

TCS – Set 5

1. A lady has some socks and hats in her closet - 17 blue, 47 red, and 24 yellow. The lights are out and it is totally dark. In spite of the darkness, she can make out the difference between a hat and a sock. She takes out an item out of the closet only if she is sure that it is a sock. How many socks must she take out to make sure she has two socks of each colour?

a. 73 b. 64 c. 57 d. 55

Answer: a.73

Explanation: Consider they are all socks and no hats.

First take out - 47 red socks

Next take out - 24 yellow socks

Finally - 2 blue socks

The total number of attempts that will be required to take two socks of each colour will be 73.

2. Udvama Pradipa Udarka is a tall, lean tower with 24 floors. Its security chief Lokabahya is very popular (or notorious depending on one's math knowledge or lack thereof) among the visitors. Once a visitor asked him the ratio of people in 24th floor to those in ground floor. Lokabahya said that if four persons are added to both the floors, the ratio of fraction becomes $\frac{9}{11}$. Instead, if five move out of each of the floors, then the result is $\frac{3}{4}$. What is the fraction? What is your answer like $\frac{10}{11}$ without any blank space anywhere.

a. $\frac{22}{39}$ b. $\frac{23}{42}$ c. $\frac{23}{29}$ d. $\frac{21}{42}$

Answer: c. $\frac{23}{29}$

Explanation: Actual Fraction = $\frac{x}{y}$

a. $\frac{(x+4)}{(y+4)} = \frac{9}{11}$

$$11x + 44 = 9y + 36$$

$$9y - 11x = 8 \text{ --- (1)}$$

b. $\frac{(x-5)}{(y-5)} = \frac{3}{4}$

$$4x - 20 = 3y - 15$$

$$3y - 4x = -5 \text{ --- (2)}$$

Multiply (2) by 3.

Solve both equations,

$$9y - 11x = 8$$

$$9y - 12x = -15$$

$$x = 23$$

putting x in (1)

$$9y - 11(23) = 8$$

$$9y = 8 + 253 = 261$$

$$y = 261/9$$

$$y = 9$$

$$\text{So, } x/y = 23/9$$

3. i, j, k, l and m are positive integers in ascending order such that $(8 - i)(8 + j)(8 - k)(8 - l)(8 + m) = 3927$. What is the value of $I + j + k + l + m$?

a. 19

b. 25

c. 35

d. 14

Answer: b. 25

Explanation: Given equation, $(8-i)(8+j)(8-k)(8-l)(8+m) = 3927$

3927 is the product of 5 numbers

Split the product,

$$3927$$

$$= 3 \times 1309$$

$$= 3 \times 11 \times 119$$

$$= 3 \times 11 \times 17 \times 7$$

$$= 3 \times 11 \times 17 \times 7 \times 1 \text{ (multiplying by one will not affect the product)}$$

Now substitute these numbers in the equation,

$$8 - i = 3 \rightarrow i = 5$$

$$8 + j = 11 \rightarrow j = 3$$

$$8 - k = 7 \rightarrow k = 1$$

$$8 - l = 1 \rightarrow l = 7$$

$$8 + m = 17 \rightarrow m = 9$$

The numbers are 1, 3, 5, 7, 9.

Sum of these would be 25.

4. Some scientists interpret satellite data to mean that glaciers are melting faster than in earlier centuries. In each decade since the industrial revolution, the amount of glacier melt has doubled and some scientists predict that all the glaciers will have melted away by the year 2037. If indeed this were true, in which year, would we have lost 50% of all the glaciers?

a. 2027

b. 2037

c. 2017

d. 2008

Answer: a. 2027

Explanation:

End of all glaciers = 2037 - 100% melted

One decade ago = 2027 - 50%

Since melting doubles every decade, the previous decade it would be half of this decade.
So, if in 2037 it would be 100% melted, in the year 2027 it would be half of that, which is 50%.

