APTITUDE

List of Topics

REASONING

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NUMBER SYSTEM

1) Prime Number:

A Prime number is a number which has factors only unity/one and itself.

Eg : 2, 3, 5, 7,11,13 ....

2) Composite number:

A number which has more than two different factors is called a composite number.

Eg : 106, 18, 10...

3) Co-Prime Number:

The two prime numbers are said to be Co-prime to each other if they do not have any common factors other than one.

Eg: (2, 3), (5, 7)....

4) Twin Prime Numbers:

Two numbers are said to be twin prime if the difference between them is two.

Eg: (3,5), (5,7), (11,13).....

5) Highest Common Factors:

Highest Common Factors (H.C.F) or greatest common Divisor (G.C.D) or Greatest Common Measure (G.C.M) of two or more than two numbers is the greatest number that divides each one of them exactly.

Eg: H.C.F of 8 & 20 is 4

6) Lowest Common Multiple (L.C.M):

The least number which is exactly divisible by each of them given numbers is called their lowest common multiple (L.C.M)

Eg: L.C.M of 8 & 20 is 40

7) Relation between L.C.M and H.C.F. of two Numbers:

LCM X HCF = Product of the two numbers

Examples

Example 1

A man has some hens and cows. If the number of heads is 48 and the number of feet equals 140, then the number of hens will be:

A) 22 **B) 23** **C) 24** **D) 26**

Answer Option D

Explanation

Let the number of hens be *x* and the number of cows be *y*.
Then, $x + y = 48$ .... (i)
and $2x + 4y = 140 \Rightarrow x + 2y = 70$ .... (ii)
Solving (i) and (ii) we get: $x = 26$, $y = 22$.
$\therefore$ The required answer = 26.

Example 2

A number consists of 3 digits whose sum is 10. The middle digit is equal to the sum of the other two and the number will be increased by 99 if its digits are reversed. The number is:

A) 145 **B) 253** **C) 370** **D) 352**

Answer Option B

Explanation

Let the middle digit be *x*.
Then, $2x = 10$ or $x = 5$. So, the number is either 253 or 352.
Since the number increases on reversing the digits, so the hundred's digits is smaller than the unit's digit.
Hence, required number = 253.

Example 3

$\frac{0.0203 \times 2.92}{0.0073 \times 14.5 \times 0.7}$ **=?**

A) 0.8 **B) 1.45** **C) 2.40** **D) 3.25**

Answer Option A

Explanation

$\frac{0.0203\times2.92}{0.0073\times14.5\times0.7} = \frac{203\times292}{73\times45\times7} = \frac{4}{5} = 0.8$

Example 4

$\left(3-\frac{1}{3}\right)^2 = ?$

A) $\frac{3}{4}$ B) $\frac{5}{3}$ C) $\frac{64}{9}$ D) None of these

Answer option C

Explanation

$\left(3-\frac{1}{3}\right)^2 = (3)^2 + \left(\frac{1}{3}\right)^2 - 2 \times 3 \times \frac{1}{3} = \frac{64}{9}$

Example 5

If the sum of two numbers is 55 and the H.C.F. and L.C.M. of these numbers are 5 and 120 respectively, then the sum of the reciprocals of the numbers is equal to:

A) $\frac{55}{106}$ B) $\frac{601}{55}$ C) $\frac{11}{120}$ D) $\frac{120}{11}$

Answer option C

Explanation

Let the numbers be *a* and *b*.

Then, $a + b = 55$ and $ab = 5 \times 120 = 600$.

The required sum = $\frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab} = \frac{55}{600} = \frac{11}{120}$

PROBLEMS

1. Find the greatest number which divides 615 and 963, leaving the remainder 6 for each case.

a. 67 b. 77 c. 87 d. 97

2. A tree broke at a point and its top touched the ground 5m away from its base. If point of breakage at height of 12 m from ground what was tree's total height?

a. 18m b. 25m c. 32m d. 35m

3. If 4 chickens are worth 3 ducks, 7 ducks worth 2 geese and 9 geese worth 7 fowls what is the price of a chicken if a fowl costs Rs. 150?

a. Rs. 75 b. Rs. 25 c. Rs. 50 d. Rs. 150

4. If x, y, and z are consecutive negative integers, and if x > y > z, which of the following must be a Positive odd integer?

a. xyz b. (x - y) (y - z) c. x - yz d. x(y + z)

5. $(\frac{1}{4})3 + (\frac{3}{4})3 + 3(\frac{1}{4})(\frac{3}{4})(\frac{1}{4} + \frac{3}{4})$ =?

a. 1/64 b. 27/64 c. 49/64 d. 0

6. The number of distinct prime factors of 8! Is.....

a. 3 b. 4 c. 5 d. 8

7. $\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{154 + \sqrt{225}}}}}$ =

a. 16 b. 10 c. 5 d. 4

8. What is the value of 'x' if it is the mean proportional of x - 4 and x + 8 is8?

a. 8 b. -12 c. 6 d. -12 & 8

9. $(\frac{1}{4})^{th}$ of $(\frac{1}{2})^{nd}$ of $(\frac{3}{4})^{th}$ of 52000 = ?

a. 4875 b. 4857 c. 4785 d. 4877

10. If you save Rs.2 on Jan 1, Rs. 4 on Feb 1, Rs. 6 on Mar 1 and so on then how much you save in 1 year?

a. Rs. 136 b. Rs. 146 c. Rs. 156 d. Rs. 166

AVERAGE

1. Average = $\frac{Sum of Quantities}{Number of Quantities}$

2. Sum = Average X Number of Quantities

3. Average of numbers first 'n' natural numbers = $\frac{(n+1)}{2}$

4. Average of squares of first 'n' natural numbers = $\frac{(n+1)(2n+1)}{6}$

5. Average of cubes of first 'n' natural numbers = $\frac{n(n+1)^2}{4}$

Examples

Example1

A pupil's marks were wrongly entered as 83 instead of 63. Due to that the average marks for the class got increased by half (1/2). The number of pupils in the class is:

A) 10 **B) 20** **C) 40** **D) 73**

Answer option C

Explanation

Let there be *x* pupils in the class

Total increase in marks = $\left(x \times \frac{1}{2}\right) = \frac{x}{2}$

X = (83-63) $\Rightarrow \frac{x}{2} = 20 \Rightarrow$ **x = 40.**

Example2

The average weight of 16 boys in a class is 50.25 kg and that of the remaining 8 boy is 45.15 kg. Find the average weights of all the boys in the class.

A) 47.55kg **B) 48kg** **C) 48.55kg** **D) 49.25kg**

Answer option C

Explanation

Required Average = $\left(\frac{50.25 \times 16 + 45.15 \times 8}{16+8}\right) = \left(\frac{804 + 361.20}{24}\right) = \left(\frac{116}{24}\right) = 48.55$

Example3

The average weight of A, B and C is 45 kg. If the average weight of A and B be40 kg and that of B and C be 43 kg, then the weight of B is:

A) 17kg **B) 20kg** **C) 26kg** **D) 31kg**

Answer option D

Explanation

Let A, B, C represent their respective weights. Then, we have:
A + B + C = (45 x 3) = 135.... (i)
A + B = (40 x 2) = 80.... (ii)
B + C = (43 x 2) = 86.... (iii)
Adding (ii) and (iii), we get: A + 2B + C = 166.... (iv)
Subtracting (i) from (iv), we get: B = 31.
B's weight = 31 kg.

Example4

The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is:

A) 35 **B) 40** **C) 50** **D) None of these**

Answer option B

Explanation

Sum of the present ages of husband, wife and child= (27x3+3x3) years = 90 years.
Sum of the present ages of wife and child= (20x2+5x2) years
Husband's present age = (90-50) years= 40years

Example5

A car owner buys petrol at Rs.7.50, Rs. 8 and Rs. 8.50 per liter for three successive years. What approximately is the average cost per liter of petrol if he spends Rs. 4000 each year?

A) Rs. 7.98 **B) Rs.8** **C) Rs.8.50** **D) Rs. 9**

Answer option A

Explanation

Total quantity of petrol consumed in 3 years= $\left(\frac{4000}{7.50}+\frac{4000}{8}+\frac{4000}{8.50}\right)$ **liters**

4000$\left(\frac{2}{15}+\frac{1}{8}+\frac{2}{17}\right)$ **liters =**$\frac{76700}{51}$ **liters**

Total amount spent = Rs.(3x4000)=Rs.12000

Average cost=Rs.$\left(\frac{12000\times51}{6700}\right)$ = Rs. $\frac{6120}{767}$ = Rs. 7.98

PROBLEMS

1) The average weight of a class of 24 students is 35 kg if the weight of the teacher be included; the average rises by 400 gm. find the weight of the teacher
   a) 40 b) 45 c) 48 d) 50

2) The average of 11 results is 50. If the average of first six results is 49 and that of last six is 52, find the sixth result.
   a) 52 b)54 c) 56 d) 58

3) 10 sheep and 5 pigs were bought for Rs. 6000. If the average price of a sheep be Rs. 450, find the average price of a pig.
   a)200 b) 300 c) 400 d) 500

4) Sandeep covers a journey from Meerut to Delhi by car at an average speed of 40 km/hr. He returns back by scooter with an average speed of 24 km/hr. Find his average speed during the whole journey.
   a)30 b) 35 c) 40 d) 45

5) The average of first nine multiples of 3 is. . . . .
   a) 12.0 b) 12.5 c) 15.0 d) 18.5

6) Average score of a cricketer in 2 matches is 27 and that in 3 other is 32. Then his average Score In 5 matches is. . . . . .
   a) 8 b) 25 c) 29.5 d) 30

7) The average weight of 19 students is 15 kg. By the admission of a new student the average weight is reduced to 14.8 kg. The weight of the new student is

   a)10.6 kg b) 10.8 kg c) 11kg d) 14.9 kg

8) The average weight of 8 men is increased by 2 kg when one of the men, whose weight is 50 kg, is replaced by a new man. The weight of the new man is:

   a)52 kg b) 58 kg c) 66 kg d) 68 kg

9) The average of first 61 natural numbers is

   a) 30 b) 30.5 c) 31 d) 32

10) The average temperature of Monday, Tuesday, Wednesday and Thursday was 380 and that of Tuesday, Wednesday, Thursday and Friday was 400 .If the temperature on Monday was 300, the temperature of Friday was:

   a)400 b) 390 c) 380 d) 300

PERCENTAGE

1. Percentage → PERCENT → %

2. Per → Divided by and Cent → 100, Eg: 5% = $\frac{5}{100}$

3. Of = Multiplications

4. $33\frac{1}{3}=\frac{100}{3}$, $66\frac{2}{3}=\frac{200}{3}$

5. If the price of a commodity is increased by R%, then the reduction in consumption so as not to increase the Expenditure is: $\left(\frac{100R}{100+R}\right)$ %

6. If the price of a commodity is decreased by R%, then the increase in consumption so as not to decrease the Expenditure is: $\left(\frac{100R}{100-R}\right)$ %

7. Results on Population:
Let the population of a town be P now and suppose it increases at the rate of R% per Annum, then:

1. Population after n years = $p\left(1+\frac{R}{100}\right)^n$

2. Population n years ago = $\left(1+\frac{R}{100}\right)^n$

8. Results on Depreciation:
Let the present value of a machine be P suppose it depreciates at the rate of R% per annum. Then:

1. Value of the machine after *n* years = $p\left(1-\frac{R}{100}\right)^n$

2. Value of the machine *n* years ago=$\left(1-\frac{R}{100}\right)^n$

3. If A is R% more than B, then B is less than A by $\left[\frac{R}{(100+R)}\times 100\right]$%

4. If A is R% less than B, then B is more than A by $\left[\frac{R}{(100-R)}\times 100\right]$%

Examples

Example1

The population of a town increased from 1,75,000 to 2,62,500 in a decade. The average percent increase of population per year is:

A) 4.37% **B) 5%** **C) 6%** **D) 8.75%**

Answer option B

Explanation

Increase in 10 years = (262500-175000) =87500

Increase % = $\left(\frac{87500}{175000} \times 100\right)$**%=50%**

Required Average = $\left(\frac{50}{10}\right)$**%=5%**

Example2

Rajeev buys good worth Rs. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax @ 10%. Find the amount he will have to pay for the goods.

A) 6876.10 **B) 6999.20** **C) 6654** **D) 7000**

Answer option A

Explanation

Rebate = 6% of Rs.6650 = Rs. $\left(\frac{6}{100} \times 6650\right)$**=Rs.399**

Sales tax=10% of Rs. (6650 - 399) = Rs. $\left(\frac{10}{100} \times 6251\right)$**= Rs. 625.10**

Final amount = Rs. (6251 + 625.10) = Rs. 6876.10

Example3

Three candidates contested an election and received 1136, 7636 and 11628 votes respectively. What percentage of the total votes did the winning candidate get?

A) 57% **B) 60%** **C) 65%** **D) 90%**

Answer option A

Explanation

Total number of votes polled = (1136 + 7636 + 11628) = 20400.

Required percentage =$\left(\frac{11628}{20400} * 100\right)$%=57%

Example4

Two tailors X and Y are paid a total of Rs. 550 per week by their employer. If X is paid 120 percent of the sum paid to Y, how much is Y paid per week?

A) Rs. 200 B) Rs. 200 C) Rs. 200 D)None of these

Answer option B

Explanation

Let the sum paid to Y per week be Rs. *z*.

Then, *z* + 120% of *z* = 550.

Z +$\frac{120}{100}$ z=55

$\frac{11}{5}$ z=550

Z=$\left(\frac{550*5}{11}\right)$=250

Example 5

In a certain school, 20% of students are below 8 years of age. The number of students above 8 years of age is $\frac{2}{3}$ of the number of students of 8 years of age which is 48. What is the total number of students in the school?

A)72 B)80 C)100 D)120

Answer option C

Explanation

Let the number of students be *x*. Then,

Number of students above 8 years of age = (100 - 20) % of *x* = 80% of *x*.

80% of x=48+$\frac{2}{3}$ of 48

$\frac{80}{100}$ x=80

x=100.

PROBLEMS

1. The percentage change in the surface are of a cube when each side is doubled is
a) 25 b) 50 c) 100 d) 300

2. A portion of $7200 is invested at a 4% annual return, while the remainder is invested at a 5% annual return. If the annual income from both portions is the same, what is the total income from the two Investments?
a) $160 b) $320 c) $400 d) $720

3. If 25% of a number is added to another number then the second number increases by 10%. The ratio of the first number to the second number is
a) 1:2 b) 2:1 c) 5:2 d) 2:5

4. A has a share of 75% in a property and sold two-third of his share for Rs.3 lakhs. The value of the Entire property (in lakhs of rupees) is....
a) 7 b) 6 c) 5 d) 4

5. If $\frac{3}{4}$ of 15% of an amount is Rs.72. Then the amount (in Rupees) is.....

a) 1400 b) 540 c) 360 d) 640

6. Two students appeared at an examination. One of them secured 9 marks more than the other and is marks was 56% of the sum of their marks. The marks obtained by them are:
a)3,390 b) 4,132 c) 4,233 d) 4,334

7. If A = *x*% of *y* and B = *y*% of *x*, then which of the following is true?
a) A is smaller than B
b) A is greater than B
c) Relationship between A and B cannot be determined
d) If *x* is smaller than *y*, then A is greater than B

8. What percent of a day is 3 hours?
a) 12×1/2% b) 16×1/2% c) 18×2/3% d) 22×1/2%

9. 75% of a number is added to 75, we get the same number. Find the number?
a) 200 b) 250 c) 300 d)350

10. In an election of two candidates, the candidate who gets 41% rejected by a majority of 2412 votes. Find the total number of votes polled?
a) 13000 b) 13400 c) 14000 d) 15000

Profit And Loss

1. Cost Price: The price, at which an article is purchased, is called its cost price, abbreviated as C.P.

2. Selling Price: The price, at which an article is sold, is called its selling prices, abbreviated as S.P.

3. Profit or Gain: If S.P. is greater than C.P., the seller is said to have a profit or gain.

4. Loss: If S.P. is less than C.P., the seller is said to have incurred a loss.

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

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

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

8. GainPercentage (Gain %) = $\left[\frac{Gain}{C.P} * 100\right]\%$

9. LossPercentage (Loss %) = $\left[\frac{Loss}{C.P} * 100\right]\%$

10. Selling Price with Gain% (S.P) = $\left[\frac{(100+Gain\%)}{100} * C.P\right]$

11. Selling Price with Loss% (S.P) = $\left[\frac{100-Loss\%}{100} * C.P\right]$

12. Cost Price with Gain% (C.P) = $\left[\frac{100}{(100+Gain\%)} * S.P\right]$

13. Cost Price with Loss% (C.P) = $\left[\frac{100}{(100-Loss\%)} * S.P\right]$

14. 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:

$$\text{Loss\%} = \left[\frac{CommonLossorGain\%}{10}\right]^2$$

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

$$\text{Gain\%} = \left[\frac{Error}{TrueValue-Error} * 100\right]\%$$

Examples

Examples 1

When a plot is sold for Rs. 18,700, the owner loses 15%. At what price must that plot be sold in order to gain 15%?

A) Rs. 21,000 **B) Rs. 22,500** **C) Rs. 25,300** **D) Rs. 25,800**

Answer option C

Explanation

85:18700 = 115:x

X=$\left[\frac{18700*115}{85}\right]$=25300

Hence, S.P = Rs.25, 300

Examples 2

100Oranges are bought at the rate of Rs.350 and sold at the rate of Rs.48 per dozen.The percentage of profit or loss is..?

A) 14 $\frac{2}{7}$ % Gain **B) 15% Gain** **C) 14$\frac{2}{7}$ %Loss** **D) 15% Loss**

Answer option A

Explanation

C.P of 1 orange = Rs. $\left[\frac{350}{100}\right]$ = Rs.3.50

S.P of 1 Orange = Rs.$\left[\frac{48}{12}\right]$ = Rs.4

Gain%= $\left[\frac{0.50}{3.50} * 100\right]$% = $\left[\frac{100}{7}\right]$=14 $\frac{2}{7}$ %

Examples 3

A trader mixes 26 kg of rice at Rs. 20 per kg with 30 kg of rice of other variety at Rs. 36 per kg and sells the mixture at Rs. 30 per kg. His profit percent is:

A) No Profit No Loss **B)5%** **C)8%** **D)10%**

Answer option B

Explanation

C.P. of 56 kg rice = Rs. (26 x 20 + 30 x 36) = Rs. (520 + 1080) = Rs. 1600.

S.P. of 56 kg rice = Rs. (56 x 30) = Rs. 1680.

Gain%= $\left[\frac{80}{1600} * 100\right]$%=5%

Examples 4

On selling 17 balls at Rs. 720, there is a loss equal to the cost price of 5 balls. The cost price of a ball is:

A) Rs. 45 B) Rs. 50 C) Rs. 55 D) Rs. 60

Answer option D

Explanation

(C.P. of 17 balls) - (S.P. of 17 balls) = (C.P. of 5 balls)

C.P of 12 balls =S.P of 17 balls = Rs.720

C.P of 1 ball = Rs.$\left(\frac{720}{12}\right)$= Rs.60

Examples 5

A shopkeeper expects a gain of 22.5% on his cost price. If in a week, his sale was of Rs. 392, what was his profit?

A) Rs. 18.20 B) Rs. 70 C) Rs.72 D) Rs. 82.25

Answer option C

Explanation

C.P= Rs.$\left(\frac{100}{122.5} * 392\right)$ = Rs. $\left(\frac{1000}{1225} * 392\right)$ = Rs.320

Profit=Rs. (392-320) = Rs.72

PROBLEMS

1) An article was sold at Rs. 9625 at a loss of 23%. At what price should it be sold for to gain 20%?
   A) 12500 b) 13000 c) 14000 d) 15000

2) By selling 40 meters of cloth, a merchant gains the cost price of 10 meters. Find his gain percent?
   A) 15 b) 20 c) 25 d) 30

3) Haribabu uses dishonest means to make profit by announcing that he sells at cost price weighs 800 gm for every 1000 gm. What is the gain percent of Hari?
   A) 10 b) 20 c) 25 d) 30

4) Srinivas has goods worth Rs. 1500, he sells two third of them so as to lose 10%, for what % should he sell the remaining so that he neither gains nor loses in the transaction ?
   A) 10% b) 15% c) 20% d) 25%

5) A man brought two articles, one costing Rs. 500 more than the other. He charged 8% profit on the dearer article and sold the other at a loss of 3%. If he gained Rs. 240 on whole find the C.P of cheaper article .
   a) 2000 b) 3000 c) 5000 d) 4000

6) If the cost price of 20 books is equal to the selling price of 16 books , then the percentage of profit is....
   a)16 b) 20 c)25 d)32

7) A man sells two flats at the rate of Rs.1.995 lakhs each. On one he gains 5% and on the other, he loses 5%. His gain or loss percent in the whole transaction is
   a) 0.25 % Loss b) 0.25 % gain c) 2.5 % loss d) 25% loss

8) After successive discounts of x% and y% , an article worth Rs.250 is available for Rs. 170. If y = 15 then x = ?
   a) 25 b) 20 c) 15 d) 10

9) Daal is now being sold at Rs. 20 a kg. During last month its rate was Rs. 16 per kg. By how much Percent should a family reduce its consumption so as to keep the expenditure fixed?
   a) 20 %. b) 30% c) 40% d) 50%

10) Selling Price of an article is Rs.18.75 and the loss percentage is equal to the cost price of the article. Which of the following could be the cost price of the article?
   a) 75 b)65 c)50 d)60

Ratio & Proportion

1. Ratio: The ratio of two quantities *a* and *b* in the same units, is the fraction $\frac{a}{b}$ and we write it as *a*: *b*.

In the ratio *a*: *b*, we call *a* as the first term or antecedent and b, the second term or consequent.

Eg. The ratio 5 : 9 represents $\frac{5}{9}$ With antecedent = 5, consequent = 9.

