Numbers

SUBTOPICS:

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10 .DIVISION ALGORITHM

CLASSIFICATION OF NUMBERS:

NATURAL NUMBERS: {1, 2, 3, 4, 5, …………..}

WHOLE NUMBERS: {0, 1, 2, 3, 4, 5, …………..}

RATIONAL NUMBERS: Numbers are in the form of p/q (q is not equal to 0)
 Examples: 4, 2/5, 1/3, 22/7, …….

IRRATIONAL NUMBERS: Numbers which are not rational but can be represented by points on the number line.
Examples: √2, ∏, e, ……

Alternate definition:
Terminating decimals and recurring decimals are both rational numbers. Any non-terminating, non-recurring decimal is an irrational number.

REAL NUMBERS: Both rational and irrational numbers are real numbers.

SET OF INTEGERS: All negative integers, zero and all positive integers.

PRIME NIMBERS: Numbers with exactly 2 factors are prime numbers. Or numbers which are divisible by 1 and itself are prime numbers.
Examples: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97,…..

COMPOSITE NUMBERS: Numbers with more than 2 factors.
 Examples: 4, 6, 8,……

Co primes / Relative primes: If the HCF of 2 numbers is 1, the numbers are called co primes or relative primes.
Examples: (8, 9), (9, 10), (2, 3),……

Twin primes: Primes which are differ by 2 are twin primes.
Examples: (3, 5), (5, 7)……

SUMMATION FORMULE:

Sum of first n natural numbers= $1+2+3+\ldots\ldots+n = [n(n+1)]/2$

Sum of the squares of first n natural numbers= $1^2+2^2+3^2+\ldots\ldots+n^2 = [n(n+1)(2n+1)]/6$

Sum of the cubes of first n natural numbers= $1^3+2^3+3^3+\ldots\ldots+n^3 = [n^2(n+1)^2]/4$

Sum of even numbers = $n(n+1)$, where n is number of even numbers.

Sum of odd numbers = n^2, where n is number of odd numbers.

1.What is the sum of first 80 natural numbers?
a) 3140   b) 3240   c) 3340   d) 3440

Explanation:

Sol: Sum = [n (n+1)]/2 = (80) (80+1)/2 =3240

2. What is the sum of the squares of first 20 even natural numbers?
a) 9480 b) 10480 c) 11480 d) 12480

Explanation:

Sol: $2^2+4^2+6^2+8^2+\ldots\ldots + 40^2 = 2^2 (1^2+2^2+3^2+\ldots\ldots.+20^2)$

$$= 4 \times [n(n+1)(2n+1)]/6$$
$$= 4 \times (20 \times 21 \times 41)/6 = 11480$$

3. A wants to type first 1000 natural numbers. How many times he has to press the buttons of a computer key board?

 a) 2893   b) 2987   c) 3000   d) 2500

Explanation:

 For 1 to 9, number of times to be pressed = 9

 For 10 to 99, number of times to be pressed = 90 x 2 = 180

 For 100 to 999, number of times to be pressed = 900 x 3 = 2700

 For 1000, number of times to be pressed = 4

 Hence total = 9+180+2700+4 = 2893

4. A printer numbers the pages of a book starting with 1 and uses 3089 digits in all. How many pages does the book have?
 a) 1040   b) 1048   c) 1049   d) 1050

Explanation:

For pages 1 to 9, number of digits used = 9

For pages 10 to 99, number of digits used = 90 x 2 = 180

For pages 100 to 999, number of digits used = 900 x 3 = 2700

So far the digits used = 9+180+2700 = 2889

The remaining digits = 3089 – 2889 = 200, with these next 50 pages can be numbered.

So total = 999+ 50 = 1049.

5.   One page is torn from a booklet whose pages are numbered in the usual manner starting from the first page 1. The sum of the numbers on the remaining pages is 195. The torn page contains which of the following numbers?

 a) 5, 6   b) 7, 8   c) 9, 10   d) 11, 12

Explanation:

   Here, basically, our sum of first n natural numbers should be slightly greater than 195.

   By trial and error, if n = 10, then [n (n+1)]/2 = (10 x 11)/2 = 55

                        if n = 15, then [n (n+1)]/2 = (15 x 16)/2 = 120

                        if n = 20, then [n (n+1)]/2 = (20 x 21)/2 = 210

      So, 210 – 195=15.That is the torn page contains pages 7 and 8

DIVISIBILITY RULES

By 2: Check the last digit
By 4: Check the last 2 digit number
By 8: Check the last 3 digit number
By 16: Check the last 4 digit number, etc

By 3: Check the sum of the digits
By 9: Check the sum of the digits

BY 5: Last digit should be 0 or 5

BY 11: A number is divisible by 11, if the difference between the sum of the digits in odd places and the sum of the digits in even places is 0 or a multiple of 11.

In case of composite numbers:
Divisible by 6: Check with 2 and 3
D Divisible by 12: Check with 3 and 4
Divisible by 18: Check with 2 and 9
Divisible by 24: Check with 8 and 3
That is, for composite numbers we need to check with co prime pair

6.If 6896x45 is divisible by 9 then x is -
a) 4   b) 5   c) 6   d) 7

Here sum of the digits = 38+x, so x= 7

7.If 481A769B is divisible by 5, 6 and 9 then A+B is -
a) 0   b) 1   c) 2   d) 3

Given, 481A769B is divisible by 5 and 6, implies B = 0
By 9, sum of the digits = 35+ A, so A = 1 and A+B = 1

8. An 8 digit number 4252746B leaves a remainder 0 when divided by 3.
How many values are possible for B?
a) 2   b) 3   c) 4   d) 6

Explanation:

Sum of the digits of 4252746B = 30+B
So, B can take 0, 3, 6 and 9, that is 4 values.

9. What is the remainder when the 100 digit number starting with 1, writing the consecutive natural numbers next to it, is divided by 5?

a) 1   b) 2   c) 4   d) 0

Explanation:

Here we need to know the last digit of this 100 digit number.

The 100 digit number is 1234…..9101112…….545 (that is 9 single digit numbers, then 45 two digit numbers, 10 to 54 and then 5)

So the remainder is 0

10 .If the 8 digit number 5668x25y is divisible by 48, find the least value of x+y
a)10   b) 9   c) 8   d) 7

Explanation:

   Divisibility by 48 means we need to check with 3 and 16.

   Sum of the digits of 5668x25y = 32+(x + y)

   Among the options if (x + y) is 7 or 10 then only it is divisible by 3.

   Divisibility by 16 means we need to check last 4 digit number and for 8
   we have to check the last 3 digit number.

   25y is divisible by 8, implies y = 6

   If x= 1, then the 4 digit number 1256 is not divisible by 16.

   Hence the value of (x+y) is 10

Def: A decimal in which a digit or a set of digits is repeated continuously is called a recurring decimal.

Examples are given below

1/3 = 0.333333…. = 0.**3** (read highlighted 3 as bar 3, to denote repetition)

1/7 = 0.142857142857142857 = 0. **142857**

Let us see how to convert a recurring decimal in to fraction

Let x = 0.3333333…… (1)

10 x = 3.333333…….(2)

(2) – (1) gives 9x = 3, implies x = 1/3

Let x = 0.454545…….. (1)

100 x = 45.454545…… (2)

(2) – (1) gives 99x = 45, implies x = 45/99=

5/11

11. The value of 0.057057057057……. is -

a) 57/99   b) 57/999   c) 57/990   d) 57/909

Explanation:

Let x = of 0.057057057057…….(1)

1000 x = 057.057057………….(2)

(2) – (1) gives 999x = 057, implies x = 57/999

Short cut: Take the repeated digits once in the numerator and the number of 9's corresponding to the number of repeated digits in the denominator. That is = 057/999 = 57/999

12.The value of 0.1254545454………. is (that is 0.1**254**)

a) 1242/(9900)   b) 621/(2950)   c) 207/(1650) d) 69/(550)

Explanation:

Answer = (1254 – 12)/(9900) = 1242/(9900)

(Numerator: Take the whole number and subtract the non recurring part.)

(Denominator: Number of 9's corresponding to the number of repeated digits, followed by number of 0's corresponding to the number of non repeated digits)

13.The recurring decimal representation 1.27272727……….. is -
a) 13/11   b) 14/11   c) 127/99   d) 137/99

Explanation:

Answer= 1+ (27/99) = 126/99 =   14/11

FACTORS

:

Factors of 6 are 1, 2, 3, and 6
Factors of 12 are 1, 2, 3, 4, 6, and 12
Factors of 16 are 1, 2, 4, 8 and 16
Factors of 25 are 1, 5 and 25

NOTE:
Prime numbers contain exactly 2 factors.
Squares of primes contain exactly 3 factors.
Any perfect square contains odd number of factors.

Example: Prime factorization of 400 is?

$400 = 4 \times 100 = 4 \times 10 \times 10 = (2 \times 2)(2 \times 5)(2 \times 5) = 2^4 \times 5^2$

Here 2, 5 are prime factors of 400.

FORMULE:

If N is a composite number such that $N = a^p \times b^q \times c^r \ldots$ where a, b, c... are prime factors of N and p, q, r...... are positive integers.

Then, number of factors on $N = (p+1)(q+1)(r+1) \ldots$

Number of ways of writing N as product of 2 factors
$$= (1/2)[(p+1)(q+1)(r+1)\ldots]$$

Sum of all the factors $= [a^{p+1} - 1] / (a-1) \times [b^{q+1} - 1] / (b-1) \times \ldots$

14. Find the number of factors 1225

    a) 5   b) 6   c) 8   d) 9

Explanation:

$1225 = 25 \times 49 = 5^2 \times 7^2$,

    Number of factors = (p+1) (q+1) (r+1) ……

                      = (2+1) (2+1) = 9

15. Find the number of factors 19404, excluding 1 & the number itself?
    a) 52   b) 54   c) 58   d) 59

   Explanation:

   $19404 = 11 \times 1764 = 11 \times 9 \times 196 = 11^1 \times 3^2 \times 2^2 \times 7^2$
       Therefore number of factors = 2 x 3 x 3 x4 = 54
        Answer = 54 – 2 = 52.

16. In how many ways can 3420 be written be written as product of 2 factors?
    a) 12   b) 14   c) 18   d) 36

Explanation:

   $3420 = 10 \times 342 = 10 \times 9 \times 38 = (2 \times 5)(3 \times 3)(2 \times 19) = 2^2 \times 3^2 \times 5^1 \times 19^1$
       Answer = (1/2) [(p+1) (q+1) (r+1)….]
                = (1/2) [3 x 3 x 2 x 2] = 18

17. Find the number of odd & even number of factors of 1680?

    a) 8, 32   b) 8, 9   c) 10, 9   d) none

Explanation:

$1680 = 10 \times 168 = 10 \times 4 \times 42 = (2 \times 5)(2 \times 2)(2 \times 3 \times 7) = 2^4 \times 5^1 \times 3^1 \times 7^1$

Number of odd factors = All the factors of $(5^1 \times 3^1 \times 7^1) = 2 \times 2 \times 2 = 8$

$$2^4 \times 5^1 \times 3^1 \times 7^1 = 2\,[2^3 \times 5^1 \times 3^1 \times 7^1]$$

Number of even factors = All the factors of $[2^3 \times 5^1 \times 3^1 \times 7^1] = 4 \times 2 \times 2 \times 2 = 32$

18. Find the number of factors of 243243 which are multiples of 21?

    a) 20   b) 23   c) 25   d) none

Explanation:

$243243 = 243 (1001) = 3^5$ x 11 x 13 x7 = $21[3^4$ x 11 x 13] =5 x 2 x 2 = 20

19.Find the sum of all the factors of 120?

a) 240   b) 280   c) 360   d) 400

Explanation:

$120 = 40$ x $3 = 8$ x 5 x $3 = 2^3$ x 5^1 x 3^1

Sum of all the factors = $[a^{p+1} - 1] / (a-1)$ x $[b^{q+1} - 1] / (b-1)$ x ……….

$$= (2^4 - 1)/(2\text{-}1) \times (5^2 - 1)/(5\text{-}1) \times (3^2 - 1)/(3\text{-}1)$$

$$= 360$$

20. What is the smallest number that should multiply 840 to make it a
perfect square and 2940 to make it a perfect cube respectively?
a) 200, 3100　　b) 210, 3150　　　　c) 210, 3250　d) None

Explanation:

Note:

To make it a perfect square, make the powers of prime factors a multiple of 2
To make it a perfect cube, make the powers of prime factors a multiple of 3

$840 = 2^3 \times 5^1 \times 3^1 \times 7^1$, answer $= 2 \times 5 \times 3 \times 7 = 210$

$2940 = 2^2 \times 5^1 \times 7^2 \times 3^1$, answer $= 2 \times 5^2 \times 7 \times 3^2 = 3150$

LCM AND HCF

LCM is the least common multiple

    Ex: LCM 0f 6, 8
        Multiples of 6 = 6, 12, 18, 24, 30, 36, 42, 48………
        Multiples of 8 = 8, 16, 24, 32, 40, 48 ………………..
        Common multiples of 6, 8 = 24, 48 ……………
        In these least one = 24. That is LCM of 6, 8 = 24

HCF is the highest common factor

     Ex: HCF 12, 18
        Factors of 12 = 1, 2, 3, 6 and 12
        Factors of 18 = 1, 2, 3, 6, 9 and 18
        Common factors are 1, 2, 3 and 6
        So the highest common factor is 6. That is HCF of 12, 18 = 6

FORMULE:

1 . Product of 2 numbers = LCM X HCF

2. LCM of fractions = (LCM of numerators)/(HCF of denominators)

3. HCF of fractions = (HCF of numerators)/(LCM of denominators)

21. Find the respective LCM and HCF of the following
 (i) 42, 72, 90
   a) 1200, 4   b) 7200, 16   c) 2520, 6 d) 1000, 35

(ii) ½, 2/3, ¾, 4/5
   a) 12, 1/60   b) 24, 1/30   c) 1/24, 30   d) 24, 30

Explanation:

   (i) 42, 72, 90, HCF = 6 & LCM = 2520

Explanation:

   (ii) ½, 2/3, ¾, 4/5,
   LCM = (LCM of 1, 2, 3 ,4)/(HCF of 2, 3, 4, 5) = 12/1 = 12
   HCF = (HCF of 1, 2, 3 ,4)/(LCM of 2, 3, 4, 5) = 1/60

22. The HCF of 2 numbers is 16 and their LCM is 160. If one of the numbers is 32, what is the other?

    a) 60   b) 80   c) 40   d) 20

Explanation:

We have, Product of 2 numbers = LCM X HCF

        $32 * x = 16 * 160$, implies $x = 80$

23. Find the least number which when divided by 48 and 72 leaves a remainder of 9 in each case and is greater than 9?

    a) 144   b) 152   c) 151   d) 153

Explanation:

    Required number = LCM of (48, 72) +9

                = 144 + 9 = 153

24. What is least 4 digit number which when divided by 3, 4, 5 and 6 leaves remainder of 2 in each case?

    a) 1012   b) 1022   c) 1122   d) 1222

Explanation:

Required number will be of the form = k [LCM of (3, 4, 5, 6)] + 2
                                     = 60k +2
    When k = 17, we get the least 4 digit number, which is 1020 +2 = 1022

25. Find the smallest number which when divided by 3,5,7,9 and 11 leaves respective remainder of 2,4,6,8 and 10?

  a) 2265   b) 2275   c) 2274   d) 3464

Explanation:

Here the difference between the divisor and the remainder is 1
    Required number = LCM of (3, 5, 7, 9 and 11) − 1
                = 3365 − 1
                = 3364

26. Find the smallest number which leaves a remainder of 7 when divided by 11 and leaves a remainder of 12 when divided by 13?

a) 51   b) 62   c) 72   d) 36

Explanation:

Using the division algorithm (N = dq +r) we can write the number as

$$N = 11a + 7 = 13b + 12$$

$$11a = 13b + 5$$

Now find the least value of 'b' so that 'a' is an integer.

