Question 1

A trader sells 10 litres of a mixture of paints A and B, where the amount of B in the mixture does not exceed that of A. The cost of paint A per litre is Rs. 8 more than that of paint B. If the trader sells the entire mixture for Rs. 264 and makes a profit of 10%, then the highest possible cost of paint B, in Rs. per litre, is

A) 20

B) 16

C) 22

D) 26

Question 2

In a circle with centre O and radius 1 cm, an arc AB makes an angle 60 degrees at O. Let R be the region bounded by the radii OA, OB and the arc AB. If C and D are two points on OA and OB, respectively, such that OC = OD and the area of triangle OCD is half that of R, then the length of OC, in cm, is

A) $\left(\frac{M}{4}\right)^{\frac{1}{2}}$

B) $\left(\frac{M}{6}\right)^{\frac{1}{2}}$

C) $\left(\frac{\pi}{4\sqrt{3}}\right)^{\frac{1}{2}}$

D) $\left(\frac{M}{3\sqrt{3}}\right)^{\frac{1}{2}}$

Question 3

If $f(x + 2) = f(x) + f(x + 1)$ for all positive integers x, and $f(11) = 91$, $f(15) = 617$, then $f(10)$ equals. [TITA]

Question 4

The distance from A to B is 60 km. Partha and Narayan start from A at the same time and move towards B. Partha takes four hours morethan Narayan to reach B. Moreover, Partha reaches the mid-point ofA and B two hours before Narayan reaches B. The speed of Partha, inkm per hour, is

A) 6

B) 3

C) 4

D) 5

Question 5

A CAT aspirant appears for a certain number of tests. His average score increases by 1 if the first 10 tests are not considered, and decreases by 1 if the last 10 tests are not considered. If his average scores for the first 10 and the last 10 tests are 20 and 30, respectively, then the total number of tests taken by him is [TITA]

Question 6

Two types of tea, A and B, are mixed and then sold at Rs. 40 per kg. The profit is 10% if A and B are mixed in the ratio 3 : 2, and 5% if thisratio is 2 : 3. The cost prices, per kg, of A and B are in the ratio

A) 21 : 25

B) 19 : 24

C) 18 : 25

D) 17 : 25

Question 7

A wholesaler bought walnuts and peanuts, the price of walnut per kgbeing thrice that of peanut per kg. He then sold 8 kg of peanuts at a profit of 10% and 16 kg of walnuts at a profit of 20% to a shopkeeper.However, the shopkeeper lost 5 kg of walnuts and 3 kg of peanuts in transit. He then mixed the remaining nuts and sold the mixture at Rs.166 per kg, thus making an overall profit of 25%. At what price, in Rs.per kg, did the wholesaler buy the walnuts?

A) 84

B) 86

C) 96

D) 98

Question 8

When they work alone, B needs 25% more time to finish a job than Adoes. They two finish the job in 13 days in the following manner: A works alone till half the job is done, then A and B work together for four days, and finally B works alone to complete the remaining 5% ofthe job. In how many days can B alone finish the entire job?

A) 16

B) 22

C) 20

D) 18

Question 9

Given an equilateral triangle T1 with side 24 cm, a second triangle T2is formed by joining the midpoints of the sides of T1. Then a third triangle T3 is formed by joining the midpoints of the sides of T2. If this process of forming triangles is continued, the sum of the areas, in sq cm, of infinitely many such triangles T1, T2, T3,... will be

A) $192\sqrt{3}$
B) $164\sqrt{3}$
C) $248\sqrt{3}$
D) $188\sqrt{3}$

Question 10

While multiplying three real numbers, Ashok took one of the numbers as 73 instead of 37. As a result, the product went up by 720. Then the minimum possible value of the sum of squares of the other two numbers is: [TITA]

Question 11

If x is a positive quantity such that $2^x = 3^{\log_5 2}$, then x is equal to

A) $\log_5 9$

B) $1 + \log_5 \left(\frac{3}{5}\right)$

C) $1 + \log_3 \left(\frac{5}{3}\right)$

D) $\log_5 8$

Question 12

If $\log_{12} 81 = p$, then $3\left(\frac{4-p}{4+p}\right)$ is equal to:

A) $\log_2 8$

B) $\log_6 8$

C) $\log_4 16$

D) $\log_6 16$

Question 13

A right circular cone, of height 12 ft, stands on its base which has diameter 8 ft. The tip of the cone is cut off with a plane which is parallel to the base and 9 ft from the base. With $\pi = 22/7$, the volume, in cubic ft, of the remaining part of the cone is:[TITA]

Question 14

How many numbers with two or more digits can be formed with thedigits 1, 2, 3, 4, 5, 6, 7, 8, and 9 so that in every such number, each digit is used at most once and the digits appear in the ascending order?[TITA]

Question 15

John borrowed Rs. 2,10,000 from a bank at an interest rate of 10% per annum, compounded annually. The loan was repaid in two equal instalments, the first after one year and the second after another year. The first instalment was interest of one year plus part of the principal amount, while the second was the rest of the principal amount plus due interest thereon. Then each instalment, in Rs., is: [TITA]

Question 16

If $u^2 + (u - 2v - 1)^2 = -4v(u + v)$, then what is the value of $u + 3v$?

A) $\frac{1}{4}$

B) $\frac{1}{2}$

C) 0

D) $-\frac{1}{4}$

Question 17

Point P lies between points A and B such that the length of BP is thrice that of AP. Car 1 starts from A and moves towards B. Simultaneously, car 2 starts from B and moves towards A. Car 2 reaches P one hour after car 1 reaches P. If the speed of car 2 is halfthat of car 1, then the time, in minutes, taken by car 1 in reaching Pfrom A is:[TITA]

Question 18

Let ABCD be a rectangle inscribed in a circle of radius 13 cm. Which one of the following pairs can represent, in cm, the possible lengthand breadth of ABCD?

A) 25, 10

B) 24, 12

C) 25, 9

D) 24, 10

Question 19

In an examination, the maximum possible score is N while the pass mark is 45% of N. A candidate obtains 36 marks, but falls short of thepass mark by 68%. Which one of the following is then correct?

A) $N \leq 200$

B) $243 \leq N \leq 252$

C) $N \geq 253$

D) $201 \leq N \leq 242$

Question 20

Let x, y, z be three positive real numbers in a geometric progression such that $x < y < z$. If 5x, 16y, and 12z are in an arithmetic progression then the common ratio of the geometric progression is

A) $\frac{1}{6}$

B) $\frac{3}{6}$

C) $\frac{3}{2}$

D) $\frac{5}{2}$

Question 21

The number of integers x such that $0.25 < 2^x < 200$, and $2^x + 2$ is perfectly divisible by either 3 or 4, is [TITA]

Question 22

Each of 74 students in a class studies at least one of the three subjects H, E and P. Ten students study all three subjects, while twenty study H and E, but not P. Every student who studies P also studies H or E or both. If the number of students studying H equalsthat studying E, then the number of students studying H is [TITA]

Question 23

Train T leaves station X for station Y at 3 pm. Train S, traveling at three quarters of the speed of T, leaves Y for X at 4 pm. The two trains pass each other at a station Z, where the distance between X and Z is three-fifths of that between X and Y. How many hours does train T take for its journey from X to Y? [TITA]

Question 24

Points E, F, G, H lie on the sides AB, BC, CD, and DA, respectively, of a squareABCD. If EFGH is also a square whose area is 62.5% of that of ABCD and CG islonger than EB, then the ratio of length of EB to that of CG is:

A) 1 : 3

B) 4 : 9

C) 2 : 5

D) 3 : 8

Question 25

Given that $x^{2018}\, y^{2017} = 1/2$ and $x^{2016}\, y^{2019} = 8$, the value of $x^2 + y^3$ is

A) $\frac{37}{4}$

B) $\frac{31}{4}$

C) $\frac{35}{4}$

D) $\frac{33}{4}$

Question 26

Raju and Lalitha originally had marbles in the ratio 4 : 9. Then Lalitha gave some of her marbles to Raju. As a result, the ratio of the number of marbles with Raju to that with Lalitha became 5 : 6. What fraction of her original number of marbles was given by Lalitha to Raju?