2. The equality of two ratios is called proportion.

If *a*: *b* = *c*: *d*, we write *a*: *b*:: *c* : *d* and we say that *a, b, c, d* are in proportion.

3. Product of means = Product of extremes.

4. Fourth Proportional: If *a*: *b* = *c*: *d*, then *d* is called the fourth proportional to *a, b, c*.

5. Third Proportional: *a*: *b* = *c*: *d*, then *c* is called the third proportion to *a* and *b*.

Mean Proportional: Mean proportional between *a* and *b* is $\sqrt{ab}$.

7.Comparison of Ratios: We say that (*a* : *b*) > (*c* : *d*) $\frac{a}{b} > \frac{c}{d}$.

8.Compounded Ratio: The compounded ratio of the ratios: (*a* : *b*), (*c* : *d*), (*e* : *f*) is (*ace* : *bdf*).

9. Duplicate Ratios: Duplicate ratio of (*a* : *b*) is (a^2 : b^2).

10. Sub-duplicate ratio of (*a* : *b*) is ($\sqrt{a}$: $\sqrt{b}$).

11. Triplicate ratio of (*a* : *b*) is (a^3 : b^3).

12. Sub-triplicate ratio of (*a* : *b*) is ($a^{1/3}$: $b^{1/3}$).

13. If $\frac{a}{b}=\frac{c}{d}$ then $\frac{a+b}{a-b}=\frac{c+d}{c-d}$. [Componendo and Dividendo]

Examples

Examples 1

In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?

A) 50 **B) 100** **C) 150** **D) 200**

Answer Option C

Explanation

Let the number of 25 p, 10 p and 5 p coins be *x*, 2*x*, 3*x* respectively.

Then, Sum of their values = Rs. $\left[\frac{25x}{100} + \frac{10\times 2x}{100} + \frac{5\times x}{100}\right]$ **= Rs.** $\frac{60x}{100}$

$$\therefore \frac{60x}{100} = 30 \Leftrightarrow x = \frac{30 \times 100}{60} = 5$$

Hence, the number of 5 p coins = (3 x 50) = 150.

Examples 2

The fourth proportional to 5, 8, 15 is: ?

A) 18 **B)24** **C) 19** **D)20**

Answer Option C

Explanation

Let the fourth proportional to 5, 8, 15 be *x*.

Then, 5 : 8 : 15 : *x*

$\Rightarrow$ **5*x* = (8 x 15)**

X= $\frac{(8\times 15)}{5}$ **= 24.**

Examples 3

The salaries A, B, C are in the ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries?

A) 3 : 3 : 10 **B) 10 :11 :20** **C) 23 :33 : 60** **D) None**

Answer Option C

Explanation

Let A = 2k, B = 3k and C = 5k.

A' new salary = $\frac{115}{100} of\ 2k = \left(\frac{115}{100} \times 2k\right) = \frac{23k}{10}$

B' new salary = $\frac{110}{100} of\ 3k = \left(\frac{110}{100} \times 3k\right) = \frac{33k}{10}$

C' new salary = $\frac{120}{100} of\ 5k = \left(\frac{120}{100} \times 5k\right) = 6k$

$\therefore$ New ratio $\left(\frac{23k}{10} : \frac{33k}{10} : 6k\right)$ = 23:33:60

Examples 4

The ratio of the number of boys and girls in a college is 7:8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?

A) 8:9 B)17:18 C)21:22 D)None

Answer option C

Explanation

Originally, let the number of boys and girls in the college be 7x and 8x respectively.
Their increased number is (120% of 7x) and (110% of 8x).

$$\Rightarrow \left(\frac{120}{100} \times 7x\right) and \left(\frac{110}{100} \times 8x\right) \Rightarrow \left(\frac{42x}{5}\right) and \left(\frac{44x}{5}\right)$$

The required ratio = $\left(\frac{42x}{5} : \frac{44x}{5}\right)$ = 21:22

Examples 5

If Rs. 782 be divided into three parts, proportional to $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$, then the first part is:

A) Rs. 182 B) Rs. 190 C) Rs. 196 D) Rs. 204

Answer option D

Explanation

Given ratio = $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ = 6: 8: 9

1st part Rs. = $\left(78 \times \frac{6}{23}\right)$ =Rs.204

PROBLEMS

1) If the area of two circles are in the ratio 169 : 196 then the ratio of their radii is

   a. 10 : 11 b. 11 : 12 c. 12 : 13 d. 13 : 14

2) 8% members of a certain group are married. What is the respective ratio between of married members to the number of unmarried members?

   a) 7 : 17 b) 5 : 18 c) 7 : 18 d) Cannot be determined

3) The ratio between a two-digit number and the sum of the digits of that number is 4 : 1.If the digit in the unit's place is 3 more than the digit in the ten's place, what is the number?

   a. 32 b. 36. c. 40 d. 46

4) A and B together have Rs. 1210. If $\frac{4}{15}$ of A's amount is equal to $\frac{2}{5}$ of B's amount, how much amount does B have?

   a. Rs. 460 b. Rs. 484 c. Rs. 550 d. Rs. 664

5) Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:
   a) 2:5 b) 3:5 c) 4:5 d) 6:7

6) A sum of money is to be distributed among A, B, C, D in the proportion of 5 : 2 : 4 : 3. If C gets Rs. 1000 more than D, what is B's share?
   a) Rs. 500 b) Rs. 1000 c) Rs. 1500 d) Rs. 2000

7) Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?
   a) 2 : 3 : 4 b) 6 : 7 : 8 c) 6 : 8 : 9 d) 8:9:7

8) In a mixture 60 litres, the ratio of milk and water 2 : 1. If the this ratio is to be 1 : 2, then the quantity of water to be further added is:
   a) 20 litres b) 30 litres c) 40 litres d) 60 litres

9) The ratio of the number of boys and girls in a college is 7 : 8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?
   a) 8 : 9 b) 17 : 18 c) 21 : 22 d) 24 : 25

10) Salaries of Ravi and Sumit are in the ratio 2 : 3. If the salary of each is increased by Rs. 4000, the new ratio becomes 40: 57. What is Sumit's salary?
    a) Rs. 17,000 b) Rs. 20,000 c) Rs. 25,500 d) Rs. 38,000

PARTNERSHIP

Partnership: When two or more than two persons run a business jointly, they are called **partners** and the deal is known as **partnership**.

Ratio of Divisions of Gains: When investments of all the partners are for the same time, the gain or loss is distributed among the partners in the ratio of their investments.
When investments are for different time periods, then equivalent capitals are calculated for a unit of time by taking (capital x number of units of time). Now gain or loss is divided in the ratio of these capitals.
Suppose A invests Rs. *x* for *p* months and B invests Rs. *y* for *q* months then, (A's share of profit) : (B's share of profit)= *xp* : *yq*.

Working and Sleeping Partners: A partner who manages the business is known as a **working partner** and the one who simply invests the money is a **sleeping partner**.

Examples

Examples1

A began a business with Rs. 85,000. He was joined afterwards by B with Rs. 42,500. For how much period does B join, if the profits at the end of the year are divided in the ratio of 3 : 1?

A) 4 months B) 5 months C) 6 months D) 8 months

Answer option D

Explanation

Suppose B joined for x months. Then, $\left(\frac{85000\times12}{42500\times x} = \frac{3}{1}\right)$

x = $\left(\frac{85000\times12}{42500\times3}\right)$ = 8

So, B joined for 8months

Examples 2

Arun, Kamal and Vinay invested Rs. 8000, Rs. 4000 and Rs. 8000 respectively in a business. Arun left after six months. If after eight months, there was a gain of Rs. 4005, then what will be the share of Kamal?

A) Rs. 890 B) Rs. 1335 C) Rs. 1602 D) Rs. 1780

Answer option A

Explanation

Arun : Kamal : Vinay = (8,000 x 6) : (4,000 x 8) : (8,000 x 8)
= 48 : 32 : 64 = = 3 : 2 : 4

Kamal's share = Rs. $\left(4005 \times \frac{2}{9}\right)$ = Rs.890

Examples 3

Aman started a business investing Rs. 70,000. Rakhi joined him after six months with an amount of Rs.. 1,05,000 and Sagar joined them with Rs. 1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, 3 years after Aman started the business?

A) 7 : 6 : 10 B) 12 : 15 : 16 C) 42 : 45 : 56 D)None

Answer option B

Explanation

Aman : Rakhi : Sagar = (70,000 x 36) : (1,05,000 x 30) : (1,40,000 x 24) = 12 : 15 : 16.

Examples 4

Simran started a software business by investing Rs. 50,000. After six months, Nanda joined her with a capital of Rs. 80,000. After 3 years, they earned a profit of Rs. 24,500. What was Simran's share in the profit?

A) Rs. 9,423 B) Rs. 10,250 C) Rs. 12,500 D) Rs. 10,500

Answer option D

Explanation

Simran : Nanda = (50000 x 36) : (80000 x 30) = 3 : 4

Simran's share = Rs. $\left(24500 \times \frac{3}{7}\right)$ = Rs.10, 500.

Examples 5

A and B entered into partnership with capitals in the ratio 4 : 5. After 3 months, A withdrew $\frac{1}{4}$ of his capital and B withdrew $\frac{1}{5}$ of his capital. The gain at the end of 10 months was Rs. 760. A's share in this profit is:

A) Rs. 330 B) Rs. 360 C) Rs. 380 D) Rs. 430

Answer option A

Explanation

A:B = $\left[4x \times 3 + \left(4x - \frac{1}{4} \times 4x\right)7\right] : \left[5x \times 3 + \left(5x - \frac{1}{5} \times 5x\right)7\right]$

= (12x+21x) : (15x+28x) = 33x : 43x=*33:43*

A' Share = *Rs.*$\left(720 \times \frac{33}{76}\right)$ = *Rs.330*

Problems

1) A's share is Rs. 1000 more than B's but A's capital is invested for 8 months. If A's share of the yearly profits is same as that of B what is A's capital?

   a) 1500 b)2000 c) 3000 d) 4000

2) In a partnership A invested 1/6 of the capital for 1/6 of the time; B invested 1/3 of the capital for 1/3 of the time and C invested the rest of the capital for the whole time. If the total profit of the business is Rs.46,000/- then the share of B is....

   a) Rs.2000/- b) Rs.6000/- c) Rs.8000 d) Rs.36000/-

3) A started a business with a capital of Rs.6,400. Later B joined the business with a capital of Rs.8,000. T the end of the year they shared the profit in the ratio 6:5. After how many months B has joined the business?

   a) 8 b) 6 c) 4 d) 3

4) A, B and C started a business investing a sum of money in the ratio of 8:9:10. After 3 months B contributed another $\frac{1}{3}^{rd}$ of his capital towards business while C withdrew $\frac{1}{5}^{th}$ of his capital after 6months. If they get an annual profit of Rs.2,37,300 then C's share of profit in Rupees is....

   a) 94,200 b) 83,700 c) 75,600 d) 67,200

5) A, B and C started a business with some investments. At the end of the year, in the profit, the share of B is Rs.5000 more than that of A and C's share is Rs.2000 more than B.If the total profit is Rs. 1,11,000, then the share of C, in the profit in Rupees is...

   a) 39,000 b) 37,000 c) 38,000 d) 40,000

6) A and B started business together. B's capital is Rs.700 more than that of A. But B invested his capital for 9 months and A invested for 10 months. If A and B share the profit in the ratio 8:9, then the capital of B (in Rupees) is....

   a) 3,500 b) 4,200 c) 4,000 d) 2,100

7) Rs. 3000 is distributed among A, B and C such that A GETS $2/3^{rd}$ of what B and C together get and C gets ½ of what A and B together get. Find C's share ?

a) 750 b) 1000 c) 800 d) 1200 e) None

8) A and B started a partnership business investing some amount in the ratio of 3:3. C joined them after 6 months with an amount equal to that of B. In what proportion should the profit in the end of one year be distributed among A, B and C?

a) 3:5:2 b) 3:5:5 c) 6:10:5 d) Data inadequate

9) A, B, C rent a pasture. A puts 10 oxen for 7 months, B puts 12 oxen for 5 months and C puts15 oxen for 3 months For grazing. If the rent of the pasture is Rs.175, how much C pay as his share of rent?

a) Rs. 45 b) Rs. 50 c) Rs. 55 d) Rs. 60

10) A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 Earned at the end of 2 years from the starting of the business?

a) Rs. 7500 b) Rs. 9000 c) Rs. 9500 d) Rs. 10,000

Allegations & Mixtures

1) **Allegation:** It is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of desired price.

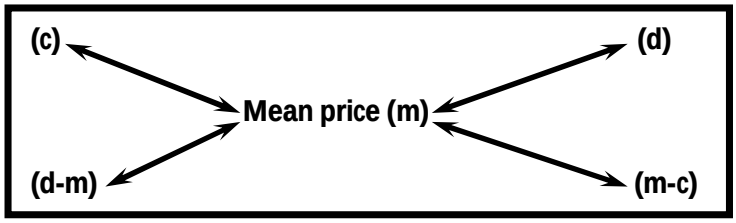
2) **Mean Price:** The cost of a unit quantity of the mixture is called the mean price.

3) **Rule of Allegation:** If two ingredients are mixed, then

$$\left[\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}}\right] = \left[\frac{\text{C. P. of dearer} - \text{Mean Price}}{\text{Mean price} - \text{C. P. of cheaper}}\right]$$

We present as under:

C.P of a unit quantity of a cheaper C.P of a unit quantity of a dearer



(Cheaper quantity): (Dearer quantity) = (d - m): (m - c).

$$Suppose\ a\ containercontains\ x\ of\ liquid\ from\ which\ y\ units\ are\ taken\ out\ and\ replaced\ by\ water.\ After\ n\ operations,\ the\ quantity\ of\ pure\ liquid = x\left(1-\frac{y}{x}\right)^n\ units$$

Examples

Example 1

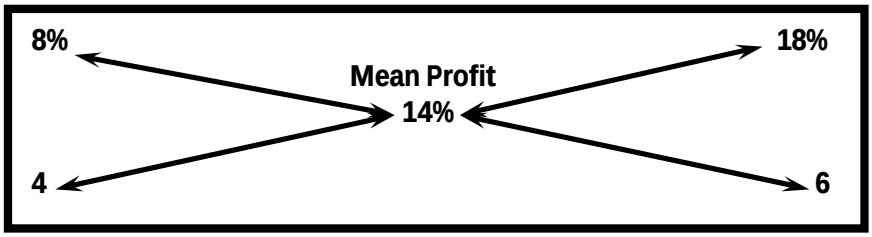
A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:

A) 400kg B)560kg C)600kg D)640kg

Answer option C

Explanation

By the rule of Allegation , we have:



Ration of 1st and 2nd parts = 4 : 6 = 2 : 3
Quantity of 2nd kind = $\left(\frac{3}{5} \times 1000\right)$kgs= 600kgs

Example 2

8 liters are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of water is 16 : 81. How much wine did the cask hold originally?

A) 18 liters B) 24 liters C) 32 liters D) 42 liters

Answer option B

Explanation

Let the quantity of the wine in the cask originally be *x* liters.

Then, quantity of wine left in cask after 4 operations = $\left[x\left(1-\frac{8}{x}\right)^4\right]$ liters

$\left[\frac{x(1-\frac{8}{x})^4}{x}\right] = \frac{16}{81} \Rightarrow \left(1-\frac{8}{x}\right)^4 = \left(\frac{2}{3}\right)^4 \Rightarrow \left(\frac{x-8}{x}\right) = \frac{2}{3}$

3x-24=2x ∴ x=24

Example 3

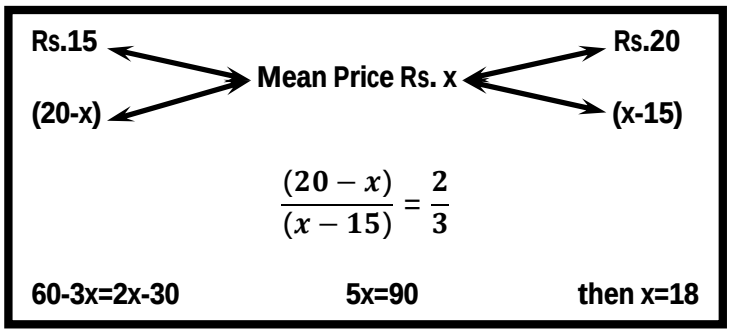
The cost of Type 1 rice is Rs. 15 per kg and Type 2 rice is Rs. 20 per kg. If both Type 1 and Type 2 are
5x=90 ∴ x=18
mixed in the ratio of 2 : 3, then the price per kg of the mixed variety of rice is:

A) Rs. 18 B) Rs. 18.50 C) Rs. 19 D) Rs. 19.50

Answer option A

Explanation

Let the price of the mixed variety be Rs. *x* per kg.
By rule of allegation, we have:
Cost of 1 kg of Type 1 rice Cost of 1 kg of Type 2 rice



Example 4

In what ratio must a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a kg so that by selling the mixture at Rs. 68.20 a kg he may gain 10%?

A) 3 : 2 B) 3 : 4 C) 3 : 5 D) 4 : 5

Answer option A

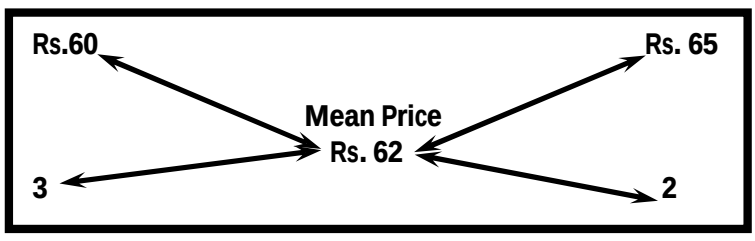
Explanation

S.P. of 1 kg of the mixture = Rs. 68.20, Gain = 10%.

C.P. of 1 kg of the mixture = Rs. $\left(\frac{100}{110} \times 68.20\right) = Rs.62$

By the rule of allegation, we have:

Cost of 1 kg tea of 1st kind .Cost of 1 kg tea of 2nd kind.



Required ratio = 3: 2.

Example 5

Find the ratio in which rice at Rs. 7.20 a kg be mixed with rice at Rs. 5.70 a kg to produce a mixture worth Rs. 6.30 a kg.

A) 1 : 3 B) 2 : 3 C) 3 : 4 D) 4 : 5

Answer option B

Explanation

By the rule of allegation:

Cost of 1 kg of 1st kind Cost of 1 kg of 2nd kind

720 p Mean Price
630 p 570 p
60 90

Required ratio = 60: 90 = 2: 3.

PROBLEMS

1) A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?

A) $\frac{1}{3}$ B) $\frac{1}{4}$ C) $\frac{1}{5}$ D) $\frac{1}{7}$

2) Tea worth Rs. 126 per kg and Rs. 135 perkg are mixed with a third variety in the ratio1:1:2 if the mixture is worth Rs. 153 per kg ,the price of the third variety per kg will be:

A) Rs. 169.50 B) Rs. 170 C) Rs. 175.50 D) Rs. 180

3) A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

A)10 B)20 C)21 D)25

4) A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5?

A) 4 litres, 8 litres B) 6 litres, 6 litres C) 5 litres, 7 litres D) 7 litres, 5 litres

5) In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?

A) 3 : 7 B) 5 : 7 C) 7 : 3 D) 7 : 5

6) A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is:

A) 4% B) $6\frac{1}{4}\%$ C) 20% D) 25%

7) How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?

A) 36 kg B) 42 kg C) 54 kg D) 63 kg

8) A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

A) 26.34 litres B) 27.36 litres C) 28 litres D) 29.16 litres

9) A jar full of whisky contains 40% alcohol. A part of this whisky is replaced by another containing 19% Alcohol and now the percentage of alcohol was found to be 26%. The quantity of whisky replaced is:

A) $\frac{1}{3}$ B) $\frac{3}{2}$ C) $\frac{2}{3}$ D) $\frac{2}{5}$ E) $\frac{3}{5}$

10) In what ratio must water be mixed with milk to gain $16\frac{2}{3}\%$ on selling the mixture at cost price?

A) 1 : 6 B)6:1 C) 2:3 D)4:3

Data Interpretation

Examples

Example 2

The following table gives the sales of batteries manufactured by a company over the years.
Number of Different Types of Batteries Sold by a Company Over the Years (Numbers in Thousands)

Year	Types of Batteries					
	4AH	7AH	32AH	35AH	55AH	Total
1992	75	144	114	102	108	543
1993	90	126	102	84	126	528
1994	96	114	75	105	135	525
1995	105	90	150	90	75	510
1996	90	75	135	75	90	465
1997	105	60	165	45	120	495
1998	115	85	160	100	145	605

The total sales of all the seven years is the maximum for which battery?
A) 4AH **B) 7AH** **C) 32AH** **D) 35AH**

Answer option C

Explanation

The total sales (in thousands) of all the seven years for various batteries are:
For 4AH = 75 + 90 + 96 + 105 + 90 + 105 + 115 = 676
For 7AH = 144 + 126 + 114 + 90 + 75 + 60 + 85 = 694
For 32AH = 114 + 102 + 75 + 150 + 135 + 165 + 160 = 901
For 35AH = 102 + 84 + 105 + 90 + 75 + 45 + 100 = 601
For 55AH = 108 + 126 + 135 + 75 + 90 + 120 + 145 = 799.
Clearly, sales are maximum in case of 32AH batteries.

Example 2

The following table gives the percentage distribution of population of five states, P, Q, R, S and T on the basis of poverty line and also on the basis of sex.

State	Percentage of Population below the Poverty Line	Proportion of Males and Females	
		Below Poverty Line	Above Poverty Line
		M : F	M : F
P	35	5 : 6	6 : 7
Q	25	3 : 5	4 : 5
R	24	1 : 2	2 : 3
S	19	3 : 2	4 : 3
T	15	5 : 3	3 : 2

What will be the number of females above the poverty line in the State S if it is known that the population of State S is 7 million?

A) 3 million **B) 2.43 million** **C) 1.33 million** **D) 5.7million**

Answer: Option B

Explanation:

Total population of State S = 7 million.

