



CAT Quant Questions PDF

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Instructions

For the following questions answer them individually

Question 1

How many distinct scalene triangles with integral sides are possible whose perimeter is less than 15 units?

- A 5
- B 4
- C 6
- D 7

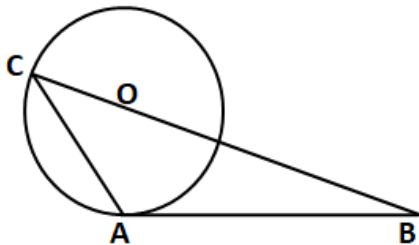
Answer: C

Explanation:

The only scalene triangles with perimeter less than 15 with integral sides are (2,3,4); (2,4,5); (2,5,6); (3,4,5); (3,4,6) and (3,5,6). So, the total number of triangles possible is 6

Question 2

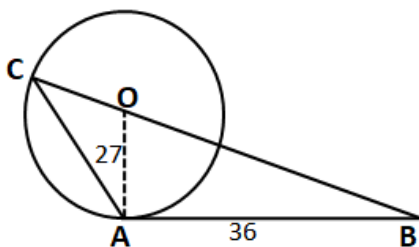
AB is tangent to a circle of radius 27 cm as shown in the diagram below where O is the centre of the circle. If AB = 36 cm and BC passes through centre of the circle then find out the area of triangle ABC?



- A 742.40 sq.cm
- B 834 sq. cm
- C 777.60 sq. cm
- D None of the above

Answer: C

Explanation:



Since AB is a tangent to the circle, $\angle OAB = 90^\circ$

Hence in right-angled triangle OAB, $OB^2 = OA^2 + AB^2$

$$\Rightarrow OB^2 = 27^2 + 36^2$$

$$\Rightarrow OB^2 = 729 + 1296 = 2025$$

$$\Rightarrow OB = 45\text{cm.}$$

Therefore, $BC = BO + OC = 45 + 27 = 72 \text{ cm} \dots (1)$

Also $\sin OBA = \frac{OA}{OB} = \frac{27}{45} = \frac{3}{5} \dots (2)$

We can see that area of triangle $ABC = \frac{1}{2} \times AB \times BC \times \sin ABC = \frac{1}{2} \times 36 \times 72 \times \frac{3}{5} = 777.60 \text{ sq.cm}$

Hence, option C is the correct answer.

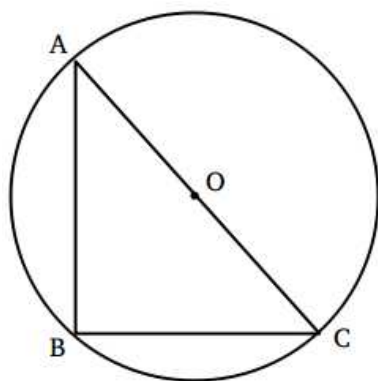
Question 3

A triangle with two of its sides as 20 cm and 99 cm is inscribed in a circle such that the area of a triangle is maximum possible. What is the diameter of that circle (in cm)?

Answer: 101

Explanation:

We can write area of a triangle as $\frac{1}{2} ab \sin \theta$ where a and b are two sides of the triangle and θ is the included angle. As the maximum value of $\sin \theta$ is 1 at $\theta = 90$, the triangle should be right angled for maximum area. Also, for a right-angled triangle, circumradius is $\frac{1}{2} \times \text{hypotenuse}$.



So, for the given triangle hypotenuse $= \sqrt{20^2 + 99^2} = 101 \text{ cm}$

Thus, circumradius $= \frac{101}{2} \text{ cm} = 50.5 \text{ cm}$

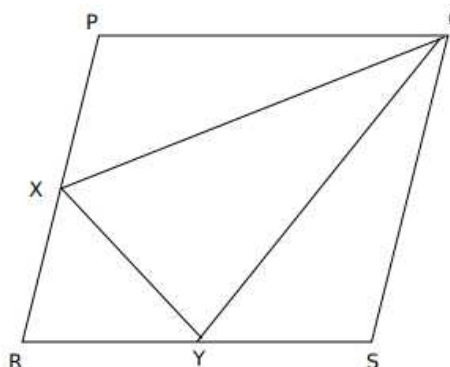
Diameter = 101 cm

Hence, 101 is the correct answer.

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Question 4

PQRS is a parallelogram, X and Y are the midpoints of the sides PR and RS respectively. If the area of the $\triangle QYS$ is 60, The area of the triangle $\triangle QXY$ is



A 60

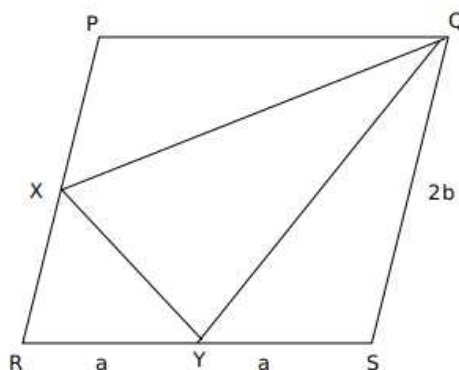
B 120

- C** 90
- D** Cannot be determined

Answer: C

Explanation:

Let the length and breadth of the parallelogram be $2a$, $2b$ and the angle between them be θ



Given the area of the $\triangle QYS = 60$

$$\frac{1}{2} * a * 2b * \sin \theta = 60$$

$$a * b * \sin \theta = 60$$

Area of $\triangle XYQ = \text{Area of the parallelogram} - (\text{Area of } \triangle PQX + \text{Area of } \triangle RXY + \text{Area of } \triangle QYS)$

$$\begin{aligned} \text{Area of the parallelogram PQRS} &= 2a * 2b * \sin \theta \\ &= 4 * 60 = 240 \end{aligned}$$

$$\begin{aligned} \text{Area of } \triangle PQX &= \frac{1}{2} * 2a * b * \sin(180 - \theta) \\ &= 60 \end{aligned}$$

$$\begin{aligned} \text{Area of } \triangle RXY &= \frac{1}{2} * a * b * \sin(180 - \theta) \\ &= 30 \end{aligned}$$

$$\begin{aligned} \text{Area of } \triangle XYQ &= 240 - 60 - 60 - 30 \\ &= 90 \end{aligned}$$

Hence C is the correct answer.

Alternate approach

If we consider h to be the height of the parallelogram.

$$\text{Area of the parallelogram PQRS} = 2a * h = 4 * 60 = 240$$

Height of the $\triangle RXY$ will be equal to $h/2$. (Perpendicular dropped from the mid-point.)

$$\text{Area of } \triangle RXY = \frac{1}{2} * a * h/2 = 30$$

$$\text{Area of } \triangle PQX = \frac{1}{2} * 2a * h = 60$$

$$\text{Area of } \triangle XYQ = 240 - 60 - 60 - 30 = 90$$

Question 5

A point on the circumference of a semicircle is joined with the endpoints of the diameter of the semicircle. It is found that the sides of the triangle so formed are in an arithmetic progression. If it is known that the length of the sides of the triangle are integers, which of the following can be the perimeter of the semicircle? (Take $\pi = \frac{22}{7}$)

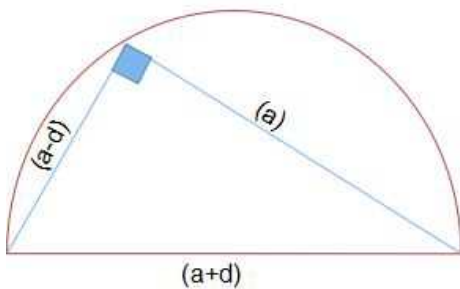
- A 120 units
- B 140 units
- C 160 units
- D 180 units

Answer: D

Explanation:

It has been given that a point on the circumference of the circle is joined with the end points of the semicircle. Therefore, the triangle so formed should be a right-angled triangle (Since the angle subtended by the diameter of the circle on the circumference is 90°).

It has been given that the sides of the triangle are in an arithmetic progression. Let us assume the sides to be $a - d$, a , and $a + d$ units. $a + d$ must be the length of the hypotenuse of the triangle.



Applying Pythagoras theorem, we get,

$$\begin{aligned}(a + d)^2 &= a^2 + (a - d)^2 \\ a^2 + d^2 + 2ad &= a^2 + a^2 + d^2 - 2ad \\ 4ad &= a^2 \\ 4d &= a\end{aligned}$$

Therefore, the 3 sides of the triangle will be of the form $3d$, $4d$ and $5d$.

$5d$ is the diameter of the semicircle.

$$\Rightarrow \text{Radius of the semicircle} = 2.5d$$

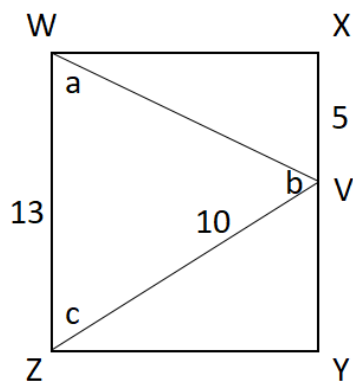
$$\begin{aligned}\text{Perimeter of the semicircle} &= \pi * r + 2r \\ &= \frac{22}{7} * r + 2r \\ &= r * \frac{36}{7} \\ &= 2.5d * \frac{36}{7}\end{aligned}$$

$$\text{Perimeter of the semicircle} = \frac{90 * d}{7} \text{ units.}$$

We know that 'd' has to be an integer. Therefore, the perimeter has to be a multiple of $90/7$. Only option D satisfies this condition and hence, option D is the right answer.

Question 6

In the rectangle WXYZ given below $WZ = 13$ cm, $VX = 5$ cm and $ZV = 10$ cm. a, b and c represent the measure of angle ZWV , WVZ and VZW respectively. Which of the following options accurately shows the relation between a, b and c .



- A $a > b > c$
- B $b > a > c$
- C $b > c > a$
- D Cannot be determined

Answer: B

Explanation:

$XY = 13$ cm $= XV + VY = 5 + VY$ Thus, $VY = 8$ cm

Thus, $ZY = \sqrt{10^2 - 8^2} = 6$ cm

Thus, $WV = \sqrt{5^2 + 6^2} = \sqrt{61} \approx 8$ cm

Thus, $WZ > ZV > WV$.

Thus, $b > a > c$

Hence, option B is the correct answer

Top-100 CAT Quant Questions Part-2 Video

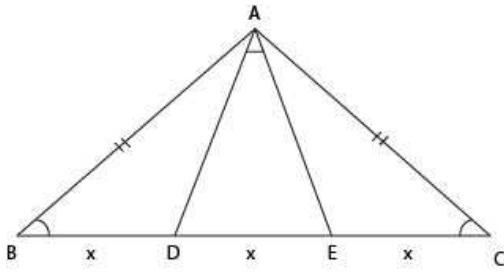
Question 7

In an isosceles triangle ABC with $AB = AC$, AD and AE trisect BC such that $BD = DE = EC$. If angle DAE is equal to angle ABC and the area of triangle ABC is equal to $\frac{27\sqrt{7}}{4}$, then find AC.

- A 3
- B 8
- C 9
- D 6

Answer: D

Explanation:



Since $AB = AC$

Angle $B = \text{Angle } C$

Let $BD = DE = EC = x$

$BD = EC = x$, $AB = AC$ and Angle $B = \text{Angle } C$

Triangle ABD is congruent to triangle ACE

$AD = AE$

Angle $ADE = \text{Angle } AED$ ---- (1)

Now Angle $ADE = \text{Angle } B + \text{Angle } BAD$ as angle ADE is the exterior angle of BAE . --- (2)

It is given that angle $DAE = \text{angle } ABC$. Hence, replacing angle B with angle DAE in eqn(2), we get

angle $ADE = \text{angle } DAE + \text{angle } BAD$

From (1), we can replace angle ADE with angle AED .

Angle $AED = \text{Angle } DAE + \text{Angle } BAD$

Angle $AED = \text{Angle } BAE$

Hence, $AB = BE = 2x$

$\Rightarrow AB = AC = 2x$

$BC = 3x$

Hence, height of triangle $ABC = h = \sqrt{(2x)^2 - (3x/2)^2} = \sqrt{7}x/2$

Area of triangle = $\frac{27\sqrt{7}}{4}$

$1/2 * 3x * \sqrt{7}x/2 = \frac{27\sqrt{7}}{4}$

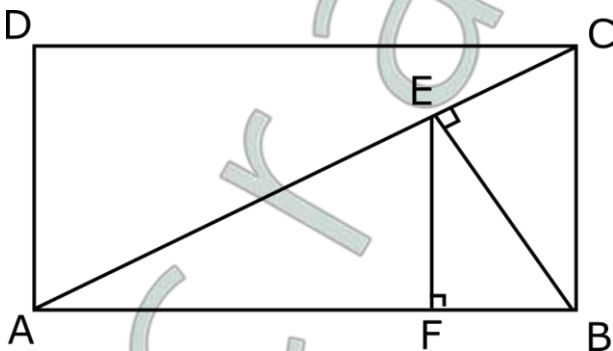
$x^2 = 9 \Rightarrow x = 3$

$2x = 6$

$AB = AC = 6$

Question 8

ABCD is a rectangle as shown in the figure. $AB = 8$ cm and $BC = 6$ cm. BE is the perpendicular drawn from B to the diagonal AC . EF is the perpendicular drawn from E to AB . What is the length of BF ?



A 3.24 cm

B 1.96 cm

C 2.56 cm

D 2.88 cm

Answer: D

Explanation:

By Pythagoras theorem $AC = \sqrt{AB^2 + BC^2} = \sqrt{8^2 + 6^2} = 10$ cm

Triangle BEC is similar to triangle ABC . So we get,

$$\frac{BE}{AB} = \frac{BC}{AC}$$

$$\Rightarrow \frac{BE}{8} = \frac{6}{10}$$

$$\Rightarrow BE = 4.8 \text{ cm}$$

Triangle BFE is similar to triangle BEA . So we get,

$$\frac{BF}{BE} = \frac{BE}{AB}$$

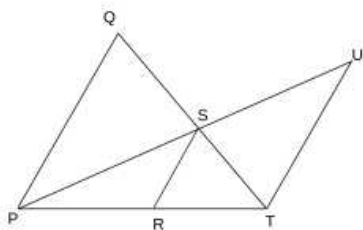
$$\Rightarrow BF = \frac{BE^2}{AB}$$

$$\Rightarrow BF = \frac{4.8^2}{8}$$

$$\Rightarrow BF = 2.88 \text{ cm}$$

Question 9

In the figure given below $PQ \parallel RS \parallel TU$. If $PQ:TU=3:2$, then what is the value of $SR:TU$?



A 3:5

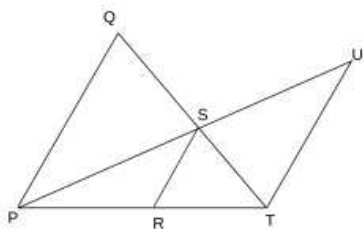
B 2:5

C 3:4

D 2:3

Answer: A

Explanation:



$$PQ:TU=3:2$$

$$PQ=3y$$

$$TU=2y$$

$$\text{If } SR = x$$

$$\triangle PUT \text{ is similar } \triangle PSR \text{ then } PR/PT=x/2y$$

$$\text{Similarly, } \triangle PQT \text{ is similar } \triangle RST \text{ then } RT/PT=x/3y$$

$$RT=PT-PR$$

$$\therefore (PT-PR)/PT= x/3y$$

$$1-PR/PT=x/3y$$

$$1 - x/2y = x/3y$$

$$x = 6y/5$$

$$\text{thus } SR/TU = 6y/(5 \cdot 2y) = 3/5$$

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Question 10

In triangle ABC, two points P and Q are on AB and BC respectively such that AP:BP=1:4 and BQ:CQ=2:3. The ratio of areas of triangle BPQ and the quadrilateral PQCA is

A $\frac{8}{25}$

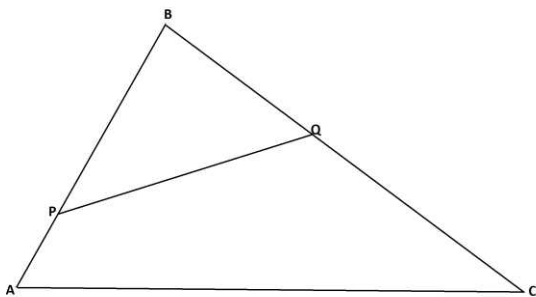
B $\frac{17}{25}$

C $\frac{9}{17}$

D $\frac{8}{17}$

Answer: D

Explanation:



We have AP:PB=1:4 and BQ:CQ=2:3

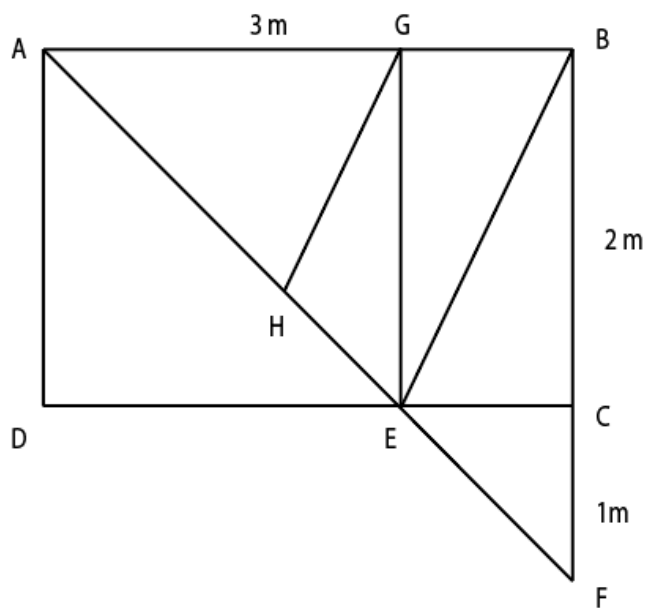
Now the area of ABC = $\frac{1}{2} BA * BC \sin \theta = x$ (Assume)

Similarly, area of BPQ = $\frac{1}{2} BP * BQ \sin \theta = \frac{1}{2} \left(\frac{4}{5} BA \right) * \left(\frac{2}{5} BC \right) \sin \theta = \frac{8}{25} x$

Now, $\frac{\text{area BPQ}}{\text{area PQCA}} = \frac{\text{area BPQ}}{\text{area ABC} - \text{area BPQ}} = \frac{\frac{8}{25} x}{x - \frac{8}{25} x} = \frac{8}{17}$

Question 11

In the given figure ABCD is a rectangle. AB is 3m and BC is 2m. It is given that CF is 1m. AF intersects CD at E and it is known that BE is parallel to HG. GE is perpendicular to AB. Find the length of HG (in m).