A) $\frac{1}{4}$

B) $\frac{1}{5}$

C) $\frac{6}{19}$

D) $\frac{7}{33}$

Question 27

If $\log_2(5 + \log_3 a) = 3$ and $\log_5(4a + 12 + \log_2 b) = 3$, then $a + b$ is equal to:

A) 32

B) 59

C) 67

D) 40

Question 28

Humans and robots can both perform a job but at different efficiencies. Fifteen humans and five robots working together take thirty days to finish the job, whereas five humans and fifteen robots working together take sixty days to finish it. How many days will fifteen humans working together (without any robot) take to finish it?

A) 40

B) 32

C) 36

D) 45

Question 29

In a parallelogram ABCD of area 72 sq cm, the sides CD and AD havelengths 9 cm and 16 cm, respectively. Let P be a point on CD such that AP is perpendicular to CD. Then the area, in sq cm, of triangle APD is:

A) $18\sqrt{3}$
B) $24\sqrt{3}$
C) $32\sqrt{3}$
D) $12\sqrt{3}$

Question 30

In a circle, two parallel chords on the same side of a diameter have lengths 4 cm and 6 cm. If the distance between these chords is 1 cm,then the radius of the circle, in cm, is

A) $\sqrt{13}$

B) $\sqrt{14}$

C) $\sqrt{11}$

D) $\sqrt{12}$

Question 31

A tank is fitted with pipes, some filling it and the rest draining it. Allfilling pipes fill at the same rate, and all draining pipes drain at the same rate. The empty tank gets completely filled in 6 hours when 6filling and 5 draining pipes are on, but this time becomes 60 hours when 5 filling and 6 draining pipes are on. In how many hours will the empty tank get completely filled when one draining and two filling pipes are on? [TITA]

Question 32

If among 200 students, 105 like pizza and 134 like burger, then the number of students who like only burger can possibly be

A) 26
B) 23
C) 96
D) 93

Question 33

Let $f(x)=\min\{2x^2, 52 - 5x\}$, where x is any positive real number. Then the maximum possible value of f(x) is [TITA]

Question 34

In an apartment complex, the number of people aged 51 years and above is 30 and there are at most 39 people whose ages are below 51 years. The average age of all the people in the apartment complexis 38 years. What is the largest possible average age, in years, of the people whose ages are below 51 years?

A) 25

B) 26

C) 27

D) 28

Solutions

1) Option A
2) Option D
3) 54
4) Option D
5) 60
6) Option B
7) Option C
8) Option C
9) Option A
10) 40
11) Option B
12) Option B
13) 1981
4) 502
15) 121000
16) Option D
17) 12
18) Option D
19) Option B
20) Option D
21) 5
22) 52
23) 36
24) Option A
25) Option D
26) Option D
27) Option B
28) Option B
29) Option C
30) Option A
31) 10
32) Option D
33) 32
34) Option A

Solution 1

Let the quantities of the paints A and B in the mixture sold be a litres and b litres respectively.

Value at which the entire mixture is sold=264 Profit percent made=10%

Value at which the entire mixture is bought = $264 \times \frac{100}{100} = 240$

Price at which the entire mixture is bought=24 per litre Let the cost of B be x per litre.

Cost of A=(x+8)per litre

$$\frac{(x+8)a + xb}{10} = 24$$

Maximum cost of B will occur when a is minimum. b<=a. So, minimum a is 5.

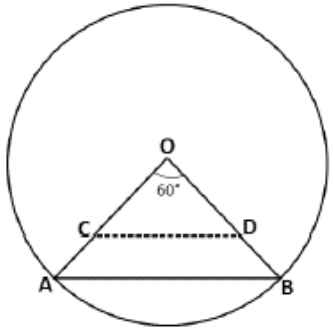
Corresponding b is 5. Then (x+8)(5)+x(5)=240 x=20

Solution 2

It is given that radius of the circle = 1 cm

Chord AB subtends an angle of 60° on the centre of the given circle. R be the region bounded by the radii OA, OB and the arc AB.