∴ Population above poverty line

= [(100 - 19)% of 7] million

= (81% of 7) million

= 5.67 million.

And so, the number of females above poverty line in State S

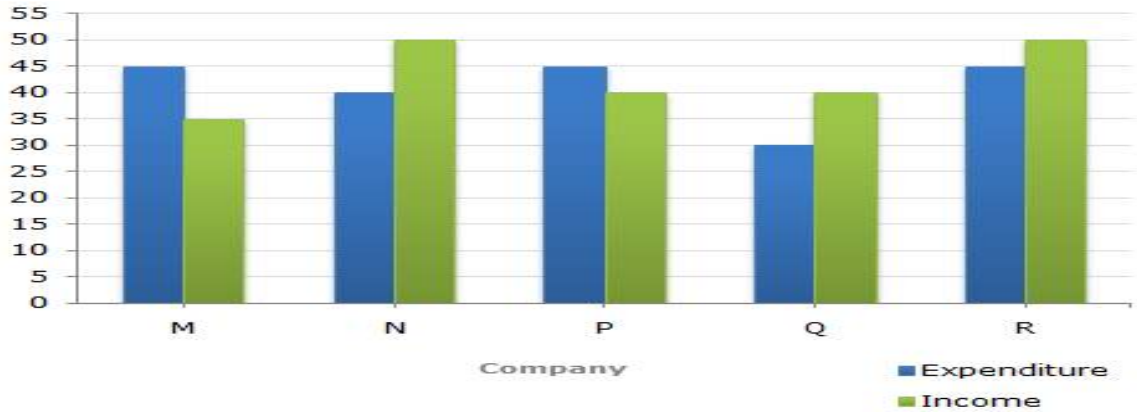
$= \left(\frac{3}{7} \times 5.67\right) million = 2.43\ million$

Example 3

The following bar graph shows the Income and Expenditures (in million US $) of five companies in the year 2001. The percent profit or loss of a company is given by

$$\% \text{ Profit/Loss} = \frac{\text{Income - Expenditure}}{\text{Expenditure}} \times 100$$

Income and Expenditure (in million US $) of five companies in the year 2001.



If the income of Company Q in 2001 was 10% more than its income in 2000 and the Company had earned a profit of 20% in 2000, then its expenditure in 2000 (in million US $) was?
A) 28.28 B) 30.30 C)32.32 D)34.34

Answer Option B

Explanation

Let the income of Company Q in 2001 = *x* million US $.

Then, income of Company in 2001 = $\left(\frac{110}{100} \times x\right)$ **million US $**

$$\therefore \frac{110x}{100} = 40 \Rightarrow x = \frac{400}{11}$$

i.e., income of Company Q in 2000 =$\left(\frac{400}{11}\right)$ **million US $**

Let the expenditure of Company Q in 2000 be E million US $.

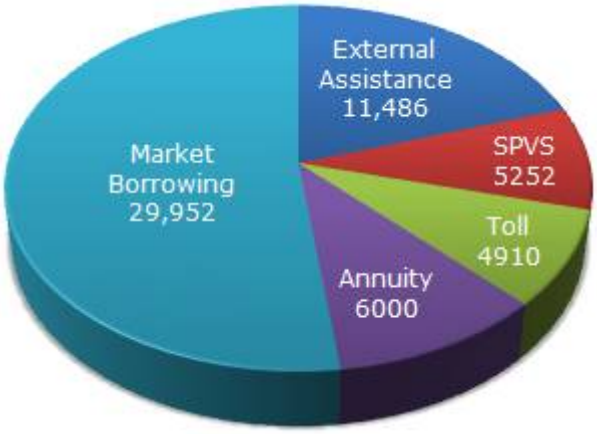
Then, 20 = $\left[\frac{\frac{400}{11} - E}{E} \times 100\right]$ **[** $\because$ **%Profit = 20%]**

$$\Rightarrow 20 = \left[\frac{400}{11E} - 1\right] \times 100 \Rightarrow E = \frac{400}{11} \times \frac{100}{120} = 30.30$$

Expenditure of Company Q in 2000 = 30.30 million US $.

Example 4

The following pie-chart shows the sources of funds to be collected by the National Highways Authority of India (NHAI) for its Phase II projects. Study the pie-chart and answers the question that follow.
Sources of funds to be arranged by NHAI for Phase II projects (in crores Rs.)



If the toll is to be collected through an outsourced agency by allowing a maximum 10% commission, how much amount should be permitted to be collected by the outsourced agency, so that the project is supported with Rs. 4910 crores?

A) Rs. 6213 crores **B) Rs.5827 crores** **C) Rs.5401 crores** **D) Rs. 5316 crores**

Answer Option C

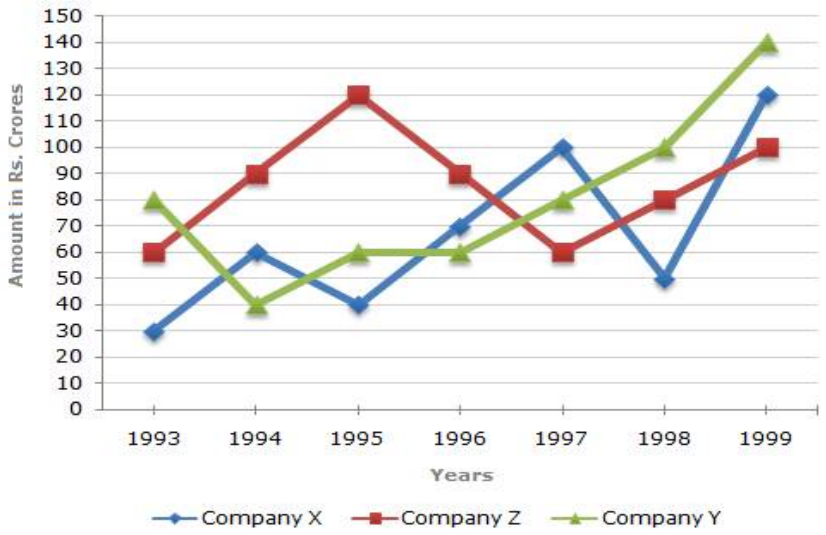
Explanation

Amount permitted = (Funds required from Toll for projects of Phase II) + (10% of these funds)
= Rs. 4910 crores + Rs. (10% of 4910) crores
= Rs. (4910 + 491) crores
= Rs. 5401 crores.

Example 5

Study the following line graph and answer the questions.

Exports from Three Companies Over the Years (in Rs. crore)



What was the difference between the average exports of the three Companies in 1993 and the average exports in 1998?

A) Rs. 15.33 crores **B) Rs. 18.67 crores** **C) Rs. 20 crores** **D) Rs. 22.17 crores**
Answer Option C

Explanation

Average exports of the three Companies X, Y and Z in 1993

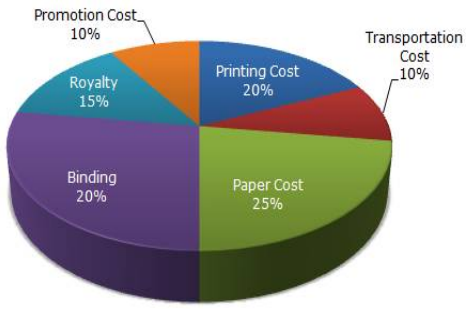
= Rs. $\left[\frac{1}{3} \times (30 + 80 + 60)\right] crores = Rs.\frac{170}{3} crores$

= Rs. $\left[\frac{1}{3} \times (50 + 100 + 80)\right] crores = Rs.\frac{230}{3} crores$

Difference = Rs. $\left[\frac{230}{3} - \frac{170}{3}\right] croresRs.\frac{60}{3} crores = Rs.20\ crores$

PROBLEMS

The following pie-chart shows the percentage distribution of the expenditure incurred in publishing a book. Study the pie-chart and the answer the questions based on it.
Various Expenditures (in percentage) Incurred in Publishing a Book



1) If for a certain quantity of books, the publisher has to pay Rs. 30,600 as printing Cost, then what will be amount of royalty to be paid for these books?

A) Rs.19,450 **B) Rs.21,200** **C) Rs.27,950** **D) Rs.26,150**

2) What is the central angle of the sector corresponding to the expenditure incurred on Royalty?

A) 15° **B) 24°** **C) 54°** **D) 48°**

3) The price of the book is marked 20% above the C.P. If the marked price of the book is Rs. 180, then what is the cost of the paper used in a single copy of the book?

A) Rs.36 **B) Rs. 37.50** **C) Rs. 42** **D) Rs. 44.25**

4) If 5500 copies are published and the transportation cost on them amounts to Rs. 82500, then what should be the selling price of the book so that the publisher can earn a profit of 25%?

A) Rs. 187.50 **B) Rs. 191.50** **C) Rs. 175** **D) Rs. 180**

5) Royalty on the book is less than the printing cost by:

A) 5% **B)** $33\frac{1}{5}\%$ **C) 20%** **D) 25%**

6) If the difference between the two expenditures are represented by 18° in the pie-chart, then these expenditures possibly are

A) Binding Cost and Promotion Cost **B) Paper Cost and Royalty**
C) Binding Cost and Printing Cost **D) Paper Cost and Printing Cost**

7) For an edition of 12,500 copies, the amount of Royalty paid by the publisher is Rs.2,81,250. What should be the selling price of the book if the publisher desires a profit of 5%?

A) Rs. 152.50 **B) Rs. 157.50** **C) Rs. 162.50** **D) Rs. 167.50**

8)If for an edition of the book, the cost of paper is Rs. 56250, then find the promotion cost for this edition

A) Rs. 20,000 **B) Rs. 22,500** **C) Rs. 25,500** **D) Rs. 28,125**

Time And Work

1. Work from days: If A can do a piece of work in 'n' days, then A's one days work=$\frac{1}{n}$.
2. Days from work: If A's 1 day's work = $\frac{1}{n}$, then A can finish the work in 'n' days.

3. Ratio: If A is thrice as good a workman as B then, Ratio of work done by A and B = 3:1.
   Ratio of times taken by A and B to finish a work =1:3

EXAMPLES

Example 1

A and B together can do a piece of work in 30 days. A having worked for 16 days, B finishes the remaining work alone in 44 days. In how many days shall B finish the whole work alone?

A) 30 Days B) 40 Days C) 60 Days D) 70 Days

Answer option C

Explanation

Let A's 1 day's work = *x* and B's 1 day's work = *y*.

Then X+Y = $\frac{1}{30}$ and 16X + 44Y = 1.

Solving these two equations, we get X=$\frac{1}{60}$ and Y=$\frac{1}{60}$

B's 1 day's work = $\frac{1}{60}$

Hence, B alone shall finish the work in 60 days.

Example 2

A and B can do a job together in 7 days. A is $1\frac{3}{4}$ times as efficient as B. The same job can be done by A alone in :

A) $9\frac{1}{3} days$ B) 11 days C) $12\frac{1}{4} days$ D) $16\frac{1}{3} days$

Answer option B

Explanation

(A's I day's work): (B's I day's work) =$\frac{7}{4}$: 1 = 7:4.
Let A's and B's 1 day's work be 7X and 4X respectively.

Then 7x+4x= $\frac{1}{7}$, then x = $\frac{1}{77}$

A's 1 day work = $\left(\frac{1}{77} \times 7\right) = \frac{1}{11}$

So A can finish the work in 11 days.

Example 3

A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in:

A)5 days B) 6 days C) 10 days D) 10 $\frac{1}{2}$ days

Answer option C

Explanation

(B+C)'s 1 day's work = $\left(\frac{1}{9} + \frac{1}{12}\right) = \frac{7}{36}$

Work done by Band C in 3 days = $\left(\frac{7}{36} \times 3\right) = \frac{7}{12}$

Remaining work = $\left(1 - \frac{7}{12}\right) = \frac{5}{12}$

Now, $\frac{1}{24}$ work is done by a in 1 day

So, $\frac{5}{12}$ work is done by A in $\left(24 \times \frac{5}{12}\right) = 10$ days

Example 4

A and B can do a work in 8 days, B and C can do the same work in 12 days. A, B and C together can finish it in 6 days. A and C together will do it in :

A) 4 days B) 6 days C) 8 days D) 12 days

Answer option C

Explanation

(A + B + C)'s 1 day's work = $\frac{1}{6}$

(A + B)'s 1 day's work =$\frac{1}{8}$

(A+C)'s 1 days work $\left(2 \times \frac{1}{6}\right) - \left(\frac{1}{8} + \frac{1}{12}\right) = \left(\frac{1}{3} - \frac{5}{24}\right) = \frac{3}{24} = \frac{1}{8}$

So A and C together will do the work in 8 days.

Example 5

A takes twice as much time as B or thrice as much time as C to finish a piece of work. Working together, they can finish the work in 2 days. B can do the work alone in:

A) 4days B) 6days C) 8days D) 12days

Answer option B

Explanation

Suppose A, B and C take x, $\frac{x}{2}$ and $\frac{x}{3}$ days respectively to finish the work

Then, $\left(\frac{1}{x} + \frac{2}{x} + \frac{3}{x}\right) = \frac{1}{2} \Rightarrow \frac{6}{x} = \frac{1}{2} \Rightarrow x = 12.$

So, B takes ($\frac{12}{2}$)= 6 days to finish the work

PROBLEMS

1) A and B can do a piece of work in 8 days and 12 days respectively. A started the work and after 3 days B joined him to finish the work. The number of days B worked is....

   a) 1 b) $1\frac{1}{2}$ c) 2 d) 3

2) If 3 men or 4 women can do a piece of work in 43 days, how long will 7 men and 5 women take to finish the work ?

   a)10days b) 9days c) 11days d) 12days

3) A, B and C can do a work individually in 20 days, 15 days and 25 days respectively. To complete the work fast, which of the two are to be assigned the work?

   a) A, B b) B, C c) C,B d) B alone

4) 10 cats can eat 10 rats in 10 minutes. In how many minutes 1 cat can eat 1 rat?

a) 1min. b) 10min. c) 1/10 min. d) o.1 mn

5) Two identical taps fill 2/5 of a tank in 20 minutes. When one of the taps goes dry in how many minutes will the remaining one tap fill the rest of the tank?

a) 5 min b)10 min c) 15 min d) 20 min

6) Two pipes A and B can fill a tank in 10 and 15min respectively while C can empty in 20min. If all 3 pipes are opened for 1min and then tap C is closed. The extra time required to fill the tank is...

a)8 $\frac{3}{10}$ min b) 6 $\frac{3}{10}$ min c) 5 $\frac{3}{10}$ min d) 5 min

7) Pipe A fills a tank in 3hrs while pipe B empties it in 5hrs. If both the pipes are opened the portion of the tank filled in 80min is...

a) $\frac{8}{45}$ b) $\frac{17}{45}$ c) $\frac{16}{45}$ d) $\frac{13}{45}$

8) An empty swimming pool can be filled to capacity through an inlet pipe in 3 hours, and it can be completely drained by a drainpipe in 6 hours. If both pipes are fully open at the same time, in how many hours will the empty pool be filled to capacity?

a) 4 b) 4.5 c) 5 d) 5.5

9) Two pipes A and B can fill an empty tank in 6 hrs and 8 hrs respectively. After opening both of them for't'hrs the pipe B is closed and the pipe A filled the rest of the tank in 4 hrs. Then t =....

a) $\frac{8}{7}$ b) $\frac{8}{3}$ c) $\frac{4}{3}$ d) $\frac{2}{3}$

10) Two pipes can fill an empty tank in 36min and 45min respectively. If both the pipes are opened simultaneously how much time needed to fill the tank?

a)10min b) 15 min c) 20 min d)25 min

PIPES AND CISTERNS

1) **Inlet: A pipe Connected with a tank or a cistern or a reservoir, that fills it, is known as an inlet.**

2) **Outlet: A pipe connected with a tank or a cistern or reservoir, emptying it, is known as outlet.**

3) **If a pipe can fill a tank in x hours, then part filled in 1 hour =** $\frac{1}{x}$ **.**

4) **If a pipe can empty a tank in y hours then, part emptied in 1 hour =** $\frac{1}{y}$**.**

5) **If a pipe can filled a tank in x hours and another pipe can empty the full tank In y hours(where y>x), Then on opening both the pipes, then the net part filled in 1 hour =** $\left(\frac{1}{x}-\frac{1}{y}\right)$.

6) **If a pipe can fill a tank in *x* hours and another pipe can empty the full tank in *y* hours (where *y* > *x*), then on opening both The pipes, then the net part emptied in 1 hour =** $\left(\frac{1}{y}-\frac{1}{x}\right)$

Examples

Example 1

Three pipes A, B and C can fill a tank in 6 hours. After working at it together for 2 hours, C is closed and A and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill the tank is:

A)10 B)12 C)14 D)16

Answer option C

Explanation

Part filled in 2 hours = $\frac{2}{6}=\frac{1}{3}$

Remaining part = $\left(1-\frac{1}{3}\right)=\frac{2}{3}$

$\therefore (A+B)$**'s 7 hours work =** $\frac{2}{3}$

(A+B)'s 1 hour's work = $\frac{2}{21}$

∴C's 1 hour's work = [(A+B+C)'s 1 hour's work]-[(A+B)'s 1 hour's] = $\left(\frac{1}{6}-\frac{2}{21}\right)=\frac{1}{14}$

C alone can fill the tank in 14 hours.

Example 2

Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B and C are open for one hour each alternately, the tank will be full in:

A)6 hours **B) $6\frac{2}{3}$ hours** **C) 7 hours** **D) $7\frac{1}{2}$ hours**

Answer option C

Explanation

(A + B)'s 1 hour's work = $\left(\frac{1}{12}+\frac{1}{15}\right)=\frac{9}{60}=\frac{3}{20}$

(A + C)'s hour's work = $\left(\frac{1}{12}+\frac{1}{20}\right)=\frac{8}{60}=\frac{2}{15}$

Part filled in 2 hours = $\left(\frac{3}{20}+\frac{2}{15}\right)=\frac{17}{60}$

Part filled in 6 hours = $\left(3\times\frac{17}{60}\right)=\frac{17}{20}$

Remaining part = $\left(1-\frac{17}{20}\right)=\frac{3}{20}$

Now, it is the turn of A and B and $\frac{3}{20}$ part is filled by A and B in 1 hour

Total time taken to fill the tank = (6+1)hrs = 7hrs

Example 3

A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the total time taken to fill the tank completely?

A)3 hrs 15 min **B) 3 hrs 45 min** **C) 4 hrs** **D) 4 hrs 15 min**

Answer option B

Explanation

Time take by one tap to fill half of the tank = 3hrs.

Part filled by the four taps in 1 hour = $\left(4\times\frac{1}{6}\right)=\frac{2}{3}$

Remaining part = $\left(1-\frac{1}{2}\right)=\frac{1}{2}$

$\frac{2}{3}:\frac{1}{2}$::1:x

$\therefore x = \left(\frac{1}{2} \times 1 \times \frac{3}{2}\right) = \frac{3}{4}$ hours i.e., 45mins

So, total time taken = 3hrs.45mins

Example 4

A large tanker can be filled by two pipes A and B in 60 minutes and 40 minutes respectively. How many minutes will it take to fill the tanker from empty state if B is used for half the time and A and B fill it together for the other half?

A) 15 min B) 20 min C) 27.5 min D) 30 min

Answer option D

Explanation

Part filled by (A + B) in 1 minute = $\left(\frac{1}{60} + \frac{1}{40}\right) = \frac{1}{24}$

Suppose the tank is filled in x min. Then $\frac{x}{2}\left(\frac{1}{24} + \frac{1}{40}\right) = 1$

$\Rightarrow \frac{x}{2} \times \frac{1}{15} = 1$, Then x=30min

Example 5

One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, then the slower pipe alone will be able to fill the tank in:

A) 81 min. B) 108 min. C) 144 min. D) 192 min.

Answer option C

Explanation

Let the slower pipe alone fill the tank in *x* minutes

Then, faster pipe will fill it in $\frac{x}{3}$ minutes

$\Rightarrow \frac{1}{x} + \frac{1}{3} = \frac{1}{36} \Rightarrow \frac{x}{4} = \frac{1}{36} \Rightarrow x = 144$min.

PROBLEMS

1) Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes, and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P,Q and R respectively. What is the proportion of the solution R in the liquid in the tank after 3 minutes?

A) $\frac{5}{11}$ B) $\frac{6}{11}$ C) $\frac{7}{11}$ D) $\frac{8}{11}$

2) Pipes A and B can fill a tank in 5 and 6 hours respectively. Pipe C can empty it in 12 hours. If all the three pipes are opened together, then the tank will be filled in:

A) $1\frac{3}{17}$ hours B) $2\frac{8}{11}$ hours C) $3\frac{9}{17}$ hours D) $4\frac{1}{2}$ hours

3) A pump can fill a tank with water in 2 hours. Because of a leak, it took $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water of the tank in:

A) $4\frac{1}{3}$ hours B) 7 hours C) 8 hours D) 14 hours

4) Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both pipes are opened. The cistern will be filled in just half an hour, if the B is turned off after:

A) 5min B) 9min C) 10min D)15min

5) A tank is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the tank in the same time during which the tank is filled by the third pipe alone. The second pipe fills the tank 5 hours faster than the first pipe and 4 hours slower than the third pipe. The time required by the first pipe is:

A) 6 hours B) 10 hours C) 15 hours D) 30 hours

6) Two pipes can fill a tank in 20 and 24 minutes respectively and a waste pipe can empty 3 gallons per minute. All the three pipes working together can fill the tank in 15 minutes. The capacity of the tank is:

A) 60 gallons B) 100 gallons C) 120 gallons D) 180 gallons

7) A tank is filled in 5 hours by three pipes A, B and C. The pipe C is twice as fast as B and B is twice as fast as A. How much time will pipe A alone take to fill the tank?

A) 20hours B)25hours C)35 hours D)None

8) Two pipes A and B together can fill a cistern in 4 hours. Had they been opened separately, then B would have taken 6 hours more than A to fill the cistern. How much time will be taken by A to fill the cistern separately?

