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CMAT 2018 Slot 1

Quant

1. How many iron balls, each of radius 1 cm, can be made from a sphere whose radius is 8 cm?

- A 64
- B 256
- C 512
- D 124

Answer: C

Explanation:

Volume(V) of the sphere with radius R=8 cm is given by $V = \frac{4}{3} \pi R^3$.

$$= \frac{4}{3} \pi (8^3) = \frac{4}{3} \pi (512) \text{ cm}^3.$$

and Volume (v) of each iron ball with radius r= 1cm is given by $v = \frac{4}{3} \pi r^3$.

$$= \frac{4}{3} \pi (1^3) = \frac{4}{3} \pi \text{ cm}^3.$$

Let say 'n' iron balls each of volume 'v' are required to form a sphere of volume 'V'.

=> Total volume of 'n' iron balls = Volume of the sphere

$$\Rightarrow n \times v = V$$

$$\Rightarrow n = \frac{V}{v} = \frac{\frac{4}{3} \pi (512)}{\frac{4}{3} \pi} = 512.$$

Hence 512 iron balls are required in total to form the sphere.

2. If a is between 0 and 1, which of the following statements is (are) true?

- (i) $a^2 - 1 > 0$
- (ii) $a^2 + 1 > 0$
- (iii) $a^2 - a > 0$

- A only (ii)
- B (i) & (ii)
- C (iii) only
- D All three

Answer: A

Explanation:

Given $0 < a < 1$(1)

Let us go with the verification of options

Option (i):

squaring on both sides of (1), we get

$$0 < a^2 < 1$$

Subtracting '1' in the above equation, we get

$$-1 < a^2 - 1 < 0 \dots \dots \dots (2)$$

$\Rightarrow a^2 - 1 < 0$, Hence option (i) is false.

Option (ii):

Squaring on both sides of (1), we get

$$0 < a^2 < 1$$

Adding '1' on both sides of above equation, we get

$$1 < a^2 + 1 < 2 \dots \dots \dots (3)$$

$\Rightarrow a^2 + 1 > 0$, Hence Option (ii) is true.

Option (iii):

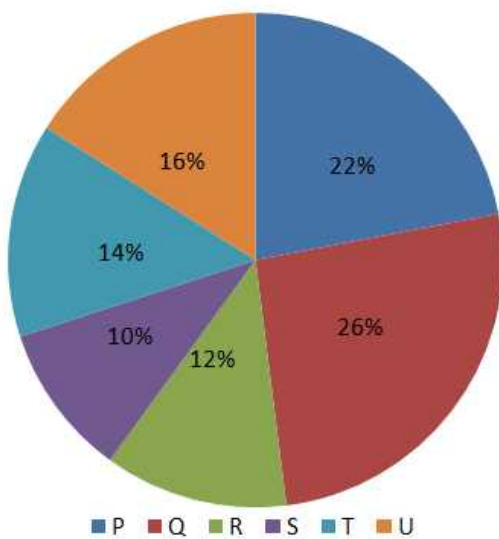
$$\text{As } 0 < a < 1, a^2 < a \dots \dots \dots (4)$$

Subtracting 'a' on both sides of (4), we get

$$a^2 - a < 0, \text{ Hence Option (iii) is also false.}$$

3. The following pie chart provides information about the revenue share of six companies P, Q, R, S, T, U as a percentage of the total car market (in Rs.) in the year 2010. These are the only six companies producing car in the market.

Revenue share



If the revenue share of company T increases by 20% in the year 2011, then find the percentage increase in the revenue share of these six companies in the year 2011 assuming that all the other companies except T generated the same revenue as they did in the year 2010.

- A 2.8%
- B 3.2%
- C 1.8%
- D 2.6%

Answer: A

Explanation:

Let, us assume the total revenue for 2010 as 100.