Therefore, R = $\frac{60^\circ}{360^\circ} \times$Area of the circle = $\frac{1}{6} \times \pi \times (1)^2 = \frac{\pi}{6}$ sq. cm



It is given that OC = OD and area of triangle OCD is half that of R. Let OC = OD = x.

Area of triangle COD = $\frac{1}{2} \times OC \times OD \times sin60^\circ$

$$\frac{\pi}{6 \times 2} = \frac{1}{2} \times x \times x \times \frac{\sqrt{3}}{2}$$

$$\Rightarrow x^2 = \frac{\pi}{3\sqrt{3}}$$

$$\Rightarrow x = \left(\frac{\pi}{3\sqrt{3}}\right)^{\frac{1}{2}} \text{ cm.}$$

Solution 3

$f(x+2) = f(x) + f(x+1)$

$f(11) = 91$

Let $f(12) = a$

$f(13) = 91 + a$

$f(14) = 91 + 2a$

$f(15) = 182 + 3a$.

This is also equal to 617.

$182 + 3a = 617 => a = 145$

$f(10) = f(12) - f(11) = 145 - 91 = 54$

Solution 4

Let the time taken by Partha to cover 60 km be x hours.

As per the condition, Narayan will cover 60 km in x-4 hours.

Therefore, Speed of Partha $= 60/x$

And Speed of Narayan $= 60/(x-4)$

It is also given that Partha reaches the mid-point of A and B two hours before Narayan reaches B. Hence,

$$\Rightarrow \frac{30}{\frac{60}{x}} + 2 = \frac{60}{\frac{60}{(x-4)}}$$

$$\frac{x}{2} + 2 = x - 4$$

$$\frac{x+4}{2} = x - 4$$

$$x + 4 = 2x - 8$$

$$x = 12$$

OR Partha will take 12 hours to cross 60 km.
=> Speed of Partha = 60/12=5 Kmph.

Solution 5 Let the average score of the aspirant in all the tests be x. Let the number of tests be n. The aspirant's average score for the first 10 tests and last 10 tests are 20 and 30 respectively.

$$\frac{nx-200}{n-10} = x+1 \text{ and } \frac{nx-300}{n-10} = x-1$$

Solving, we get n=60

Solution 6

The selling price of the mixture is Rs.40/kg.
Let a be the quantity of tea A in the mixture and b be the quantity of tea B in the mixture.
It has been given that the profit is 10% if the 2 varieties are mixed in the ratio 3:2

Let the cost price of the mixture be x.
It has been given that $1.1x = 40$

$x = 40/1.1$

$$\frac{3a+2b}{5} = \frac{40}{1.1}$$

$3.3a + 2.2b = 200$ --------(1)

The profit is 5% if the 2 varieties are mixed in the ratio 2:3.

$$\frac{2a+3b}{5} = \frac{40}{1.05}$$

$2.1a + 3.15b = 200$ ------(2)

Equating (1) and (2), we get,

$3.3a + 2.2b = 2.1a + 3.15b$

$1.2a = 0.95b$

$$\frac{a}{b} = \frac{0.95}{1.2}$$

$$\frac{a}{b} = \frac{19}{24}$$

Solution 7 Let the cost price of peanuts for the wholesaler be x per kg.

Cost price of walnuts for the wholesaler is 3x per kg.
The wholesaler sold 8 kg of peanuts at 10% profit and 16 kg of walnuts at 20% profit to a shopkeeper.
Total cost price to the shopkeeper = (8)(x)(1.1) + 16(3x)(1.2) = 66.4x The shopkeeper lost 5 kg walnuts and 3 kg peanuts.
The shopkeeper sold the mixture of 11 kg walnuts and 5 kg peanuts.
His total selling price=166(16) = 2656
His total cost price = $2656 = \left(\frac{100}{125}\right) = 2124.8$
66.4 x = 2124.8
x= 32
Price at which the wholesaler bought walnuts = 3x = 96/- per kg

Solution 8 Let the time taken by A to finish the job be "a" days.
Time taken by B to finish the job = $\frac{5}{4}a$ days.
Part of the job completed when A and B worked together for 4 days = $1 = \frac{1}{2} - \frac{5}{100} = \frac{9}{20}$

$$4\left(\frac{1}{a}+\frac{1}{\frac{5a}{4}}\right)=\frac{9}{20}\Rightarrow a=16$$

Time taken by B alone to complete the entire job = 5a/4 = 20 days.