A) 1hour B) 2 hour C) 6 hour D)8 hour

9) Two pipes A and B can fill a tank in 20 and 30 minutes respectively. If both the pipes are used together, then how long will it take to fill the tank?

A)12 min B) 15 min C)25 min D)30 min

10) Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are opened together but after 4 minutes, pipe A is turned off. What is the total time required to fill the tank?

A)10min 20sec B) 11min 45sec C) 12min 30sec D) 14min 40sec

Time Speed And Distance

1.Speed, Time and Distance:

$$Speed = \left(\frac{Distance}{Time}\right), Time = \left(\frac{Distance}{Speed}\right), Distance = Speed \times Time$$

2.Kmph to m/sec Conversion: = $xKmph = \left(x \times \frac{5}{18}\right) m/sec$

3. m/sec to Kmph Conversion: = $xm/sec = \left(x \times \frac{18}{5}\right) km/hr$

4. If the ratio of the speeds of A and B is a : b then the ratio of the times taken by them to cover the same distance is $\frac{1}{a} : \frac{1}{b}$ **or b: a.**

5. Suppose a man covers a certain distance at xkmph and an equal distance at y kmph. Then the average speed during the whole journey is $\left(\frac{2xy}{x+y}\right) kmph$

Examples

1) A man covered a certain distance at some speed. Had he moved 3 kmph faster, he would have taken 40 minutes less. If he had moved 2 kmph slower, he would have taken 40 minutes more. The distance (in km) is:

A) 35 B)$36\frac{2}{3}$ C)$37\frac{1}{2}$ D)40

Answer option D

Explanation

Let distance = x km and usual rate = y kmph

Then, $\frac{x}{y} - \frac{x}{y+3} = \frac{40}{60} \Rightarrow 2y(y+3) = 9x$.....(1)

And $\frac{x}{y-2} - \frac{x}{y} = \frac{40}{60} \Rightarrow y(y-2) = 3x$.....(2)

On dividing 1 by 2 we get x = 40

2) A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:

A) 14 km B) 15 km C) 16 km D) 17 km

Answer option C

Explanation

Let the distance travelled on foot be *x* km.
Then, distance travelled on bicycle = (61 -*x*) km.

So, $\left(\frac{x}{4} + \frac{(61-x)}{9}\right) = 9$

$\Rightarrow$ 9*x* + 4(61 -*x*) = 9 x 36

$\Rightarrow$ 5*x* = 80 $\Rightarrow$ *x* = 16 km.

3) It takes eight hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more, if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the cars is:

A) 2:3 B) 3:2 C) 3:4 D)4:3

Answer option C

Explanation

Let the speed of the train be *x* km/hr and that of the car be *y* km/hr.

Then, $\frac{120}{x} + \frac{480}{y} = 8 \Rightarrow \frac{1}{x} + \frac{4}{y} = \frac{1}{15}$ .....(1)

And, $\frac{200}{x} + \frac{400}{y} = \frac{25}{3} \Rightarrow \frac{1}{x} + \frac{2}{y} = \frac{1}{24}$.....(2)

Solving (i) and (ii), we get: *x* = 60 and *y* = 80.
Ratio of speeds = 60 : 80 = 3 : 4.

4) Robert is travelling on his cycle and has calculated to reach point A at 2 P.M. if he travels at 10 kmph, he will reach there at 12 noon if he travels at 15 kmph. At what speed must he travel to reach A at 1 P.M.?

A) 8kmph B) 11 kmph C)12 kmph D)14 kmph

Answer option C

Explanation

Let the distance travelled by *x* km.
Then, $\frac{x}{10} - \frac{x}{15} = 2$

$\Rightarrow$ 3x-2x=60 $\Rightarrow$ x=60 km

Time taken to travel 60 km at 10 km/hr =$\left(\frac{60}{10}\right) hrs = 6hrs$

So, Robert started 6 hours before 2 P.M. *i.e.,* at 8 A.M.

Required speed =$\left(\frac{60}{5}\right) kmph = 12kmph.$

5) In covering a distance of 30 km, Abhay takes 2 hours more than Sameer. If Abhay doubles his speed, then he would take 1 hour less than Sameer. Abhay's speed is:

A) 5 kmph B) 6 kmph C) 6.25 kmph D) 7.5 kmph

Answer option A

Explanation

Let Abhay's speed be *x* km/hr.

Then, $\left(\frac{30}{x} - \frac{30}{2x}\right) = 3$

$\Rightarrow$ 6*x* = 30
x = 5 km/hr

PROBLEMS

1) The speed of a car increases by 2 kms after every one hour. If the distance travelling in the first one hour was 35 kms. what was the total distance travelled in 12 hours?

   a) 456 kms b) 482 kms c) 552 kms d) 556 kms

2) A person croses a 600 m long street in 5 minutes. What is his speed in km per hour?

   a) 3.6 b) 7.2 c) 8.4 d) 10

3) A train travels at an average of 50 miles per hour for 2x1/2 hours and then travels at a speed of 70 miles per hour for 1x1/2 hours. How far did the train travels in the entire 4 hours?

   a) 120 miles b) 150 miles c) 200 miles d) 230 miles

4) An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in 1x2/3 hours, it must travel at a speed of

   a) 300 kmph b) 360 kmph c) 600 kmph d) 720 kmph

5) A truck covers a distance of 550 meters in 1 minute whereas a bus covers a distance of 33 kms in 45 minutes. The ratio of their speed is

   a) 3 : 5 b) 3:4 c) 1:45 d) 50 : 3

6) The average speed of a train is 3 times the average speed of a car. The car covers a distance of 520 kms in 8 hours .How much distance will the train cover in 13 hours ?

   a) 2553 km b) 2585 km c) 2355 km d) 2535 km

7) A person can row 3/5 of a km in upstream in 10 min. and return in 6 min. find the speed of the man in still water?

   a)4.4kmph b) 4.5kmph c) 4.8kmph d) 4.9kmph

8) A train running at 52kpmh takes 36 sec to pass a platform, next it takes 24 sec to pass a man traveling at 10kmph in the same direction. Find the length of the train and the platform ?

   800m,440m b) 280m,440m c) 280m,240m d) 260m,260m

9) A boat is rowed down the river at 10 kmph and up the river at 2 kmph. What is thespeed of the current?
   a) 8 kmph b) 6 kmph c) 3.5 kmph d) 4 kmph

10) If a train running at 72 kmph crosses a tree in 7 s its length is

   a) 150 m b) 135 m c) 140 m d) 126 m

Simple and Compound Interest

Principal: The money borrowed or lent out for a certain period is called the principal or the sum

Interest: Extra money paid for using other's money is called interest.

Simple Interest (S.I.):

If the interest on a sum borrowed for certain period is reckoned uniformly, then it is called simple interest.
Let Principal = P, Rate = R% per annum (p.a.) and Time = T years. Then

Simple Interest (S.I)=$\left[\frac{P\times T\times R}{100}\right]$ $P = \left[\frac{S.I\times 100}{T\times R}\right]; T = \left[\frac{S.I\times 100}{P\times R}\right];\quad R = \left[\frac{S.I\times 100}{P\times T}\right]$

Examples

EXAMPLE1

A person borrows Rs. 5000 for 2 years at 4% p.a. simple interest. He immediately lends it to another person at 6 $\frac{1}{4}$ p.a for 2 years. Find his gain in the transaction per year.

A) Rs. 112.50 B) Rs. 125 C) Rs. 150 D) Rs. 167.50

Answer option A

Explanation

Gain in 2 years = Rs.$\left[\left(5000\times\frac{25}{4}\times\frac{2}{100}\right)-\left(5000\times\frac{4\times 2}{100}\right)\right]$

= Rs. (625-400) = Rs.225.

Gain in 1 year = Rs. $\left(\frac{225}{2}\right) = Rs.112.50$

EXAMPLE 2

A certain amount earns simple interest of Rs. 1750 after 7 years. Had the interest been 2% more, how much more interest would it have earned?

A) Rs. 35 B) Rs. 245 C) Rs. 350 D)None
Answer option D

Explanation

We need to know the S.I., principal and time to find the rate.
Since the principal is not given, so data is inadequate.

EXAMPLE 3

What will be the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years?

A) 1:3 B) 1:4 C)2:3 D)3:2

Answer option C

Explanation

Let the principal be P and rate of interest be R%.

Required Ratio = $\frac{\left(\frac{P\times R\times 6}{100}\right)}{\left(\frac{P\times R\times 9}{100}\right)} = \frac{6\times P\times R}{9\times P\times R} = \frac{6}{9} = 2:3$

EXAMPLE 4

A sum of money amounts to Rs. 9800 after 5 years and Rs. 12005 after 8 years at the same rate of simple interest. The rate of interest per annum is:

A)5% B) 8% C)12% D)15%

Answer option C

Explanation

S.I. for 3 years = Rs. (12005 - 9800) = Rs. 2205.

S.I. for 5 years = Rs. $\left(\frac{2205}{3}\times 5\right) = Rs.3675$

Principal = Rs.(9000-3675) =Rs.6125

Hence, Rate = $\left(\frac{100\times 3675}{6125\times 5}\right)\% = 12\%$

EXAMPLE 5

A man took loan from a bank at the rate of 12% p.a. simple interest. After 3 years he had to pay Rs. 5400 interest only for the period. The principal amount borrowed by him was:

A) Rs. 2000 B) Rs. 10,000 C) Rs. 15,000 D) Rs. 20,000

Answer option C

Explanation

Principal = Rs.$\left(\frac{100\times5400}{12\times3}\right) = Rs.\,15000$

COMPOUND INTEREST

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

When interest is compound Annually: Amount = P$\left[1+\frac{R}{100}\right]^n$

When interest is Compound Half yearly: Amount = P$\left[1+\frac{R/2}{100}\right]^{2n}$

When interest is Compound Quarterly: Amount = p$\left[1+\frac{R/4}{100}\right]^{4n}$

When interest is compounded Annually but time is in fraction, say $3\frac{2}{5}$ years

Amount = p$\left[1+\frac{R}{100}\right]^3\times\left[1+\frac{\frac{2}{3}R}{100}\right]$

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

Then Amount = P $\left[1+\frac{R1}{100}\right]\left[1+\frac{R2}{100}\right]\left[1+\frac{R3}{100}\right]$

6.The Present worth of Rs.x due n years is given by Present worth = $\frac{x}{\left[1+\frac{R}{100}\right]^n}$

Examples

Example 1

The compound interest on a certain sum for 2 years at 10% per annum is Rs. 525. The simple interest on the same sum for double the time at half the rate percent per annum is:

A) Rs. 400 B) Rs. 500 C) Rs. 600 D) Rs. 800

Answer option B

Explanation

Let the sum be Rs. P.

Then $\left[P\left(1+\frac{10}{100}\right)^2 - P\right] = 525 \Rightarrow P\left[\left(\frac{11}{10}\right)^2 - 1\right] = 525$

$\Rightarrow$ P = $\left[\frac{525\times100}{21}\right] = 2500 \quad \therefore Sum = Rs.2500$

So, S.I. = Rs. $\left[\frac{2500\times5\times4}{100}\right] = Rs.500$

Example 2

The difference between compound interest and simple interest on an amount of Rs. 15,000 for 2 years is Rs. 96. What is the rate of interest per annum?

A) 8 B)10 C) 12 D)None

Answer option A

Explanation

$\left[1500\times\left(1+\frac{R}{100}\right)^2 - 15000\right] - \left[\frac{15000\times R\times2}{100}\right] = 96 \Rightarrow$

$15000\left[\left(1+\frac{R}{100}\right)^2 - 1 - \frac{2R}{100}\right] = 96 \Rightarrow 15000\left[\frac{(100+R)^2-10000-(200\times R)}{10000}\right] = 96$

$R^2 = \left[\frac{96\times2}{3}\right] = 64 \Rightarrow$ R = 8 $\Rightarrow$ Rate = 8%

Example 3

The difference between simple interest and compound on Rs. 1200 for one year at 10% per annum reckoned half-yearly is:

A) Rs. 2.50 B) Rs. 3 C) Rs. 3.75 D) Rs. 4

Answer option B

Explanation

S.I. = Rs. $\left[\frac{1200\times10\times1}{100}\right] = Rs.120$

C.I. = Rs. $\left[1200\times\left(1+\frac{5}{100}\right)^2 - 1200\right] = Rs.123$

Difference = Rs. (123 - 120) = Rs. 3.

Example 4

If the simple interest on a sum of money for 2 years at 5% per annum is Rs. 50, what is the compound interest on the same at the same rate and for the same time?

A) Rs. 51.25 B) Rs. 52 C) Rs. 54.25 D) Rs. 60

Answer option A

Explanation

Sum = Rs. $\left[\frac{50\times100}{2\times5}\right] = Rs.500$

Amount = Rs. $\left[500 \times \left(1+\frac{5}{100}\right)^2\right] = Rs.\left[500 \times \frac{21}{20} \times \frac{21}{20}\right] = Rs.551.25$

C.I. = Rs.(551.25-500) =Rs.51.25

Example 5

Simple interest on a certain sum of money for 3 years at 8% per annum is half the compound interest on Rs. 4000 for 2 years at 10% per annum. The sum placed on simple interest is:

A) Rs. 1550 B) Rs. 1650 C) Rs. 1750 D) Rs. 2000

Answer option C

Explanation

C.I. = Rs. $\left[4000 \times \left(1+\frac{10}{1000}\right)^2 - 4000\right] = \left[4000 \times \frac{11}{10} \times \frac{11}{10} - 4000\right] = Rs.840$

Sum = Rs. $\left[\frac{420\times100}{3\times8}\right] = RsRs.1750.$

PROBLEMS

1) A invests two equal amounts earning 10% and 12% of interest annually. If the interest on them earned is Rs.1650/- in an year then the sum invested in each is...

   a. Rs.17000/- b. Rs.15000 c. Rs.8500/- d. Rs.7500/-

2) The difference between compound interest and simple interest on a sum for 2years at the same 6% interest per annum is Rs.36.Then that sum (in Rupees) is...

   a. 10,000 b. 20,000 c. 15,000 d. 18,000

3) Mr. Khans took a lone of 10,000 Rs on simple interest for two years at the rate of 3 p. c. p. a The total amount that he will be paying as interest in 2 years is 3% of his monthly salary. What is his monthly salary?

   a. Rs 30,000 b) Rs 16,000 c) Rs 20,000 d) Rs 12,000

4) How much will be the compound interest to be paid on a principal amount of Rs 85,000 after 3 years at the rate of 6 p. c. p. a.?

   a. Rs 16623.36 b) RS 16236.36 C) Rs 16326. d) Rs 16632.36

5) Manju took Rs. 20000 at 5% SI for 2 years and invested it at 4% CI for same period. Find her gain/loss.

   a) Rs. 368 gain b) Rs.423 gain c) Rs. 368 loss d) Rs. 200 gain

6) A sum was put at simple interest at a certain rate for 3 years. Had it been put at 2% higher rate, it would have fetched Rs. 360 more. Find the sum.

   a) Rs. 6000. b) Rs. 7000. c) Rs. 8000. d) Rs. 9000.

7) Find the simple interest on Rs. 3000 at 6 1/4% per annum for the period from 4th Feb., 2005 to 18th April, 2005.

   a) Rs.36.50. b) Rs.37.50. c) Rs.38.50. d)Rs.39.50.

8) Find the simple interest on Rs. 68,000 at 16 2/3% per annum for 9 months.

   a) Rs.7500 b) Rs.8500 c) Rs.9000 d) Rs.9500

9) A sum at simple interests at 13 ½ % per annum amounts to Rs.2502.50 after 4 years find the sum.

   a) Rs.1325. b) Rs.1425. c) Rs.1525. d) Rs.1625.

10) Adam borrowed some money at the rate of 6% p.a. for the first two years , at the rate of 9% p.a. for the next three years , and at the rate of 14% p.a. for the period beyond five years. If he pays a total interest of Rs. 11, 400 at the end of nine years how much money did he borrow?

    a) Rs.10, 000. b) Rs.10, 500. c) Rs.11, 000. d) Rs.12, 000.

MENSURATIONS

CUBOID:

Let length = *l*, breadth = *b* and height = *h* units. Then

Volume = (*l* x *b* x *h*) cubic units.

Surface area = 2(*lb* + *bh* + *lh*) sq. units.

Diagonal = $l^2 + b^2 + h^2$ units.

CUBE:

Let each edge of a cube be of length *a*. Then,

Volume = a^3 cubic units.

Surface area = $6a^2$ sq. units.

Diagonal = 3*a* units.

CYLINDER:

Let radius of base = *r* and Height (or length) = *h*. Then,

Volume = ($\pi r^2 h$) cubic units.

Curved surface area = ($2\pi rh$) sq. units.

Total surface area = $2\pi r(h + r)$ sq. units.

CONE:

Let radius of base = *r* and Height = *h*. Then,

Slant height, $l = h^2 + r^2$ units.

Volume = $\frac{\pi r^2 h}{3}$ cubic units.

Curved surface area = (πrl) sq. units.

Total surface area = ($\pi rl + \pi r^2$) sq. units.

SPHERE:

Let the radius of the sphere be *r*. Then,

Volume = $\frac{4\pi r^3}{3}$ cubic units.

Surface area = ($4\pi r^2$) sq. units.

HEMISPHERE:

Let the radius of a hemisphere be *r*. Then,

Volume = $\frac{2\pi r^3}{3}$ cubic units.

Curved surface area = ($2\pi r^2$) sq. units.

Total surface area = ($3\pi r^2$) sq. units.

Note: 1 litre = 1000 cm^3.

Examples

Example 1

A rectangular tank can hold 650 liter of milk. If it is 130cm long & 250cm wide, find the height of the tank?

A) 10 cm B)20 cm C) 30 cm D)40 cm

Answer option B

Explanation

Volume of rectangular tank = 650 liter = 650 × 1000 cm^3 = 650000 cm^3

We know that Volume of a cuboid = l × b × h; 650000 = 130 × 250 × h;

⇒ h = $\frac{650000}{130\ x\ 250}$ = 20 cm; Therefore, height of the tank = 20 cm.

Example 2

How many bricks, each measuring 25 cm x 11.25 cm x 6 cm, will be needed to build a wall of 8 m x 6 m x 22.5 cm?

A) 5600 B) 6000 C) 6400 D) 7200

Answer option C

Explanation

Number of bricks = $\frac{Volume\ of\ the\ wall}{Volume\ of\ 1\ brick}$ = $\frac{800\ x\ 600\ x\ 22.5}{25\ x\ 11.25\ x\ 6}$ = 6400

Example 3

A large cube is formed from the material obtained by melting three smaller cubes of 3, 4 and 5 cm side. What is the ratio of the total surface areas of the smaller cubes and the large cube?

A) 2 : 1 B) 3 : 2 C)25 : 18 D)27 : 20

Answer option C

Explanation

Volume of the large cube = $(3^3 + 4^3 + 5^3) = 216\ cm^3$.

Let the edge of the large cube be *a*. So, $a^3 = 216$ cm, $a = 6$ cm.

Required ratio = $\frac{6\ x\ (3^2 + 4^2 + 5^2)}{6\ x\ 6^2}$ = $\frac{50}{36}$ = 25: 18

Example 4

What is the total surface area of a right circular cone of height 14 cm and base radius 7 cm?

A)498.35 sq cm B)498.35 sq m C)502.35 sq cm D)502.35 sq m

Answer option B

Explanation

$h = 14$ cm, $r = 7$ cm.

So, $l = (7)^2 + (14)^2 = 245 = 75$ cm.

Total surface area = $\frac{22}{7}$ $(rl + r^2)$

= $\frac{22}{7}$x 7 x 75 + $\frac{22}{7}$ x 7 x 7 cm^2= [154(5 + 1)] cm^2

= (154 x 3.236) cm^2 = 498.35 cm^2.

Example 5

A cistern of capacity 8000 liter measures externally 3.3 m by 2.6 m by 1.1 m and its walls are 5 cm thick. The thickness of the bottom is:

A)90 cm B)1 dm C)1 m D) 1.1 cm

Answer option B

Explanation

Let the thickness of the bottom be *x* cm

Then, [(330 - 10) x (260 - 10) x (110 - *x*)] = 8000 x 1000

320 x 250 x (110 - *x*) = 8000 x 1000;

(110 - *x*) = $\frac{8000\ X\ 1000}{320\ X\ 250}$ = 100

x = 10 cm = 1 dm.

PROBLEMS

1) Find the volume, curved surface area and the total surface area of a cylinder with diameter of base 7 cm and height 40 cm.

a)V= 1640 cm3 CSA= 880 cm2 TSA = 960 cm2 b) V= 1590 cm3 CSA= 990 cm2 TSA = 875 cm2
c) V= 1540 cm3 CSA= 880 cm2 TSA = 957 cm2 d) V= 1740 cm3 CSA= 800 cm2 TSA = 857 cm2

2) Three solid cubes of sides 1 cm, 6 cm and 8 cm are melted to form a new cube. Find the surface area of the cube so formed.
a)386 cm^2. b) 400 cm^2. c) 450 cm^2. d) 486 cm^2.

3) If the capacity of a cylindrical tank is 1848 m^3 and the diameter of its base is 14 m, then find the depth of the tank.
a)8 m b) 10 m c) 12 m d) 14 m

4) How many iron rods, each of length 7 m and diameter 2 cm can be made out of 0.88 cubic meter of iron?
a)200. b) 300. c) 400. d) 500.

5) Find the slant height, volume, curved surface area and the whole surface area of a cone of radius 21 cm and height 28 cm.

a)30cm. b) 35cm c) 40cm. d) 50cm.

6) Find the length of canvas 1.25 m wide required to build a conical tent of base radius 7 meter and height 24 meter.
a)140 m b) 240 m c) 340 m d) 440 m

7) The heights of two right circular cones are in the ratio 1 : 2 and the perimeters of their bases are in the ratio 3 : 4. Find the ratio of their volumes.

a)30 : 8. b) 8: 30. c) 32 : 9 d) 9 : 32.

