joined in how many days will the work be completed?
a) 5 days   b) 8days
c) 6 days   d) 7 days

Q.277 Work done by A in one days is half of the work done by B in one day. Work done by B is half of the work done by C in one day. If C alone can complete the work in 7 days, in how many days can A, B and C together complete the work?
a) 28   b) 14
c) 4   d) 21

Q.278 24 men can complete a piece of work in 16 days. The same work can be complete by 8 women in 72 days whereas 24 children take 32 days to complete it If 10 men, 14women and 24 children work together, in how many days can the work be completed?
 a) 18   b) 8
c) 22   d) 12

Q.279 A alone can complete a piece of work in 8 days. Work done by B

alone in one day is half of the work done by A alone in one day. In how many days can the work be completed if A and B work together

a) $6\frac{1}{3}$ b) $5\frac{2}{3}$

c) $5\frac{1}{3}$ d) $6\frac{2}{3}$

Q.280 8 men alone can complete a piece of work in 12 days. 4 women alone can complete the same piece of work in 48 days and 10 children alone can complete the piece of work in 24 days. In how many days can 10 men, 4 women and 10 children together complete the piece of work?
a) 5 b) 15
c) 28 d) 6

Q.281 Pipe P and Q can fill a tank in 36 minutes & 90minuties respectively. Pipe R can empty it at 3 liters/min. All pipes were opened simultaneously. They filled the tank in 45 minutes. Find its capacity (in liters).
a) 150 b) 270
c) 225 d) 180

Q.282 Three taps A, B, and C can fill a tank in 8, 12 and 16 minutes respectively. If the taps were shut after 4 minutes, what is the volume of water that overflows [as a percentage of total volume of tank?]
a) 10% b) $9\frac{1}{10}\%$
c) $11\frac{1}{9}\%$ d) $8\frac{1}{3}\%$

Q.283 A and B complete a job in m times the time that C would take to complete it Band C can complete it in m times the time that A would take to complete it. A and C can compete it in m times the time taken by B to complete it Find m
a) 1/4 b) 4
c) 2 d) ½

Q.284 Five people A,B,C,D,E do certain job A,B, and C together compete the job

in 7.5hrs, A,C and E together complete it in 5 hours : A,C and D together compete it in 6 hours; B,D E together compete it in 4hours.If all the five people work together , then how much time will be required?
a) 3.5hours b) 3hours
c) 2.5hours d) 1.5hours

Q.285 25 men were employed to do a piece of work in 24 days. After 15 days, 10 more men were engaged and the work was finished a day too soon. In what time could they finish the work if extra men were not employed?
a) 29.5days b) 24.6 days
c) 26.2 days d) 21.7 days

Q.286 36 workmen are employed to finish a certain work in 48 days. But it is found that in 24 days only2/5 work is done. How many more men must be taken in order to finish the work in time?
a) 16 men b) 18 men
c) 20 men d) 22 men

Q.287 A garrison of 1500 men is provisioned for 60 days. After 25 days the garrison is reinforced by 500 men. How long will the remaining provisions last?
a) 24 days b) 21.75 days
c) 26.25 days d) 52 days

Q.288 20 men can complete a piece of work in 10 days but after every 4 days 5 men are called off. In what time will the work be finished?
a) 16 days b) 17 days
c) 12 days d) 14 days

Q.289 A worker A began digging a trench. After three days, another worker B joined him It now took them eight more days to complete the work. Instead, if during the first three days, B alone would have worked, then both of them would have required another nine days to complete the job .How much time would each take to complete the job.

How much time would each take to complete the job separately?
a) A: 12days; B: 20days
b) A: 15 days; B: 30 days
c) A: 10 days; B: 20 days
d) A: 15 days; B:20 days

Q.290 A cistern can be two tap A and B in 25 min and 30 min respectively and can be emptied by a third in 15 min. if all the taps are turned on at the same moment, what part of the cistern will remain unfilled at the end of 100min?

a) $\dfrac{1}{4}$
b) $\dfrac{1}{3}$
c) $\dfrac{1}{2}$
d) $\dfrac{2}{5}$

Q.291 Twenty workers can finish a piece of work in 30 days. After how many days should 5 workers leave the job so that work is competed in 35 days?
a) 5 days
b) 10 days
c) 15 days
d) 20 days

Q.292 Subhash can copy 50 pages in 10 hours; Subhash and Prakash together can copy 300 pages in 40 hours. In how much time can Prakash copy 30 pages?
a)13 h
b)12h
c)11h
d)9 h

Q.293 Apurva can do a piece of work in 12 days. Apurva and Amit complete the work together and were paid Rs. 54 and Rs.81 respectively. How many days must they have taken to competed the work together?
a)4 days
b)4.5 days
c)4.8 days
d)5 days

Q.294 In a fort there sufficient food for 200 soldiers for 31 days. After 27 days 120 soldiers left the fort. For how many extra days will the rest of the food last for the remaining soldiers?
a) 12days
b) 10 days
c) 8 days
d) 6 days

Q.295 A cistern is normally filled in 5 hours. However, it takes 6 hours when there is leak in its bottom, If the cistern is full, in what time shall the leak empty it?
a) 6h
b) 5h
c) 30h
d)15h

Q.296 Pipe A and B running together can fill a cistern in 6 minutes. If B takes 5 minutes more than A to fill the cistern, then the time in which A and B will fill the cistern separately will be respectively?
a) 15min,20min
b) 15min,10 min
c) 10 min,15 min
d) 25 min, 20 min

Q.297 A takes 5 days more than B to do a certain job and 9 days more than C. A and B together can do the job in the same time as C. How many days A would take to do it?
a)16 days
b)10 days
c)15 days
d)20 days

Q.298 There are two pipes in a tank. .Pipe A is for filling the tank and Pipe B is for emptying the tank. If A can fill the tank in 10 hours and B can empty the tank in 15 hours then find how many hours will it take to completely fill a half empty tank?
a)30 hours
b)15 hours
c)20 hours
d)33.33 hours

Q.299 A, B, and C can do some work in 236 days. A and B together do twice as much work as C alone and A and C together can do thrice as much work as B alone. Find the time taken by C to do the whole work.
a)72 days
b)96 days
c)108 days
d)120 days

Q.300 There are three taps A, B, and C in a tank. They can fill the tank in 10 hrs, 20 hrs and 25 hrs respectively. At first, all of them are opened simultaneously. Then after 2 hours, tap C is closed and A and B are kept

running .After the 4th hour, tap B is also closed. The remaining work is done by tap A alone. Find the percentage of the work done by tap A by itself.

a)32%　　　　　　b)52%
c)75%　　　　　　d)None of these

Q.301 A man riding his bicycle covers 225m in 15s. What is his speed in km/h?
a) 45 km/h　　　　b) 75 km/h
c) 36 km/h　　　　d) None of these

Q.302 A car covers the first 150 km in 3 h, the next 100km in 5 h and the remaining 60 km in 2 h. What is the average speed of the car?
a) 31 km/h　　　　b) 33 km/h
c) 36 km/h　　　　d) 39 km/h

Q.303 Kunal covers a distance by walking for 5h While returning his speed decreases By 3km/h and he take 8 h to cover the same distance. What was his speed in return journey?
a) 5 km/h　　　　b) 5.2 km/h
c) 5.4 km/h　　　　d) 5.6 km/h

Q.304 A car completes a certain journey in 11h. It covers half the distance at 50 km/h and the rest at 60 km/h The length of the journey is
a) 600 km　　　　b) 610 km
c) 700 km　　　　d) 710 km

Q.305 A train covers distance of 15 km, 30 km and 60 km at speed of 30 km/h, 45km/h and 90km/h respectively. The average speed of the train was
a) 58 km/h　　　　b) 72 km/h
c) 48 km/h　　　　d) none of these

Q.306 A man travelled a distance of 56 km in 7 h. He travelled partly on foot at 3 km/h and partly on partly on bicycle at 10 km/h. The distance travelled on bicycle is
a) 6 km　　　　b) 50 km
c) 8 km　　　　d) 48 km

Q.307 Excluding stoppages the speed of a bus is 24 km/h and including stoppages it is 20 km/h. For how many minutes does the bus stop per hour?
a) 10 min　　　　b) 8 min
c) 6 min　　　　d) 4min

Q.308 Two men starting from the same place walk at the rate of 5 km/h and 5.6 km/h respectively. What time will they take to be 3 km apart, if they walk in the same direction?
a) 3 h　　　　b) 4 h
c) 5 h　　　　d) 6 h

Q.309 Two trains start from A and B respectively and travel towards each other at a speed of 50 km/h and 75 km/h respectively .By the time they meet, the second train has travelled 40 km more than the first. The distance between A and B is
a) 170 km　　　　b) 180 km
c) 190 km　　　　d) 200 km

Q.310 Two trains of length 110 m and 90 m are running on parallel lines in the same direction with a speed of 45 km/h and 50 km/h respectively. In what time will they pass other?
a) 136 s　　　　b) 138 s
c) 142 s　　　　d) None of these

Q.311 A train of length 150 m takes 10 s to pass over. Another train 100 m long coming from the opposite direction. If the speed of the first train is 36 km/h the speed of the second train is
a) 36 km/h　　　　b) 48 km/h
c) 54 km/h　　　　d) 65 km/h

Q.312 A man can row upstream at 7 km/h and downstream at 11 km/h. What is the man's rate in still water?
a) 9 km/h　　　　b) 9.4 km/h
c) 10 km/h　　　　d) 10.4 km/h

Q.313 A man can row up stream at 4 km/hr and downstream at 7 km/h . What is the rate of the current?
a) 1.5 km/h　　　　b) 1.8 km/h
c) 2.1 km/h　　　　d) 2.4 km/h

Q.314 A boatman can row 48km downstream in 4 h. If the speed of the current is 3 km/h. then find in what time will he be able to cover 15 km upstream?
a)1 h 45 min   b) 2 h 30 min
c) 3 h 12 min   d) 3 h 40 min

Q.315 In a stream running at 2 km/h a motor boat goes 32 km upstream and back again to the starting. Point in 12 h. Find the speed of the motor boat in still water.
a)6 km/h   b) 8 km/h
c) 10 km/h   d) 12 km/h

Directions for Ques. No. 316 to 317
Read the following information and answer question given below it. Two men A and B start together from the same point to walk around a circular path 9km long. A walks 5km and B walks 2 km an hour in the same direction.

Q.316 When will they first meet?
a)3 h   b) 4 h
c) 5 h   d) 6 h

Q.317 When will they first meet at the starting point?
a) 4 h   b) 6 h
c) 9 h   d) 12 h

Q.318 A 320 m long train takes 80 s more to cross a platform twice its length then it takes to cross a pole at the same speed. What is the speed of the train in m/s?
a) 16   b) 10
c) 6   d) Can't be determine

Q.319 Amit, Sucheat and Neeti started running, around a circular track and complete one round in 18, 24, and 32 seconds respectively. In how many second will the three meet again at the starting point if they all have started running at the same time?
a) 196   b) 288
c) 324   d) None of these

Q.320 A 180 m long train crosses a platform of equal length in 18s.What is the speed of the train?
a) 22 m/s   b) 10 m/s
c) 15 m/s   d) None of these

Q.321 Two trains start at the same time from Aligarh and Delhi and proceed towards each other at the rate of 16 km and 21 km per hour respectively. When they meet, it is found that one train has travelled 60 km more than the other. The distance between two stations is
a) 445 km   b) 444 km
c) 440 km   d) 450 km

Q.322 A monkey climbing up a greased pole ascends 10 m and slips down 3 m in alternate minutes. If the pole is 63 m high, how long will it take him to reach the top?
a) 16 min 42 sec b) 16 min 40 sec
c) 18 min 42 sec d) None of these

Q.323 For covering a distance X km, a man takes t hours. If he moves 3 kmph faster, he takes 40 min less. But if he moves 2 kmph slower, he takes 40 more min. Then X is equal to
a) 20 km   b) 36 km
c) 37.5 km   d) 40 km

Q.324 In the above problem, the original speed of the man is
a) 18 kmph   b) 12 m/sec
c) 3.33 m/sec   d) 16 kmph

Q.325 A thief sports a policemen 100 m away and takes to his heels. If the policeman gives a chase immediately, then how far would the thief have run before he is overtaken? The speeds of the thief and policeman are 8 and 10 kmph respectively.
a) 500 m   b) 200 m
c) 400 m   d) 2 km

Q.326 A train leaves Indore at 6 am and reaches Bhopal at 10 am. Another train leaves Bhopal at 8 am and

reaches Indore at 11.30 am. At what time do the two trains cross one another? (Assume uniform speeds throughout.)
a) 8 : 56 am   b) 8 : 52 am
c) 7 : 56 am   d) 7 : 52 am

Q.327 Two trains travel in opposite directions at 36 kmph and 45 kmph and a man sitting in slower train passes the faster train in 8 seconds. The length of the faster train is:
a) 80 m   b) 100 m
c) 120 m   d) 180 m

Q.328 Two trains, each 100 m long, moving in opposite direction, cross each other in 8 seconds. If one is moving twice as fast the other, then the speed of the faster train is:
a) 30 km/hr   b) 45 km/hr
c) 60 km/hr   d) 75 km/hr

Q.329 A train 150 m long passes a km stone in 15 seconds and another train of the same length travelling in opposite direction in 8 seconds. The speed of the second train is:
a) 60 km/hr   b) 66 km/hr
c) 72 km/hr   d) 99 km/hr

Q.330 A train X starts from Meerut at 4 p.m. and reaches Ghaziabad at 5 p.m. while another train Y starts from Ghaziabad at 4 p.m. and reaches Meerut at 5.30 p.m. The two trains will cross each other at:
a) 4.36 p.m.   b) 4.42 p.m.
c) 4.48 p.m.   d) 4.50 p.m.

Q.331 The speed of a boat in still water is 15 km/hr and the rate of current is 3 km/hr. The distance travelled downstream in 12 minutes is:
a) 1.2 km   b) 1.8 km
c) 2.4 km   d) 3.6 km

Q.332 A man can row $\frac{1}{3}$ kmph in still water and finds that it takes him thrice as much time to Row up than as to row

down the same distance
a) $3\frac{1}{3}$ km / hr   b) $3\frac{1}{9}$ km / hr
c) $4\frac{2}{3}$ km / hr   d) $4\frac{1}{2}$ km / hr

Q.333 The speed of a boat in still water is 10 km/hr. If it can travel 26 km downstream and 14 km upstream in the same time, the speed of the stream is:
a) 2 km/hr   b) 2.5 km/hr
c) 3 km/hr   d) 4 km/hr

Q.334 A boat covers 24 km upstream and 36 km downstream in 6 hours while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. The speed of the current is:
a) 1 km/hr   b) 1.5 km/hr
c) 2 km/hr   d) 2.5 km/hr

Q.335 A person divides his total route of journey into three equal parts and decides to travel the three parts at the speeds of 80 kmph, 60 kmph and 30 kmph respectively. What is the average speed during the journey?
a) 40 kmph   b) 45 kmph
c) 48 kmph   d) 49 kmph

Q.336 A bus travels 3 hrs at 60 kmph, 4 hrs at 50 kmph and next 5 hrs at 59 kmph. Find its average speed.
a) 52 kmph   b) 46 kmph
c) 50 kmph   d) 56.25 kmph

Q.337 A train traveling at 72 km/hr crosses a platform in 30 seconds and a man standing on the platform in 18 seconds. What is the length of the platform in meters?
a) 220m   b) 260m
c)240m   d) 200m

Q.338 In a kilometer race, A beats B by 100 m or 15 seconds. How long does A take to complete the race?
a) 200s   b) 125s
c)135s   d) 155s

Q.339 A man is late by 30 minutes if he travels the distance from his house to office at a speed of 50 km/hr. If he increases his speed by 25 km/hr, he reaches his office 20 minutes early. Find the distance between his house and office, and also the speed required to reach the office in time.
a) 125km; 75kmp
b) 125km;62.5kmph
c)180km;75kmph
d)180km; 72.5kmph

Q.340 In a 1 km race, A beats B by 200m and C by 360 m. In a race of 500m, by how many meters would B beat C?
a) 90m   b) 80m
c) 100m   d) 40m

Q.341 There are 5 routes from pace A to B and 2 routes from place B to C. Find how many routes are there from A to C via B.
a) 7   b) 10
c) 8   d) 12

Q. 342 5children are to be seated on a bench. In how many ways can it be if the eldest child always sits in the middle?
a) 48   b) 12
c) 36   d) 24

Directions for Ques. No. 34 3 to 344
In how many ways can 3 prizes be distributed among 4 boys when

Q. 343 No boy gets more than one prize?
a) 36   b) 24
c) 64   d) 48

Q. 344 A boy gets any number of prizes?
a) 36   b) 24
c) 64   d) 48

Q. 345 Find the number of ways of arranging 6 boys and 4 Girls in a row so that all the girls sit together.
a) $7! \times 4!$ b) $7 \times 4!$

c) $7! \times 4$ d) $7! \times 4! \times 2!$

Q. 346 How many 4 letter words can be made using the letters of the words "ORIENTAL'.
a) 1660   b) 1650
c) 1640   d) none of these

Q. 347 How many different words can be formed using all the letters of the word 'CHEESE'?
a) 124   b) 120
c) 125   d) 128

Q. 348 Find the number of ways of arranging the host and 8 guests at a circular table so that the host always sits in a particular seat?
a) 4!   b) 8!
c) 6!   d) 9!

Q. 349 Find the number of different ways of forming a committee consisting of 3 men and 3 women from 6 men and 5 women.
a) 190   b) 200
c) 210   d) 220

Q. 350 Find the number of ways in which 6 players out of 11 players can be selected so, as to include 3 particular players.
a) 56   b) 54
c) 45   d) 65

Q. 351 Find the number of ways in which 8 players out of 12 players can be selected such that 2 particular players are always included and 3 particular players are always exclude?
a)6   b) 7
c) 8   d) 9

Q.352 Find the number of diagonals of a polygon with 8 sides.
a) 16   b) 20
c) 24   d) 28

Q.353 In a meeting, there are 20 delegates. If each delegate shakes hand with every other delegate.

Find the total number of handshakes in the meeting.
a) 110   b) 145
c) 190   d) Can't be determined

Directions for Ques. No. 354, 355, 355
Read the following information and the question and answer the question given below it. A committee of 7 members has to be formed from 9 men and 4 women. In how many ways can this be done when the committee consists of?

Q. 354 Exactly 3 women ?
a) 504   b) 505
c) 506   d) 507

Q. 355 At least 3 women ?
a) 586   b) 587
c) 588   d) 589

Q. 356 At the most 3 women ?
a) 1634   b) 1633
c) 1632   d) 1631

Directions for Ques. No. 357 ,358, 359, 360
From the following, different committees are to be made as per the requirement given in each question. In how many different ways can it be done from 10 men and 8 women out of which 5 men are teachers, 3 men are doctors, and 2 are business men. Among the women, 3 are teachers, 2 are doctors, 2 are researchers and 1 is social worker.

Q. 357 A committee of 5 in which 3 men and 2 women are there.
a) 3360   b) 8568
c) 4284   d) 1680

Q. 358 A committee of 5 in which 2 men teachers, 2 women teachers, and 1 doctor are there.
a) 75   b) 150
c) 214   d) 20

Q. 359 A committee of 7.

a) 31824   b) 1200
c) 9600   d) 15912

Q.360 A committee of 3 in which there is no teacher and no doctor.
a) 100   b) 120
c) 10   d) 12

Q.361 A five lettered word is formed with the letters {a, b, h, i, p, r, s} How many of them will be palindromes ?
a)125   b)225
c)343   d)729

Q.362 In how many ways can 13 beads be arranged in a necklace?
a) $\dfrac{13!}{2!}$ b)12!

c) $12! \times 2!$ d) $\dfrac{12!}{2!}$

Q.363 How many four digit numbers greater than 6800 can be formed using the digits 3,5,6,7, 8 where repetition of digits is allowed?
a)130   b)180
c)195   d)275

Q.364 From a company which contains 6 women and 5 men , a committee of 5 persons is to be formed. In how many ways can this committee be formed so that it consists of more women than men?
a)125   b)150
c)275   d)281

Q.365 How many numbers between 2000 and 3000 can be formed with the digits 0,1,2,3,4,56,7 (repetition of digits not allowed?
a)42   b)210
c)336   d)440

Q.366 In how many ways can a person send invitation cards to 6 of his friends if he has four servants to distribute the cards?
a)6^4 b) 4^6
c)24   d)120

Q.367 In how many ways can 7 Indians, 5 Pakistanis and 6 Dutch be seated in a row so that all persons of the same nationality sit together?
a)3!   b)7!5!6!
c)3!,7!,5!,6!   d)182

Q.368 There is a question paper consisting of 15 questions. Each question has an internal choice of 2 options. In how many ways can a student attempt one or more questions of the given fifteen questions in the paper?
a) 3^7 b) 3^8
c) 3^{15} d) $3^{15} - 1$

Q.369 How many numbers can be formed with the digits 1,6,7,8,6,1 so that the odd digits always occupy the odd places?
a)15   b)12
c)18   d)20

Q.370 Find the number of 6-digit numbers that can be found using the digits 1,2,34,5,6, once such that the 6-digit number is divisible by its unit digit.(The unit digit is not 1)
a)620   b)456
c)520   d)528

Q.371 In a class with boys and girls a chess competition was played wherein every student had to play 1 game with every other student. It was observed that in 36 matches both the players were boys and in 66 matches both were girls. What is the number of matches in which 1 boy and 1girl play against each other?
a)108   b)189
c)210   d)54

Q.372 The letters of the word ALLAHABAD are rearranged to form new words and put in a dictionary. If the dictionary has only these words and one word on every page in alphabetical order then what is the page number on which the word LABADALAH comes?
a)6089   b)6088
c)6087   d)6086

Q.373 There are nine points in a plane such that exactly three points out of them are collinear. Find the number of triangles that can be formed using these points as vertices.
a)81   b)90
c)9   d)83

Q.374 One red flag, three white flags and two blue flags are arranged in a line such that,
a) no two adjacent flags are of the same color
b) the flags at the two ends of the line are of different colors.
In how many different ways can the flags be arranged?
a)6   b)4
c)10   d)2

Q.375 Let n be the number of different 5-digit numbers, divisible by 4 that can be formed with the digits 1,2,3,4,5 and 6 with no digit being repeated. What is the value of n?
a)144   b)168
c)192   d)none of these

Q.376 In how many ways is it possible to choose a white square and a black square on a chess board so that the squares must not lie in the same row or column?
a)56   b)896
c)60   d)768

Q.377 A group contains 'n' person. If the number of ways of selecting 7 person is equal to the number of ways of selecting 10 persons. Then the number of ways of selecting 5 person from the group is
a) $^{10}C_5$ b) $^7C_5$
c) $^{17}C_5$ d) $^{17}C_{10}$

Q.378 A man has 7 friends .In how many ways can he invite at least one of his friends for a dinner?
a)63   b)120
c)127   d)256

Q.379 In triangle PQR, the sides PQ, QR and RP contain 5, 6 and 7 points respectively. How many triangles can be formed by joining these points?
a)751   b)826
c)900   d)936

Q.380 18 people are to travel by a van and a car. The van can carry 10 people and the car can carry 8.In how many ways can the group be distributed between the van and the car, if four people refused to travel by a car?
a)330   b)440
c)770   d)890

Q.381 An unbiased dice is thrown. What is the probability of getting a multiple of 3?
a) $\dfrac{1}{3}$ b) $\dfrac{1}{4}$
c) $\dfrac{2}{3}$ d) $\dfrac{1}{2}$

Q.382 Two dice are thrown simultaneously. What is the probability that the sum of the two numbers appearing on the top of the dice is 7.
a) $\dfrac{1}{6}$ b) $\dfrac{1}{5}$
c) $\dfrac{3}{5}$ d) $\dfrac{1}{3}$

Q.383 What is the probability that a number selected from the numbers 1,2,3,…. 50 is a prime number when each of the given numbers is equally likely to be selected.
a) $\dfrac{1}{10}$ b) $\dfrac{3}{10}$
c) $\dfrac{7}{10}$ d) $\dfrac{1}{5}$

Q.384 Tickets numbered from 1 to 29 are mixed up together and then a ticket is drawn at random. What is the probability that the ticket has a number which is a multiple of 4 or 5 ?
a) $\dfrac{13}{29}$ b) $\dfrac{15}{29}$
c) $\dfrac{18}{29}$ d) None of these

Q.385 45 cards numbered 1,2,3,….45 are put in box and mixed thoroughly . One person draws a card from the box. Find the probability that the number on the card is divisible by 2 and 5 both.
a) $\dfrac{4}{45}$ b) $\dfrac{5}{18}$
c) $\dfrac{7}{45}$ d) $\dfrac{11}{18}$

Q.386 A bag contains mango flavored candies only. A girl takes out 2 candies without looking into the bag. What is he probability that she takes out only mango flavored candies ?
a)0   b) 1
c) $\dfrac{1}{2}$ d) $\dfrac{1}{3}$

Q.387 Three numbers are chosen from 1 to 8. Find the probability for the 3 chosen numbers to be consecutive.
a) $\dfrac{11}{28}$ b) $\dfrac{3}{28}$
c) $\dfrac{5}{28}$ d) $\dfrac{9}{28}$

Q.388 Cards are drawn at random from a pack of 250 cards numbered 1 to 250. Find the probability of drawing a number which is a perfect cube?
a) $\dfrac{12}{125}$ b) $\dfrac{9}{125}$
c) $\dfrac{3}{125}$ d) $\dfrac{1}{125}$

Directions for Ques. Nos. 389, 390, 391
A bag contains 5 white & 6 green balls. 5 balls are drawn at random. Find the probability that

Q.389 3 white and 2 green balls are chosen

a) $\dfrac{13}{18}$ b) $\dfrac{14}{81}$

c) $\dfrac{25}{77}$ d) $\dfrac{26}{77}$

Q.390 2 white and 3 green balls are chosen

a) $\dfrac{13}{18}$ b) $\dfrac{14}{81}$

c) $\dfrac{25}{77}$ d) None of these

Q.391 All the 5 balls are of the same color.

a) $\dfrac{1}{66}$ b) $\dfrac{3}{49}$

c) $\dfrac{5}{66}$ d) $\dfrac{1}{49}$

Directions for Ques. No. 392 ,393
A bag contains 2 black balls and 4 red balls. A ball is drawn at random

Q.392 Find the odds in favor of getting a black ball
a) 2:1 b) 1: 2
c) 1:3 d) 3:1

Q.393 Find the odds against getting a black ball
a) 2:1 b) 1:2
c) 1:3 d) 3:1

Directions for Ques. No. 394 to 395
Study the information carefully to answer the question that follows
A basket contains 3 blue, 2 green & 5 red balls.