We can easily see that when b = 3, 'a' is an integer.

So the required number = 13b +12 = 51

27. Find the smallest and largest 3 digit number which when divided by 22, 33 and 55 leave a remainder of 5 in each case?

a) 330, 990   b) 345, 980   c) 335, 995   d) 325, 925

Explanation:

Number form = k (LCM of 22, 33 and 55) + 5

$\qquad\qquad$ = 330k +5

$\quad$ For smallest 3 digit number, put k = 1, N = 335

$\quad$ For greatest 3 digit number, put k = 3, N = 995

28. Find the smallest and the largest 4 digit number which when decreased by 12 is exactly divisible by 16, 24 and 40?

a) 1208, 9848 b) 1200, 9840   c) 1212, 9852   d) 1188, 9828

Explanation:

Number form = k (LCM of 16, 24 and 40) + 12

           = 240k +12

    For smallest 4 digit number, put k = 17, N = 1212

    For greatest 4 digit number, put k = 41, N = 9852

29. Six bells ring together at 11am and after that they ring at intervals of 5, 10, 15, 25, 30 seconds. How many times will they ring together from 11.00 am to 12.30 pm on the same day?

    a) 18   b) 19   c) 20   d) 17

Explanation:

LCM of (5, 10, 15, 25, 30) = 300 seconds = 5 minutes

    So, answer = (90/5) + 1 = 19

30. Find the greatest number which when 110 and 99 are divided it leaves a remainder of 2 and 3 respectively?

    a) 24   b) 6   c) 12   d) 36

Explanation:

Required number = HCF of [(110 – 2), (99 – 3)]

                        = HCF of (108, 96)

                        = 12

31. Find the largest number which when 145, 121, 97 are divided the remainders are same?

a) 48   b) 12   c) 36   d) 24

Explanation:

Required number = HCF of [(145 – 121), (121 – 97)]

= HCF of (24, 24)

= 24

32. What is the greatest length x such that 3½ m and 8¾ m are integral multiples of x?

    a)1 ½ m   b) 1 1/3 m   c) 1 ¼ m   d) 1 ¾ m

Explanation:

3½ = 7/2

8¾ = 35/4

HCF of fractions = (HCF of numerators)/(LCM of denominators)

= (HCF of 7, 35)/(LCM of 2, 4)

= 7/4

= 1 ¾ m

LARGEST POWER OF A NUMBER IN N!

33. Find the highest power of 2 in 100!

Explanation:

100/2 = 50 + 25 + 12 + 6 + 3 + 1 = 97

34. Find the highest power of 3 in 100!

Explanation:

100/3 = 33 + 11 + 3 + 1 = 48

35. Find the highest power of 6 in 100!

Explanation:

Highest power of 6 in 100!
= smaller of [highest power of 2 in 100!, highest power of 3 in 100!]
= smaller of (97, 48)
= 48

36. Find the highest power of 24 in 500!
a) 166   b) 165   c) 164   d) 163

Explanation:

$24 = 8 \times 3 = 2^3 \times 3$.

In 500!,number of 8's are lesser compare to number of 3's. So we need to find only number of 8's

Number of 2's in 500!, 500/2 = 250+125+62+31+15+7+3+1 = 494

Therefore number of 8's in 500! = 494/3 =164

37. Find the number of zeros at the end of 200!

   a) 48   b) 49   c) 50   d) 51

Explanation:

With a combination of 2 and 5 we get 1 zero.
For number of zero's at the end of any factorial, in general, we find the number of 5's
200/5 = 40 + 8 + 1=49

38. Find the number of zeros at the end of (150)! x (80)!
a) 50   b) 55   c) 56   d) 58

Explanation:

150/5 = 30 + 6 + 1 = 37
80/5 = 16 +3 = 19
Answer = 37 + 19 =56

39. Find the number of zeros in the product 1 x 5 x 10 x 15 x 20 x 25 x…….x 60
   a) 10   b) 12   c) 14   d) 15

Explanation:

	1	5	10	15	20	25	30	35	40	45	50	55	60
5's	0	1	1	1	1	2	1	1	1	1	2	1	1
2's	0	0	1	0	2	0	1	0	3	0	1	0	2

Number of 5's in the product = 14 & number of 2's = 10
Therefore number of zero's = smaller of (14, 10) = 10

THE LAST DIGIT/ UNIT'S OF ANY POWER

Let us look at the powers of 2

2^1 ends with 2

2^2 ends with 4

2^3 ends with 8

2^4 ends with 6

2^5 ends with 2

2^6 ends with 4

2^7 ends with 8

2^8 ends with 6

Let us look at the powers of 3

3^1 ends with 3

3^2 ends with 9

3^3 ends with 7

3^4 ends with 1

3^5 ends with 3

3^6 ends with 9

3^7 ends with 7

3^8 ends with 1

We can notice that the last digits repeat after every 4 steps for both 2 and 3. In other words whenever the power is a multiple of 4, the last digit of the number will be same as the last digit of 2^4 and for powers of 3 it is 3^4.

NOTE:
Last digit of (even number)^{4k} = 6
Last digit of (odd number)^{4k} = 1

If the number ends with 0 and raised to any power, the last digit = 0

If the number ends with 5 and raised to any power, the last digit = 5

40. Find the last digit of 2^{99}

  a) 2   b) 3   c) 4   d) 6

Explanation:

$2^{99} = 2^{96} \times 2^3 = 4 \times 8 = 2$ (2^{96} is in 2^{4k} form, the last digit is 6 & 2^3 ends with 8)

41. Find the units digit of $14^{124} \times 29^{123}$

  a) 2   b) 3   c) 4   d) 6

Explanation:

$14^{124} = 4^{124} = $ (even number)$^{(4k)}$ form, so last digit is 6

$29^{123} = 9^{123} = 9^{120} \times 9^3 = 1 \times 9 = 9$

In the product last digit = 6 x 9 = 4

42. Find the units digit of $(518)^{163} + (142)^{157}$

a) 2   b) 3   c) 4   d) 6

Explanation:

$(518)^{163} = 8^{163} = 8^{160} \times 8^3 = 6 \times 2 = 2$

$(142)^{157} = 2^{157} = 2^{156} \times 2^1 = 6 \times 2 = 2$

So unit digit = 2 + 2 = 4

43. Find the units digit of $(1567)^{143} \times (1239)^{197} \times (2566)^{1027}$

a) 2   b) 3   c) 4   d) 6

Explanation:

$(1567)^{143} = 7^3 = 3$

$(1239)^{197} = 9^1 = 9$

$(2566)^{1027} = 6$

Answer = 3 x 9 x 6 = 6

FINDING THE REMAINDERS

44. Find the remainder when 2^{55} is divided by 9?
a) 1   b) 2   c) 3   d) 4

Explanation:
We need to find the remainder when 2^{55} is divided by 9.
   Check which power of 2 leaves a remainder of +1 or – 1 when divided by 9.
   Clearly it is 2^3 (since 8 by 9 the remainder is -1)
   So $2^{55} = (2^3)^{18} \times 2^1 = (-1)^{18} \times 2 = 1 \times 2 = 2$

45. Find the remainder when 3^{147} is divided by 11?
a) 8   b) 9   c) 7   d) None

Explanation:

Check which power of 3 leaves a remainder of +1 or – 1 when divided by 11.
   Clearly it is 3^5 (since $3^5/11 = 243/11$, implies remainder = 1)
   So $3^{147} = (3^5)^{29} \times 3^2 = (1)^{29} \times 9 = 1 \times 9 = 9$

46. Find the remainder when 3^{86} is divided by 8?

   a) 1   b) 6   c) 7   d) 2

Explanation:

   Check which power of 3 leaves a remainder of +1 or − 1 when divided by 8.
      Clearly it is 3^4 (since $3^4/8$ = 81/8, implies remainder = 1)
      So $3^{86} = (3^4)^{20} \times 3^2 = (1)^{20} \times 9 = 1 \times 9 = 9$
       When 9 is divided by 8 the remainder is 1

47. Find the remainder when (1251 x 1252 x 1253) is divided by 11?

   a) 6   b) 9   c) 8   d) 7

Explanation:

   we have to find the remainder when (1251 x 1252 x 1253) is divided by 11?
      Now Remainder of [(1251)/11] = 8
         Remainder of [(1252)/11] = 9
         Remainder of [(1253)/11] = 10
        Therefore Remainder of [(8 x 9 x 10)/11] = (-3) x (-2) x (-1) = 6

PROBLEMS ON DIVISION ALGORITHM (N = d x q +r)

48. A number when divided by 161 leaves a remainder of 57. Find the remainder
    when the same number is divided by 7?
    a) 0   b) 1   c) 2   d) 3

Explanation:

A number when divided by 161 leaves a remainder of 57.
   Using the division algorithm we can write the number as, N = 161q + 57
   Now R (N/7) = R [(161q +57)]/7 = 1 (since 161 is divisible by 7 & when 57 is
   divided by 7, the remainder is 1)

49. A number when divided by a certain divisor leaves a remainder of 19. When twice the number is divided by the same divisor, the remainder is 7. Find the divisor?

a) 14   b) 21   c) 31   d) cannot be determined

Explanation:

A number when divided by a certain divisor leaves a remainder of 19.

Using the division algorithm we can write the number as, N = d x q + 19

Now twice the number, 2N = 2 d x q + 38

Given, R (2N)/d = 7

That is R (2 d x q + 38)/d = 7, implies d must be 31

50. A number when divided by a certain divisor leaves a remainder of 11. When the Square of the same number is divided by the same divisor the remainder is 1. How many values are possible for the divisor?

a)10   b) 11   c) 12   d) None

Explanation:

 Given, a number N, when divided by a certain divisor d leaves a remainder of 11.

   Using the division algorithm we can write the number as, $N = d \times q + 11$

   Now square of the number, $N^2 = d^2q^2 + 22 \times d \times q + 121$

   Here d^2q^2 is divisible by d and $(22 \times d \times q)$ is also divisible by d.

   That means R (121/d) = 1, means 120 is divisible by d
   That means d can be any factor of 120, greater than 11.
   Therefore d can be 12, 15, 20, 24, 30, 40, 60 and 120.
   So, 8 values are possible for d.

PRACTICE EXERCISE FOR NUMBERS TOPIC

1. The prime factorization of 1936 is,
   a) 2^2 x 3 x 11^3 b) 2^3 x 11^3 c) 2^4 x 11^2 d) None

2. The prime factorization of 1240 is,
   a) 2^3x5x31   b) 2^2x5x31   c) 3^2x5x31   d)none

3. Find the number of divisors or factors of 1800?
   a) 24   b) 32   c) 36   d) 40

4. Find the number of odd divisors or factors of 1800?
   a) 8   b) 10   c) 9   d) 6

5. Find the number of even divisors or factors of 1800?
   a) 24   b) 32   c) 30   d) 27

6. Find the sum of all the factors of 600?
   a) 2400   b) 1280   c) 1360   d) 1860

7. Find the sum of all odd factors of 600?
   a) 120   b) 124   c) 360   d) 240

8. Find the sum of all even factors of 600?
   a)1240   b)1736   c)3452   d)1346

9. Find the number of factors of 1800 which are multiples of 5?
   a) 24   b) 23   c) 32   d) 20

10. Find the number of factors of 1200 which are multiples of 15?
    a) 20   b) 12   c) 10   d) none

11. Find the number of factors of 1800 which are divisible by 5 but not by 25?
    a) 24   b) 30   c) 12   d) 15

12. Find the number of factors of 1200 which are perfect squares?
    a) 4   b) 6   c) 10   d) 8

13. Find the number of factors of 1500 which are perfect squares?
    a) 4   b) 6   c) 10   d)8

14. Find the number of factors of 5400 which are perfect cube?
    a) 4   b) 6   c) 10   d)8

15. Find the no of divisors of 19404 excluding 1 and the no itself?
    a) 54   b) 53   c) 52   d) 50

16. In how many ways can 2744 be resolved as a product of 2 factors?
    a) 16   b) 8   c) 12   d) 4

17. The number of ways in which 1296 can be expressed as a product of 2 distinct factors and product of 2 factors respectively is -
    a) 25, 25   b) 13, 12   c) 12, 13   d) 15, 10

18. What is the smallest number that should be multiplied with 840 to make it a perfect square and 2940 to make it a perfect cube respectively?
    a) 200, 3100   b) 210, 3150   c) 210, 3250   d) None

19. What is the smallest number that should be multiplied with 3600 to make it a perfect square?
    a) 1   b) 6   c) 10   d) 2

20. What is the smallest number that should be multiplied with 3600 to make it a perfect cube?
    a) 60   b) 6   c) 10   d)8

21. Express 0.81818181……. in form of a fraction?
    a) 9/11   b)6/11   c)10/11   d)8/11

22. Express 0.27777777……. in form of a fraction?
    a) 5/18   b)6/17   c) 7/18   d)8/18

23. Express 0.279797979……. in form of a fraction?
    a) 277/990   b) 377/990   c) 277/999   d)377/999

24. Express 1. 116161616……. in form of a fraction?
    a) 223/198   b) 367/330   c) 62/55   d)221/198

25. Which of the following is a prime number?
    a) 851   b) 589   c) 429   d) 307

26. Which of the following is not a prime number?
    a) 113   b) 181   c) 223   d) 161

27. Find the value of 50+51+52+53+………+99
    a) 3627   b) 8510   c) 3725   d) 3075

28. What is the sum of first 80 natural numbers?
    a) 3140   b) 3240   c) 3340   d) 3440

29. What is the sum of the squares of first 20 even natural numbers?
    a) 9480   b) 10480   c) 11480   d) 12480

30. A wants to type first 1000 natural numbers on a desktop. How many times should he press the buttons of the computer key board?
    a)   2893   b) 2987   c) 3000   d) 2500

31. A printer numbers the pages of a book starting with 1 and uses 3089 digits in all. How many pages does the book have?
    a) 1040   b) 1048   c) 1049   d) 1050

32. One sheet is torn from a book, in which both sides of the sheet have page numbers, starting from page number 1. The sum of the numbers on the remaining pages is 195. The sheet that is removed contains which of the following page numbers?
    a) 5, 6   b) 7, 8   c) 9, 10   d) 11, 12

33. If 6896x45 is divisible by 9 then x is,
    a) 4   b) 5   c) 6   d) 7

34. If 481A769B is divisible by 5, 6 and 9 then A+B is -
    a) 0   b) 1   c) 2   d) 3

35. An 8 digit number 4252746B leaves a remainder 0 when divided by 3. How many values are possible for B?
    a) 2   b) 3   c) 4   d) 6

36. What is the remainder when the 100 digit number starting with 1, writing the consecutive natural numbers next to it, is divided by 5?

a) 1   b) 2   c) 4   d) 0

37. If the 8 digit number 5668x25y is divisible by 48, find the least value of x + y?

a) 10   b) 9   c) 8   d) 7

38. The value of 0.057057057057……. is ,

a) 57/99   b) 57/999   c) 57/990   d) 57/909

39. The value of 0.1254545454………. is (that is 0.12**54)**

a) 1242/(9900)   b) 621/(2950)   c) 207/(1650)   d) 69/(550)

40. The fraction equivalent of the recurring decimal representation 1.27272727……….. is,

a) 13/11   b) 14/11   c) 127/99   d) 137/99

41. Find the number of factors 1225?

a) 5   b) 6   c) 8   d) 9

42. In how many ways 3420 can be written be written as product of 2 factors?

a) 12   b) 14   c) 18   d) 36

43. Find the number of odd & even number of factors respectively of 1680?

a) 8, 32   b) 8, 9   c) 10, 9   d) none

44. Find the number of factors of 243243 which are multiples of 21?

a) 20   b) 23   c) 25   d) none

45. Find the sum of all the factors of 120?

a) 240   b) 280   c) 360   d) 400

46. Find the smallest four digit number which when increased by 3 is divisible by 4,5 & 6?

a) 1090   b) 1027   c) 1017   d) 1005

47. Which smallest natural number should be added to 5312468 to make the result divisible by 11?

a) 6   b) 4   c) 8   d) 2

48. Which number amongst the following is divisible by 15 & 24?

a) 4680   b) 3630   c) 2460   d) 5460

49. Which number among the following is divisible by 144?

a) 23764   b) 428888   c) 195320   d) 66528

50. Which of the following is a prime number?

a)1567893   b) 89394811   c) 96314283   d)None of these

51. A person belonging to a charitable organization had some money with him. The amount available with him could be divided equally among 7 or 9 or 11 people. Find the least amount in rupees he must have had, if it was a four digit number?

a) 1212   b) 1386   c) 1425   (d) 1584

52. If the number 23576X is divisible by 36, Find value of the digit denoted as X?

a) 8   b) 6   c) 4   d) 0

53. Let N be a natural number. If N^2 is divisible by 8 , then which of the following is true

(a) N is always divisible by 4
(b) N is always divisible by 8
(c) N is always divisible by 16.
(d) N is always divisible by 64.