8) A conical vessel, whose internal radius is 12 cm and height 50 cm, is full of liquid. The contents are emptied into a cylindrical vessel with internal radius 10 cm. Find the height to which the liquid rises in the cylindrical vessel.

a)82 cm b)72 cm c)64 cm d)54 cm

9) If the radius of a sphere is increased by 50%, find the increase percent in volume and the increase percent in the surface area.

a)V=237.5%, SA= 125%. b)V=240.5%, SA= 120%.
c)V=220.5%, SA= 150%. d)V=260.5%, SA= 135%.

10) The radius of the bases of a cylinder and a cone are in the ratio of 3 : 4 and It heights are in the ratio 2 : 3. Find the ratio of their volumes.

a)2:3 b)3:4 c)3:5 d)9:8

Permutations And Combinations

Factorial Notation:

Let *n* be a positive integer. Then, factorial *n*, denoted *n*! is defined as:
n! = n(n - 1)(n - 2) ... 3.2.1.

Examples:

We define 0! = 1.
4! = (4 x 3 x 2 x 1) = 24.
5! = (5 x 4 x 3 x 2 x 1) = 120.

Permutations:

The different arrangements of a given number of things by taking some or all at a time, are called permutations

Examples:

All permutations (or arrangements) made with the letters *a*, *b*, *c* by taking two at a time are
(*ab*, *ba*, *ac*, *ca*, *bc*, *cb*).
All permutations made with the letters *a*, *b*, *c* taking all at a time are:
(*abc*, *acb*, *bac*, *bca*, *cab*, *cba*)

Number of Permutations:

Number of all permutations of *n* things, taken *r* at a time, is given by:
${}^{n}p_{r}$= n(n-1)(n-2).....(n-r+1) = $\frac{n!}{(n-r)!}$

Examples:

${}^{6}P_{2}$ = (6 x 5) = 30.
${}^{7}P_{3}$ = (7 x 6 x 5) = 210.
Cor. number of all permutations of *n* things, taken all at a time = *n*!.

An Important Result:

If there are *n* subjects of which p_1 are alike of one kind; p_2 are alike of another kind; p_3 are alike of third kind and so on and p_r are alike of r^{th} kind,

such that ($p_1 + p_2 + ... p_r$) = *n*.

Then, number of permutations of these n objects is = $\left[\frac{n!}{P1!P2!.....Pr!}\right]$

Combinations:

Each of the different groups or selections which can be formed by taking some or all of a number of objects is called a combination.

Examples:

Suppose we want to select two out of three boys A, B, C. Then, possible selections are AB, BCand CA.

Note:

AB and BA represent the same selection.
All the combinations formed by *a*, *b*, *c* taking *ab*, *bc*, *ca*.
The only combination that can be formed of three letters *a*, *b*, *c* taken all at a time is *abc*.
Various groups of 2 out of four persons A, B, C, D are:
AB, AC, AD, BC, BD, CD.
Note that *ab ba* are two different permutations but they represent the same combination.

Number of Combinations:

The number of all combinations of *n* things, taken *r* at a time is:

$^{n}C_{r} = \frac{n!}{r!(n-r)!} = \frac{n(n-1)(n-2).....r\ factors}{r!}$

Note:

$^{n}C_{n} = 1$ and $^{n}C_{0} = 1$.

$^{n}C_{r} = {}^{n}C_{(n-r)}$

Examples

$^{11}C_{4} = \frac{11\times10\times9\times8}{4\times3\times2\times1} = 330$

$^{16}C_{13} = {}^{16}C_{(16-13)} = {}^{16}C_{3} = \frac{16\times15\times14}{3\times2\times1} = 560$

Example 1

In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?

A) 120 B) 720 C) 4320 D) 2160 E) None of these

Answer: Option B

Explanation:

The word 'OPTICAL' contains 7 different letters.
When the vowels OIA are always together, they can be supposed to form one letter.
Then, we have to arrange the letters PTCL (OIA).
Now, 5 letters can be arranged in 5! = 120 ways.
The vowels (OIA) can be arranged among themselves in 3! = 6 ways.
Required number of ways = (120 x 6) = 720.

Example 2

In how many different ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together?

A) 10080 B) 4989600 C) 120960 D) None of these

Answer: Option C

Explanation:

In the word 'MATHEMATICS', we treat the vowels AEAI as one letter.
Thus, we have MTHMTCS (AEAI).
Now, we have to arrange 8 letters, out of which M occurs twice, T occurs twice and the rest are different.
Number of ways of arranging these letters = $\frac{8!}{(2!)\,(2!)}$ = 10080
Now, AEAI has 4 letters in which A occurs 2 times and the rest are different.
Number of ways of arranging these letters = $\frac{4!}{2!}$ = 12
∴ Required number of words = (10080 x 12) = 120960.

Example 3

How many 4-letters words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed?

A) 40 B) 400 C) 5040 D) 2520

Answer: Option C

Explanation:

'LOGARITHMS' contains 10 different letters.
Required number of words = Number of arrangements of 10 letters, taking 4 at a time.
= 10P4
= (10 x 9 x 8 x 7)
= 5040

Example 4

In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?

A) 63 B) 90 C) 126 D) 45

Answer: Option A

Explanation:

Required number of ways = $({}^{7}C_5 \times {}^{3}C_2) = ({}^{7}C_2 \times {}^{3}C_1) = (\frac{7 \times 6}{2 \times 1} \times 3) = 63$

Example 5

In how many different ways can the letters of the word 'DETAIL' be arranged in such a way that the vowels occupy only the odd positions?

A) 32 B) 48 C) 36 D) 60

Answer: Option C

Explanation:

There are 6 letters in the given word, out of which there are 3 vowels and 3 consonants.
Let us mark these positions as under:
(1) (2) (3) (4) (5) (6)
Now, 3 vowels can be placed at any of the three places out 4, marked 1, 3, 5.
Number of ways of arranging the vowels = ${}^{3}P_3 = 3! = 6$.
Also, the 3 consonants can be arranged at the remaining 3 positions.
Number of ways of these arrangements = ${}^{3}P_3 = 3! = 6$.
Total number of ways = (6 x 6) = 36.

PROBLEMS

1. Find permutations of letters taken all at a time that can be formed out of 'watch'.

a) 20 b) 24 c)120 d) 124

2. The number of ways of arranging 4 men and 5 women alternately in a row so that the row begins and ends with a woman, is....

a)280 b) 720 c) 2880 d) 3600

3. The number of ways of arranging 4 boys and 3 girls in a row so that the row begins with a boy and ends with a girl?

a) 360 b) 480 c)720 d)1440

4. In how many different ways can the letters of the word SECOND be arranged?

a) 720 b) 120 c) 5040 d) 2704

5. In how many different ways can the letters of the word ARMOUR be arranged?

a) 720 b) 300 c) 640 d)360

6. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

a) 159 b) 194 c) 205 d) 209

7. How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?

a) 5 b) 10 c) 15 d) 20

8. In how many ways a committee, consisting of 5 men and 6 women can be formed from 8 men and 10 Women?

a) 266 b) 5040 c) 11760 d) 86400

9. A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?

a) 32 b) 48 c) 64 d) 96

10. In how many different ways can the letters of the word 'DETAIL' be arranged in such a way that the Vowels occupy only the odd positions?

a) 32 b) 48 c) 36 d) 60

PROBABLITY

Experiment:

An operation which can produce some well-defined outcomes is called an experiment.

Random Experiment:

An experiment in which all possible outcomes are know and the exact output cannot be predicted in advance, is called a random experiment.

Examples:

Rolling an unbiased dice.
Tossing a fair coin.
Drawing a card from a pack of well-shuffled cards.
Picking up a ball of certain colour from a bag containing balls of different colours.

Details:

When we throw a coin, then either a Head (H) or a Tail (T) appears.
A dice is a solid cube, having 6 faces, marked 1, 2, 3, 4, 5, 6 respectively. When we throw a die, the outcome is the number that appears on its upper face.
A pack of cards has 52 cards.

It has 13 cards of each suit, name Spades, Clubs, Hearts and Diamonds.
Cards of spades and clubs are black cards.
Cards of hearts and diamonds are red cards.
There are 4 honours of each unit.
There are Kings, Queens and Jacks. These are all called face cards.

Sample Space:

When we perform an experiment, then the set S of all possible outcomes is called the sample space.

Examples:

In tossing a coin, S = {H, T}
If two coins are tossed, the S = {HH, HT, TH, TT}.
In rolling a dice, we have, S = {1, 2, 3, 4, 5, 6}.

Event:

Any subset of a sample space is called an event
Probability of Occurrence of an Event:
Let S be the sample and let E be an event.
Then, E ⊆ S.

∴ P(E) = $\frac{n(E)}{n(S)}$

Results on Probability:
P(S) = 1
0 ≤ P (E) ≤ 1
P(ϕ) = 0
For any events A and B we have : P(A ∪ B) = P(A) + P(B) - P(A ∩ B)
If A denotes (not-A), then P(A) = 1 - P(A).

Examples

1) A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

A) $\frac{3}{4}$ B) $\frac{4}{7}$ C) $\frac{1}{2}$ D) $\frac{3}{7}$

Answer Option B

Explanation

Let number of balls = (6 + 8) = 14.
Number of white balls = 8.
P (drawing a white ball) = $\frac{8}{14}$=$\frac{4}{7}$.

2) One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card (Jack, Queen and King only)?

A) $\frac{1}{13}$ B) $\frac{3}{13}$ C)$\frac{1}{4}$ D) $\frac{9}{52}$

Answer Option B

Explanation

Clearly, there are 52 cards, out of which there are 12 face cards.
P (getting a face card) =$\frac{12}{52}$ =$\frac{3}{13}$.

3) Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart, is:

A) $\frac{3}{20}$ B) $\frac{29}{34}$ C) $\frac{47}{100}$ D) $\frac{13}{102}$

Answer Option D

Explanation

Let S be the sample space.

Then, $n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326.$

Let E = event of getting 1 spade and 1 heart.

$\therefore$ $n(E)$ = number of ways of choosing 1 spade out of 13 and 1 heart out of 13

$= ({}^{13}C_1 \times {}^{13}C_1) = 13 \times 13 = 169$

$P(E) = \frac{n(E)}{n(S)} = \frac{169}{1326} = \frac{13}{102}$.

4) A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red, is:

A) $\frac{1}{22}$ B) $\frac{3}{12}$ C) $\frac{2}{91}$ D) $\frac{2}{27}$

Answer Option C

Explanation

Let S be the sample space.

Then, $n(S)$ = number of ways of drawing 3 balls out of 15

$= {}^{15}C_3 = \frac{15x14x13}{3x2x1} = 455.$

Let E = event of getting all the 3 red balls

$N(E) = {}^{5}C_3 = {}^{5}C_2 = \frac{(5x4)}{(2x1)} = 10$

$P(E) = \frac{n(E)}{n(S)} = \frac{10}{455} = \frac{2}{91}$

5) A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is:

A) $\frac{1}{13}$ B) $\frac{2}{13}$ C) $\frac{1}{26}$ D) $\frac{1}{52}$

Answer option C

Explanation

Here, $n(S) = 52$.
Let E = event of getting a queen of club or a king of heart.

Then, $n(E) = 2$.

P(E) = $\frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}$

PROBLEMS

1) If $P(0 \leq z \leq z_1) = 0.3770$ then z_1 =.....
   a) ± 1.16 b) ±2.26 c) ±3.12 d) ±4.16

2) The probability of getting no head in four tosses of a fair coin is.....
   a) 0.01 b) 0.02 c) 0.03 d) 0.06

3) If mean = 5, variance = $\frac{10}{3}$ of a binomial distribution, then n =.....
   a)10 b) 13 c)15 d) 17

4) 10% of tools produced in a certain manufacturing process turns out to be defective. The probability that in a sample of 10 tools chosen at random exactly 2 will be defective is.....
   a) 0.184 b) 0.28 c) 0.316 d) 0.48

5) One of the mode of Poisson distribution is 2 and p(x = 2) = 0.612 then μ =.....
   a) 0.184 b) 0.282 c) 0.316 d) 0.48

6) If X is a Poisson variety such that p(x = 2) = 27 and p(x = 3) = 0.18 then μ =.....
   a) 1 b) 2 c) 3 d) 5

7) If a binomial distribution is bimodal at x = 4 and 5 and p = q then =.....
   a) 1 b) 3 c) 6 d) 9

8) Six coins are tossed, probability of getting 2 to 4 head using normal distribution is.....
   a) .625 b) .785 c) .81 d) .435

9) If on an average one ship is every ten is wrecked. The probability that only 2 arrive safely one of 5 ship is.....
   a) .81 b) .081 c) .9 d) .0081

10) The overall percentage of failures in a certain examination is 20. If six candidates appear in the Examination. The probability that at least five pass the examination is
   a) .25 b) .321 c) .655 d) .825

PROBLEMS ON AGES

Examples

1) The age of father 10 years ago was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:

A) 5:2 **B) 7:3** **C) 9:2** **D) 13:4**

Answer Option B

Explanation:

Let the ages of father and son 10 years ago be 3*x* and *x* years respectively.
Then, (3*x* + 10) + 10 = 2[(*x* + 10) + 10]
⇒ 3*x* + 20 = 2*x* + 40
⇒ *x* = 20.
Required ratio = (3*x* + 10) : (*x* + 10) = 70 : 30 = 7 : 3.

2) Q is as much younger than R as he is older than T. If the sum of the ages of R and T is 50 years, what is definitely the difference between R and Q's age?

A) 1Year **B) 2 Years** **C) 25 Years** **D) Data inadequate**

Answer Option D

Explanation

Given that:
1. the difference of age b/w R and Q = the difference of age b/w Q and T.

2. Sum of age of R and T is 50 i.e. (R + T) = 50.

Question: R - Q =?.

Explanation:

R - Q = Q – T ⇒ (R + T) = 2Q

Now given that, (R + T) = 50

so, 50 = 2Q and therefore Q = 25.

Question is (R - Q) =?

Here we know the value (age) of Q (25), but we don't know the age of R.

Therefore, (R-Q) cannot be determined.

3) A person's present age is two-fifth of the age of his mother. After 8 years, he will be one-half of the age of his mother. How old is the mother at present?

A) 32 Years B) 36 Years C)40 Years D) 48 Years

Answer Option C

Explanation

Let the mother's present age be *x* years.

Then, the person's present age = $\left[\frac{2}{5}x\right]$ years.

$\therefore \left[\frac{2}{5}x + 8\right] = \frac{1}{2}(x + 8)$

$\Rightarrow$ 2(2*x* + 40) = 5(*x* + 8)

$\Rightarrow$ *x* = 40.

4) Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was born. What is the difference between the ages of her parents?

A)2 years B) 4 years C) 6 years D) 8 years

Answer Option C

Explanation

Mother's age when Ayesha's brother was born = 36 years.
Father's age when Ayesha's brother was born = (38 + 4) years = 42 years.
Required difference = (42 - 36) years = 6 years.

The present ages of three persons in proportions 4: 7:9. Eight years ago, the sum of their ages was 56. Find their present ages (in years).

A)8,20,28 B) 16,28,32) 20,35,45 D) None of these

Answer Option B

Explanation

Let their present ages be 4*x*, 7*x* and 9*x* years respectively.
Then, (4*x* - 8) + (7*x* - 8) + (9*x* - 8) = 56

$\Rightarrow 20x = 80$
$\Rightarrow x = 4.$
Their present ages are $4x = 16$ years, $7x = 28$ years and $9x = 36$ years respectively.

PROBLEMS

1. M's father is thrice as old as his daughter. After 12 years he will be twice the age of his daughter. His present age is
   a) 36 b) 39 c) 42 d) 45

2. Kati is three times as old as her son. After fifteen years she will be twice as old as her son. Hence Kati's age now is
   a) 36 b) 42 c) 45 d) 48

3. Five years ago, Beth's age was three times that of Amy. Ten years ago, Beth's age was one half that of Chelsea. If C represents Chelsea's current age, which of the following represents Amy's current age?
   a) c/6 + 5 b) 2c c) (c-10)/3 d) 3c-5

4. The average age of a family of 5 members is 20 years. If the age of the youngest member be 10 years Then what was the average age of the family at the time of the birth of the youngest member?
   a) 13.5 b) 14 c) 15 d) 12.5

5. Fifteen years ago the ages of a mother and her daughter were in the ratio 6:1. If the present age of the Daughter is 20years, then the mother's age, in years, after 5years from now is.....
   a) 40 b) 45 c) 50 d) 55

6. The age of a son and his father were in the ratio 2:5 seventeen years ago. If the present age of the son Is 35, then what is the present age of the father?
   a) 66 b) 65 c) 64 d) 62

7. Twenty years back, the ratio of the ages of a father and his son was 11:3. If the ratio of their present ages Is 2:1, then the age of the son is....
   a) 30 b) 35 c) 34 d) 32

8. The present age of father and son are in the ratio 5:2. If after 10 years the ratio becomes 2:1, The present age of the son is....
   a) 25 b) 20 c) 15 d) 10

9. Five years back the ratio of a son's age to that of his father is 2:5. The present age of the father is 50years. Then the present age of the son (in years) is....
   a) 18 b) 21 c) 23 d) 25

10. The average age of a man and his son is 44 years. The ratio of their 31:13 respectively. What is the Daughter age?
    a) 35 years b) 26 years c) 15 years d) 20 years

Reasoning

List of Topics

1) Coding And Decoding
   - ❖ Alphabet Coding
   - ❖ Coded Language
   - ❖ Artificial Language

2) Number Series
   - ❖ Mathematical Operations
   - ❖ Series

3) Directions

4) Blood Relations
   - ❖ Coded Relations
   - ❖ Direct Relations
   - ❖ Puzzle Relations

5) Cubes

6) Clocks

7) Calendars

8) Puzzle Test
   - ❖ Seating Or Sitting Arrangements
   - ❖ Puzzle Arrangements

9) Syllogisms

10) Data Sufficiency
   - ❖ Blood Relations
   - ❖ Coding And Decoding

1) Coding And Decoding

1. Alphabet Coding

Introduction:

A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	2	3	4	5	6	7	8	9	10	11	12	13	14
26	25	24	23	22	21	20	19	18	17	16	15	14	13

O	P	Q	R	S	T	U	V	W	X	Y	Z
15	16	17	18	19	20	21	22	23	24	25	26
12	11	10	9	8	7	6	5	4	3	2	1

Problems For Practise:

01. If CEJQ is coded as XVQJ, then BDIP will be coded as :
a) WURQ b) YWRK c) WUPI d) YWPI e) None

02. If 'EFGHIJ' are coded letters representing 'VUTSRQ'. Choose the right code for the word'ZERO'.
a) BUHN b) AVIM c) AVIL d) AUTL e) AVTI

03.'GO AHEAD' is coded as 'JRDKHDG' and STOP is coded as 'VWRS', how will you code/decode the letters for the word GRZQ.
a) OWNS b) DOWN c) DONE d) COME e) SHUT

04.If MAILED is coded as NBJMFE. How will you code the word ACTED?
a) BDUFE b) BUDFE c) BUFDE d) BDUEF e) None

05.If TSEREVE and NOITACUDE stands for EVEREST and EDUCATION respectively. How will you code REDFORT.
a) FDERTRO b) ROFDERT c) TROFDER d) TFRODER e) None

06.If LODES is coding as 463121, how will you code the word DOES?
a) 4632 b) 3261 c) 3621 d) 6321 e) None

07.If 'FIRE' is coded for a secret message to be tele printed as 'EHQD', how is the reply 'DONE' to be relayed?
a) DMOE b) CNMD c) DLNC d) DNDE e) None

08. In a certain code 'MOTHER' is written as OMHTRE. How will 'ANSWER' be written in that code?
a) NBWRRF b) MAVSPE c) NBWTRD d) NAWSRE e) None

09. In a certain code, MONKEY is written as XDJMNL. How is TIGER written in that code?

a)QDFHS b) QDFSH c) FGHIR d) REFDS e) None

10. In a certain code, BOMBAY is written as MYMYMY. How is TAMIL NADU written in that code?
a) TIATIATIA b) IATIATIAT c) MNUMNUMNU d) ALDALDALD e) None

11. In a code DID = 17and DONE = 38, then BASIS = ?
a) 50 b) 51 c) 45 d) 49 e) None

12. In a code SHARP = 58034 and PUSH = 4658, then RUSH = ?
a) 3658 b) 3568 c) 5447 d) 6855 e) None

13.If in a certain language, MADRAS is written as NBESBT, how is BOMBAY coded in that code?
a)CPNCBX b)CPNCBZ c)CPOCBZ d)CQOCBZ e) None

14. In a certain language TRIPPLE is written as SQHOOKD, how is DISPOSE written in that code?
a)CHRONRD b)DSOESPI c)ESJTPTF d)ESOPSID e)None

15. If in a code language, COULD is written as BNTKC and MARGIN is written as LZQFHM, how will MOULDING be written in that code?
a)CHMFINTK b)LNKTCHMF c)LNTKCHMF d)NITKHCMF e)None

16. In a certain code, MUNICIPALITY is written as INMUAPCIYTLI, how is JUDICIAL written in that code?
a) UJDILACI b) IDUJLACI c)IDJULAIC d)IDJULACI e)None

17. If FRAGRANCE is written as SBHSBODFG, how can IMPOSING be written?
a)NQPTJHOJ b)NQPTJOHI c)NQTPJOHJ d)NQPTJOHJ e)None

18. In a certain code, COMPUTER is written as RFUVQNPC, how is MEDICINE written in the same code?
a)EOJDJEFM b)EOJDEJFM c)MFEJDJOE d)MFEDJJOE e)None

19. If in a certain code, GAMBLE is written as FBLCKF, how FLOWER is coded in that code?
a)GKPVFQ b)EMNXDS c)GMPVDS d)HNQYGT e)EKNVDQ

20. If in a certain code, NATURE is coded as MASUQE, how is FAMINE coded in that code?
a)FBMJND b)FZMHND c)GANIOE d)EALIME e)FZNJME

21. If in a certain code, TEACHER is written as VGCEJGT , how would DULLARD be written in that code?
a)FWMNCTF b)FWNNBTE c)FWNNCSF d)FWNNCTF e)None

22. If in a certain code, FASHION is coded as FOIHSAN, how is PROBLEM is written in that code?
a)ROBLEMP b)PELBORM c)PRBOELM d)RPBOELM e)PELBROM

23. If in a certain code, KINDLE is coded as ELDNIK, how is EXOTIC coded in that language?
a)EXOTLC b)CXOTIE c)COXITE d)CITOXE e)EOXITC

24. If CERTAIN is coded as XVIGZRM, how can MUNDANE be coded?
a)MFMXZMV b)NFMWZMV c)NFMWZMX d)VMZWMFN e)None

25. In a certain code DATE is written as #%$@ and STYLE is written as *$©!@. How is DELAY written in that code?

a)#@!%© b)#©$%@ c)#@$%© d)#$!%© e)None

26. In a certain code ABRACADABRA is written as ZYIZXZWZYIZ. How is HOCUSPOCUS written in that code?
a)SLXFHKLXFH b)SLXZHKLXFH c)SLXFHKMXFH d)SLXFHILXFH e)None

27. In a certain code DECEMBER is written as RDEEBCME. How is FEBRUARY written in that code?
a)YFAERBRU b)YFREABUR c)YFAEBRUR d)YFAERUBR e)None

28. In a certain code SUCCESS is written as TWFGJYZ. How is MIRACLE written in that code?
a)NKVEHRL b)NKUEHRL c)NKTEHRL d)NKUHHRL e)None

29. In a certain code HYD is written as 50. How is NAG written in that code?
a) 2 b) 0.5 c) 1 d) 20 e)None

Key: 1.b 2.c 3.b 4.a 5.c 6.c 7.b 8.d 9.a 10.c 11.a 12.a 13.b
14.a 15.c 16.d 17.d 18.a 19.b 20.d 21.d 22.b 23.d 24.b 25.a 26. a
27. B 28.b 29. a

2. Coded Language

Directions (1-2): Study the following information to answer the given questions.