Q.394 If three balls are picked at random, what is the probability that at least one is red?

a) $\dfrac{1}{2}$ b) $\dfrac{7}{12}$

c) $\dfrac{11}{12}$ d) $\dfrac{1}{5}$

Q.395 If four are picked at random , what is the probability that two are green and two are blue?

a) $\dfrac{1}{18}$ b) $\dfrac{1}{70}$

c) $\dfrac{3}{5}$ d) $\dfrac{1}{2}$

Directions for Ques. No. 396 to 398
Study he information and the question that follow.
A basket contains 3 red balls 5 blue balls and 2 green balls

Q.396 If three balls are drawn at random, what is the Probability that none is blue?

a) $\dfrac{1}{6}$ b) $\dfrac{1}{12}$

c) $\dfrac{1}{5}$ d) $\dfrac{3}{10}$

Q.397 If four balls are drawn at random, what is the probability that at least one is green?

a) $\dfrac{2}{3}$ b) $\dfrac{1}{2}$

c) $\dfrac{1}{3}$ d) $\dfrac{2}{5}$

Q.398 If two balls are drawn at random, what is the probability that both are red?

a) $\dfrac{1}{5}$ b) $\dfrac{3}{10}$

c) $\dfrac{3}{5}$ d) $\dfrac{1}{15}$

Directions for Ques. No. 399 to 400
A box contains 8 red, 16 blue, 4 yellow and 12 black balls

Q.399 One ball is picked up randomly. What is the probability that is not blue?
a) 0.24 b) 0.8
c) 0.3 d) None of these

Q.400 Two balls are picked up randomly. What is he chance that both are red?

a) $\dfrac{56}{4039}$ b) $\dfrac{1}{5}$

c) $\dfrac{7}{39}$ d) $\dfrac{7}{195}$

Q.401 What is the probability that a non-leap year has 53 Tuesday?

a) $\dfrac{6}{7}$ b) $\dfrac{1}{7}$

c) $\dfrac{5}{7}$ d) $\dfrac{4}{7}$

Q.402 A three digit number is chosen at random. What is the probability that the number chosen is a multiple of 5?

a) $\dfrac{2}{3}$ b) $\dfrac{1}{5}$

c) $\dfrac{1}{4}$ d) $\dfrac{3}{5}$

Q.403 A person tosses an unbiased coin. When lead turns up, he gets Rs10 and tail turns up the losses Rs. 5 If three coins are tosses. What is the probability that he gets no money?

a) $\dfrac{1}{8}$ b) $\dfrac{3}{8}$

c) $\dfrac{1}{4}$ d) $\dfrac{1}{2}$

Q.404 A and B are two independent events. The probability that both A and B occur is $\dfrac{1}{6}$ and the probability of the occurrence A can be

a) $\dfrac{1}{4}$ b) $\dfrac{1}{3}$

c) $\dfrac{1}{8}$ d) $\dfrac{1}{10}$

Q.405 The odds against A solving a problem are 3:5 and odds in favour of B solving the same problem are 4:7. The probability that both of them solve the problem is

a) $\dfrac{1}{22}$ b) $\dfrac{3}{22}$

c) $\dfrac{5}{22}$ d) $\dfrac{7}{22}$

Q.406 One square is selected from an 8 × 8 chess board What is the probability that it is a square of size 3 × 3

a) $\dfrac{3}{17}$ b) $\dfrac{1}{9}$

c) $\dfrac{2}{17}$ d) $\dfrac{5}{34}$

Q.407 100 students appeared for two examinations. 60 passed the first, 50 passed the second and 30 passed both .Find the probability that a student selected at random has failed in both the examinations?

a) $\dfrac{1}{5}$ b) $\dfrac{1}{7}$

c) $\dfrac{5}{7}$ d) $\dfrac{5}{6}$

Q.408 Amit throws three dice in a special game of Ludo. If it is known that the needs 15 or higher in this throw to win then find the chance of his winning the game.

a) $\dfrac{5}{54}$ b) $\dfrac{17}{216}$

c) $\dfrac{13}{216}$ d) $\dfrac{15}{216}$

Q.409 The odds against an event is 5:3 and the odds in favour of another independent event is 7:5 .Find the probability that at least one of the two events will occur.

a) $\dfrac{52}{96}$ b) $\dfrac{69}{96}$

c) $\dfrac{71}{96}$ d) $\dfrac{13}{96}$

Q.410 Kamal and Monica appeared for an interview for two vacancies. The probability of Kamal's selection is 1/3 and that of Monica's selection is 1/5.Find the probability that only one of them will be selected.

a) $\dfrac{2}{5}$ b) $\dfrac{1}{5}$

c) $\dfrac{5}{9}$ d) $\dfrac{2}{3}$

Q.411 Two fair dices are thrown .Given that the sum of the dice is less than

or equal to 4, find the probability that only one dice shows two.

a) $\dfrac{1}{4}$ b) $\dfrac{1}{2}$

c) $\dfrac{2}{3}$ d) $\dfrac{1}{3}$

Q.412 A can hit target 3 times in 6 shots, B 2 times in 6 shots and C 4 times in 6 shots .They fire a volley. What is the probability that at least 2 shots hit?

a) $\dfrac{1}{2}$ ` b) $\dfrac{1}{3}$

c) $\dfrac{2}{3}$ d) $\dfrac{3}{4}$

Q.413 There are two bags, one of them contains 5 red and 7 white balls and the other 3 red and 12 white balls. And a ball is to be drawn from one or the other of the two bags. Find the chance of drawing a red ball.

a) $\dfrac{37}{120}$ b) $\dfrac{30}{120}$

c) $\dfrac{11}{120}$ d)None of these

Q.414 Out of all the 2-digit integers between 1 to 200, a 2-digit number has to be selected at random. What is the probability that the selected number is not divisible by 7?

a) $\dfrac{11}{90}$ b) $\dfrac{33}{90}$

c) $\dfrac{55}{90}$ d) $\dfrac{77}{90}$

Q.415 A child is asked to pick up 2 balloons from a box containing 10 blue and 15 red balloons. What is the probability of the child picking, at random, 2 balloons of different colors?

a) $\dfrac{1}{2}$ b) $\dfrac{2}{3}$

c) $\dfrac{1}{3}$ d) $\dfrac{3}{5}$

Q.416 If 4 whole numbers are taken at random and multiplied together, what is the chance that the last digit in the product is 1,3,7 or 9 ?

a) $\dfrac{15}{216}$ b) $\dfrac{12}{542}$

c) $\dfrac{16}{625}$ d) $\dfrac{17}{625}$

Q.417 Three of the six vertices of a regular hexagon are chosen at random .The probability that the triangle with these vertices is equilateral is

a) $\dfrac{1}{10}$ b) $\dfrac{3}{10}$

c) $\dfrac{1}{5}$ d) $\dfrac{4}{10}$

Q.418 Eleven books, consisting of five Engineering books, four Mathematics books and two Physics books, are arranged in a shelf at random. What is the probability that the books of each kind are all together?

a) $\dfrac{4}{165}$ b) $\dfrac{2}{165}$

c) $\dfrac{3}{165}$ d) $\dfrac{1}{165}$

Q.419 12 persons are seated around a round table .What is the probability that two particular person sit together?

a) $\dfrac{2}{11}$ b) $\dfrac{1}{6}$

c) $\dfrac{3}{11}$ d) $\dfrac{3}{15}$

Q.420 A bag contains 100 tickets numbered 1, 2, 3... 100. If a ticket is drawn out of it at random .What is the probability that the ticket drawn has the digit 2 appearing on it?

a) $\dfrac{19}{100}$ b) $\dfrac{21}{100}$

c) $\dfrac{32}{100}$ d) $\dfrac{23}{100}$

Q.421 In the figure, ΔABC is similar to ΔEDC
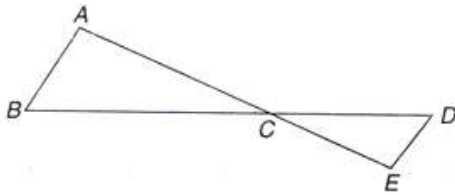
If we have AB=4cm,
ED=3cm,CE=4.2 and
CD=4.8 cm,
Find the value of CA and CB
a)6cm, 6.4 cm   b)4.8 cm, 6.4 cm
c)5.4 cm, 6.4 cm   d)5.6 cm, 6.4 cm

Q.422 Two ploes of height 6m and 11m stand vertically upright on a plane ground .If the distance between their foot is 12m, find the distance between their tops.
a)12cm   b)14cm
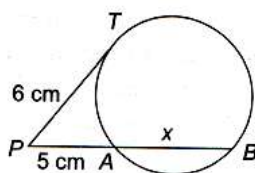c)13cm   d)11cm

Q.423 If O is the centre of circle, find ∠x
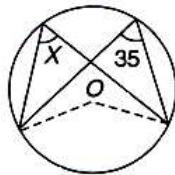
a)35°   b) 30°
c) 39°   d) 40°

Q.424 Find the value of x in the given figure.

a)2.2cm   b)1.6cm
c)3cm   d)2.6cm

Q.425 Find the value of x in the given figure.
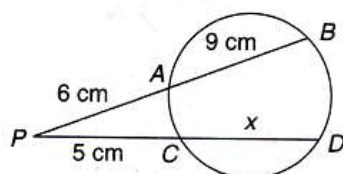
a)13cm   b)12cm
c)16cm   d)15cm

Q.426 ABC is a right angled triangle with BC=6cm & AB=8cm. A circle with centre 0 and radius x has been inscribed in ΔABC. What is the value of x .
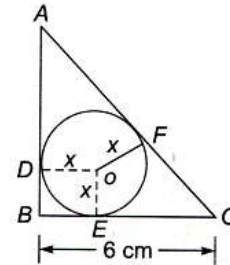
a)2.4cm   b)2cm
c)3.6cm   d)4cm

Q.427 In the given figure find ∠ADB
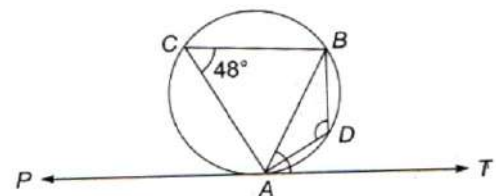
a) 132°   b) 144°
c) 48°   d) 96°

Q.428 In the given two straight line PQ and RS intersect each other at O. If ∠SOT=75°, find the value of a, b, and c
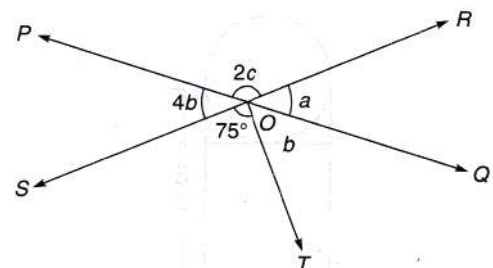
a) a=84°,b=21°,c=48°
b) a=48°,b=20°,c=50°
c) a=72°,b=24°,c=54°
d) a=64°,b=28°,c=45°

Q.429 In the following figure, it is given that O is the centre of the circle and ∠AOC=140° Find ∠ABC
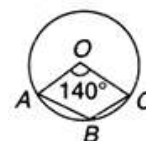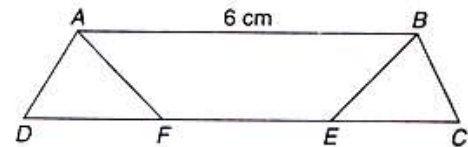

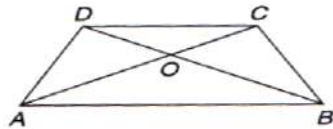a) 110°   b) 120°
c) 115°   d) 130°

Q.430 In a triangle ABC, point D is on side AB and point E is on side AC, such that BCED is a trapezium. DE : BC = 3:5. Calculate the ratio of the area of ΔADE and the trapezium BCED
a)3:4   b)9:16
c)3:5   d)9:25

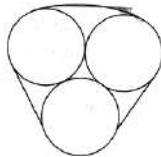**Q.431** In the adjoining figure, ABCD is a trapezium in which AB||DC and AB=3DC. Determine the ratio of the areas of (ΔAOB and ΔCOD).
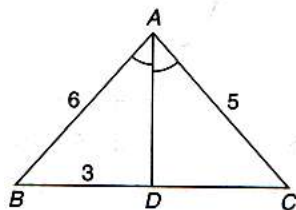

a)9:1   b)1:9
c)3:1   d)1:3

Q.432 The diagram below represents three circular garbage cans, each of diameter 2m. The three cans are touching as shown fig , in meters , the perimeter of the rope encompassing the three cans.

a) 2π+6   b) 3π+6
c) 4π+6   d) 6π+6

Q.433 In the above figure, AD is the bisector of ∠BAC, A B= 6cm AC=5cm and BD = 3cm. Find DC,

a)11.3cm   b)2.5cm
c)3.5cm   d)4cm

Q.434 ABCD is a trapezium in which AB is parallel to DC, AD=BC, AB=6 cm, AB=EF and DF=EC. If two lines AF and BE are drawn so that area of ABEF is half of ABCD. Find DF/CD.

a)1/4   b)1/3
c)2/5   d)1/6

Q.435 The length ,breadth and height of a room are in the ratio of 3 : 2 : 1. If its volume be $1296 \, m^3$, find tits bredth
a)18meters   b)19 meters
c)16 meters   d)12meters

Q.436 The volume of a cube is $216 cm^3$ Part of this cube is then melted to form a cylinder of length 8 cm. Find the volume of the cylinder.
a) $343 cm^3$ b) $216 cm^3$
c) $36 cm^3$ d)Data indadequate

Q.437 Three metal cubes with edges 6cm, 8cm and 10 cm respectively are melted together and formed into a single cube. Find the side of the resulting cube.
a)11cm   b)12cm
c)13cm   d)24cm

Q.438 Find curved and total surface area of a conical flask of radius 6cm and height 8cm.
a) 60π 96π   b) 20π 96π
c) 60π 48π   d) 30π 48π

Q.439 The volume of a right circular cone is $100 \pi cm^3$ and its height is 12 cm. Find its curved surface area.
a) $130 \pi cm^3$ b) $65 \pi cm^3$
c) $204 \pi cm^3$ d) $65 cm^3$

Q.440 The diameters of two cones are equal. If their slant height be in the ratio 5:7, find the ratio their curved surface areas.
a)25:7   b)25:49
c)5:49   d)5:7

Q.441 The ratio of radii of a cylinder to a that of a cone is 1:2.If their heights are equal, find the ratio of their volumes

a)1:3   b)2:3

c)3:4   d)3:1

Q.442 A silver wire when bent in the form of a square, encloses an area of $484cm^2$. Now if the same wire is bent to form a circle , the area of enclosed , by it would be

a) $308cm^2$ b) $196cm^2$

c) $616cm^2$ d) $88cm^2$

Q.443 Seven equal cubes each of side 5cm are joined end to end. Find the surface area of the resulting cuboid .

a) $750cm^2$ b) $1500cm^2$

c) $2250cm^2$ d) $700cm^2$

Q.444 In a swimming pool measuring 90m by 40 m, 150 men take a dip. If the average displacement of water by a man is 8 cubic meters, what wil be rise in water level ?

a)30cm   b)50cm

c)20cm   d)33.333cm

Q.445 How many meters of cloths 5m wide will be required to make a conical tent , the radius of whose base is 7m and hight is 24 m?

a)55m   b)330m

c)220m   d)110m

Q.446 A closed wooden box measures externally 10cm long ,8 cm broad and 6cm high. Thickness of wood is 0.5cm. Find the volume of wood used.

a) 230cubic cm   b)165cubic cm
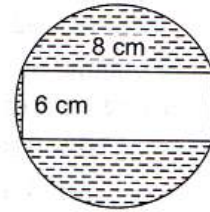
c)330 cubic cm   d)300 cubic cm

Q.447 The largest cone I formed at the base of a cube of side measuring 7cm Find the ratio of volume of cone to cube.

a)20:21   b)22:21

c)21:22   d)42:11

**Q.448** Find the radius of the circle is circumscribed in a triangle whose sides are 8cm. 15cm and 17cm

a)4cm   b)5cm

c)3cm   d) $2\sqrt{2}$cm

Q.449 In the adjacent figure, find the area of the shaded region. (Use=22/7)

a)$15.28cm^2$ b) $61.14cm^2$

c) $30.57cm^2$ d) $40.76cm^2$

Q.450 The diagram represents the area swept By the wiperof a car. With the dimensions given in the figure, calculated the shaded area swept by the wiper .
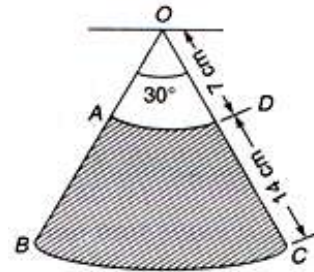
a)102.67 cm   b)205.34 cm

c) 51.33cm   d)208.16 cm

Directions for Q. 451 to Q.455

Study the following table carefully to answer these questions :

Subject	History	Geography	Maths	Science	Eng	Hindi
Max Marks	75	75	100	150	50	60

Q. 451 what are the average marks obtained by all the students in Science out of 150?

a) 75   b) 112.50

c) 108.50   d) 78

Q.452 What are the total marks obtained by B in all the subjects together?

a) 336   b) 223

c) 446   d)none of these

Q.453 Marks obtained by C in Science is approximately what per cent of his total marks obtained in all the six subjects together?

a) 22   b) 16

c) 20   d) 28

Q.454 What is the ratio of the total marks obtained by D in Maths, Science and English together to the total marks obtained by F in these subjects together?
a) 209:215 b) 215:209
c) 206:223 d) 223:206

Q.455 What are the average marks obtained by all students in Geography?
a) 54.25 b) 54.75
c) 73 d) 71

Directions for Q.456 to Q.460
Study the following table carefully and answer the questions given below:
Annual Income of Various Individuals over the Years (Income in Lakhs)

Year	Individual					
	A	**B**	**C**	**D**	**E**	**F**
2002	5.5	3.2	4.8	6.35	6.15	3.5
2003	5.65	3.25	4.85	6.55	6.25	3.65
2004	5.7	3.725	4.95	7.155	6.425	3.75
2005	6.2	4.25	5.1	7.35	7.15	4
2006	6.5	4.5	5.2	7.4	7.25	4.25
2007	6.75	5	5.25	7.48	7.285	4.8
2008	7	5.35	5.3	8	7.3	5.1

Q.456 What is the approximate average monthly income of A over the years?
a) Rs. 44762 b) Rs.48348
c) Rs. 53216 d) none of these

Q.457 What is the ratio of the annual income of B to that of C in the year 2005?
a) 6:5 b) 6:7
c) 5:6 d) 7:6

Q.458 What is the difference between the total annual income of all the individuals in the year 2003 and the total annual income of all the individuals in the year 2007?
a) Rs. 736500 b) Rs.645400
c) Rs. 636500 d) Rs.743300

Q.459 The annual income of E in the year 2004 is approximately what per cent of the average annual income earned by E over the years?
a) 98 b) 86
c) 88 d) 94

Q.460 What is the average annual income of F over the years?
a) Rs. 416000 b) Rs.425000
c) Rs.401500 d) none of these

Directions for Q.461 to Q.465
Study the pie-charts carefully to answer the questions that follow.
Chart I gives : Percentage distribution of candidates studying in various disciplines of a college.
 Total Number of students=4800
Chart II give : Percentage of breakup of girl students in each dicipline. Total Number of girls =2000
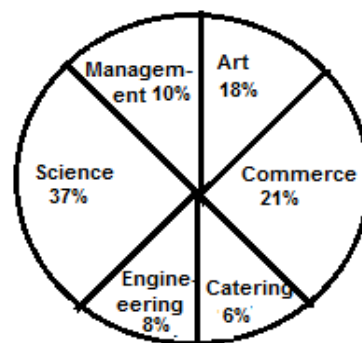
Chart I
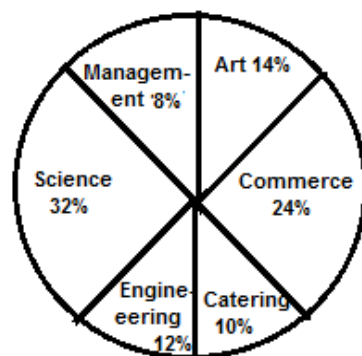
Chart II

Q.461 What is the number of girls studying in Engineering discipline?
a) 180 b) 220
c) 320 d) none of these

Q.462 Which discipline has the highest number of boys studying in it ?
a) Science b)commerce
c) Arits d)None of these

Q.463 The number of boys studying in Commerece discipline forms approximately what per cent of the total number of students studying in that discipline?
a) 40
b) 52
c) 36
d) 28

Q.464 What is the respective ratio of number of boys studying in Mangement discipline to the boys studying in Science discipline?
a) 71:20
b) 18:67
c) 20:71
d) None of these

Q.465 The number of girls studying in Catering discipline forms what per cent of the total number of students in the college? (rounded off two digits after decimal)
a) 3.28
b) 5.61
c) 3.95
d) 4.17

Directions for Q.466 to Q.470
Study the pie-charts carefully to answer the questions that follow.
Degreewise break-up of expenditure of a family in a month.
Total amount spent in a month is Rs 45800
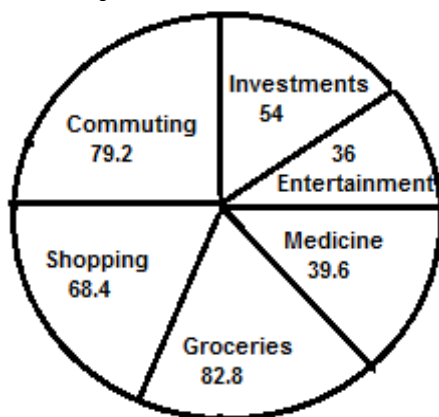
Q.466 What is the amount spent by the family on Commuuting?
a) Rs.10076
b) Rs.10534
c) Rs.6870
d) None of these

Q.467 What is the ratio of the amount spent on medicine to the amount spent on Groceries?

a) 1:2
b) 13:21
c) 3:5
d) None of these

Q.468 What is the total amount spent by the family on Entertainment and Shopping together?
a) Rs.9618
b) Rs.13282
c) Rs.13740
d) Rs.11908

Q.469 The total amount spent by the family on Groceries. Entertainment and Investments together forms approximately what percent of the amount spent on Commuting ?
a) 209
b) 76
c) 154
d) 218

Q.470 The amount spent by the family on Medicine forms what per cent of the amount on shopping ? (rounded off to two digits after decimal)
a) 43.67
b) 49.52
c) 57.89
d) 61.89

Directions for Q.471 to Q.472
Study the following graphs carefully to answer the questions:
Number of Candidates Appearing for Common Engineering Entrance Test (CEE) for Various Towns (Number in lakh)
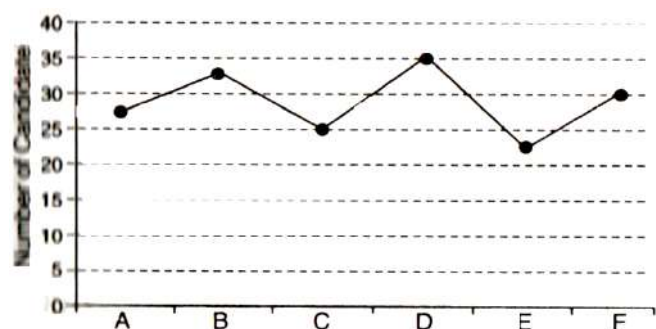
Q.471 The number of candidate appearing for CEET from town B is approximately what percent of the number of candidates appearing for CEET from town E?
a) 81
b) 112
c) 144
d) 69

Q.472 The number of candidates appearing for CEET from town C is what per cent of the total number of candidates appearing for CEET from all the towns together? (Rounded off to two after decimal)
a) 11.57   b) 17.43
c) 20. 31   d) 14.49

Q.473 What is the average number of candidates appearing for CEET from the entire town together?
a) 2995000   b) 2515000
c) 2755000   d) 2875000

Q.474 What is the ratio of the number of candidates appearing for the CEET from town A to town F?
a) 11:12   b) 13:11
c) 12:11   d) 11:13

Q.475 What is the ratio of the number of students appearing for the CEET from towns A, B and C together to the number of students appearing for the CEET from towns D,E and F together?
a) 33:35   b) 34:35
c) 35:37   d) 35:36

Directions for Q.476 to Q.477
Study the following graphs carefully to answer the questions given below.
Unit of Raw Material Manufactured and Sold by a company over the years (Units in crores)
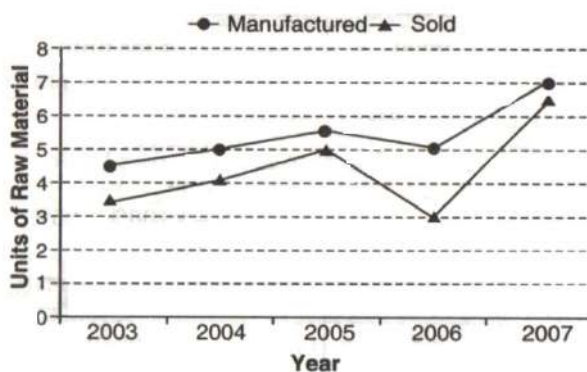
Q.476 What is the average number of unit sold over the years?
a) 440000000   b) 4400000

c) 440000   d) 44000000

Q.477 What is the ratio of the difference between the number of units manufactured and sold in the year 2005 to the difference between the number of units manufactured and sold in the year 2006?
a) 2:3   b) 1:2
c) 1:4   d) 3:5

Q.478 What is the ratio of the number of units manufactured in the year 2003 to the number of units manufactured in the year2007?
a) 7:11   b) 9:14
c) 7:9   d) 9:11

Q.479 What is the approximate per cent increase in the number of units sold in the year 2007 from the previous year?
a) 190   b) 70
c) 60   d) 117

Q.480 What is the difference between the number of units manufactured and the number of units sold over the years?
a) 50000000   b) 5000000
c) 500000000   d) 500000

Directions for Q.481 to Q.485
Study the following graph carefully to answer the questions that follow
Production and Sale of Printers of Various Companies in a Month
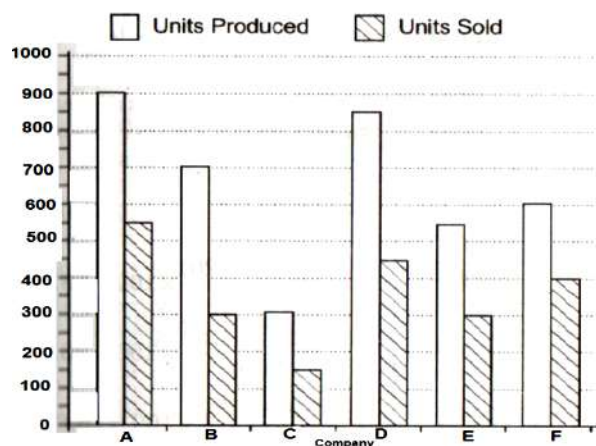
Q.481 What is the average number of units sold by all the companies together?
a) 360　　　　　b) 390
c) 375　　　　　d) 410