A $\frac{2\sqrt{5}}{3}$

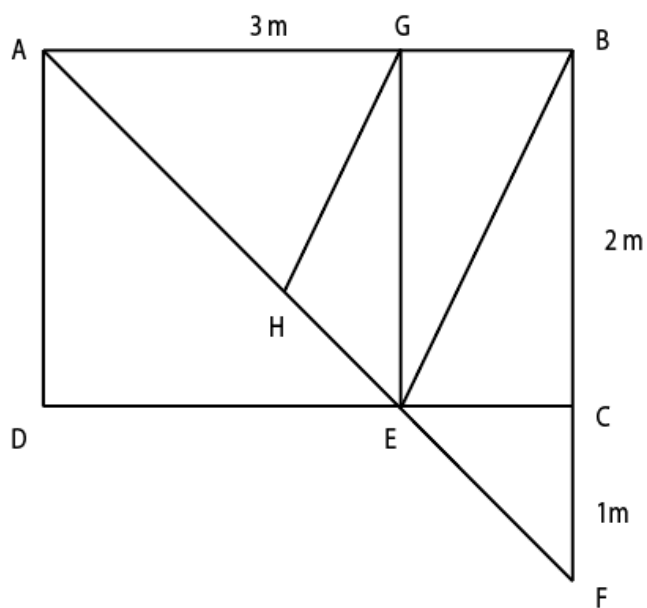
B $\sqrt{2}$

C $\frac{4\sqrt{5}}{3}$

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

Answer: A

Explanation:



In the figure given above,

In $\triangle ABF$, AB is parallel to EC.

$$\frac{EC}{AB} = \frac{CF}{BF}$$

$$\frac{EC}{3} = \frac{1}{3}$$

$$\therefore EC = 1\text{m}$$

Then according to the figure, $GB = 1\text{m}$.

$$\begin{aligned}\text{Length of side } BE &= \sqrt{GB^2 + GE^2} = \sqrt{2^2 + 1^2} \\ &= \sqrt{5}\end{aligned}$$

$$\triangle AHG \sim \triangle AEB \quad (\text{Since } HG \parallel BE)$$

Thus $AG/AB = HG/BE$.

$$2/3 = HG/\sqrt{5}$$

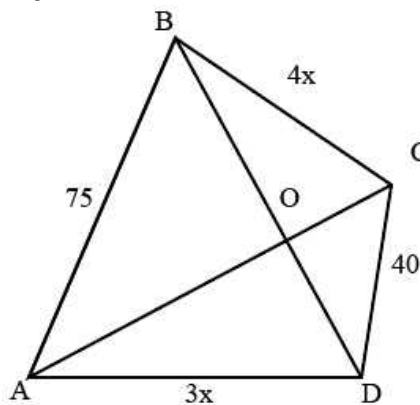
$$HG = 2\sqrt{5}/3$$

Question 12

ABCD is a quadrilateral such that its diagonals are perpendicular to each other. If $AB = 75$ and $CD = 40$. If $AD:BC = 3:4$, then the sum of the lengths of AD and BC is

Answer: 119

Explanation:



Assume the diagonals intersect at O. Now $OA^2 + OB^2 + OC^2 + OD^2 = OA^2 + OD^2 + OB^2 + OC^2$

Hence $AB^2 + CD^2 = AD^2 + BC^2 \dots (1)$

$$75^2 + 40^2 = (3x)^2 + (4x)^2 \quad (\text{Consider } AD = 3x \text{ and } BC = 4x)$$

$$\Rightarrow 7225 = 25x^2$$

$$\Rightarrow x^2 = 289$$

$$\Rightarrow x = 17$$

$$AD + BC = 3x + 4x = 7x = 7 \times 17 = 119$$

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Question 13

In a triangle PQR, PA divides the QR in the ratio of 3:2. The angular bisectors of $\angle PAQ$ and $\angle PAR$ intersect PQ and PR at B and C, respectively. If $PB:BQ = 2:1$, then the ratio $PC:CR$ is

A 2:1

B 1:2

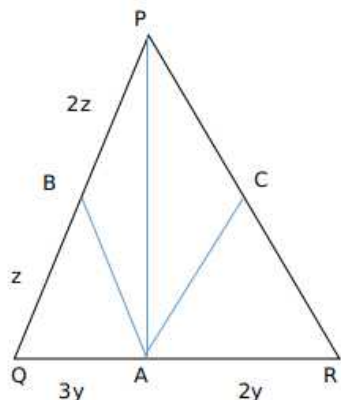
C 3:4

D 3:1

Answer: D

Explanation:

Let's try to represent the information on a diagram.



The angular bisector AB divides PQ in the ratio of 2:1

Let $PB = 2z$ and $BQ = z$

The angular bisector divides the opposite side in the ratio of the sides containing the angle.

So $AP: AQ = 2:1$

So $AP = 6y$

Similarly, $PC: CR = AP: AR = 6y:2y = 3:1$

D is the correct answer.

Question 14

ABCD is an isosceles trapezium with angle $A = 45^\circ$ and the length of one of the non-parallel sides are $10\sqrt{2}$, and the area of ABD is 200 sq. Units. What is the sum of the lengths of the parallel sides.

A 60

B 50

C 40

D 30

Answer: A

Explanation:

Given ABCD is an isosceles trapezium, so the length of the non-parallel sides is equal.

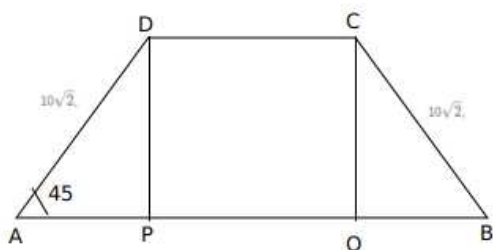
And area of the triangle ABD is 200 sq units.

$$\frac{1}{2} \cdot AD \cdot AB \sin \theta = 200$$

$$\frac{1}{2} \cdot 10\sqrt{2} \cdot AB \sin 45^\circ = 200$$

$AB = 40$ units

Now let us draw a perpendicular from vertices C and D to AB,



The lengths of AP and PD should be equal, ($A = 45^\circ$)

$$AP^2 + PD^2 = 200$$

$$2AP^2 = 200$$

$AP = 10$ units

The length of AP and BQ is same,

$BQ = 10$ units

$$CD = AB - (AP + BQ)$$

$$40 - 20 = 20 \text{ units}$$

Sum of the lengths of the parallel sides = $40+20 = 60$ units

Question 15

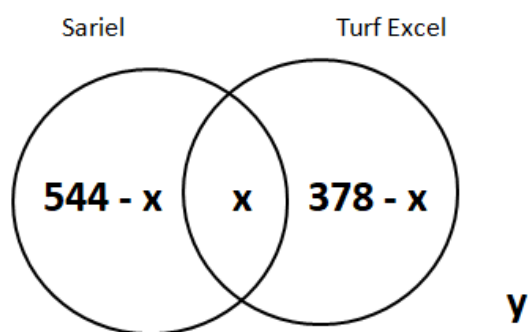
A survey was conducted in a town to gauge the popularity of 2 detergent powders viz. Sariel and Turf Excel. A total of 800 housewives participated in the survey. It was found that 544 housewives knew about Sariel whereas only 378 housewives knew about Turf Excel. What can be the number of housewives who knew about Sariel alone?

- A 150
- B 425
- C 165
- D 394

Answer: D

Explanation:

Let ' x ' be the number of housewives who knew about both detergent powders. Let ' y ' be the number of housewives who didn't know about any of the two brands. We can draw a Venn diagram as shown below:



It is given that a total of 800 housewives participated in the survey.

$$\Rightarrow 544 - x + x + 378 - x + y = 800$$

$$\Rightarrow x = 122 + y$$

We know that $y \geq 0$, therefore, we can say that $x \geq 122 \dots (1)$

Also, the number of housewives who knew about Turf excel alone = $378 - x$. Therefore, $378 - x \geq 0$

$$\Rightarrow x \leq 378 \dots (2)$$

By combining inequality (1) and (2) we can say that

$$\Rightarrow 122 \leq x \leq 378$$

$$\Rightarrow -122 \geq -x \geq -378$$

$$\Rightarrow 544 - 122 \geq 544 - x \geq 544 - 378$$

$$\Rightarrow 166 \leq 544 - x \leq 422$$

Hence, the number of housewives who knew about Sariel alone = $(544 - x) \in [166, 422]$

We can see that only 394 lies in that range. Therefore, option D is the correct answer.

CAT Previous Papers PDF

Question 16

In a township of 1000 families, some families have an SUV and some families have a car. Some families have both the vehicles and some families have no vehicle. It is known that 350 families own an SUV. Out of those who own an SUV, 50% own a car too. If it is known that 75% of the families of the township owns at least one vehicle, how many families own at most one vehicle?

Answer:825

Explanation:

No. of families who owns an SUV = 350

No. of families who owns both SUV and car = 50% of 350 = 175

It is given that 75% of the families own at least one vehicle.

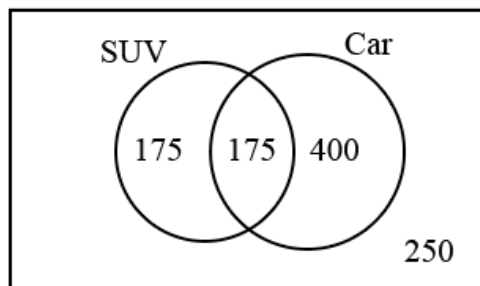
So, 250 families do not own any vehicle.

No. of families who own a car and not an SUV = $750 - 350 = 400$

So, no of families who own at most one vehicle

$= 250 + (350 - 175) + (750 - 350) = 825$

Hence, 825 is the correct answer.



Question 17

In a CAT prep institute, all the students are interested in at least one of the following series: GOT, FRIENDS, Big Bang Theory. It was found that the percentage of students who like the shows are 55,86,69 respectively. Let x be the percentage of students who are interested in all the three series. Find the ratio of the maximum to the minimum value of x .

A 11

B 6

C 5.5

D 4

Answer: C

Explanation:

Let A be the percentage of students who like only one show

B be the percentage of students who like two shows

C be the percentage of students who like all the three shows

$A+B+C=100$ -----(1)

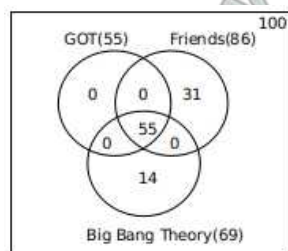
$A+2B+3C=55+86+69$

$A+2B+3C=210$ -----(2)

$B+2C=110$

Since we have to maximize C, if $B=0$ $C=55$ $A=45$ which satisfies both the equations

The maximum value of $C=55$



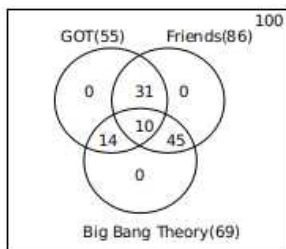
Let us try to find the minimum value of C

Eq (2) - 2*Eq (1), we get $C-A=10$

Minimum value of C is 10 when $A=0$ then $B=90$

$A=0$, $B=90$, $C=10$ satisfies both the equations.

Hence the minimum value of C is 10



The ratio of Maximum to Minimum=5.5
Hence C is the correct answer.

Question 18

Two sets P and Q contain elements such that $p \in P$ and $q \in Q$. p is a 4 digit number in decimal system which has at least 3 trailing zeroes when converted into base 6 and q is a four digit perfect square. How many elements does the set $P \cup Q$ contain?

- A 79
- B 99
- C 108
- D 110

Answer: C

Explanation:

The 4 digit number should be divided by $6^3 = 216$ in order to get at least 3 trailing zeroes.

First 4 digit number divided by 216 = 1080

Last 4 digit number divided by 216 = 9936

$$9936 = 1080 + 216(n-1)$$

$$\Rightarrow n = 42$$

Total elements in $Q = 4$ digit squares = $\{32^2 \text{ to } 99^2\} = 99 - 32 + 1 = 68$

No of elements in $P \cap Q = 2$, because 4 digit square divisible by 6^3 will also be divisible by $6^4 = 1296$. Hence it can come in P as $36 \times 36 = 1296$ and $72 \times 72 = 5184$.

Total number of elements in $P \cup Q = 68 + 42 - 2 = 108$

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Question 19

In a residential school, every student has to play at least one out of three sports namely hockey, badminton and cricket. Out of 100 students, 81 play hockey, 75 play cricket and 71 play badminton then the maximum number of students who play exactly two games can be

- A 71
- B 77
- C 73
- D 75

Answer: C

Explanation:

Consider the number of students who play exactly 1 sport = x, the number of students who play exactly 2 sports = y and the number of students who play exactly 3 sports = z

$$x+y+z=100$$

$$2x+2y+2z=200....(1)$$

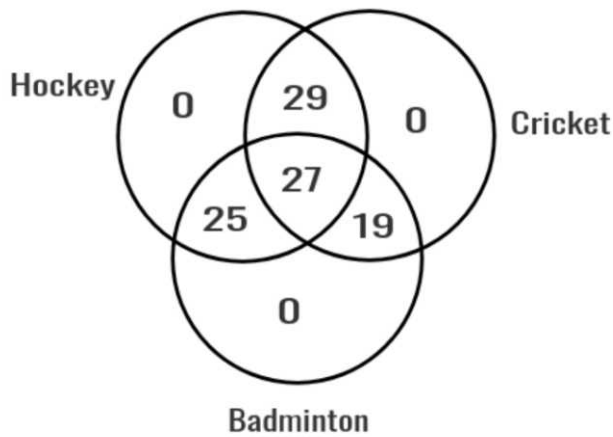
$$x+2y+3z=227.....(2)$$

Subtracting (1) from (2), we get $z-x=27$

The minimum value of x can be 0. Hence $z=27$ and $y=73$ (from (1))

The number of students who play exactly 2 sports = 73

The Venn diagram for the case when $x=0$, $y=73$ and $z=27$ is as follows:



Question 20

In a class, each student likes at least one of the five activities, namely Playing, Singing, Drawing, Dancing, Reading. 80% of the students like playing, 70% of the students like singing, 90% of the students like Drawing, 80% of the students like dancing and 90% like reading. What is the maximum percentage of the students who like exactly four of the five activities?

Answer:90

Explanation:

Let I be the percentage of students who like exactly one activity
 II be the percentage of students who like exactly two activities.
 III be the percentage of students who like exactly three activities.
 IV be the percentage of students who like exactly four activities.
 V be the percentage of students who like all the five activities.

$$I+II+III+IV+V=100$$

$$I+2II+3III+4IV+5V=410$$

We have to maximize the percentage of students who like exactly four activities.

Let us consider I, II, III be 0

$$IV+V=100$$

$$4IV+5V=410$$

On solving both the equations, we get

$$V=10, IV=90$$

90 is the correct answer.

Question 21

If $A = \{2,4,5\}$, How many natural numbers less than 101 are not divisible by any of the numbers in the set A?

Answer:40

Explanation:

Here, all the numbers that are divisible by 4 are divisible 2.(Hence, we do not need to find the numbers that are not divisible by 4)

Hence, we need to find the numbers that are divisible 2, 5 and both 2 and 5.

The number of natural numbers divisible by 2 = 50(all the even numbers from 1 to 100)

The number of natural numbers that are divisible by 5 = 20 (from 5×1 to 5×20).
 Numbers that are divisible by both 5 and 2 are divisible by 10.
 Hence, there are 10 numbers that are divisible by both.
 $N(2 \cup 5) = N(2) + N(5) - N(2 \text{ and } 5)$
 $N(2 \cup 5) = 50 + 20 - 10 = 60$
 Number of numbers that are not divisible by both 2 and 5 = $100 - 60 = 40$

Alternate Solution

Since 2 is a factor of 4, the crux of the question is to find how many number less than 100 are not divisible by either 2 or 5

Since 100 is divisible by both 2 and 5

No of numbers not divisible by 2 = $100 \times \frac{1}{2} = 50$

No of numbers not divisible by 2 and not divisible by 5 = $100 \times \frac{1}{2} \times \frac{4}{5} = 40$

Complete CAT Verbal In 45 Minutes

Question 22

A and B are two series as follows.