Solution 9

Any equilateral triangle formed by joining the midpoints of the sides of another equilateral triangle will have its side equal to half the side of the second equilateral triangle. Side of T1 = 24 cm Side of T2 = 12 cm Side of T3 = 6 cm and so on. Sum of the areas of all the triangles

$$= \frac{\sqrt{3}}{4}\left(24^2 + 12^2 + 6^2 + \ldots\ldots\right)$$

$$= \frac{\sqrt{3}}{4}\left(\frac{576}{1-\frac{1}{4}}\right) = 192\sqrt{3}$$

Solution 10

Let the other two numbers be y and z.

As per the condition 73yz - 37yz = 720

Or 36yz=720

Or yz=20

Minimum possible sum of the squares of the other two numbers would occur when y = z i.e.

$y = z = \sqrt{20}$

Hence the required sum = 40.

Solution 11

Givne that: $2^x = 3^{\log_5 2}$

$\Rightarrow 2^x = 2^{\log_5 3|}$

$\Rightarrow x = \log_5 3$

$\Rightarrow x = \log_5 \frac{3*5}{5}$

$\Rightarrow x = \log_5 5 + \log_5 \frac{3}{5}$

$\Rightarrow x = 1 + \log_5 \frac{3}{5}.$

Solution 12

$$\log_{12} 81 = p \Rightarrow \log_{12} 3^4 = p$$

$$\Rightarrow 4\log_{12} 3 = p$$

$$\Rightarrow \frac{p}{4} = \log_{12} 3$$

$$3\left(\frac{4-p}{4+p}\right) = 3\left(\frac{1-\frac{p}{4}}{1+\frac{p}{4}}\right)$$

$$= 3\left(\frac{1-\log_{12} 3}{1+\log_{12} 3}\right)$$

$$= 3\left(\frac{\log_{12} 12 - \log_{12} 3}{\log_{12} 12 + \log_{12} 3}\right)$$

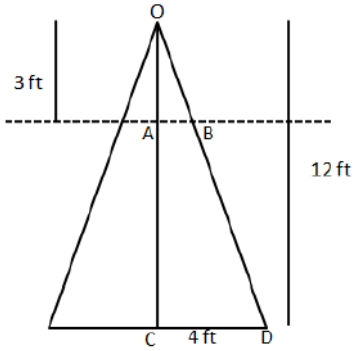
$$= 3\left(\frac{\log(12/3)}{\log(12/3)}\right)$$

$$= 3\frac{\log 4}{\log 36} = 3\log_{36} 4$$

$$= \log_6 8$$

Solution 13

We are given that diameter of base = 8 ft. Therefore, the radius of circular base = 8/2 = 4 ft



In triangle OAB and OCD

$$\frac{OA}{AB} = \frac{OC}{CD}$$

$$\Rightarrow \text{AB} = \frac{3 \times 4}{12} = 1 \text{ ft.}$$

Therefore, the volume of remaining part = Volume of entire cone - Volume of smaller cone

$$\Rightarrow \frac{1}{3}\times\pi\times4^2\times12-\frac{1}{3}\times\pi\times1^2\times3$$

$$\Rightarrow \frac{1}{3}\times\pi\times189$$

$$\Rightarrow \frac{22}{7\times3}\times189$$

$$\Rightarrow 198 \text{ cubic ft}$$

Solution 14

As the digits appear in ascending order in the numbers, number of ways of forming a n-digit number using the 9 digits $= {}^{9}C_{n}$ Number of possible two-digit numbers which can be formed $=$

$${}^{9}C_2+{}^{9}C_3+{}^{9}C_4+{}^{9}C_5+{}^{9}C_6+{}^{9}C_7+{}^{9}C_8+{}^{9}C_9$$

$$=2^9-(9C_1+{}^{9}C_1)$$

$$=512-(1+9)=502$$

Solution 15

Let each instalment be ₹x. Equating the present value of both the instalments to the money borrowed,