Q.482 Which company had the highest percentage of sale with respect to its production?
a) D　　　　b) B
c) E　　　　d) None of these

Q.483 What is the average number of units produced by all the companies together?
a) 675　　　　　b) 650
c) 625　　　　　d) 600

Q.484 The total unit sold by the companies A, B and C together is approximately was per cent of the total units produced by these companies?
a) 62　　　　　b) 50
c) 76　　　　　d) 58

Q.485 What is the ratio of the total production of companies D and E to the total sale of the same companies?
a) 28:15　　　b) 9:5
c) 15:11　　　d)None of these

Directions for Q.486 to Q.490
Study the following graph carefully to answer the question that follows
Total Number of Boys and Girls in Five Different Departments
Total Number of Boys and Girls in Five Different Department
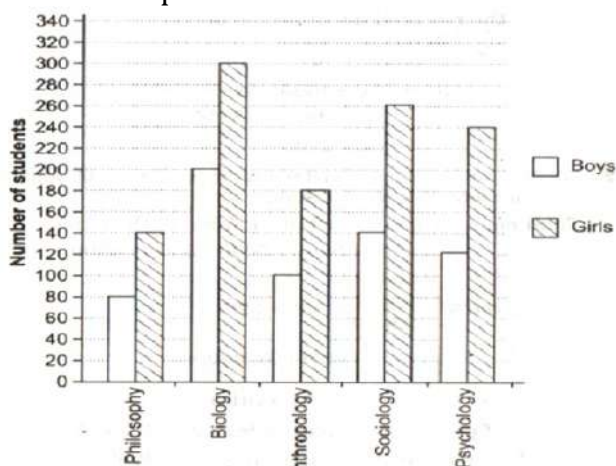
Q.486 The number of girls from Biology Department is approximately what per cent of the total number of girls from all he departments together?
a) 32　　　　　b) 21
c) 37　　　　　d)43

Q.487 What is the different between the total number of boys and the total number of girls from all the departments together?
a) 440　　　b) 520
c) 580　　　d) None of these

Q.488 What is the average number of boys from all the departments together?
a) 122　　　　　b) 126
c) 130　　　　　d) 134

Q.489 The number of boys from Anthropology Department is approximately what per cent of the total number of boys from all the departments together?
a) 15　　　　　b) 23
c)31　　　　　d) 44

Q.490 What is the ratio of the number of girls from Philosophy Department to the number of girls from psychology Department?
a) 1:2　　　　　b) 7:12
c) 5:12　　　　　d)3:4

ANSWER KEY:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
(a)	(a)	(b)	(c)	(d)	(d)	(b)	(c)	(d)	(a)	(d)	(a)	(a)	(a)
15	16	17	18	19	20	21	22	23	24	25	26	27	28
(d)	(c)	(a)	(c)	(c)	(d)	(c)	(d)	(a)	(d)	(c)	(d)	(b)	(a)
29	30	31	32	33	34	35	36	37	38	39	40	41	42
(c)	(c)	(c)	(a)	(d)	(a)	(c)	(b)	(c)	(b)	(d)	(a)	(c)	(b)
43	44	45	46	47	48	49	50	51	52	53	54	55	56
(a)	(c)	(b)	(b)	(a)	(c)	(b)	(a)	(a)	(b)	(a)	(c)	(c)	(d)
57	58	59	60	61	62	63	64	65	66	67	68	69	70
(b)	(b)	(b)	(c)	(d)	*	(d)	(a)	(a)	(b)	(a)	(c)	(c)	(d)
71	72	73	74	75	76	77	78	79	80	81	82	83	84
(d)	(b)	(d)	(c)	(a)	(d)	(d)	(d)	(d)	(a)	(d)	(c)	(c)	(b)
85	86	87	88	89	90	91	92	93	94	95	96	97	98
(b)	(b)	(b)	(b)	(b)	(c)	(c)	(b)	(b)	(c)	(d)	(a)	(a)	(c)
99	100	101	102	103	104	105	106	107	108	109	110	111	112
(c)	(d)	(b)	(d)	(c)	(c)	(a)	(a)	(d)	(d)	(d)	(b)	(d)	(d)
113	114	115	116	117	118	119	120	121	122	123	124	125	126
(c)	(d)	(a)	(d)	(c)	(d)	(d)	(c)	(c)	(a)	(d)	(b)	(a)	(a)
127	128	129	130	131	132	133	134	135	136	137	138	139	140
(c)	(d)	(a)	(b)	(b)	(c)	(d)	(b)	(a)	(d)	(c)	(a)	(a)	(b)
141	142	143	144	145	146	147	148	149	150	151	152	153	154
(d)	(d)	(b)	(a)	(c)	(b)	(d)	(b)	(a)	(c)	(d)	(c)	(a)	(c)
155	156	157	158	159	160	161	162	163	164	165	166	167	168
(c)	(d)	(c)	(c)	(d)	(a)	(b)	(b)	(a)	(c)	(d)	(b)	(d)	(b)
169	170	171	172	173	174	175	176	177	178	179	180	181	182
(a)	(c)	(a)	(b)	(c)	(a)	(a)	(d)	(a)	(c)	(d)	(c)	(a)	(c)
183	184	185	186	187	188	189	190	191	192	193	194	195	196
(c)	(c)	(d)	(d)	(b)	(d)	(b)	(a)	(c)	(a)	(c)	(a)	(a)	(d)
197	198	199	200	201	202	203	204	205	206	207	208	209	210
(d)	(a)	(c)	(b)	(b)	(d)	(b)	(c)	(c)	(d)	(a)	(d)	(d)	(b)
211	212	213	214	215	216	217	218	219	220	221	222	223	224
(a)	(b)	(b)	(a)	(a)	(a)	(b)	(d)	(b)	(d)	(b)	(d)	(d)	(c)
225	226	227	228	229	230	231	232	233	234	235	236	237	238
(a)	(d)	(c)	(a)	(d)	(d)	(c)	(d)	(a)	(b)	(b)	(c)	(b)	(b)
239	240	241	242	243	244	245	246	247	248	249	250	251	252
(a)	(c)	(c)	(c)	(a)	(a)	(d)	(b)	(b)	(c)	(a)	(d)	(c)	(d)
253	254	255	256	257	258	259	260	261	262	263	264	265	266
(d)	(a)	(c)	(c)	(c)	(a)	(b)	(c)	(c)	(b)	(a)	(c)	(c)	(b)
267	268	269	270	271	272	273	274	275	276	277	278	279	280
(d)	(d)	(b)	(c)	(c)	(c)	(b)	(c)	(a)	(a)	(c)	(d)	(c)	(d)

281	282	283	284	285	286	287	288	289	290	291	292	293	294
(d)	(d)	(d)	(b)	(c)	(a)	(c)	(a)	(b)	(b)	(c)	(b)	(c)	(d)
295	296	297	298	299	300	301	302	303	304	305	306	307	308
(c)	(c)	(c)	(b)	(c)	(d)	(d)	(a)	(a)	(a)	(d)	(d)	(a)	(c)
309	310	311	312	313	314	315	316	317	318	319	320	321	322
(d)	(d)	(c)	(a)	(a)	(b)	(a)	(a)	(c)	(d)	(b)	(d)	(b)	*
323	324	325	326	327	328	329	330	331	332	333	334	335	336
*	*	*	*	(d)	(a)	(d)	(a)	(d)	(c)	(c)	(c)	(c)	(d)
337	338	339	340	341	342	343	344	345	346	347	348	349	350
(c)	(c)	(b)	(b)	(b)	(d)	(b)	(c)	(a)	(d)	(b)	(b)	(c)	(a)
351	352	353	354	355	356	357	358	359	360	361	362	363	364
(b)	(b)	(c)	(a)	(c)	(c)	(a)	(b)	(a)	(c)	(c)	(d)	(d)	(d)
365	366	367	368	369	370	371	372	373	374	375	376	377	378
(b)	(b)	(c)	(d)	(c)	(d)	(a)	(a)	(d)	(a)	(c)	(d)	(c)	(c)
379	380	381	382	383	384	385	386	387	388	389	390	391	392
(a)	(a)	(a)	(a)	(b)	(d)	(a)	(b)	(b)	(c)	(c)	(d)	(a)	(b)
393	394	395	396	397	398	399	400	386	387	388	389	390	391
(a)	(c)	(b)	(b)	(a)	(d)	(d)	(d)	(b)	(b)	(c)	(c)	(d)	(a)
392	393	394	395	396	397	398	399	400	401	402	403	404	405
(b)	(a)	(c)	(b)	(b)	(a)	(d)	(d)	(d)	(b)	(b)	(b)	(b)	(c)
406	407	408	409	410	411	412	413	414	415	416	417	418	419
(a)	(a)	(a)	(c)	(a)	(d)	*	(a)	(d)	(a)	*	(a)	(a)	(a)
420	421	422	423	424	425	426	427	428	429	430	431	432	433
(a)	(d)	(c)	(a)	(a)	(a)	(b)	(a)	(a)	(a)	(b)	(a)	(a)	(b)
434	435	436	437	438	439	440	441	442	443	444	445	446	447
(b)	(d)	(d)	(b)	(a)	(b)	(d)	(c)	(c)	(a)	(d)	(d)	(b)	(d)
448	449	450	451	452	453	454	455	456	457	458	459	460	461
(c)	(c)	(a)	(b)	(d)	(d)	(a)	(b)	(d)	(c)	(c)	(d)	(d)	(d)
462	463	464	465	466	467	468	469	470	471	472	473	474	475
(a)	(b)	(c)	(d)	(a)	(d)	(b)	(d)	(c)	(c)	(d)	(c)	(d)	(d)
476	477	478	479	480	481	482	483	484	485	486	487	488	489
(c)	(d)	(d)	(d)	(b)	(b)	(c)	(a)	(c)	(d)	(a)	(b)	(a)	(a)
490													
(b)													

EXPLANATIONS

Q.1 **(a)**
The units digit in this case would obviously be '0' because the given expression has a pair of 2 and 5 in it's prime factors.

Q.2 **(a)**
When you read the sentence "when the digits are reversed, the number decrease by 54, you should automatically get reactions going in your mind.
(i) The difference between the digits would be 54/9=6
(ii) Since the number 'decrease 'the tens digit of the number would be larger than the units digit.
Also since we know that the sum of the digits is 10, we get that the digits must be 8 and 2 and the number must be 82. Thus, the changed number is 28.

Q.3 **(b)**
The two numbers should be factors of 405. A factor search will yield the factors (look only for 2 digit factors of405 with sum of digits between 1 to 19).
Also $405 = 5 \times 3^4$ Hence 15×27
45×9 are the only two options.
From these factors pairs only the second pair gives us the desired result
i.e. Number×sum of digits =405

Q.4 **(c)**
For the number A381 to be divisible by 11, the sum of the even placed digits and the odds placed digits should be either 0 or a multiple of 11.This means that(A+8)-(3+1) should be a multiple of 11 –as it is not possible to make it zero. Thus the smallest value that can take (and in fact the only value it can take) is 7 Option (c) is correct.

Q.5 **(d)**
LCM of 5,15 and 20=60.HCF of 45,15 and 20=5.The required ratio is 60:5 =12:1

Q.6 **(d)**
LCM of 5/2, 8/9 and 11/14 would be given by: (LCM of numerators) /(HCF of denominators)
=440/1=440

Q.7 **(b)**
The unit's digit would be given by 5+6+9 =20 (numbers ending in 5 and 6 would always end in 5 and 6 irrespective of the power and 3^{54} will give a units digit equivalent to 3^{4n+2} which would give us a unit digit of 3^2 ie. 9) Required answer is 0 Option (b) is correct.

Q.8 **(c)**
The respective units digits for the three parts of the expression would be :
5+9+2=16→required answer is 6
Option (c) is correct.

Q.9 **(d)**
The respective units digits for the six parts of the expression would be:
1×4×7×6×5×6→ Required answer is 0. Option (d) is correct.

Q.10 **(a)**
The number of zeros would be given by adding the quotients when we successively divide 1090 by 5:
$$\frac{1090}{5} + \frac{218}{5} + \frac{43}{5} + \frac{8}{5} = 218 + 43 + 8 + 1$$
$$= 270$$

Q.11 (d)
The sides of the pentagon being 1422, 1737, 2160, 2214, and 2358, the least difference between any two numbers is 54. Hence, the correct answer will be a factor of 54.

Q.12 (a)
They will ring together again after a time which would be the LCM of 6,8,12 and 18.The required LCM=72. Hence they would ring together after 72 seconds.

Q.13 (a)
Let the consecutive even numbers be (x +1),(x+3) and (x+5) and consecutive odd numbers be (y +1),(y+3) and (y+5)
$\therefore (x+1)\times(x+3)\times(x+5)\times(y+1)$
$\times(y+3)\times(y+5)=231$
(y +1)=(x+1)-54
Solving both the equations we get
x=41 and y=30
Sum of largest even number and odd number =46+35=81

Q.14 (a)
Let the consecutive even numbers be (x +1)and (x+3)
(x +1)×(x+3)=3248
Solving equation we get
x= 55
larger number is 58

Q.15 (d)
Let the five consecutive odd numbers be (x+1),(x+3),(x+5),(x+7) and (x+9)
(x+1)+(x+3)+(x+5)+(x+7)+(x+9)= 575
x= 110
So the numbers are 110, 113, 115, 117, 119
Sum of next set of numbers = 121+123+125+127+129 = 625

Q.16 (c)

For number to be divisible by 8 last three digits of the number should be divisible by 8. If 4 is added to the number then the number is divisible by 8.

Q.17 (a)
Let the two numbers be x and y.
2x+3y=100   ......(1)
3x+2y=120   ......(2)
Solving both the equations we get,
x = 32 and y=12
So the largest number is 32.

Q.18 (c)
Let the two digit number be (10x+y)
(10y+x)= (10x+y)-54   .....(1)
x+y=10   .....(2)
Solving both the equations we get,
x= 8 and y=2
So the two digit number is 82.

Q.19 (c)
Icecream < Cookies < Pastries
9   10   13   OR
9   11   12
So the number of cookies Rachita can have is 10 or 11.

Q.20 (d)
Let the two number be x and y
x × y=330   ....(1)
x + y=37   ....(2)
Solving both the equation we get,
x=22 and y=15.   So the smaller number is 15.

Q.21 (c)
For number to be divisible by 24 it should be divisible by 8 and 3 both. Checking each of the options it can be seen that the value in option (c) 1362480 is divisible by 24.

Q.22 (b)
For the sum of squares of digits to be 13, it is obvious that the digits should be 2 and 3 .So the number can only be 23 or 32. Further, the

number being referred to has to be 32 since the reduction of 9, reverse the digits.

Q.23 (a)
Trying the value in the options we get that the product of 54 × 45 = 2430 options (a) is correct.

Q.24 (d)
The pairs given in option (d) 78 and 13 and 26 and 39 meet both the conditions of LCM of 78 and HCF of 13.Option (d) is correct.

Q.25 (c)
Amrit would place eight oranges in the basket (as there are eight 1's).For the mangoes , he would place six mangoes (number of 2's) and remove four mangoes (number of 4's)from the basket .Thus there would be 2 mangoes and 8 oranges in the basket.
A total of 8-2 =6 extra oranges in the basket. Option (c) is correct.

Q.26 (d)
There would be multiple ways of scoring 34.5 marks. Thinks about this as follows: If he solves 80 and gets all 80 correct , he would end up scoring 80 marks. With every question that would go wrong his score would fall down by 1.5 marks (he would lose the 1 mark he is gaining and further attract a penalty of 0.5 marks). Also, for every question he does of attempt his score would fall down by 1.25 marks (he would lose the 1 mark he is gaining and further attract a penalty of 0.25 marks)
Thus, his score would drop @1.5 and @1.25 marks for every wrong and every unattempted question respectively.
Also, to get a total of 34.5 marks overall he has to lose 45.5 marks.

There are many possible combinations of non attempts and wrongs through which he can possibly lose 45.5 marks for example:
17 wrongs (loses 25.5 marks) and 16 non-attempts (loses 20 marks)
12 wrongs (loses 18 marks) and 22 non attempts (loses 27.5 marks)
Hence, we cannot answer this question uniquely and the answer is Option (d).

Q.27 (b)
3M + 4G + 5W = 750 .....(i)
6M + 9G + 10W = 1580 ......(ii)
Now, if we look at the equation (i) and multiply it by 2, we get:
6M + 8G + 10W = 1500 ....(iii)
From equation (ii) and (iii) we get,
G=80
If we subtract the cost of 4 guavas from equation (iii) we would get:
6M+4G+10W=1500-320=1180

Q.28 (a)
Ties <Trousers <Shirts .Since each of the three is minimum 11, the total would be a minimum of 33 (for all 3) The remaining 5 need to be distributed amongst ties, trousers and shirts so that they can maintain the inequality Ties< Trousers < shirts This can be achieved with 11 ties, and the remaining 27 pieces of clothing distributed between trousers and shirts such that the shirts are greater than the trousers. This can do done in at least 2 ways: 12 trousers and 15 shirts; 13 trousers and 14 shirts If you try to go for 12 ties, the remaining 26 pieces of clothing need to distributed amongst shirts and Trousers and both are together than 12.
With only 26 pieces of clothing to be distributed between shirts and trousers this is not possible. Hence the number of ties has to be exactly 11. Option (a) is correct.

Q.29 (c)
7056 is the closest perfect square below 7147. Hence 7147-7056=91 is the required answer Option (c) is correct.

Q.30 (c)
The number of bottle sizes possible would be given by the number of factors of the HCF of 170, 102 ad 374. Since the HCF of these numbers is 34, the bottle sizes that are possible would be the divisors of 34 which are l liter, 2 liters, 17 liters and 34 liters respectively. Thus, a total of 4 bottle sizes are possible Option (c) is correct.

Q.31 (c)
280 + 56 + 11 + 2 = 349

Q.32 (a)
13 + 4 + 1 = 18

Q.33 (d)
The required sum would be given by the formula n (n+1) for the first n even numbers. In this case it would be 50×51=2550

Q.34 (a)
763/57 leaves a remainder of 22 when it is divided by 57. Thus, if we were to add 35 to this number the number we obtain would be completely divisible by 57.

Q.35 (c)
Since 8441/57 leaves a remainder of 5. Thus, we would need to subtract 5 from 8441 in order to get a number divisible by 57. Option (c) is correct.

Q.36 (b)
The multiple of 13 between 200 and 400 represented by the series:
208,221,234,247,260,273,286,299,312,325,338,351,364,377 and 390
There are a total of 15 numbers in the above series. Option (b) is correct.

Q.37 (c)
8n/5-5n/8=39n/40=39 Solve for n to get the value of n=40, Option (c) is correct.

Q.38 (b)
x+y=3(x-y)→If we take y as 10, we would get the value of x as 20 Options (b) is correct.

Q.39 (d)
$$= 4^{11} + 4^{12} + 4^{13} + 4^{14} + 4^{15}$$
$$= 4^{11}\left(1 + 4^1 + 4^2 + 4^3 + 4^4\right)$$
$$= 4^{11} \times 341$$
The factors of 341 are :
1, 11, 31 and 341. Thus we can seen that the values in each of the three options would divide the expression $4^{11} + 4^{12} + 4^{13} + 4^{14} + 4^{15}$ Thus, options (d) is correct.

Q.40 (a)
Since the number have their HCF as 16, both the numbers have to be multiples of 16 (i.e. 2^4)
$$7168 = 2^{10} \times 7^1$$
In order to visualize the required possible pairs of numbers we need to look at the prime factors of 7168 in the following fashion:
$$7168 = 2^{10} \times 7^1$$
$$=(2^4 \times 2^4) \times 2^2 \times 7^1$$
$$=(16 \times 16) \times 2 \times 2 \times 7.$$
It is then a matter of distributing 2 extra twos and 1 extra seven in $2^2 \times 7^1$ between the two numbers given by 16 and 16 inside the bracket.
The possible pairs are :
32×224; 64× 112; 16× 448. Thus there are 3 distinct pairs of numbers which are multiple of 16 and whose product is 7168. However, out of these the pair 32×224 has its HCF as 32 and thus does not satisfy the condition. Thus there are two options satisfying the condition so the answer choice (a) is correct.

Q.41 **(c)**

Let Gabbar Singh purchase 'R' kg rice and 'W' kg wheat

$R+W=60$ ... (1)

$15R+10W= 700$ ... (2)

Solving 1 and 2 we get,

R=20kg   W=40kg

Q.42 **(b)**

Let, the two digits no. be 10x+y

$x + y=9$ ... (1)

$x = \dfrac{1}{6}(10x + y) - 4$ ... (2)

Solving Eq (1) and (2) we get,

x = 5 and y = 4

Therefore, Number = 54

Q.43 **(a)**

Let, the two digit no be 10x+y

$10x + y = 4(x + y)$ ... (1)

$10x + y + 27= 7(x + y)$ ... (2)

From eq (1) and (2)

x = 3 and y = 6

Therefore number =36

Q.44 **(c)**

Let, the 20p coins be T and 50p coins be F

$T+F = 26$ ... (1)

$20T +50F =1000$

$2T+5F=100$ ... (2)

Solving (1) and (2) we get

F =16   T=10

Q.45 **(b)**

Let distance travels by Taxi be T km and that by bus be B km

$T+B =80$ ... (1)

$15T+5B = 500$ ... (2)

On solving (1) and (2) we get

T= 10km   B=70km

Q.46 **(b)**

Let, the two digit no be 10x+y

$10x + y =3(x + y)$ ... (1)

$(10y + x) - (10x + y) = 45$ ... (2)

Solving eq (1) and (2) we get

x = 2 and y = 7

Number = 27

Q.47 **(a)**

Let the no of students in class room A and B

$A-5 = B+5$ ... (1)

$A+5 = 2(B-5)$ ... (2)

Solving (1) and (2) we get

A=35   B=25

Total no of students =35 + 25= 60

Q.48 **(c)**

Let the two digits no be 10x+y

Dividend = [Divisor × Quotient] + Reminder

$10x + y = [(x+y) × 2] + 8$ ... (1)

$10y + x = [(y + x) × 8] + 2$ ... (2)

Solving (1) and (2) we get

x =2 and y = 8

Number = 28

Q.49 **(b)**

Let the no of 5Rs. note be F and 2Rs. note be T

$5F + 2T = 29$ ... (1)

$F = \dfrac{1}{2}(T - 1)$ ... (2)

Solving (1) and (2) we get,

F = 3   T= 7

Q.50 **(a)**

Let there are 'H' horses and 'C' chickens

$H+C = 36$ ... (1)

$4H + 2C =84$ ... (2)

Solving (1) and (2) we get

H =6   C =30

Q.51 **(a)**

$SI = \left(\dfrac{PNR}{100}\right)$

1st Part	2nd Part
$P_1 = x$	$P_2 = 3783 - x$
$N_1 = 3/12$	$N_2 = 7/12$
$R_1 = 4.5\%$	$R_2 = 2.25\%$

$SI_1 = SI_2$

$\dfrac{x \times 3 \times 4.5}{12 \times 100} = (3783 - x)\dfrac{7 \times 2.25}{12 \times 100}$

Solving we get,

x = 2037

Q.52 **(b)**

Let, the two numbers be x and y

x + y = 45   ... (1)

$x^2 - y^2 = 675$ ... (2)

x = 30 and y = 15

Q.53 (a)

Q.54 (c)

Let the fraction be $\left(\dfrac{x}{y}\right)$

x = y - 5   ... (1)

4x = y + 1   ... (2)

Solving (1) and (2)

x = 2 and y = 7

Fraction = 2/7

Q.55 (c)

Let the 2 digits no. be (10x+y)

(10x + y) + (10y + x)= 99   ... (1)

(10x + y)-(10y + x)=27   ... (2)

Solving equation (1) and (2) we get

x= 6   y= 3

Number is = 63

Reversed Number is = 36

Q.56 (d)

Let the 3 digit no be 100x +10y +z

x + y + z = 17

y = 6

100x +10y + z – 297 = 100z +10y + x

x + z =11   .... (1)

x – z =3   ....(2)

Solving (1)and (2)we get,

x =7   and   z = 4

Number is = 764

Q.57 (b)

Let the 3 digit no. be 100x + 10y +z

$y = \dfrac{1}{2}x$

z = y - 2

100z+10y+x = 100x +10y +z -594

$z = \dfrac{1}{2}x - 2, x - 2z = 4$ ... (1)

x- z = 6   ... (2)

x =8 and z=2 and y=4

Number is = 842

Q.58 (b)

$\dfrac{A+B+C}{3} = 28 \Rightarrow A + B + C = 84$ ... (1)

$A + B = \dfrac{4}{3}C$ ... (2)

$B + 16 = \dfrac{1}{2}(A + 16 + C + 16)$ ... (3)

Solving (1) , (2) and (3) we get,

C = 36 ,B= 28, A=20

Q.59 (b)

Let the ages be u, n_1 and n_2 for uncle, niece and nephew

$u + n_1 + \dfrac{n_2}{3} = 12 \Rightarrow u + n_1 + n_2 = 36$

$n_1 + 2 = \dfrac{1}{3}(u + 2) \Rightarrow u = 3n_1 + 4$

$n_2 = n_1 + 2 \Rightarrow n_1 = n_2 - 2$

$3(n_2 - 2) + 4 + n_2 - 2 + n_2 = 36$

$n_2 = 8\text{yr}$

Q.60 (c)

2(k - 4)= s + 4

s - 2 = k + 2

2k - 8=k + 4 + 4

k = 16

S = 20

Q.61 (d)

$\dfrac{11x - 2y}{3x + 9y} = \dfrac{2}{3} \Rightarrow \dfrac{11x - 2y}{3(x + 3y)} = \dfrac{2}{3}$

$\dfrac{11x - 2y}{x + 3y} = \dfrac{2}{1} \Rightarrow \dfrac{x}{y} = \dfrac{8}{9}$

$\dfrac{x^2 + y^2}{y^2 - x^2} = \dfrac{64 + 81}{81 - 64} = \dfrac{145}{17}$

Q.62 (A)- (b) , (B) -(c),(C)-(d) (D)-(c)

Q.63 (d)

a : b : c : d : e

2 : 3

    6 : 7

       14 : 25

          1 : 2

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8 : 12 : 14 : 25 : 50

a : e
8 : 50
4 : 25

Q.64 (a)
P : F
7 : 1
$$F = \frac{1}{8} \times 7200 = 900$$

Q.65 (a)
Let 2 numbers be x & y
$$40\%x = \frac{3}{4}y \Rightarrow \frac{2}{5}x = \frac{3}{4}y$$
$$\frac{x}{y} = \frac{15}{8} \Rightarrow x : y = 15 : 8$$

Q.66 (b)
A : B : C : D   i.e.   A=2K
2 : 7 : 11 : 12
B=7K
C=11K
D=12K
B+D=6650
$$7k + 12k = 6650$$
$$k = \frac{6650}{19} = 350$$
$$D - A = 12k - 2k = 10k = 10 \times 350$$
= 3500

Q.67 (a)
Let 50p coin=x
25p coin=x
Total amt = 45Rs = 4500 paise
50x + 25x = 4500
x = 60

Q.68 (c)
A : B : C : D
3k : 4k : 9k : 10k
C = B + 2580
9k = 4k + 2580
k = 516
A + D = 3k + 10k = 13k = 13 × 516
= 6708 Rs.