A = {1, 4, 7, 10,181}

B = {22, 45, 68,482}

The value of the product of the number of terms in set A and Set B is

- A** 1281
- B** 1280
- C** 1200
- D** 1820

Answer: A

Explanation:

Set A = {1, 4, 7, 10181}

Here the first term = 1

Common difference = 3

$181 = 1 + (n-1)3$

$n = 61$

Set B = {22, 45, 68,482}

First term = 22

Common difference = 23

$482 = 22 + (n-1)23$

$n = 21$

The product of the number of terms in set A and B = $61 \times 21 = 1281$

A is the correct answer.

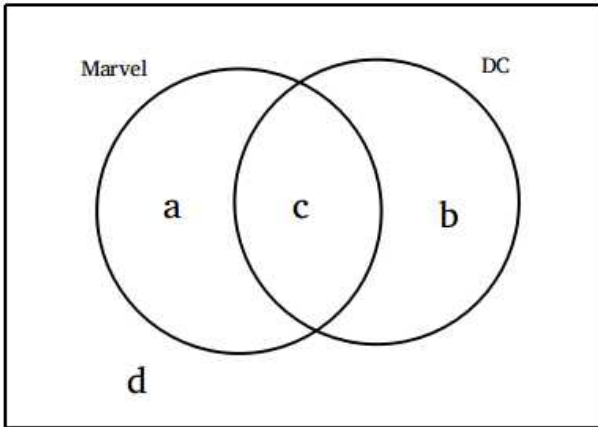
Question 23

Among the first year students of IIM Calicut, 100 students do not like DC comics and 134 students do not like Marvel comics. If the difference between the students who like both and the number of students who like none is 24, how many students like only one out of the two comics?

- A** 200
- B** 198
- C** 186
- D** Cannot be determined

Answer: D

Explanation:



100 students do not like DC comics. So, $a + d = 100$ (i)

134 students do not like Marvel comics. So, $b + d = 134$ (ii)

Difference between the number of students who like both and the number of students who like none is 24.

$\Rightarrow |c - d| = 24$ (iii)

Adding (i), (ii) and (iii), we get

$a + b + c + d = 258$ (iv)

$a + c + 3d - b = 258$ (v)

We have to find the value of $(a + b)$

By using these equations, we cannot find the value of $(a + b)$.

Thus, the answer cannot be determined.

Hence, option D is the correct answer.

Question 24

A shrewd trader bought some rice. But while buying rice from a wholesaler, he cons him into selling 25% more rice than what he is paying for. He marks up the price by 20% and after giving a discount of 20% makes some profit/loss.

This profit/loss is the same as the profit he would have made if he sold all the rice he bought for Rs 'A' per kg. It is also known that 'A' is Rs 4 more than the rate he effectively got the rice for, after conning the wholesaler. What is the price of rice per kg?

- A** Rs 125
- B** Rs 25
- C** Rs 20
- D** Cannot be determined

Answer: B

Explanation:

Let the price of 100kg be Rs x . This means price per kg is $x/100$.

So, in the first transaction, the trader buys 125 kg for Rs x . This means cost price per kg for the trader is $x/125$, i.e. $x/125$.

The marked up price is $x/100 \times 1.2$ per kg

The selling price is $x/100 \times 1.2 \times 0.8$ per kg = $24x/2500$ per kg

The cost price for the trader is $20x/2500$ per kg.

\Rightarrow Per kg profit is $4x/2500$ per kg.

Since in the second transaction the quantity bought and the profit is same, $4x/2500$ should be equal to Rs 4.

$\Rightarrow x = 2500$

Thus, the price is Rs 2500 for 100 kg or Rs 25/kg.

Complete CAT DILR In 1 Hour

Question 25

A shopkeeper makes a profit on the sale of a material by marking the price 20% more than cost price on a normal day. On a particular day, while buying he gets 10% extra material for a given price. If he gives 25% discount on the marked prices, what is the profit or loss percentage on the transaction?

- A 2% loss
- B 1% loss
- C 2% profit
- D 1% profit

Answer: B

Explanation:

Assume the cost of material = Re 1/unit and normal marked price = 1.2/unit

Consider the amount of money spent on the given day = Rs. 100

Then the shopkeeper will get 110 units of material.

The marked price of 110 units = 110×1.2

After giving 25% discount, new selling price = $110 \times 1.2 \times 0.75 = 99$

Hence on the whole transaction he makes $100 - 99 = 1\%$ loss

Question 26

Salary of a person decreases by 50% every year. His expenses increase by 100% every quarter. The ratio of salary to expenses at present is $x:1$. If after two years, his salary becomes equal to his expenses, what is the value of x ?

Answer: 1024

Explanation:

Initially, let the expenditure be 1.

His expenses increased by 100% every quarter.

Then the expenditure after 1st quarter = $1(1 + \frac{100}{100}) = 2$

The expenditure after 2 year = $1(1 + \frac{100}{100})^8 = 256$

Salary of a person is decreased by 50% every year.

After two years the salary will be 256.

Since the present expenses = 1, hence the present salary = x

$$x(1 - \frac{50}{100})^2 = 256$$

$$x = 1024$$

The present the Salary and expense of the person are in ratio 1024:1

Question 27

An online seller sells books such that he gives Rs 5 more discount on each successive book purchased. For example, if the discount on 1st book is x , then the discount on the 2nd book will be $x+5$. The marked price of each book is 500 and the cost price is 300. If the discount on the 3rd book is 20, what is the maximum number of books that he can sell such that he still makes overall profit?

- A 75
- B 80

C 77

D 76

Answer: D

Explanation:

Since discount on the 3rd book is 20, discount on the first book will be 10.

Assuming he sells n number of books.

Total cost price = $300n$, Selling price of all the books = $500n - (10 + 15 + 20 + \dots + 10 + (n-1)5)$

Now since he makes overall profit.

$500n - (10 + 15 + \dots + 10 + (n-1)5) > 300n$

$\Rightarrow (n/2)[20 + (n-1)5] < 200n$

$\Rightarrow 20n + (n-1)5n < 400n$

$\Rightarrow 4n + n^2 - n < 80n$

$\Rightarrow n(n-77) < 0$

$\Rightarrow 0 < n < 77$ Hence maximum value of $n=76$.

Complete CAT Revision Videos (Most Important)

Question 28

A metal trader sells zinc, copper and iron. On a particular day, the cost price of iron is 25% more than copper which in turn has cost price 33.33% more than zinc. The profit booked on zinc, copper and iron is 50%, 40% and 30% respectively. If the overall profit is 40%, what should be the ratio of quantities of zinc and iron sold on that day assuming that every metal was traded?

A 5/3

B 3/5

C 5/4

D Cannot be determined

Answer: A

Explanation:

Assuming the cost price of zinc/kg = a

Hence the price of copper/kg = $4a/3$

Hence the price of iron/kg = $5a/3$

Assuming $a/3 = b$, The price per kg for zinc, iron and copper be $3b$, $4b$ and $5b$ respectively.

The profit made on zinc/kg = $3b \cdot 0.5 = 1.5b$

Profit on copper/kg = $4b \cdot 0.4 = 1.6b$

Profit on iron/kg = $5b \cdot 0.3 = 1.5b$

Now assuming the quantities for zinc, iron and copper be x , y and z respectively.

Overall profit = $(1.5bx + 1.6by + 1.5bz) / (3bx + 4by + 5bz) = 40/100 = 0.4$

$\Rightarrow (1.5bx + 1.6by + 1.5bz) = 1.2bx + 1.6by + 2bz$

$\Rightarrow 0.3x = 0.5z$

$\Rightarrow x/z = 5/3$

Question 29

If the ratio of selling price of three items P, Q, R is 3:4:5. If a profit of 20% is realised on P, a profit of 20% on Q and a loss of 10% on R. Then the overall profit/loss percentage occurred during the transaction is

A profit of 10.73%

- B** loss of 5.37%
- C** profit of 5.37%
- D** loss of 10.73%

Answer: C

Explanation:

Let the selling price of P, Q, R be $3x, 4x, 5x$

After realization of 20% profit, the selling price of P is $3x$

$$\text{Cost price of P} = 3x \times \frac{100}{120} = 2.5x$$

After realization of 20% profit, the selling price of Q is $4x$

$$\text{Cost price of Q} = 4x \times \frac{100}{120} = \frac{10x}{3}$$

After realization of 10% loss, the selling price of R is $5x$

$$\text{Cost price of R} = 5x \times \frac{100}{90} = \frac{50x}{9}$$

$$\text{Sum of the cost price} = \frac{205x}{18}$$

$$\text{Sum of the selling price} = 12x$$

$$\text{Overall profit percentage} = \frac{12x - \frac{205x}{18}}{\frac{205x}{18}} \times 100$$

$$= 5.37\%$$

C is the correct answer.

Question 30

If a man saves Rs.916.66 every month, he can pay off a loan that is compounding annually in 1 year. However, if he wishes to pay off the loan in 2 years, he finds out that he should save Rs 504.16 every month. Find the rate of interest charged for the loan.

- A** 10%
- B** 12%
- C** 15%
- D** 16%

Answer: A

Explanation:

$$P(1 + \frac{r}{100})^1 = 916.66 \times 12$$

$$P(1 + \frac{r}{100}) = 11000 \text{ --- Eq(1)}$$

Similarly,

$$P(1 + \frac{r}{100})^2 = 504.16 \times 24$$

$$P(1 + \frac{r}{100})^2 = 12100 \text{ --- Eq(2)}$$

$$P(1 + \frac{r}{100})(1 + \frac{r}{100}) = 12100$$

$$11000(1 + \frac{r}{100}) = 12100$$

$$r=10$$

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Question 31

A fruit seller buys fresh grapes containing 80 percent water. It is known that the price per kg of grapes vary inversely to the square of the percent water content. The water content decreases with time. What can be the final percentage of water content if the fruit seller makes a loss of $\frac{100}{9}$ percent?

- A 27
- B 64
- C 50
- D 60

Answer: D

Explanation:

Assuming the initial quantity to be 1 kg and price per kg = $\frac{k}{y^2}$ where y is the percentage content of the water and k is the proportion constant.

Price of 1 kg grapes with 80 percent water = $\frac{k}{80^2}$

After losing the water content the weight of grapes with water content x (assume) price of 1 kg grapes become = $\frac{k}{x^2}$
Since the pulp mass remain constant, $0.2 = z \times (1 - \frac{x}{100})$ (where z is the total mass of grape with x water content)

Hence, $z = \frac{20}{100-x}$ kg

Price for $\frac{20}{100-x}$ kg raisin = $\frac{20}{100-x} \times \frac{k}{x^2} = \frac{20k}{(100-x)x^2}$

Loss = $\frac{\frac{k}{80^2} - \frac{20k}{(100-x)x^2}}{\frac{k}{80^2}} = \frac{1}{9}$

$\Rightarrow 1 - \frac{20 \cdot 80^2}{(100-x)x^2} = \frac{1}{9}$

$\Rightarrow \frac{20 \cdot 80^2}{(100-x)x^2} = \frac{8}{9}$

$\Rightarrow x^3 - 100x^2 + 144000 = 0$

From the options, x=60 satisfies the given equation.

Question 32

A faulty machine records the price and number of goods purchased but reverses the digits of the number of goods when computing the bill. At the end of the day when the accountant was tallying the number of goods left, he found that the number of goods recorded by the machine was 63 less than the actual number of goods and that the value of the recorded goods was Rs.696. What is the actual price of a good? (Assume that the price and the number of goods are two-digit numbers and that the price of each good is the same).

- A 24
- B 12
- C 29
- D 58

Answer: A

Explanation:

Let the faulty value of the number of goods be ab

Let actual value of number of goods be ba.

$ba - ab = 63$

$$10b + a - (10a + b) = 63$$

$$9(b - a) = 63$$

$$b - a = 7$$

So we have the following possibilities (9,2),(8,1)

So the possible values are 92,29,18,81

Among the above values only 29 divides 696.

So the number of goods as shown by the faulty machine = 29

$$\text{Price of each good} = \frac{696}{29}$$

$$= 24$$

A is the correct answer.

Question 33

A milkman bought 15 litres of milk and mixed it with 3 litres of mineral water (which is not free). He claims to his customers, who do not know about mixing, that he is making a profit of 10% only. However, his actual profit is 20%. What is the ratio of the cost of milk/litre and water/litre.

A 2:3

B 3:4

C 2:1

D 3:2

Answer: C

Explanation:

Let the CP of milk be Rs. 100/litre

As he is claiming 10% profit, SP of the total mixture = Rs. $[(15 + 3) \times 110] = \text{Rs. } 1980$

Actual profit = 20%

Let actual CP be Rs. x .

Then, $x + 20\% \text{ of } x = \text{Rs. } 1980$

Solving for x , we get $x = \text{Rs. } 1650$

So, Actual CP = Total CP of milk + Total CP of water

Or, Total CP of water = Rs. $1650 - (15 \times 100) = \text{Rs. } 150$

Or, CP of water = Rs. 50/litre

Required ratio = $100:50 = 2:1$

Hence, option C is correct.

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Question 34

A shopkeeper marks up the price of the article by $n\%$ and then offers a discount of $n\%$. He ends up making a loss of Rs. 100. Had he marked up the price of the article by $2n\%$ and offered a discount of $n\%$, he would have made a profit of Rs. 100. How much will the shopkeeper earn if he marks up the price by $3n\%$ and offers a discount of $2n\%$?

A A profit of Rs. 600

B A profit of Rs. 300

C A loss of Rs. 600

D A loss of Rs. 300

Answer: D

Explanation:

Let the cost price of the article be 'x'.

When the shopkeeper marks up the price of the article by n% and offers a discount of n%, he incurs a loss of Rs. 100.

$$(1 + n)(1 - n)x = x - 100$$

$$x - xn^2 = x - 100$$

$$\Rightarrow xn^2 = 100 \dots (1)$$

When the shopkeeper marks up the price by 2n% and offers a discount of n%, he makes a profit of Rs. 100.

$$(1 + 2n)(1 - n)x = x + 100$$

$$(1 - n + 2n - 2n^2)x = x + 100$$

$$x + nx - 2n^2x = x + 100$$

Substituting (1), we get,

$$nx - 200 = 100$$

$$nx = 300 \dots (2)$$

Dividing (1) by (2), we get,

$$n = \frac{1}{3} \text{ and } x = 900$$

When the shopkeeper marks up the price by 3n% and offers a discount of 2n%, the selling price of the article will be

$$(1 + 3n)(1 - 2n)x$$

$$(1 + 3n)(1 - 2n)x = (1 + n - 6n^2)x$$

$$= x + nx - 6n^2x$$

$$= 900 + 300 - 600$$

$$= 600$$

$$\Rightarrow \text{Loss} = 900 - 600 = \text{Rs. } 300.$$

Therefore, option D is the right answer.

Question 35

A fruit seller gives 10% discount on the marked price and sells apples. He also gives 15 apples (per dozen) to a regular customer to reward his loyalty. If he still ends up making a 20% profit on the apples, how much % above the cost price are the apples listed?

A 33.33%

B 50%

C 66.67%

D 80 %

Answer: C

Explanation:

Let the MP of 12 apples be 100 Rupees.

He gives 10% discount on it i.e. he sells 12 apples at Rs 90.

But instead of giving 12 apples he gives 15 apples i.e. he sells 15 apples at Rs. 90.

SP of 1 apple = Rs 6.

$$\frac{6 - CP}{CP} = \frac{1}{5}$$

He still ends up with 20% profit i.e.

i.e. CP of 1 apple = Rs 5.

CP of 12 apples = Rs. 60.

MP of 12 apples = Rs. 100

$$\frac{100 - 60}{60}$$

Therefore, % Markup = $\frac{100 - 60}{60} = 66.66\%$

Hence, option C is the correct answer.

Question 36

An amount was lent at a certain rate of interest compounded annually. Had the amount been lent at simple interest, the amount of interest would have been Rs 5400 less for initial two years and 17820 for initial three years, then the amount lent is equal to

- A 72000
- B 40000
- C 80000
- D 60000

Answer: D

Explanation:

Assuming the amount = P the rate of interest = R% and $R/100 = a$

For two years difference between compound and simple interest = $P(1+a)^2 - P - 2Pa = Pa^2 = 5400 \dots (1)$

Now for three years, the difference = $P(1+a)^3 - P - 3Pa = Pa^3 + 3Pa^2 = 17820 \dots (2)$

Putting the value of Pa^2 in (2), we get $5400a + 3 \times 5400 = 17820 \Rightarrow a = 3/10$

Now, on putting $a = 3/10$ in (1), we get $P \times 9/100 = 5400 \Rightarrow P = 60000$

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Question 37

A wholesaler buys an equal number of pens and pencils. The cost price of a pen and a pencil are in ratio 3:2. The total cost price for all the pencils is a . He sells all the pencils for Rs 144 at a profit of $a\%$. If the profit on all the pencils and all the pens is the same, what is the overall profit percentage after selling all the pens and pencils?