$$\frac{x}{1.1}+\frac{x}{1.1^2}=210000$$

x=121000

Solution 16

$$u^2+(u-2v-1)^2=-4v(u+v)$$

$$\Rightarrow u^2+u^2+4v^2+1-4uv+4v-2u+4vu+4v^2=0$$

$$\Rightarrow 2u^2-2u+8v^2+4v+1=0$$

$$\Rightarrow 2\left(u^2-u+\frac{1}{4}\right)+2\left(4v^2+2v+\frac{1}{4}\right)=0$$

$$\Rightarrow 2\left(u-\frac{1}{2}\right)^2+2\left(2v+\frac{1}{2}\right)^2=0$$

$$\Rightarrow u-\frac{1}{2}=0;2v+\frac{1}{2}=0$$

$$\mathrm{u}=\frac{1}{2}\ \text{and}\ \mathrm{v}=-\frac{1}{4}$$

$$\mathrm{u}+3\mathrm{v}=\frac{1}{2}-\frac{3}{4}=-\frac{1}{4}$$

Solution 17

Let the time taken for car 1 to reach P from A be x hours.

Speed of car 1=AP/x

Given BP=3AP

Car 2 starts from B to A and reaches P one hour after car 1 reaches P.

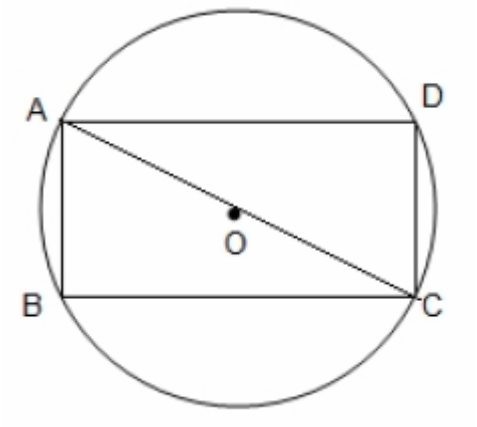
Speed of car $2 = \frac{3AP}{x+1}$

Therefore,

$$\frac{3AP}{x+1} = \frac{1}{2}\left(\frac{AP}{x}\right)$$

Or $x = \frac{1}{5}$. Time taken for car 1 to reach from is 12 min. P A

Solution 18



We know that AC is the diameter and $\angle$ ABC = 90°. AC = 2*13 = 26 cm

In right angle triangle ABC,

$AC^2 = AB^2 + BC^2$

$\Rightarrow AB^2 + BC^2 = 26^2$

$\Rightarrow AB^2 + BC^2 = 676$

Let us check with the options.

Option (A): $24^2 + 10^2 = 676$.

Option (B): $25^2 + 9^2 = 706 \neq 676$.

Option (C): $25^2 + 10^2 = 725 \neq 676$.

Option (D): $24^2 + 12^2 = 720 \neq 676$.

Solution 19

A got 36 marks but falls short of pass marks by 68%. Maximum possible score is N.
Pass mark is 45% of N. 32% of 45% of N = 36 => N = 250

Solution 20

Since x, y ,and z are in G.P. and x<y<z, let x = a, y=ar and z=ar2, where a>0 and r>1.
It is also given that, 15x, 16y and 12z are in A.P.
Therefore, 2×16y=5x+12z

Substituting the values of x, y and z we get,
$32\ ar = 5a + 12ar^2$

$$\Rightarrow 32r = 5 + 12r^2$$

$$\Rightarrow 12r^2 - 32r + 5 = 0$$

On solving the above quadratic equation we get r=1/6 or 5/2.
Since r>1, therefore r=5/2.

Solution 21

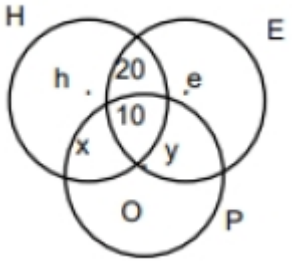
$$0.25 \le 2^x \le 200$$

Possible values of x satisfying the above inequality are $-2, -1, 0, 1, 2, 3, 4, 5, 6, 7$.