Since, all the companies except T have generated the same revenue in 2011, the percentage increase in revenue for all companies will be only due to the increase in revenue of T.

$$\text{Increase in revenue of T(2011)} = 20\% * 14 = 2.8$$

$$\text{Total revenue(2011)} = 102.8$$

$$\therefore \% \text{ increase in revenue} = \frac{102.8 - 100}{100} * 100\% = 2.8\%$$

Hence, option A.

4. In how many years will Rs. 2 lakh double itself at 11.5% per annum simple interest?

- A Less than 8
- B Between 8 and 9
- C 9.3
- D 10.5

Answer: B

Explanation:

Let say after a Time period (T) 'x' years the amount Rs. 2 lakh gets doubled at a rate of interest (R) = 11.5% per annum

Initial principle amount (P) = 2,00,000 Rs.

Simple Interest (I) for 'x' years is given by $I = \frac{PTR}{100} = 200000 \times x \times 11.5 \div 100$

$$\Rightarrow I = 23000 \times x.$$

Final Principle amount (P') = P + I = 2 × P (as given)

$$\Rightarrow I = 2 \times P - P = P$$

$$\Rightarrow 23000 \times x = 200000$$

$$\Rightarrow x = 200000 \div 23000$$

$$\Rightarrow x = 8.695 = \text{between 8 and 9.}$$

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5. If $AB + C = D$, find A and C given that when B = 6, D = 30 and when B = 8, D = 36.

- A A = 2, C = 6
- B A = 3, C = 12
- C A = 6, C = 3
- D A = 4, C = 3

Answer: B

Explanation:

Given $AB + C = D$(1)

If B = 6 and D = 30, then from (1),

$$6A + C = 30$$
.....(2)

and If B = 8 and D = 36,

$$8A + C = 36$$
.....(3)

$$(3)-(2) \Rightarrow 2A = 6$$

$$\Rightarrow A = 3$$

Substituting the value of A in equation (2) we get,

$$18 + C = 30$$

$$\Rightarrow C = 12.$$

6. If $y^2 + 3y - 18 \geq 0$, which of the following is true?

- A $y \leq 3$ or $y \geq 0$
- B $y > -6$ or $y < 3$
- C $-6 \leq y \leq 3$

D $y \geq 3$ or $y \leq -6$

Answer: D

Explanation:

$$y^2 + 3y - 18 \geq 0$$

$$\Rightarrow y^2 + 6y - 3y - 18 \geq 0$$

$$\Rightarrow y(y + 6) - 3(y + 6) \geq 0$$

$$\Rightarrow (y - 3)(y + 6) \geq 0$$

$$\Rightarrow y \geq 3 \text{ and } y \leq -6$$

7. In how many different ways can 3 red balls, 2 blue balls and 4 yellow balls be arranged so that the balls of the same color come together?

A 1742

B 1732

C 1728

D 1750

Answer: C

Explanation:

Since balls of same color should come together, let us consider 3 red balls as one unit and 2 blue balls as one unit and 4 yellow balls as another unit.

So, we have a total of 3 different units which can be arranged in '3!' ways.

these 3 red balls can internally be arranged in '3!' ways.

Similarly the blue balls and yellow balls can be arranged internally in '2!' and '4!' ways respectively.

So, total number ways = $3! \times 3! \times 2! \times 4! = 6 \times 6 \times 2 \times 24 = 1728$ ways

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8. The following table shows the courier charges (in Rs.) for sending 1 kg parcel from one city to another.

Cities	Ahmedabad	Mumbai	Kolkata	Bangalore	Jaipur
Ahmedabad		10	5	15	10
Mumbai	10		7	25	20
Kolkata	5	7		20	15
Bangalore	15	25	20		10
Jaipur	10	20	15	10	

Among the following, the charges will be the least for sending a parcel from:-

A Ahmedabad to Jaipur

B Mumbai to Bangalore

C Jaipur to Bangalore

D Kolkata to Mumbai

Answer: D

Explanation:

By carefully observing the given data and by observing the given options,

The charges will be least for the parcel from Kolkata to Mumbai which is Rs. 7,
Hence option (D) is the answer.