- A 80%
- B 64%
- C 40%
- D 48%

Answer: B

Explanation:

The cost price of all pencils = a , the profit percentage = a

$$\frac{144 - a}{a} = \frac{a}{100}$$

$$\Rightarrow a^2 + 100a - 14400 = 0$$

$$\Rightarrow a = -180, 80$$

$a = -180$ is rejected

Then the profit of pens = $144 - 80 = 64$

Cost price of pens = 120

Now cost price = $120 + 80 = 200$

Profits = $64 \times 2 = 128$

\Rightarrow The overall profit percentage = $128/200 = 64\%$

Question 38

A fruit seller buys 60 oranges and 50 bananas such that price of 5 bananas is equivalent to price of 4 oranges. If he sells equal number of bananas and oranges at the loss of 20 percent and remaining at the profit of 40 percent such that his overall profit is 18.4 percent. What is the total number of oranges and bananas that he sold at profit?

- A 80
- B 70
- C 50
- D 60

Answer: B

Explanation:

Price of 5 bananas = Price of 4 oranges

$$5x = 4y \Rightarrow x/y = 4/5$$

Assume cost price of 1 banana = $4a$ and the price of 1 orange = $5a$,

$$\text{Overall price} = 60 \cdot 5a + 50 \cdot 4a = 500a$$

Also the number of bananas sold = x , the number of oranges sold = x

$$\text{Selling Price of fruits sold at loss} = (x \cdot 4a + x \cdot 5a) \cdot 0.8 = 7.2ax$$

$$\text{Selling price of remaining fruits} = ((60-x) \cdot 5a + (50-x) \cdot 4a) \cdot 1.4 = 700a - 12.6ax$$

$$\text{Overall selling price} = 7.2ax + 700a - 12.6ax = 500a \cdot (1 + 0.184 \cdot 500)$$

$$\Rightarrow 700a - 5.4ax = 592a \Rightarrow 108a = 5.4ax \Rightarrow x = 20$$

$$\text{Total number of oranges and bananas that he sold at profit} = 60 - 20 + 50 - 20 = 40 + 30 = 70$$

Question 39

The ratio of cost of a notebooks and a pads for the shopkeeper is in the ratio 3:2. For every 5 notebooks sold, the shopkeeper gives 1 pad for free. The profit margin for each notebook is 50%. If the profit realized by the shopkeeper when a customer buys 10 notebooks is ₹231, what is the total cost of a notebook and a pad ?

Answer: 105

Explanation:

Let the cost price of the notebook and the pad be ₹ $3x$ and ₹ $2x$ respectively.

the profit percent on a notebook is 50%.

$$\text{The selling price of a notebook} = (1 + 50/100) \cdot 3x = 4.5x$$

When a customer buys 10 notebooks,

$$\text{Cost price for the shopkeeper} = 10 \cdot 3x + 2 \cdot 2x = 34x$$

$$\text{Selling price for the shopkeeper} = 10 \cdot (4.5x) = 45x$$

$$\Rightarrow 45x = 34x + 231$$

$$\Rightarrow 11x = 231$$

$$\Rightarrow x = 21$$

$$\text{hence, the total cost of a notebook and a pad} = 5x = 21 \cdot 5 = \text{Rs}105$$

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Question 40

A takes 8 days and B takes N days to complete a job working alone. A and B work on the job on alternate days. If they take exactly the same time irrespective of who starts the job, what is the maximum integral value possible for N?

Answer: 56

Explanation:

If B also takes 8 days, then it does not matter who starts the job first.

There can also be other solutions such that the part of the work done in two days, $\frac{1}{8} + \frac{1}{N}$, is of the form $\frac{1}{x}$ where x is a positive integer. The work will be completed in $2x$ days.

$$\frac{1}{8} + \frac{1}{N} = \frac{1}{x}$$

$$\text{So, } \frac{1}{N} = \frac{1}{x} - \frac{1}{8}$$

$$\text{So, } \frac{1}{N} = \frac{8-x}{8x}$$

$$\text{Or, } N = \frac{8x}{8-x}$$

This will be maximized when $x = 7$ and equals 56

Question 41

Two trains, Garibrath express and Durunto express are moving towards each other on parallel tracks. The speed of Garibrath and Durunto express are 72 km/hr and 54km/hr respectively. Ram is sitting near the front end of Garibrath and Shyam is sitting near the rear end of Durunto express. As soon as the trains start crossing each other, Ram starts moving towards the rear end of Garibrath at the speed of 3 m/s and Shyam starts to move towards the front end of Durunto at the speed of 4 m/s. If the lengths of Garibrath and Durunto express are 120 m and 180 m respectively. After how much time(in seconds) from the instant that trains start crossing each other, will Ram and Shyam cross each other?

Answer:5

Explanation:

Speed of Garibrath express = 72 km/hr = 20m/s

Speed of Durunto express = 54 km/hr = 15m/s

When the trains start to cross each other, Ram is at front end of Garibrath express and Shyam is at rear end of Durunto express. So the initial distance between them is equal to the length of Durunto express.

Hence initial distance between them = 180m

Shyam is moving in the same direction as the train so his effective speed is $15+4 = 19$ m/s

Ram is moving in the direction opposite to the train, so his effective speed is $20-3 = 17$ m/s.

Hence with reference to the train Ram and Shyam are moving in the same direction but with reference to ground they are moving in the opposite direction with relative speed of $19+17 = 36$ m/s

Total distance to be covered = 180 m

Hence required time = $180/36 = 5$ seconds

Question 42

Ten men and eight women working for 12 days can complete a piece of work which can be completed by twelve men working for 16 days. If eight men and six women are currently working, the number of additional women required to complete the work in 9.6 days is

Answer:10

Explanation:

Consider the work done by 1 man in 1 day = M units and that by a woman in 1 day = W units

$$\text{Hence, } (10M + 8W) \cdot 12 = 12M \cdot 16$$

$$120M + 96W = 192M$$

$$96W = 72M$$

$$4W = 3M$$

$$\text{Total work} = 12M \cdot 16 = 192M$$

Let x be the number of additional women to be employed.

$$(8M + 6W + xW) \cdot 9.6 = 192M$$

$$(8M + 6 \cdot \frac{3M}{4} + x \cdot \frac{3M}{4}) \cdot 9.6 = 192M$$

$$(8M + \frac{18M}{4} + \frac{3xM}{4}) \cdot 9.6 = 192M$$

$$\left(\frac{50}{4} + \frac{3x}{4}\right) = 20$$

$$x = 10$$

10 is the correct answer.

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Question 43

Ram and Shyam can complete a work together in 24 days. Ram is 50 percent more efficient than Shyam. They started working and Ram took rest every 2nd day and Shyam every 3rd day. On which day will the work get completed?

- A 51
- B 40
- C 43
- D 40

Answer: C

Explanation:

Assume the work = 120 units

Work done by both in 1 day = $120/24 = 5$ units

Now, $1.5x + x = 5$ units

Work done by Ram in a day = 3 units

Work done by Shyam in a day = 2 units

It is given that Ram took rest every 2nd day and Shyam every 3rd day.

Work done by them on 1st day, 2nd day, 3rd day, 4th day, 5th day and 6th day = 5, 2, 3, 2, 5, 0 = 17 units

This pattern will repeat every 6 days. Hence, after 42 days total work done = $17 \times (42/6) = 119$ units

Hence the work will be finished on 43rd day.

Question 44

Rinesh can work for 5 hours non-stop but he rests for 1 hour after that. Similarly his wife can work for 2 hours 15 minutes non-stop and rests for 45 minutes after that. His son can work for 2.5 hours non stop and rests for 30 minutes after that. What is the minimum number of integral hours taken by three of them to complete a work which requires 60 man-hours? Assume all are equally skilled in their work

- A 25
- B 24
- C 23
- D 26

Answer: A

Explanation:

Total work = 60 man-hours.

Work completed by Rinesh in 6 hrs = 5 man-hours (Since he rests for 1 hr)

Work completed by his wife in 3 hours = 2.25 man-hours.

Work completed by his son in 3 hours = 2.5 man-hours.

Total work done by them in 6 hours = $5 + 2.25 \times 2 + 2.5 \times 2 = 14.5$

Work done by them in 1 hr = $14.5/6 = 2.41$

Work done by them in 24 hrs = $14.5 \times 4 = 58$

The remaining 2 man-hours gets completed in next 0.66 hrs

So the integral number of hours is $24+1 = 25$ hours

Question 45

Three men can build a wall in 5 days. The total money of the job is 150000. If the efficiency of the three people is in the ratio 4:5:6, what is the difference in amount received by the person receiving the most and the person receiving the least amount of money?

- A 15000
- B 20000
- C 60000
- D 75000

Answer: B

Explanation:

Let the people be A,B,C.

Let the amount of work done per day by A,B,C be $4x, 5x$ and $6x$ units

Thus, total work done in 1 day = $4x + 5x + 6x = 15x$ units

Total work of the wall = $15x \times 5 = 75x$ units

Total amount of money for the construction of wall = 150000

The most amount of money will be earned by C as his efficiency is the most and therefore will also do the most amount of work. The least amount of money will be earned by A as his efficiency is the least and therefore will also do the least amount of work.

$$\text{Money paid to C} = \frac{6}{4+5+6} \times 150000 = 60000$$

$$\text{Money paid to A} = \frac{4}{4+5+6} \times 150000 = 40000$$

$$\text{Difference in amount} = 60000 - 40000 = 20000$$

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Question 46

A, B and C can do a work in 20 days, 15 days and 12 days respectively. They all started the work together, but C left the job three days before its completion, and B left the job two days before C. In how many days, did the work get completed?

- A $8\frac{11}{12}$ days
- B $7\frac{11}{12}$ days
- C $6\frac{11}{12}$ days
- D $5\frac{11}{12}$ days

Answer: B

Explanation:

Let the total work be 60 units (LCM of 15, 20 and 12)

A can complete the work in 20 days.

=> A's 1 day's work = 3 units

B can complete the work in 15 days.

=> B's 1 day's work = 4 units

C can complete the work in 12 days.

=> C's 1 day's work = 5 units

Let the total time required to complete the work be x days.

Then, A worked for x days, C worked for $(x - 3)$ days, and B worked for $(x - 5)$ days.

Therefore, $3 \times x + 4 \times (x - 5) + 5 \times (x - 3) = 60$

On solving, we get $x = \frac{95}{12}$ days = $7\frac{11}{12}$ days

Hence, option B is the correct answer.

Question 47

A cistern is connected to 10 pipes. Some pipes fill the tank while the rest empty the tank. The capacity of each pipe is the same (both filling and emptying pipes). If all the pipes that fill the tank are opened and all the pipes that empty the tank are closed, an empty tank will be full in 20 minutes. If all the pipes that empty the tank are opened and all the pipes that fill the tank are closed, a half-full tank will be emptied in 15 minutes. If all the pipes that fill the tank and half the pipes that empty the tank are opened in an empty tank, the time in which the tank will be filled (in minutes) is

Answer:30

Explanation:

Let the number of pipes that fill the tank be x .

=> Number of pipes that empty the tank = $10 - x$.

Let us assume the capacity of each pipe to be 1 unit/minute.

The tank will be full in 20 minutes if all the pipes that fill the tank are opened and all the pipes that empty the tank are closed.

=> Capacity of the tank = $20 \times x$ -----(1)

If all the pipes that empty the tank are opened and all the pipes that fill the tank are closed, a half-full tank will be emptied in 15 minutes. Therefore, a full tank will be emptied in 30 minutes if all the tanks that empty the tank are opened and all the tanks that fill the tank are closed.

=> Capacity of the tank = $30 \times (10 - x)$ -----(2)

Equating (1) and (2),

$$20x = 300 - 30x$$

$$50x = 300$$

$$x = 6$$

The number of pipes that fill the tank is 6 and the number of pipes that empty the tank is 4.

If all the pipes that fill the tank and half the pipes that empty the tank are opened, then $6 - 2 = 4$ pipes will be filling the tank.

Capacity of the tank is $20x = 20 \times 6 = 120$ units.

=> Time taken = $120/4 = 30$ minutes.

Therefore, 30 is the right answer.

Question 48

Two workers can complete a job in 24 days while working together. First one of the two workers works alone for 16 days then the other worker works for 24 days alone. If it is known that only 20% of assigned work is left after 40 days, then find out the time (in days) taken by the slower worker to complete the remaining work.

Answer:12

Explanation:

Let 'x' be the total amount of work.

Let 'a' and 'b' be the amount of work completed by 1st and 2nd worker in one day.

Then we can say that $24a + 24b = x$... (1)

Also $16a + 24b = \frac{4x}{5} \dots (2)$

From equations (1) and (2),

$$8a = 5$$

$$x = 40a \dots (3)$$

Hence we can say that 1st worker will take 40 days to complete the entire work alone.

From equations (1) and (3),

$$x = 60b$$

Hence, we can say that 2nd worker will take 60 days to complete the entire work alone.

We can see that among two workers 2nd worker is the slower one. He can complete the entire work in 60 days hence we will take 12 days to complete remaining work.

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Question 49

If $|\log_{(6x+4)}(3x-2)| = 1$. What is the number of possible values of x ?

- A 1
- B 2
- C 3
- D 0

Answer: A

Explanation:

$$|\log_{(6x+4)}(3x-2)| = 1$$

$$3x - 2 > 0$$

$$x > 2/3 \dots (1)$$

$$\log_{(6x+4)}(3x-2) = \pm 1$$

Case 1

$$\log_{(6x+4)}(3x-2) = 1$$

$$\therefore 6x + 4 = 3x - 2$$

$$x = -2$$

which is not possible according to the equation 1

Case 2

$$\log_{(6x+4)}(3x-2) = -1$$

$$\therefore \frac{1}{6x+4} = 3x-2$$

$$(6x+4)(3x-2) = 1$$

$$18x^2 = 9$$

$$x = \pm \frac{1}{\sqrt{2}}$$

$$1/\sqrt{2} > 2/3$$

thus only one value of x i.e. $1/\sqrt{2}$ can satisfy the equation.

Question 50

If the value of ${}^{5}_{2}\log 800^3 + {}^{1}_{\log 5} 800^3$ can be expressed as $\frac{a}{b}$, where a and b are co-primes, then $a^2 + b^2$ is

- A 17
B 29
C 37
D 10

Answer: C

Explanation:

$$\begin{aligned} & 2\log_2 800^3 + \log_5 800^3 \\ &= 2 \cdot 3 \log_2 800 + 3 \log_5 800 \\ &= 2 \cdot 3 \log_2 2^3 \cdot 5 \cdot 2 + \frac{\log_{800} 5}{3} \\ &= \frac{5 \log_{800} 2}{2 \cdot 3} + \frac{\log_{800} 25}{3} \\ &= \log_{800} 2^{5/6} + \log_{800} 5^{1/3} \\ &= \log_{800} 2^{5/6} 5^{1/3} \end{aligned}$$

$$\text{Now, } 2^{5/6} 5^{1/3} = 2^{5/6} 5^{2/6} = 32^{1/6} 25^{1/6} = 800^{1/6}$$

$$\text{Hence, } \log_{800} 2^{5/6} 5^{1/3} = \log_{800} 800^{1/6} = 1/6$$

$$\text{Here, } \frac{a}{b} = \frac{1}{6}$$

$$\Rightarrow a=1, b=6$$

$$\text{Therefore, } a^2 + b^2 = 1^2 + 6^2 = 37$$

Question 51

Find the number of ordered pairs of integers (p,q), which satisfy the condition: $\log_4(p+q) + \log_4(p-q) = 4$.

- A 18
B 5
C 9
D 7

Answer: D

Explanation:

$$\begin{aligned} \log_4(p+q) + \log_4(p-q) &= 4 = \log_4(p+q) * (p-q) = 4 \\ \Rightarrow (p+q)(p-q) &= 4^4 = 256. \end{aligned}$$

Number of integral factors of 256 = 18.

Total of 9 positive and 9 negative factors.

But $p+q, p-q > 0$ (as $\log(-ve)$ is undefined) so, number of possible value = 9.

But among these 9 cases there will be 2 cases where p and q will not be integers.

For example if $p+q = 256$ and $p-q = 1$, p and q will not be integers. So this is not possible. So out of the given 9 cases, 2 cases won't be possible.