When $x = 0, 1, 2, 4$ and 6, $2^x + 2$ is divisible by 3 or 4.

The number of value of x is 5

Solution 22 Let the number of students who studying only H be h, only E be e, only H and P but not E be x, only E and P but not H be y



Given only P = 0 All three = 10; Studying only H and E but not P = 20 Given number of students studying H = Number of students studying E = h + x + 20 + 10 = e + y + 20 + 10 h + x = e + y total number of students = 74 Therefore, h + x + 20 + 10 + e + y = 74 h + x + e + y = 44 h + x + h + x = 44 h + x = 22 Therefore, the number of students studying H = h + x + 20 + 10 = 22 + 20 + 10 = 52.

Solution 23

Train T starts at 3 PM and train S starts at 4 PM.
Let the speed of train T be t.
=> Speed of train S = 0.75t.
When the trains meet, train t would have traveled for one more hour than train S.
Let us assume that the 2 trains meet x hours after 3 PM. Trains S would have traveled for x-1 hours.
Distance traveled by train T = xt
Distance traveled by train S = (x-1)*0.75t = 0.75xt-0.75t

We know that train T has traveled three fifths of the distance. Therefore, train S should have traveled two-fifths the distance between the 2 cities.
=> (xt)/(0.75xt-0.75t) = 3/2
2xt = 2.25xt-2.25t
0.25x = 2.25

x = 9 hours.
Train T takes 9 hours to cover three-fifths the distance. Therefore, to cover the entire distance, train T will take 9*(5/3) = 15 hours.
Therefore, 15 is the correct answer.
Solution 24 Let the area of ABCD be 100. Side of ABCD = 10 Area of EFGH is 62.5 => Side of EFGH = √62.5
Triangles AEH, BFE, CGF and DHG are congruent by ASA.
Let AE = BF = CG = DH = x; EB = FC = DG = AH = 10 -xx
$AE^2 + AH^2 + EH^2$

$$x^2 + (10 - x)^2 = (\sqrt{62.5})^2$$

Solving, x = 2.5 or 7.5

Since it's given that CG is longer than EB, CG = 7.5 and EB = 2.5. Therefore, EB : CG = 1 : 3
Solution 25

$$x^{2018} y^{2017} = \frac{1}{2} \ldots..(1)$$

and $x^{2016}y^{2019} = 8$ .....(2)

Dividing (1) by (2), $\frac{x^{2}}{y^{2}} = \frac{1}{16}$

$\frac{x}{y} = \frac{1}{4}$ i.e. $x = \pm\frac{1}{4}y$

$\left(\pm\frac{1}{4}y\right)^{2018} y^{2017} = \frac{1}{2}$

$y^{4035} = 2^{4035}$

$y = 2$

Therefore, $x = \pm\frac{1}{4}y = \pm\frac{1}{2}$

Hence, $x^2 + y^3 = \frac{1}{4} + 8 = \frac{33}{4}$

Solution 26 Let the number of marbles with Raju and Lalitha initially be 4x and 9x.

Let the number of marbles that Lalitha gave to Raju be y.
It has been given that $(4x+y)/(9x-y) = 5/6$
$24x + 6y = 45x - 5y$
$11y = 21x$
$y/x = 21/11$
Fraction of original marbles given to Raju by Lalitha = $y/9x$ (As Lalitha had 9x marbles initially). $y/9x = 21/99 = 7/33$.

Solution 27

$$5 + \log_3 a = 2^3 = 8 \Rightarrow a = 27$$

Similarly, $4a + 12 + \log_2 b = 5^3 = 125$

since $a = 27, 4(27) + 12 + \log_2 b = 125 \Rightarrow b = 32$

a + b = 59.