54. Let "A" be a three digit number with digits "abc" that are distinct. Let "B" be another number "cba" formed by reversing the digits of A. Then the highest number, that divides , the absolute difference of A & B is,

a) 96   b) 99   c) 11   d) 98

55. How many numbers from 300 to 500 (both inclusive) are divisible by 4?

a) 52   b) 49   c) 50   d) 51

SOLUTIONS FOR PRACTICE EXERCISE:

1. The prime factorization of 1936 is,
   a) 2^2 x 3 x 11^3 b) 2^3 x 11^3 c) 2^4 x 11^2 d) None of these

   1936=11x11x2x2x2x2=11^2x2^4 (Option c)

2. The prime factorization of 1240 is,
   a)2^3x5x31   b) 2^2x5x31   c) 3^2x5x31   d)None of these

   1240=124 x10 =4 x 31 x 5x 2=2^3x5x31 (Option a)

3. Find the number of divisors or factors of 1800?
      a) 24   b) 32   c) 36   d) 40

   1800=18 x 100 =9 x 2 x 25 x4 =2^3 x 3^2 x5^2
   No of factors = (3+1) x (2+1) x(2+1)=4 x 3 x3=36(Option c)

4. Find the number of odd divisors or factors of 1800?
   a)8   b) 10   c) 9   d) 6

    1800=18 x 100 =9 x 2 x25 x4 =2^3 x 3^2 x5^2
    For odd divisors we find divisors of 3^2 x 5^2
    No of odd factors = (2+1) x(2+1)= 3x3=9 (Option c)

5. Find the number of even divisors or factors of 1800?
   a) 24   b)32   c)30   d)27

    1800=18 x 100 =9 x 2 x25 x4 =2^3 x 3^2 x5^2
   No of factors = (3+1) x (2+1) x (2+1)=4 x 3 x3=36
   No of odd factors = (2+1) x(2+1)= 3x3=9
   No of even factors = total factors – odd factors=36-9=27 (Option d)

6. Find the sum of all the factors of 600?
   a) 2400 b) 1280   c) 1360   d) 1860

600= 3 x 2x 25 x 4 = 2^3 x 3 x 5^2

Sum of all factors of 600 = {(2^{3+1} -1)/(2-1)} x {(3^{1+1} -1)/(3-1)}x{(5^{2+1} – 1)/(5-1)} = 15 x 4 x 31 = 1860 (Option d)

7. Find the sum of all odd factors of 600?
   a)120   b)124   c)360   d)240

   600= 3 x2x25x4=2^3 x 3 x 5^2

   To find sum of odd factors drop the even factors.

   Sum of odd factors of 600 ={(3^{1+1} -1)/(3-1)}x{(5^{2+1} – 1)/(5-1)} = 4 x 31
   = 124 (Option b)

8. Find the sum of all even factors of 600?
   a)1240   b)1736   c)3452   d)1346

600= 3 x2x25x4=2^3 x 3 x 5^2
(Sum of factors of a number is basically summation of geometric progressions. This approach is used here to solve the question. Student can solve this problem using sum of factors formula too)

 Sum of all factors of 600 = (2^0 + 2^1 +2^2 + $2^{3)}$) x (3^0 + $3^{1)}$) x (5^0+5^1+5^2)
=15 x 4 x 31 =1860

Sum of odd factors of 600 =(1+3) x(1+5+25)= 4 x 31 =124

Sum of even factors of 600 = total sum of factors – odd factors sum =1860 – 124=1736 (Option b)

9. Find the number of   factors of 1800 that are divisible by 5?
   a) 24   b) 23   c)32   d)20

   1800=18 x 100 =9 x 2 x25 x4 =2^3 x 3^2 x5^2

   Factors which are all divisible by 5 = 5 (2^3 x 3^2 x5)

Factors which are all divided by 5 = (3+1) x (2+1) x (1+1) =4x3x2=24 (Option a)

10. Find the number of factors of 1200 which are divisible by 15?
   a) 20   b) 12   c) 10   d) none of these

$1200=4x3x25x4=2^4 \times 3 \times 5^2$
Factors which are all divisible by 15 = 3 x 5 x ($2^4 \times 5^1$)

Factors which are all divisible by 15 = (4+1) x (1+1) =5 x2 =10 (Option c)

11. Find the number of factors of 1800 that are divisible by 5 but not by 25?
   a) 24   b) 30   c)12   d)15

   $1800=18 \times 100 =9 \times 2 \times 25 \times 4 =2^3 \times 3^2 \times 5^2$

   Factors which are all divisible by 5 = 5 ($2^3 \times 3^2 \times 5$)

   Factors which are all divisible by 5 = (3+1) x (2+1) x (1+1) =4x3x2=24
   Factors which are all divisible by 25= 25 ($2^3 \times 3^2$)= (3+1) x (2+1) =4 x 3
                                                                 =12
Therefore factors which are divisible by 5 but not by 25 = 24 – 12 = 12 (Option c)

12. Find the number of factors of 1200 which are perfect squares?
   a) 4   b)6   c)10   d)8

$1200= 4 \times 3 \times 25 \times 4 =2^4 \times 3 \times 5^2$
Examine the powers of the prime factors & carry out the following exercise.
2^0 , 2^2 , 2^4 are perfect squares of 2 so total 3
3^0 is a perfect squares of 3 so total 1
5^0 , 5^2 are perfect squares of 5 total 2
Hence number of factors of 1200 which are perfect squares =3 x 1 x2 =6 (Option b)

13. Find the number of factors of 1500 which are perfect squares?
   a) 4   b)6   c)10   d)8

   1500= 5 x 3 x 25 x 4 =2^2 x 3 x5^3

2^0 , $2^2$are prefect squares total 2

3^0 is prefect squares total 1

5^0 , 5^2 are prefect squares total 2

number of factors of 1500 which are perfect squares =2 x 1 x2 =4 (option a)

14.Find the number of factors of 5400 which are perfect cube ?
   a) 4   b)6   c)10   d)8
5400 = 54 x 25 x 24 =27x 2x25x4 =2^3 x3^3x 5^2
2^0 , 2^3 are perfect cube of 2 so total 2
3^0 , $3^3$are perfect cube of 3 so total 2
5^0 is prefect cube of 5 so total 1
Hence   number of factors of 5400 which are perfect cube =2 x 2 x1 =4 (option a)

15. Find the no of divisors of 19404 excluding 1 and the no itself?
   a) 54   b) 53   c) 52   d) 50

19404 = 11 x 4 x 21x21 =11 x4x 7x3x7x3=11 x2^2x3^2x7^2
Number of factors = (1+1) x(2+1) x(2+1)x(2+1)=54
Find the number of divisors of 19404 excluding 1 and the number itself =
total factors – 2 =54-2=52 (option c)

16. In how many ways can 2744 be resolved as a product of 2 factors?

   a) 16   b) 8   c) 12   d) 4
   2744 =8 x 343 =2^3 x7^3
   Number of factors of 2744 is =(3+1) x(3+1)=4x4=16
   Number of ways in which 2744 can be resolved as a product of two
      factors is = ½ (total factors)=1/2 x 16 =8 (Option b)

17. In how many ways can 1296 be expressed as a product of 2 distinct factors and product of 2 factors respectively is -

      a) 25, 25   b) 13, 12   c) 12, 13   d) 15, 10

$1296 = 4 \times 324 = 4 \times 4 \times 81 = 2^4 \times 3^4$

Total factors = 5 x 5 = 25
But 25 is not divisible by 2.
So as a product of 2 distinct factors we can write in (25 -1)/2 ways=12
And as a product of 2 factors in= (25 + 1)/2 ways. = 13.
 Hence answer is (Option c)

Note to student: Whenever the number is a perfect square you will encounter this situation, because any perfect square has odd number of factors.

18. What is the smallest number that should be multiplied with 840 to make it a perfect square and 1200 to make it a perfect cube respectively?

   a) 200, 3100   b) 210, 3150   c) 210, 3250   d) None of these

$840 = 8 \times 105 = 8 \times 5 \times 21 = 2^3 \times 3 \times 5 \times 7$
The smallest number that should be multiplied with 840 to make it a perfect square is found by converting all powers on the prime factors to even numbers,thus $= (2^3 \times 3 \times 5 \times 7) \times (2 \times 3 \times 5 \times 7) = 2^4 \times 3^2 \times 5^2 \times 7^2$

So ans $= 2 \times 3 \times 5 \times 7 = 210$

$1200 = 2^2 \times 3 \times 5^2 \times 2^2 = 2^4 \times 3 \times 5^2$

 The smallest number that should be multiplied with 1200 to make it a perfect cube is found by converting all powers on the prime factors into multiples of 3 ,thus $= (2^4 \times 3^2 \times 5^2) \times 2^2 \times 3 \times 5$

So ans is $2^2 \times 3 \times 5 = 60$.
(Option d)

19. What is the smallest number that should be multiplied with 3600 to make it a perfect square?

a) 1   b) 6   c)10   d) 2

$3600 = 9 \times 4 \times 25 \times 4 = 2^4 \, x3^2 \, x5^2$

To make it a perfect square $= (2^4 \, x3^2 \, x5^2) \times 1$ we have to multiply it with 1 ,because the powers of prime factors are already even. Also note that 3600 is already a perfect square.
(Option a)

20. What is the smallest number that should be multiplied with 3600 to make it a perfect cube?

a) 60   b) 6   c) 10   d) 8

To make prefect cube $= (2^4 \, x3^2 \, x5^2) \, 2^2 \times 3 \times 5.$
We have to multiply it with 60 to make cube (Option a)

21. Express 0.81818181…….= 0.**81(bold faced to denote repetition,read as 0.81 bar)** in form of a fraction?

   a) 9/11   b)6/11   c)10/11   d)8/11

   0.81818181……. = 81/99 = 9/11
   (Two digits repeat after decimal point so put two 9's in denominator.
    Remove decimal point and bar you are left with the number 81 which is numerator.
   (Simplify in cases where it is possible & then report the answer)
   (Option a)

22. Express 0.27777777……=0.2**7** (read as 0.27 with bar on 7) in form of a fraction?

   a) 5/18   b)6/17   c) 7/18   d)8/18

   0.27777777… = (27 − 2)/(90) = 25/90 = 5/18
   [(Numerator: Remove decimal & bar you end up with 27.From this subtract the non repeating digit which is 2 .)
   [Denominator: One digit repeats after decimal so put one 9 in denominator. One digit doesn't repeat after the decimal point hence put one 0 in the denominator correspondingly] (Option a)

 23. Express 0.279797979…….= 0.2**79** in form of a fraction?

a) 277/990   b) 377/990   c) 277/999   d) 377/999

0.279797979……. = (279 − 2)/(990) = 277/990 (Option a)

24. Express 1. 116161616……. in form of a fraction?
a) 223/198   b) 367/330   c) 62/55   d) 221/198

  1. 116161616……= 1.1**16** = 1 +[(116 − 1)/(990)] = (990 +115)/(990)
    = 223/990 (Option a)

25. Which of the following is a prime number?
a) 429   b) 307   c) 428   d) 851

a) 429, sum of the digits = 15, divisible by 3
b) 307, approximate square root of 307 is 18.
   List out all primes below 18, i.e 2, 3, 5, 7, 11, 13 and 17
   We observe that 307 is not divisible by any one of these primes.
   So it is a prime number (if it is divisible by any one of these primes
     then it is not a prime)
c) Divisible by 4
d) Divisible by 23. Using the same method as described in option b.
(Option b)

26. Which of the following is not a prime?
a) 113   b) 161   c) 223   d) 181

 a) 113 is not divisible by 2,3,5,7 and 11. So it is a prime.
 b) 161 is divisible by 7
 c) 223 is not divisible by 2,3,5,7,11,13.So it is prime
 d) 181 is not divisible by 2,3,5,7,11,13.So it is prime.
(Option b)

27. Find the value of 50+51+52+53+………+99
    a) 3627   b) 8510   c) 3725   d) 3075

   50+51+52+53+………+99, an AP
   Sum of n terms = (n/2) [a + l], a & l are first and last terms
               = (50/20 [50 + 99]

= 3725

Alternate method:
50+51+52+53+.........+99 = (1+2+3+........+99) − (1+2+.....+49)
Then apply sum of first n terms formula (Option c)

28. What is the sum of first 80 natural numbers?
   a) 3140   b) 3240   c) 3340   d) 3440

   Sum = [n (n+1)]/2 = (80) (80+1)/2 =3240 (Option b)

29. What is the sum of the squares of first 20 even natural numbers?
   a) 9480   b) 10480   c) 11480   d) 12480

   $2^2+4^2+6^2+8^2+$....... $+ 40^2 = 2^2 (1^2+2^2+3^2+$........$+20^2)$
                         = 4 x [n (n+1)(2n+1)]/6

                         = 4 x (20 x 21 x 41)/6 = 11480   (Option c)

30. A wants to type first 1000 natural numbers on a desk top. How
    many times he has to press the keys of the computer key board?
   a) 2893   b) 2987   c) 3000   d) 2500

   To enter 1 to 9, number of times key to be pressed = 9
   To enter10 to 99, number of times keys to be pressed = 90 x 2 =
   180
   To enter 100 to 999, number of times keys to be pressed = 900 x 3
   = 2700
   To enter 1000, number of times keys to be pressed = 4
   Hence total = 9+180+2700+4 = 2893 (Option a)

31. A printer numbers the pages of a book starting with 1 and uses
    3089 digits in all. How many pages does the book have?

   a) 1040   b) 1048   c) 1049   d) 1050

   For pages 1 to 9, number of digits used by printer = 9

For pages 10 to 99, number of digits used by printer = 90 x 2 = 180

For pages 100 to 999, number of digits used by printer = 900 x 3 = 2700

So far the digits used = 9+180+2700 = 2889
The remaining digits to be used = 3089 – 2889 = 200, with these next 50 pages can be numbered.