9. Three numbers X, Y and Z are in the ratio of 12: 15: 25. If the sum of twice of these numbers is 614, the ratio between the difference of Y and X and the difference of Z and Y is:-

- A 3:7
- B 5:1
- C 3:10
- D 10:3

Answer: C

Explanation:

Given X, Y and Z are in the ratio 12: 15: 25

Let say $X = 12k$, $Y = 15k$ and $Z = 25k$, where k is any constant.

Difference between Y and X = $15k - 12k = 3k$(1)

and Difference between Z and Y = $25k - 15k = 10k$(2)

Ratio of (1) and (2) = $3k \div 10k = 3 : 10$.

10. Ankush and Babulal walk around circular track. They start at 9 a.m. from the same point in the opposite directions. Ankush and Babulal walk at a speed of 3 rounds per hour and 5 rounds per hour respectively. How many times shall they cross each other until 10.30 a.m.?

- A 9
- B 10
- C 12
- D 11

Answer: C

Explanation:

Given speed of Ankush = 3 rounds per hour = 1 round per 20 min

Whereas speed of Babulal = 5 rounds per hour = 1 round per 12 min.

Let us consider Ankush as stationary at the starting point.

The relative speed of Babulal with respect to Ankush = 3 rounds per hour + 5 rounds per hour = 8 rounds per hour

This implies, In one hour Babulal crosses Ankush 8 times.

So, starting from 9.00 am to 10.30 am i.e., 1.5 hours or 90 min, Babulal crosses Ankush 12 times.

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11. The monthly incomes of Amit and Bharat are in the ratio of 5:4, their monthly expenses are in the ratio of 19:21, and their monthly savings are in the ratio of 37:18. If the total annual savings of Amit and Bharat is Rs.1,32,000, Amit's monthly income is:-

- A Rs. 12,000
- B Rs. 15,000
- C Rs. 18,000
- D Rs. 16,000

Answer: B

Explanation:

Given monthly savings of Amit and Bharat are in the ratio 37:18. Let the savings of Amit and Bharat be 37k and 18k, where 'k' is a constant.

⇒ Total monthly savings of Amit and Bharat = 55k.

Given Total annual savings of Amit and Bharat = 1,32,000.

⇒ Total monthly savings = 11,000.

⇒ 55k = 11000

⇒ k = 200.

Hence monthly savings of Amit and Bharat are 7400 and 3600 respectively.

From the given data,

Let the monthly incomes of Amit and Bharat be 5x and 4x respectively, where 'x' is a constant.

Similarly, let the monthly expenditures of Amit and Bharat be 19y and 21y respectively, where 'y' is a constant.

Savings = Income - Expenditure

⇒ $5x - 19y = 7400$(1)

and $4x - 21y = 3600$(2)

Solving both the equations we get $x = 3000$ and $y = 400$.

Therefore, the monthly income of Amit is 5x i.e., 15000.

12. In a circle of radius 6 cm, arc AB makes an angle of 114° with centre of the circle O. What is angle ABO?

- A 23°
- B 42°
- C 38°
- D 33°

Answer: D

Explanation:

In $\triangle AOB$, $AO = OB$ (Equal radii)

∴ $\triangle AOB$ is isosceles.

∴ $\angle ABO = \angle BAO = (180^\circ - 114^\circ) / 2 = 33^\circ$

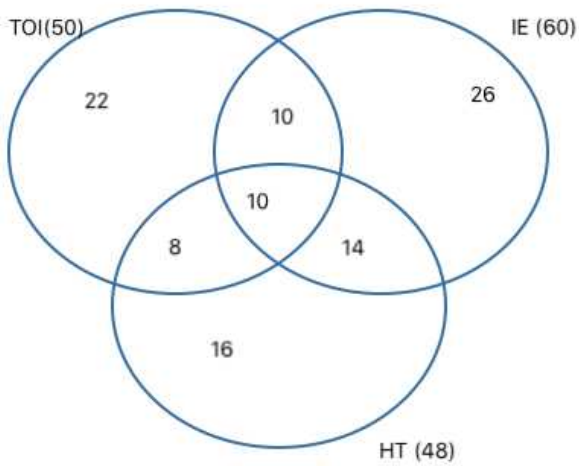
Hence, option D.