Solution 28 Let the rates of work of each human and each robot be H and R respectively (both in units/day).

$$15H + 5R = \frac{1}{30} \ldots\ldots (1)$$

$$5H + 15R = \frac{1}{60} \ldots\ldots (2)$$

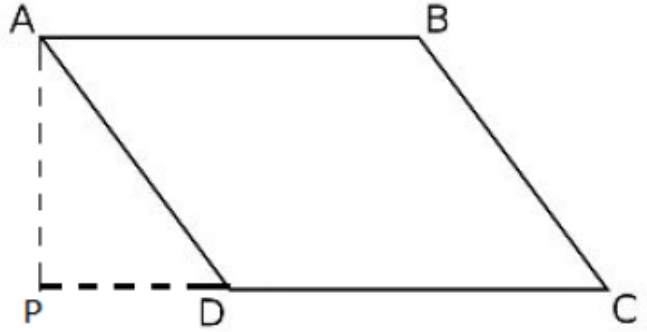
$$3(1) - (2) \Rightarrow 40H = \frac{1}{12}$$

$$H = \frac{1}{480}$$

In a day, 15 humans can complete 15H i.e. $\frac{1}{32}th$ of the job.

15 humans can complete the job in 32 days

Solution 29



$(CD)(AP) = 72\ 9(AP) = 72 \Rightarrow AP = 8$

$$DP = \sqrt{AD^2 - AP^2} = \sqrt{16^2 - 8^2} = 8\sqrt{3}$$

Area of triangle $APD = \frac{1}{2}(AP)(PD) = 32\sqrt{3}$

Solution 30

Let the 6 cm long chord be x cm away from the centre of the circle. Let the radius of the circle be r cm.
The perpendiculars from the centre of the circle to the chords bisect the chords.

$$r^2 = x^2 + 3^2 = (x+1)^2 + 2^2$$

Solving, $x = 2$ and $r = \sqrt{13}$

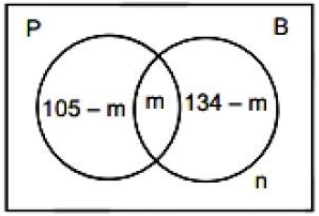
Solution 31

Let the rate of each filling pipes be 'x lts/hr' similarly, the rate of each draining pipes be 'y lts/hr'.
As per the first condition,
Capacity of tank = (6x - 5y)×6.....(i)
Similarly, from the second condition,
Capacity of tank = (5x - 6y) × 60.....(ii)
On equating (i) and (ii), we get
(6x - 5y) × 6 = (5x - 6y)×60
or, 6x - 5y = 50x - 60y
or, 44x = 55y
or, 4x = 5y
or, x = 1.25y
Therefore, the capacity of the tank = (6x - 5y) × 6 = (7.5y - 5y) × 6 = 15y lts

Effective rate of 2 filling pipes and 1 draining pipe = (2x - y) = (2.5y - y) = 1.5y
Hence, the required time = 15y/1.5y=10 hours.

Solution 32

Let the number of students who like both pizza and burger be ‘m’ .
The number of students who like neither of them be n



From venn diagram 105 – m + m + 134 – m + n = 200 m – n = 39
∴ The possible values of (m, n) are (39, 0) (40, 1).....(105, 66)
∴ The number of students who like only burger is lies in the range [134 – 105, 134 – 39] = [29, 95]
∴ From options, 93 is a possible answer

Solution 33

$f(x) = \min(2x^2, 52-5x)$

The maximum possible value of this function will be attained when $2x^2 = 52-5x$.

$2x^2 + 5x - 52 = 0$

$(2x+13)(x-4) = 0$

$\Rightarrow x = \frac{-13}{2}$ or $x = 4$

Since x has to be positive integer, we can discard the case $x = \frac{-13}{2}$.

is the point at which the function attains the maximum value. 4 x

putting in the original function, we get, $2x^2 = 2*4^2 = 32$.

Or the maximum value of f(x) = 32

Solution 34

Let the average age of people aged 51 years and above be x years.

Let the average age of people aged below 51 years be y years.

Let the number of people aged below 51 years be N.

Given, the average age of all the people in the apartment complex is 38 years.

Therefore,

$\frac{x \times 30 + y \times N}{30 + N} = 38$ ....(1)

We want to maximize y, which occurs when x is minimum i.e. for x=51.

Substituting the value of x in (1) we get
$390 = N \times (38 - y)$
Again, when y is maximum, N is also maximum i.e. 39
Therefore maximum value of $y = 28$.