5. I have a two-digit number. The unit's digit is twice as ten's digit. If I reverse the number and subtract 36 from it, I get the initial number. What's the number I started with?

a. 48 b. 53 c. 60 d. 73

Answer: a. 48

Explanation: Consider the number to be,
 $10x+y$ (x - tens digit, y - units digit)

given, $y = 2x$ --- (1)

reverse it,

$$10y+x-36 = 10x+y$$

$$10y-y+x-10x = 36$$

$$9(y-x)=36$$

$$y-x = 4 \text{ --- (2)}$$

Using (1) in (2)

$$2x - x = 4$$

$$x = 4$$

$$y = 2(4) = 8$$

$$10x+y = 10(4)+8 = 40+8 = 48$$

6. We live and work in a time of rapidly advancing technology. A social media start-up is doubling the number of users each weeks. It took just 47 weeks to acquire a million users. How long did it take to acquire half a-million users?

a. 45 weeks b. 23.5 weeks c. 24 weeks d. 46 weeks

Answer: d. 46 weeks

Explanation: Given, 47 weeks to reach 1 million and it doubles up each week. Which means in the previous week it would be half of this week. So in 46th week it was half a million.

7. The kids Phalaa and Adhiphalaa (don't confuse with Balaa and Adhibalaa, the abracadabra that sage Vishwamitra taught to Rama and Lakshmana to successfully stay the demoness Taadaka) carry some fruits. Being tender and small, each could carry only a single digit number of fruits. Adhiphalaa has three times the fruits that Phalaa has. If the digits corresponding to Phalaa's and Adhiphalaa's fruits are written in that order, the resulting two digit number is a multiple of three. How many fruits does Adhiphalaa have?

a. 9 b. 2 c. 3 d. 6

Answer: a. 9

Explanation: Given, Both have single digit number of fruits. Adhiphalaa has thrice the number of fruits that Phalaa has.

Possibilities,

(Phalaa, Adhiphalaa)

(1,3)

(2,6)

(3,9)

The resulting two digit number is a multiple of three, so from the possibilities we can write,

$$1 \text{ \& } 3 = 13$$

$$2 \text{ \& } 6 = 26$$

$$3 \text{ \& } 9 = 39$$

Now, adhiphalaa has 9 fruits.

8. Multiplication is repeated addition. Exponentiation, represented by a single up-arrow is repeated multiplication. So the next operation is repeated exponentiation. Donald Knuth thereby developed an ingenious system that allows this process of compounding the better-known arithmetic operations defining infinitely many more levels of arithmetic operations.

If a single arrow(^) represents iterated multiplication(exponentiation)

$$2^4 = 2*(2*(2*2)) = 16,$$

Double arrow represents iterated exponentiation (tetration)

$$2^{^4} = 2^{(2^{(2^2)})} = 65536,$$

Triple arrow represents iterated tetration (pentatoin)

$$2^{^^4} = 2^{^(2^{^(2^{^2})})},$$

What is $5^{^2}$?

a. 3125

b. 9765625

c. 25

d. 625

Answer: a. 3125

Explanation: From given examples, $5^{^2} = 5^5 = 5*5*5*5*5 = 3125$

9. If the average of 3 distinct positive integers is 4, what is the largest possible value of any of them?

a. 4

b. 9

c. 12

d. 10

Answer: b. 9

Explanation: Consider the numbers as, x, y and z

$$(x+y+z)/3 = 4$$

$$x+y+z = 12$$

Consider the first two numbers to the least positive numbers,

$$x = 1$$

$$y = 2$$

$$\text{then, } 1 + 2 + z = 12$$

$$z = 9$$

Hence, the largest possible value is 9.

10. The probability that there are 53 Mondays in a leap year is (Express answer as a ratio p/q) _____.

a. $\frac{2}{7}$ b. $\frac{6}{77}$ c. $\frac{3}{7}$ d. $\frac{1}{7}$

Answer: a. $\frac{2}{7}$

Explanation: Days in the a leap year = 366

Odd days in a leap year = $366/7 = 52$ normal days and 2 odd days

Odd days can be in any of the following combinations,

Sun, Mon

Mon, Tue

Tue, Wed

Wed, Thur

Thur, Fri

Fri, Sat

Sat, Sun

We have 52 weeks in a year, so 52 Mondays.