So total = 999+ 50 = 1049 pages can be numbered. (Option c)

32. One sheet is torn from a book ,in which both sides of the sheet have page numbers, starting from page number 1. The sum of the numbers on the remaining pages is 195. The sheet that is removed contains which of the following page numbers?
a) 5, 6   b) 7, 8   c) 9, 10   d) 11, 12

Here, basically, our sum of first n natural numbers should be slightly greater than 195.

By trial and error, if n = 10, then [n (n+1)]/2 = (10 x 11)/2 = 55
if n = 15, then [n (n+1)]/2 = (15 x 16)/2 = 120
if n = 20, then [n (n+1)]/2 = (20 x 21)/2 = 210
So, 210 – 195=15. ,i.e, the removed sheet contains pages 7 and 8 (Option b)

33. If 6896x45 is divisible by 9 then x is ,
a) 4   b) 5   c) 6   d) 7
Here sum of the digits = 38+x = 45, so x= 7 (Option d)

34. If 481A769B is divisible by 5, 6 and 9 then A+B is,
a) 0   b) 1   c) 2   d) 3

Given, 481A769B is divisible by 5 and 6, implies B = 0
For 9, sum of the digits = 35+ A = 36, so A = 1 and A+B = 1
(Option b)

35. An 8 digit number 4252746B leaves a remainder 0 when divided by 3. How many values are possible for B?

  a) 2   b) 3   c) 4   d) 6

Sum of the digits of 4252746B = 30+B,
30,33,36 & 39 are all multiples of 3,
So, B can take 0, 3, 6 and 9, that is 4 values. (Option c)

36. What is the remainder, when the 100 digit formed by writing consecutive natural numbers side by side starting with 1, is divided by 5?

  a) 1   b) 2   c) 4   d) 0

Here we need to know the last digit of this 100 digit number.
The 100 digit number is 1234…..9101112…….545 (that is 9 single digit numbers, then 45 two digit numbers, 10 to 54 and then 5)
So the remainder is 0. (Option d)

37. If the 8 digit number 5668x25y is divisible by 48, find the least value of x+y?

  a) 10   b) 9   c) 8   d) 7

Divisibility by 48 means we need to check divisibility with 3 and 16.
Sum of the digits of 5668x25y = 32+(x + y)
Among the options if (x + y) is 7 or 10 then only it is divisible by 3.
Divisibility by 16 means we need to check last 4 digit number and for 8 we have to check the last 3 digit number.
25y is divisible by 8, implies y = 6

If x= 1, then the 4 digit number 1256 is not divisible by 16.
Hence the value of (x + y) is 10 (Option a)

38. The value of 0.057057057057……. is,

  a) 57/99   b) 57/999   c) 57/990   d) 57/909

Let x = of 0.057057057057...... .(1)

   1000 x = 057.057057..............(2)

  (2) − (1) gives 999x = 057, implies x = 57/999

Short cut: As explained in Q.No 21 & 22. (Option b)

39. The value of 0.1254545454.......... is (that is 0.12**54)**

  a) 1242/(9900)   b) 621/(2950)   c) 207/(1650)
  d) 69/(550)

  Answer = (1254 − 12)/(9900) = 1242/(9900)
  (Numerator: Take the whole number and subtract the non recurring part.) (Denominator: Number of 9's corresponding to the number of repeated digits after decimal point, followed by number of 0's corresponding to the number of non repeated digits after decimal point) (Option a)

40. The recurring decimal representation 1.27272727........... is,
  a) 13/11   b) 14/11   c) 127/99   d) 137/99

  Answer= 1+ (27/99) = 126/99 =14/11 (Option b)

41. Find the number of factors 1225
  a) 5   b) 6   c) 8   d) 9

  $1225 = 25 \times 49 = 5^2 \times 7^2$,
  Number of factors = (p+1) (q+1) (r+1) ......
           = (2+1) (2+1) = 9 (Option d)

42. In how many ways can 3420 be written be written as product of 2 factors?
  a) 12   b) 14   c) 18   d) 36

  3420 = 10 x 342 = 10 x 9 x 38 = (2x5) (3x3) (2x19)
               $= 2^2 \times 3^2 \times 5^1 \times 19^1$

Answer = $(1/2) [(p+1) (q+1) (r+1)....]$
$= (1/2) [3 \times 3 \times 2 \times 2] = 18$ (Option c)

43. Find the number of odd & even number of factors of 1680?
   a) 8, 32   b) 8, 9   c) 10, 9   d) none

$1680 = 10 \times 168 = 10 \times 4 \times 42 = (2\times5)(2\times2)(2\times3\times7) = 2^4 \times 5^1 \times 3^1 \times 7^1$

a) Number of odd factors = All the factors of $(5^1 \times 3^1 \times 7^1) = 2\times2\times2 = 8$

b) For even factors

$2^4 \times 5^1 \times 3^1 \times 7^1 = 2 [2^3 \times 5^1 \times 3^1 \times 7^1]$

Number of even factors = All the factors of $[2^3 \times 5^1 \times 3^1 \times 7^1]$

$= 4\times2\times2\times2 = 32$

Answer is (Option a)

44. Find the number of factors of 243243 which are multiples of 21?
   a) 20   b) 23   c) 25   d) none

$243243 = 243 (1001) = 3^5 \times 11 \times 13 \times 7 = 21[3^4 \times 11 \times 13]$
$= 5 \times 2 \times 2$
$= 20$ (Option a)

45. Find the sum of all the factors of 120?
   a) 240   b) 280   c) 360   d) 400

$120 = 40 \times 3 = 8 \times 5 \times 3 = 2^3 \times 5^1 \times 3^1$
Sum of all the factors $= [a^{p+1} - 1] / (a-1) \times [b^{q+1} - 1] / (b-1) \times ..$

$= (2^4 - 1)/(2-1) \times (5^2 - 1)/(5-1) \times (3^2 - 1)/(3-1)$
$= 360$ (Option c)

46. Find the smallest four digit number which when increased by 3 is divisible by 4,5 & 6?

a) 1090   b) 1027   c) 1017   d)1005

Proceed by options,
Increase of 3 gives options as 1093,1030,1020,1008 in that
order. Only 1020 & 1008 are divisible by 4 of which only 1020 is
divisible by 5. Now check 1020 for divisibility by 6.

Sum of digits is 3 so divisible by 3 & the number ends in 0 , so
Even. Hence answer is (Option c)

47. Which smallest natural number should be added to 5312468 to
make the result divisible by 11?
   a) 6   b) 4   c) 8   d) 2

Proceed by options,
5312468 + 6 = 5312474, (5 + 1 + 4 + 4 = 14)
                        (3 + 2 + 7 = 12)
Both sums don't match & their difference is not a multiple of
11. So eliminate first option.
 5312468 + 4 = 5312472, (5 + 1 + 4 + 2 = 12)
                        (3 + 2 + 7 = 12)
The sums match hence this is the answer.
The reader is expected to check other two options as explained
above. (Option b)

48. Which number amongst the following is divisible by 15 & 24?
   a) 4680   b) 3630   c) 2460   d) 5460

We test divisibility by 3, 5 & 8.
Only (Option a) satisfies.

49. Which number among the following is divisible by 144?
   a) 23764   b) 428888   c) 195320   d) 66528

We test divisibility by 9 & 16.
If you proceed by options only (Option d) is divisible by 9.
Hence divisibility by 16 becomes an optional check.

50. Which of the following is a prime number?
    a)1567893   b) 89394811
    c) 96314283   d) None of these

Option a & c are divisible by 3 & Option b by 11.
So answer in none of these

51. A person belonging to a charitable organization had some
    money with him. The amount available with him could be divided
    equally among 7 or 9 or 11 people. Find the least amount in
    rupees he must have had, if it was a four digit number?
    a) 1212   b) 1386   c) 1425   (d) 1584

    We should choose that number from the options that is divisible
    by 7,9 & 11.
    Options b & d are divisible by both 9 & 11,of which 7 divides only
    Option b.

52. If the number 23576X is divisible by 36, Find value of the digit
    denoted as   X?
    a) 8   b) 6   c) 4   d) 0

    We test divisibility by 4 & 9 .Recall that they are co-primes.
    When divisible by 4 X can take 0 or 4 or 8.
    When divisible by 9 ,check sum of digits = 23 + x.
    Divisibility by 9 gets established only when X=4. (Option c)

53. Let N be a natural number. If N^2 is divisible by 8 , then which of
    The following is true
    (a) N is always divisible by 4

(b) N is always divisible by 8

(c) N is always divisible by 16.

(d) N is always divisible by 64.

As N^2 is divisible by 8 it is of the type 8k where k is a positive integer, but 8k should also be a perfect square.

Some values are worked out to explain the method as in the table below.

k	$8k = N^2$	N^2	N
1	8	Not a perfect square	
2	16	Perfect square	4
3	24	Not a perfect square	
4	32	Not a perfect square	
5	40	Not a perfect square	
6	48	Not a perfect square	
7	56	Not a perfect square	
8	64	Perfect square	8
18	144	Perfect square	12

Hence we observe N is divisible by 4.

Alternate method:

$N^2 = 8k = 2^3 \times k$, k should be chosen such that it has a factor 2 in it multiplied by a prime factor with an even power, only then N gets defined.

$N^2 = 2^3 \times 2^1 \times p^x$, where p is prime number & x is even.

Then $N = 2^2 \times \sqrt{(p)^x}$

Which implies N will always be a multiple of 4. (Option a)

54. Let "A" be a three digit number with digits "abc" that are distinct. Let "B" be another number "cba" formed by reversing the digits of A. Then the highest number, that divides , the absolute difference of A & B is,

a) 96   b) 99   c) 11   d) 98

Consider for example the number 45 whose value is = 10 x 4 +5 x 1 ,
because 4 occupies place value 10 & 5 occupies place value 1.
Like wise,
Value of A = abc = 100a + 10b + c
Value of B = cba = 100c + 10b + a
The absolute difference of A & B = |99 (a-c)| = 99 |a – c|
Such a number is divisible by 9, 11 & 99 .
Out of which 99 is the highest number. (Option b)

55. How many numbers from 300 to 500 (both inclusive) are divisible by 4?

   a) 52   b) 49   c) 50   d) 51

300 = 4 x 75 & 500 = 4 x 125
From 75 to 125 we have 125 – 75 + 1 = 51 numbers.
Hence answer is (Option d)

Percentage

GENERAL APTITUDE

Basics

- Percentage always refers to 100 as the base.
- A percentage value can be more than 100 not necessarily less than 100 always.

Basic Formulae

(1) a % of b is calculated as = (a/100)* b

(2) What % of a is b, (?/100) * a = b

$\qquad$? = (b/a) * 100 is the formula for calculation

(3) <u>Percentage increase Calculation</u>

If the number "a" increases to "b" ,% increase is calculated as

$\qquad$ = {(b-a)/a} * 100

Note: The base value for calculation is always the original number which is "a" in this case

(4) <u>Percentage decrease Calculation</u>

If the number "a" decreases to "b" ,% decrease is calculated as =
{(a-b)/a} * 100

Note the base value for calculation is always the original number which is "a" in this case.

(5) <u>If the number N increases by p %</u> , the new value is calculated as
= N * (1 + (p/100))

(6) <u>If the number N decreases by p %</u>, the new value is calculated as
= N * (1 - (p/100))

(7) Consider two numbers a & b such that a>b.

By what % a exceeds b is calculated as ((a-b)/b) * 100

By what % b is less than a is calculated as ((a-b)/b) * 100

Any % calculation is always with respect to a base value. A wrong choice of base will end up giving you a wrong answer.

If 25% of (280) is equal to 7% of (x), then x is
a) 500   b) 1000   c) 700   d) 800

Solution:

- (25/100)* 280 = (7/100) * x

- x = 25 x 280 /7 = 1000 (choice b)

If A:B = 6:5, then by what % is A is more than B?
a) 20%   b) 30%   c) 50%   d) 10%

Solution:

Let A = 6k & B = 5k ,where k € z+

More than B , means B becomes the base for comparison,

Hence required result = {(6k – 5k)/5k } * 100

= 20 %   (choice a)

150 is what % of 120?
a) 150% b) 125% c) 110%   d) 75%

Solution

- $150 = (?/100) \times 120$

- $? = 150 * 100 / 120$

- $= 125\%$ (choice b)

- Note that you can get a % value greater than 100 as your answer as specified earlier.

What % of 60 is 40?
a) 33 1/3%   b) 66 2/3%   c) 50   d) 80%

- Solution
- (?/100) * 60 = 40
- ? = (40/60) * 100
-     = 66 2/3% (Choice b)

Which of the following is least?
a) 20% of (80)   b) 30% of (60)
c) 35% of (50)   d) 40% of (45)

- Solution

- a) 20 % of 80 = 16

- b) 30 % of 60 = 18

- c) 35 % of 50 can be converted as 50% of 35 = 17.5

- d)40 % of 45 = (2/5) * 45 = 18

- Hence least is option a.

A number when decreased by 20% becomes 136. What is the number ?

a) 160   b) 150   c) 170   d) 140

Solution

- Let the number be N.
- N (1- (20/100)) = 136 (Refer to formula discussed in basics section)
- N (1 – (1/5)) = 136
- N = 136 * 5/4 = 170 (choice c)

A number when increased by 40% becomes 420. What is the number ?

a) 200   b) 300   c) 400   d) 320

- Solution
- Let the number be N.
- N (1 + (40/100)) = 420
- N * 7/5 = 420
- N = 300 (Option b)

The price of an article is first decreased by 10% & then increased by 10% successively . If the price after these changes is Rs990, the original price of the article was,
a) 990   b) 1000   c) 1010   d) 1020

- Solution
- Let the original price = k
- Price after first change = k (1- (10/100)), now this price undergoes the second change.
- Hence price after second change =

k (1- (10/100)) (1 + (10/100)) = Rs 990

k * 9/10 * 11/10 = 990

On simplifying k = 1000 (choice b)

If A's income is 20% more than that of B, then by what % is B's income less than that of A?
a) 25%   b) 20%   c) 16 2/3%   d) 50%

- Solution
- If B's income is k.
- A's income = k(1+(20/100))= 1.2k
- by what % is B's income less than that of A
- Recall that now the base for calculation is A's income
- Required result = {(1.2k – k)/1.2k} * 100

$$= (1/6) * 100 = 16\ 2/3\ \%\ \text{(Option c)}$$

Also note that while A's income exceeds B's income by 20%,

B's income is less than A's income by 16 2/3%. Both these values are not equal, as percentage calculation depends on choice of base value.

The price of an ice cream is decreased by 20%, then by what % should the consumption be increased in order to maintain a constant expenditure?

a) 20%   b) 50%   c) 25%   d) 40%

- Solution:

	Price	Consumption	Expenditure
Original	100	4	400
Revised	80	5	400

If original price = Rs 100,revised price is Rs 80/-

Choose a common multiple for 100 & 80 and fix that value as expenditure.

Work out the consumption values as shown in the table.

Consumption has increased from 4 to 5 unit's, so % increase is

((5-4)/4) x 100 = 25%.