In a certain code:
'for profit order now' is written as 'hoja ye ga'; 'right now for him' is written as 'gaveja se' ;
'place order for profit' is written as 'ga bi ho ye' 'only in right order' is written as 've du ye zo'

01. 'hove du' could be a code for which of the following?
a)In right profit b)only in profit c)Order only him d)Place in right e)Order only now

02. Which of the following may represent 'only for now'?
a)ja bi zo b)du zo ga c)zo gaja d)zo ga ye e)du bi ja

Directions (3-5): Study the following information to answer the given questions
'rise and shine' is written as '9 3 5'; 'nice sun rise' is written as '7 1 9'; 'sun and moon' is written as '6 5 7'

03. What is the code for 'sun'?
a)5 b)6 c)7 d)1 e)9

04. Which of the following represents 'moon rise'?
a)5 9 b)7 1 c)6 7 d)1 3 e)9 6

05. What does '1' stand for?
a)Nice b)Sun c)Rise d)Moon e)Either 'moon' or 'sun'

Directions (6-9): Study the following information to answer the given questions
'school is far from here' is written as 'to ga dib a ni' , 'here is the school bus' is written as 'ru to ni di zi'

'come from school' is written as 'ganimo', 'is the bus late' is written as 'ruzi fa to' then

06.What will the code 'fa moba' stand for in the given code language?
a)come far late b)bus far late c)come far school d)come late from e)None of these

07. What may the code 'rumo di' stand for in the given code language?
a)the bus here b)come from here c)come the late d)come the Here e)late is come

08. What may be the code for 'come this far' in the given code language?
a)bamoru b)mobazi c)jo mo di d)job a mo e)jo bani

09. What may be the code for 'from school bus' in the given code language?
a)ni gab a b)zi rug a c)gani di d)zini di e)ziniga

10. If in a certain code language
'2 4 5' means-'Art and Talent', '3 1 6' means-'Callous to Generous', '1 4 7' means-'Callous and Polite'

What is the code used for 'to'?
a)Only 3 b)Only 1 c)3 or 6 d)Only 6 e)None of these

11.In a certain code language
'5 7 9' means-'Kanchan is softspoken', '6 9 4' means-'Soft-spoken beautiful pure',
'4 7 3' means-'Ganga is pure',What is the code used for 'Kanchan'?
a)only 5 b) Only 7 c) 5 or 9 d)Cannot be determined e)None

12.In a certain code language
'1 2 3' means-'Mahendra is able', '3 4 5' means-'Sunita is unlucky',
'5 2 6' means-'Mahendra was unlucky',

What is the code used for unlucky?
a)2 b)3 c)1 d)Cannot be determined e)None

Directions (13-14): If '6 7 8' means-'Society Family Husbandry', '5 7 4' means-'Husbandry Health Control', '3 4 2' means-'Health Census shop'

13. Which code has been used for 'Census'?
a)3 or 2 b)3 or 7 c)4 d)5 e)6

14. For which word code '6' has been used?
a)Society b)Family c)Husbandry d)Society or Family e)None

15. If 'K R N' means-'Callous collision life', 'R T P' means-'Life very sad', 'N P D' means-'Collision sad future' then what is the code used for 'Callous'?
a)R b)N c)K d)Cannot be determined e)None

16. If 'M L T' means-'Day is clear', 'L K S' means-'Life is sad','S M O' means-'Clear or sad', then What is the code used for 'Day'?
a)T b)K c)MO d)L e)None

17. If 'nsoptrkilchn' stands for 'Sharma gets marriage gift', 'ptrlnm wop nhi' stands for 'wife gives marriage gift', 'tip wop nhi' stands for 'he gives Nothing',.What is the code for 'gives'?

a)Chn b)nhi c)ptr d)wop e)None

18. In a certain code language 'neetim see' means how are you? 'Ble nee see' means where are you? What is the code for where?

a)Nee b)tim c)see d)can't be determined e)None

Key: 1.a 2.c 3.c 4.e 5.a 6.a 7.d 8.d 9.e 10.c 11.b 12.e 13.a 14.d 15.c 16.a 17.d 18.e

3. Artificial Language

Directions to Solve

First, you will be given a list of three "nonsense" words and their English word meanings. The question(s) that follow will ask you to reverse the process and translate an English word into the artificial language.

1. **Here are some words translated from an artificial language.**
   ***gorblflur* means fan belt**
   ***pixngorbl* means ceiling fan**
   ***arthtusl* means tile roof**

   Which word could mean "ceiling tile"?
   A. gorbltusl B. flurgorbl
   C. arthflur D. pixnarth

2. **Here are some words translated from an artificial language.**
   ***hapllesh* means cloudburst**
   ***srenchoch* means pinball**
   ***resbosrench* means ninepin**

   Which word could mean "cloud nine"?
   A. leshsrench B. ochhapl C. haploch D. haplresbo

3. **Here are some words translated from an artificial language.**
   ***agnoscrenia* means poisonous spider**
   ***delanocrenia* means poisonous snake**
   ***agnosdeery* means brown spider**

   Which word could mean "black widow spider"?
   A. deeryclostagnos B. agnosdelano
   C. agnosvitriblunin D. trymuttiagnos

4. Here are some words translated from an artificial language.
   moolokarn means blue sky
   wilkospadi means bicycle race
   moolowilko means blue bicycle

   Which word could mean "racecar"?
   A. wilkozwet B. spadiwilko
   C. moolobreil D. spadivolo

5. Here are some words translated from an artificial language.
   migenlasan means cupboard
   lasanpoen means boardwalk
   cuopdansa means pullman

   Which word could mean "walkway"?
   A. poenmigen B. cuopeisel
   C. lasandansa D. poenforc

6. Here are some words translated from an artificial language.
   godabim means kidney stones
   romzbim means kidney beans
   romzbako means wax beans

   Which word could mean "wax statue"?
   A. godaromz B. lazbim
   C. wasibako D. romzpeo

7. Here are some words translated from an artificial language.
   granamelke means big tree
   pinimelke means little tree
   melkehoon means tree house

   Which word could mean "big house"?
   A. granahoon B. pinishur
   C. pinihoon D. melkegrana

8. Here are some words translated from an artificial language.
   daftafoni means advisement
   imodafta means misadvise
   imolokti means misconduct

   Which word could mean "statement"?
   A. kratafoni B. kratadafta
   C. loktifoni D. daftaimo

9. Here are some words translated from an artificial language.
   lelibroon means yellow hat
   plekafroti means flower garden
   frotimix means garden salad

Which word could mean "yellow flower"?
A. lelifroti B. lelipleka C. plekabroon D. frotibroon

10. Here are some words translated from an artificial language.
myncabel means saddle horse
conowir means trail ride
cabelalma means horse blanket

Which word could mean "horse ride"?
A. cabelwir B. conocabel C. almamyn D. conoalma

Key: 1. D 2. D 3. C 4. D 5. D 6. C 7. A 8. A 9. B 10. A

2) Number Series

1. Mathematical Operations

1. If '+' means 'x', 'x' means '÷', '÷' means '-' and '-' means '+', then what is the value of
285 x 19 -25 + 4÷ 60 = ?
a) 160 b) 120 c) 80 d) 90 e) None

2. If '+' means '-', '-' means 'x',' x' means '÷' and '÷' means '+', then what is the value of
9 – 7 + 85 x 17 ÷ 15 = ?
a) 73 b) 83 c) 79 d) 68 e) None

3. If '+' means '÷', '-' means '+', 'x' means '-' and '÷' means 'x', then what is the value of 16 ÷12 – 6 x 8 + 4 = ?
a) 96 b) 192 c) 162 d) 196 e) None

4. If '-' means 'added to', 'x' means 'subtracted from', '÷' means 'multiplied by' and '+' means 'divided by', then what is the value of 20 x 12 + 4 – 16 ÷ 5 = ?
a) 17 b) 80 c) 63 d) 97 e) None

5. If '+' means '÷', '÷' means 'x', 'x' means '-' and '-' means '+', then what is the value of 15 ÷ 5 x 9 + 3 – 6 = ?
a) 78 b) 72 c) 28 d) 30 e) None

Key: 1. e 2. a 3. d 4. d 5. a

2. Series

Find out the wrong term in the given Number Series.
01. 24, 27, 31, 33, 36
a) 24 b) 27 c) 31 d) 33 e) None of these

02. 196, 169, 144, 121, 80
a) 80 b) 121 c) 169 d) 196 e) None of these

03. 3, 5, 7, 9, 11, 13

a) 3 b) 5 c) 7 d) 9 e) None of these

04. 121, 143, 165, 186, 209
a) 143 b) 165 c) 186 d) 209 e) None of these

05.1, 2, 4, 8, 16, 32, 64, 96
a) 4 b) 32 c) 64 d) 96 e) None of these

06. 8, 14, 26, 48, 98, 194, 386
a) 14 b) 48 c) 98 d) 194 e) None of these

07. 8, 13, 21, 32, 47, 63, 83
a) 13 b) 21 c) 32 d) 47 e) None of these

08. 3, 10, 27, 4, 16, 64, 5, 25, 125
a) 3 b) 4 c) 10 d) 27 e) None of these

09. 380, 188, 92, 48, 20, 8, 2
a) 188 b) 92 c) 48 d) 20 e) None of these

10. 1, 3, 7, 15, 27, 63, 127
a) 7 b) 15 c) 27 d) 63 e) None of these

11. 5, 10, 17, 24, 37
a) 10 b) 17 c) 24 d) 37 e) None of these

12. 1, 3, 10, 21, 64, 129, 256, 778
a) 10 b) 21 c) 129 d) 256 e) None of these

13. 15, 16, 22, 29, 45, 70
a) 16 b) 22 c) 45 d) 70 e) None of these

14. 6, 14, 30, 64, 126
a) 6 b) 14 c) 64 d) 126 e) None of these

15. 10, 26, 74, 218, 654, 1946, 5834
a) 26 b) 74 c) 218 d) 654 e) None of these

16. 3, 7, 15, 39, 63, 127, 255, 511
a) 15 b) 39 c) 63 d) 127 e) None of these

17. 445, 221, 109, 46, 25, 11, 4
a) 25 b) 46 c) 109 d) 221 e) None of these

18. 1236, 2346, 3456, 4566, 5686
a) 1236 b) 3456 c) 4566 d) 5686 e) None of these

19. 5, 10, 40, 80, 320, 550, 2560
a) 80 b) 320 c) 550 d) 2560 e) None of these

20. 3, 2, 8, 9, 13, 22, 18, 32, 23, 42
a) 8 b) 9 c) 13 d) 22 e) None of these

21. 8, 27, 125, 343, 1331
a) 8 b) 343 c) 1331 d) 125 e) None of these

22. 10, 14, 28, 32, 64, 68, 132
a) 28 b) 32 c) 64 d) 132 e) None of these

23. 1, 5, 5, 9, 7, 11, 11, 15, 12, 17
a) 11 b) 12 c) 17 d) 15 e) None of these

24. 11, 2, 21, 3, 32, 4, 41, 5, 51, 6
a) 21 b) 11 c) 32 d) 51 e) None of these

25. 11, 5, 20, 12, 40, 26, 74, 54
a) 5 b) 20 c) 40 d) 26 e) None of these

26. 56, 72, 90, 110, 132, 150
a) 72 b) 90 c) 110 d) 150 e) None of these

27. 8, 13, 21, 32, 47, 63, 83
a) 13 b) 32 c) 47 d) 63 e) None of these

28. 89, 78, 86, 80, 85, 82, 83
a) 83 b) 82 c) 86 d) 78 e) None of these

29. 25, 36, 49, 81, 121, 169, 225
a) 36 b) 49 c) 69 d) 225 e) None of these

30. 2, 5, 10, 17, 26, 37, 50, 64
a) 17 b) 26 c) 37 d) 64 e) None of these

31. 1, 5, 9, 16, 25, 37, 49
a) 9 b) 16 c) 25 d) 37 e) None of these

32. 2, 5, 10, 50, 500, 5000
a) 5 b) 10 c) 50 d) 5000 e) None of these

33. 46080, 3840, 384, 48, 24, 2, 1
a) 384 b) 48 c) 24 d) 2 e) None of these

34. 105, 85, 60, 30, 0, -45, -90
a) 105 b) 60 c) 0 d) -45 e) None of these

35. 325, 259, 202, 160, 127, 105, 94
a) 94 b) 127 c) 202 d) 259 e) None of these

36. 125, 126, 124, 127, 123, 129
a) 126 b) 124 c) 123 d) 129 e) None of these

37. 3, 4, 10, 32, 136, 685, 4116
a) 10 b) 32 c) 685 d) 4116 e) None of these

38. 3, 10, 27, 4, 16, 64, 5, 25, 125
a) 3 b) 4 c) 10 d) 27 e) None of these

39. 5, 27, 61, 122, 213, 340, 509
a) 27 b) 61 c) 122 d) 509 e) None of these

40. 16, 22, 30, 45, 52, 66
a) 30 b) 45 c) 52 d) 66 e) None of these

41. 14, 17, 20, ____ , 26, 29
a) 21 b) 22 c) 23 d) 24

42.48, 43, 39, ____ , 34, 33
a) 40 b) 36 c) 37 d) 35

43.6, 8, 12, 18, 26, ____
a) 36 b) 30 c) 28 d) 26

44.63, 66, 71, 78, 87, ____
a) 98 b) 89 c) 93 d) 95

45.43, 44, 48, 57, 73, ____
a) 89 b) 98 c) 93 d) 95

46.4, 49, 144, 289, ____
a) 244 b) 344 c) 484 d) None of these

47. 2, 4, 8, 3, 9, 27, 5, 25, 125, ____ , ____ , ____
a) 7, 49, 343 b) 6, 36, 216 c) 9, 81, 729 d) None of these

48.4, 16, 64, 256, ____ , 4096
a) 512 b) 1024 c) 2048 d) 814

49.1, 2, 6, 42, 1806, ____
a) 3263442 b) 363442 c) 323442 d) 3623442

50.10, 11, 101, 111, 1011, 1101, ____
a) 1111 b) 1001 c) 10001 d) 1100

51.3, 3, 6, 18, 72, 360, ____
a) 720 b) 2160 c) 1800 d) 1980

52.8, 40, 20, 100, 50, ____ , 125
a) 250 b) 500 c) 1250 d) 75

53.43, 47, 53, 59, 61, ____
a) 62 b) 64 c) 67 d) 63

54.43, 47, 90, 56, 63, 119, 67, 79, ____
a) 150 b) 149 c) 148 d) 146

55.13, 221, 17, 19, 437, 23, 23, ____ , 29
a) 667 b) 567 c) 767 d) None of these

56.64, 216, 512, 1000, 1728, ____
a) 2744 b) 2700 c) 2674 d) 2467

57.3, 5, 12, 38, 154, ____
a) 914 b) 772 c) 534 d) 687

58.0, 6, 24, ____ , 120, 210
a) 90 b) 60 c) 80 d) 100

59.3, ____ , 9, 22.5, 67.5, 236.25, 945
a) 4 b) 5 c) 4.5 d) 6.5

60.3, ____ , 12, 27, 50, 105
a) 7 b) 9 c) 8 d) None of these

Key:	1.c	2.a	3.d	4.c	5.d	6.b	7.d	8.c	9.c	10.c	11.c	12.d	13.b
	14.c	15.d	16.b	17.b	18.d	19.c	20.b	21.e	22.d	23.b	24.c	25.c	26.d
	27.c	28.c	29.a	30.d	31.b	32.d	33.c	34.c	35.c	36.d	37.b	38.c	39.a
	40.b	41.c	42.b	43.a	44.a	45.b	46.a	47.a	48.b	49.a	50.c	51.b	52.a
	53.c	54.d	55.a	56.a	57.b	58.b	59.c	60.a					

3) Directions

01.One day ,David left home and cycled 10 km southwards, turned right and cycled 5km and cycled 10km and turned left and cycled 10km.How many kilometres will he have to cycle to reach his home straight?

a.10km b.15km c.20km d.25km

02. Nita moved 50m towards the north. She then turned to the left and walking for about 25 meter, turned left again and walked 60 meters. Finally, she turned to the right at an angle of 45^0 .In which direction was she moving finally?

a.North-east b. North-west c. South-west d.None

03. A man is facing North –East. He turns 90^0 in the clock wise direction and then 135^0 in the anticlockwise direction. Which direction is he facing now?

a. East b. West c. South d.None

04. A Rat runs 20 m towards east and turns right,runs 10m and turns to right, runs 9m and again turns to left runs 5m and then turns to left ,runs 12m and finally turns to left and runs 6m.Now which direction is the rat facing?

a. East b. West c. South d.None

05. Ravi walks 10 kilometres towards North. From there,he walks 6 kilometres towards south. Then he walks 3 kilometres towards East. How far and in which direction is he with respect to starting point?

a. 7 km East b. 5 km West c. 5 km North-east d.None

06. A person travels a distance of 4m northwards, then travels 3m westwards, the travels 15 metres rightwards. What is the approximate distance of the place he reached from his original place?

a. 17m b. 19m c. 20m d.34m

07. A person travels a distance of 12m north wards and then travels a distance of 5m westwards, then a distance of 3m leftwards and again 6m leftwards and finally travels 15m towards the south. What is the present horizontal distance from the place he had started? Is he to the west or east of the starting point?

a. 7m towards east b. 1m towards west c. 7m towards south d. 1m towards east

08. A person starts from his house and travels a distance of 10m southwards and then travels a distance of 12m rightwards, then travels a distance of 10m rightwards and finally travels a distance of 10m in the eastern direction. At what horizontal distance is he from his house?

a. 2m b. 32m c. 22m d. 12m

09. A person, starting from his house, travels 5km to the west, then travels 7km to the right and then travels 4km to the left after which he travels 2km southwards and finally travels 3km westwards. How far is he from his house straight?

a. 14km b.13km c. 10km d. 15km

10. A person travels 4km towards north and then travels 5km eastward. He then travels 10km rightwards, and then 3km to the left and finally 5km northwards. How far is he approximately from his original destination and in what direction?

a.13.5km towards south-east b. 15km towards south c. 8km towards south-east d. 18km towards south

11. A person starts from his house and travels 10km towards south and then travels 4km rightwards. He then

travels 7km leftwards, again travels 7km leftwards and finally travels 17km to the left. How far is he from his original place?

a. 35km b. 6km c. 31km d. 3km

12. A person travels 20km in the northward direction then 4km in the eastward direction, and then 10km in the northward direction again, then travel 3km in the eastward direction and finally travels 6 km in the southward direction. How far is he from the starting point?

a. 23km b. 25km c. 37km d. 24km

13.Simitha moved a distance 85 m towards south, then turned to right and walked for 15m. She turned right again and walked60m.Finally, she turned right at an angle of 45^{o} and continued walking. In which direction was shemoving ultimately?

a. South-East b. North-West c. North d. North-East

14. One evening, A was standing facing a pole. The shadow of the pole fell exactly to his left. Which direction was he facing?

a. South-East b. South c. North d. East

15. A clock is so placed that at 2pm.the minute hand points towards north-west. In which direction does the hour hand point at 6pm?

a. North-West b. West c. North-East d. South-East

16. A watch shows 8.30. If the minute hand points towards east, in what direction will the hour hand point?

a. South-West b. South-East c. West d. North-West

17. One evening, two friends Swapna and Keerthi were talking to each other with their backs towards each other. If Swapna's shadow was exactly to the right of her, which direction was Keerthi facing?

a. South b. North c. East d. West

18.A Clock is so placed that at 12noon its hour hand points towards north-east. In what direction does the minute hand point at 4pm?

a. South-East b. South-West c.North-East d. North-West

19. Sunil walks 15km towards south and from there he walks 5km towards north. Then, he walks 5km towards west. In which direction is he with reference to his starting point?

a. South-West b. North-West c. South-east d. North-East

20. A man going 50m to the south of his house, turns left and goes another 20m then turning to the north, he goes 30m and thestarts walking to his house. In which direction is he walking now?

a. North-West b. North c. South-East d. West

Key: 1. d 2. c 3. d 4. d 5. c 6. b 7. d 8. a 9. b 10. c 11. d 12. b 13. d 14. b 15. d 16. b 17. a 18. c 19. a 20. b

4) Blood Relations

Introduction:

The questions which are asked in this section depend upon Relation. You should have a sound knowledge of the blood relation in order to solve the questions.
To remember easily the relations may be divided into two sides as given below:

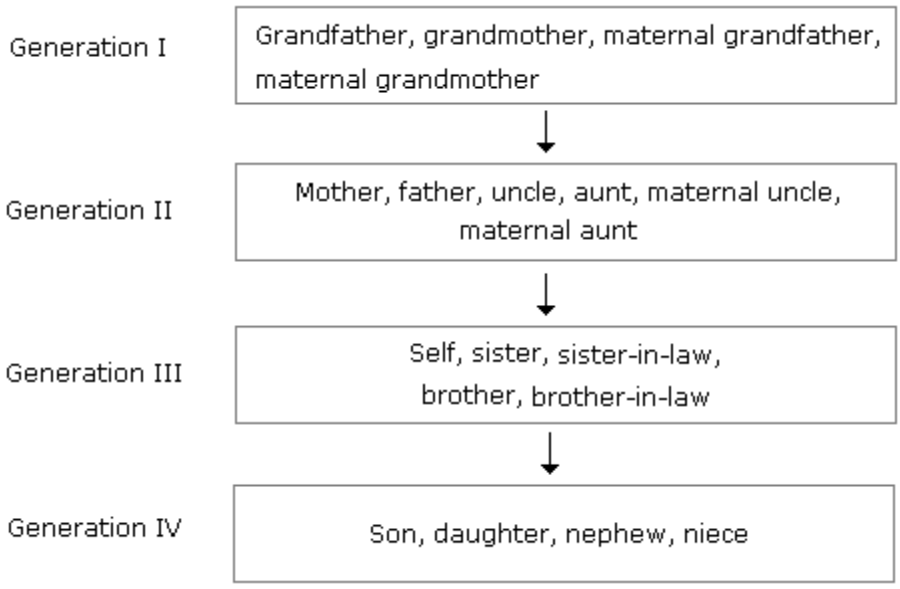
1. Relations of Paternal side:

Father's father → Grandfather
Father's mother → Grandmother
Father's brother → Uncle
Father's sister → Aunt
Children of uncle → Cousin
Wife of uncle → Aunt
Children of aunt → Cousin
Husband of aunt → Uncle

2. Relations of Maternal side:

Mother's father → Maternal grandfather
Mother's mother → Maternal grandmother
Mother's brother Maternal uncle
Mother's sister → Aunt
Children of maternal uncle → Cousin
Wife of maternal uncle → Maternal aunt

Relations from one generation to next:



Different types of questions with explanation:

Type 1:

If A + B means A is the mother of B; A x B means A is the father of B; A $ B means A is the brother of B and A @ B means A is the sister of B then which of the following means P is the son of Q?