13. In a survey conducted among 120 houses, it was found that 50 read Times of India, 60 read Indian Express and 48 read Hindustan Times; 20 read Times of India and Indian Express, 18 read Times of India and Hindustan Times and 24 read Indian Express and Hindustan Times. If 10 read all three, how many read only one newspaper?

- A 50
- B 32
- C 64
- D 84

Answer: C

Explanation:



As can be seen from the above venn diagram distribution

Number of households reading only one newspaper = $22 + 26 + 16 = 64$.

Hence, option C.

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14. The length of the minute of a watch is 42 mm. The area swept by it in 30 minutes (in mm^2) by taking π as 3.14 is:-

- A 2769.5
- B 44π
- C 728
- D 1040π

Answer: A

Explanation:

60 minutes = 360 degrees or 2π radians.

\Rightarrow 1 minute = 60 degrees.

\Rightarrow 30 minutes = 180 degrees or π radians.

Therefore area (A) swept by minute hand of length 42 mm in 30 minutes = area of semi-circle of radius ($r = 42$ mm) .

$$\Rightarrow A = \pi r^2 \div 2 = 3.14 \times 42^2 \div 2 = 2769.5mm^2.$$

15. If $(x + 4)$ is a factor of $x^3 + 2x^2 + bx + 68$, what is the value of b?

- A -9
- B 9
- C 8
- D -8

Answer: B

Explanation:

Let say $f(x) = x^3 + 2x^2 + bx + 68$ and given $(x+4)$ is a factor of $f(x)$.

$$\Rightarrow f(x) = (x + 4) \times k \dots \dots \dots (1)$$

where 'k' is the quotient when $f(x)$ is divided by $(x+4)$.

Substituting 'x= -4' in the equation (1), we get

$$f(-4) = 0$$

$$\Rightarrow -4^3 + 2(-4)^2 + b(-4) + 68 = 0$$

$$\Rightarrow -64 + 32 - 4b + 68 = 0$$

$$\Rightarrow 4b = 36$$

$$\Rightarrow b = 9.$$

16. Rakesh covers 12 km at 6 km/hr, 36 km at 9 km/hr and then 32 km at 4 km/hr. Find the approximate average speed in covering the whole distance.

- A 4.2 km/hr
B 5.52 km/hr
C 5.71 km/hr
D 5 km/hr

Answer: C

Explanation:

Average speed = Total distance covered \div Total time taken.

Total distance covered = 12 + 36 + 32 = 80 km.

Total time taken = 12 \div 6 + 36 \div 9 + 32 \div 4 = 2 + 4 + 8 = 14hrs.

\Rightarrow *Average speed = 80 \div 14 = 5.71km/hr.*

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17. Two pipes A and B can fill a cistern in 120 minutes and 150 minutes respectively. There is also an outlet C. If all the three pipes are opened together, the cistern gets filled in 100 minutes. How much time will be taken by C to empty full tank?

- A 3 h 20 min
B 2 h 40 min
C 3 h
D 3 h 40 min

Answer: A

Explanation:

Let the capacity of the cistern be 600 units.

From the given data, the efficiencies of pipes A and B are 5 units/min and 4 units/min respectively.

Let the efficiency of outlet pipe C be 'k' units/min.

Given the time taken to fill the cistern when all the three pipes are open = 100 minutes

\Rightarrow *Efficiency of pipes \times time taken = Capacity of cistern.*

$$\Rightarrow (5 + 4 - k) \times 100 = 600$$

$$\Rightarrow 9 - k = 6$$

$$\Rightarrow k = 3$$

Therefore the time taken (t) by pipe C to empty the cistern = *Capacity of the cistern \div efficiency of pipe C*

$$\Rightarrow t = 600 \div 3 = 200 \text{ minutes} = 3 \text{ hrs } 20 \text{ min.}$$

18. Ramesh works A hours a day and rests B hours a day. This pattern continues for 1 week, with an exactly opposite pattern next week, and so on for four weeks. Every fifth week he adopts a new pattern which then continues for the next four weeks. When he works longer than he rests, his wage per hour is three times what he earns per hour when he rests longer than he works. The following table shows his daily working hours for the week numbered 1 to 13.