Free CAT Study Material

Question 52

$\log_5 x \log_5(yz) = 4 - \log_5 y \log_5 z$, where x, y and z are real numbers. If $\frac{xz}{125} = \frac{125}{y}$, then the value of $(\log_5 x)^2 + (\log_5 y)^2 + (\log_5 z)^2$ is

- A 24
B 30
C 28
D 32

Answer: C

Explanation:

We have, $\log_5 x \log_5 yz = 4 - \log_5 y \log_5 z$

$$\Rightarrow \log_5 x (\log_5 y + \log_5 z) + \log_5 y \log_5 z = 4$$

$$xz/125 = 125/y \Rightarrow xyz = 125 \times 125 \Rightarrow \log_5 x + \log_5 y + \log_5 z = 6$$

Using $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$$(\log_5 x)^2 + (\log_5 y)^2 + (\log_5 z)^2 = (\log_5 x + \log_5 y + \log_5 z)^2 - 2(\log_5 x (\log_5 y + \log_5 z) + \log_5 y \log_5 z)$$

$$= 6^2 - 2 \times 4 = 28$$

Question 53

If p, q and r are real numbers such that $p^{\log_8 27} = 2$, $q^{\log_{1/2} 9} = 0.25$ and $r^{\log_{\sqrt{3}} 4} = 3$, then the value of $p^{(\log_8 27)^2} + q^{(\log_{1/2} 9)^2} + r^{(\log_{\sqrt{3}} 4)^2}$ is

Answer: 100

Explanation:

$$p^{(\log_8 27)^2} = (p^{\log_8 27})^{\log_8 27} \quad (p^{\log_8 27} = 2)$$

$$= 2^{\log_8 27} = 27^{\log_8 2} = 3$$

$$\text{Similarly, } q^{(\log_{1/2} 9)^2} = (q^{\log_{1/2} 9})^{\log_{1/2} 9} = (0.25)^{\log_{1/2} 9} = 9^{\log_{1/2} 20.25} = 81$$

$$r^{(\log_{\sqrt{3}} 4)^2} = (r^{\log_{\sqrt{3}} 4})^{\log_{\sqrt{3}} 4} = 3^{\log_{\sqrt{3}} 4} = 4^{\log_{\sqrt{3}} 3} = 16$$

Hence the required sum $= 3 + 81 + 16 = 100$

Question 54

If $q > 1$ and $p \geq q$, then $\log_p p + \log_q q$ can never be

- A -1
B 3
C 2
D 4

Answer: A

Explanation:

$$\log_p p + \log_q q.$$

$$= \log_p q - \log_p p + \log_q p - \log_q q$$

$$= \log_p q + \log_q p - 2 \dots (1)$$

Both $\log_p q$ and $\log_q p$ are positive numbers as p and q are greater than 1

Using $AM \geq GM$

$$\log_p q + \log_q p \geq 2$$

$$\frac{\log_p q + \log_q p}{2} \geq \sqrt{\log_p q \cdot \log_q p}$$

$$\log_p q + \log_q p \geq 2$$

$$\Rightarrow \log_p q + \log_q p - 2 \geq 2 - 2$$

$$\Rightarrow \log_p^q p + \log_q^p q \geq 2 - 2 \quad \dots\dots(\text{From (1)})$$

$$\log_p p + \log_q q \geq 0$$

A is the correct answer.

Top-500 Free CAT Questions (With Solutions)

Question 55

The value of $\log_3 3 + \log_3 27 + \log_3 243 \dots\dots\dots$ 25 terms is

A 125

B 625

C 600

D 900

Answer: B

Explanation:

$\log_3 3 + \log_3 27 + \log_3 243 \dots\dots\dots$ 25 terms can be re-written as

$\log_3 3 + \log_3 3^3 + \log_3 3^5 \dots\dots\dots$ 25 terms is

$1 + 3 + 5 + 7 \dots\dots\dots$ 25 terms

The above sequence is an Arithmetic progression with first term = 1 and common difference = 2

Sum of n terms of an Arithmetic progression = $\frac{n * [2a + (n-1) * d]}{2}$

$$= \frac{25}{2} * [2 * 1 + 24 * 2]$$

$$= 625$$

B is the correct answer.

Question 56

If 'a' is the smallest value of x which satisfies the equation $4^x + \frac{35}{4^x} = 12$. Then the value of 16^a is

Answer: 25

Explanation:

$$4^x + \frac{35}{4^x} = 12$$

$$\text{Let } 4^x = p$$

$$p + \frac{35}{p} = 12$$

$$p^2 - 12p + 35 = 0$$

$$p = 5, 7$$

The value of x = $\log_4 5, \log_4 7$

Since a is the smallest value which satisfies the equation, $a = \log_4 5$

Let's find the value of 16^a

$$= 16^{\log_4 5}$$

$$= 4^{2 * \log_4 5}$$

$$= 25$$

25 is the correct answer.

Question 57

Number of digits in 3^{98} in base 9

A 49

B 50

C 48

D 51

Answer: B

Explanation:

Number of digits in 3^{98} in base 9 is given by GIF of $\log_9 3^{98} + 1$

$$= \log_9 3^{98}$$

$$= \frac{\log 3^{98}}{\log 9}$$

$$= \frac{98 \log 3}{2 \log 3}$$

$$= 49$$

Number of digits in 3^{98} in base 9 = $49 + 1 = 50$

Hence B is the correct answer.

Quantitative Aptitude for CAT Questions (download pdf)

Question 58

If $\log_3 x + \log_3 y + \log_3 z \geq 3$ where x, y, z are positive real numbers. Then the least value of $3(x + y + z)$ is

A 8

B 9

C 27

D 81

Answer: C

Explanation:

$$\log_3 x + \log_3 y + \log_3 z \geq 3$$

$$\log_3 xyz \geq 3$$

$$xyz \geq 3^3$$

$$\text{As } \frac{x+y+z}{3} \geq \sqrt[3]{xyz}$$

$$\frac{x+y+z}{3} \geq 3$$

$$x + y + z \geq 9$$

$$3 * (x + y + z) \geq 27$$

C is the correct answer.

Question 59

If p, q, r are whole numbers, how many distinct triplets satisfy the condition $p \log_{21}^7 + q \log_{21}^3 + r \log_{21}^2 = 10$?

Answer: 1

Explanation:

$$p \log_{21}^7 + q \log_{21}^3 + r \log_{21}^2 = 10$$

$$\log(7^p * 3^q * 2^r)_{21} = 10 \quad [\because \log a + \log b = \log ab]$$

$$7^p * 3^q * 2^r = 21^{10}$$

$$7^p * 3^q * 2^r = 3^{10} * 7^{10}$$

Since there is no power in 2, $r=0$

$$p=q=10$$

Number of distinct triplets = 1

Hence 1 is the correct answer.

Question 60

If $\log_{12}(3^x + 3x - 81) = x(1 - \log_{12} 4)$ and x is positive, what is the value of x ?

Answer: 27

Explanation:

$$\log_{12}(3^x + 3x - 81) = x(1 - \log_{12} 4)$$

$$\Rightarrow \log_{12}(3^x + 3x - 81) = x(\log_{12} 12 - \log_{12} 4)$$

$$\Rightarrow \log_{12}(3^x + 3x - 81) = x(\log_{12} 3)$$

$$\Rightarrow \log_{12}(3^x + 3x - 81) = (\log_{12} 3^x)$$

$$\Rightarrow 3^x + 3x - 81 = 3^x$$

$$\Rightarrow 3x = 81$$

$$\Rightarrow x = 27$$

Hence, 27 is the correct answer.

How to prepare for Logical Reasoning for CAT

Question 61

If $7^x = 3^{\log_9 7} * 5^{\log_{25} 49}$ where x is positive, then the value of $20x$ is

Answer: 30

Explanation:

$$7^x = 3^{\log_9 7} * 5^{\log_{25} 49}$$

$$\Rightarrow 7^x = 7^{\frac{1}{3}} * 49^{\frac{1}{5}}$$

$$\Rightarrow 7^x = 7^{\frac{1}{3}} * 7^{\frac{2}{5}}$$

$$\Rightarrow 7^x = 7^{\frac{2}{3}} * 7^{\frac{2}{5}}$$

$$\Rightarrow 7^x = 7^{\frac{2}{3} + \frac{2}{5}}$$

$$\Rightarrow x = 2$$

$$\Rightarrow 20x = 30$$

Hence, 30 is the correct answer.

Question 62

If it is known that x and y are two positive numbers such that $\log_3 x \geq \frac{4 \log_3 3 - 1}{\log_3 3}$, what is the minimum value of $x + y$?

A 6

- B** 24
C 18
D 54

Answer: C

Explanation:

$$\log_3 x \geq \frac{4 \log_3 3 - 1}{\log_3 3}$$

$$= \log_3 x \geq 4 - \frac{1}{\log_3 3}$$

$$= \log_3 x \geq 4 - \log_3 y$$

$$= \log_3 x + \log_3 y \geq 4$$

$$= \log_3 xy \geq 4$$

$$\text{i.e. } xy \geq 3^4$$

$$\text{i.e. } xy \geq 81$$

$$\text{A.M} \geq \text{G.M}$$

$$\text{Thus, } \frac{x+y}{2} \geq xy^{0.5}$$

$$\text{Thus, } \frac{x+y}{2} \geq 81$$

$$\text{Hence, } x + y \geq 18$$

Hence, option C is the correct answer.

Question 63

For how many integral values does the inequality $|x - ||x-1| + x + 3|| < 4$ satisfy

- A** 0
B 1
C 2
D 3

Answer: B

Explanation:

We have, $|x - ||x-1| + x + 3|| < 4$

$$\Rightarrow -4 < x - ||x-1| + x + 3| < 4$$

For $x=1$

$$-4 < 1 - |4| < 4, \text{ Hence } x=1 \text{ satisfies}$$

For $x < 1$

$$-4 < x - |1 - x + x + 3| < 4$$

$$-4 < x - 4 < 4 \Rightarrow 0 < x < 8$$

$$\Rightarrow x \in (0, 1) \text{ Hence no integral value satisfies.}$$

For $x > 1$, $-4 < x - |x-1| + x + 3| < 4$

$$\Rightarrow -4 < x - (2x+2) < 4 \Rightarrow -4 < -x-2 < 4 \Rightarrow -4 < x+2 < 4 \Rightarrow -6 < x < 2 \text{ For } x > 1 \text{ (0 integral values)}$$

Total integral values = 1

Data Interpretation for CAT Questions (download pdf)

Question 64

If $a + 3b + 2c = 12$ where a, b and c are positive numbers, then the maximum value of $a * b^3 * c^2$ is

Answer: 64

Explanation:

$$AM \geq GM$$

$$\frac{a+b+b+c+c}{6} \geq \sqrt[6]{a * b^3 * c^2}$$

$$\frac{12}{6} \geq \sqrt[6]{a * b^3 * c^2}$$

$$2 \geq \sqrt[6]{a * b^3 * c^2}$$

$$\sqrt[6]{a * b^3 * c^2} \leq 2$$

$$a * b^3 * c^2 \leq 2^6$$

Maximum value is 64 which will occur when $a = b = c$

C is the correct answer.

Question 65

$x + y = 8$ and $P = 5x^2 + 11y^2$. What is the minimum possible value of P?

A 310

B 237.31

C 110

D 220

Answer: D

Explanation:

We have, $x+y=8$

$$x=8-y$$

$$\text{Now, } P = 5x^2 + 11y^2$$

$$= 5(8-y)^2 + 11y^2$$

$$= 320 + 5y^2 - 80y + 11y^2$$

$$= (4y-10)^2 + 220$$

$$\text{At } y = 2.5, (4y-10)^2 + 220$$

Hence minimum value = 220

Question 66

Find the smallest integer value of 'n' such that for all $m \geq n$, the value $m^3 - 16m^2 + 81m - 126$ is positive.

Answer: 8

Explanation:

The expression $m^3 - 16m^2 + 81m - 126$ can be written as $(m-3)(m-6)(m-7)$

$(m-3)(m-6)(m-7) \geq 0$ for $m \geq 7 \cup [3, 6]$.

So, the smallest integer value of 'n' such that for all $m \geq n$, the value of $(m-3)(m-6)(m-7)$ is positive is $n = 8$.

Know the CAT Percentile Required for IIM Calls

Question 67

How many unit squares with integer coordinates are there inside $|x| + |y| = 4$

A 20

B 16

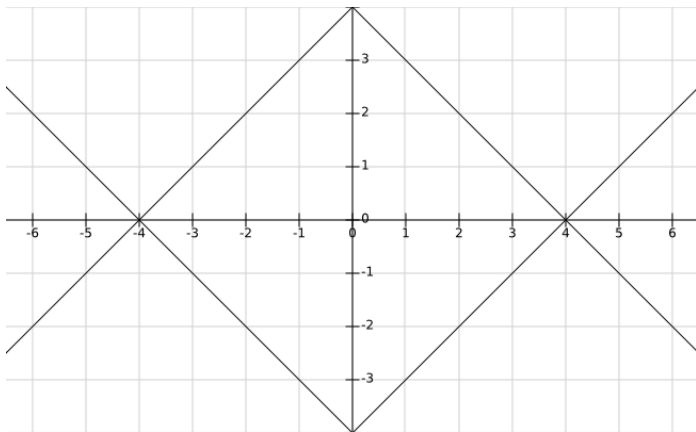
C 32

D 24

Answer: D

Explanation:

The graph of $|x| + |y| = 4$



Let's find the number of unit squares with integer coordinates in the first quadrant and multiply by 4.

The number of unit squares in the first quadrant = $3 + 2 + 1 = 6$.

Hence, there are $6 \times 4 = 24$ unit squares.

Question 68

What is the sum of all the roots of the equation

$$x^2 - 2x + |x - 1| - 5 = 0$$

Answer: 2

Explanation:

We have to take two cases:

Case I: When $x \geq 1$, then $|x - 1|$ will be positive

$$x^2 - 2x + |x - 1| - 5 = 0$$

$$\Rightarrow x^2 - 2x + x - 1 - 5 = 0$$

$$\Rightarrow x^2 - x - 6 = 0$$

$$\Rightarrow x = 3 \text{ or } x = -2$$

But, $x \geq 1$ So, $x = -2$ is neglected.

Case II: When $x < 1$, then $|x - 1| = 1 - x$

$$x^2 - 2x + |x - 1| - 5 = 0$$

$$\Rightarrow x^2 - 2x - x + 1 - 5 = 0$$

$$\Rightarrow x^2 - 3x - 4 = 0$$

$$\Rightarrow x = 4 \text{ or } x = -1$$

But, $x < 1$ So, $x = 4$ is ignored.

Therefore, the roots of the given equation are 3 and -1 and their sum is 2.

Hence, 2 is the correct answer.

Question 69

For what value of m , will the equation

$$m^2(x^2 - x + 1) - m(3x + 1) - 2(2x^2 + x + 3) = 0 \text{ have more than two solutions?}$$

A 1

B -2

C -3

D No such value of m exists

Answer: B

Explanation:

The given equation can be written as

$$(m^2 - 4)x^2 - (m^2 + 3m + 2)x + m^2 - m - 6 = 0$$

It will have more than two solutions when it is an identity.

$$\Rightarrow (m^2 - 4) = (m^2 + 3m + 2) = m^2 - m - 6 = 0$$

$$(m^2 - 4) = 0 \Rightarrow m = 2 \text{ or } -2$$

$$(m^2 + 3m + 2) = 0 \Rightarrow m = -2 \text{ or } -1$$

$$(m^2 - m - 6) = 0 \Rightarrow m = 3 \text{ or } -2$$

Since, $m = -2$ satisfies all the equations, for $m = -2$, the given equation will have more than two solutions or infinite solutions.

Hence, option B is the correct answer.

Important Verbal Ability Questions for CAT (Download PDF)

Question 70

If $x^2 + 4ax + 20 - 2a > 0$ for all real x , then which of the following holds true for all the values of a ?

A $a > 0$

B $-\frac{5}{2} < a < 2$

C $a > 2$

D $-2 < a < \frac{5}{2}$

Answer: B

Explanation:

The co-efficient of x^2 is greater than 0, so the discriminant should be less than zero, if the given expression is greater than 0 for all values of x .

$$(4a)^2 - 4 \cdot 1 \cdot (20 - 2a) < 0$$

$$\Rightarrow 16a^2 - 80 + 8a < 0$$

$$\Rightarrow 2a^2 + a - 10 < 0$$

$$\Rightarrow 2a^2 + 5a - 4a - 10 < 0$$

$$\Rightarrow a(2a+5) - 2(2a+5) < 0$$

$$\Rightarrow (a-2)(2a+5) < 0$$

$$-\frac{5}{2} < a < 2$$

B is the correct answer.

Question 71

Sumitra has to solve 384 questions. She decides to solve a particular number of questions per day to complete the task in a certain number of days. Shalini, her friend, suggests that if she solves eight more questions per day than what Sumitra has decided, she will take eight fewer days to finish the task than what Sumitra has calculated. In how many days can the task be completed if Sumitra follows what Shalini suggested?

Answer: 16

Explanation:

Let the number of questions to be solved per day be x , and the number of days required be y as per Sumitra's plan.

$$\text{So, } xy = 384$$

As per Shalini,

$$(x + 8)(y - 8) = 384$$

$$\text{or, } xy - 8x + 8y - 64 = 384$$

$$\text{or, } 8y - 8x = 64$$

$$\text{or, } y - x = 8$$

$$384$$

Putting $y = x + 8$, we get

$$384$$

$$x^2 - x = 8$$

$$\text{or, } 384 - x^2 = 8x$$

$$\text{or, } x^2 + 8x - 384 = 0$$

On solving, we get $x = -24$ or $x = 16$

But, x cannot be negative.

$$\text{So, } x = 16$$

$$384$$

$$\Rightarrow y - x = 24$$

According to Shalini, number of days required = $(y - 8) = 16$ days

Hence, 16 is the required answer.