We need 53 Mondays, so there are 2 possibilities out of 7.

So, $\frac{2}{7}$ is the answer.

11. Arun wrapped a gift for his friend in a big box, which contains 4 small boxes. Each of these small boxes again contain 3 boxes. Each of these boxes contain 3 boxes. The gift is randomly kept in one of the smallest boxes. If you can open one of the smallest boxes, what is the probability that the gift is in it?

a. $\frac{1}{36}$ b. $\frac{1}{53}$ c. $\frac{1}{52}$ d. $\frac{1}{48}$

Answer: a. $\frac{1}{36}$

Explanation:

Level 1 = 1 box

1 big box has 4 smaller boxes

Level 2 = 4 boxes

Each small box has 3 more boxes = 12 boxes

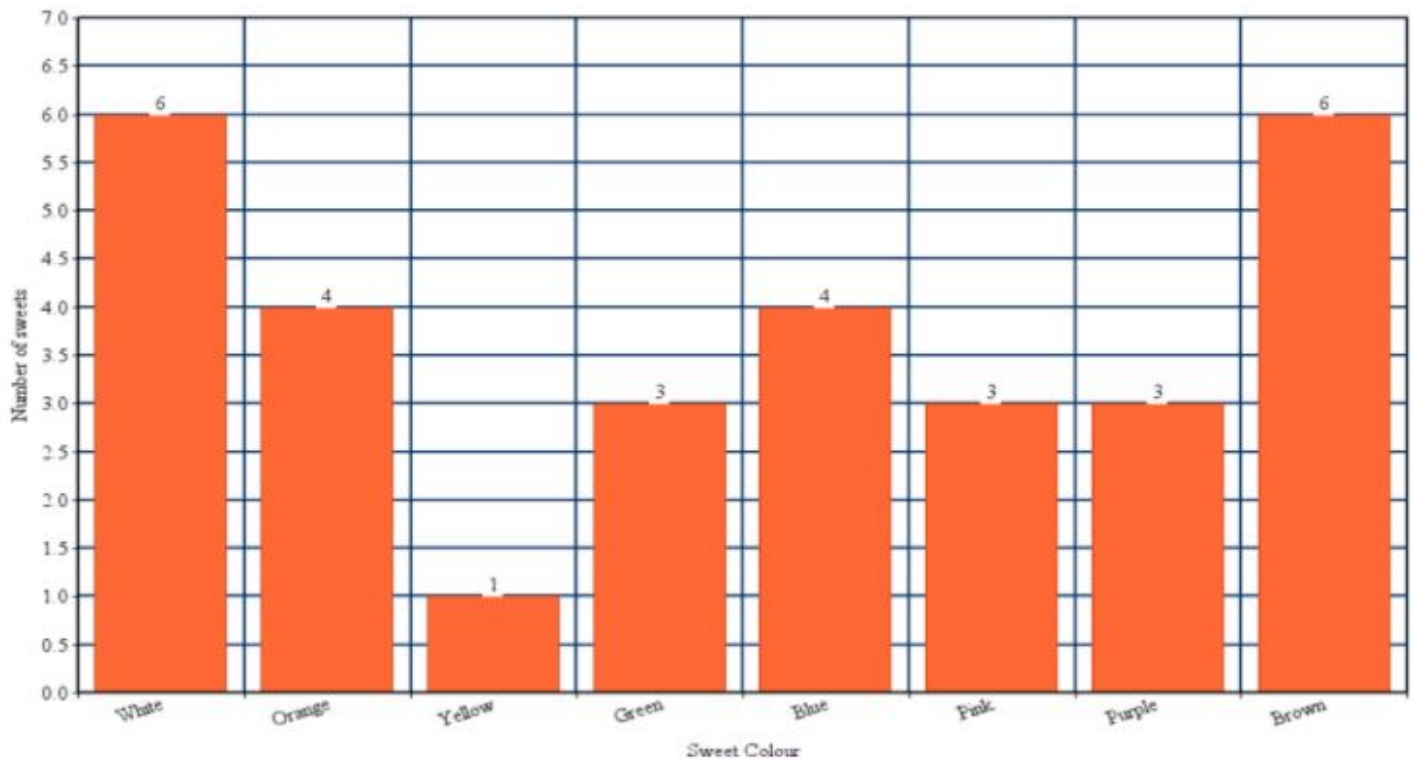
Level 3 = 12 boxes

Each of these have 3 more boxes = 36 boxes

Level 4 = 36 boxes

Probability = $\frac{1}{36}$

12. Anmol picks sweets from a bag without looking. The distribution of sweets of each colour in the bag is given below. What is the probability that Anmol will pick a white sweet?



- a. 0.3 b. 0.6 c. 0.5 **d. 0.2**

Answer: d. 0.2

Explanation:

Probability = Favourable Outcomes/Total Outcomes = $6/30 = 1/5 = 0.2$

13. Your friend places 100 cards in a row, one of which contains the Jack of Clubs that you need to guess. You pick the card at position 12. The host removes all the cards except the card chosen by you at position 12 and another card at position 61. He now says, "One of these two cards is the Jack of Clubs". What is the percentage probability that the card is at position 61?

- a. 99%** b. 50% c. 98% d. 1%

Answer: a. 99%

Explanation: Assume that every time he takes out two cards, one chosen by you and one random card. One of them is Jack of clubs. Assume that there is only one such card.

The probability that the jack of cards is at 12th position that you chose.

$P(12\text{th position}) = 1/100$

The probability that it would be at 61st position,