Q.69 (c)

Total boys = 20
Total Girls = 25
Let, x no. of boys &girls join the group Therefore, $\dfrac{20 + x}{25 + x} = \dfrac{7}{8}$
x = 15
Total members = 75

Q.70 (e)
Let 2 numbers be x & y
$$\frac{1}{4} \text{ of } 60\% \times x = \frac{2}{5} \text{ of } 20\%xy$$
$$\frac{1}{4} \times \frac{3}{5} \times x = \frac{2}{5} \times \frac{1}{5} \times y$$
$$\frac{x}{y} = \frac{8}{15}$$

Q.71 (e)
L : B
8k : 5k
B = l - 60
5k = 8k - 60
K = 20
Perimeter of rectangle = 2(l + b)
= 2(8k + 5k)
= 26 × 20
= 520m

Q.72 (b)
A : S : V
5k : 6k : 3k
Total amount = 2800 Rs
A + S + V = 2800
14k = 2800
K = 200
Amount with Amit, Sumit & Vinit are Rs, 1000, 1200Rs, &600 Rs respectively If an amount of 200Rs is added to their shares then the new ration is
A : S : V
1200 : 1400 : 800
6 : 7 : 4

Q.73 (d)
Let, the nos. be x, y, z

$x : y : z$

$4k : 3k : 2k$

$xy + yz + zx = 234$

$12k^2 + 6k^2 + 8k^2 = 234$

$k = 3$

The numbers are 12, 9 and 6

Q.74 (c)

Let, the ages be a, b & c

$2a = 3b \Rightarrow \dfrac{a}{b} = \dfrac{3k}{2k}$

$a + b = 2c$

$5k = 2c \Rightarrow c = \dfrac{5}{2}k$

$a = c + 12$

$3k = \dfrac{5}{2}k + 12 \Rightarrow k = 24$

Age of $b = 2k = 48$

Q.75 (a)

Given $P_1:P_2=4:5$ & $R_1=10\%$, $R_2=15\%$

$N=2yr$

We have, $SI = \dfrac{PNR}{100}$

$\dfrac{SI_1}{SI_2} = \dfrac{P_1 N_1 R_1}{P_2 N_2 R_2} = \dfrac{4}{5} \times \dfrac{2}{2} \times \dfrac{10}{15}$

$\dfrac{SI_1}{SI_2} = \dfrac{8}{15}$

Q.76 (d)

Volume of cube=V

Edges of cube =e

$V \propto e^3$

$V = ke^3$ ...(1)

For V =80 cubic unit ,e =2 units

From equation ... (1)

$80 = k \times 2^3$

$k=10$

Now with k=10 & V=3430cubic unit

E = ?

From eq ... (1)

$e^3 = \dfrac{V}{k} = \dfrac{3430}{10} = 343$

e = 7unit

Q.77 (d)

Let the 2 numbers be x & y

$\dfrac{3}{5}x = 85\% \text{ of } y$

x: y=17:12

Q.78 (d)

B:G = 4:5

B:G

4k:5k

Now $\dfrac{4k}{5k-100} = \dfrac{6}{7}$

k=300

No of boys = 4k = 4 × 300 = 1200

Q.79 (d)

$A : B : C$

$4 : 7 : 9$

Since the amount to be distributed is not given, it is not possible to find the share of B & A so the answer cannot be determined.

Q.80 (a)

$A \propto B$ constant =C

$A \propto \dfrac{1}{C}$ constant =B

$A \propto \dfrac{B}{C} \Rightarrow A = \dfrac{KB}{C}$

When A=26,B=65 & C=30

$26 = \dfrac{K \times 65}{30} \Rightarrow K = 12$

With k=12,B=84 & C=42 A=?

$A = \dfrac{12 \times 84}{42} = 24$

Q.81 (d)

Let the total expenditure, the fixed expenditure and the variable expenditure of Raju in any month be denoted by T, F, and V respectively.

Let the distance he traveled that month be denoted by D.

T=F+V

V varies directly with D.

∴ V=KD where K is a constant.

∴ T=F+KD

1600=F+400K-(1)

2200=F+800K-(2)
Required expenses (in Rs) =F+900K
Solving (1) and (2) F=1000 and K=1.5

$\therefore$ F+900K=2350

Q.82 (c)

Let the maximum mark in each exam be 100 Let the marks he secured in Physics, Chemistry , Biology and Social studies be 2x,3x,4x and 5x respectively. Total

marks in the exams $= \dfrac{70}{100}(400)$

= 280

$\therefore 2x + 3x + 4x + 5x = 280$

$\Rightarrow 14x = 280 \Rightarrow x = 20$

$\therefore$ His marks were 40,60 ,80 and 100. In order to get 50% in any exam, he must score 50 in it.

$\therefore$ He got more than 50% in three exams.

Q.82 (c)

Let the number of marbles received by P, Q, and R be p, q and r respectively.

$\dfrac{p}{q} = \dfrac{5}{4}$ and $\dfrac{q}{r} = \dfrac{3}{2}$

$\therefore p = \dfrac{5}{4}q$ and $q = \dfrac{3}{2}r$

$\therefore p = \dfrac{5}{4}\left(\dfrac{3}{2}r\right) = \dfrac{15}{8}r$

Given p – q = 9

$\Rightarrow \dfrac{15}{8}r - \dfrac{3}{2}r = 9 \Rightarrow \dfrac{3}{8}r = 9 \Rightarrow r = 24$

Q.84 (b)

Let the force applied and the acceleration produced be denoted by F and a respectively. F varied directly with a

$\therefore \dfrac{F}{a} = $ constnat.

Given that,

$F = 20N$ and $a = 8m/sec^2$

This constant $= \dfrac{20}{8} = \dfrac{5}{2} \therefore F = \dfrac{5}{2}a$

If instead F = 5N, a would have been

$\dfrac{2}{5}(5) = 2m/sec^2$

Q.85 (b) A:B =3:4 and B:C

$= \dfrac{7}{2}:3 = \dfrac{8}{7} \times \dfrac{7}{2} : \dfrac{8}{7} \times 3 = 4 : \dfrac{24}{7}$

$\therefore A:B:C = 3:4:\dfrac{24}{7} = 21:28:24$

$\therefore$ B's share $= Rs\left(730 \times \dfrac{28}{73}\right) = Rs.280$

C's share $= Rs\left(730 \times \dfrac{24}{73}\right) = Rs.240$

Hence B's share exceeds by 280-240= Rs.40

Q.86 (b)

Here A: B=3:2

$B:C = 3:2 = \dfrac{2}{3} \times 3 : \dfrac{2}{3} \times 2 = 2 : \dfrac{4}{3}$

$\therefore A:B:C = 3:2:\dfrac{4}{3} = 9:6:4$

Let their incomes are 9x, 6x and 4x respectively.

As per the conditions given,

$\dfrac{9x}{3} - \dfrac{4x}{3} = 500$

Or $2x = 500 \Rightarrow x = Rs.250$

$\therefore$ B's income $= 6x = Rs.6 \times 250$

$= Rs.1500$

Q.87 (b)

The total weight of the mixture is (4×5+3×4+2×3)=38 units

$\Rightarrow$ The weight of X=20/38×114kg

= 60kg

$\Rightarrow$ The weight of Y =12/38×114kg

=36kg

$\Rightarrow$ The weight of Z=6/38×114kg

=18kg

Q.88 (b)

$(A+B) = 3(C+D)$

A+B=375 and C+D=125

Also, since C gets 1.5 times D

We have,
C=75 and D=50, and B=75, A=300

Q.89 (b)
The numbers would be 3x and 4x and their LCM would be 12x. This gives us the values as 45 and 60. The first number is 45.

Q.90 (c)
Since equal quantities are being mixed assume that both alloys have 18kgs (18 being number which is the LCM of 9 and 18)
So the ratio is 7:5.

Q.91 (c)
$2x + 20 : 3x + 20 : 5x + 20 = 4 : 5 : 7 \rightarrow x = 10$
and initially the number of students would be 20, 30 and 50
$\Rightarrow$ Total of 100

Q.92 (b)
The initial amount of water is 9 liters and milk is 27 liters. By adding 15 liters of milk the mixture becomes 42 milk and water $\rightarrow 14 : 3$ the required ratio.

Q.93 (b)
Since pressure and volume are inversely proportional, we get that if one is reduced by 25% the other would grow by 25% Option (b) is correct

Q.94 (c)
$$\frac{27-11}{35-11} = \frac{16}{24} = 2/3$$

Q.95 (d)
If we were to draw out 4 liters of wine and substitute it with plain water, the ratio of wine to water would become 1:1 Hence option (d) is correct.

Q.96 (a)

$$T = \frac{KD}{V} = \left(K_1 Q^{1/2}\right) / N$$

Where K and K_1 are constant.
T is the time duration of the journey.
Q is the quantity of coal used and
N is the number of carriages.
Thus,
$$T = (KDN) / \left(K_1 Q^{1/2}\right) \text{or}$$

$$T = (K_2 DN) / (Q^{1/2}) \rightarrow$$
if we take K / K_1 as K_2
From, the information provided in the question:
$$30 = \left(K_2 \times 50 \times 18\right) / 1024 K_2 = 1/3$$
Thus, the equation becomes:
$$T = (DN) / \left(3Q^{1/2}\right) \text{Then,}$$
When D=42, T=28 and N=16 we get:
$$28 = 42 \times 16 / \left(3Q^{1/2}\right) \rightarrow Q = 64$$

Q.97 (a)
The ratio of total salaries will be:
40:10:3
This gives 53 corresponds to 318.
Hence, 1 corresponds to 6.Thus the wages are 240, 60 & 18 respectively.

Q.98 (c)
Solve using options. From option (c), we will get that initially there are 125 boys and 140 girls after the given increases the number of boys would 145, and the number of girls would becomes 154 which gives a difference of 9 as required.

Q.99 (c)
$5 : 4 \rightarrow 5 : 4.8 \rightarrow 25 : 24$

Q.100 (d)

$$P = {}_2K \times W \rightarrow 12250 = {}_2K \times 35 \rightarrow K = 10$$

Thus our price and weight relationship is $P = 10W^2$
When the two pieces are in the ratio 2:5 (weight wise) then we know that their weight must be 10 grams and

25 grams respectively. Their values would be:

10 grams piece: $10 \times 10^2 = Rs.\,1000$

20 grams piece: $10 \times 25^2 = Rs.6250$

Total Price = 1000 + 62450 = 7250.

From an initial value of 12250, this represents a loss of Rs. 5000.

Q.101 (b)

B's salary is less than that of A by

$$= \left\{ \frac{R}{(100+R)} \times 100 \right\}\%$$

$$= \left\{ \frac{25}{(100+25)} \times 100 \right\}\%$$

$$= \left\{ \frac{25}{125} \times 100 \right\}\%$$

$$= 20\%$$

Q.102 (d)

B's salary is more than that of A by

$$= \left\{ \frac{R}{(100-R)} \times 100 \right\}\%$$

$$= \left\{ \frac{20}{(100-20)} \times 100 \right\}\%$$

$$= \left\{ \frac{20}{125} \times 100 \right\}\%$$

$$= 25\%$$

Q.103 (c)

Reduction % in consumption so as not to increase the expenditure

$$= \left\{ \frac{R}{(100+R)} \times 100 \right\}\%$$

$$= \left\{ \frac{10}{110} \times 100 \right\}\%$$

$$= 9\frac{1}{11}\%$$

Q.104 (c)

Increase % in consumption so as not to decrease the expenditure

$$= \left\{ \frac{R}{(100-R)} \times 100 \right\}\%$$

$$= \left(\frac{12}{88} \times 100 \right)\%$$

$$= 13\frac{7}{11}\%$$

Q.105 (a)

Value of the machine after 2 yr

$$= Rs \left\{ 148000 \times \left(1 - \frac{10}{100} \right)^2 \right\}$$

$$= Rs \left\{ 148000 \times \frac{90}{100} \times \frac{90}{100} \right\}$$

$$= Rs119880$$

Q.106 (a)

Value of the machine 2 yr

$$= Rs \frac{162000}{\left(1 - \frac{10}{100} \right)^2} a$$

$$= Rs \left\{ 162000 \times \frac{10}{9} \times \frac{10}{9} \right\} a$$

$$= 200000$$

Q.107 (d)

Let, the original price be Rs x per kg.

Reduced price $= Rs(95\% \text{ of } x)$

$$= Rs \left(\frac{95}{100} \times x \right) = Rs \frac{19x}{20} \text{ per kg}$$

$$\frac{95}{\left(\frac{19x}{20} \right)} - \frac{95}{x} = 1$$

$$\Rightarrow \frac{95 \times 20}{19x} - \frac{95}{x} = 1$$

$$\Rightarrow \frac{95}{19x} = 1$$

$$\Rightarrow x = \frac{95}{19} = 5$$

Therefore Original price= Rs 5 per kg

Q.108 (d)

Let, the original price of the book be Rs x.

Then, new number

$$= \left(\frac{25}{100} \times \frac{125}{100} \times x \right)$$

$$= \frac{15x}{16}$$

Now, $x - \frac{15x}{16} = 8$

$\Rightarrow \quad \frac{x}{16} = 8$

$\Rightarrow \quad x = 128$

Q.109 (d)
Let, the original number = 100
Then, new number = 110% of 120% of 100

$$= \left(\frac{110}{100} \times \frac{120}{100} \times 100 \right)$$

Decrease of 132 = 32

$\therefore$ Decrease of $100 = \left(\frac{32}{132} \times 100 \right)\%$

$$= 24\frac{8}{33}\%$$

Q.110 (b)
Let, Raghu invests Rs x
Then, Mona invests Rs

$$\left(\frac{90x}{100} \right) = Rs \frac{9x}{10}$$

And Sonu invests Rs $= \left(\frac{110}{100} \times \frac{9x}{10} \right)$

$$= \left(\frac{99x}{100} \right)$$

Now , $x + \frac{9x}{10} + \frac{99x}{100} = 5780$

$\Rightarrow x = \frac{5780 \times 100}{289} = 2000$

Q.111 (d)
Invests of Sunil = (100-30)% of 6000

$= 70\%$ of $6000 = \left(\frac{70}{100} \times 6000 \right) = 4200$

Invest of Rita $= (100 + 25)\%$ of 4200

$= 125\%$ of 4200

$$= \left(\frac{125}{100} \times 4200 \right) = 5250$$

Hence, total investment
=Rs (6000+4200+5250) = 15450
Required ratio = 5250:15450 = 35:103

Q.112 (d)
Let, monthly income of Rahul be Rs x.
Then, [100-(50+20+5)]% of x = 11250
25% of x =11250
25/100*x=11250
x = 11250*100/25 = 45000
Hence, the monthly salary of Rahul = Rs 45000

Q.113 (c)
Let, the salary of Prerna be Rs x.
Then, 80% of 15% of x = 1896

$\Rightarrow \left(\frac{80}{100} \times \frac{15}{100} \times x \right) = 1896$

$\Rightarrow x = \left(\frac{1896 \times 100 \times 100}{80 \times 15} \right)$

$\Rightarrow x = 15800$

Hence, the salary of Prerna is Rs 15800

Q.114 (e)
Let, the monthly income of Mr. Moore be Rs x
Then,

$\left[100 - (20 + 15) \right]\% \times \left[100 - (40 + 30) \right]\% \times x = 8775$

$\Rightarrow \left(\frac{65}{100} \times \frac{30}{100} \times x \right) = 8775$

$\Rightarrow x = \frac{8775 \times 100 \times 100}{65 \times 30} = 45000$

Hence, the monthly income of Mr. Moore is Rs 45000

Q.115 (a)
Let, Maya's monthly income be Rs x.
Then, Asha's monthly income = Rs (60% of 7800)

$$= Rs \left(\frac{60}{100} \times 78000 \right) = Rs \ 46800$$

Also Asha's income = 120% of Maya's income

$$\Rightarrow 46800 = \frac{120}{100} \times x$$

$$\Rightarrow x = \frac{46800 \times 100}{120} = 39000$$

Hence, Maya's monthly income= Rs 39000

Q.116 (e)

Amount of water in 60 g of mixture
= 75% of 60 g

$$= \left(\frac{75}{100} \times 60 \right) g = 45g$$

Now, 15 g of water is added to the mixture.
Hence, percentage of water in the new mixture

$$= \left(\frac{45+15}{60+15} \times 100 \right)\%$$

$$= \left(\frac{60}{75} \times 100 \right)\% = 80\%$$

Q.117 (c)

Number of sweets each students gets

= 20% of 65 = $\frac{20}{100} \times 65 = 13$

Number of sweets each teacher gets

= 40% of 65 = $\frac{40}{100} \times 65 = 26$

Total number of sweets
= (65✕13)+(4✕26)
= 845 + 104 = 949

Q.118 (d)

Valid votes = 85% of 15200

$$= \frac{85}{100} \times 15200 = 12920$$

Valid votes polled by one candidate

= 55% of 12920 = $\frac{55}{100} \times 12920 = 7106$

Therefore Valid votes polled by the other candidate
=(12920-7106)= 5814

Q.119 (e)

Let, the third number be x.
Then, the first number = 50% of

$$x = \frac{50}{100} \times x = \frac{1x}{2} \text{ and}$$

The second number = 46% of

$$x = \frac{46}{100} \times x = \frac{23x}{50}$$

Now, second number is less than the first number by

$$\left(\frac{\frac{x}{2} - \frac{23x}{5}}{\frac{x}{2}} \times 100 \right)\% = \left(\frac{x}{25} \times \frac{2}{x} \times 100 \right)\%$$

$$= 8\%$$

Q.120 (c)

Let, the income of B be Rs x then,
Income of A=Rs (150% of x)

$$= Rs\left(\frac{150}{100} \times x \right) = Rs \frac{3x}{2}$$

And income of C= Rs $\left(120\% \text{ of } \frac{3x}{2} \right)$

$$= Rs\left(\frac{120}{100} \times \frac{3x}{2} \right) = Rs \frac{9x}{2}$$

Now, $\frac{3x}{2} + x + \frac{9x}{2} = 86000$

$$\Rightarrow \frac{43x}{10} = 86000$$

$$\Rightarrow x = \frac{86000 \times 10}{43} = 20000$$

Hence, C's share $= Rs\left(\frac{9 \times 20000}{5} \right)$

= Rs. 36000

Q.121 (c)

The area of triangle depends on the product base × height
Since, the height increase by 40% and the area has to increase by 60% overall, the following PCG will give the answer.

$$100 \xrightarrow{40\%\uparrow} 140 \xrightarrow{?} 160$$

Base   height

The required answer will be 20/140
=14.28%

Q.122 (a)

$$100 \xrightarrow{25\%\downarrow} 750 \xrightarrow{?} 120$$

We have assumed initial expenditure to be 100 , in the above figure. Then the final expenditure is 120 The percentage change in consumption can be seen to be 45/75× 100=60%

Q.123 (d)

The winning candidate gets 56% of the votes cast and the losing candidate gets 44% of the votes cast. And the losing candidate gets 44% of the votes cast. Thus the gap between the two is 12% of the votes cast =144 votes. Thus the votes cast=1200 Since this is 80% of the number of voters on the voting list, the number of people on the voting lost=1200 /0.8=1500

Q.124 (b)

30% students got a final score of 13.10% students got a final score of 33 inclusive of grace marks.) 35% students got a final score of 60
Hence, average score of the class
$$= \frac{0.35 \times 60 + 0.1 \times 33 \times + 0.3 \times 13}{0.75} = 37.6$$

Q.125 (a)

If Ash's salary= 100 , then Vicky's salary =175 Ash's salary =125, Vicky's new salary=175× 1.4=245. Percentage difference between C Vicky's salary and Ashu's salary now= 120 × 100/125=96%

Q.126 (a)

Let the second row contain 100books, Then the first row would contain 125 books and the third row would contain 75 books .The total number of books would be 100+125+75=300.But this number is given as 600 which means that the total number of books would be would be double the assume values for each row. Thus. First row would contain 125× 2 =250 books

Q.127 (c)

Total people present=700+500+800 =2000
Indians=0.2×700+0.4×500+0.1×800 =420=21% of the population. Thus, 79% of the people were not Indian

Q.128 (d)

The total cost for a year = 2,55,00 + 2% of 2,50,000 + 2000
= 2,55,000 + 2,000 = 2,57000
To get a return of 15% he must earn 257,000×0.15=38,550 in twelve months.

Q.129 (a)

The following Venn diagram would solve this problem :
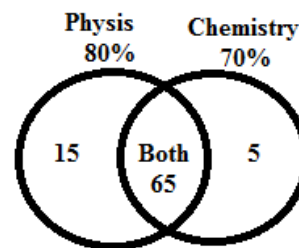
We can clearly see from the above figure that 655 of he people passed both subjects. Since this value is given as 325, we get that the total number of students who appeared for the exam is 500.

Q.130 (b)

$$100 \xrightarrow[\text{sales in crease}]{50\% \uparrow} 150 \xrightarrow[\text{Price}]{?} 82.5$$

(final sales figure)
Sales increase   Price drop
Hence, the required price drop is 67.5/150=45% drop. Thus there is a drop of 250× 45 =112.5

Q.131 (b)

Solve using options. Checking for option (b) . Gives us:
200000→180000→171000→153900→ 146205
(by consecutively decreasing200000 by 10% and 5% alternately)

Q.132 (c)

Total characters in her report = 25×60×75

Let the new no. of pages be n.

Then

n×55×90=25×60×75

n=22.72

This means that her report would required 23 pages. A drop of 8% in terms of the pages.

Q.133 (d)

Rajesh's score in each area is 65 and 82 respectively out of 100 each. Since, the exam is of a total of 250 marks (100+100+50) he needs a total of 195 marks in order to get his target of 78% overall. Thus he should score 195-65-82=195-147=48mark in Sociology which would mean 96%

Q.134 (b)

The total wealth given would be 50%+25%(which is got by 50% of the remaining 50%)+12.5% (which is got by 50% of heremaining25%). Thyus the total wealth given by him would be equivalent to 87.5% of the total. Since this is equal to 1309000 kilograms of gold. The total gold would be :

130900×8/7=149600

Q.135 (a)

Population at the start=100

Population after 2 years= 100×1.08×1.01×1.08×1.01=108.984

Thus, the required percentage increase =18.984%

Q.136 (d)

Assume the initial surface area as 100 on each side A total of 6 such surfaces would give a total surface area of 600. Two surface areas would be impacted by the combined effect of length and breadth , two would be affected by length and height and two would be affected by breadth and height. Thus, the respective surface areas would be (110.25 twice, 126 twice and 126 twice) Thus, new surface area $= 220.5 + 504 = 724.5$. A percentage increase of 20.75% Option (d) is correct.

Q.137 (c)

Option (c)fits the situation as if the ration is 10:9, the value of B's salary would first go up from 10 to 12 and then come down from 12 to 9 (after a 255 12 and then come down from 12 to 9 (after a 25% decrease) On the other hand, the value of A's salary would go up from 9 to 11.25 and then come back to 9 (Note that a 25% increase followed by a 20% decrease gets one back to the starting value.)

Q.138 (a)

On Rs. 100 he saves Rs.6. On 115 he still saves Rs 6. Thus , his expenditure goes up from 94 to 109 a percentage increase of 15 on 94= 15.95%

Q.139 (a)

Think about this problem through allegation. Since A spends 12% of his money and B spends 20% of his money and together they spend 15% of their money –we can conclude that the ratio of the money A had to the money B had would be 5:3 Hence,

Total money with $A = 5 \times 1200 / 8 = 750$

Money spend by A = 12%of 750=90

Money left with $A = 750 \times 90 = 660$

Q.140 (b)

The total population of the town can be taken as 9+8++3=20

The number of literates would be:

80% of 9+70% of 8+90% of 3
=7.25.6+2.7 =15.5
15.5 out of 20represents a 77.45%
literacy rate.

Q.141 (d)

CP of 72 oranges =Rs 324
SP of 72 oranges =Rs (50 × 6 + 165)
= Rs 465
∴ His profit =Rs (465-324)=Rs 141

Q.142 (d)

Let the CP = Rs x

Then, $\dfrac{110x}{100} - \dfrac{80x}{100} = 45$

$\Rightarrow$ $30x = 4500$

$\Rightarrow$ $x = \dfrac{4500}{30} = Rs150$

Q.143 (b)

Let the values of the consignment be Rs. x. Then SP

$= Rs\left(\dfrac{1}{3} \times x \times \dfrac{108}{100} + \dfrac{2}{3} \times x \times \dfrac{99}{100}\right)$

$= Rs\left(\dfrac{36x}{100} + \dfrac{66x}{100}\right) = Rs.\dfrac{102x}{100} = \dfrac{51x}{50}$

$\therefore \dfrac{51x}{50} - x = 320 \Rightarrow \dfrac{x}{50} = 320$

$\Rightarrow x = 16000$

Value of the consignment =Rs16000

Q.144 (a)

Let their CP be Rs. X and Rs (900-x) respectively

Then, $\dfrac{120}{100} \times x + \dfrac{75}{100}(900 - x) = 900$

$\Rightarrow \dfrac{45x}{100}$

$= 225 \Rightarrow x = \left(\dfrac{225 \times 100}{45}\right) = 500$

So, the cost of one article =500
And the cost of another article =Rs (900-x)= Rs 4400

Q.145 (c)

Let, the cost price be 100x. He lost during theft 25% of the good

∴ The cost price=75x & profit =15%
∴ SP = CP(1 +%P)

$= 75x \times \left(1 + \dfrac{15}{100}\right)$

$= SP = 86.25x$

∴ In whole transaction he suffers a loss which is given by

$\%L = \dfrac{100x - 86.25x}{100x} \times 100$

$\%L = 13.75\%$

Q.146 (b)

Let, the CP be Rs.100
Then MP=Rs 120
Sp = 90% of 90% of Rs 120

$= Rs\left(\dfrac{90}{100} \times \dfrac{90}{100} \times 120\right) = Rs.97.20$

∴ Price is decreased by (100-97.20)=2.8%

Q.147 (d)

CP of 30kg of wheat
$= Rs(30 \times 45) = Rs1350$

SP of 405 of 30kg (i.e, 12kg)
$= Rs(12 \times 50) = Rs.600$

Now P% =25% and CP=Rs 1350
$\Rightarrow$ SP of 30kg of wheat

$= Rs\left(\dfrac{125}{100} \times 1350\right) = Rs1687.50$

∴ SP of 18kg of wheat =Rs (1687.50-600) =Rs.1087.50
$\Rightarrow$ SP of 1 kg of wheat

$= Rs\left(\dfrac{1087.50}{18}\right) = Rs.60.41 = Rs.60$

Q.148 (b)

Purchase price =11250
Total cost price= 11250 + 150 + 800 = 12200

$SP = \dfrac{12200 \times 115}{100} = 14030$

Q.149 (a)

Let the CP be $Rs.x$
Then $1754 - x = x - 1492$
$\Rightarrow 2x = 1754 + 1492 = 3246$
$\Rightarrow x = 1623$
So, CP is Rs. 1623.