(A) Q + R @ P @ N (B) Q + R * P @ N
(C) Q x R $ P @ N (D) Q x R $ P $ N

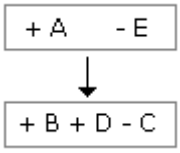
Solution: (D)

Q x R = Q is the mother of R [-Q, ±R]
R $ P = R is the brother of P [+ R, ±P]
P $ N = P is the brother of N [+ P, ±N]
Therefore P is the son of Q.

Type 2:

A has 3 children. B is the brother of C and C is the sister of D, E who is the wife of A is the mother of D. There is only one daughter of the husband of E. what is the relation between D and B?

Solution: With the chart

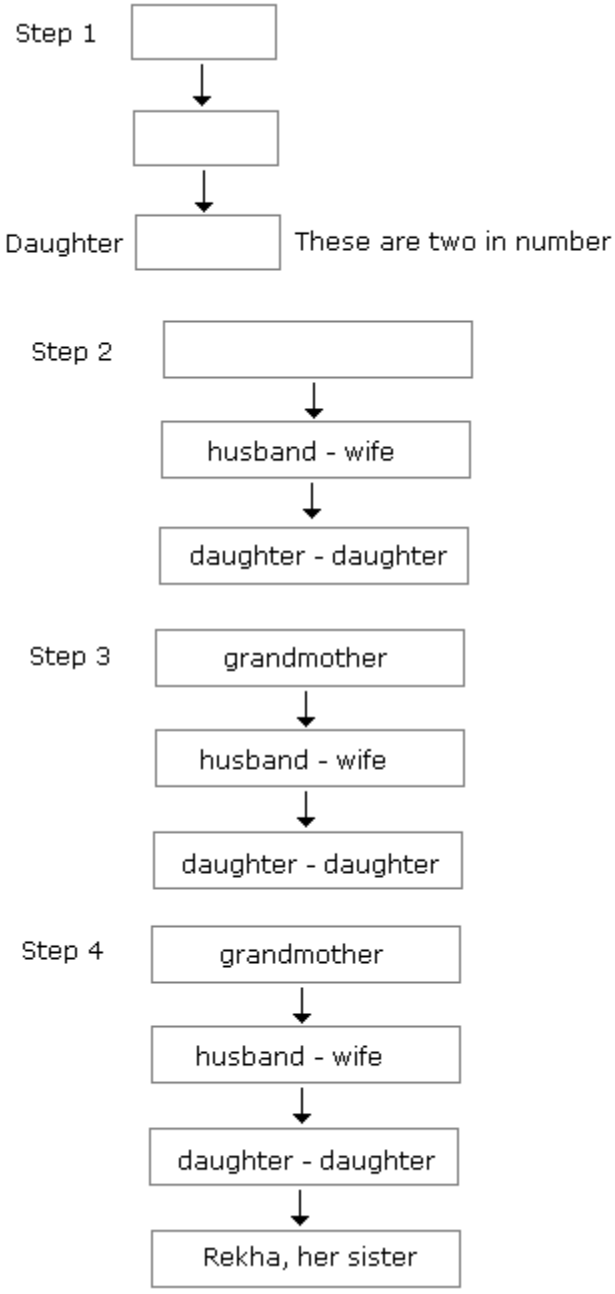


Therefore, D is a boy because there is only one daughter of E.
Hence, B is the brother of D.

Type 3:

Pointing to a photograph, Rekha says to Lalli, "The girl in the photo is the second daughter of the wife of only son of the grandmother of my younger sister." How this girl of photograph is related to Rekha?

Solution:
First Method - By Generating Charts:



Second method:

Grandmother of younger sister of Rekha → Grandmother of Rekha
Wife of only son of grandmother → Mother of Rekha
Younger daughter of the mother → Younger sister.
Note: While solving the question (+) can be used for male and (-) can be used for female.

1. Coded Relations

Directions(Q.No. 1–5):

Read the following information carefully and answer the questions,which follow:

'A – B' means 'A is father of B' 'A + B' means 'A is daughter of B'
'A ÷ B' means 'A is son of B' 'A × B' means 'A is wife of B'

1. Which of the following means P is grandson of S?
a. P + Q – S b. P ÷ Q × S c. P ÷ Q + S d. P × Q ÷ S

2. How is P related to T in the expression 'P + S – T'?
a. Sister b. Wife c. Son d. Daughter

3. In the expression 'P + Q × T' how is T related to P?
a. Mother b. Father c. Son d. Brother

4. Which of the following means T is wife of P?
a. P × S ÷ T b. P ÷ S × T c. P – S ÷ T d. None

5. In the expression 'P × Q – T' how is T related to P?
a. Daughter b. Sister c. Mother d. Can't be determined

6. A3P means A is the mother of P; A4P means A is the brother of P; A9P means A is the husband of P; A5P means A is the daughter of P Which of the following means that K is the mother-in-law of M?
a. M9N3K4J b. M9N5K3J c. K5J9M3N d. K3J9N4M

7. If A $ B means A is the brother of B; A @ B means A is the wife of B; A # B means A is the daughter of B and A * B means A is the father of B, which of the following indicates that U is the father-in-law of P?
a. P @ Q $ T # U * W b. P @ W $ Q * T # U c. P @ Q $ W * T # U d. P @ Q $ T # W * U

8. If X + Y means X is the daughter of Y; X – Y means X is the brother of Y; X % Y means X is the father of Y and X x Y means X is the sister of Y. Which of the following means I is the niece of J?
a. J – N % C x I b. I x C – N % J c. J + M x C % I d. I x C + N – J

9. Question is based on the following information:
A + B means A is the mother of B; A – B means A is the sister of B; A * B means A is the father of B; A β B means A is the brother of B Then which of the following means Q is the grandfather of P?
a.P + N * M * Q b. Q * N * M + P c. Q β M β N * P d. None

Directions (Q.No.10 – 12) :

Read the following information carefully and answer the questions that follow:
X – Y means X is the husband of Y; X + Y means X is the daughter of Y; X × Y means X is the brother of Y.

10.If A + B × C, then which of the following is true?
a. A is the daughter-in-law of C b. A is the aunt of C c. A is the niece of C d.A is the daughter of C

11.If A + B – C, then which of the following is true?
a. C is the mother-in-law of A. b. C is the aunt of A. c. C is the mother of A.
d.C is the sister-in-law of A.

12.If A × B + C, then which of the following is true?
a. A is the father of C. b. A is the uncle of C. c.A is the brother of C. d.A is the son of C.

Directions (Q.No13 & 15) :

Answer the questions based on the following information:
I.'P × Q' means 'P is the brother of Q'.
II.'P + Q' means 'P is the father of Q'.
III.'P ÷ Q' means 'P is the sister of Q'.

13.Which of the following represents 'P is the uncle of Q'?
a. P + D ÷ Q b. P × D + Q c. P + D × Q d.P ÷ D + Q

14.Which of the following statements is superfluous to answer the above question?
a. Only III b. Only II or III c.Only I d.Only II

15.A is the brother of B. C is the sister of B. How is A related to C?
a. Uncle b. Sister c. Brother d.Data insufficient

Key: 1. c 2.a 3.b 4.c 5.d 6.b 7.a 8.d 9.d 10.c 11.c 12.d 13.b 14.a 15.c

2. Direct Relations

01.Pointing to a photograph of a Boy Suresh said, " He is the son of the only son of my mother." How is Suresh related to thatboy?
a) Brother b) Uncle c) Cousin d) Father

02. Introducing a boy, a girl said, " He is the son of the daughter of the father of my uncle." How is the boy related to the girl?
a) Brother b) Nephew c) Uncle d) Son-in-law

03. Pointing to a photograph Lata says, " He is the son of the only son of my grandfather." How is the man in the photograph related to Lata?
a) Brother b) Uncle c) Cousin d) Data is inadequate

04. Deepak said to Nitin, " That boy playing with the football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Deepak?
a)Son b) Brother c) Cousin d) Brother-in-law

05.Veena who is the sister-in-law of Ashok, is the daughter-in-law of Kalyani. Dheeraj is the father of Sudeep who is the only brother of Ashok. How Kalyani is related to Ashok?
a) Mother-in-law b) Aunt c) Wife d) None

06. Amit said – " This girl is the wife of the grandson of my mother." How is Amit related to the girl?
a) Brother b) Grandfather c) Husband d) Father-in-law

07. Introducing Sonia, Aamir says, " She is the wife of only nephew of only brother of my mother." How Sonia is related to Aamir?
a) Wife b) Sister c) Sister-in-law d) Data inadequate

08. Pointing to a person, Deepak said, " His only brother is the father of my daughter's father." How is the person related to Deepak?
a) Father b) Grandfather c) Uncle d) Brother-in-law

09. Pointing to a boy in the photograph Reena said, " He is the only son of the only child of my grandfather." How Reena is related to that boy?
a) Mother b) Sister c) Aunt d) Cannot be determined

10.Anupam said to a lady sitting in a car, " The only daughter of the brother of my wife is the sister-in-law of the brother of your sister." How the husband of the lady is related to Anupam?
a) Maternal Uncle b) Uncle c) Father d) Son-in-law

11.If Raji's mother is Ramu's mother's daughter, how is Ramu related to Raji?
a) Grandfather b) Brother c) Grandson d) Maternal uncle

12. Ranjini who is Sahil's daughter, tells Anjali, "Your mother Rekha is the younger sister of my father, who is the third daughter of Captain Rathore". How is Captain Rathore related to Anjali?
a) Father b) Grandfather c) Father-in-law d) Brother

13.How is Suresh's brother's grandmother's only daughter's child related to Suresh?
a) Brother b) Cousin c) Sister d) Cannot be determined

14.R told S that T is his father's nephew. U is R's cousin but not brother of T. How is U related to T?
a) Mother b) Father c) Aunt d) Sister

15.A lady while looking at a photograph said, "This person is the brother of the daughter of the wife of my brother". How is theperson in the photograph related to the lady?
a) Sister b) Brother c) Nephew d) Niece

Key: 1.d 2.a 3.a 4.b 5.d 6.d 7.a 8.c 9.b 10.d 11.d 12.b 13.a 14.d 15.c

3. Puzzle Relations

Directions (Q.No.1 – 4):

Read the given information carefully and answer the questions that follow.

A family consist of 5 members P, Q, R, S and T. T has two sons, an unmarried daughter and only one

daughter-in-law.

P is the brother-in-law of the above mentioned daughter-in-law. Q's sister is not happy with Q's wife. But P and his father support Q's wife S.

1.Who is the daughter of T?

a) P b) Q c) R d) S

2.How is P related to S?

a) Brother b) Brother-in-law c) Sister-in-law d) Sister

3.How is T related to Q?

a) Father b) Brother c) Father-in-law d) Sister-in-law

4.Who is the wife of Q?

a) P b) R c) S d) T

Directions (Q.No. 5 – 8):

Read the following information carefully and answer the questions that follow.

A family consists of eight persons P, Q, R, S, T, U, V and W. P is a doctor. R is a Computer Engineer and is the wife of Q, who is a Mechanical Engineer. V is the father-in-law of T, a teacher. R and U are the daughters of V, a scientist. W is the wife of V and Grandmother of P and S. P is the cousin of S and the son of the Mechanical Engineer. U is the wife of the Teacher. S is a Student.

5.How is the Student related to the Computer Engineer?

a) Nephew b) Son c) Niece d) Cannot be determined

6.How is the Scientist related to S?

a) Father b) Grandfather c) Cousin d) Cannot be determined

7.How many female members are there in the family?

a) 4 b) 2 c) 3 d) Either (a) or (c)

8.How is T related to R?

a) Father b) Father-in-law c) Brother-in-law d) Either (b) or (c)

Key: 1.c 2.b 3.a 4.c 5.d 6.b 7.d 8.c

5) Cubes

01.A cube is cut into 64 equal cubes. Now from each side of the original cube, 2nd and 3rd small cubes are removed. Now the whole thing is painted black. No of cubes which are not painted?

a) 64 b) 8 c) 26 d) 16

02.A cube is cut into 64 equal cubes. Now from each side of the original cube, 2nd and 3rd small cubes are removed. Now the whole thing is painted black. No of cubes which are painted 1 face?

a) 2 b) 8 c) 0 d) 32

03.A cube is cut into 64 equal cubes. Now from each side of the original cube, 2nd and 3rd small cubes are removed. Now the whole thing is painted black. No of cubes which are painted 2 faces?

a) 0 b) 48 c) 2 d) 1

04.A cube is cut into 64 equal cubes. Now from each side of the original cube, 2nd and 3rd small cubes are removed. Now the whole thing is painted black. No of cubes which are painted 3 faces?

a) 36 b) 24 c) 16 d) 28

05.A cube is cut into 64 equal cubes. Now from each side of the original cube, 2nd and 3rd small cubes are removed. Now the whole thing is painted black. No of cubes which are painted in more than 3 faces

a) 16 b) 32 c) 24 d) 8

06. What is the least number of cuts required to cut a cube into 24 identical pieces?

a) 6 b) 8 c) 4 d) 12

07. 64 smaller identical cubes are arranged to form a larger cube. How many such smaller identical cubes are required to cover this larger cube?

a) 96 b) 125 c) 61 d) 152

08. A cube is cut parallel to one face by 12 cuts (such that all the resulting pieces are identical). What is the maximum number of identical pieces that can be obtained by now making 3 more cuts in any direction?

a) 110 b) 36 c) 96 d) 78

09. What is the minimum number of identical pieces a cube can be cut into by 5 cuts?

a) 5 b) 6 c) 18 d) 25

10. What is the maximum number of identical pieces a cube can be cut into by 13 cuts?

a) 125 b) 136 c) 150 d) 96

11. A cube measuring 5cm each edge has been cut into 125 small but identical cubes. A painter estimated that 16 litres of paint will be required to paint all the faces of the original cube. How much paint is required to paint all the faces of all the smaller cubes?

a) 80liters b) 85liters c) 90liters d) Cannot be determined

12. A cube is painted on all its faces with red colour. This cube is now cut into 125 smaller identical cubes. The number of cubes with only one face painted red?

a) 8 b) 27 c) 36 d) 54

13. A cube is painted on all its faces with red colour. This cube is now cut into 125 smaller identical cubes. The

number of cubes with only two face painted red?

a) 8 b) 27 c) 36 d) 54

14. A cube is painted on all its faces with red colour. This cube is now cut into 125 smaller identical cubes. The number of cubes with three face painted red?

a) 8 b) 27 c) 36 d) 54

15. A cube is painted on all its faces with red colour. This cube is now cut into 125 smaller identical cubes. The number of cubes with no face painted red?

a) 8 b) 27 c) 36 d) 54

16. A cube is painted on three pairs of opposite faces with same colour Red, Blue and Green. This cube is now cut into 216 smaller identical cubes. The number of cubes with no blue paint at all?

a) 150 b) 144 c) 72 d) 180

17. A cube is painted on three pairs of opposite faces with same colour Red, Blue and Green. This cube is now cut into 216 smaller identical cubes. The number of cubes with at least two different colours on their faces?

a) 48 b) 52 c) 56 d) 64

18. A cube is painted on three pairs of opposite faces with same colour Red, Blue and Green. This cube is now cut into 216 smaller identical cubes. The number of cubes with only blue or only green on their faces?

a) 144 b) 32 c) 64 d) 72

19. A cube is painted on three pairs of opposite faces with same colour Red, Blue and Green. This cube is now cut into 216 smaller identical cubes. The number of cubes with only blue and green on their faces?

a) 8 b) 12 c) 16 d) 24

20. A cube is painted on three pairs of opposite faces with same colour Red, Blue and Green. This cube is now cut into 216 smaller identical cubes. The number of cubes with blue and green on their faces?

a) 8 b) 12 c) 16 d) 24

Key: 1.b 2.c 3.a 4.b 5.d 6.a 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20.

6) Clocks

01. How many times are the hands of a clock at right angle in a day?

a) 22 b) 24 c) 44 d) 48

02. What is the angle between the hands of the clock 4 : 20?

a) 2300 b) 100 c) 560 d) 1100

03. At what time between 6 and 7 will the hands be perpendicular?

a) $49\frac{1}{11}$ min b) $54\frac{1}{11}$ min c) $47\frac{1}{11}$ min d) $41\frac{1}{11}$ min

04. At what time between 4 and 3 O'clock will the hands of a clock be together?

a) $59\frac{1}{11}$min b) $54\frac{1}{11}$ min c) $16\frac{4}{11}$ min d) None

05. A clock loses 5 minutes for every hour and another gains 5 minutes every hour. If they are set correct at 10 A.M. on Monday then when will they be 12 hours apart?

a) 10 A.M on Friday b) 10 A.M on Thursday c) 10 A.M on Wednesday d) 10 A.M on Tuesday

06. How much does a watch lose per day, if its hands coincide every 64 minutes?

a) $32\frac{8}{11}$ min b) $36\frac{5}{11}$ min c) 90 min d) 96 min

07. If the hands of a clock coincide every 65 minutes, how much time does the clock gain or lose in 12 hours?

a) $5\frac{5}{144}$ min b) $5\frac{10}{143}$ min c) $5\frac{5}{143}$ min d) $4\frac{5}{143}$ min

08. At what angle the hands of a clock are inclined at 15 minutes past 5?

a) 58 ½^O b) 64^O c) 67 ½^O d) 72 ½^O

09. At what angle the hands of a clock are inclined at 10 : 10?

a) 100^0 b) 110^0 c) 115^0 d) 120^0

10. What is the angle between the two hands of a clock when the clock shows 8.40 pm?

a) 20^0 b) 10^0 c) 15^0 d) 30^0

11. What is the time when the angle between two hands of the clock is 60^0 and the time is between 4'O clock and5'O clock?

a) 4hrs $32\frac{8}{11}$ min b) 4hrs $10\frac{10}{11}$ min c) 4hrs $57\frac{10}{11}$ min d) Both (a) & (b)

12. What is the actual time if the time shown by the watch in a mirror is 3.20?

a) 9.40 b) 8.20 c) 8.40 d) 9.20

13. At what time between 4'o clock and 5'o clock will the minute hand and hour hand coincide?

a) $4.21\frac{9}{11}$ b) 4.20 c) 4.22 ½ d) Never happens

14. Find the time between 2 and 3'o clock at which the minute hand and the hour hand overlap?

a) $10\frac{10}{11}$min past 2 b) $10\frac{11}{12}$ min past 2 c) $10\frac{12}{10}$ min past 2 d) $11\frac{10}{12}$ min past 2

15. At what time between 8 and 9'o clock will the hands of a clock together?

a) 8 hr $43\frac{7}{11}$ b) 9 hr $43\frac{10}{11}$ min c) 8 hr $22\frac{8}{11}$ min d) 9hr $22\frac{8}{11}$ min

16. At what time between 12 and 1'o clock will the hands of a clock together?

a) 12 hr $5\frac{5}{11}$ min b) 12 hr $2\frac{2}{11}$ min c) 12 hr $1\frac{1}{11}$ min d) Never happens

17. At what time between 2 and 3'o clock will the hands of a clock opposite to each other?

a) 8 hr $43\frac{7}{11}$ min b) 9 hr $43\frac{7}{11}$ min c) 8 hr $22\frac{8}{11}$ min d) None

18. At what time between 6 and 7'o clock will the hands of a clock opposite to each other?

a) 12hr $1\frac{1}{11}$ min b) 12hr $2\frac{2}{11}$ min c) 12hr 5 min d) None

19. At what time between 10 and 11'o clock will the hands of a clock opposite to each other?

a) 4hr $21\frac{9}{11}$ min b) 4 hr $21\frac{11}{9}$ min c) 4hr $34\frac{6}{11}$ min d) None

20. At what time between 5 and 6'o clock will the hands of a clock right angle to each other?

a) 5hr $10\frac{10}{11}$ min b) 2hr $21\frac{9}{11}$ min c) 5hr $43\frac{7}{11}$ min d) Both 1 & 3

21. At what time between 1 and 2'o clock will the hands of a clock right angle to each other?

a) 1hr $54\frac{6}{11}$ min b) 1hr $22\frac{8}{11}$ min c) 1hr $43\frac{7}{11}$ min d) Both 1 & 3

22. At what time between 2 and 3'o clock will the hands of a clock right angle to each other?

a) 2hr $10\frac{10}{11}$ min b) 2hr $27\frac{3}{11}$ min c) 3'o clock d) Both 2 & 3

23. At what time between 6 and 6:30 will the hands of a clock right angle to each other?

a) 6hr $48\frac{2}{11}$ min b) 6hr $16\frac{4}{11}$ min c) 6:20 d) Never happen

24. How many times both the hands(min & hr) meets together in 12hrs?

a) 13 b) 12 c) 11 d) 10

25. Speed of minute hand is.....

a) ½^{O} per min b) 3/2 ^{O} per min c) 6^{O} per min d) 10^{O} per min

26. Speed of hour hand is.....

a) 6^{O} per min b) ½^{O} per min c) 3/2 ^{O} per min d) 5^{O} per min

Key: 1.c 2.b 3.a 4.c 5.b 6.a 7.c 8.c 9. 10. 11. 12. 13. 14.
15. 16. 17. 18. 19. 20. 21. 22. 23. 24. c 25. c 26. b

7) Calendars

Key Points:

I. The year which is exactly divisible by 4 is called leap year. Ex: 2004, 2008, 2012....
But in Centuries the year which is divisible by 400 is only called leap year. Ex: 1200, 1600, 2000,...
The Centuries like 1700, 1800, 2100, 2200 are not leap years, because they are not divisible by 400, even divisible by 4.