(Option c)

The price of sugar increased by 50%, then by what % does the consumption of sugar be reduced so that the total expenditure on sugar increased by 20%?
a) 20%   b) 25%   c) 40%   d) 10%

- Solution:

	Price	Consumption	Expenditure
Original	100	1	100
Revised	150	120/150	120

Expenditure increases by 20 % , original consumption is one unit, revised is 120/150 =4/5 = 0.8 units.

Hence % reduction in consumption = ((1-0.8)/1) x 100
                                  = 20% (Option A)

The price of tea increased by 20%, then by what % should the consumption be decreased so that the total expenditure is decreased by 10%?
a) 20%   b) 25%   c) 40%   d) 10%

- Solution:

	Price	Consumption	Expenditure
Original	100	1	100
Revised	120	90/120	90

Expenditure reduced by 10 %,original consumption = 1 unit.

Revised consumption is $90/120 = \frac{3}{4}$ units $= 0.75$.

% reduction in consumption $= ((1-0.75)/1) \times 100 = 25\%$ (option b)

The length of a rectangle increased by 25% and the breadth decreased by 10%. What is the increased % in its area?
a) 10%   b) 35%   c) 15%   d) 12.5%

- Solution:

	Length	Breadth	Area
Original	L	B	LB
Revised	L (1 +(25/100))	B (1- ((10/100))	
	= 1.25 L	= 0.9 B	1.25L x 0.9B
	=1.125LB		

% increase in area = { (1.125LB − LB)/LB} x 100

= 12.5% (Option d)

A spends 60% of his salary and saves the remaining. His salary is increased by 25% and he increased his expenditure by 20%. By what % does his saving increase?
a) 30%   b) 32.5%   c) 35%   d) 40%

- Solution:

	Salary	Expenditure	Saving
Original	100k	60k	40k
Revised	125K	72k (60 x 1.2)	53k

- % increase in saving = ((53k – 40k)/40k) x 100
- $\qquad$ = 32.5% (Option b)

In an examination 65% of the students passed. If the number of failures is 420, find the total number of students?

a) 1000   b) 900   c) 1200   d) 1500

- Solution:
- If 65 % students passed, failure is 35 % of total students.
- Let total students = T
- 35% of T = 420 given
- T = 420 x (100/35) = 1200 (option c)

In an election between 2 candidates, a candidate secured 62% of the votes and is elected by a majority of 144 votes. Find the total number of votes polled?
a) 400   b) 600   c) 800   d) 1000

- Solution:
- Let total votes polled be 100k.
- One candidate secured 62% of total votes = 62k.
- The other candidate would have bagged 100k – 62k = 38k votes.
- Given 62k – 38 k = 144, k=6
- So 100k = 100 x 6 = 600 which is the total number of votes.(Option b)

The value of a machine depreciates 10% annually .If its present value is Rs.4000, its value after 2 yrs in rupees will be,

a) 3200   b) 2000   c) 3000   d) 3240

- Solution:
- Depreciation means reduction in the book value.
- We can visualize the problem as follows

- Present value   →   Reduced value   Reduced value
                        after first year   →   after second year.

4000 (reduction by 10%)

4000(1 – (10/100) = 3600 (reduction by 10 %)

=3600 ((1-10/100) = 3240   (Option d)

In a test P got 40% of the maximum marks and got 10 marks more than the pass mark. Q got 30% of maximum marks and failed by 10 marks. Find the pass mark?
a) 60   b) 70   c) 80   d) 90

- Solution:
- We visualize a mark spread as indicated below.

Q   pass mark   P
10 marks   10 marks.
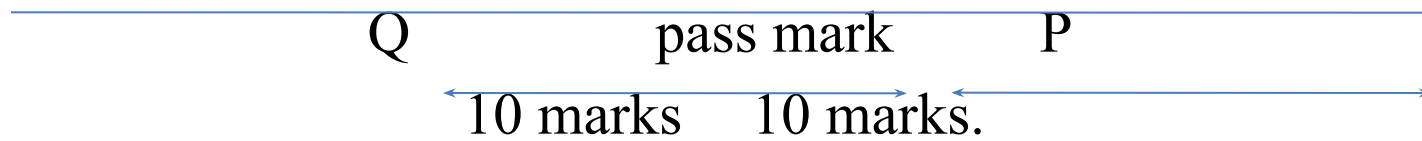
P's mark = 40 % of maximum

Q's mark is 30% of maximum.

Difference between their marks = 10 + 10 = 20 (See figure above).

Implies 40 % of maximum – 30% of maximum= 20

So maximum marks is 200.

P's score = 40 % of 200 = 80 ,which is 10 marks more than pass mark.

So pass mark = 80 – 10 = 70 (choice b)

In a group of persons 70% of the persons are male and 30% of the persons are married. If 2/7 of the males are married, what fraction of the females is single?

a) 2/7   b) 1/3   c) 3/7   d) 2/3

- Solution:
- The excel sheet below shows the complete working.

	Married	Unmarried	Total
Males	20k	50k	70k
Females	10k	20k	30k
Total	30k	70k	100k

- Based on the above table 20 k females are unmarried out of a total of 30k females Hence required result is 2/3 (option d).

LOGARITHMS

If x , a and m are any three numbers connected by the relation: $m=a^x$ (a>0, a≠1), then,

"x" is defined as the logarithm of "m" to the base "a" and is written as:

$\log_a m = x$

Logarithm means power of base $m = a^x$

Important properties:

$\log_a a = 1$

$\log_a (m^n) = n. \log_a m$

$\log_a 1 = 0$

$\log_a (m \times n) = \log_a m + \log_a n$

$\log_a (m/n) = \log_a m - \log_a n$

$$x = \log_a (a^x)$$

$$\log_{a^b} m^x = \frac{x}{b} \log_n m.$$

$$\log_b a \times \log_c b = (\log_c a) ..... \text{ Chain rule}$$

$$\log_a m = (\log_b m) / (\log_b a) .... \text{ Change of base theorem}$$

$$\log_a m = 1 / (\log_m a)$$

$$\log_a b * \log_b a = 1$$

1. The value of $\log_{343} 7$

Solution:
$\log_{7^3} 7^1 = 1/3 \log_7 7 = 1/3.$

2.Find $\log_5 \frac{1}{125}$

Solution:

$= \log_5 5^{-3}$

$= -3 \log_5 5$

$= -3$

3. Find the value of Log√8/log8
Solution:
log√8 / log8

log 8 ^ 1/2 / log 8

= 1/2 log 8 / log 8

= 1/2 .

We used the formula, log a^b = b log a

4. FIND THE VALUE OF X

Log_{10} 20X= 4

SOLUTION:

10^4=20X

X=$\dfrac{10^4}{20}$=500

5. FIND THE VALUE OF X

$\log(x+3)+\log(x-3)=\log 72$

$\log[(x+3)(x-3)]=\log 72.$

apply the exponential function on both sides of the equation :

$(x+3)(x-3)=72$

$x^2-9=72$

$x^2=81,$

$X=+9,-9$

-9 NOT APPLICABLE SO +9

Find the value of

$$= \frac{\square\square}{\square\square\square\square\square_{\square\square}(\square\square\square\square\square)} + \frac{\square\square}{\square\square\square\square\square_{\square\square}(\square\square\square\square\square)} + \frac{\square\square}{\square\square\square\square\square_{\square\square}(\square\square\square\square\square)}$$

$= 2$

7. FIND THE VAULE OF X :

$\log_{27} 8 . \log_x 3 = 1$

SOLUTION:

$\log_{3^3} 2^3 . \log_x 3 = 1$

$= \dfrac{3}{3} \log_3 2 . \log_x 3 = 1$

$= \log_3 2 . \log_x 3 = 1$ hint($\log_a b * \log_b a = 1$)

 X $= 2$

8. FIND THE VALUE OF

$\frac{1}{2}\log(11+4\sqrt{7})=\log(2+x)$

$\log(11+4\sqrt{7})=\log(2+x)^2$

$11+4\sqrt{7}=(2+x)^2$

$11+4\sqrt{7}=4+4x+x^2$

$7+4\sqrt{7}=x^2+4x$

Comparing both the side,

$X=\sqrt{7}$.

Find the value of

$= \square\square\square\square_{\square\square}\square\square + \square\square\square\square\square\;_{\square\square}\square\square + \square\square\square\square\;_{\square\square}\square\square + \ldots\ldots\ldots + \square\square\square\square\square\;_{\square}\square\square, a>1$

$= 1 + \dfrac{\square\square}{\square\square} + \dfrac{\square\square}{\square\square} + \cdots \dfrac{\square\square}{\square\square\square}$

$= 1+2+3+\ldots\ldots+20 = \dfrac{\square\square\square\times\square\square\square}{\square\square} = 210.$

10. FIND THE VALUE OF

$$\log_2 \log_2 \log_3 \log_3 27^{3^3}$$

Solution

$$= \log_2 \log_2 \log_3 (3\log_3 3^{3^3})$$

$$= \log_2 \log_2 \log_3 9$$

$$= \log_2 \log_2 2$$

$$= \log_2 1 = 0$$

11.The value of $\log_2 3$ x $\log_3 2$ x $\log_3 4$ x $\log_4 3$ is ?
1.1
2.2
3.3
4.4

SOLUTION:
hint($\log_a b * \log_b a = 1$)
= $\log_2 3$ x $\log_3 2$ x $\log_3 4$ x $\log_4 3$
= (log3 / log2) x (log2 / log3) x (log4 / log3) x (log3 / log4)
= 1

12.If log 2 = 0.3010, then the number of digits in 2^{64} is ?

SOLUTION
Required answer = $[64 \log_{10} 2]$

= [64 x 0.3010]

= 19.264

= 19 + 1

= 20

13. Given that $\log_{10} 2 = 0.3010$, then $\log_2 10$ is equal to ?

1. 0.3010
2. 0.6990
3. 1000 / 301
4. 699 / 301

SOLUTION
$\log_2 10 = \log 10 / \log 2$
$= 1 / \log 2$
$= 1.0000 / 0.3010$
$= 1000 / 301$

14. The value of log 9/8 - log 27/32 + log3/4 is ?

SOLUTION:

Given Exp. = log [{(9/8) / (27/32)} x 3/4)]

= log [(9/8) x (3/4) x (32/27)]

= log 1
= 0

16. If $\log_{10}2 = 0.3010$ and $\log_{10}7 = 0.8451$, then find the value of $\log_{10} 2.8$?

1. 0.4471
2. 1.4471
3. 2.4471
4. 14.471

SOLUTION:

$\log_{10}2.8 = \log_{10}(28/10)$

$= \log 28 - \log 10$

$= \log (7 \times 4) - \log 10$

$= \log 7 + 2 \log 2 - \log 10$

$= 0.8451 + 2 \times 0.3010 - 1$

$= 0.8451 + 0.6020 - 1$

$= 0.4471$

17.If $a^x = b$, $b^y = c$, $c^z = a$, then the value of xyz is ?

SOLUTION

$\because a^x = b$

$\Rightarrow \log_a b = x$

$\because b^y = c$

$\Rightarrow \log_b c = y$

$\because c^z = a$

$\Rightarrow \log_c a = z$

$\therefore xyz$

$= \log_a b \times \log_b c \times \log_c a$

$= 1$

18. If $\log_x 4 = 0.4$ then the value of x is ?

SOLUTION:
$\log_x 4 = \log 4 / \log x = 2/5$

$\Rightarrow 2\log 2 / \log x = 2/5$
$\Rightarrow \log x = 5\log 2 = \log 2^5$

$\Rightarrow \log x = \log 32$

$= 32$

Thank You

Introduction

Profit and loss percentage are used to refer to the amount of profit or loss that has been incurred in terms of percentage.

.

IMPORTANT FACTS

- **Cost Price:**

- The price, at which an article is purchased, is called its **cost price**, abbreviated as **C.P.**

- **Selling Price:**

- The price, at which an article is sold, is called its **selling prices**, abbreviated as **S.P.**

- **Profit or Gain:**

- If S.P. is greater than C.P., the seller is said to have a **profit** or **gain**.

- **Loss:**

- If S.P. is less than C.P., the seller is said to have incurred a **loss**

IMPORTANT FORMULAE

1. Gain = (S.P.) - (C.P.)

2. Loss = (C.P.) - (S.P.)

3. Loss or gain is always reckoned on C.P.

4. Gain Percentage: (Gain %)

$$\text{Gain \%} = \left(\frac{\text{Gain x 100}}{\text{C.P.}} \right)$$

5. Loss Percentage: (Loss %)

$$\text{Loss \%} = \left(\frac{\text{Loss x 100}}{\text{C.P.}} \right)$$

6. Selling Price: (S.P.).Profit

$$SP = \left[\frac{(100 + Gain\ \%)}{100} \times C.P\right]$$

7. Selling Price: (S.P.) Loss

$$SP = \left[\frac{(100 - Loss\ \%)}{100} \times C.P.\right]$$

8. Cost Price: (C.P.).Profit

$$C.P. = \left[\frac{100}{(100 + Gain\ \%)} \times S.P.\right]$$

9. Cost Price: (C.P.).Loss

$$C.P. = \left[\frac{100}{(100 - Loss\ \%)} \times S.P.\right]$$

10. When a person sells two similar items, one at a gain of say x%, and the other at a loss of x%, then the seller always incurs a loss given by:

$$\text{Loss \%} = \left(\frac{\text{Common Loss and Gain \%}}{10}\right)^2 = \left(\frac{x}{10}\right)^2.$$

11. If a trader professes to sell his goods at cost price, but uses false weights, then

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

12. The reduction made on the 'marked price' of an article is called the discount. When no discount is given, ' selling price' is the same as 'marked price'.

* Discount=Marked price * Rate of discount

* S.P=M.P – Discount

* Discount%=(Discount/M.P)*100

1. A person purchased an article for ₹ 100. If he sells it at a 15% profit then find his selling price.

a)Rs.100   b)Rs.125   c)Rs.115   d)Rs.120

Answer: C

Solution: SP = CP [1 + (Gain % x 100)]

SP = 100 [1 + (15/100)]

= 100 x 1.15

= 115.

The article selling price is ₹ 115.

2. If the selling price of 10 articles is same as the cost price of 11 articles, find the profit or loss percent.

a)11%   b)16%   c)6%   d)10%

Answer: D

Let the cost price of 1 article be Re. 1

Therefore, the C.P. of 10 article = Rs. 10

Also, the C.P. of 11 articles = Rs. 11

Hence, Selling price (S.P.) of 10 articles = Rs. 11

Here X= 10 and Y=11, therefore, profit percent = $\left(\dfrac{11-10}{10}\right) \times 100 = 10\%$

3. The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:

a)15   b)16   c)18   d)25

Answer: B

Let C.P. of each article be Re. 1

C.P. of x articles = Rs. x.

S.P. of x articles = Rs. 20.

Profit = Rs. (20 - x).

$$\therefore \left(\frac{20 - x}{x} \times 100 = 25 \right)$$

$\Rightarrow$ 2000 - 100x = 25x

125x = 2000

x = 16.