Q.150 (c)

Let the CP be Rs. x.

Then 140% of 120% of x =10500

$$\Rightarrow \frac{140}{100} \times \frac{120}{100} \times x = 10500$$

$$\Rightarrow x = Rs\left(\frac{10500 \times 100 \times 100}{140 \times 120}\right) = Rs6250$$

Q.151 (d)

$$\%L = \frac{(L)^2}{100} = \frac{15^2}{100} = 2.25\%(Loss)$$

Q.152 (c)

Let the CP of 1 article =1 Rs.

CP of 21 article =21 Rs

SP of 21 article =35Rs

$$\%P = \frac{P}{CP} \times 100 \Rightarrow \frac{14}{21} \times 100 = 66\frac{2}{3}\%(profit)$$

Q.153 (a)

Let the S.P of article be 1300Rs.

$$\therefore \left(\frac{9}{13}\right)th \text{ of SP=900 Rs.}$$

$$\%L = 10\%$$

$$SP = CP(1 - \%L)$$

$$900 = CP(1 - \frac{10}{100})$$

$$CP = 1000Rs.$$

Q.154 (c)

Let the MP be $100x$

$$100x \xrightarrow[15\%]{dis} 85x \xrightarrow[20\%]{dis} 68x \xrightarrow[5\%]{dis} 64.6x$$

After successive discount the SP of article = 64.6x

= 1292

$$\therefore x = 20$$

Q.155 (c)

	A		B		C
I	8000		20000		32000
	2	:	5	:	8
N	1	:	1	:	1
P.S	2	:	5	:	8

B's share $= \frac{5}{15} \times 5400 = 1800Rs.$

Q.156 (e)

	A		B		C
I	15000		21000		27000
	5	:	7	:	9
N	8	:	1	:	1
	1	:	1	:	1
P.S	5	:	7	:	9

B's share $= \frac{7}{21} \times T.S$

$$1260 = \frac{1}{3} \times T.S \Rightarrow T.S. = 3780Rs.$$

$$A's = \frac{5}{21} \times 3780 = 900Rs$$

Q.157 (c)

	A		B
I	42000		63000
	2	:	3
N	12	:	4
	3	:	1
P.S	6	:	3
	2	:	1

$$B = \frac{1}{3} \times 9600 = 3200Rs$$

Q.158 (c)

	A		B		C
I	3	:	5	:	8
P.S	6	:	15	:	4
N	2	:	3	:	2

$$\because N = \frac{PS}{I}$$

Q.159 (b)

	Om		Jai		Jagdish
I	80,000		64,000		48000
	5	:	4	:	3
N	1	:	1	:	1
PS	5	:	4	:	3

$$\text{Jagdish} = \frac{3}{12} \times \text{T.S}$$
$$\text{T.S} = 43200$$

Q.160 (a)

	A	B	C
I	45,000	55,000	60000
	9 :	11 :	12
N	1 :	1 :	1
PS	9k :	11k :	12k

$$9k + 11k + 12k = \text{Total profit}$$
$$32k = 11200$$
$$k = 350$$
B gets more than A=11k-9k
$$= 2k$$
$$= 700 \text{ Rs.}$$

Q.161 (b)

The buying price is Rs. 9 per dozen, while the sales price is Rs. 12 per dozen, while the sales price is Rs. 12 per dozen –a profit of 33.33%

Q.162 (b)

$$100 \xrightarrow{20\%\uparrow} 120 \xrightarrow{10\%\downarrow} 108$$
Hence, 8% is the correct answer.

Q.163 (a)

For Rs. 72, we can buy a dozen pair of gloves, Hence for Rs. 24 we can buy 4 pairs of gloves.

Q.164 (c)

The customer pays Rs. 38 after a discount of 5% hence the list price must be Rs. 40. This also means that at a 20% discount, the retailer buys the item at Rs. 32.
Hence, the profit for the retailer will be= 38-32 = Rs. 6

Q.165 (d)

In the question, A's investment has to be considered as Rs. 10, 00 (the house he puts up for sales)

He sells at 11,500 and buys back at Rs. 9775 .Hence his profit is Rs. 1725

$$\text{Required answer} = \frac{1725}{10000} \times 100$$
$$= 17.25$$

Q.166 (b)

A's selling price $= 1.25 \times 120 = 150$.
C'cost price = B's selling price $= 198/1.1 = 180$.
Thus B's profit =Rs. 30
and his profit percent $= 30 \times \dfrac{100}{150}$
$$= 20\%$$

Q.167 (d)

Let the cost price be p.
Then,
$$P \times 0.95 \times 1.1 = P \times 1.05 - 2 \Rightarrow P = 400$$
Alternately, you could have solved this using option.

Q.168 (b)

Solve using options, Options (b) fits the situation as a 12.5% discount on 288 would mean discount of Rs. 36. This would leave us with a selling price of 252 which represents a profit percent of 20%on Rs. 210.

Q.169 (a)

Solve using options. Option (a) fits as if we take SP as 2000, we gets CP_1 as 1500 and
CP_2 As 1600 which gives us the required difference of Rs 100.

Q.170 (c)

Assume that for 100 items the cost price is Rs. 100, and then the selling price is Rs. 130. Since 24 is sold at half the price, he would recover $24 \times 1/2 = \text{Rs.} 12$ (since it is sold at half the cost price) the revenue $= 91 + 12 = 103 \rightarrow$ a profit of 3% (on a cost of 100)

Q.171 (a)

An increase in the price by Rs. 12 will correspond to 50% of the CP. Hence The CP is Rs. 24 and initially the book was being sold at Rs. 19.2 Hence if there is an increment of Rs. 4.8 in the selling price, there would be no profit or loss.

Q.172 (b)

$x \times 8 + 0.75x \times 22 = 1.4 \times 4725$

$\Rightarrow x = 270$

On an investment of Rs. 4725, a profit of 40%means a profit of 1890 Hence, the targeted sales realizations Rs. 6615 The required equation would be:

$8p + 22(3p)/4 = 6615$

$\rightarrow 8p + 33p/2 = 6615$

In this expression for LHS to be equal to RHS, we need 3p/2 to be an odd number. This can only happen when p is not multiple of 4. Hence options a & C get eliminated automatically.

Q.173 (c)

Total number of microwave ovens =15

Hence, washing machines =10

Thus, he sells 80% of both at a profit of Rs. 40,000 Cost of 80% of the goods

$= 08 \times 2,05,000 = 1,64,000$

Total amount recovered
= 1,64,000 + 40,000 = 2,04,000
Hence, loss=Rs. 1000

Q.174 (a)

He would be selling 800grams for Rs. 12. Since a kg costs Rs. 10,800-grams would cost Rs. 8

Hence, his profit percentage is 50%

Q.175 (a)

C's purchases price $= 2145 \times 10/11 = 1950$ B's rate of profit is 3 times C's rate of profit .Hence B sells to C at 30% profit. B's price +30% profit =1950 (C's price)

Hence, B's Price =1500
Further, since A's profit rate is 5/3rd the rate of profit of B, A's profit percent would be 30× 5/3=50%
Thus A's price=1000

Q.176 (d)

	S	v	s'	v'
I	60000	100000	100000	60000
	3 :	5 :	5 :	3
N	6 :	6 :	6 :	6
	1 :	1 :	1 :	1
P.S.	3 :	5 :	5 :	3

At the end of the year ratio of profit share of Sridhar and vijay is

S : V

8 : 8

1 : 1

Q.177 (a)

Time period	Investment	
	Guha (G)	Tara(T)
1 month	500	6000
2 month	1000	5500
3month	1500	5000
.	.	.
.	.	.
.	.	.
12 month	6000	500
Total Amount	39000	39000

	G	:	T
I	39000	:	39000
	1	:	1
N	1	:	1
PS	1	:	1

$T = \dfrac{1}{2} \times 3000 = 1500$ Rs.

Q.178 (c)

Time period	Investment	
	K	M
Initial	2400	4800
After 3 months	3600	4000
Next 3month	4800	3200
Next 3 month	6000	2400
Total Amount	16800	14400

	K	:	M
I	16800	:	14400
	7	:	6
N	1	:	1
PS	7	:	6

$$M = \frac{6}{13} \times 2600 = 1200 \text{ Rs.}$$

Q.179 (e)

	A	S	M
I	90000	600000	45000
	6 :	4 :	3
N	$\frac{1}{2}$:	$\frac{1}{2}$:	1
P.S.	3 :	2 :	3

	N	A	S	M
		$\frac{1}{2}$:	$\frac{1}{2}$:	1
		1 :	1 :	2
		6 month	6 month	12 month

Q.180 (c)

	M	A
I	78000 :	65000
	7 :	5
N	$\frac{1}{6}$:	$\frac{1}{5}$
P.S	1 :	1

	M	A
I	$\frac{1}{6}$:	$\frac{1}{5}$
	5k :	6k

6k =12months.
k = 2
M = 5k =10 months.

Q.181 (a)

Here, P=Rs 7200, R = 8% per annum

and $T = \frac{10}{12}$ yr $= \frac{5}{6}$ yr

$$Si = \left(\frac{P \times T \times R}{100} \right)$$

$$= \text{Rs.} \left(7200 \times \frac{5}{6} \times \frac{8}{100} \right)$$

$$= \text{Rs } 480$$

Q.182 (c)

Here, P = Rs 16000, R $= \frac{17}{2}$% per

annum and $T = \frac{5}{2}$ yr

$$SI = \left(\frac{P \times T \times R}{100} \right)$$

$$= \text{Rs.} \left(16000 \times \frac{5}{2} \times \frac{17}{2 \times 100} \right)$$

$$= \text{Rs } 3400$$

Q.183 (c)

Let the sum be Rs x.
Then,

$$SI = \text{Rs} \left(x \times 2 \times \frac{8}{100} \right) = \frac{4x}{25} = 1560$$

$$X = \frac{1560 \times 25}{4} = \text{Rs } 9750$$

Q.184 (c)

Let the sum be Rs 100.
Amount = Rs 200
Simple Interest =Rs(200−100)=Rs 100
Now,

$$T = \left(\frac{100 \times SI}{P \times T} \right) = \frac{100 \times 100}{100 \times 8} = \frac{25}{2} = 12\frac{1}{2} \text{ yr}$$

Q.185 (d)

P= Rs 5000, A = Rs 5800, R= 8% per annum
SI= A−P = Rs.(5800-5000)= Rs 800
Now,

$$T = \left(\frac{100 \times SI}{P \times R} \right) = \frac{100 \times 800}{5000 \times 8} = 2\text{yr}$$

Q.186 (d)

Let the required time be x years. Then,

$$9000 + 9000 \times \frac{12}{100} \times x = 12000 + 12000 \times \frac{8}{100} \times x$$

9000 + 1080x = 12000 + 960x

120x = 3000

$$X = \frac{3000}{120} = 25$$

Hence, the required time period is 25 yr

Q.187 (b)

Let the principle invested in two different schemes be Rs x and Rs y . Then,

$$\frac{x \times 5 \times 12}{100} = \frac{y \times 8 \times 10}{100}$$

$$\frac{x}{y} = \frac{8 \times 10}{5 \times 12} = \frac{4}{3}$$

Q.188 (d)

Let the money added be Rs x. Then,

$$\frac{(4800 + x) \times 12 \times 3}{100} - \frac{4800 \times 9 \times 3}{100} = 720$$

X = 800

∵ Money added is Rs 800.

Q.189 (b)

P = Rs 6750, $R = \frac{20}{3}\%$ per annum, T = 3 yr

$$A = P\left(1 + \frac{R}{100}\right)^3$$

$$= Rs\left[6750 \times \left(1 + \frac{\frac{20}{3}}{100}\right)^3\right]$$

$$= Rs\left[6750 \times \left(\frac{16}{15}\right)^3\right] = Rs\ 8192$$

Compound Interest = Amt − Principle
= Rs (8192-6750) = Rs 1442

Q.190 (a)

P = Rs 15625, R% = 8% per annum,
A = Rs 17576
Let the no of half – yearly period = n

Then, $P\left(1 + \frac{\frac{R}{2}}{100}\right)^n = A$

$$15625\left(1 + \frac{\frac{R}{2}}{100}\right)^n = 17576$$

$$\left(\frac{26}{25}\right)^n = \frac{17576}{15625} = \left(\frac{26}{25}\right)^3$$

N = 3
As the interest is compound 3 times the total time period is $1\frac{1}{2}$ yr.

Q.191 (c)

P = Rs 3200, R1 = 8 % per annum for first year R2 = 10% per annum for second year

$$A = P\left(1 + \frac{R1}{100}\right)\left(1 + \frac{R2}{100}\right)$$

$$= Rs.\left[3200\left(1 + \frac{8}{100}\right)\left(1 + \frac{10}{100}\right)\right]$$

$$= Rs.\left(3200 \times \frac{108}{100} \times \frac{110}{100}\right)$$

= Rs 3801.60
CI = Amount − Principle
= Rs (3801.60 − 3200) = Rs 601.60

Q.192 (a)

P = Rs 12450, n = 9 months $= \frac{9}{12}$ yr, R = 12% per annum

$$A = P\left[1 + \frac{\frac{R}{4}}{100}\right]^{4n}$$

$$= Rs.\left[12450 \times \left(1 + \frac{\frac{12}{4}}{100}\right)^{4 \times \frac{9}{12}}\right]$$

$$= Rs.\left[12450 \times \left(1 + \frac{3}{100}\right)^3\right]$$

$$= \text{Rs } 12450 \times \left(\frac{103}{100}\right)^3 = \text{Rs } 13604.45$$

CI = Rs(13604.45-12450)= Rs 1154.45

Q.193 (c)

$$SI = \text{Rs}\left[\frac{1500 \times 1 \times 8}{100}\right] = \text{Rs } 120$$

$$CI = \text{Rs.}\left[1500 \times \left(1 + \frac{\frac{8}{2}}{100}\right)^{2\times 1} - 1500\right]$$

$$= \text{Rs.}\left[1500 \times \frac{26}{25} \times \frac{26}{25} - 1500\right] = \text{Rs } 122.40$$

∵ Difference = Rs [122040 – 120]
= Rs 2.40

Q.194 (a)

$$\text{Sum} = \text{Rs}\left(\frac{100 \times 120}{2 \times 8}\right) = \text{Rs } 750$$

$$CI = \text{Rs}\left[750 \times \left(1 + \frac{8}{100}\right) - 750\right]$$

$$= \text{Rs.}\left[750 \times \left(1 + \frac{8}{100}\right)^2 - 750\right]$$

$$= \text{Rs.}\left[750 \frac{27}{25} \times \frac{27}{25} - 750\right]$$

= Rs. (874.80-750)
= Rs 124.80

Q.195 (a)

Let the sum be Rs 100. Then
P = Rs 100, R = 2% per annum semi – annual time
= 2 half yr

$$\text{Amount} = \text{Rs}\left[100 \times \left(1 + \frac{2}{100}\right)^2\right]$$

$$= \text{Rs}\left[100 \times \frac{102}{100} \times \frac{102}{100}\right] = \text{Rs } 104.04$$

∵ Effective annual rate = 4.04 % per annum

Q.196 (d)

Q.197 (d)

SI = Rs 1000, R% = 5% per annum, T = 4 yr

$$P = \left(\frac{100 \times SI}{T \times R}\right) = \text{Rs}\left(\frac{100 \times 1000}{4 \times 5}\right) = \text{Rs } 5000$$

2P = Rs 10000
Now, P= Rs 10000, n = 2 yr, R% = 5% per annum

$$A = P\left(1 + \frac{R}{100}\right)^n = \text{Rs}\left[10000\left(1 + \frac{5}{100}\right)^2\right]$$

$$= \text{Rs}\left(10000 \times \frac{105}{100} \times \frac{105}{100}\right) = \text{Rs } 11025$$

Compound Interest = Amount – Principle
= Rs (11025-10000) = Rs 1025

Q.198 (a)

Q.199 (c)

Q.200 (b)

Q.201 (b)

Let, the sum be Rs x and the rate of interest be r%
Then,

$$x + \frac{x \times 5 \times r}{100} = 12480 \qquad \ldots (1)$$

$$x + \frac{x \times 8 \times r}{100} = 13728 \qquad \ldots (2)$$

Solving (1) and (2) we get,

$$\Rightarrow \frac{12480 - x}{13728 - x} = \frac{5}{8}$$

$$\Rightarrow x = \text{Rs} 10,400$$

Q.202 (d)

Let the sum be Rs x

$$\frac{x \times 4 \times 4}{100} + \frac{x \times 8 \times 3}{100} + \frac{x \times 5 \times 2}{100} = 8500$$

$$\Rightarrow x \times \frac{50}{100} = 8500 \Rightarrow x = \text{Rs} 17,000$$

Q.203 (b)

Let, the rate of interest be R% p.a.

Extra simple interests =

$$(12000)\left(\frac{R}{100}\right)(2)=3600$$

R = 15%

Q.204 (c)

Let, the sum is Rs P.

$$P\left(1+\frac{15x}{100}\right)=18125 \qquad \text{... (1)}$$

$$P\left(1+\frac{20(x+2)}{100}\right)=25000 \qquad \text{... (2)}$$

Dividing (2) by (1)

$$\frac{1+\dfrac{20(x+2)}{100}}{1+\dfrac{15x}{100}}=\frac{40}{29}$$

$$\Rightarrow\frac{140+20x}{100+15x}=\frac{40}{29}$$

$$\Rightarrow 812+116x=800+120x$$

$$\therefore x=3$$

Substituting the value of x in (1) or (2),
P=12500

Q.205 (c)

Sum borrow=Rs 64,000
Interest on the sum for the first year

$$=\frac{64000\times5}{100}=Rs\,3,200$$

Amount at the end of the fourth year
= Rs 67,200
Let, the amount repaid be Rs x
Then principle at the beginning of the second year = 67200-x
Amount at the end of the second year= (67200-x)× 1.05
(67200-x) ×1.05=35000
67200-x=34000⟹x=33200

Q.206 (d)

Let, p = Rs x and rate = R% p.a.

$$4x=x\left[1+\frac{R}{100}\right]^{x}$$

$$\Rightarrow 4=\left[1+\frac{R}{100}\right]^{x} \qquad \text{... (1)}$$

Let, we assume the time taken for the same sum to become16 times be T years.

$$\therefore 16x=x\left[1+\frac{R}{100}\right]^{T}\Rightarrow 16=\left[1+\frac{R}{100}\right]^{T}$$

From (1), $\left[1+\dfrac{R}{100}\right]^{2n}=\left[1+\dfrac{R}{100}\right]^{T}$

T=2n years.

Q.207 (a)

Let, the sum be Rs x.
Amount after 2 years if the rate is R% p.a. compounded annually is

$$62720=x\left(1+\frac{R}{100}\right)^{2} \qquad \text{... (1)}$$

Amount after 3 years, if the rate is R% p.a. compounded annually is

$$70246.40=x\left(1+\frac{R}{100}\right)^{3} \qquad \text{... (2)}$$

Dividing (2) by (1)

$$\left(1+\frac{R}{100}\right)^{1}=\frac{70246.40}{62720}=1.12$$

$$1+\frac{R}{100}=\frac{112}{100}$$

$$\frac{R}{100}=\frac{12}{100}\Rightarrow R=12$$

$$(1)\Rightarrow 62720=x\left(\frac{112}{100}\right)^{2}$$

$$(62720)\frac{(100)(100)}{(112)(112)}=x\Rightarrow x=50000$$

Q.208 (d)

Let, the value of the machine two years ago Rs x
Then,

$$x\left(\frac{90}{100}\right)^{2}=24300\Rightarrow x=Rs\,30,000$$

Q.209 (d)

Let, the sum be Rs. x and the rate of interest be r%, then difference of S.I. and

C.I.=r% of simple interest of one year.

$$\frac{r}{100} \times \frac{1560}{2} = 1653.60 - 1560$$

$$\Rightarrow \frac{78r}{100} = 93.6$$

$$\Rightarrow r = 12\%$$

Also, r % of sum=S.I for one year.

$$\Rightarrow \frac{12}{100} \times x = 780 \Rightarrow x = Rs6,500$$

Q.210 (b)

Let, the rate % be x

$$S.I = \frac{8000 \times r \times t}{100} = \frac{8000x}{100} (t = 1year)$$

10% of interest paid $\Rightarrow$ 90% of interest left = Rs.900 (given)

So, Complete interest (100%) = Rs.1000

$$1000 = \frac{8000x}{100} \Rightarrow x = \frac{100}{8} = 12.5\%$$

Q.211 (a)

The net rate 2%

If money transacted=x

then, S.I. at 2% will be

$$\frac{x \times 1 \times 2}{100} = 2.4 \, or \, x = Rs.120 crore$$

Q.212 (b)

The value of van would be

$$196000 \times \frac{6}{7} \times \frac{6}{7} = 144000$$

Q.213 (b)

Solving through options:

$$10000 \xrightarrow{20\%\uparrow} 12000 \xrightarrow{20\%\uparrow} 14400 \xrightarrow{20\%\uparrow} 17280$$

Q.214 (a)

$$\left(\frac{73}{365}\right) \times 0.09 \times 700 = Rs.12.6$$

(Since, the time period is 73 days)

Q.215 (a)

Base on the information we have, we can say that there would have been Rs.30 extra interest per year.

For 2% of principle to be equal to Rs. 30, the Principle amount should be Rs. 1500.

Q.216 (a)

Total effective amount lent for 1 year

$$= 400 \times 2 + Rs.100 \times 4 = Rs.1200$$

Interest being Rs. 60, Rate of interest 5%

Q.217 (b)

The total interest in 6 years=75%

Thus, per year=SI=12.5%

Q.218 (d)

The interest he pays per year would be 36+55=91

Thus, in 4 year the interest would amount to Rs. 364.

Q.219 (b)

12% rate of interest on the amount invested gives an interest of Rs. 3240.

This means that 0.12

A=3240→A=Rs. 27000.

The sum of the investments should be Rs. 27000.

If Akbar invest x, Amar invest $x - 5000$ and Anthony invest $x + 2000$.

Thus,

$$x + x - 5000 + x + 2000 = 27000 \to x = 10000.$$

Q.220 (d)

The rate of interest is not defined.

Hence, option (d) is correct

Q.221 (b)

$$Average = \frac{12.5 + 11.6 + 13.2 + 15.6 + 9.8}{5} = 12.54$$

Q.222 (d)

Sum of the first 40 natural numbers

$$= \frac{40 \times 41}{2} = 820$$

$$Average = \frac{820}{40} = 20.5$$

Q.223 (d)

Sum of first 12 multiple of 12 are

$(12\times1)+(12\times2)+(12\times3)+....+(12\times12)=936$

$$\text{Average}=\frac{936}{12}=78$$

Q.224 (c)

Average of 55 items =29

If 2 are added to each of the term then the new average is also increased by 2. So the new average is 31.

Q.225 (a)

Average of 24 items =18

If 3 are multiplied to each of the term then the new average is also multiplied by 3. So the new average is 54.

Q.226 (d)

Let the five no be x, (x+1), (x+2), (x+3) and (x+4) respectively

Now,

$$\frac{x+x+1+x+2+x+3+x+4}{5}=27$$

$\Rightarrow$ x=25

$\therefore$ Smallest number = 25

Q.227 (c)

For odd number of terms the middle number is the average.

$\therefore$ 6$^{\text{th}}$ term=$\dfrac{253}{11}$ =23

$\Rightarrow$ 1$^{\text{st}}$ term=(23-10) =13

Q.228 (a)

Sum of first six odd multiple of 5

=5 + 15 + 25 + 35 + 45 + 55 = 180

$$\text{Average}=\frac{180}{6}=30$$

Q.229 (d)

Required Average=$\dfrac{(42\times6)+(45\times6)}{12}$

= 43.5

Q.230 (d)

Required Average =$\left(\dfrac{1215+1080}{75+60}\right)$ =17

Q.231 (c)

Given 11a+11b=33

Divide equation by 3 we get, a + b=3

Average of a and b $=\dfrac{a+b}{2}=1.5$

Q.232 (e)

Let the third number be x.