II. Odd Days of a Month: The remainder when the number of days of a month are divided by 7

Jan – 3, Feb – 0 (In non leap year), 1 (In leap year),
Mar – 3, Apr – 2, May – 3,
Jun – 2, Jul – 3, Aug – 3,
Sep – 2, Oct – 3, Nov – 2, Dec – 3.

In every Ordinary Year Jan-1st and Dec-31st falls on same DAY.

III. Odd Days of a Year: The remainder when the number of days of a month are divided by 7

Ordinary Year: 52 weeks + 1 day: No of Odd days = 1
Leap Year: 52 weeks + 2 days: No of Odd days = 2

In any Leap year Dec-31st will be the next Day of Jan-1st

IV. Odd Days of number of Years:

In 1yr = 1 Odd day
In 2yrs = 2 Odd days
In 3yrs = 3 Odd days
In 4yrs = 5 Odd days
In 100yrs = 5 Odd days
In 200yrs = 3 Odd days
In 300yrs = 1 Odd day
In 400yrs = 0 Odd day

In every year April 1st, July 1st, will be same day

Odd Days of all the years which are multiples of 400 are ZERO.
Ex: 400, 800, 1200, 1600... Odd Days = 0

No Century ends with Tue OR Thu OR Saturday

In every year March 1st and Nov 1st will be same day

V. Odd Days – Days

0 – Sunday 1 – Monday 2 – Tuesday
3 – Wednesday 4 – Thursday 5 – Friday 6 – Saturday

In every yearSept 1st and Dec 1st will be same day

Ex - 1: What is the day of 26th January 1930?
Soln: 1930-Jan-26 = 1600yrs + 300yrs + 29yrs + 26 days
Odd Days → 0 + 1+(7X2 + 22X1) + 5(7 Leap yrs + 22 Ordinary yrs)
→ 0 + 1 + 36days + 5
→ 0 + 1 + 1+ 5 = 0→ Sunday

Ex - 2: What is the day of 21st April 1977?
Soln:1977-April-21 = 1600yrs + 300yrs +76yrs + Jan + Feb + March + 21 days

Odd Days → 0 + 1 +(19X2 + 57X1) + 3 + 0 + 3 + 0(19 Leap yrs + 57 Ordinary yrs)
→ 0 + 1 + 95days + 3 + 0 + 3 + 0
→ 0 + 1 + 4 + 3 + 0 + 3 + 0 = 11 = 4→Thursday

Ex - 3: If 2014 Nov 5th is Wednesday then 2015 Nov 5thfalls on which day?
Soln: 2014 Nov 5th to 2015 Nov 5th is an ordinary year. ∴ Odd days = 1, ∴ Wednesday + 1 = Thursday

Ex - 4: If today is Friday, which day will be after 478 days?
Soln: 478 days = 68weeks + 2 days = 2 Odd days
∴ Friday + 2 = Sunday

Ex - 4: When 2005 Calendar can be used again?
Soln: 2005 odd days = 1
2006 odd days = 1
2007 odd days = 1
2008 odd days = 2
2009 odd days = 1
2010 odd days = 1

2005 to 2010 total no of odd days = 7 → 1 week = 0
∴2005 Calendar can be used again for 2011.

1. How many odd days are these 265 days?
a) 1 b) 2 c) 3 d) 4

2. The last day of the Century cannot be?
a) Friday b) Wednesday c) Monday d) Tuesday

3. The first day of a century year cannot be a?
a)Tuesday b) Friday c) Thursday d) Saturday

4. What will be next leap year after 2096?
a) 2100 b) 2101 c) 2104 d) 2108

5. Which among the following year is a leap year?
a) 1700 b) 1800 c) 2100 d) 2400

6.The first republic day of India was celebrated on 26th January, 1950 it was?
a) Monday b) Tuesday c) Thursday d) Friday

8) Puzzle Test

1. Seating OR Sitting Arrangements

Directions (1- 5):

Eight friends A,B,C,D,E,F,G and H are sitting around a circle facing the centre. E is to the third to the left of G who is to the immediate right of B who is third to the left of A. H is second to the right of F who is not an immediate neighbour of E. D is not an immediate neighbour of B.

1. Which of the following pairs has the first person to the immediate left of second person?
a) GB b) AF c) CE d) HD e) None

2. Which of the following is the correct position of B with respect to D?
a) Second to the right b) Second to the left c) Third to the right d) Third to the left e) None

3. Who sit between A and D?
a) F b) E c) G d) B e) None

4. What is E's position with respect to C?
a) To the immediate right b) To the immediate left c) Second to the right d) Cannot be determine e) None

5. Who is second to the right of B?
a) F b) A c) H d) D e) None

Directions (6 -7):

Eight persons E,F,G,H,I,J,K and L are seated around a square table two on each side. There are three lady members and they are not seated next to each other. J is between L and F. G is between I and F. H, a lady member, is second to the left of J. F, a male is seated opposite E, a lady member. There is a lady member between F and I.

6. Who among the following is seated between E and H?
a) F b) I c) J d) K e) Cannot be determined

7. How many persons are seated between K and F?
a) One b) Two c) Three d) Cannot be determined e) None

Directions (8 – 12):

A,B,C,D,E,F,G and H are sitting around a circular table facing the centre. Each one of them has a different profession viz. Doctor, engineer, architect, teacher, clerk, shopkeeper, businessman and banker. A sits third to right of teacher. D sits second to left of G. G is not an immediate neighbour of the teacher. Only one person sits between B who is the shopkeeper and teacher. The one who is an architect sits third to right of the shopkeeper. H sits between architect and engineer. E is not an immediate neighbour of H. Engineer sits third to the right of clerk. Only one person sits between businessman and F. E is neither a businessman nor a doctor.

8. Which of the following is TRUE with respect to the given seating arrangement?
   a) E is an immediate neighbour of the engineer b) E is an architect
   c) The clerk is an immediate neighbour of the banker d) The teacher sits between H and the engineer
   e) None

9. What is the profession of H?
   a) Businessman b) Architect c) Banker d) Teacher e) Shopkeeper

10. What is the position of doctor with respect to the banker?
   a) Immediately to the left b) Third to the left c) Second to the right
   d) Fourth to the left e) Second to the left

11. Who sit/s exactly between the architect and the businessman?
   a) C and H b) Clerk c) Banker and Shopkeeper d) Doctor e) C and Teacher

12. Who amongst the following is a clerk?
   a) C b) D c) E d) F e) G

Directions (13 – 16):

At a formal meeting called by the U N secretary General to discuss Barrack Obama's victory, Seven top World leaders were sitting around a table at equal distance from each other. The U S President forms an angle of 90degrees from Russian President and 120degrees from the British P.M. German Chancellor is sitting three places to the right of French President, who is sitting one place to the right of Indian P.M. The British P.M is opposite Chinese P.M and is sitting to the left of Russian President.

13. The only person sitting between the British P.M and the German Chancellor is
a) Russian President b) French President c) Indian P.M d) U S President e) None

14. The Russian President is not sitting at equal distance from
a) German Chancellor and French President b) Indian P.M and U S President
c) British P.M and French President d) All of the above e) None

15. The Russian President is sitting _____ of Chinese President
   a) Two places to the left b) Three places to the right c) Two places left or three places right
   d) Three places left or four places right e) None

16. The angle between the Russian President and the British P.M is in the Clock Wise direction of _____ degrees.
   a) 30 b) 60 c) 90 d) 12 e) None

Directions (17 – 21):

A,B,C,D,E,F,G and H are sitting around a circular table facing the centre. No two males (or) two females are immediate neighbors of each other. A is wife of H. A sits third to the left of E. F sits second to the right of D. D is not an immediate neighbor of A or E. H and C are immediate neighbor of each other. F is not an immediate neighbor of his wife B.

17. Which of the following is true about G?
a) G is male b) G sits exactly between F and H c) G sits third to the left of E
d) G sits second to the right of B e) None

18. Who sits third to the left of B?
a) F b) H c) D d) A e) None

19. How many people sit between B & F when counted in anti-clockwise direction from B?
a) One b) Two c) Three d) Four e) More than Four

20. Four of the following five are alike in a certain way so form a group. Which is the one that does not belong to that group?
a) H b) F c) E d) G e) D

21. Which of the following groups consists of only female members of the group?
a) A,B,B b) G,F,C c) C,H,G d) D,H,C e) None

Key: 1. d 2. c 3. e 4. a 5. d 6. c 7. c 8. d 9. d 10. b 11. d 12. e 13. a
14. 15. d 16. c 17. d 18. b 19. b 20. d 21. e

2. Puzzle Arrangements

Study the following information carefully and answer the given questions:

Directions (1 – 5):

P,Q, R, S, T and V are six students studying in a class. Each of them has a different height and weight. The tallest is not the heaviest is taller than only P but lighter than R.Q is taller than S and P and heavier than only T and V. P is lighter than only S. T is heavier than V.S is taller than V and Q is not the tallest.

01. How many of them are heavier than T?
a) One b) Two c) Three d) Five e) None

02. How many of them are shorter than Q?
a) Two b) Four c) Three d) Five e) None

03. Who among them is the tallest?
a) V b) P c) T d) R e) None

04. Who among them is third from top if arranged in descending order of height?
a) Q b) V c) S d) Data inadequate e) None

05. Who among them is the lightest?
a) V b) T c) P d) R e) None

Directions (6 – 9):

(i) Six persons namely A,B,C,D,E and F teach one subject each, one after another viz., Physics, Chemistry, Maths, Statistics, Zoology and Botany but not necessarily in the same order.

(ii) The first subject to teach is Botany which is not be taught by either C or E. A, C and E are not available to teach the last subject.

(iii) Physics is taught by B just after maths and just before statistics which is taught by D.

(iv) Chemistry is not taught before maths nor it is the last subject to teach.

06. Who does teach Chemistry?
a) C b) D c) E d) Either C or D e) Either C or E

07. Which subject is taught just after Botany?
a) Physics b) Statistics c) Maths d) Chemistry e) None

08. Which subject is taught in the last?
a) Physics b) Maths c) Statistics d) Zoology e) None

09. Who does teach Botany?
a) A b) C c) E d) Data inadequate e) None

Directions (10 – 14):

A,B,C,D,E and F are six boys each belonging to a different city, via Delhi, Agra, Kanpur, Luchnow, Pilibhit and Jaipur, not necessarily in the same order. Each of them got selected in a different bank, via Canara bank, Syndicate bank, UCO bank, Vijaya bank, Dena bank and Central bank, not necessarily in the same order.
B belongs to Jaipur but did not get selected in either Dena bank or Canara bank. D doesn't belong either to Delhi or to Lucknow but got selected in Syndicate bank. The one who got selected in Dena bank doesn't belong to Jaipur. The one who got selected in Central bank belongs to Lucknow. F did not get selected in Dena bank. Either C or F got selected in UCO bank but neither of them belongs to pilibhit or Lucknow. A belongs to Kanpur and he got selected in either Canara bank or UCO bank. F doesn't belong to Delhi.

10. Who among the following belongs to Pilibhit?
a) A b) B c) C d) D e) None

11. Who among the following got selected in Dena Bank?
a) A b) B c) C d) D e) None

12. The one who got selected in Vijaya bank belong to which of the following cities?
a) Delhi b) Jaipur c) Pilibhit d) Agra e) None

13. The one who belongs to Agra got selected in which of the following banks?
a) UCO bank b) Dena bank c) Either UCO bank or Dena bank d) Vijaya bank e) None

14. Who belongs to Delhi?
a) A b) B c) C d) D e) None

Key: 1.e 2.b 3.d 4.c 5.6.e 7.c 8.d 9.a 10.d 11.c 12.b 13.a 14.c

9) Syllogisms

Directions (1- 10):

In each questions below are given some statements followed by two conclusions I and II. You have to take given statements to be true even if they seem to be at variance from commonly known facts and then decide which of the given conclusions logically follow/s from the given statements, disregarding commonly known facts. Read both the conclusions and give answers as –
1) If only conclusion I follows. 2) if only conclusion II follows. 3) if either conclusion I or II follows.
4) if neither conclusion I nor II follows. 5) If both conclusions I and II follow.

1.Statements: All mobiles are androids. No android is a phone.
Conclusions: I. Some mobiles are not phones. II. No phone is a mobile.

2.Statements: Some nails are pins. Some pins are fingers.
Conclusions: I. No finger is a nail. II. Some nails are fingers.

3.Statements: Some cranes are ducks. No duck is a peacock.
Conclusions: I. No peacock is a crane II. Some peacock are cranes.

4.Statements: No chair is a glass. All glasses are tables.
Conclusions: I. All tables are chairs. II. Some tables are not chairs.

5.Statements: All cinemas are films. All films are movies.
Conclusions: I.Some movies are cinemas. II. All cinemas are movies.

6.Statements: All friends are officers. Some relatives are friends.
Conclusions: I. No officer is a relative. II. Some relatives are officer.

7.Statements: Some girls are engineers. Some engineers are teachers. All teachers are politicians.
Conclusions: I. No politician is a girl. II. Some politicians are engineers.

8.Statements: All fingers are rings. No ring is a chain. Some bags are rings.
Conclusions: I. No bag is a chain. II. Some bags are chains.

9.Statements: All numbers are digits. Many digits are dots. No dot is a light.
Conclusions: I.Some dots are numbers. II. Some lights are digits.

10.Statements: All songs are smiles. All smiles are lives. No life is a cinema.
Conclusions: I. No cinema is a song. II. No smile is a cinema.

11.Statements: All trains are cars. No car is a bus. Some buses are scooters.
Conclusions: I. No scooter is a car. II. All buses are trains. III. Some trains are scooters.
IV. Some scooters are cars.

12.Statements:All husbands are inspectors. All wives are directors. No director is an inspector.
Conclusions:I. No wife is a husband. II. No husband is a director. III. Some wives are husbands.
IV. Some husbands are directors.

13. Statements: No hook is a handle. No handle is a door. All switches are handles.
Conclusions: I. All doors are hooks. II. No switch is a hook. III. Some switches are hook.
IV. No door is a hook.

14. Statements: No wire is a bulb. Some candles are wires. Some bulbs are tubes.
Conclusions: I. No bulb is a candle. II. Some bulbs are candles. III. Some tubes are wires.
IV. No tube is a wire.

15. Statements: All wines are liquids. All liquids are drinks. Some fruits are wines.
Conclusions: I.Some drinks are fruits. II. Some liquids are fruits. III. All fruits are drinks.
IV. All fruits are liquids.

16. Statements: All instruments are drum. No drum is vessel. All vessels are tins.
Conclusions: I. No drum is a vessel. II. No tin is a drum. III. Some tins are drums.
IV. No instrument is a vessel.

17. Statements: Some trees are animals. No tiger is a tree. Some states are animals.
Conclusions: I.Some animals are tigers. II. Some states are tigers. III. No tiger is an animal.
IV. No tiger is a state.

18. Statement: All knots are holes. All holes are guns. No song is a gun.
Conclusion: I. No knot is a gun. II. No song is a knot. III. All holes are songs.
IV. Some songs are holes.

19. Statements: No cook is a bird. All birds are moons. Some stars are moons.
Conclusions: I. All moons are being stars is a possibility. II. All cooks are being stars is a possibility.
III. Some birds are being stars is a possibility. IV. Some stars are being cooks is a possibility.

20. Statements: All fools are parrots. Some singers are actors. No actor is a fool.
Conclusions: I. Some parrots are being singers is a possibility.
II. Some actors are being parrots is a possibility.
III. All singers are fools. IV. No parrot is an actor.

Key:

1.Both I and II follows. 2. Either I or II follows. 3. Either I or II follows.
4.Only conclusion II follows. 5. Both I and II follows. 6. Only II follows.
7. Only II follows. 8. Either I or II follows. 9. Neither conclusion I nor II follows.
10. Both I and II follows. 11. Only either Conclusions I (or) Conclusions IV follows.
12. Only I and II follows. 13. Only II and either I or IV follows.
14. Either I or II and Either III or IV follows. 15. Only I and II follow
16. Only either II or III and Both I and IV follows. 17. Either I or III and Either II or IV follows.
18. Only II follows. 19. All follow. 20. Only I, II and IV follow.

10) Data Sufficiency

1. Blood Relations

1. If D is the brother of B, how B is related to C ? To answer this question which of the statements is/are necessary?

(i) The son of D is the grandson of C. (ii) B is the sister of D.

a) Only I b) Only ii c) Either I or ii d) I and ii both are required

2. A and B are children of D. Who is the father of A? to answer this question which of the statements is/are is necessary?

(i) C is the brother of A and the son of E. (ii) F is the mother of B.

a) Only I b) Only ii c) Either I or ii d) I and ii both

3. P is the mother of K; K is the sister of D; D is the father of J. How is P related to J?

a) Mother b) Grandmother c) Aunt d) Data inadequate

4. A's son B is married with C whose sister D is married to E the brother of B. How D is related to A?

a) Sister b) Daughter's-in-law c) Sister-in-law d) Cousin

5. A is the son of C; C and Q are sisters; Z is the mother of Q and P is the son of Z. Which of the following statements is true?

a) P and A are cousins b) P is the maternal uncle of A

c) Q is the maternal grandfather of A d) C and P are sisters

6. M is the father of N who is the son of V. In order to know the relation of M to P.
Which of the following statement/statements is/ are necessary?

(i) P is the brother of V (ii) The daughter of N is the granddaughter of V.

a) Only I b) Only ii c) Either I or ii d) I and ii both

7.A is the mother of B. B's father C has 3 children. Based on this information, state which of the following statements is definitely true?

a) C has 3 daughters b) C has 3 sons c) B is a male child d) A has 3 children

Key: 1.d 2.b 3.b 4.b 5.b 6.a 7.d

2. Coding And Decoding

Each of the questions below consists of a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statements are sufficient to answer the question. Read both the statements and give answer

(a) If the data in statement 1 alone are sufficient to answer the question, while the data in statement II alone are not sufficient to answer the question.

(b) If the data in statement II alone are sufficient, to answer the question, while the data in statement I alone are not sufficient to answer the question

(c) If the data either in statement I alone or in statement II alone are sufficient to answer the question
(d) If the data even in both statements I and II together are not sufficient to answer the question

(e) If the data in both statements I and II together are necessary to answer the question

1. How is 'party' coded in the language?
   I. 'going to a party' is coded as 'la fa qu tu' and 'for a party' is coded as 'fa me tu'.
   II. 'start the party' is coded as 'tu co ra' and 'going to start' is coded as 'qu co la'.

2. How is 'see' written in a code language?
   I. 'hope to see you' is written as '3692', and 'do you see that' is written as '1973'.
   II. 'to pray and hope' is written as '0286' and 'hope I do well' is written as '5467'.

3. What is the code for 'sky' in the code language?
   I. 'sky is clear' is written as 'de ra fa'.
   II. 'make it clear' is written as 'de ga jo'.

4. Which word in the code language means 'flower'?
   I. 'de fu la pane' means 'rose flower is beautiful' and 'la quiz' means 'beautiful tree'.
   II. 'de la chin' means 'red rose flower' and 'pa chin' means 'red tea'.

5. What is the code for 'or' in the code language?
   I. 'nik sa te' means 'right or wrong', 'ro da nik' means 'he is right' and 'fe te ro' means 'that is wrong'.
   II. 'pa nik la' means 'that right man', 'se ne pa' means 'this or that' and 'ne ka re' means 'tell this there'.

Key: 1.e 2. a 3. d 4. d 5. c