Question 72

'y' years ago, Priti's age was twice her sister's age and '4y' years ago, Priti's age was thrice her sister's age. If it is known that 'y' is a natural number, the difference between their present ages can be

A 20

B 43

C 36

D 25

Answer: C

Explanation:

Let the present age of Priti and her sister be P, Q respectively.

$$y \text{ years ago } P - y = 2(Q - y)$$

$$P = 2Q - y \quad \text{-----Eq (1)}$$

$$4y \text{ years ago, } P - 4y = 3(Q - 4y)$$

$$P = 3Q - 8y \quad \text{-----Eq (2)}$$

Equating Eq 1 & 2, we get

$$Q = 7y$$

$$P = 13y$$

$$\text{Difference of their ages} = 13y - 7y = 6y$$

Among the given options, only 36 is a multiple of 6.

C is the correct answer.

CAT Percentile Predictor

Question 73

Two sums are formed by alternating the '+' and '*' signs between consecutive odd natural numbers as shown below.

$$P = 1*3+5*7+9*11+\dots+2017$$

$$Q = 1+3*5+7*9+11*\dots+2015*2017$$

What is the remainder when (Q-P) is divided by 1000?

- A 512
- B 256
- C 128
- D 64

Answer: C

Explanation:

$$Q - P = 1 + 3*4 + 7*4 + 11*4 + \dots + 2015*4 - 2017$$

$$\text{This equals } 4*(3+7+11+\dots+2015) - 2016$$

$$\text{This equals } 4*504*1009 - 2016$$

$$\text{This equals } 2034144 - 2016 = 2032128$$

Hence, the correct answer is 128 which is option (c)

Question 74

The ratio of the sum of n terms of two arithmetic progressions is $1+3/n$ for all natural numbers 'n'. Then the ratio of the 8th term of both the series is

- A $7/5$
- B $7/6$
- C $8/7$
- D $6/5$

Answer: D

Explanation:

Assume a_1, d_1 and a_2, d_2

$$\text{Ratio of the sum} = \frac{2a_1 + (n-1)d_1}{2a_2 + (n-1)d_2} = 1 + 3/n$$

$$\Rightarrow \frac{a_1 + ((n-1)/2)d_1}{a_2 + ((n-1)/2)d_2} = 1 + 3/n \dots (1)$$

$$\text{Now, the ratio of 8th terms} = (a_1 + 7d_1)/(a_2 + 7d_2)$$

On putting $(n-1)/2 = 7$ in (1), we can get the required ratio.

$$\Rightarrow n=15$$

$$(a_1 + 7d_1)/(a_2 + 7d_2) = 1 + 3/15 = 6/5$$

Question 75

The sum of an infinite geometric progression is 5. If all the terms are of the GP are raised to the power 3, the sum of resulting series is 375. Then the common ratio of the GP is

- A $-1/2$
- B $1/5$

C $2/3$

D $-2/5$

Answer: A

Explanation:

Assuming the first term = a and the common ratio = r .

The sum = $a/(1-r) = 5 \dots(1)$

Now after raising to the power 3, sum = $a^3/(1-r^3) = 375 \dots(2)$

After raising both sides of (1) to the power 3 and dividing by (2), we get

$$(1+r+r^2)/(1-2r+r^2) = 1/3$$

$$\Rightarrow 3+3r+3r^2 = 1-2r+r^2$$

$$\Rightarrow 2r^2+5r+2=0$$

$$\Rightarrow r=-1/2 \text{ or } r=-2,$$

Since GP is infinite, hence $r=-2$ will be rejected.

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Question 76

The sum of 151 terms of a GP is 500 and the sum of 302 terms is 700. Then the sum of 604 terms of the GP is

A 862

B 900

C 812

D 875

Answer: C

Explanation:

Let the common ratio be r .

Hence sum of 302 terms = Sum of 151 terms + r^{151} (Sum of 151 terms)

$$\Rightarrow 700=500+r^{151}(500)$$

$$\Rightarrow r^{151}=200/500 = 2/5$$

Sum of 604 terms =

Sum of 302 terms + (r^{302}) *(Sum of 302 terms)

$$\text{Sum of 302 terms} + (r^{151}) * (r^{151}) * (\text{Sum of 302 terms}) = 700 + 700(4/25) = 700 + 112 = 812$$

Question 77

How many points in the region enclosed by $x \geq 0$, $y \leq 0$ and $7x - 9y \leq 63$ have integral coordinates?

A 41

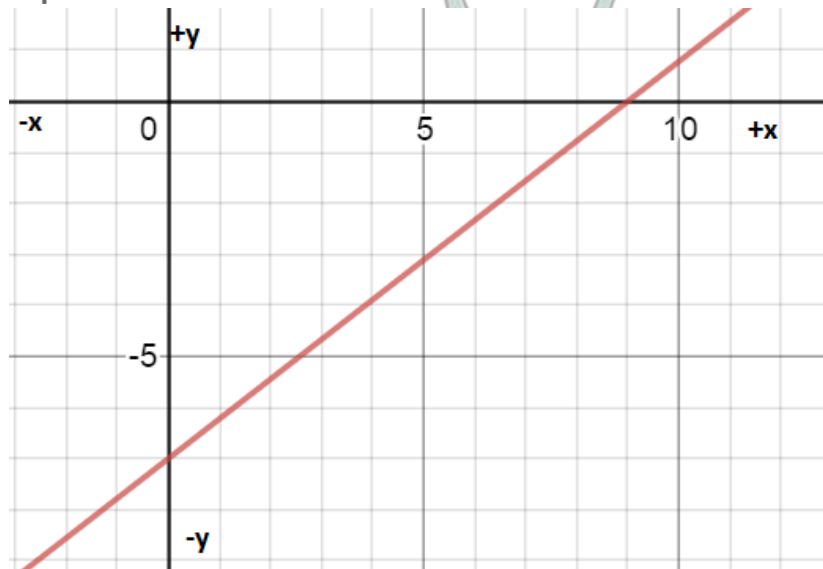
B 36

C 24

D 39

Answer: A

Explanation:



The region enclosed by the lines is a triangle in the third quadrant formed by the points (0,-7), (0,0) and (9,0). The number of coordinates in the region with x coordinate are as follows

$x=0 \Rightarrow 8$ points,

$x=1$, 7points,

$x=2$, 6points,

$x=3$, 5points,

$x=4$, 4points,

$x=5$, 4points and so on.

Total no. of points =41

Question 78

If $f(x \cdot y) = f(x)f(y)$, where $x, y > 0$, and $f(36)=16$, the value of $f(1).f(2).f(3).f(6).f(12).f(18)$ can be?

A 4096

B 1024

C 256

D 64

Answer: B

Explanation:

$$f(1 \cdot 1) = f(1).f(1)$$

$$f(1) = f(1)^2$$

Thus $f(1) = 1$...($f(1)$ cannot be 0 as then other values will become 0 because $f(n) = f(1).f(n)$)

$$f(36) = f(12)f(3) = 16$$

$$f(36) = f(18).f(2) = 16$$

$$f(36) = f(6).f(6) = 16$$

$$f(6) = +4, -4$$

Hence, one of the possible values is $f(1).f(2).f(3).f(6).f(12).f(18) = 1 \times 16 \times 16 \times 4 = 1024$

CAT Syllabus (Download PDF)

Question 79

A quadratic function $f(x)$ has a value 5 at $x=-2$. If the maximum value of the function is 8 at $x=-1$, then $f(-3)$ is

- A 3
- B -6
- C -4
- D 5

Answer: C

Explanation:

Assuming the quadratic function to be $f(x) = ax^2 + bx + c$

We have, $f(-2) = 4a - 2b + c = 5$

$f(-1) = a - b + c = 8$

$\Rightarrow 3a - b = -3 \dots\dots(1)$

Now the maximum value will occur at $-b/2a = -1$

$\Rightarrow b = 2a \dots\dots(2)$

From (1) and (2), we get

$3a - 2a = -3 \Rightarrow a = -3$

$b = 3a + 3 = -9 + 3 = -6$

$c = 8 + b - a = 8 - 6 + 3 = 5$

Therefore $f(-3) = 9a - 3b + c = 9(-3) - 3(-6) + 5 = -4$

Alternate Solution:

As the quadratic equation reaches its maximum when $x = -1$, it is of the form $a(x+1)^2 + c$.

As this maximum value equals 8, the value of $c = 8$. Hence, the quadratic equation is of the form $a(x+1)^2 + 8$

The value of this function when $x = -2$ is 5. Hence, $a + 8 = 5$ or $a = -3$

So, the quadratic equation is $-3(x+1)^2 + 8$.

When, $x = -3$, it equals $-3(-3+1)^2 + 8 = -12 + 8 = -4$

Question 80

If $p(x) = \min(8-x, x-7)+1$, $q(x) = \max(6-x, x-9)-1$. Find the area of region bounded by $p(x)$ and $q(x)$.

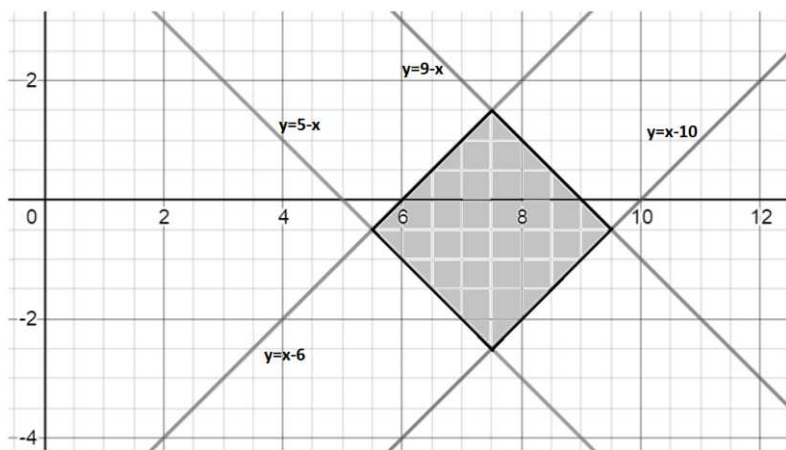
- A 16
- B 8
- C $8\sqrt{2}$
- D $6\sqrt{2}$

Answer: B

Explanation:

$p(x) = \min(8-x, x-7)+1$ and $q(x) = \max(6-x, x-9)-1$

$\Rightarrow p(x) = \min(9-x, x-6)$ and $q(x) = \max(5-x, x-10)$



Since all the lines are intersecting are perpendicular to each other, the area bound will be rectangular.

The distance between parallel lines $x+y=9$ and $x+y=5$ is equal to $|\frac{9-5}{\sqrt{1^2+1^2}}| = 2\sqrt{2}$

The distance between parallel lines $x-y=6$ and $x-y=10$ is equal to $|\frac{10-6}{\sqrt{1^2+1^2}}| = 2\sqrt{2}$

Hence the area will be $2\sqrt{2} \cdot 2\sqrt{2} = 8$

Question 81

If $f(n) = 6 + 4g(n)$, where $g(n) = \text{minimum of } \{4n+3, 24-n\}$. Find number of possible integral value of n if $f(n) > 0$?

A 7

B 27

C 15

D 13

Answer: B

Explanation:

$$g(n) = \min(4n+3, 24-n)$$

Both are the equation of a line,

assume at x both are equal $g(x_1) = 4x+3$

$$g(x_2) = 24-x$$

$$4x+3=24-x$$

$$x=4.2$$

Case 1

For $n > 4.2$

$$g(n) = 24-n$$

$$f(n) = 6 + 4(24-n)$$

$$f(n) = 102-4n$$

$$f(n) > 0$$

$$102-4n > 0$$

$$\therefore n \leq 25$$

Case 2

$$n < 4.2$$

$$g(x) = 4n+3$$

$$f(n) = 6+4(4n+3)$$

$$f(n) > 0$$

$$n > -18/16$$

Hence every integer from $\{-1, 25\}$ both inclusive will give $f(n) > 0$

Hence 27 integers is the correct answer.

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Question 82

A quadratic function $f(x)$ is defined such that $x^2 - 6x + 4 \leq f(x) \leq 2x^2 - 12x + 13$. If $f(7) = 19$, then the value of $f(9)$ is

A 39

B 49

C 41

D 29

Answer: B

Explanation:

$$x^2 - 6x + 4 = (x-3)^2 - 5$$

$$2x^2 - 12x + 13 = 2(x-3)^2 - 5$$

Both the functions reach their minimum value i.e. -5 at $x=3$

Hence, $f(x)$ should also be -5 at $x=3 \Rightarrow f(3) = -5$

The equation $f(x)$ should be of form $k(x-3)^2 - 5$.

$$\text{Now } f(7) = 19, k(4)^2 - 5 = 19 \Rightarrow k = 3/2 = 1.5$$

$$f(9) = 1.5(9-3)^2 - 5 = 1.5 \cdot 36 - 5 = 54 - 5 = 49$$

Question 83

If the function $f(x)$ is defined for all the positive values of x and y such that $f(x*y) = f(x) + f(y)$ and $f(4) = 8$. Then the value of $f(8) + f(16) + f(32) + \dots + f(128) + f(256)$ is

A 136

B 120

C 132

D 108

Answer: C

Explanation:

$$f(4) = (2*2) = f(2) + f(2)$$

$$f(4) = 2*f(2) = 8$$

$$\therefore f(2) = 4$$

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

$$\therefore f(1) = 0$$

$$f(8) = f(4*2)$$

$$= f(4) + f(2)$$

$$= 2*f(2) + f(2) = 3*f(2)$$

$$f(16)=f(4*4) = f(4)+f(4)$$

$$=4*f(2)$$

$$\text{Similarly, } f(32) = 5f(2), f(64)=6f(2), f(128)=7f(2), f(256)=8f(2)$$

$$f(8)+f(16)+f(32)+f(64)+f(128)+f(256)$$

$$= 3*f(2)+4*f(2)+....8*f(2)$$

$$=33*f(2)$$

$$=33*4=132$$

C is the correct answer.

Alternate Explanation:

Using Cauchy's Functional Equation: The solution of $f(x*y)=f(x)+f(y)$ is $f(x) = \log_k x$

$$\text{Hence, } f(4) = \log_k 4 = 8 \Rightarrow 2\log_k 2 = 8 \Rightarrow \log_k 2 = 4$$

$$\text{We have, } f(8)+f(16)+f(32)+.....+f(128)+f(256) = \log_k 8 + \log_k 16 + \log_k 32 + + \log_k 256$$

$$\Rightarrow 3\log_k 2 + 4\log_k 2 + 5\log_k 2 + + 8\log_k 2 = (3+4+5+....+7+8)*\log_k 2 = 33*4=132$$

Question 84

If $f(x)=\frac{9^x}{9^x+3}$, then the value of $f(1/99)+f(2/99)+f(3/99)+.....+f(98/99)$ is

Answer:49

Explanation:

$$f(1-x) = \frac{9^{1-x}}{9^{1-x}+3} = \frac{9}{3*9^x+9} = \frac{3}{9^x+3}$$

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

$$\text{Hence } f(1/99)+f(98/99)=1$$

Since 49 such pairs are there, sum = 49

How to prepare for Data Interpretation for CAT

Question 85

If a function $F(x)$ is defined such that $F(x)+F(x-1)=x^2$ and $F(10)=2019$. Then the value of $F(52)$.

Answer:3342

Explanation:

$$F(x)+F(x-1)=x^2$$

$$F(11)+F(10)=11^2 \quad \text{----- Eq (1)}$$

$$F(12)+F(11)=12^2 \quad \text{----- Eq (2)}$$

$$\text{Eq(2) - Eq(1)}$$

$$F(12)-F(10)=12^2 - 11^2 \quad \text{----- Eq (3)}$$

$$F(13)+F(12)=13^2 \quad \text{----- Eq (4)}$$

$$F(14)+F(13)=14^2 \quad \text{----- Eq (5)}$$

$$\text{Eq(5) - Eq(4)}$$

$$F(14)-F(12)=14^2 - 13^2 \quad \text{----- Eq (6)}$$

Adding Eq (6) and Eq(3), we get

$$F(14) - F(10)=14^2 - 13^2 + 12^2 - 11^2$$

$$\text{Similarly, } F(52) - F(10) = 52^2 - 51^2 + 50^2 - 49^2 + + 12^2 - 11^2$$

$$F(52) = (52 + 51)(52 - 51) + (50 + 49)(50 - 49) + (12 + 11)(12 - 11) + F(10)$$

$= 52 + 51 + 50 + 49 + \dots + 12 + 11 + 2019$
 $= 1323 + 2019$
 $= 3342$
 3342 is the correct answer.

Question 86

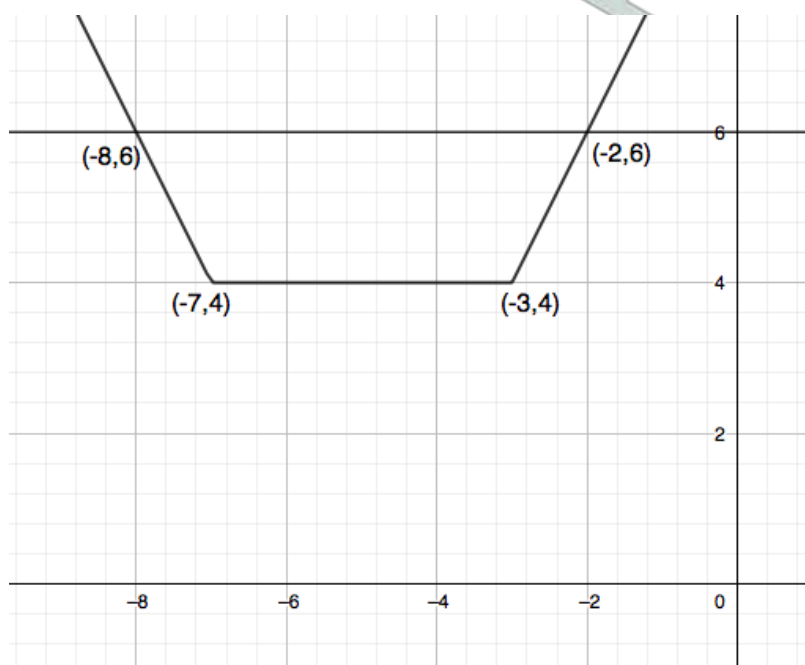
Find the area of the region bounded by the curve $f(x) = |x + 3| + |x + 7|$ and the line $y = 6$.