4. A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle?

a)Rs.1090   b)Rs.1160   c)Rs.1190   d)Rs.1202

Answer: C

C.P of cycle=1400

Loss%=15%

Therefore , SP of cycle=(100-loss%) *CP

                          100

=(85/100)*1400=Rs. 1190

(Or)

S.P=85% of Rs.1400=Rs.(85*1400)/100=Rs.1190

5. 6% more is gained by selling a coat for Rs.1425 than by selling it for Rs.1353. the CP of the coat is:

a)Rs.1000   b)Rs.1250   c)Rs.1500   d)Rs.1200

Answer: D

6% of cost price (CP) = 1425 - 1353 = 72

6% of CP
∴ CP = (72 x 100) / 6 = 1200

6. A milkman purchases the milk at Rs.x per litre and sells it at Rs.2x per litre still he mixes 2 litres water with every 6litres of pure milk. What is the profit percentage?

a)116%   b)166.66%   c)60%   d)100%

Answer:B

Let the cost price of 1litre pure milk be Re.1, then

6litres(milk)-> CP=Rs.6

2litres(water)->CP=Rs.0→   CP=Rs.6 only

And 8litres mixture-> SP->8*2=Rs.16, Profit=16-6/6 * 100 = 1000/6 = 166.66%

7. A table and 2 chairs together cost $400. If by selling the chairs at 10% loss and the table at 10% profit, a total of 5% profit is made. What is the cost price of a chair?

(a) $ 25   (b) $ 75   (c) $ 100   (d) $ 50

Answer: D

Table $= x$

Chair $= 400 - x$

$$x \times \frac{11\cancel{0}}{10\cancel{0}} + \frac{400 - x}{10\cancel{0}} \times 9\cancel{0} = 4\cancel{00} \times \frac{105}{1\cancel{00}}$$

$$\frac{11x}{10} + \frac{3600}{10} - \frac{9x}{10} = \$ 420$$

x = 300

2 chairs = $ 100 $\therefore$ 1 chair = $ 50.

8. A man bought 18oranges for a rupee and sold them at 12 oranges for a rupee. What is the profit percentage?

a)33.33%   b)50%   c)66.66%   d)none of these

Answer: B

Easy way is to make number of oranges purchased and sold equal.

Let Number of oranges bought & sold = LCM(18,12) = 36

CP = 36/18 =2

SP = 36/12 =3

Profit % = (3 - 2)/2 x 100 = 50%

(Or)

He recovers cost of 18 oranges by selling 12 oranges.

Remaining 6 oranges reflect profit.

Profit = 6/12 x 100 = 50%

9. Ram buys a watch for Rs. 500 and sells it to Shyam at 10% loss. Shyam then sells it to Ravi at 20% profit and Ravi sells it to Rakesh at 10% profit. How much did Rakesh pay for the watch?

A. Rs. 600   B. Rs. 594   C. Rs. 495   D. Rs. 675

Answer: B

Let us consider that Ram spends 100 to buy the watch.
Ram buys watch at 100 and sells it to Shyam at 10% loss. 10% of 100 is 10. Therefore,

*Cost Price for Ram = 100
Selling Price for Ram = 100 – (10% of 100 = 10) = 100 - 10 = 90

*Cost Price for Shyam = 90
Selling Price for Shyam = 90 + (20% of 90 = 18) = 90 + 18 = 108

*Cost Price for Ravi = 108
Selling Price for Ravi = 108 + (10% of 108 = 10.8) = 108 + 10.8 = 118.8

* Cost Price for Rakesh = 118.8
The initial amount was Rs. 500 and the percentage we considered 100. So for final calculation, the equation becomes,

(500/100)*118.8=594

So, the amount Rakesh spent to buy the watch is Rs. 594.

10. A man purchases 8 pens for Rs. 9 and sells 9 pens for Rs. 8. How much profit or loss does he make?

a)20%   b)14%   c)21%

d)18%

Answer: C

	Quantity	Price
Buying	8	9
Selling	9	8

es equal,

	Quantity	Price
Buying	8 x 9	9 x 9
Selling	9 x 8	8 x 8

After the calculations,

	Quantity	Price
Buying	72	81
Selling	72	64

➡ When the data is observed, we can see that 72 oranges are bought in Rs. 81 while 72 oranges are sold in Rs. 64. Ultimately, the person is having LOSS in the entire transaction.

$$\text{Loss Percentage} = \frac{\text{Cost Price} - \text{Selling Price}}{\text{Cost Price}} \times 100$$

$$= \frac{81 - 64}{81} \times 100$$

$$= \frac{17}{81} \times 100 = \frac{1700}{81} = 20.98\% \text{ (final answer)}$$

11. A dishonest dealer professes to sell his goods at Cost Price, but he uses a weight of 960 gm for the kg weight. Find his gain percentage.
a)5 1/6%   b)4 1/6%   c)6 1/6%   d)3 1/6%

Answer: B

Since the kg weight is of 1000 gm but the dealer uses only the 960 gm weight. Thus giving himself the profit of 1000 – 960 = 40 gm

On the sale of 960 gm, Thus the profit percentage can be calculated as

Difference of weight ⟵ 40

$$\frac{40}{960} \times 100 \longrightarrow \text{To calculate the profit percentage}$$

960

The weight that is actually sold ⟵

$$\frac{40}{960} \times 100 = 4\frac{1}{6}\% \text{ (Profit percentage)}$$

12. A bicycle marked at Rs 1,500 is sold for Rs 1,350. What is the percentage of the discount?

a) 8%   b) 10%   c) 12%   d) 14.3%

Answer:B

Given : Marked Price = Rs 1500, and Selling Price = Rs 1350.

Amount of discount is = Marked Price – Selling Price.

 In other words we can say that = (1500 – 1350) = Rs 150.

Discount for Rs. 1500 =Rs 150

Therefore, the Discount for Rs 100 = (150/1500) × 100 = 10%

Thus, the Percentage of discount = 10%

13. A shopkeeper allows a discount of 10% to his customers and still gains 20%. Find the marked price of an article which costs Rs 450 to the shopkeeper.

A) Rs. 800   B) Rs 400   C) Rs 600   D) Rs 379

Answer: C

Let us use the formula method first:

Discount = 10%, Gain = 20%, C.P. = Rs. 450, M.P. = ?

M.P. = [(100 + Gain%)/(100 – Discount%)] × C.P.

Thus we have = [(100 + 20)/(100 – 10)]×450 = Rs. 600

14. The MRP of the product is given as Rs. 2000 and the merchant decides to provide successive discounts of 30% and 20% on the product. Find the selling price.

A. Rs. 1100   B. Rs. 1120   C. Rs. 1150   D. Rs. 1200

Answer: B

1st discount will be, 30% of 2000 = Rs. 600.

So, the discounted price will be 2000 – 600 = Rs. 1400.

Final discounted price will be 1400 – 20% of 1400 => 1400 – 280 = Rs. 1120.

So, the final SP of the product will be Rs. 1120.

15. What will be more profitable from a customer's point of view? Two successive discounts of 30% and 20% respectively or a single discount of 50%?

A. A single discount   B. Two successive discounts
C. Either of the two   D. Cannot be possible

Answer: A

Suppose that the market price of a product is Rs. 100.

For Case I two successive discounts of 30% and 20% are given respectively. So, the price after the first discount will be, 100 – 30% of 100 = 100 – 30 = Rs. 70.

 Now, the price after the second discount will be, 70 – 20% of 70 = 70 – 14 = Rs. 56. So, the customer has to pay Rs. 56

For case II there is a single discount of 50% given. So, final price after the single discount will be, 100 – 50% of 100 => 100 – 50 = Rs. 50.

16. The difference between a discount of 35% and two successive discounts of 20% and 20% on a certain bill was Rs.22. Find the bill amount.
(a) Rs.1100 (b) Rs.200 (c) Rs.2200 (d) data inadequate

Answer : C

Equivalent discount 20%, 20% =

$$x + y - \frac{xy}{100}$$

$$40 - \frac{400}{100} = 36\%$$

36% – 35% = 1% value = 22

100% value = ? = 2200

17. A golf shop pays its wholesaler Rs.40 for a club and then sells it for Rs.75. What is the markup rate?

(a) 12.5%   (b) 87.5%   (c) 33.33%   (d) 63.77%

Answer : B

$75 - 40 = 35$

The mark up rate $= 35 = x(40)$

$35/40 = x = 0.875 = 87.5\%$

18. A retailer buys a machine at a discount of 20% and sells it for $ 1955. Thus he makes a profit of 10%. The discount is
(a) $ 520   (b) $ 300   (c) $ 620   (d) $ 600

Answer: A

SP = 1955 = 1.20CP

Let MP be x. After discount of 20% it was sold for 10% profit at Rs.1955

$1.20(0.90)x = 1955$

$x = \dfrac{1955 \times 1.20}{0.90} = 2606$

Discount = 20% of 2606 = 520

19. A shop keeper fixes the marked price of an item 35% above the cost price. The percentage of discount allowed to gain 12% is.
(a) 14%   (b) 15%   (c) 16%   (d) 17%

Answer: D

Let CP = 100

Marked price = 100 + 35 = 135

SP = 112

Discount percentage = $\dfrac{23}{135} \times 100 = 17\%$

20. A shop is offering discount on shirts costing $ 20 each. If someone buys 2 shirts, he will be offered 15% discount on the first shirt and another 10% on the already reduced price for the second shirt. How much would one pay for 2 shirts at this shop?

(a) $ 15.3   (b) $ 17   (c) $ 32.3   (d) $ 16.4

Answer: C

The reduced price for the 1st shirt

$$20 - \frac{15}{100} \times 20 = \$ 17$$

The reduced price for the 2nd shirt. The 10% discount will be on the already reduced price, hence the price of the second shirt is given by

$17 - 10\%$ of $17 = \$ 15.3$

Total cost for 2 shirts is $17 + 15.3 = \$32.3$.

Simple & Compound Interest

Simple interest (SI)

This is one of the interest forms, when interest is calculated only on the principal and calculating uniformly through the intervals then the interest is called simple interest.

$$\text{Simple Interest} = \frac{(P \times R \times T)}{100}$$

What will be the simple interest on Rs. 80,000 at 16(2/3) % per annum for 9 months?

a. 8,000   b. 9,000   c. 10,000   d. 11,000

Explanation:

given:

Principal = Rs. 80,000

Rate of interest = $16\,\dfrac{2}{3}\,\%$

Time = 9 months

Simple Interest = $\dfrac{80,000}{100} \times \dfrac{50}{3} \times \dfrac{3}{4}$

Simple Interest = Rs.10,000

Find the simple interest on Rs.500 for 9 months at 6 paisa per month?
A. 345 Paisa   B. 270 Paisa   C. 275 Paisa   D. Paisa 324

Explanation:

I = (500*9*6)/100 = 270 Paisa

A sum of Rs. 12,000 amounts to Rs. 15,000 in 4 years at the rate of simple interest. Find the rate of interest.

a. 6.25 %   b. 4.25 %   c. 5.9 %   d. 5 %

Explanation:

Therefore,

S.I. = Rs. 15000 – Rs. 12000

S.I. = Rs. 3000

$$\text{Rate of Interest} = \frac{(100 \times S.I.)}{(P \times T)}$$

$$= \frac{(100 \times 3000)}{(12000 \times 4)}$$

= 6.25 %

Rate of Interest = 6.25 %

A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:

A) 650   B) 690   C) 698   D) 700

Explanation:

S.I. for 1 year = Rs. (854 - 815) = Rs. 39.

S.I. for 3 years = Rs.(39 x 3) = Rs. 117.

Principal = Rs. (815 - 117) = Rs. 698

Compound Interest

In a compound interest calculation, interest being calculated on the then amount, means in each period of time the base of the interest calculation is varying. This is the basic concept of successive variation.

Let Principal = P, Rate = R% per annum, Time = n years.

When interest is compound Annually:

$$\text{Amount} = P \left(1 + \frac{R}{100}\right)^n$$

Compound Interest: (Amount - Principal)

Principal = P, Rate = R % per annum, Time = n years

1. Amount = $P\left[1 + \dfrac{R}{100}\right]^{n}$ - - - - - - - - - - [Interest compounded annually]

1. Amount = $P\left[1 + \dfrac{(R/2)}{100}\right]^{2n}$ - - - - - - - - - [Interest compounded Half-yearly]

1. Amount = $P\left[1 + \dfrac{(R/4)}{100}\right]^{4n}$ - - - - - - - - - [Interest compounded quarterly]

Numerical on population:

a) If population of a city is P_1 and it increases by R % annually, then population after n years is given by:

$$P_2 = P_1 \left[1 + \frac{R}{100} \right]^n$$

b) If population of a city is P1 and it decreases by R % annually, then the population after n years is given by:

$$P_2 = P_1 \left[1 - \frac{R}{100} \right]^n$$

When Rates are different for different years, say R_1%, R_2%, R_3% for 1st, 2nd and 3rd year respectively.

$$\text{Then, Amount} = P \left(1 + \frac{R_1}{100} \right)\left(1 + \frac{R_2}{100} \right)\left(1 + \frac{R_3}{100} \right).$$

If difference between compound interest and simple interest is given for:
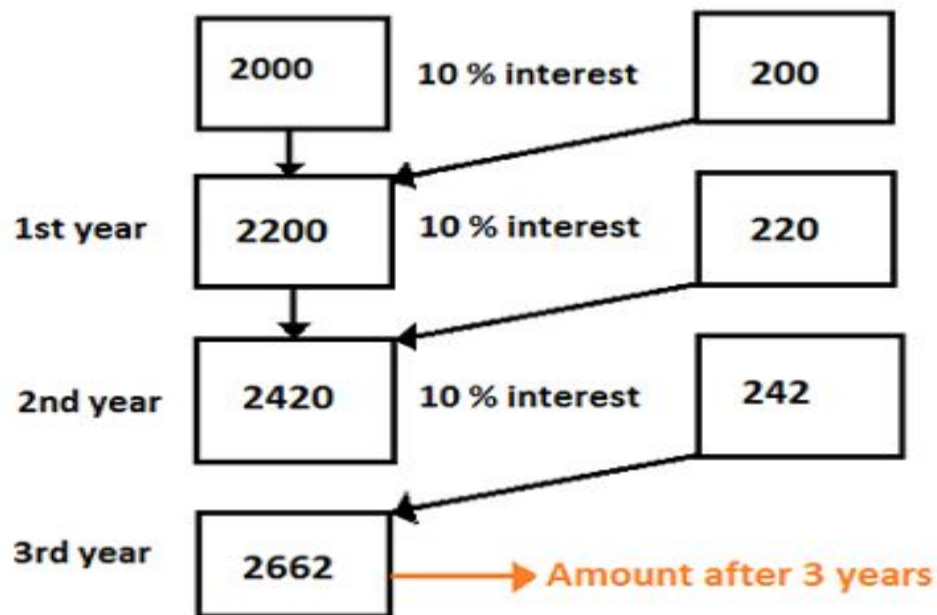
a) Two years

$$\text{C.I.} - \text{S.I.} = P \left(\frac{R}{100} \right)^2$$

b) Three years

$$\text{C.I.} - \text{S.I.} = P \left[\frac{R^2}{100^2} \right] \times \left[\frac{(300 + R)}{100} \right]$$

A person borrows Rs. 2000 at 10 % compound interest. Find the total amount paid by him after 3 years.