	1st Week	5th Week	9th Week	13th Week
Rest	3	4	5	
Work	6	8	9	8

A week consists of six days and a month consists of four weeks. If Ramesh is paid Rs. 60 per working hour in the 1st week, what is his salary for the 1st month? (Assume that he is paid half his wages for his resting hours on duty)

- A Rs. 6840
 B Rs. 11400
 C Rs. 7240
 D None of these

Answer: A

Explanation:

As per the given conditions, weeks 1 and 3 will have similar pay structure and weeks 2 and 4 will have similar pay structure.

For weeks 1 and 3

wage/hr for working = 60

wage/hr during rest = 30

Total payment per day = $(60 \times 6) + (30 \times 3) = 450$

Total payment for weeks 1 and 3 = $450 \times 12 = 5400$

For weeks 2 and 4

wage/hr for working = 20

wage/hr during rest = 10

Total payment per day = $(20 \times 3) + (10 \times 6) = 120$

Total payment for weeks 2 and 4 = $120 \times 12 = 1440$

\therefore Total monthly salary = $5400 + 1440 = 6840$

Hence, option A.

19. In a box, there are eight yellow and four black balls. If three balls are drawn at random, what is the probability that two are yellow and one black?

- A $1/16$
 B $28/55$
 C $3/8$
 D $8C2 / 4C1$

Answer: B

Explanation:

Probability = $\frac{\text{Expected number of outcomes}}{\text{Total number of outcomes}}$.

Total number of outcomes = Total number of ways to draw randomly 3 balls out of 12 balls = $12C3$ ways.

Expected number of outcomes = Number of ways to draw 2 yellow balls out of 8 and 1 black ball out of 4 = $8C2 \times 4C1$

Hence Probability = $8C2 \times 4C1 \div 12C3 = 28 \times 4 \div 220 = \frac{28}{55}$

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20. If $\tan A + \cot A = \sqrt{5}$, What is the value of $\tan^3 A + \cot^3 A$?

- A $\sqrt{5}$
- B 3
- C $2\sqrt{5}$
- D $\frac{2}{\sqrt{5}}$

Answer: C

Explanation:

$$\cot A = \frac{1}{\tan A}$$

let $\tan A = x$, then $\cot A = \frac{1}{x}$

$$\text{Given, } x + \frac{1}{x} = \sqrt{5} \dots \dots \dots (1)$$

Cubing on both sides, we get

$$\left(x + \frac{1}{x}\right)^3 = \sqrt{5}^3$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \times \left(x + \frac{1}{x}\right) = 5\sqrt{5}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times \sqrt{5} = 5\sqrt{5}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = 2\sqrt{5}$$

$$\Rightarrow \tan^3 A + \cot^3 A = 2\sqrt{5}$$

21. Two balls were bought for Rs. 37.40 at a discount of 15%. What must be the marked price of each of the ball?

- A Rs. 11
- B Rs. 22
- C Rs. 33
- D Rs. 44

Answer: B

Explanation:

Let the marked price of two balls be X

Given that they were bought at 37.40 rupees at 15% discount.

$$\Rightarrow X \times \frac{85}{100} = 37.40$$

$$X = 44$$

we have considered that the marked price of two balls is X i.e: 44 rupees.

The question is asking to find marked price of each ball

so, answer is 22 rupees

option B

22. Find the value of a, if:

$$\text{Modulus}(2a-3)=3a+2$$

- A 1/5
- B 0

C -5

D -1/5

Answer: A

Explanation:

Modulus $|2a-3| = 3a+2$, which can also be written as $|2a-3| = 3a+2$.