- A 10 Sq. units
- B 24 Sq. units
- C 12 Sq. units
- D 16 Sq. units

Answer: A

Explanation:

Below is the graph for the given curve and line:



For the curve, the two critical points are -3 and -7. For any value of 'x' between -3 and -7, the value of y will always be 4. The enclosed area is that of a trapezium with two parallel bases of length 4 and 6 units and height 2 units.

\therefore area of bounded region $= \frac{1}{2} \times (4 + 6) \times 2$ Sq. units $= 10$ Sq. units.

Hence, option A is the correct answer.

Question 87

$A = \{1, 2, 4, 5, 7, 8, 9\}$, $B = \{2, 3, 5, 7, 8, 9\}$

$P \# Q$ is defined as a set of all those elements which are either in P or in Q, but not in the both.

$P @ Q$ is defined as a set of all those elements which are present in both P and Q.

How many elements will $(A @ B) \# (A \# B)$ have?

- A 9
- B 8
- C 7
- D 4

Answer: B

Explanation:

$$A = \{1, 2, 4, 5, 7, 8, 9\}$$

$$B = \{2, 3, 5, 7, 8, 9\}$$

$$A @ B = \{2, 5, 7, 8, 9\}$$

$$A \# B = \{1, 3, 4\}$$

$$(A @ B) \# (A \# B) = \{1, 2, 3, 4, 5, 7, 8, 9\}$$

There, there are 8 elements in $(A @ B) \# (A \# B)$.

Hence, option B is the correct answer.

How to prepare for Quantitative aptitude for CAT

Question 88

A function $f(n)$ can be written as $f(n) - f(n-1) = n-1$ for all n which are integers and greater than 1. If $f(1) = 1$, find $f(50)$.

A 1251

B 1275

C 1201

D 1226

Answer: D

Explanation:

$$f(2) - f(1) = 1$$

$$f(2) = 2$$

$$f(3) - f(2) = 2$$

$$f(3) = 4$$

$$f(4) = 7, f(5) = 11 \text{ and so on.}$$

The series is 1, 2, 4, 7, 11, 16 and so on in which the difference of the series is in AP.

$$S = 1 + 2 + 4 + 7 + 11 + \dots + f(50)$$

$$S = 1 + 2 + 4 + 7 + \dots + f(49) + f(50)$$

Subtract both the equations

$$0 = 1 + 1 + 2 + 3 + 4 + \dots + 49 - f(50)$$

$$f(50) = 1 + (49 \cdot 50 / 2) = 1225 + 1 = 1226$$

Alternatively,

We know that the series is 1, 2, 4, 7, 11, 16...

We know that the series 1, (1+2), (1+2+3)... is 1, 3, 6, 10, 15

If we compare the 2 series, If we add 1 to second series, it is equivalent to first series from second term.

$$\text{Hence } f(50) = 1 + (49 \cdot 50 / 2) = 1225 + 1 = 1226$$

$$f(50) = 1 + (49 \cdot 50 / 2) = 1225 + 1 = 1226$$

Question 89

If $2 < a < 4$ and $[a]$ = The greatest integer less than a , What is the probability (p) of $[a^2] = [a]^2$?

A $0.75 < p < 1$

B $0.5 < p < 0.75$

C $0.25 < p < 0.5$

D $0 < p < 0.25$

Answer: D

Explanation:

Given function is $[a^2] = [a]^2$

Let us consider RHS

If $[a]^2 = 4$

then $2 \leq a < 3$

If $[a]^2 = 9$

Then $3 \leq a < 4$

Let us consider LHS

If $[a^2] = 4$

Then $2 < a \leq \sqrt{5}$

If $[a^2] = 9$

Then $3 \leq a < \sqrt{10}$

Hence, the range satisfying $[a^2] = [a]^2$ is $(2, \sqrt{5})$ and $[3, \sqrt{10})$

Required probability = $\frac{\sqrt{5}-2+\sqrt{10}-3}{4-2} = \frac{2.23-2+3.16-3}{2} = \frac{0.39}{2} \sim 0.2$

Hence, option D is the correct answer.

Question 90

Two functions $A(x)$ and $B(x)$ are such that $4A^2(x) - 2B(x)B(-x) = B^2(x) + B^2(-x)$. If $A(4) = 24$ what is the value of $A(-4)$?

- A 24
- B -24
- C 32
- D Cannot be determined

Answer: D

Explanation:

$$4A^2(x) - 2B(x)B(-x) = B^2(x) + B^2(-x)$$

$$\Rightarrow 4A^2(x) = [B(x) + B(-x)]^2$$

$$\Rightarrow 4A^2(x) = 4A^2(-x)$$

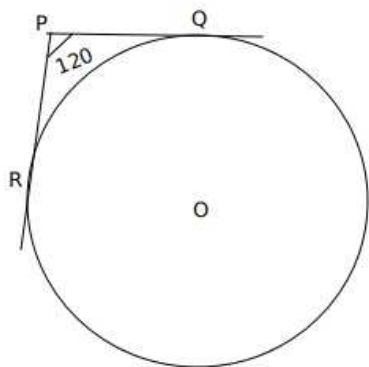
$$\Rightarrow A(x) = \pm A(-x)$$

$$\Rightarrow A(-4) = \pm A(4) = \pm 24$$

How to prepare for Verbal Ability for CAT

Question 91

In the figure given below, O is the centre of the circle of radius 5cm. Two tangents are drawn from an external point P. What is the length of QR (in cm) if $\angle QPR$ is 120°



Answer: 5

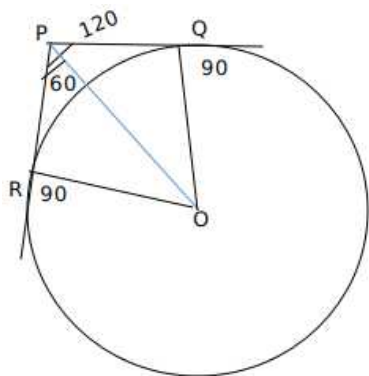
Explanation:

The length of the tangent drawn from an external point to a circle is equal.

length of PQ=length of PR

The angular bisector of angle QPR passes through the centre of the circle.

The tangent to the circle makes right angle with the radii of the circle.



Therefore the $\angle POQ = 180 - (60 + 90)$

$$= 30^\circ$$

Angle QOR = $2 * \angle POQ$

$$= 60^\circ$$

In the triangle QOR, the lengths of QO and OR are equal. So the angles opposite to them should be equal.

$$\angle RQO + \angle QRO = 180^\circ - 60^\circ = 120^\circ$$

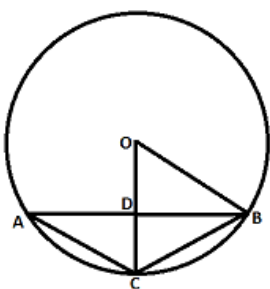
$$\angle RQO = \angle QRO = 60^\circ$$

\therefore Triangle QOR is an equilateral triangle, hence the length of QR = 5 cm

5 is the correct answer.

Question 92

In given circle, O is the center, OB and OC are the radii. It is given that OD:DC = 2:3, angle BDC = 105° and AC = 11.52 cm. If the radius of the circle is equal to 10 cm, find the area of the triangle BOC (Take $\sin 75^\circ = 0.96$).



A $25\sqrt{3}$

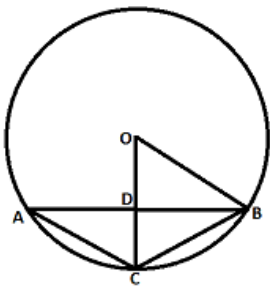
B 50

C 48

D $25\sqrt{2}$

Answer: A

Explanation:



From question, $OD:DC = 2:3$, $OD=4$ cm, $DC = 6$ cm

$$\angle BDC = 105^\circ \Rightarrow \angle ADC = 180 - 105 = 75^\circ$$

In the circle, using sin rule in triangle ADC, $\frac{AC}{\sin \angle ADC} = \frac{DC}{\sin \angle DAC}$

$$\Rightarrow \frac{11.52}{0.96} = \frac{6}{\sin \angle DAC}$$

$$\Rightarrow \sin \angle DAC = 0.5$$

$$\angle DAC = 30^\circ,$$

Now $\angle DAC$ and $\angle BOC$ are subtended from same chord, $2 \angle DAC = \angle BOC$

$$\angle BOC = 2 \times 30^\circ = 60^\circ$$

$$\text{Area of } \triangle BOC = \frac{1}{2} \times 10 \times 10 \times \sin 60^\circ = 25\sqrt{3}$$

A is the answer.

Question 93

If the values of inradius and circumradius of a right-angled triangle are 3 cm, 8.5 cm. Then the area of the triangle (in cm^2) is

- A 60
- B 30
- C 45
- D Cannot be determined

Answer: A

Explanation:

Let a,b,c be the base, height and hypotenuse of the triangle

We know that inradius $r = \frac{a+b-c}{2}$

$$r = \frac{a+b+c-2c}{2}$$

$$r = \frac{2s-2c}{2}$$

$$r = s - c$$

$$r = s - 2R$$

$$r + 2R = s$$

we know that $r = \frac{\text{Area of the triangle}}{s}$

$$\text{Area of the triangle} = r(r + 2R)$$

On substituting the values, we get

$$= 3(3 + 17)$$

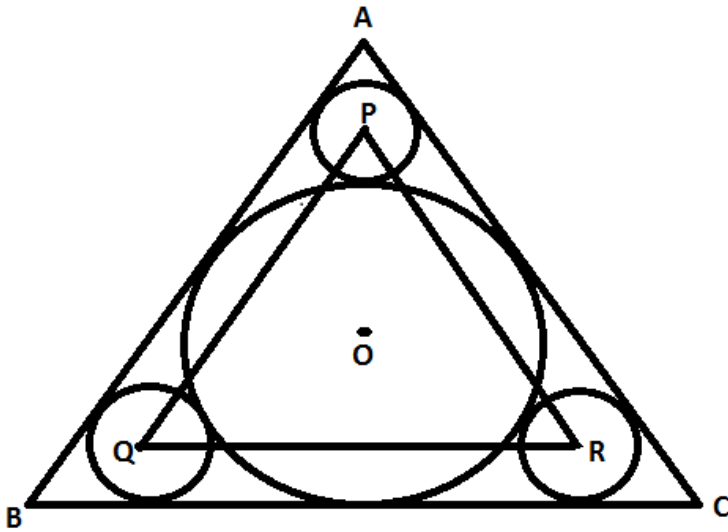
$$= 60$$

A is the correct answer.

How to prepare for Logical Reasoning for CAT

Question 94

A circle with radius 6 cm is inscribed inside an equilateral triangle ABC. Three smaller circle are drawn touching the incircle and the sides of ABC as shown in the figure. Another triangle is formed by joining centres P, Q and R of these smaller circles. What is the perimeter of triangle PQR?



A $24\sqrt{3}$

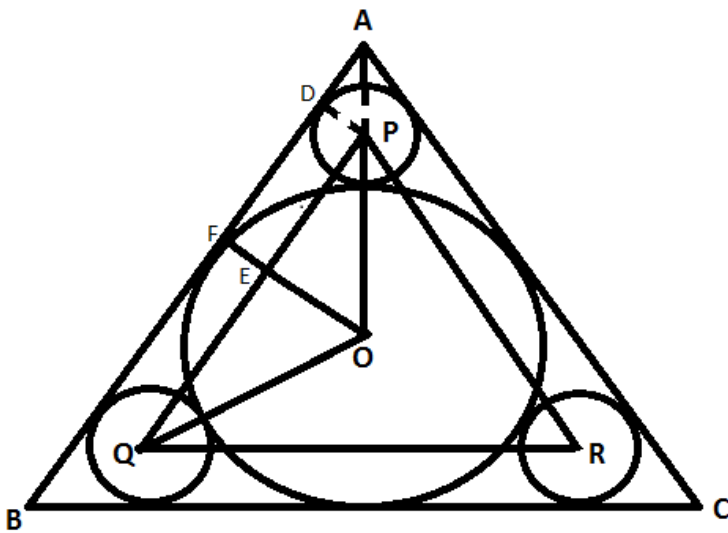
B $36\sqrt{3}$

C $8\sqrt{3}$

D $12\sqrt{3}$

Answer: A

Explanation:



Consider radius of each smaller circle be r and that of the larger circle be $R = 6$ cm.

Construct PD such that PD is perpendicular to AB .

In right triangle ADP , $AP = DP/\cos(\angle APD) = DP/\cos(60^\circ) = 2DP = 2r$

In right triangle OFA , $OF/\cos(\angle OFA) = AO \Rightarrow R/(1/2) = AP + OP \Rightarrow 2R = 2r + r + R \Rightarrow R = 3r$

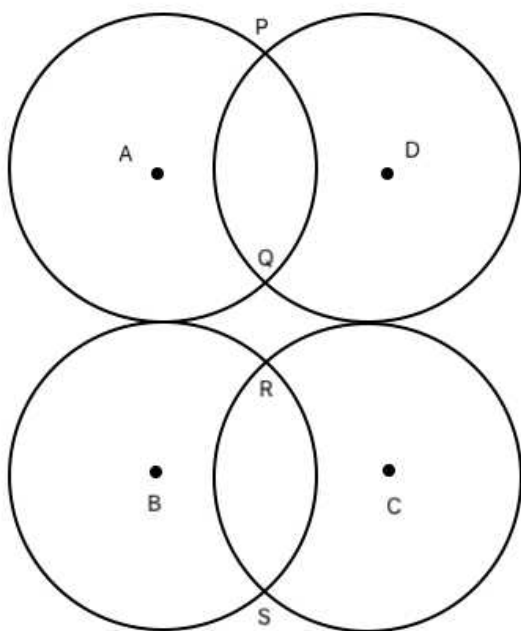
In right triangle OEP , $EP = OP \cos(\angle EPO) = (R+r)((\sqrt{3})/2) = (4R/3)((\sqrt{3})/2) = 2R/(\sqrt{3})$

$PQ = 2EP = 4R/(\sqrt{3})$

Perimeter $= 12R/(\sqrt{3}) = 24\sqrt{3}$ cm ($R = 6$ cm)

Question 95

Four circles of radius 2cm each are arranged as shown in the figure. A, B, C and D are the centres of the given circles. Also, $\angle PAQ = 60^\circ$. The given figure is symmetrical. Find out the area bounded by the circles that does not lie inside any of the circles.



A $4\sqrt{3} + \frac{3\pi}{2}$

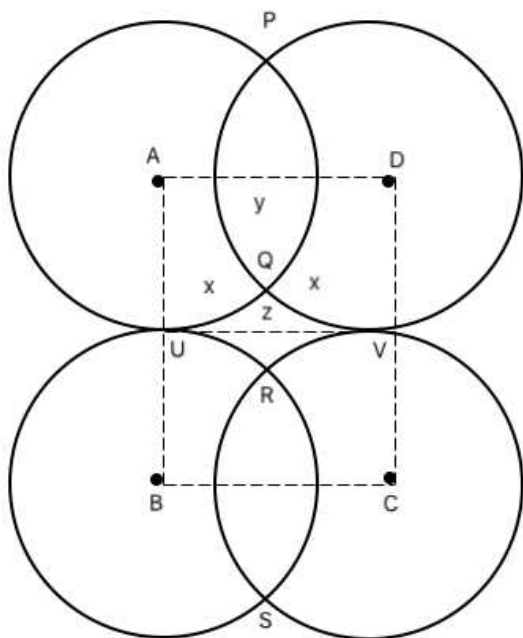
B $3\sqrt{3} - \frac{4\pi}{3}$

C $4\sqrt{3} - \frac{3\pi}{2}$

D $6\sqrt{3} - \frac{8\pi}{3}$

Answer: D

Explanation:



Since, the given figure is symmetrical so, areas denoted by 'x' are equal.