Explanation:

Find the compound interest on Rs. 5000 for 9 months at 6% per annum, if the interest is reckoned quarterly.

a. Rs. 218.98   b. Rs. 228.39   c. Rs. 250.69   d. Rs. 356.50

Explanation:

Principal = Rs. 5000, Time = 9 months = 3 quarters, Rate = 6 % per annum
Substituting the given values, we get

$$\text{Amount} = P\left[1 + \frac{(6/4)}{100}\right]^3$$

Amount=Rs.5228.39

Compound interest = 5228.39 – 5000 = Rs. 228.39

The compound interest on ₹30,000 at 7% per annum is ₹4347. The period (in years) is:

A. 2   B. 3

C. 1   D. 3.5

Explanation:

Let the period be n years

Amount after n years $= 30000 + 4347 = 34347$

$$30000\left(1 + \frac{7}{100}\right)^n = 34347$$

$$\Rightarrow 30000\left(\frac{107}{100}\right)^n = 34347$$

$$\Rightarrow \left(\frac{107}{100}\right)^n = \frac{34347}{30000} = \frac{11449}{10000} = \left(\frac{107}{100}\right)^2$$

$$\Rightarrow n = 2$$

The population of a city increases 5 % annually but decreases by ¼ % due to emigration. Find the net increase in percent in 3 years.

A. 8.63 %   b. 11.89 %   c. 13.25 %   d. 14.93 %

Explanation:

We are given that, the population of a city increases 5 % annually but decreases by ¼ % due to emigration.
Assume original population of the city = 100
1) Increase in population = 5 %
2) Decrease in population due to emigration = ¼ %
Hence, net annual increase = 5 % - ¼ % = 19/4 %

$$\text{Population in 3 years} = P_2 = P_1 \left[1 + \frac{R}{100} \right]^n$$

$$= 100 \left[1 + \frac{19}{4 \times 100} \right]^3$$

= 114.93
Population after 3 years will be 114.93 and at present it is 100. Therefore,
Increase in population = 114.93 − 100 = 14.93 %

The value of a sewing machine depreciates at the rate of 10 % after every year. If at the end of 3 years, its value is Rs. 8748, then find its purchase price.

a. 8000   b. 10000   c. 12000   d. 15000

Explanation:

We are given that the value of a sewing machine depreciates at the rate of 10 % after every year. After 3 years, its value is Rs. 8748.

$$8748 = P_1 \left[1 - \frac{10}{100} \right]^3$$

$P_1 = $Rs.12000

The difference between simple and compound interest(compounded annually) on a certain sum of money for 2 years at 4% per annum is ₹1. What is the sum?

A. ₹600   B. ₹645

C. ₹525   D. ₹625

Explanation:

Let the sum be x

Amount after 2 years (when interest is compounded annually)

$$= x\left(1 + \frac{4}{100}\right)^2 = x\left(\frac{26}{25}\right)^2$$

Compound interest

$$= x\left(\frac{26}{25}\right)^2 - x = x\left[\frac{676}{625} - 1\right] = \frac{51x}{625}$$

Simple interest $= \dfrac{x \times 4 \times 2}{100} = \dfrac{2x}{25}$

Difference between compound interest and simple interest is 1. Therefore,

$$\Rightarrow \frac{51x}{625} - \frac{2x}{25} = 1$$

$$\Rightarrow \frac{51x - 50x}{625} = 1$$

$$\Rightarrow x = 625$$

$$P\left(\frac{4}{100}\right)^2 = 1$$

$$\Rightarrow P\left(\frac{1}{25}\right)^2 = 1$$

$$\Rightarrow \frac{P}{25^2} = 1$$

$$\Rightarrow P = 625$$

A sum of money doubles itself at compound interest in 10 years. In how many years will it be eight times?

a. 30 years   b. 28 years   c. 25 years   d. 22.5 years

Explanation:

sum of money doubles itself at compound interest in 10 years. Therefore, C.I. = 2 P

$$P\left[1 + \frac{R}{100}\right]^n = 2P$$

$$\left[1 + \frac{R}{100}\right]^n = \left\{\left[1 + \frac{R}{100}\right]^{10}\right\}^3$$

$$\left[1 + \frac{R}{100}\right]^n = 2$$

$$P\left[1 + \frac{R}{100}\right]^n = 8P$$

$$\left[1 + \frac{R}{100}\right]^n = \left[1 + \frac{R}{100}\right]^{30}$$

Hence, we get n = 30 years

$$\left[1 + \frac{R}{100}\right]^n = 8 = 2^3$$

Radhika wants to invest some amount for 3 years in a new scheme which says that the compound rate of interest for three years will be 5%, 12% and 8% respectively. How much investment will yield her Rs 6350.40 at the end of the investment period?

a. Rs. 5000   b. Rs. 5800   c. Rs. 6000   d. Rs. 6500

Explanation:

$$\text{Total Amount} = \text{Rs. } 6350.40 = P\left(1 + \frac{R}{100}\right)^n$$

Rate of interest, R_1 = 5% for 1st year; Time, n_1 = 1 year (1st year)

R_2 = 12% for 2nd year; n_2 = 1 year (2nd year)

R_3 = 8% for 3rd year; n_3 = 1 year (3rd year)

$$\therefore 6350.40 = P\left(1 + \frac{5}{100}\right)^1\left(1 + \frac{12}{100}\right)^1\left(1 + \frac{8}{100}\right)^1$$

$$\therefore 6350.40 = P\left(\frac{105}{100}\right)\left(\frac{112}{100}\right)\left(\frac{108}{100}\right)$$

$$\therefore P = \frac{6350.40 \times 100 \times 100 \times 100}{105 \times 112 \times 108}$$

$\therefore$ **P = Rs. 5000**

24. What annual installment will discharge a debt of Rs. 1035 due in 3 years at 15% SI?

a) 300   b) 400   c) 350   d) 325

Explanation:

Let each instalment be 100

Amount Due = 100 + 115 + 130

= 345

i.e.   345 ⮕ 100

1035 ⮕ ?

So Answer is Rs. 300.

25.The SI and CI on a sum for 2 years are Rs. 800 and Rs. 864 respectively. Find the sum and rate% p.a.?

a) 3600, 8%   b) 4000, 16%   c) 2500, 16%   d) 5000, 12%

Explanation:

2 Years SI = 800   i.e.   400 +400
2 Years CI = 864   i.e.   400 + (400+64)

There fore Rs.64 is the SI on Rs.400

     R = (64/400) x 100 = 16 %

To find P

    (P x 1 x 16) /100 = 400

         P = 2500

26.A man borrowed Rs. 42000 at 10 CI. He repaid the entire amount in 2 equal installments. Find the amount paid in each installment?
a) 23200 b) 23400   c) 24000   d) 24200

Explanation:

                    42000
        At 10%   4200

                               46200

    Let 'x ' be the first installment
            ⮚ Remaining =(46200 –x)

    Therefore (46200 – x) + [(10 /100) * (46200 –x) = x
                    ⮚ x = 24200

Simple Equations

1. Solve the equation for x :

$19(x + y) + 17 = 19(-x + y) - 21$

(A) -1   (B) -2   (C) -3   (D) -4

Explanation:

$19x + 19y + 17 = -19x + 19y - 21$

$38x = -38 \Rightarrow x = -1$

2. The cost of 10 kg of apples is equal to the cost of 24 kg of rice. The cost of 6 kg of flour equals the cost of 2 kg of rice. The cost of each kg of flour is Rs.20.50. Find the total cost of 4 kg of apples, 3 kg of rice and 5 kg of flour?

(A)Rs.849.50   (B) Rs. 877.40

(C)Rs.901.60   (D) Rs. 815.20

Explanation:

Let the costs of each kg of apples and

each kg of rice be Rs.a and Rs.r respectively.

$10a = 24r$ and $6 * 20.50 = 2r$

$a = 12/5$ r and r $= 61.5$

$a = 147.6$

Required total cost $= 4 * 147.6 + 3 * 61.5 + 5 * 20.5$

$= 590.4 + 184.5 + 102.5 = $ Rs.877.40

3. Three friends, returning from a movie, stopped to eat at a restaurant. After dinner, they paid their bill and noticed a bowl of mints at the front counter. Sita took 1/3 of the mints, but returned four because she had a momentary pang of guilt. Fatima then took 1/4 of what was left but returned three for similar reasons. Eswari then took half of the remainder but threw two back into the bowl. The bowl had only 17 mints left when the raid was over. How many mints were originally in the bowl?

(A) 38   (B) 31   (C) 41   (D) 48

Explanation:

Let's the initial count be X

Sita took 1/3 and returned four => Current count is

$X - X/3 + 4 = 2X/3 + 4$

Fatima took 1/4 and returned three => Current count is $3/4 * (2X/3 + 4) + 3 = X/2 + 3 + 3 = X/2 + 6$

Eshwari took half of remaining and returned two => $1/2 (X/2 + 6) + 2 = X/4 + 3 + 2 = X/4 + 5$

It is given that $X/4 + 5 = 17$

$X/4 = 12$

$X = 48$

4. Using only 2, 5, 10, 25 and 50 paise coins, what will be the minimum number of coins required to pay exactly 78 paise, 69 paise, and Re. 1.01 to three different persons?

(A) 17   (B) 18   (C)19   (D)1

Explanation

As we need the minimum number of coins go for the highest denomination first
78 -- > 50 + 2 x 10 + 4 x 2 (7 coins)
69 -- > 50 + 10 + 5 + 2 x 4 (5 coins)
1.01 -- > 50 + 25 + 2 x 10 + 3 x 2 (7 Coins)
Total = 7 + 5 + 7 = 19 coins.

5. The product of two consecutive odd numbers is 4623. Which is the greater of the two numbers?

(A) 66　　(B)69　　(C) 68　　(D) 67

Explanation:

$X (X + 2) = 4623$

$X^2 + 2X - 4623 = 0$

$X^2 + 69X - 67X - 4623 = 0$

$(X - 67)(X + 69) = 0$

$X = 67$, Greater odd number $= X + 2 => 67 + 2 = 69$

6.The number obtained by interchanging the digits of a two-digit number is less than the original number by 63. If the sum of the digits of the number is 11, what is the original number?

(A) 29   (B)92   (C) 74   (D) 83

Explanation:

$10X + Y - (10Y + X) = 63$

$9X - 9Y = 63$

$X - Y = 7$

$X + Y = 11$

Solving these equations, we get

$X = 9, Y = 2$

Required number $= 10X + Y$

$=> 10 * 9 + 2 = 92$

7. Shankar is 5 years younger than Ron. Four years later, Ron will be twice as old as Aaron. Find their present ages.

(A) 1   (B) 2   (C) 4   (D) 5

Explanation:

Let Ron's present age be x.
Then Shankar present age = x - 5
After 4 years Ron's age = x + 4, Shankar age x - 5 + 4.
According to the question;
Ron will be twice as old as Shankar.
Therefore, x + 4 = 2(x - 5 + 4)
$\Rightarrow$ x + 4 = 2(x - 1)
$\Rightarrow$ x + 4 = 2x - 2
$\Rightarrow$ x + 4 = 2x - 2
$\Rightarrow$ x - 2x = -2 - 4
$\Rightarrow$ -x = -6
$\Rightarrow$ x = 6
Therefore, Shankar present age = x - 5 = 6 - 5 = 1

8. If one-third of a number exceeds its one-fourth by 1, find the number.

(A)10   (B) 11   (C)12   (D) 14

Explanation:

Let the required number be x.

$\frac{1}{3}(x) - \frac{1}{4}(x) = 1$

$x/12 = 1$

$x = 12$

9. Each of the 2 equal sides of an isosceles triangle is twice as large as the third side. If the perimeter of the triangle is 30 cm, find the length of equal side of the triangle.

(A) 6   (B)12   (C) 8   (D)15

Explanation:
Let the length of the third side be x cm.
Each equal side = 2x cm.
As per the condition of the question, we have
Perimeter = x + 2x + 2x = 30
$\Rightarrow$ 5x = 30
$\Rightarrow$ x = 6
Thus, the third side of the triangle = 6 cm
and other two equal sides are 2 × 6 = 12 cm each

10. A man when asked how many hens and buffaloes he has told that his animals have 120 eyes and 180 legs. How many hens have he?

(A) 30   (B) 20   (C) 40   (D)10

Explanation:

Let number of buffaloes = x

The number of hens = y

$\therefore$ Total eyes = 2x + 2y = 120

$\therefore$ Total legs = 4x + 2y = 180

Solve this Equations we will get,

X=30, y=30

11. If $(x^2-3x+2)/(x^2-5x+4) = (x^2-6x+8)/(x^2-9x+14)$, then the value of x is
(A) 2 (1/2)   (B) 1/2 (C) 2   (D) -2

Explanation:

$(x-2)(x-1)/(x-4)(x-1) = (x-2)(x-4)/(x-2)(x-7)$
=>x-2/x-4= x-4/x-7
=>x2 – 9x + 14 = x2 – 8x + 16
=>x = -2

12. The distance between two stations is 340 km. two trains start simultaneously from these stations on parallel tracks to cross each other. The speed of one of them is greater than that of other by 5 km/h. If the distance between the two trains after 2 hours of their start is 30 km, then the speed of each train are

(A) 75 km/h, 80 km/h   (B) 60 km/h, 65 km/h

(C) 80 km/h, 85 km/h   (D) 55km/h, 60km/h

Explanation:
Let speed of first train = x km/h and speed of second train = x + 5km/h
Distance travelled in 2 h by first train = 2x km/h
Distance travelled in 2 h by second train = (x + 5) * 2 km
As 2x + (2x + 10) + 30 = 340
   => 4x = 340
   => x = 75
Speed of first train = 75 km/h and speed of second train = 80 km/h.

13. The sum of two numbers is 2490 and if 6.5% of one number is equal to 8.5% of the other, then numbers are

(A)   1414, 1076   (B) 1411, 1079
(C) 1412, 1078   (D) 1413, 1077

Explanation:
Let the numbers be x and 2490 – x
6.5 % of one = (6.5/100)* x = (13x/200)
8.5 % of other number = (8.5/100)(2490 – x) = (17/200)(2490 – x)
By condition, (13x/200) = ((17/200)(2490-x))
   => 13x = 17(2490 – x)
   => 13x + 17x = 42330
   => x = (42330/30) = 1411
Second number = 2490 – 1411 = 1079

14. Three prizes are to be distributed in a quiz contest. The value of the second prize is five-sixth of the value of the first price and the value of the third prize is four-fifth of that of the second prize. If the total value of the three prizes is Rs.150, then the value of second price is

(A) 40   (B)50   (C) 60   (D) 70

Explanation:
Let the value of first prize be Rs.x
Value of second prize = Rs.(5/6) x
Value of third prize = (4/5) [(5/6)x] = Rs (2/3) x
as (2/3)x + (5/6)x + x = 150
    => 15x/6 = 150 => x = 60
    => Hence, value of first prize = Rs.60
    => Value of second prize= (5/6) * 60 = Rs.50
    => Value of third prize= (2/3) * 60 = Rs.40

15. Two planes start from a city and fly in opposite directions, one averaging a speed of 40 km/h greater than the others. If they are 3400 km apart after 5 hours, the average speeds respectively are

(A) 330, 370 km/h (B) 320, 360 km/h

(C) 250, 290 km/h (D) 300, 340 km/h

Explanation:
Let average speed of one plane be x km/h
Then average speed of other plane be (x + 40) km/h
Distance travelled by first plane in 5 hours = 5x km
Distance travelled by second plane in 5 hours = 5(x + 40) km
So, 5x + 5(x + 40) = 3400
10x + 200 = 3400
10x = 3200
x = 3200/10 = 320km/hr
so, average speed of second plane = 320 + 40 = 360 Km/h

16. Sunita has 10 paise and 50 paise coins in her purse. If the total number of coins is 17 and their total value is Rs. 4.50, then the number of 10 paise coins is

(A)9   (B)7   (C) 10   (D) 5

Explanation:
Let number of 10 paise coins be x and number of 50 paise coins be y
Then, $x + y = 17$ …(i)
and $10x + 50y = 450$ …(ii)
from eq (ii) $x + 5y = 45$ …(iii)
subtracting eq (i) and (iii), we get
$4y = 28$
$y = (28/4) = 7$
Number of 10 paise coins $= y = 17 - x = 17 - 7 = 10$

17. Reshma has pens and pencils which together are 40 in number. If she had 5 more pencils and 5 less pens, the number of pencils would have become 4 times the number of pens. Then, the original number of pencils Reshma had:

(A) 19   (B) 27   (C) 13   (D) 17

Explanation:

Let the original number of pens be x and
original number of pencils be y.
As, x + y = 40 …(i)
and (y + 5) = 4(x − 5) …(ii)
From eq.(i) y = 40 − x
Put in eq. (ii) (40 − x) + 5 = 4(x − 5)
=> 45 − x = 4x − 20

- => -5x = -65
- => x = 13

∴Original number of pencils = 40 − 13 = 27

18. The ratio between the present ages of X and Y is 5:7 respectively. If the difference between Y's present age and X's age after 6 years is 2, what is the total of X's and Y's present ages?