$P(61\text{st position}) = (99/100) \times 100 = 99$

14. Bhaskar and Shakuntala challenge each other in math and are at loggerheads always. At the end of a milestone in their project, the team had a dinner and were seated in a circular table. If there were 16 people for dinner, what are the odds against the event that Bhaskar and Shakuntala will sit together? (Give the answer as a:b)
- a. 12:3 b. 16:2 **c. 13:2** d. 2:13

Answer: c. 13:2

Explanation: Odds against = $P(\text{Not } E)/P(E)$

Total ways in which 16 people can be made to sit in circular table = $15!$

Combine Bhaskar and Shakuntala as one unit. $P(E) = (14! \times 2!)/15!$

$P(\text{Not } E) = [15! - (14! \times 2!)]/15! = 13/2 = 13:2$

15. Two finals are scheduled The Wimbledon match and the World Cup Cricket at the same time. Anu wants to watch the Wimbledon finals and her brother Vinu wants to watch WCC final. They decide to roll a tetrahedral die twice. The tetrahedral is numbered 1,2,3,4 on its four sides and all numbers are equally likely to appear. Anu rolls first and then Vinu rolls. If the number on the first roll is strictly greater than the number on the second roll, Anu wins and gets to watch 'Wimbledon'. What is the probability that Anu will get to watch Wimbledon?
- a. $7/16$ b. $9/16$ **c. $3/8$** d. $1/2$

Answer: c. $3/8$

Explanation:

Possibilities = (1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2), (3,3), (3,4), (4,1), (4,2), (4,3), (4,4)

Total Outcomes = 16

Favourable Outcomes = 6

$P(\text{Anu wins}) = \text{Favourable Outcomes} / \text{Total Outcomes} = 6/16 = 3/8$

16. Ram Speaks truth 40% of the time and Laxman speaks truth 60% of the time. Percentage of cases Ram and Laxman are likely to contradict each other in stating the same fact is ____.
- a. 48% **b. 52%** c. 50% d. 60%

Answer: b. 52%

Explanation:

Ram speaks truth = 40%

Ram lies = 60% (100%-40%)

Laxman speaks truth = 60%

Laxman lies = 40% (100%-60%)

Case 1: Ram speaks truth & Laxman lies

% of times this happens = $(40/100) \times (40/100) = (1600/10000) = (16/100)$

Case 2: Laxman speaks truth & Ram lies

% of times this happens = $(60/100) \times (60/100) = (3600/10000) = (36/100)$

Add both cases

Case 1 + Case 2 = $(16/100) + (36/100) = (52/100)$

Convert to % $\rightarrow (52/100) \times 100 = 52\%$

17. Uma has 50 red and 50 blue balls. She has two bowls with her. She has to distribute the balls in these two bowls in such a way that none of the bowls are left empty. If one were to choose one of the two bowls at random and then randomly draw a ball from it, the probability of the ball being red is maximized. After this distribution, what will be the total number of balls in the bowl with a larger number of balls?

a. 59 b. 72 **c. 99** d. 1

Answer: c. 99

Explanation: Assume both bowls will be chosen equally,

Bowl 1:

$P(B1) = 1/2$

1 red ball (to increase the probability consider only one ball in bowl 1)

$P(\text{red ball}) = (1/2) \times 1$

Bowl 2:

$P(B2) = 1/2$

99 odds (49 red and 50 blue)

$P(\text{red ball}) = (1/2) \times (49/99)$

Obviously, bowl 2 has maximum number of balls, which is 99 balls.

18. Imagine a drunk man standing near a cliff. From where he stands, one step forward would send him over the edge. He takes random steps, either towards or away from the cliff. At any step, his probability of taking a step away is $\frac{2}{3}$ and a step towards the cliff is $\frac{1}{3}$. What is his chance of falling off the cliff after 3 steps?

a. 2/27 b. 11/27 c. 1/3 d. 5/9

Answer: a. 2/27

Explanation:

Step away = $2/3$

Step towards = $1/3$

Chance of falling after 3 steps,

1 - step back

2 - step forward

3 - step forward

$P(\text{fall}) = (2/3) \times (1/3) \times (1/3) = 2/27$

19. A new AI-based non-invasive cancer detection test has been put through trial. For any person suffering from cancer, there is a 80% chance of him testing positive. The probability of a person who does not have cancer testing positive(false positive) is 10%. It is known that 8% of all people who come for screening have cancer. Given that a person tested positive, what is the probability he actually has cancer?

a. 54/1000 b. 92/4500 **c. 16/39** d. 18/3700

Answer: c. 16/39

Explanation:

A – Person has cancer

B – Person tests positive

Using Bayes' Theorem

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)} = \frac{\frac{80}{100} \times \frac{8}{100}}{\frac{8}{100} \times \frac{80}{100} + \frac{92}{100} \times \frac{10}{100}} = \frac{\frac{640}{10000}}{\frac{640+920}{10000}} = \frac{640}{1560} = \frac{16}{39}$$

20. A race horse starts chasing a wild pony 2 hours after the pony bolts the stable. The race horse finally catches up with the pony after 3 hours. If the average speed of the race horse is 49 km/h, then the average speed of the wild pony is _____.

a. 30.4 km/h **b. 29.4 km/h** c. 19.6 km/h d. 32.67 km/h(8/100)

Answer: b. 29.4 km/h

Explanation: Speed of pony = x km/h

$$d_1 = d_2$$

$$x * (2+3) = 49 * 3$$

$$5x = 147$$

$$x = 147/5 = 29.4 \text{ km/h}$$

21. Ahilyanagari Express running at a speed of 60 km/h and Cholan Express at 120 km/h take 10 s to cross each other, when they are running in opposite directions (these two trains operate in the same route only as a mathematical fantasy and not in reality). If Cholan express is 120 m longer than Ahilyanagari Express, what's the length in meters of the latter?