Then, $(65.5\times2)+x+(72.5\times2)=350$
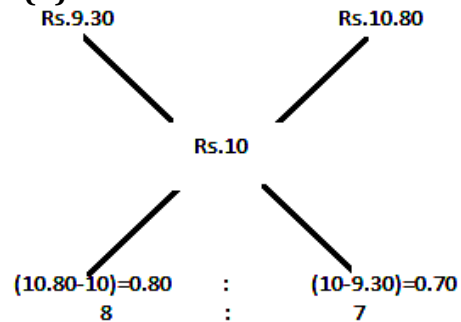
X=74

Q.233 (a)
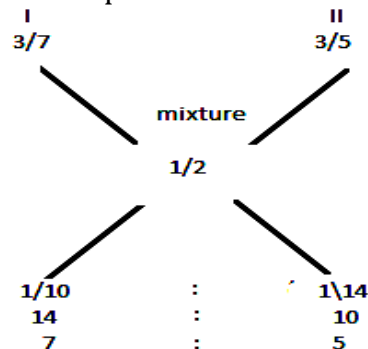
Let, the four no be x,(x+2),(x+4) and (x+6) respectively.
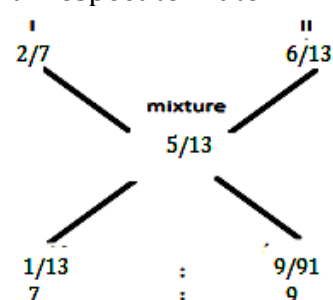
Now, $\dfrac{x+(x+2)+(x+4)+(x+6)}{4}=34$

Q.234 (b)

```
   Rs.9.30              Rs.10.80
        \              /
         \            /
          \          /
            Rs.10
          /          \
         /            \
   (10.80-10)=0.80  :  (10-9.30)=0.70
        8           :        7
```

Q.235 (b)

With respect to Water

```
    I                         II
   3/7                       3/5
      \                     /
       \     mixture       /
        \     1/2         /
         \              /
         /              \
        /                \
    1/10      :        1\14
     14       :         10
      7       :          5
```

Q.236 (c)

With respect to Water

```
    I                         II
   2/7                       6/13
      \      mixture         /
       \      5/13          /
        \                 /
        /                 \
       /                   \
   1/13         :        9/91
    7           :          9
```

Q.237 (b)

For Mixture,
Selling Price=Rs.9.24 & Profit =10%
SP=CP(1+%P)
9.24=CP(1+10%)
CP=8.4Rs.

x Kg ... 27 Kg
Rs.9 ... Rs.7
mixture
Rs.8.4
1.4 : 0.6
7 : 3
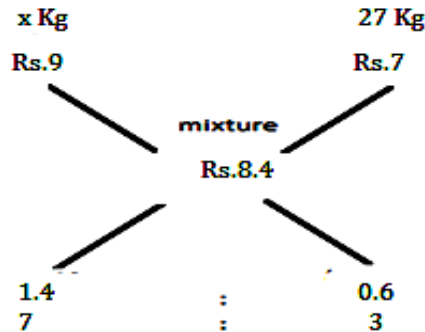
The quantity used is in the ratio 7:3. Therefore, 63Kg of sugar costing Rs.9 per kg is mixed.

Q.238 (b)

Rs.9.30 ... Rs. X
mixture
Rs.10
(X-10) : 0.70
8 : 7
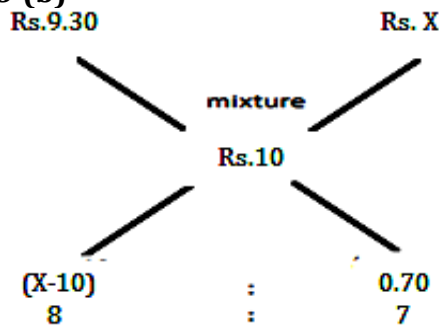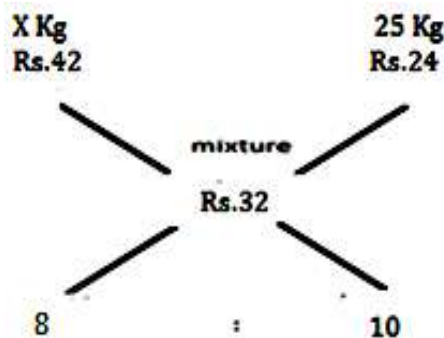
$$\frac{X-10}{0.70} = \frac{8}{7}$$
X=10.80 Rs.

Q .239 (a)

For Mixture,
Selling Price=Rs.40 and Profit =25%
SP=CP (1+%P)
40=CP (1+25%)
CP=32Rs.

X Kg ... 25 Kg
Rs.42 ... Rs.24
mixture
Rs.32
8 : 10

The quantity used is in the ratio 8:10. Therefore, 20Kg of sugar costing Rs 42 per kg is mixed

Q .240 (c)

In a mixture of 30 liter, the ratio of milk to water is 7:3
∴ Milk=21liter and Water=9liter
Let x liter of water be added in a mixture
Then the Quantity of water in the new mixture is

$$(9+x) = \frac{40}{100}(30+x) \Rightarrow X = 5\text{liter}$$

Q.241 (c)
$$P = 25 \times 15 - 24 \times 14 = 375 - 336 = 39$$

Q.242 (c)
D'sweight
$$= 4 \times 80 - 3 \times 84 = 320 - 252 = 68$$
E's weight = 68 + 3 = 71
Now, we know that $A+B+C+D = 4 \times 80$
$= 320$ & $B+C+D+E = 78 \times 4 = 312$
Hence A's weight is 8kg more than E's weight $A = 71 + 8 = 79$

Q.243 (a)
Average income over 9months
$$= [3 \times (2750 + 650) + 3 \times (3150 + 650)$$
$$+ 3 \times (6750 + 650)]/9$$
$$= [3 \times 3400 + 3 \times 3800 + 3 \times 7400]/9$$
$$= 4866.66$$

Q.244 (a)
if the average age of 8 people has gone up by 2 years it means: the total age has gone up by 16 years. Thus the total age of the women would be: 35 + 45 + 16 = 96. Hence their average age = 48

Q.245 (d)
Teacher'sweight $= 40.5 \times 30 - 40 \times 29$
$$= 1215 - 1160 = 55$$

Q.246 (b)

Let the numbers be a, b, c, and d respectively $a+b+c=16\times3=48$ and $b+c+d=15\times3=45$ Also, since d=18, we have $b+c=45-18=27$ Hence $a=48-(b+c)\rightarrow a=21$

Q.247 (b)

Let the number of ladies be n. Then, we have,

$$8\times15+n\times6=(8+n)\times(10.8)$$
$$\rightarrow120+6n=86.4+10.8n\rightarrow4.8n$$
$$=33.6\rightarrow n=7$$

Q.248 (c)

Let the number of marks in the 7th paper be M. Then the total of the first seven papers = 7 × 42 while the total of the last (ie 7th to 13th papers) would be

$$=7\times35$$

Total of 1st 7+total of 7th to 13th = total of all 13 +marks in the 7th paper

$$\rightarrow7\times42+7\times35=13\times40+M$$
$$529=520+M\rightarrow M=19$$

Q.249 (a)

The total weight of the six people goes up by 15 kgs (when the average for 6 persons goes up by 2.5 kg.).Thus, the new person must be 15kgs more than the person who he replaces. Hence, the new person's weight =50+15=65kg

Q.250 (d)

If the number of questions correct is N, then the number of wrong answers is (100-N).
Using this we get.

$$N\times2-(100-N)\times0.5=120\rightarrow2.5N$$
$$=170\rightarrow N=68$$

Q.251 (c)

Mixing Rs. 4/kg and Rs. 5/kg to get Rs. 4.6 per kg we get that the ratio of mixing is 2:3 If the first oil is 40 kg ,the second would be 60 kg

Q.252 (d)

Since by selling at Rs. 4.40 we want a profit of 10% it means that the average cost required is Rs. 4 per kg .Mixing sugar worth Rs. 3.6/kg and Rs. 4.2/kg to get Rs. 4/kg means a mixture ratio of 1:32 .Thus, to get 8 kg of the second variety we need to add 4 kg of the first variety to get the required cost price.

Q.253 (d)

In 125 gallons we have 25 gallons water and 100 gallons wine. To increase the percentage of water to 25%, we need to reduce the percentage of wine to 75%.This means that 100 gallons of wine =75% of this new mixture. Thus the total mixture = 133.33 gallons. Thus, we need to mix 133.33-125=8.33 gallons of water in order to make the water equivalent to 25% of the mixture

Q.254 (a)

The ratio of boys and girls appearing for the exam can be seen to be 3:1 using the following alligation figure

This means that out of 400 students, there must have 100 girls who appeared in the exam.

Q.255 (c)

The cost price of the mixture would have been Rs. 8 per liter for him to get a profit of 25% by selling at Rs. 10 per liter. The ratio of mixing would have been 1:4 (water is to milk) as can be seen in the figure

Since we are putting in 5 liters of water, the amount of milk must be 20 liters.

The amount of mixture then would become 25 liters.

Q.256 (c)

In order to sell at a 25% profit by selling at Rs.13.75 the cost price should be 13.75/1.25 =11.Also since water is freely available, we can say that the ratio of water and soda must be 1:11

Q.257 (c)

Solving using options Initially there are 7 liters of water in 70 liters of the mixture. By mixing 2 liters of water we will have 9 liters of water in 72 liters of the mixture –which is exactly 12.5%

Q.258 (a)

The requisite 11.11% profit can be got by mixing 0.111 liters of water in 1 liter of milk. In such a case the total milk quantity would be 1.111 liters and the price would be for 1 liters only. The profit would be 0.111/1=11.11%

Q.259 (b)

The percentage of honey in the new mixture would be:
$(2 \times 25 + 3 \times 75)/5 = 275/5 = 55\%$
The ratio of honey to water in the new mixture would be 55:45 =11:9

Q.260 (c)

The first vessel contains 25% spirit while the second vessel contains 37.5% spirit to get 1:2 ratio we need 33.3 % sprit in the mixture .The ratio of mixing can be seen using the following alligation figure.

25%   33.33%   37.5%

Ratio of mixing =4.1666:8.333 =1:2
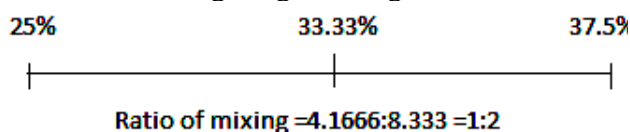
Q.261 (c)

A's 1 day's work = $\dfrac{1}{6}$

B's 1 day's work = $\dfrac{1}{8}$ and

C's 1 day's work = $\dfrac{1}{12}$

∵ (A+B+C)'s 1 day's work = $\left(\dfrac{1}{6} + \dfrac{1}{8} + \dfrac{1}{12}\right)$

$= \dfrac{3}{8}$

So, A, B and C together can finish the job in $\dfrac{8}{3} = 2\dfrac{2}{3}$ days

Q.262 (b)

A's 1 day's work = $\dfrac{1}{16}$

B's 1 day's work = $\dfrac{1}{12}$

(A+B+C)'s 1 day's work = $\dfrac{1}{6} - \left(\dfrac{1}{16} + \dfrac{1}{12}\right)$

$= \dfrac{1}{6} - \dfrac{7}{48} = \dfrac{1}{48}$

So, C alone can do work in 48 days.

Q.263 (a)

Ratio of times of A and B = 2:1
Ratio of work done by A and B = 1:2

(A+B)'s 1 day's work = $\dfrac{1}{8}$

Divide $\dfrac{1}{8}$ in the ratio 1:2

∵ A's 1 day's work = $\left(\dfrac{1}{8} \times \dfrac{1}{3}\right) = \dfrac{1}{24}$

Hence, A alone can finish the work in 24 days.

Q.264 (c)

Ratio of efficiency of Rekha and Surekha
= 100 : 125 = 4 : 5
Hence, ratio of time taken to do work by Rekha and Surakha = 5 : 4

So, if Rekha can do a work in 40 days, Surekha will do the same work in 32 days.

Q.265 (c)

A's 1 day's work = $\frac{1}{12}$ B's 1 day's work = $\frac{1}{15}$

(A+B)'a 6 day's work. $= 6\left(\frac{1}{12} + \frac{1}{15}\right)$

$= 6 \times \frac{3}{20} = \frac{9}{10}$

Work left $= \left(1\frac{9}{10}\right) = \frac{1}{10}$

Q.266 (b)

B's 1 day's work = $\frac{1}{15}$

Hence, B's 5 day's work = $\frac{5}{15} = \frac{1}{3}$

Work remaining = $\left(1\frac{1}{3}\right) = \frac{2}{3}$

$\frac{2}{3}$ of the work can be done by A in $\left(\frac{2}{3} \times 24\right)$ days

= 16 days

Q.267 (d)

A's day's work = $\frac{1}{48}$

B's 1 day's work = $\frac{1}{18}$

And C's 1 day's work = $\frac{1}{36}$

(B+C)'s 2 day's work = $2\left(\frac{1}{18} + \frac{1}{36}\right)$

$= 2 \times \frac{1}{12} = \frac{1}{6}$

So, $\frac{5}{6}$ of the work can be done by A in

$\left(\frac{5}{6} \times 48\right)$ days = 40 days

Q.268 (d)

A can do 1 work in $\left(\frac{5}{4} \times 24\right)$ days = 30 days

Let, B can do the work in x days.

Work remaining $= \left(1 - \frac{4}{5}\right) = \frac{1}{5}$

$\frac{1}{5}$ of the work was done by A and B in 2 days

$\frac{2}{30} + \frac{2}{X} = \frac{1}{5}$

$\frac{2}{X} = \frac{1}{5} - \frac{1}{30} = \frac{1}{5} - \frac{1}{15} = \frac{2}{15}$

x=15 days

Q.269 (b)

Let A's 1 day's work =x and B's 1 day's work =y

Then, x+y = $\frac{1}{16}$ and 8x+32y =1

Solving these two equations, we get

$x = \frac{1}{24}$ and $y = \frac{1}{48}$

∵ B's 1 day's work = 48 days

Q.270 (c)

Whole work is done by A in (4×4) days = 16 days

Whole work is done by B in (8×3) days = 24 days

A's wages: B's wages= A's 1 day's work: B's 1 day's work

$= \frac{1}{16} : \frac{1}{24} = 3:2$

∵ A's share=Rs $\left(\frac{3}{5} \times 4500\right)$ = Rs 2700

Q.271 (c)

(A+B)'s 2 day's work = $\left(\frac{1}{12} + \frac{1}{48}\right) = \frac{5}{48}$

Work done in 9 pairs of days = $\left(\frac{5}{48} \times 9\right) = \frac{15}{16}$

Remaining Work = $\left(1 - \dfrac{15}{16}\right) = \dfrac{1}{16}$

Work done by B on 19th day = $\dfrac{1}{48}$

Remaining work = $\left(\dfrac{1}{16} - \dfrac{1}{48}\right) = \dfrac{1}{24}$

Now, $\dfrac{1}{12}$ work is done by A in 1 day.

$\dfrac{1}{24}$ work is done by A in $\left(12 \times \dfrac{1}{24}\right)$

dats = $\dfrac{1}{2}$ day

∵Total time taken = $19\dfrac{1}{2}$ days

Q.272 (c)

4M + 6W = 8 days
32M + 48W = 1 day   ... (1)
3M + 7W = 10 days
30M + 70W = 1 days   ... (2)
Equating Eq. (1) and (2),
32M + 48 W = 30M + 70W
M = 11W   ... (3)
Substituting Eq. (3) in Eq. (2), we get
30(11W) + 70W = 1 day
400 W = 1 day
400 women can do a job in 1 day.
∵ 25 women will do the job in
$\dfrac{400 \times 1}{25} = 16$ days

Q.273 (b)

1 women = 2 men = 3 boys

1 boy = $\dfrac{2}{3}$ men

$1\,\text{man} + 1\,\text{woman} + 1\,\text{boy} = 1\,\text{man} + 2\,\text{men} + \dfrac{2}{3}\,\text{men}$

$= \left(1 + 2 + \dfrac{2}{3}\right)\text{men} = \dfrac{11}{3}\,\text{men}$

If, 2 men can do a work in 55 days.

$\dfrac{11}{3}$ Men will do the same work in

$= \dfrac{2 \times 55 \times 3}{11} = 30$ days

Q.274 (c)

48W×9D = (48+x) M×6D ⇒ x = 24

Q.275 (a)

6M = 12 days
M = 72 days

1 man's 1 day's work = $\dfrac{1}{72}$

8W = 18 Days ⇒ 1W = 144 days

1 women's day's work = $\dfrac{1}{144}$

So, (A+B+C) can do the entire work

in $\left(\dfrac{15}{4} \times 2\right)$ days

$= 7\dfrac{1}{2}$ days

Q.276 (a)

8M + 4 W = 6 days and 1M = 2W

$8M + 4\left(\dfrac{M}{2}\right) = 6$ days

$\left[\because W = \dfrac{M}{2}\right]$

1 man can do a work alone in 60 days.
1 women can do a work alone in 120 days

$\left[\because W = \dfrac{M}{2}\right]$

Now, (8 men + 4 women)'s 2 day's work

$= 2\left(\dfrac{8}{60} + \dfrac{4}{120}\right) = \dfrac{1}{3}$

Work Remaining $= \left(1 - \dfrac{1}{3}\right) = \dfrac{2}{3}$

This work has to be done by (4 men and 8 women) in 1 day

$= \left(\dfrac{4}{60} + \dfrac{8}{120}\right) = \dfrac{2}{15}$

$\dfrac{2}{3}$ work can be done by 4 men and 8 women in $\left(\dfrac{2}{3} \times \dfrac{15}{2}\right)$ days = 5 days

Q.277 (c)

Q.278 (d)

24 men= 16 days
1 men =384 days
8 women = 72 days
1 women = 576 days
24 children = 32 days
1 child = 768 days
(10 men + 15 women + 24 children)'s one day work

$$= \left(\frac{10}{384} + \frac{15}{576} + \frac{24}{768} \right)$$

$$= \left(\frac{5}{192} + \frac{5}{192} + \frac{1}{32} \right) = \frac{1}{12}$$

They can complete the whole work in 12 days.

Q.279 (c)

Q.280 (d)

8 men =12 days
1 man = 96 days
4 women =48 days
1 women = 1392 days
10 children = 24 days
1 child = 240 days
Now, (10men + 4women + 10 children)'s 1 day's work

$$= \left(\frac{10}{96} + \frac{4}{192} + \frac{10}{240} \right) = \frac{5}{48} + \frac{1}{48} + \frac{1}{24} = \frac{1}{6}$$

So the entire work is completed by them in 6 days.

Q.281 (d)

Let the capacity of the tank be C liters. Let the time in which R can empty it be r minutes.
Rate at which the tank is effectively

filled $= \dfrac{C}{45}$ lit / min

Rates at which P and Q filled it are

$\dfrac{C}{36}$ lit / min   & $\dfrac{C}{90}$ lit / min

respectively

$$\frac{C}{45} = \frac{C}{36} + \frac{C}{90} - 3 \Rightarrow C = 180$$

Q.282 (d)

minute

A = 1/8, C = 1/6 and B = 1/12
A + B + C = 1/18 + 1/12 + 1/16

$$= \frac{6+4+3}{48} = 13/48$$

∴ It takes 48/13= $3\dfrac{9}{13}$ hrs to fill the

tank
Taps were opened for 4 minutes
Overflow time $= 4 - 3\dfrac{9}{13} = 4/13$

Volume of overflow $= \dfrac{\dfrac{4}{13}}{\dfrac{48}{13}}$

$$= \frac{4}{48} = \frac{1}{12} = 8\dfrac{1}{3}\%$$

Q.283 (d)

Let the times that A, B and C would take to complete the job be a day's b days and c days respectively.
Ratio of the time in which A and B would complete it to that in which C would complete it M: 1
∴ Ratio of the combined efficiency of (A and B) to c= 1:m

$$\therefore \frac{\dfrac{1}{a} + \dfrac{1}{b}}{\dfrac{1}{c}} = \frac{1}{m} \text{ i.e. } \frac{1}{a} + \frac{1}{b} = \frac{1}{m}\left(\frac{1}{c} \right)$$

Similarly $\dfrac{1}{b} + \dfrac{1}{c} = \dfrac{1}{m}\left(\dfrac{1}{a} \right)$ and $\dfrac{1}{a} + \dfrac{1}{c} = \dfrac{1}{m}\left(\dfrac{1}{b} \right)$

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{b} + \frac{1}{c} + \frac{1}{a} + \frac{1}{c} = \frac{1}{m}\left(\frac{1}{c} + \frac{1}{a} + \frac{1}{b} \right)$$

$$\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)\left(2 - \frac{1}{m} \right) = 0$$

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} \neq 0$$

$$\therefore 2 - \frac{1}{m} = 0 \Rightarrow m = \frac{1}{2}$$

Q.284 (b)

According to the problem

$$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{7.5} \qquad \text{..... (1)}$$

$$\frac{1}{A} + \frac{1}{C} + \frac{1}{E} = \frac{1}{5} \qquad \text{..... (2)}$$

$$\frac{1}{A}+\frac{1}{C}+\frac{1}{D}=\frac{1}{6} \qquad ..... (3)$$

$$\frac{1}{B}+\frac{1}{D}+\frac{1}{E}=\frac{1}{4} \qquad ...... (4)$$

By (1) + (2) + (3)

$$3\left(\frac{1}{A}+\frac{1}{C}\right)+\frac{1}{B}+\frac{1}{D}+\frac{1}{E}=\frac{1}{7.5}+\frac{1}{5}+\frac{1}{6}$$

$$\Rightarrow 3\left(\frac{1}{A}+\frac{1}{C}\right)=\frac{1}{7.5}+\frac{11}{30}-\frac{1}{4} \quad \text{from (4)}$$

$$\Rightarrow 3\left(\frac{1}{A}+\frac{1}{C}\right)=\frac{4+11-7.5}{30}$$

$$=\frac{7.5}{30}=\frac{1}{4} \; or \; \frac{1}{A}+\frac{1}{C}=\frac{1}{12} \qquad .... (5)$$

Adding to (4)

$$\frac{1}{A}+\frac{1}{B}+\frac{1}{C}+\frac{1}{D}+\frac{1}{E}=\frac{1}{12}+\frac{1}{4}=\frac{4}{12}=\frac{1}{3}$$

∴ Time required = 3 hrs

Q.285 (c)

Work done actually

$$=(25\times15)+\{(25+10)\times(24-15-1)\}$$

$$=655 \, \text{mondays}.$$

Hence, if no extra men are used. Time need = 655/25 = 26.2 days.

Q.286 (a)

20 men work for 4 days & complete 4/10 = 2/5 W = 0.4 W

15 men work for 4 days & complete 3/4 × 2/5 W = 0.43 W

10 men work for 4 days & complete 1/2 × 2/5 W = 0.2 W

5 men work for 4 days & complete 1/4 × 2/5 W = 0.1 W

▢ The work will be finish in 16 days.

Q.287 (c)

Since the garrison is reinforced by 500 men,

∴ There are (1500+500) or 2000 men now.

▢The provision left would last for 1 man for

35×1500 days

▢Provision left would last for 2000 men for $35 \times 1500 / 2000 = 26.25 \, \text{days}$.

Q.288 (a)

20 men work for 4 days & complete 4/10 = 2/5 W = 0.4 W

15 men work for 4 days & complete 3/4 × 2/5 W = 0.43 W

10 men work for 4 days & complete 1/2 × 2/5 W = 0.2 W

5 men work for 4 days & complete 1/4 × 2/5 W = 0.1 W

▢The work will be finish in 16 days.

Q.289 (b)

Suppose A alone takes x days and B alone y days to do the job separately According to the first case. A worked for 11 days and B for 8 days to complete the job.

$$\therefore \frac{11}{x}+\frac{8}{y}=1 \qquad .... (1)$$

and

$$\frac{9}{x}+\frac{12}{y}=1 \qquad .... (2)$$

From equation (1) & (2) we get

$$\frac{33}{x}+\frac{24}{y}=3 \text{ and } \frac{18}{x}+\frac{24}{y}=2$$

$$\Rightarrow \frac{15}{x}=1 \, or \, x =15$$

So y=30

Q.290 (b)

We have $\frac{1}{25}+\frac{1}{30}-\frac{1}{15}=\frac{1}{150}$ part filled in 1 min

Hence $1-100\left(\frac{1}{150}\right)=1/3\text{rd}$ of the tank is unfilled after 100 min.

Q.291 (c)

Total man days required = 600 man days. If 5 workers leave he job after 'n' days, the total work world be done in 35 days. We have to find the value of 'n' to satisfy:

$$20\times n+(35-n)\times15=600$$

Solving for n, we get

$$20n-15n+35\times15=600$$

$$5n=75$$

$$n=15$$

Q.292 (b)

Subhash can copy 200 page in 40 hours (reactions to the first sentence.) Hence, Prakash can copy 100 pages in 40 hours. Thus, he can copy 30 pages in 30% of the time: i.e. 12 hours.

Q.293 (c)

Since the ratio of money given to Apurva and Amit is 2:3 their work done would also be in the same ratio. Thus, their time ratio would be 3:2 (inverse of 2:3) So, if Apurva takes 12 days, Amit would take 8 days and the total number of days required (t) would be given by the equation

$(1/12 + 1/8)t = 1 \rightarrow t = 24/5 = 4.8 \text{days}$

Q.294 (d)

After 27 days, food left =4×200=800 soldier days worth of food. Since , now there are only 80 soldiers, this food would last for 800/80=10 days. Number of extra days for which the food lasts =10-4=6 days.

Q.295 (c)

The rate of filling will be 20% and the net rate of filling (including the leak) is 16.66% Hence the leak accounts for 3.33% per hour i.e it will take 30 hours to empty the tank.

Q.296 (c)

A+B=16.66%From here solve this one using the options. Options (c) fits the situation as it gives us A's work =10% B's work=6.66% as also that B takes 5 minutes more that A (as stipulated in the problem).

Q.297 (c)

(A+B)'s work=C's work.
Also if A takes 'a' days
B would take 'a-5' days and c would take 'a-9'days. Solving through options , options 'c' fits.
A(15 days) → A's work =6.66%

B(10 days) → B's work =10%
C (6 days) → C's work =16.66%

Q.298 (b)

A' work=105
B's negative work =6.66%
(A+B)'s work =3.33%
To fill a half empty tank, they would take 50/3.33=15 hours.

Q.299 (c)

(A+B)=2C
Also (A+C)=3 B
36 (A+B+C)=1
Solving for C, we get:
36(2C+C)=1→108C=1
C=1/108

Q.300 (d)

A+B+C=19% In the first two hours they will do 38% of the work. Further, for the next two hours work will be done at the rate of 15% per hours. Hence after 4 hours 685 of the work will be competed, when tap B is also closed. The last 32% of the work will be done by A alone. Hence, A does 40% (first4days) + 32%=72% of the work.