(A) 48 years   (B) 52 years

(C) 56 years   (D) 60 years

Explanation:

Let the present ages of X and Y be 5x years and 7x years respectively.

Then, $7x - (5x + 6) = 2 \Longleftrightarrow 2x = 8 \Longleftrightarrow x = 4$

$\therefore$ Required sum $= 5x + 7x = 12x = 48$ years.

19. A number consists of two digits. The digit in the tens place is twice the digit in the units place. If 18 be subtracted from the number, the digits are reversed. Find the number.

(A) 44   (B) 42   (C) 24   (D) 84

Explanation:

Let "x" be the digit in units place.

Then, the digit in the tens place $= 2x$

So, the number is (2x)x.

If 18 be subtracted from the number, the digits are reversed.

So, we have $(2x)x - 18 = x(2x)$

$10 \cdot (2x) + 1 \cdot x - 18 = 10 \cdot x + 1 \cdot (2x)$

Simplify. $20x + x - 18 = 10x + 2x$

$21x - 18 = 12x$, $9x = 18$, $x = 2$

units place is 2, tenth place is $=4$

 Hence the number is 42

20. The denominator of a fraction is greater than the numerator by 8. If the numerator is increased by 17 and denominator is decreased by 1, the number obtained is 3/2. Find the fraction.

(A) 21/13   (B) 13/21   (C) 33/25   (D) 25/33

Explanation:

Let numerator of a fraction be x.

Denominator = (x + 8)

Fraction = Numerator/Denominator = x/x+8

According to the question,

$(x + 17) / (x + 8 - 1) = 3/2$

$(x + 17) / (x + 7) = 3/2$

$2 (x + 17) = 3 (x + 7)$

$2x + 34 = 3x + 21$

$3x - 2x = 34 - 21$

$x = 13$

Numerator = x = 13 And

Denominator = X + 8 = 13+8 = 21

Fraction = 13/21

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Common Confusables

Common Confusables

What are common confusables?

Words that may be confused because their similarity in,

- Spelling
- Pronunciation
- Meaning

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Must-know Terms

Homonyms: *Homo* – "same", *onym* – "name"
Same spelling
Same pronunciation
Different meanings
> *Example:* Address, match, right, ring

Homophones (a kind of homonyms)
Same/different spelling
Same pronunciation
Different meanings
> *Example:* write – right, desert – desert, read - reed

Homographs (a kind of homonyms)
Same spelling
Same/Different pronunciation
Different Meanings
> *Example:* lead, close, wind, minute

Heteronyms (a kind of homonyms/homographs)
Same spelling
Different pronunciation
Different Meanings
> *Example:* conduct, content, live,

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Common Confusables (Practice Exercise)

1. We try to keep the President (appraised / apprised) of recent developments in the economy.

2. When you are finished, (precede / proceed) to the next part of the exam.

3. We need some new (stationary / stationery) for our office.

4. His (principle / principal) reason for learning Japanese was work related.

5. When I arrived at the Immigration Office, I was informed about the correct (proceedings / preceding / procedure) when applying for a work permit.

6. If you (lose / loose / lost) your ticket, you will have to replace it yourself.

7. The man sitting in the corner was (formally / formerly) the headmaster of my school.

8. I cannot (accept / except) your offer of $3500. The car is worth much more.

9. Doctors must be very (discreet / discrete) in dealing with their patients.

10. The school was (formerly / formally) opened by an (imminent / eminent) author.

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Common Confusables (Practice Exercise)

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Common Confusables (Practice Exercise)

1. When running, try not to _____ all your energy in the first few minutes. (expand, expend)

2. We should continue to _____ our technology. (expand, expend)

3. He suffered the _____ of mankind, death which befalls every man on this planet. (fate, fete)

4. They had a big _____ to celebrate the beginning of the New Year. (fate, fete)

5. A lot of replacements would be waiting _____ down the line. (farther, further)

6. He is too disabled to be trusted _____. (farther, further)

7. Loud music blurted out through amplifiers_____ on our peace and rest. (impinge, infringe)

8. I have bought a detective novel to _____ it while travelling. (peruse, pursue)

9. The trauma of the accident continues to _____ me in my vacant time. (peruse, pursue)

10. Ratan Tata has become a _____ in the automobile industry after manufacturing world's cheapest road car called "Nano". (magnet, magnate)

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Sentence Arrangement

Sentence Arrangement

Rearrange the lettered parts to make a meaningful sentence

A. And the sinners is that
B. Every saint has a past, and every sinner has a future
C. We must understand very clearly that
D. The only difference between the saints

E. The world takes you very seriously
F. If you pretend to be good,
G. The astounding stupidity of optimism is that
H. But if you pretend to be bad, it doesn't.

I. That thinks more about money than the rich,
J. And that is the poor
K. There is only one class in the community
L. It is really pathetic to know that

M. Students are unteachable and it is
N. Do not follow the moral values they teach
O. Still more shocking that many teachers

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F. If you pretend to be good,

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H. But if you pretend to be bad, it doesn't. **(CABD)**

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Sentence Arrangement

Rearrange the lettered parts to make a meaningful sentence

A. Due to which, learning them has become very tough
B. Has become an unpleasant obsession
C. Know as many English words as possible
D. The compulsion that students should

E. Is directly proportional to divine dependence
F. Divine non-dependence
G. Success in every human endeavor
H. And inversely proportional to

I. And comfort, but where he stands
J. The ultimate measure of a man
K. Is not where he stands in moments of convenience
L. At times of challenge and controversy

M. Be totally right when
N. One day we will learn
O. The head is totally wrong

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Sentence Arrangement

Rearrange the lettered parts to make a meaningful sentence

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B. Has become an unpleasant obsession
C. Know as many English words as possible
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F. Divine non-dependence
G. Success in every human endeavor
H. And inversely proportional to **(CADB)**

I. And comfort, but where he stands
J. The ultimate measure of a man
K. Is not where he stands in moments of convenience
L. At times of challenge and controversy **(BCAD)**

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Tenses

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Tenses

What are Tenses?

Forms of a verb that show

- **The time**

- **Continuance**

- **Completion**

of an action or a state that is expressed **in connection with the moment** at which a statement is made about it.

Is time a relative entity?

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Types of Tenses

There are Three main Tenses

- Present Tense

- Past Tense

- Future Tense

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Types of Tenses

There are Three main Tenses

Present Tense

- Present Simple
- Present Continuous
- Present Perfect
- Present Perfect Continuous

Past Tense

- Past Simple
- Past Continuous
- Past Perfect
- Past Perfect Continuous

Future Tense

- Future Simple
- Future Continuous
- Future Perfect
- Future Perfect Continuous

Types of Tenses

There are Three main Tenses

Present Tense

- Present Simple   - I do
- Present Continuous   - I am doing
- Present Perfect   - I have done
- Present Perfect Continuous   - I have been doing

Past Tense

- Past Simple   - I did
- Past Continuous   - I was doing
- Past Perfect   - I had done
- Past Perfect Continuous   - I had been doing

Future Tense

- Future Simple   - I will do
- Future Continuous   - I will be doing
- Future Perfect   - I will have done
- Future Perfect Continuous   - I will have been doing

Practice Exercises

Correct the mistakes in the sentences given below

1. What do you think about people who are owning lots of guns?

2. All of us supporting our team tomorrow when they trying to win the championship.

3. The grass not looking so green now because it isn't raining since last month.

4. Before the new girl was joined our group, everybody been getting along really well.

5. If they hadn't worked over the weekend, they wouldn't completed the job in time.

Practice Exercises

Corrected Version

What you think about people who are owning lots of guns?

What you think about people who **own** lots of guns?

All of us supporting our team tomorrow when they trying to win the championship.

All of us **will be** supporting our team tomorrow when they **are tryingwill be tryingtry** to win the championship.

The grass not looking so green now because it isn't raining since last month.

The grass is not looking so green now because it **hasn't been raining** since last month.

Before the new girl was joined our group, everybody been getting along really well.

Before the new girl ~~was~~ joined our group, everybody **had been** getting along really well.

If they hadn't worked over the weekend, they wouldn't completed the job in time.

If they hadn't worked over the weekend, they **wouldn't have** completed the job in time.

Practice Exercises

Match the following

1. When I got to the cafe

2. We fell asleep

3. Amy learnt Italian

4. Tom didn't come out with us

5. The car began to make a strange noise

6. The TV was on

7. When I first met Jessica

a .when she was living in Rome.

b. she was working in a clothes shop.

c .when I was driving home.

d. but nobody was watching it.

e. while we were watching a film.

f. my friends were waiting for me.

g. because he wasn't feeling well.

Practice Exercises

Spot the Error

1. Gowri told me (A) his name after (B) he left. C) No Error. (D)

2. If any of the founding fathers of our constitution (A) was to return to life for a day (B) his opinion of our amendments (C) would be interesting. (D)

3. If I had the address (A), I would have delivered (B) the package myself (C). No error (D)

4. If you will come tomorrow (A) we can go to the market (B) and do our own shopping together. (C) No error (D)

5. Ever since her promotion as manager last year, (A) Bretney is the hardest-working employee (B) of this small and highly industrious (C) company. No error (D)

Practice Exercises

Spot the Error

1. Gowri told me (A) his name after (B) he had left. (C) No Error. (D)

2. If any of the founding fathers of our constitution (A) ~~was~~ **were** to return to life for a day (B) his opinion of our amendments (C) would be interesting. (D)

3. If I had **had** the address (A), I would have delivered (B) the package myself (C). No error (D)

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Voices

Voices

What are Voices?

The voice of a **verb** tells whether the **subject** of the sentence

- **Performs**, or

- **Receives** an action

Types of Voices

There are two types of voices

- **Active Voice**

   - the subject performs the action expressed by the verb.

Example: Ram sings a song.

- **Passive Voice**

   - the subject receives the action expressed by the verb.

Example: A song is sung by Ram.

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Active Voice vs. Passive Voice

Tense	Active Voice	Passive Voice
Present Simple	He writes a letter.	
Present Continuous	He is writing a letter.	
Present Perfect	He has written a letter.	
Present Perfect Continuous	He has been writing a letter.	
Past Simple	He wrote a letter.	
Past Continuous	He was writing a letter.	
Past Perfect	He had written a letter.	
Past Perfect Continuous	He had been writing a letter.	
Future Simple	He will write a letter.	
Future Continuous	He will be writing a letter.	
Future Perfect	He will have written a letter.	
Future Perfect Continuous	He will have been writing a letter.	

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Active Voice vs. Passive Voice

Tense	Active Voice	Passive Voice
Present Simple	He writes a letter.	A letter is written by him.
Present Continuous	He is writing a letter.	A letter is being written by him.
Present Perfect	He has written a letter.	A letter has been written by him.
Present Perfect Continuous	He has been writing a letter.	**Not applicable**
Past Simple	He wrote a letter.	A letter was written by him.
Past Continuous	He was writing a letter.	A letter was being written by him.
Past Perfect	He had written a letter.	A letter had been written by him.
Past Perfect Continuous	He had been writing a letter.	**Not applicable**
Future Simple	He will write a letter.	A letter will be written by him.
Future Continuous	He will be writing a letter.	**Not applicable**
Future Perfect	He will have written a letter.	A letter will have been written by him.
Future Perfect Continuous	He will have been writing a letter.	**Not applicable**

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Voice Rules

There are two basic rules

- The places of subject and object will be interchanged in the sentence.

- Only 3rd form of the verb or past participle (e.g. written) will be used as a main verb in passive voice.

The sentences of following tenses can't be changed to passive voices.

- Present perfect continuous

- Past perfect continuous

- Future perfect continuous

- Future continuous

- Sentences having intransitive verbs

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Practice Exercises

Frame questions using the Passive voice. Some are in Present Tense and some are in Past Tense

1. Ask about glass. (how / make?)

2. Ask about television. (when / invent?)

3. Ask about mountains. (how / form?)

4. Ask about DNA. (when / discover?)

5. Ask about silver. (what / use for?)

Practice Exercises

Frame questions using the Passive voice. Some are in Present Tense and some are in Past Tense

1. Ask about glass. (how / make?)

    How is glass made?

2. Ask about television. (when / invent?)

    When was television invented?

3. Ask about mountains. (how / form?)

    How are mountains formed?

4. Ask about DNA. (when / discover?)

    When was DNA discovered

5. Ask about silver. (what / use for?)

    What is silver used for?

Practice Exercises

Frame the second sentence from the words in brackets. Sometimes the verb is active, sometimes passive.

1.   There's somebody behind us. (We / follow)

2.   This door is a different color, isn't it? (you / paint?)

3.   My bike has disappeared. (It / steal!)

4.   My umbrella has disappeared. (Somebody / take)

5.   A neighbor of mine disappeared six months ago.(He / not / see / since then)

Practice Exercises

Frame the second sentence from the words in brackets. Sometimes the verb is active, sometimes passive.

There's somebody behind us. (We / follow)

       We are being followed.

This door is a different color, isn't it? (you / paint?)

       Have you painted it?

My bike has disappeared. (It / steal!)

       It has been stolen!

My umbrella has disappeared. (Somebody / take)

       Somebody has taken it!

A neighbor of mine disappeared six months ago.(He / not / see / since then)

       He hasn't been seen since then.

Practice Exercises

1 a: What's the City Hotel like? Can you recommend it?

b: I've never stayed there, but _____ (it / supposed) very good.

2 a: How much are these paintings worth?

b: I'm not sure, but _____ (they / supposed) very valuable.

3 a: I heard that Laura has gone away.

 b: Yes, _____ (she / supposed / living) in London now.

4 a: Is it true that your neighbours were lucky in the lottery?

b: Yes, _____ (they / supposed / win) a lot of money.

5 a: Is it possible to climb to the top of the tower?

b: Yes, _____ (the view / supposed) very nice.

Practice Exercises

1 a: What's the City Hotel like? Can you recommend it?

b: I've never stayed there, **but it is supposed to be** (it / supposed) very good.

2 a: How much are these paintings worth?

b: I'm not sure, but **they are supposed to be** (they / supposed) very valuable.

3 a: I heard that Laura has gone away.

b: Yes, **she is supposed to be living** (she / supposed / living) in London now.

4 a: Is it true that your neighbours were lucky in the lottery?

b: Yes, **they are supposed to have won** (they / supposed / win) a lot of money.

5 a: Is it possible to climb to the top of the tower?

b: Yes, **the view is supposed to be** (the view / supposed) very nice.

THANK YOU