a. 190 m b. 380 m c. 60 m d. 70 m

Answer: a. 190 m

Explanation:

x => Ahilyanagari express

x + 120 => Cholan express

$$S1 = 60 \text{ km/h} = 60 \times (5/18) = 50/3 \text{ m/s}$$

$$S2 = 120 \text{ km/h} = 120 \times (5/18) = 100/3 \text{ m/s}$$

Moving towards each other, so add the speeds.

$$S1+S2 = (50/3) + (100/3)$$

$$T = D/S = \frac{(x + x + 120)}{(50/3) + (100/3)}$$

$$10 = \frac{3x + 3x + 360}{150}$$

$$1500 = 6x + 360$$

$$1500 - 360 = 6x$$

$$1140/6 = x$$

$$x = 190 \text{ m}$$

22. A police car starts chasing a fugitive in a BMW 4 hours after the BMW escapes from the scene of crime at 10 a.m. The BMW drives for 10 Km through crowded roads of Shanghai and then drives into a highway, where the traffic allows vehicles to move twice as fast. After a while, the police car finally catches up with the BMW after a chase that lasted 5 hours. By this time the moon was up in the sky for 4 hours. If the average speed of the police car is 50 km/h, then the average speed of the BMW is km/h.

a. 27 km/h b. 29 km/h **c. 27.78 km/h** d. 29.78 km/h

Answer: c. 27.78 km/h

Explanation:

Speed of police car = 50km/h

Time taken to catch up = 5hrs

Total distance = speed x time = 50 x 5 = 250 km

$$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{250}{5+4} = \frac{250}{9} = 27.78 \text{ km/h}$$

23. Velan and Karan together can build a bridge in 5 hours. Karan works twice as long as Velan does if he has to do the job alone. How long will it take Velan to complete the job alone?

a. 25 **b. 7.5** c. 10 d. 15

Answer: b. 7.5

Explanation:

Assume,

Velan -> x hours -> 1/x

Karan -> 2x hours -> 1/2x

Together = 1 hour

$$\left(\frac{1}{x} + \frac{1}{2x}\right) 5 = 1 \text{ --- Work}$$

$$\frac{5}{x} + \frac{5}{2x} = 1$$

$$\frac{10 + 5}{2x} = 1$$

$$15 = 2x$$

$$x = 15/2 = 7.5 \text{ hours}$$

24. If it takes 10 3D printers 10 min to print 10 models, how long will it take 100 printers to print 100 models?
 a. 100 min b. 20 min **c. 10 min** d. 30 min

Answer: c. 10 min

Explanation:

Given, 10 printers take 10 minutes to print 10 models. So, 1 printer takes 10 minutes to print 1 model
 -> 100 printers will take 10 minutes to print 100 models

25. In the normal course, Ravi, Sanjay and Mukund can each individually build a wall in 5, 8 and 10 days respectively. Due to difficult terrain and slushy conditions at the site, the individual time required for each to complete the work has increased by 20%, 25% and 50% respectively. How long will they take to build the wall if they work together?
a. 3 days b. 4 days c. 6 days d. $2\frac{6}{17}$ days

Answer: a. 3 days

Explanation:

Ravi = $5 + 20\% \text{ of } 5 = 5 + 1 = 6 \rightarrow 1/6$ in one day

Sanjay = $8 + 25\% \text{ of } 8 = 8 + 2 = 10 \rightarrow 1/10$ in one day

Mukund = $10 + 50\% \text{ of } 10 = 10 + 5 = 15 \rightarrow 1/15$ in one day

In one day, $\left(\frac{1}{6} + \frac{1}{10} + \frac{1}{15}\right)$ work = $\frac{5+3+2}{30} = \frac{10}{30} = \frac{1}{3} \Rightarrow 3$ days

26. The expression $3(x^2) - mx + 10$ leaves a remainder of -2 when divided by $x-3$. What's the value of m?
 a. 18 **b. 13** c. 15 d. 8