Modulus function $f(x) = |x|$ is defined as

$|x| = x$, for $x > 0$,

$|x| = -x$, for $x < 0$

So, we get two cases here,

Case (1):

$2a-3 > 0$

$$\Rightarrow a > \frac{3}{2} \dots \dots \dots (1)$$

$$|2a-3| = 2a-3 = 3a+2$$

$$\Rightarrow a = -5$$

But from equation (1), The above value of $a = -5$ is not a possible case.

Case (2):

$2a-3 < 0$

$$\Rightarrow a < \frac{3}{2} \dots \dots \dots (2)$$

$$|2a-3| = -(2a-3) = 3a+2$$

$$\Rightarrow a = \frac{1}{5}$$

This is a possible case, hence the value of $a = \frac{1}{5}$

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23. From a jar of wine containing 32 litres, 4 litres is drawn out, and the jar is filled up with water. If the same proportion of wine is further drawn out two more times, what proportion of wine to water will be there in the resulting mixture?

A 245:166

B 343:169

C 363:173

D 323:189

Answer: B

Explanation:

From 32 litres, 4 litres is drawn out and is replaced with water.

Proportion of wine drawn = $4/32 = 1/8$ th of the total volume of the wine in the mixture.

When wine is drawn out for the second time, $(1/8) \times (28) = 3.5$ litres of wine will be drawn out.

Wine remaining in the jar = $28 - 3.5 = 24.5$ litres

When wine is drawn out for the third time, $(1/8) \times (24.5) = 3.0625$ litres of wine will be drawn out.

Wine remaining in the jar = $24.5 - 3.0625 = 21.4375$ litres

Water in the jar = 10.5625 litres

Ratio of wine remaining in the jar to water remaining in the jar = 343:169

24. The geometric mean proportion between $30 + \sqrt{200}$ and $54 - \sqrt{648}$ is:

- A $6\sqrt{2}$
- B $4\sqrt{5}$
- C $6\sqrt{35}$
- D $5\sqrt{6}$

Answer: C

Explanation:

The geometric mean proportion between two numbers 'a' and 'b' is given by $\sqrt{a \times b}$

The given two numbers are $30 + \sqrt{2}00$ and $54 - \sqrt{6}48$

which are also equal to $10(3+\sqrt{2})$ and $18(3-\sqrt{2})$.

Hence the geometric mean proportion = $\sqrt{10(3 + \sqrt{2}) \times 18(3 - \sqrt{2})} = \sqrt{180 \times (3^2 - (\sqrt{2})^2)} = \sqrt{1260} = 6 \times \sqrt{35}$.

25. **Anil is twice as good a student as Bharat and is able to finish a work in 30 minutes less than Bharat's time. Find the time in which both of them can finish the same work together?**

- A 45 min
- B 30 min
- C 25 min
- D 20 min

Answer: D

Explanation:

Given Anil is twice as good a student as Bharat

⇒ Efficiency of Anil : Efficiency of Bharat = 2:1

and also, Efficiency is inversely proportional to Time taken,

⇒ Time taken by Anil : Time taken by Bharat = 1:2.....(1)

Given that Time taken by Anil is 30 min less than Bharat's time.

Let say, Time taken by Bharat be 't' minutes.

Then the time taken by Anil = t-30 minutes

Substituting these in equation (1), we get

$$\frac{t-30}{t} = \frac{1}{2}$$

⇒ t = 60 minutes.

Therefore the time taken by Anil and Bharat are 30 minutes and 60 minutes respectively.

Let Efficiency of Bharat be 'x', then Efficiency of Anil will be '2x'

⇒ Total Work = Efficiency \times Time taken = $(2x) \times 30$ (or) $(x) \times 60 = 60x$ units.

Efficiency when Anil and Bharat are working together = $x+2x = 3x$

Total Work = $60x$ units

Time taken(T) by Anil and Bharat together to complete the work = Total work / Efficiency when Anil and Bharat work together

$$\Rightarrow T = \frac{60x}{3x}$$

⇒ T = 20 minutes.

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