In $\triangle APD$, $\angle PAD = \angle PDA = 30^\circ$ & $\angle APD = 120^\circ$

$AP = PD = 2\text{cm}$ & $AD = 2\sqrt{3}\text{cm}$ (Property of $30^\circ - 30^\circ - 120^\circ$ triangle)

$$\text{Now, } 2x + y + z = 2 \times 2\sqrt{3} = 4\sqrt{3} \quad (1)$$

$$x + y = \frac{1}{4} \times \pi \times 2^2 = \pi \quad (2)$$

$$\text{So, } x + z = 4\sqrt{3} - \pi$$

$$\text{Area of segment } PQ = \frac{60^\circ}{360^\circ} \times \pi \times 2^2 - \frac{1}{2} \times 2^2 \times \sin(60^\circ)$$

$$= \frac{2\pi}{3} - \sqrt{3}$$

$$\text{So, } y = \frac{2\pi}{3} - \sqrt{3}$$

From (2)

$$x = \pi - y = \pi - \frac{2\pi}{3} + \sqrt{3} = \frac{\pi}{3} + \sqrt{3}$$

$$\text{So, } z = 4\sqrt{3} - \pi - x$$

$$\Rightarrow z = 3\sqrt{3} - \frac{4\pi}{3}$$

$$\text{Required area} = 2z = 6\sqrt{3} - \frac{8\pi}{3}$$

Hence, option D is the correct answer.

Question 96

An isosceles trapezium circumscribed over a circle has one of its parallel sides thrice the other. If the perimeter of the trapezium is 16 cms. The area of the trapezium in sq cm is

A $4\sqrt{3}$

B 8

C $8\sqrt{3}$

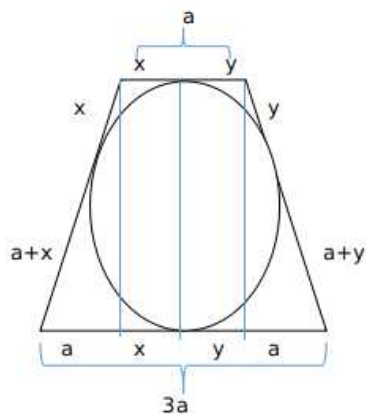
D $16\sqrt{3}$

Answer: C

Explanation:

Let the length of one of the parallel sides = $2x$

Length of other parallel side = $6x$

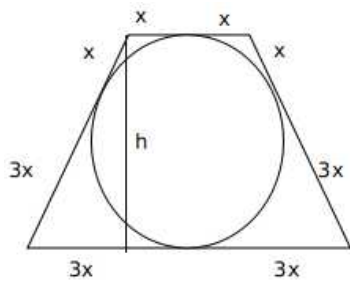


Since it is isosceles trapezium, the non parallel sides are equal

$$a + 2x = a + 2y$$

$$\therefore x = y$$

$$a = 2x$$



Given Perimeter = 16 cms

$$16x = 16$$

$$x = 1$$

Let h be the length of the height dropped to the base

$$(4x)^2 = h^2 + (2x)^2$$

$$h = 2\sqrt{3}$$

Area of the trapezium = $\frac{1}{2} \times \text{height} \times (\text{Sum of length of the parallel sides})$

$$= \frac{1}{2} \times 2\sqrt{3} \times (8)$$

$$= 8\sqrt{3}$$

Hence C is the correct answer.

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Question 97

A point on the circumference of a semicircle is joined with the endpoints of the diameter of the semicircle. It is found that the sides of the triangle so formed are in an arithmetic progression. If it is known that the length of the sides of the triangle are integers, which of the following can be the perimeter of the semicircle? (Take $\pi = \frac{22}{7}$)

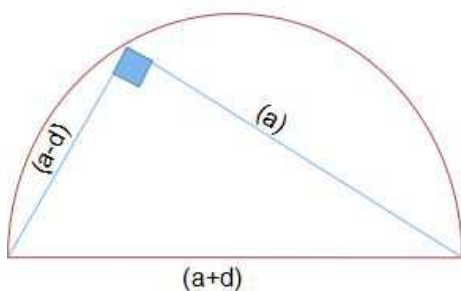
- A 120 units
- B 140 units
- C 160 units
- D 180 units

Answer: D

Explanation:

It has been given that a point on the circumference of the circle is joined with the end points of the semicircle. Therefore, the triangle so formed should be a right-angled triangle (Since the angle subtended by the diameter of the circle on the circumference is 90°).

It has been given that the sides of the triangle are in an arithmetic progression. Let us assume the sides to be $a - d$, a , and $a + d$ units. $a + d$ must be the length of the hypotenuse of the triangle.



Applying Pythagoras theorem, we get,

$$(a + d)^2 = a^2 + (a - d)^2$$

$$a^2 + d^2 + 2ad = a^2 + a^2 + d^2 - 2ad$$

$$4ad = a^2$$

$$4d = a$$

Therefore, the 3 sides of the triangle will be of the form $3d, 4d$ and $5d$.

$5d$ is the diameter of the semicircle.

=> Radius of the semicircle = $2.5d$

$$\text{Perimeter of the semicircle} = \pi * r + 2r$$

$$= \frac{22}{7} * r + 2r$$

$$= r * \frac{36}{7}$$

$$= 2.5d * \frac{36}{7}$$

$$\text{Perimeter of the semicircle} = \frac{90*d}{7} \text{ units.}$$

We know that 'd' has to be an integer. Therefore, the perimeter has to be a multiple of $90/7$. Only option D satisfies this condition and hence, option D is the right answer.

Question 98

A flight starts from Delhi at 9:00 am local time and reaches Dubai at 1 am local time. The same flight starts from Dubai at 3pm local time and reaches Delhi at 3 am local time. If the flight undertook both the journeys at the same speed, find the time difference between Dubai and Delhi?

- A** 3 hours
- B** 1.5 hours
- C** 2 hours
- D** 2.5 hours

Answer: C

Explanation:

Let Delhi be x hours ahead of Dubai.

Time taken ignoring time difference = 24 hours - (9am - 1am) = 16 hours

Actual time taken = 16 + x

Time taken from Dubai to Delhi ignoring time difference = 3 am - 3 pm = 12 hours

Actual time taken = 12 - x

As the same distance is covered in each case at same speed, time taken would be the same.

Hence, $16 + x = 12 - x$

$x = -2$ hours

Hence, Dubai is ahead of Delhi by 2 hours.

Question 99

When dropped from a height 'h', balls of Type 1 bounce to height $2h/3$ while balls of Type 2 bounce to height $h/2$. Two balls, one of Type 1 and one of Type 2, are dropped from 12m and 36m respectively. Then what is the sum of the total distance (in metres) they will travel after bouncing indefinitely?

Answer: 168

Explanation:

Initially, the distance traveled by Type 1 ball from the drop till the ground = 12m

The ball will bounce back two-third of the height = $\frac{2 \times 12}{3}$

The distance it will cover after the first bounce = $2 \times \frac{2 \times 12}{3}$

The total distance covered by Type 1 ball = $12 + 2 \times \frac{2 \times 12}{3} + 2 \times \frac{2}{3} \times \frac{2 \times 12}{3} + \dots$

The total distance covered by Type 1 ball = $12 + 2 \times 12 \left\{ \frac{1}{1 - \frac{2}{3}} \right\}$

The total distance covered by Type 1 ball = 60m

Similarly,

The total distance covered by Type 2 ball = $36 + 2 \times \frac{1 \times 36}{2} + 2 \times \frac{1}{2} \times \frac{1 \times 36}{2} + \dots$

The total distance covered by Type 2 ball = 108m

Total distance they will travel = $108 + 60 = 168$ m

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Question 100

Anand and Mahesh are travelling from place A to place B which are 100 km apart. Anand stops for 10 minutes after each km and Mahesh stops for 25 minutes after each 4 km. The ratio of speed of Anand and Mahesh is 11:2. From A, Anand started 1 hour later than Mahesh and both reach B at the same time. Find the time taken (in minutes) by Anand to travel from A to B.

- A 890
- B 1090
- C 1190
- D 1200

Answer: B

Explanation:

Consider the velocity of Anand $11v$ and the velocity of Mahesh be $2v$.

Then time taken used in traveling (without break) by Anand = $100/(11v)$

Total breaks taken by Anand = 99 Time spent in breaks = $99 \times 10 = 990$

Total time taken by Anand = $100/(11v) + 990$

Time taken used in traveling (without break) by Mahesh = $100/(2v)$

Total breaks taken by Mahesh = 24 Time spent in breaks = $25 \times 24 = 600$

Total time taken by Mahesh = $100/(2v) + 600$

Since both reach at same time, $100/(11v) + 990 + 60 = 100/(2v) + 600$ (Anand started 60 minutes late)

$\Rightarrow 100/(2v) - 100/(11v) = 450$

$\Rightarrow 100/v = 50 \times 22 = 1100$

Time taken by Anand = $100/(11v) + 990 = 100 + 990 = 1090$ minutes

Question 101

A and B start from a point P on a circular track. Both move in the opposite direction such that ratio of their speeds is 7:11. If circumference of the 44 meters. What is the shortest distance between the points where they meet for 5th time and the point where they meet for the 8th time?

- A 7
- B $7\sqrt{3}$
- C 3.5
- D $3.5\sqrt{3}$

Answer: A

Explanation:

Circumference = $2\pi r = 44$

$\Rightarrow r = 7 \text{ m}$

Divide the circumference into $7+11 = 18$ equal parts.

Then they will meet for the first time when A moves 7 parts in his direction and B moves 11 parts in the opposite direction.

Now consider the movement of A, A moves 7 parts between two points, hence between 5th and 8th meeting point he will travel $(8-5)*7 = 21$ parts.

Now the distance along the circumference between two points = $21 \bmod 18 = 3$ parts

Now 3 parts will subtend angle $(3/18)*360 = 60$ at the centre.

Therefore the radii joining two points and the line joining two points will form an equilateral triangle.

Hence the distance between two points = radius = 7m

Question 102

Muthu starts from point A on a circular track with speed 10m/s and meets his friend Vivek after 15 seconds. Now, Muthu and Vivek travel in opposite directions and Vivek reaches Point A in 10 s. Vivek then meets Muthu exactly 14 seconds after crossing point A. Find the circumference of the circular track.

A 600m

B 450m

C 800m

D 350m

Answer: A

Explanation:

Muthu meets Vivek after 15 seconds with speed 10m/s. Distance covered is 150m.

Vivek travels till point A in 10s. Hence, Vivek travels at a speed of 15m/s.

When Vivek reaches A, Muthu would have covered a Distance of 100m.

They meet together after 14 seconds. Relative speed is 25m/s. The total distance covered is $25*14=350\text{m}$.

Circumference = $150+100+350=600\text{m}$

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Question 103

If A beats B by 300 meters in a 1.5 km race and B beats C by 2 minutes 30 seconds in the same race. What is the sum of speeds of A and C if A beats C by 6 minutes 40 seconds in a 3 km race?

A 12.75 m/s

B 11.25 m/s

C 9.75 m/s

D 13.5 m/s

Answer: B

Explanation:

Consider speeds(m/s) of A, B and C be a,b and c respectively.

If A beats B by 300 meters in a 1.5 km race,

$$(1500/a)=(1200/b)$$

$$\text{or, } (a/b)=5/4.....(1)$$

If B beats C by 2 minutes 30 seconds (=150 seconds)

$$(1500/c)=(1500/b)+150$$

$$(1/c)=(1/b)+(1/10).....(2)$$

If A beats C by 6 minutes 40 seconds(=400 seconds) in a 3 km race,

$$(3000/a)+(400)=(3000/c)$$

$$(1/a)+(1/7.5)=(1/c).....(3)$$

From 1,2 and 3, we get $a=7.5$ m/s $b=6$ m/s and $c=3.75$ m/s

Sum of speeds of A and C = $7.5+3.75=11.25$ m/s

B is the answer.

Question 104

2 trains pass through a tunnel at an equal speed of 10 m/s. The first train takes twice as much time as the second train to cross the tunnel completely. The trains can cross each other completely in 2 minutes if they are travelling in the opposite directions on parallel tracks. How much time (in seconds) will a train thrice the length of the shorter train take to cross the tunnel travelling at the same speed as these 2 trains?

(Enter 0 if the answer cannot be determined)

Answer:240

Explanation:

We know that the 2 trains travel with the same speed.

Let the length of the tunnel be T m.

Let the length of the shorter train be 'x' and the length of the longer train be 'y'.

The 2 trains cross each other completely in 2 minutes (120 seconds) if they are travelling on opposite tracks.

When 2 trains travel in the opposite directions, the total distance that should be traveled by the 2 trains to cross each other completely will be equal to the sum of the length of the trains.

We know that both the trains travel at 10 m/s. Since the trains are moving in the opposite directions, the relative velocity is $10+10 = 20$ m/s.

Sum of the lengths of the trains, $x+y = 120*20$

$$\Rightarrow x+y = 2400 \text{ m}$$

$$y = 2400-x$$

It has been given that the longer train takes twice as long as the shorter train to cross the tunnel.

Distance traveled by a train to completely cross a tunnel = Length of the train + length of the tunnel.

$$2*(T+x)/10 = (T+2400-x)/10$$

$$2T+2x = T-x+2400$$

$$T+3x = 2400 \text{ m}$$

We have to find out the time taken by a train thrice as longer as the shorter train to cross the tunnel at the same speed as these 2 trains. Therefore, we have to find the time taken by a train of length $3x$ to cross the tunnel at 10 m/s.

A train of length $3x$ will have to cover a distance of $T+3x$ to cross the tunnel completely.

We know that $T+3x = 2400$ m

$$\Rightarrow \text{Time taken to cross the tunnel} = 2400/10 = 240 \text{ seconds.}$$

Therefore, 240 is the right answer.

Question 105

Akhilesh and Mamata left from Lucknow and Kolkata towards Kolkata and Lucknow respectively. They took the same route and started simultaneously. After meeting each other on the way, Mamata took another 8 hours to reach her destination, while Akhilesh took 18 hours to reach his destination. If the speed of Akhilesh is 40 km/hr then find out the speed(in km/hr) of Mamata.

Input -1 if the answer can not be determined

Answer:60

Explanation:

It is given that they started simultaneously and took the same route. Hence, we can say that they must have started $\sqrt{18 \times 8} = 12$ hours earlier from the meeting point.

Akhilesh took another 18 hours to complete the remaining distance. Hence, total time taken by Akhilesh to complete entire journey = $18 + 12 = 30$ hours.

Mamata took another 8 hours to complete the remaining distance. Hence, total time taken by Mamata to complete entire journey = $8 + 12 = 20$ hours.

We know the speed of Akhilesh. Hence, the distance between Lucknow and Kolkata = $30 \times 40 = 1200$ km

The same distance is covered by Mamata in 20 hours hence the speed of Mamata = $\frac{1200}{20} = 60$ km/hr

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Question 106

Anunay is climbing up the moving escalator that is going up. He takes 90 steps to reach the top while Vineet is coming down the same escalator. The ratio of the speed of Anunay and Vineet is 5:7. If both of them start together and take the same time to reach the other end of the escalator then find out the number of steps in the escalator.

Answer:108

Explanation:

Let the speed of Anunay and Vineet be ' $5x$ ' and ' $7x$ ' steps per second respectively.

Let escalator's speed be ' y ' steps per second.

Let ' t ' be the time taken to reach at the other end by Anunay and Vineet.

Total equivalent number of steps taken by Anunay considering the help of escalator = $5xt + yt$

Total equivalent number of steps taken by Vineet considering the resistance from escalator = $7xt - yt$

On equating the number of steps, we get

$$\Rightarrow 5xt + yt = 7xt - yt$$

$$\Rightarrow 2xt = 2yt$$

$$\Rightarrow x = y$$

When Anunay takes 90 steps, the escalator would have moved by $\frac{90y}{5x}$ steps i.e. $\frac{90}{5} = 18$ steps in the same time.

Therefore, the number of steps in the escalator = $90 + 18 = 108$.

Question 107

Two swimmers Michael Phelps and Matt Biondi started swimming towards each other from opposite ends of a river across the width. They first met at a point 1500m away from one shore. They crossed each other, touched the opposite end and returned immediately. They met each other again at 900m from the other shore. Find the width(in m) of the river.

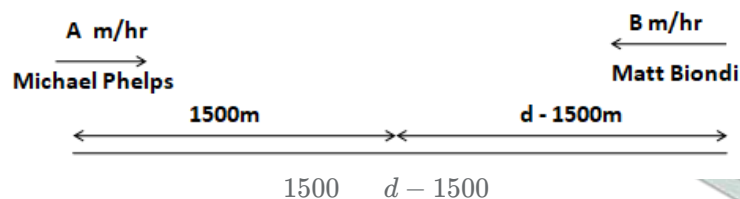
Assume that the speed of water in the river is negligible.

Answer:3600

Explanation:

Let ' d ' be the width of the river. When they first meet one swimmer must have covered a distance of 1500m and other

swimmer must have covered a distance of $d - 1500$ m. Let us assume that Michael Phelps covered a distance of 1500m with a speed of A m/hr whereas Matt Biondi covered a distance of $d - 1500$ m with a speed of B m/hr.



Hence, we can say that $\frac{1500}{A} = \frac{d - 1500}{B} \dots (1)$

In second case, when they meet 900m from the other shore then total distance covered by Michael Phelps = $d + 900$ m whereas total distance covered by Matt Biondi = $2d - 900$ m. Therefore,

$$\frac{d + 900}{A} = \frac{2d - 900}{B} \dots (2)$$

From the equation (1) and (2) we can see that,

$$\Rightarrow \frac{1500}{d - 1500} = \frac{d + 900}{2d - 900}$$

$$\Rightarrow 3000d - 1350000 = d^2 - 600d - 135000$$

$$\Rightarrow d^2 - 3600d = 0 \text{ or } d = 0, 3600$$

'd' can't be 0. Hence, $d = 3600$ m.

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