Q.301 (d)

$s = \dfrac{d}{t} = 15 \text{m/s}$
=54 km/hr

Q.302 (a)

$\text{Avg.speed} = \dfrac{\text{Total dist.}}{\text{Total time}}$
=31 k /hr

Q.303 (a)

Forward journey speed = s km/hr
time = 5hr
Return journey speed =(s-3)km/hr
Time=8hr
∵distance=constant
$\dfrac{S_1}{S_2} = \dfrac{t_2}{t_1}$
$\dfrac{S}{s-3} = \dfrac{8}{5} \Rightarrow S = 8 \text{km/hr}$

Speed in return journey = s-3 5km/hr

Q.304 (a)

$T_1 + T_2 = \text{Total time}$

$T_1 \rightarrow$ Time required for 1st half distance

$T_2 \rightarrow$ Time required for remaining distance.

$$\frac{d_1}{S_1} = \frac{d_2}{s_2} = T.T$$

$$\frac{d}{2 \times 50} + \frac{d}{2 \times 60} = 11 \Rightarrow \frac{d}{2}\left[\frac{1}{50} + \frac{1}{60}\right] = 11$$

$$\Rightarrow d = 600m$$

Q.305 (d)

$$\text{Avg.speed} = \frac{\text{Total dist.}}{\text{Total time}}$$

$$= \frac{15 + 30 + 60}{\left(\frac{15}{30} + \frac{30}{45} + \frac{60}{90}\right)} = 57.27 km/hr$$

Q.306 (b)

$D_{\text{Foot}} + D_{\text{Bicycle}} = \text{Total distance}$

Time required traveling on foot $= x\,hr$

Time required traveling on bicycle =(7-x)

$3 \times x + 10 \times (7-x) = 56$

$3x + 70 - 7x = 56$

Distance travelled on bicycle = S × T

=10 × 5 = 50km

Q.307 (a)

Due to stoppages, it covers 4 km/less

Time taken to cover

$$4km = \left(\frac{4}{24} \times 60\right)min = 10\,min$$

Q.308 (c)

$S_1 = 5km/hr \quad S_2 = 5.6km/hr$

(Same direction)

d=3km

$$t = \frac{d}{|S_1 - S_2|} = \frac{3}{0.6} = 5hr$$

Q.309 (d)

$S_A = 50km/hr \quad S_B = 75km/hr$

$D_A = x\ km \quad D_B = x + 40km$

T=constant

$$\frac{S_A}{S_B} = \frac{D_A}{D_B} \Rightarrow \frac{50}{75} = \frac{x}{x + 40}$$

x= 80

$D_{AB} = x + x + 40 = 200km$

Q.310 (d)

$$T = \frac{L_{T_1} + L_{T_2}}{\left|S_{T_1} + S_{T_2}\right|} = \frac{110 + 90}{|45 - 50| \times \frac{5}{18}}$$

=144 sec

Q.311 (c)

$S_{T_1} = 36km = 10m/s$

$$T = \frac{L_{T_1} + L_{T_2}}{S_{T_1} + S_{T_2}} \Rightarrow 10 = \frac{150 + 100}{10 + S_{T_2}}$$

$S_{T_2} = 15m/s$

$S_{T_2} = 54km/hr$

Q.312 (a)

$$S_m = \frac{S_{\text{downstream}} + S_{\text{upstream}}}{2}$$

= 9km/hr

Q.313 (a)

$$S_C = \frac{S_{\text{downstream}} - S_{\text{upstream}}}{2}$$

=1.5km/hr

Q.314 (b)

$$S_{\text{down}} = \frac{48}{4} = 12km/hr$$

$S_{\text{down}} = S_b + S_c$

$S_b = 9km/hr$

$S_{\text{up}} = S_b - S_c = 6km/hr$

$$t_{\text{up}} = \frac{15}{6} = \frac{5}{2}hr$$

$t_{\text{up}} = 2hr\,30\,min$

Q.315 (a)

$$T_{up} + T_{down} = \text{total time}$$

$$\frac{d_{up}}{S_{up}} + \frac{d_{down}}{S_{down}} = T.T$$

$$\frac{32}{S_b - 2} + \frac{32}{S_b + 2} = 12$$

$$S_b = 6 \text{km} / \text{hr}$$

Q.316 (a)

$$t_{1st\ time\ anywhere} = \frac{\text{Length of track}}{|S_A - S_B|}$$

$$= \frac{9}{3} = 3 \text{hr}$$

Q.317 (c)

$$t_{1st\ time\ at\ starting\ pt.} = \text{LCM}\{t_A, t_B\}$$

$$= \text{LCM}\left\{\frac{9}{5}, \frac{9}{2}\right\}$$

$$= 9 \text{ hr}$$

Q.318 (d)

$$L_T = 320m \quad L_p = 640m$$

Time require to cross pole $= t = \dfrac{L_T}{S_T}$

Time require to cross platform $= t + 80$

$$= \frac{L_{T+L_p}}{S_T}$$

$$\frac{L_T}{S_T} + 80 = \frac{L_{T+L_p}}{S_T}$$

$$S_T = 8m / s$$

Q.319 (b)

$$t = \text{LCM}\{t_A, t_s, t_N\}$$

$$= \text{LCM}\{18, 24, 32\}$$

$$= 288$$

Q.320 (d)

$$t = \frac{L_{T+L_p}}{S_T}$$

$$S_T = 20m / s$$

Q.321 (b)

$$S_{T_1} = 16 \text{km} / \text{hr}$$

$$S_{T_2} = 21 \text{km} / \text{hr}$$

$$D_1 = x \text{km}$$

$$D_2 = x + 60 \text{km}$$

T=constant

$$\frac{ST_1}{ST_2} = \frac{D_1}{D_2} \Rightarrow \frac{16}{21} = \frac{x}{x + 60}$$

X=192

Distance between Aligarh & Delhi

$$= x + x + 60$$

$$= 444 \text{km}$$

Q.327 (d)

$S_F = $ Speed of fast train $= 45$ km/hr

$S_m = $ Speed of man in slower train $= 36$ km/hr

$t = 8$ sec

$$t = \frac{L_T}{S_T + S_m} \Rightarrow 8 = \frac{L_T}{(45 + 36) \times 5/18}$$

L=180m

Q.328 (a)

$$L_{T_1} = L_{T_2} = 100m$$

$$t = 8 \sec \& S_{T_1} = 25_{T_2}$$

$$t = \frac{L_{T_1} + L_{T_2}}{S_{T_1} + S_{T_2}} \Rightarrow 8 = \frac{200}{3S_{T_2}}$$

$$S_{T_2} = \frac{25}{3} m / s$$

$$= \frac{25}{3} \times \frac{18}{5} \text{km} / \text{hr} = 30 \text{km} / \text{hr}$$

Q.329 (d)

$$L_{T_1} = 150m \quad t = 15 \sec$$

$$S_{T_1} = 10m / s$$

$$L_{T_2} = 150m$$

$$t = \frac{L_{T_1} + L_{T_2}}{S_{T_1} + S_{T_2}} \Rightarrow 8 = \frac{300}{10 + S_{T_2}}$$

$$S_{T_2} = \frac{55}{2} m / s$$

$$= 99 \text{km/hr}$$

Q.330 (a)

Assume distance between Meerut & Ghaziabad =1km.

$$S_X = \frac{1km}{1hr} = 1km/hr$$

$$S_Y = \frac{1km}{1\frac{1}{2}hr} = \frac{2}{3}km/hr$$

$$t = \frac{d}{S_X + S_Y} = \frac{1}{1+\frac{2}{3}} = \frac{3}{5}hr$$

= 36min

Two trains will meet at 4.36 pm

Q.331 (d)

$$S_d = S_b + S_C = 18km/hr$$

$$t = 12\min = \frac{12}{60} = \frac{1}{5}hr$$

$$D = s \times t = 18 \times \frac{1}{5} = 3.6km$$

Q.332 (c)

$$S_b = 9\frac{1}{3}km/hr = \frac{28}{3}km/hr$$

$$S_{Up} = 3S_{down}$$

$$S_b - S_w = 3(S_b - S_w)$$

$$S_w = \frac{S_b}{2} = \frac{28}{2\times 3}km/hr$$

$$S_w = 4\frac{2}{3}km/hr$$

Q.333 (c)

t = constant

$$\frac{S_{Up}}{S_{down}} = \frac{D_{Up}}{D_{down}}$$

$$\frac{10 - S_C}{10 + S_C} = \frac{14}{26}$$

SC=3km/hr

Q.334 (c)

$$T_{Up} + T_{down} = \text{total time}$$

$$\frac{d_{Up}}{S_{Up}} + \frac{d_{down}}{S_{down}} = \text{Total time}$$

$$\frac{24}{S_{Up}} + \frac{36}{S_d} = 6 \quad \text{------- (1)}$$

$$\frac{36}{S_{Up}} + \frac{24}{S_d} = \frac{13}{2} \quad \text{------- (2)}$$

$$S_{Up} = 8km/hr$$

$$S_d = 12km/hr$$

$$S_C = \frac{S_d - S_{Up}}{2} = 2km/hr$$

Q.335 (c)

Total journey = Dkm

$$\text{Avg speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$\text{Avg speed} = \frac{D}{\frac{(D/3)}{80} + \frac{(D/3)}{60} + \frac{(D/3)}{30}}$$

Avg speed = 48 km/hr

Q.336 (d)

$$\text{Avg speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{(60\times 3) + (50\times 4) + (590\times 5)}{3+4+5}$$

= 56.25km/hr

Q.337 (c)
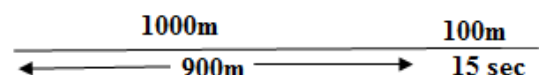
$$S_T = 72km/hr = 20m/s$$

$$t_{platform} = 30$$

$$t_{man} = 18\sec$$

$$t_{man} = \frac{L_T}{S_T} = \frac{L_T}{20}$$

$$L_T = 360m$$

$$t_{platform} = \frac{L_T + L_P}{S_T}$$

$$30 = \frac{360 + L_P}{20} \Rightarrow L_P = 240m$$

Q.338 (c)

$$D_A = 1000m$$

$$D_B = 900ma$$

$$S_A = ?$$

$$S_B = \frac{100}{15} = \frac{S_A}{\left(\frac{100}{15}\right)}$$

t = constant

$$\frac{D_A}{D_B} = \frac{S_A}{S_B} \Rightarrow \frac{1000}{900} = \frac{S_A}{\left(\frac{100}{15}\right)}$$

$$S_A = \frac{1000}{135}$$

$$t_A = 135 \sec$$

Q.339 (b)

Distance between house & office ='d'

$$d = 50 \times \left(t + \frac{30}{60}\right) \text{------- (1)}$$

$$d = 75 \times \left(t - \frac{20}{60}\right) \text{------- (2)}$$

$$50\left(t + \frac{1}{2}\right) = 75\left(t - \frac{1}{3}\right)$$

t = 2 sec

$$d = 50 \times \left(2 + \frac{1}{2}\right) = 125 km$$

$$S = \frac{d}{t} = \frac{125}{2} = 62.5 km / hr$$

Q.340 (b)

In 1000 m race

$D_A = 1000m$

$D_B = 800m$

$D_C = 640m$

$\quad D_A : D_B : D_C$

$\quad 100 : 800 : 640$

$\quad 25 \ : 20 \ : 16$

$\quad \times 20 : \times 20 : \times 20$

$\overline{\quad 500m : 400m : 320}$

In 500 m race B beats C by 80 m

Q.341 (b)

Number of routes from A to B = 5
Number of routes B to C = 2
From, fundamental principle, total number of rotes
= 5 × 2 = 10

Q.342 (d)

Here, the eldest child always sits in the middle.
Total number of remaining seats = (5-1) = 4 seats and
The total number of remaining children = 4

Q.343 (b)

In this case, repetition is not allowed. So the first prize can be given in 4 ways. The second in 3 ways and the third in 2 ways.
By fundamental principle, (4×3×2) ways = 24 ways

$$^4P_3 = \frac{4!}{(4-3)!} = \frac{4!}{1!} = \frac{4 \times 3 \times 2 \times 1}{1} = 24 \text{ ways}$$

Q.344 (c)

In this case, repetition are allowed, so all the three prizes can be given in 4 ways, i.e.,
(4×4×4) ways = 4^3 ways
= 64 ways
Or, n^r ways = 4^3 ways = 64 ways

Q.345 (a)

By taking 4 girls as one unit and 6 boys as 6 unit, the total 7 units can be arranged in $^7P_7$ ways = 7! Ways
The unit of 4 girls can be arranged amongst themselves in 4! Ways.
∵ The number of ways in which all girls sit together
= (7! ×4!) Ways

Q.346 (d)

Total no of words formed

$$= ^8P_8 = \frac{8!}{(8-4)!}$$

$$= \frac{8!}{4!} = \frac{8 \times 7 \times 5 \times 4!}{4!} = 1680 \text{ ways}$$

Q.347 (b)

Q.348 (b)

Total number of persons = 9
Host can sit in a particular seat in one way. Now, remaining positions are defined relative to the host.

Hence, the remaining can sit in 8 places in $^8P_8 = 8!$ Ways

Q.349 (c)

The number of ways of selecting 3 men and 3 women out of 6 men and 5 women is

$$= \frac{6!}{3! \times 3!} + \frac{5!}{3! \times 2!}$$

$$= \left(\frac{6 \times 5 \times 4 \times 3!}{3! \times 3 \times 2}\right) + \left(\frac{5 \times 4 \times 3!}{3! \times 2}\right)$$

$$= 20 + 10$$

$$= 30$$

Q.350 (a)

Since, 3 particular players are always include the choice now reduces to only 3 players amongst 8 players which can be done in

$$^8C_3 = \frac{8!}{3! 5!} = 56 \text{ ways}$$

Q.351 (b)

Out of the 12 players, let us delete 3 particular players. Now, there are 9 players for selection. Of these 9, two have to be included in the team always. Thus, the remaining players are (9-2) =7 and the required players for team is (8-2) = 6.

Now selection can be done in $^7C_6$ ways

Q.352 (b)

The number of diagonals of a polygon with n sides is

$$\left(^nC_2 - n\right) = \left(^8C_2 - 8\right) = \frac{8!}{2! \times 6!} - 8$$

$$= \frac{8 \times 7 \times 6!}{2 \times 6!} - 8 = 28 - 8 = 20$$

Q.353 (c)

Required number of handshakes= $^{20}C_2$ as for a handshake 2 delegates are required

$$^{20}C_2 = \frac{20!}{2! \times 18!} = \frac{20 \times 19 \times 18!}{2 \times 18!} = 190$$

Q.354 (a)

Since, committee of 7 members is to be formed, we choose 4 men out of 9 and 3 women out of

$$4 = ^9C_4 {}^4C_3 = \frac{9!}{4! 5!} \times \frac{4!}{3! \times 1!}$$

$$= \frac{9 \times 8 \times 7 \times 6 \times 5!}{4 \times 3 \times 2 \times 5!} \times \frac{4! \times 3!}{3!} = 504 \text{ ways}$$

Q.355 (c)

In order to have at least 3 women, we can select (3 women and 4 men) or (4 women and 3 men)

$$= \left(^4C_3 \times ^9C_4\right) + \left(^4C_4 \times ^9C_3\right)$$

$$= \left(\frac{4!}{3! \times 1!} \times \frac{9!}{4! \times 5!}\right) + \left(\frac{4!}{4! \times 0!} \times \frac{9!}{3! \times 6!}\right)$$

$$= 504 + 84 = 588 \text{ ways}$$

Q.356 (c)

In order to have at the most 3 women, the selection can be done as (6 men and 1 women) or (5 men and 2 women) or (4 men and 3 women) or (All 7 men)

$$= \left(^9C_7 \times ^4C_0\right) + \left(^9C_6 \times ^4C_1\right) + \left(^9C_5 \times ^4C_2\right) + \left(^9C_4 \times ^4C_3\right)$$

$$= (36 + 336 + 756 + 504) = 1632$$

Q.357 (a)

Selection of 3 men and 2 women from 10 men and 8 women can be done in

$$\left(^{10}C_3 \times ^8C_2\right) \text{ ways}$$

$$= \frac{10!}{3! \times 7!} \times \frac{8!}{2! \times 6!} = \frac{10 \times 9 \times 8 \times 7!}{3 \times 2 \times 7!} \times \frac{8 \times 7 \times 6!}{2 \times 6!}$$

$$= (120 \times 28)$$

$$= 3360$$

Q.358 (b)

Selection of 2 men and 2 women teachers and 1 doctor from from 5 men teachers, 3 women teachers and 5 doctors is

$$\left(^5C_2 \times ^3C_2 \times ^5C_1\right)$$

$$= \frac{5!}{2! \times 3!} \times \frac{3!}{2! \times 1!} \times \frac{5!}{4! \times 1!}$$

$$= \frac{5 \times 4 \times 3!}{2 \times 3!} \times \frac{3 \times 2!}{2! \times 1} \times \frac{5 \times 4!}{4! \times 1}$$

$$= 10 \times 3 \times 5 = 150$$

Q.359 (a)

Selection of 7 from 10 men and 8 women in $(^{18}C_7)$ ways

$$\frac{18!}{7! \times 11!} = \frac{18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11!}{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \times 11!}$$

$$= 31824$$

Q.360 (c)

From the 10 men and 8 women, if the teachers and doctors are neglected, then 2 men and 3 women remain.

Selection of 3 from the 5 can be done in

$$^5C_3 \text{ ways} = \frac{5!}{3! \times 2!} = \frac{5 \times 4 \times 3!}{3! \times 2 \times 1} = 10$$

Q.361 (c)

A palindrome is a word which read from left to right or right to left, remains the same.

In a palindrome, only in the first half the letters are different. The same letters that appear in the first half are repeated in the second i.e. in a five palindrome word, first three letters will be different.

First place can be filled in 7 ways.

Similarly second and 3rd places can be filled in 7 ways

∴ required number of palindrome words formed is $= 7 \times 7 \times 7 = 343$

Q.362 (d)

13 different beads can be arranged in a circular order in (13-1)! = 12!ways

Now in this case it is a necklace, and so there is no distinction in between clockwise arrangements. So the required number of arrangements is

$$= \frac{1}{2}(12!)$$

Q.363 (d)

The four digit numbers must begin with 68

The remaining two blanks can be filled using 5 digits in 5 × 5 = 25ways

The four digit numbers begin with 7 or 8

First blank can do filled in two ways (7or 8)

Remaining three blanks can be filled in 5 ways each.

Number of 4 digit numbers formed is 2 × 5 × 5 × 5 = 250

∴ The number of four digit numbers which are greater than 6800 can be formed is 250 + 25=275

Q.364 (d)

2 men and 3 women can be selected from 5 men and 6 women in $^6C_3$ $^5C_2$ ways. One man and four women can be selected from 5 men and 6 women in $^5C_1$ $^6C_4$ ways

All the five women can selected in $^6C_5$ =6 ways

Required number of ways that the committee can be formed $^5C_1{}^6C_4 + {}^5C_2{}^6C_3 + {}^6C_5$

=5(15)+(10)(20)+6=75+2000+6=281

Q.365 (b)

The first digit can only be 2 (1 way), the second digit can be filled in 7 ways, the third in 6 ways and the fourth in 5 ways. A total of 1 × 7 × 6 × 5 = 210 ways.

Q.366 (b)

Each invitation card can be sent in 4 ways. Thus $4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^6$

Q.367 (c)

We need to assume that the 7 Indians are 1 person ,so also for the 6 Dutch and the 5 Pakistanis. These 3 groups of people can be arranged amongst themselves in 3! Ways.

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Also, within themselves 7 Indians the 6 Dutch and the 5 Pakistanis can be arranged in 7! 6! And 5! Ways respectively. Thus the answer is $3! \times 7! \times 6! \times 5!$a

Q.368 (d)

For each question we have 3 choices of answering the question (2 internal choices +1 non-attempt).Thus there are a total of 3^{15} ways of answering the question paper. Out of this there is exactly one way in which the student does not answer any question. Thus there are a total of 3^{15} – 1 ways in which at Hence, Option (d) is correct.

Q.369 (c)

The digits are 1,6,7,8,7,6,1 In this seven –digit no .there are four add places and three even places-OEOEOEO .The four odd digits 1,7,7,1 can be arranged in four odd places in $\left[\dfrac{4!}{2!} \times 2\right] = 6$ ways[as 1 and 7 are both occurring twice].

The even digits 6,8,6 can be arranged in three even places in 3!/2!=3ways.

Total no. of ways= $6 \times 3 = 18$ Hence, Option (c) is correct.

Q.370 (d)

The unit digit can either be 2, 3, 4, 5, or 6 When the unit digit is 2, the number would be even and hence will be divisible by2 ,Hence all numbers with unit digit 2 will be included which is equal to 5! Or 120 When the unit digit is 3, then in every case the sum of the digits of the number would be 21 which is a multiple of 3.Hence all numbers with unit digit 3 will be divisible by 3 and hence will be included .Total number of such number is 5! Or 120 Similarly for unit digit 5 and 6 the number of required number is 120 each.

When the unit digit is 4, then the number would be divisible by 4 only if the ten's digit is 2 or 6 .Total number of such numbers is $2 \times 4!$ or 48

Hence total number of required numbers is $(4 \times 120) + 48 = 528$

Hence, Option (d) is the answer.

Q.371 (a)

Let the number of boys be B Then $^{B}C_3 = 36 \to B = 9$

Let the number of girls be G. Then $^{G}C_2 = 66 \to G = 12$

Therefore total number of students in the class=12+9=21

Hence total number of matches = $^{21}C_2 = 210$

Hence number of matches between 1 bys and 1 girls =210-(36+66)=108

Hence Option (a) is the answer

Q.372 (a)

No. of works starting with $A = 8!/\ 2!3! = 3360$

No. of works starting with $B = 8!/\ 2!4! = 840$

No. of works starting with $C = 8!/\ 2!4! = 840$

No. of works starting with $D = 8!/\ 2!4! = 840$

Now words with L start

No. of works starting with $LAA = 6!/\ 2! = 180$

Now LAB starts and first word starts with LABA.

No. of works starting with $LABAA = 4! = 24$

After this the next words will be LABADAAHL,LABADAALH,LABADA HAL, LABADAHLA

Hence ,option (a) is the answer.

Q.373 (d)

The number of combinations of tree points picked from the nine given

points is $^9C_3$ or 84.All these combinations will result in a triangle except the combination of the three collinear points. Hence number of triangles formed will be 84-1 =83 Hence Option (d) is the answer.

Q.374 (a)

This problem can be approached y putting the white flags in their possible positions. There are essentially 4 possibilities for placing the 3 white flags based on the condition that two flogs of the same color cannot be together : 1, 3, 5; 1, 3, 6; and 2, 4, 6

Out of these 4 possible arrangements for the 3 white flags we cannot use 1, 3, 6 and 1, 4, 6 as these have the same color of flag at both ends-something which is not allowed according to the question. Thus there are only 2 possible ways of placing the white flags -1, 3, 5 OR 2, 4, 6 In each of these 2 ways there are a further 3 ways of placing the 1 red flag and the 2 blue flags. Thus we get a total of a 6 ways.

Q.375 (c)

With the digit 1, 2, 3, 4, 5 and 6 the numbers divisible by 4 that can be formed are numbers ending in: 12, 16, 24, 32, 36, 52, 56 and 64. Number of numbers ending in 12 are $4 \times 3 \times 2 = 24$

Thus the number of numbers is $24 \times 8 = 192$

Options (c) is correct.

Q.376 (d)

The white square can be selected in 32 ways and once the white square is selected 8 black squares becomes ineligibles for selection Hence ,the black square can be selected in 24 ways $32 \times 24 = 768$.

Option (d) is correct.

Q.377 (c)

The number of ways selecting 7 persons from 'n' person = $^nC_7$
The number of ways selecting 10 person from 'n' person = $^nC_{10}$
According to the problem $^nC_7 = {}^nC_{10}$
n=7+10=17
The number of ways of selecting 5 persons from 17 person is $^{17}C_5$

Q.378 (c)

The number of ways (or combinations) of selecting at least one of n different things is
$^nC_1 + {}^nC_2 + \cdots {}^nC_n = 2^n - 1$
∴ The number of ways that the man can invite at least one of his friends for dinner
$= 2^7 - 1 = 128 - 1 = 127$

Q.379 (a)

Given in a triangle PQR, the sides PQ contains 5, QR contains 6 and RP contains 7 points
Total number of points is 5+6+7=18
Number of triangles that can be formed by using 18 points is $^{18}C_3$
Out of these 18 points, the points on the sides of triangle which are 5,6, and 7 do not form triangles
$= {}^{18}C_3 - {}^5C_3 - {}^6C_3 - {}^7C_3$
$= 816 - 10 - 20 - 35 = 751$

Q.380 (a)

Since 4 people refuse to bravely by van, they must travel by car and 3 people refuse to travel on car, they must travel by van .

From the remaining 11 people 4 members are to be placed in the car and 7 members by van.

This can be done in $^{11}C_4 - {}^7C_7$ ways
$= {}^{11}C_4 - {}^7C_7 = 330$

Q.381 (a)

Here, S = {1, 2, 3, 4, 5, 6} and E = Event of getting a multiple of 3 = {3, 6}

$$P(E) = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}$$

Q.382 (a)

Here, n(S) = 6×6 = 36,

Let, E = Event of getting a sum of 7
={(1,7),(2,5),(3,4),(4,3),(5,2),(6,1)} = 6

$$P(E) = \frac{n(E)}{n(S)} = \frac{6}{36} = \frac{1}{6}$$

Q.383 (b)

The total number of ways of selecting one number out of 50 numbers 1,2,3,.....50 is $^{50}C_1$ ways.

Let, E be the event of selecting a prime number from numbers 1 to 50 [i.e., 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47].

This can be done in $^{50}C_1$ ways.

$$\because P(E) = \frac{n(E)}{n(S)} = \frac{^{15}C_1}{^{50}C_1} = \frac{15}{50} = \frac{3}{10}$$

Q.384 (d)

The total number of ways of selecting one ticket out of 29 tickets numbered 1 to 29 is $^{29}C_1$ ways. Let E be the event of selecting a multiple of 4 or 5. It is to be chosen from a numbers 4, 5, 8, 10, 12, 15, 16, 20, 24, 25, 28.

This can be done in $^4C_1$ ways

$$\because P(E) = \frac{n(E)}{n(S)} = \frac{^{11}C_1}{^{29}C_1} = \frac{11}{29}$$

Q.385 (a)

The total number of ways of selecting one number out of 45 numbers is 1,2,3,....45 is $^{45}C_1$ ways.

Let E be the event of selecting a number divisible by both 2 and 5 i.e., in cards bearing numbers (10,20,30 and 40). Thus, one card can be selected from these 4 cards in $^4C_1$ ways.

$$P(E) = \frac{n(E)}{n(S)} = \frac{^4C_1}{^{45}C_1} = \frac{4}{45}$$

Q.386 (b)

Q.387 (b)

Here, n(S) = Selection of 3 numbers out of 8

$= {}^8C_3$ ways

Let, E be the event of the three numbers to be consecutive
E = {(1, 2, 3), (2, 3, 4), (3, 4, 5), (4, 5, 6), (5, 6, 7),(6, 7, 8)}

$$P(E) = \frac{n(E)}{n(s)} = \frac{6}{^8C_3} = \frac{6}{56} = \frac{3}{28}$$

Q.388 (c)

Total number of ways of selecting of selecting 1 card from 250 cards is $^{250}C_1$ ways

Let, E be the event of drawing a number which is a perfect cube
E = {1, 8, 27, 64, 125, 216}

$$\because P(E) = \frac{n(E)}{n(S)} = \frac{6}{^{250}C_1} = \frac{6}{250} = \frac{3}{125}$$

Q.389 (c)

Total number of balls in the bag = 11
Total number of ways of selecting 5 balls from 11 is $^{11}C_5$ ways

Let E be the event of selecting 3 white and 2 green balls.
Then, n(E) = $^5C_3 \times {}^6C_2$

$$P(E) = \frac{n(E)}{n(S)} = \frac{^5C_3 \times {}^6C_2}{^{11}C_5} = \frac{10 \times 15}{462} = \frac{25}{77}$$

Q.390 (d)

Let E be the event of selecting 2 white and 3 green balls.
Then, n(E) = $^5C_2 \times {}^6C_3$.

$$P(E) = \frac{n(E)}{n(S)} = \frac{^5C_2 \times {}^6C_3}{^{11}C_5} = \frac{10 \times 20}{462} = \frac{100}{231}$$

Q.391 (a)

Let E be the event of selecting all the 5 balls of the same colours.
Then, n (E) = $\left({}^5C_5 + {}^6C_5\right)$ Ways

$$P(E) = \frac{n(E)}{n(S)} = \frac{^5C_5 + {}^6C_5}{^{11}C_5}$$

$$= \frac{1+6}{462} = \frac{7}{462} = \frac{1}{66}$$

Q. 392 (b)

Total number of balls in the bags = 6
Total number of ways of drawing 1 ball from 6 balls
$= {}^6C_1$ ways.
One black ball can be drawn from 2 black balls in ${}^2C_1$ ways
Probability of getting 1 black ball
$= P(E) = \dfrac{{}^2C_1}{{}^6C_1} = \dfrac{2}{6} = \dfrac{1}{3}$
Probability of not getting one black ball
$= P(\bar{E}) = 1 - \dfrac{1}{3} = \dfrac{2}{3}$
$\because$ Odds in favour $(\bar{E}) = \dfrac{1}{3} : \dfrac{2}{3} = 1 : 2$

Q. 393 (a)

Odd against
$= P(E) : P(\bar{E}) : P(E) = \dfrac{2}{3} : \dfrac{1}{3} = 2 : 1$

Q. 394 (c)

Total number of balls in the bag = (3+2+5) = 10 balls.
Selection of 3 balls from 10 balls can be done in ${}^{10}C_3$ ways.
Now, P (at least 1 red ball) = 1 – P (no red ball)
$= 1 - \dfrac{{}^5C_3}{{}^{10}C_3} = 1 - \dfrac{10}{120} = 1 - \dfrac{1}{12} = \dfrac{11}{12}$

Q. 395 (b)

Selection of 4 balls from 10 balls can be done in ${}^{10}C_4$ ways.
Let E be the event of selecting 2 green and 2 blue balls
$n(E) = ({}^2C_2 \times {}^3C_2)$ ways
$\because P(E) = \dfrac{n(E)}{n(S)} = \dfrac{{}^2C_2 \times {}^3C_3}{{}^{10}C_4} = \dfrac{1 \times 3}{210} = \dfrac{1}{70}$

Q. 396 (b)

Q. 397 (a)

Q. 398 (d)

Q. 399 (d)

Selection of 1 ball from 40 balls can be done in ${}^{40}C_1$ ways.
Let E be the event of drawing a ball which is not blue.
$n(E) = {}^{24}C_1$ ways.
$P(E) = \dfrac{n(E)}{n(S)} = \dfrac{{}^{24}C_1}{{}^{40}C_1}$
$= \dfrac{24}{40} = \dfrac{3}{5} = 0.6$

Q.400 (d)

Selection of 2 balls from 40 balls can be done in ${}^{40}C_2$ ways.
Let E be the event of selecting 2 red balls from 8 red balls.
$n(E) = {}^8C_2$ ways

Q.401 (b)

A non leap year contain 365 days each ays repears 52 times with a balance of one day.
The day may be {sun, mon, tue, wed, thu, fri, sat}
N(s) =7
If the last day is a Tuesday then the year contains 53 Tuesdays .
Favorable case= {tue} =1 getting 6 heads or 5 heads or 4 heads or favorable out comes.
Favorable outcomes of getting 6 heads or 5 heads or 4 heads
Required probability $= \dfrac{1}{7}$

Q. 402 (b)

Total 3 digit numbers are 900 i.e. n(s) =900
These are 199 numbers which are multiple of 5 upto 999
There are19 numbers which are multiple of 5 upto 99
The 3 digit numbers which are multiples of 5 is =199-19=180
Required probability $= \dfrac{180}{900} = \dfrac{1}{5}$

Q. 403 (b)

When n coins are tossed, the probability of getting r heads is $\dfrac{^nC_r}{2^n}a$

Where 3 coins are tossed, if they show up one head and two tails, then the person does not get any money.

∴ The probability of getting one head is $\dfrac{^3C_1}{2^3} = \dfrac{3}{8}$

Required probability $= \dfrac{3}{8}$

Q. 404 (b)

Let $P(A) = x\ P(B) = y$

Given $P(A \cap B) = \dfrac{1}{6}$

$P(A).P(B) = \dfrac{1}{6} \Rightarrow xy = \dfrac{1}{6} \rightarrow (1)$

$P(\bar{A} \cap \bar{B}) = \dfrac{1}{3}$

$P(\bar{A})P(\bar{B}) = \dfrac{1}{3}$

$\Rightarrow (1-x)(1-y) = \dfrac{1}{3} \rightarrow (2)$

Solving (1) and (2) we get $x = \dfrac{1}{2}\ or\ \dfrac{1}{3}$

$P(A) = \dfrac{1}{3}$

Q. 405 (c)

Given $P(\bar{A}) : P(A) = 3 : 53$

$P(A) = \dfrac{5}{8}$ And $P(\bar{A}) = \dfrac{3}{8}$

$P(B) : P(\bar{B}) = 4 : 7$

$P(B) = \dfrac{4}{11}\ P(\bar{B}) = \dfrac{7}{11}$

Probability that both of them will solve the problem is $P(A \cap B)$

$\therefore P(A)P(B) = \dfrac{5}{8} \times \dfrac{4}{11} = \dfrac{5}{22}$

Q. 406 (a)

The number of squares is $n \times n$ chess board

$= \dfrac{n(n+1)(2n+1)}{6}$

The number of squares in

$8 \times 8 = \dfrac{8(8+1)(17)}{6} = 204$

Number of squares of size 3×3 is $6 \times 6 = 36$

The probability that the square is of size $3 \times 3 = \dfrac{36}{204} = \dfrac{3}{17}$

Q. 407 (a)
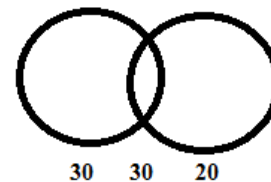
From the figure it is evident that 80 students passed at least I exam. Thus 20 failed both and the required probability is 20/100 =1/5

Q. 408 (a)

Event definition is: 15 or 16 or 17 or 18 15 can be got as: 5 and 5 and 5 (one way)

Or

6 and 5 and 4 (Six ways)

Or

6 and 6 and 3 (3 ways)

Total 10 ways

16 can be got as: 6 and 6 and 4 (3ways)

Total 6 ways

17 has 3 ways and 18 has 1 way of appearing.

Thus the required probability is:

$(10+6+3+1)/2186 = \dfrac{20}{216} = \dfrac{5}{54}$

Q. 409 (c)

$P(E_1) = \dfrac{3}{8}$

$P(E_1) = \dfrac{7}{12}$

Event definition is : E_1 occurs and E_2 does not occur or E_1 occurs and E_2 occurs or and E_1 does not occur

$$\left(\frac{3}{8}\right)\times\left(\frac{5}{12}\right)+\left(\frac{3}{8}\right)\times\left(\frac{7}{12}\right)+\left(\frac{5}{8}\right)\left(\frac{7}{12}\right)=\frac{71}{96}$$

Q. 410 (a)

Kamal is selected and Monica is not selected or Kamal is not selected and Monica is selected

$$\rightarrow\left(\frac{1}{3}\right)\times\left(\frac{4}{5}\right)\leftarrow\left(\frac{2}{3}\right)\times\left(\frac{1}{5}\right)=\left(\frac{6}{15}\right)=\left(\frac{2}{5}\right)$$

Q. 411 (d)

The possible outcomes are (1,1); (1,2); (2,1), (2,2); (3,1), (1,3)
Out of six case, in two cases there is exactly one '2'

Thus the correct answer is $=\dfrac{2}{6}=\dfrac{1}{3}$

Q.412 (*)

Event definition is A hits , B hits and C hits OR any two of the three hits.

Q.413 (a)

The event can be defined as :
First bag is selected and red ball is drawn

$$\frac{1}{2}\times\frac{5}{12}+\frac{1}{5}\times\frac{3}{15}=\left(\frac{5}{24}\right)+\left(\frac{3}{30}\right)=\frac{37}{120}$$

Q.414 (d)

The count of the event will be given by: The number of all 2 digit integers – the number of all 2 digit integers divisible by 7

Q.415 (a)

Blue and Red or Red and Blue
$$\frac{10}{25}\times\frac{15}{24}\times\frac{15}{25}\times\frac{10}{24}=\frac{1}{2}$$

Q.416 ( )

The whole numbers selected can only be 1, 3, 7 or 9 and cannot contain 2, 4, 6, 8, 0 or 5

Q.417 (a)

There will be $^6C_3$ triangles formed overall .Out of these visualize the number of equilateral triangles.

Q.418 (a)

$$P=\frac{\text{No .of arrangments with four ss together}}{\text{Total No.of arrangements}}$$

$$=\frac{\left[8!\left(4!\times 2!\right)\right]}{\left[11!/\left(4!\times 4!\times 2!\right)\right]}$$

$$=8!\times 4!/11!=\frac{24}{990}=\frac{4}{165}$$

Q.419 (a)

$$P=\frac{\text{Total no of ways in which two people sit together}}{\text{Total No.of ways}}$$

$$=(10!\times 2!)/11!$$

Q.420 (a)

The numbers having 2 in them are: 2, 12, 22, 32...92 and 21, 23, 24, 25....29. Hence n (E) =19

Q.421 (d)
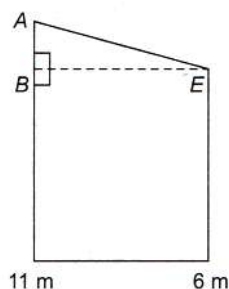
$\Delta ABC\sim\Delta CDE$

Then $\dfrac{AC}{CD}=\dfrac{BC}{CE}=\dfrac{AB}{DE}$

Then $\dfrac{AC}{4.8}=\dfrac{4}{3}=AC=6.4\text{cmand}$

$\dfrac{BC}{4.2}=\dfrac{4}{3}=BC=5.6\text{cm}$

Q.422 (c)

BC=ED=6m
AB=AC-BC=11-6=5m
CD=BC=12m
Then by Pythagoras theorem :
$AC^2=AB^2+BE^2\Rightarrow AE=13m$

Q.423 (a)

∠x=35° because angles subtended

by an are anywhere on the circumference are equal.

Q.424 (a)

By the rule of tangents, we know:

$6^2 = (5+n)5$

$\Rightarrow 36 = 25 + 5x$

$\Rightarrow 11 = 5x \Rightarrow x = 2.2\text{cm}$

Q.425 (a)

By the rule of chords, cutting externally, we get

$\Rightarrow (9+6)6 = (5+x)5 \Rightarrow 90 = 25 + 5x$

$\Rightarrow 5x = 65 \Rightarrow x = 13\text{cm}$

Q.426 (b)

In radius = area/semi perimeter

=24/12=cm

Q.427 (a)

ADBC is a cyclic quadrilateral as well its four vertices are on the circumference of the circle. Also, the opposite angles of the cyclic quadrilateral are supplementary. Therefore, ∠ADB=180-48°=132°

Q.428 (a)

∠POS = ∠QOR

(vertically opposite angles)

So a=4b

∠SOT+∠TOQ+∠QOR=180°

(sum of angles on a line = 180°)

4b+2c=180°

84+2c=180°

$\Rightarrow$ 2c=96°$\Rightarrow$c=48°

So a=84°, b=21°, c=48°

Q.429 (a)
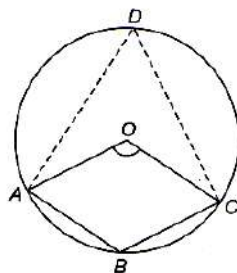
$\angle ADC = \dfrac{140}{2} 70°$ (because the angle subtended by an arc on the

circumference is half of whart it subtends at the centre.) ABCD one cyclic quadrilateral So ∠ABC=180°-70°=110° (because opposite angles of a cyclic quadrilateral are supplementary.)

Q.430 (b)
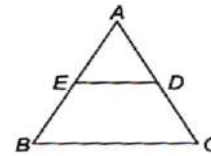
ΔADE is similar to ΔABC (AAA property)

ED:BC=3:5

Area of ΔADE: Area of ΔABC=9:25

Area of trapezium = area of ABC- Area of Ade =25-9=16

Thus, Area of ΔADE: Area of trapezium EDBC = 9 : 16

Q.431 (a)

∠DOC and ΔAOB are similar 9by AAA property)

AB:DC=3:1

So area of AOB: Area of DOC $= (3:1)^2$

$\Rightarrow 9:1$

Q.432 (a)

∠AOB=∠CO^' D=∠FO"E=120°

Distance between 2 centers = 2m

∴ BC=DE=FA=2m

Perimeter of the figure = BC + DE + FA + circumference of sector AB,CO'B and FO"E.

But three equal sectors of 120°=1 full circle of same radius
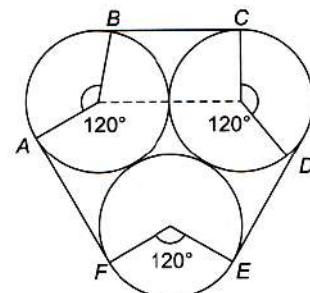
Therefore, perimeter of surface

2πr + BC + DE + FA = (2π + 6)m
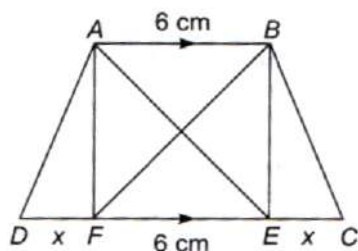
Q.433 (b)

In the given figure, ΔABD is similar to ΔADC

Then

$$\frac{AB}{BD} = \frac{AC}{DC} \Rightarrow \frac{6}{3} = \frac{5}{DC} \Rightarrow DE = 2.5\text{cm}$$

Q.434 (b)

In the above question
FE=AB=6cm
ΔADF ≅ ΔBEC; so DF = EC
Let DF = EC = x
Solving through options; e.g. options
(b) 1/3; x=6
Then by Pythagoras triplet AF = 8
Area of $ABEF = 8 \times 6 = 48\text{cm}^2$

Area of $\Delta AFD + \Delta BEC = 2 \times \frac{1}{2} \times 6 \times 8$

$\Rightarrow 48\text{cm}^2$
∴ Area of $ABCD = 48 + 48 = 96\text{cm}^2$
Hence the condition is proved.

Q.435 (d)

Let the common ratio be =x
Then; length=3x; breath=2x and height=x
Then; as per question $3x.2x.x = 1296$
$\Rightarrow 6x^3 = 1286$
$\Rightarrow$x=6m
Breadth = 2x = 12m

Q.436 (d)

Data is inadequate as it's not mentioned that what part of the cube is melted to form cylinder.

Q.437 (b)

The total volume will remain the same, let the side of the resulting cube be =a Then,
$6^3 + 8^3 + 10^3 = a^3 \Rightarrow a\sqrt[3]{1728} = 12\text{cm}$

Q.438 (a)

Slant weight $= 1 = \sqrt{6^2 + 8^2} = 10\text{cm}$
Then covered surface area = πrl
= π × 6 × 10 ⇒ 60π
And total surface area
$\pi rl + \pi r^2 \Rightarrow \left((6 \times 10) + 6^2\right) = 96\pi$

Q.439 (b)

Volume of a cone $= \frac{\pi r^2 h}{3}$

Then ; $100\pi = \frac{\pi r^2 .12}{3} \Rightarrow r = 5\text{cm}$

Curved surface area = πrl
$l = \sqrt{h^2 + r^2} \Rightarrow \sqrt{12^2 + 5^2} = 13$
Then , $\pi rl = \pi \times 13 \times 5 = 65\pi\text{cm}^2$

Q.440 (d)

Let the radius of the two cones be x = cm
Let slant height of 1st cone =7 cm
Then ratio of covered surface area
$= \frac{\pi \times 5}{\pi \times 7} = 5:7$

Q.441 (c)

Let the radius of cylinder =1(π)
Then the radius of cone = 2(R)

Then as per the question $= = \frac{\pi r 2h}{\dfrac{\pi R 2h}{s}}$

$\rightarrow \dfrac{3\pi r 2h}{\pi R 2h}$

$\rightarrow 3:4$

Q.442 (c)

The permier would remain the same in any case.
Let one side of a square be =a cm
Than $a^2 = 484 \Rightarrow a22\text{cm}$
∴ perimeter = 4a = 88cm
Let the radius of the circle be = π cm
Then 2πr=88⇒r=14cm
Then area $= \pi r^2 = 616\text{cm}^2$

Q.443 (a)

Total surface area of 7 cubes
$\Rightarrow 7 \times 6a^2 = 1050$
But on joining end to end, 12 sides will be covered.
So there area $= 12 \times a^2$

$\Rightarrow 12 \times 25 = 300$

So the surface area of the resulting figure =1050-300=750

Q.444 (d)

Let the rise in height be =h

Then, as per the question , the volume of water should be equal in both the cases.

Now, $90 \times 40 \times h = 150 \times 8$

$h = \dfrac{150 \times 8}{90 \times 40} = \dfrac{1}{3}m = \dfrac{100}{3}cm$

Q.445 (d)

Slant height $(l) = \sqrt{7^2 + 24^2} = 25m$

Area of cloth required = covered surface area of cone

$= \pi rl = \dfrac{22}{7} \times 7 \times 25 = 550m^2$

Amount of cloth required $= \dfrac{550}{3}$

=110M

Q.446 (b)

Volume of wood used = External volume – Outer Volume

$\Rightarrow$ (10×8×6) -(10-1)×(8-1)×(6-1)

$\Rightarrow$ 480 - (9 × 7 × 5) = 165cm²

Q.447 (d)

Volume of cube $= 7^3 = 343cm^2$

Radius of cone $= \dfrac{7}{2} = 3.5cm$

Height of cone =7

Ratio of volume $= \dfrac{\dfrac{\pi r^2 h}{3}}{343}$

$= \dfrac{22 \times 3.5 \times 3.5 \times 7}{7 \times 3 \times 343} \Rightarrow 11:42$

Q.448 (c)

Area of triangle = πS ;

where π = inradius

$S = \dfrac{15 + 8 + 17}{2} = 20cm$

$\Delta = \sqrt{S(S-a)(S-b)(S-c)}$

$\Rightarrow \Delta \sqrt{20(20-15)(20-8)(20-17)}$

$\Delta = \sqrt{20 \times 5 \times 12 \times 3} = 60cm^2$

$r = \dfrac{\Delta}{S} = \dfrac{60}{20} 3cm$

Q.449 (c)

Diameter of the circle =diagonal of rectangle

$= \sqrt{8^2 + 6^2} = 10cm$

Radius $= \dfrac{10}{5} = 5cm$

Area of shaded portion $= \pi r^2 - lb$

$= 3.14 \times 5^2 - 8 \times 6 = 30.57cm^2$

Q.450 (a)

Larger Radius (R)=14+7=21cm

Smaller Radius (π)=7cm

Area of shaded portion

$\pi R^2 = \dfrac{8}{360} - \dfrac{\pi r^2 \theta}{360}$

$\Rightarrow \dfrac{\pi \theta}{360}(21^2 - 7^2) \Rightarrow 102.67cm$

Q.451 (b)

Average marks $= \dfrac{1}{6} \times \dfrac{150}{100} \times 450$

$= 112.5$

Q.452 (d)

Total mark

$= (76 + 72)\dfrac{75}{100} + 65 + 84 \times \dfrac{150}{100} + 74 \times \dfrac{50}{100} + 75 \times \dfrac{60}{100}$

$= 111 + 65 + 126 + 37 + 45 = 384$

Q.453 (d)

Required percentage

$= \dfrac{99}{42 + 58.5 + 71 + 99 + 43 + 42} \times 100$

$= \dfrac{99}{355.5} \times 100 \approx 28\%$

Q.454 (a)

Required ratio $= \dfrac{\left(68 + \dfrac{3}{2} \times 72 + 33\right)}{\left(79 + \dfrac{3}{2} \times 64 + 40\right)}$

$= \dfrac{209}{215}$ i.e.209 : 215

Q.455 (a)

Average marks $= \dfrac{3}{4} \times \dfrac{438}{6} = 54.75$

Q.456 (d)

Total income of $A = 43.3$ lakh

Monthly income of $A = \dfrac{43.3}{7 \times 12}$ lakh

$= Rs.51547 \approx Rs.51245$

Q.457 (c)

Required ratio $= \dfrac{425}{510} = \dfrac{5}{6}$ i.e, 5:6

Q.458 (c)

Required difference
$= (36.565 - 30.2)$ lakh-Rs.636500

Q.459 (d)

Required percentage
$= \dfrac{6425}{47810} \times 100 \times 7.$
$= 94\%$

Q.460 (d)

Average annual income of F
$= \dfrac{1}{7}\left(\begin{array}{l}3.50 + 3.65 + 3.75 + 4 + \\ 4.25 + 4.80 + 5.10\end{array}\right)$ lakh
$= \dfrac{1}{7}(29.05) = 4.15$ lakh

Q.461 (d)

No. of girls studying in engineering discipline
$= \dfrac{12}{100} \times 2000 = 240$

Q.462 (a)

It is obvious from pie-charts.

Q.463 (b)

No. of students in Commerce discipline
$= \dfrac{21}{100} \times 4800 = 1008$

No. of girls in Commerce discipline

$= \dfrac{24}{100} \times 2000 = 480$

No. of boys = 1008 − 480 = 528
Hence, required %
$= \dfrac{528}{1008} \times 100 = 52\%$

Q.464 (c)

No. of students in Management discipline
$= \dfrac{10}{100} \times 4800 = 1008$

No. of girls in Management discipline
$= \dfrac{8}{100} \times 2000 = 160$

No. of boys $= 480 - 160 = 320$
No. of students in Science discipline
$= \dfrac{37}{100} \times 4800 = 1776$

No. of girls in Science discipline
$= \dfrac{32}{100} \times 2000 = 640$

No. of boys $= 1776 - 640 = -1136$
Hence, required ratio $= 320 : 1136$
$= 20 : 71$

Q.465 (d)

No. of girls in catering discipline
$= \dfrac{10}{100} \times 2000 = 200$

Hence, required percentage
$= \dfrac{200}{4800} \times 100 = 4.17\%$

Q.466 (a)

Required value $= \dfrac{79.2}{360} \times 45800$
$= 10076$

Q.467 (d)

Required Ratio $= 39.6 : 82.8$
$= 1.1 : 2.3 = 11 : 23$

Q.468 (b)

Total amount spent by the family on Entertainment & Shopping together

$$= \frac{(36+68.4)}{360} \times 45800$$
$$= 13282$$

Q.469 (e)

Required Percentage

$$= \frac{(82.8+36+54)}{79.2} \times 100 = 218$$

Q.470 (c)

Required Percentage $= \frac{39.6}{68.4} \times 100$

$$= 57.89\%$$

Q.471 (c)

Required % $= \frac{32.5}{22.5} \times 100 \simeq 144\%$

Q.472 (c)

Total no. of candidates appearing for CEET from all the towns together
$$= 27.5+32.5+25+35+22.5+30$$
$$= 172.5$$
Hence, required %
$$= \frac{25}{172.5} \times 100 = 14.492 \approx 14.49$$

Q.473 (d)

Average no. of candidates appearing for CEET from all the town together
$$= \frac{1}{6} \times (27.5+32.5+25+35+22.5+30) \text{Lac}$$
$$= \frac{1}{6} \times 172.5 = 28.75 \text{Lac} = 2875000$$

Q.474 (a)

Required ratio of candidates from town A to these from town

$$F = \frac{27.5}{30} = \frac{11}{12} \text{ie}, 11:12$$

Q.475 (b)

Number of students in towns (A+B+C) together
$$= (27.5+32.5+25) = 85$$

No of students in town (D+E+F) together

$$= (35+22.5+30) = 87.5$$

Hence, required ratio $= \frac{85}{87.5}$

$$= \frac{34}{35} \text{ie}, 34; 35$$

Q.476 (d)

Required average

$$= \frac{1}{5}[3.5+4+5+3+6.5]$$
$$= \frac{1}{5}[22] = 4.4 \text{crore} = 44000000$$

Q.477 (c)

Required Ratio $= \frac{(5.5-5)}{(5.3)} = \frac{0.5}{2}$

$$= \frac{1}{4} \text{ie}, 1:4$$

Q.478 (b)

Required Ratio $= \frac{4.5}{7} = \frac{9}{14} \text{ie}, 9:14$

Q.479 (d)

Required % Increase

$$= \frac{(6.5-3)}{3} \times 100$$
$$= \frac{3.5}{3} \times 100 \approx 117$$

Q.480 (a)

Required difference
$$= (4.5+5+5.5+5+7) - (3.5+4+5+3+6.5)$$
$$= (27-22) = 5 \text{crore} = 50000000$$

Q.481 (c)

Average no. of units sold by all the companies together

$$= \frac{1}{6}(650+300+150+450+300+400)$$
$$= \frac{1}{6} \times 2250 = 375$$

Q.482 (d)

Hence, it is maximum for company A

Q.483 (b)

Average no of units produced by all companies together

$= 1/6(900+700+300+850+550+600)$

$= \dfrac{1}{6} \times 3900 = 650$

Q.484 (d)

Required % $= \dfrac{1100}{1900} \times 100 = 58\%$

Q.485 (a)

Required ratio $= \dfrac{(850+550)}{(450+300)} = \dfrac{1400}{750}$

$= \dfrac{28}{15}$ ie, $28:15$

Q.486 (d)

Required %

$= \dfrac{300}{(140+300+180+250+240)} \times 100$

$= \dfrac{300}{1110} \times 100 = 27\%$

Q.487 (d)

Total difference

$= 60+100+80+100+140$

$= 480$

Q.488 (c)

Required average $= \dfrac{1}{5}(650) = 130$

Q.489 (a)

Required % $= \dfrac{100}{650} \times 100 = 15\%$

Q.490 (b)

Required ratio $= 140:240 = 7:12$