Answer: b. 13

Explanation:

$$3x^2 - mx + 10 = (x - 3)Q + (-2)$$

Q - Quotient

$$3x^2 - mx + 12 = (x - 3)Q$$

Placing $x = 3$ in the given equation

$$3(3)^2 - m(3) + 12 = 0$$

$$27 - 3m + 12 = 0$$

$$3m = 39$$

$$m = 39/3 = 13$$

27. Bhaskar called his friend Shakuntala to celebrate his wedding anniversary. Shakuntala reached the street where he was living but forgot the door number. She called Bhaskar for his door number. Being a geek in math, he didn't give the door number directly. But told this " It is the middle number of the three numbers where the difference between first and second numbers is same as that between second and third. The product of first and last is 273 and sum of all three is 51." Shakuntala reached his house on time. His door number is ____.
a. 17 b. 13 c. 21 d. 19

Answer: a. 17

Explanation:

Assume, Bhaskar's door no. = y

Other nos. = x and z

Given,

$$y - x = z - y$$

$$2y = z + x \text{ --- (1)}$$

$$x + y + z = 51$$

$$x + z = 51 - y \text{ --- (2)}$$

Use (1) in (2)

$$2y = 51 - y$$

$$3y = 51$$

$$y = 51/3$$

$$y = 17$$

28. There is a horse and a saddle. The sum of their cost is Rs.1100. The cost of the horse is Rs.1000 greater than saddle. What is the cost of saddle?

a. Rs. 100

b. Rs. 50

c. Rs. 110

d. Rs. 1000

Answer: b. 50

Explanation:

Cost of the saddle = Rs. x

Cost of horse = Rs. (x + 1000)

Give, Total = Rs. 1100

$$x + (x+1000) = 1100$$

$$2x = 1100 - 1000$$

$$2x = 100$$

$$x = 100/2$$

$$x = \text{Rs. } 50$$

29. You have three tuples: (1,2), (2,4), (3,6). What is the shape of the function that describes these?

a. S-shaped

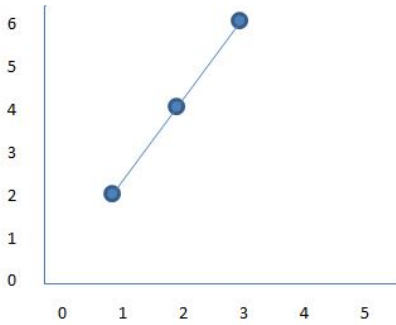
b. Parabolic

c. Straight line

d. Quadrilateral

Answer: c. Straight line

Explanation: When you plot the points in the graph, you get a straight line.

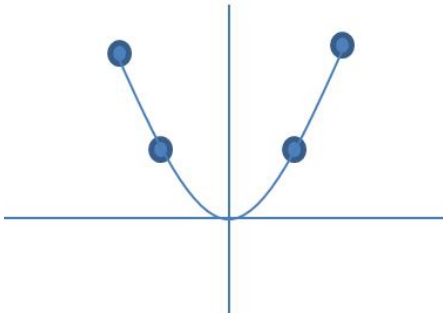


30. If $f(x) = x^2$, what is the shape of $f(x)$?

- a. S-shaped **b. Parabolic** c. Circular d. Quadrilateral

Answer: b. Parabolic

Explanation: When you plot the points in the graph, you get a parabola.



31. If company A sells a service for Rs. 50 per hour then which of the following could be a revenue function for company A?

- a. $R(t) = 50 * t$** b. $R(50) = 50 + t$ c. $R(t) = 50 + t*t$ d. $R(t) = 50 + t$

Answer: a. $R(t) = 50 * t$

Explanation:

1 hour of service = Rs. 50

t hours of service = Rs. 50t

Check the options, Option A fits correctly.

32. In function $P(x, y) = 85x(50y + 150000)$, what value indicates the increase in P that corresponds to increase in x, when y is kept a constant?

- a. 85** b. 135 c. 35 d. 50

Answer: a. 85

Explanation:

$$P(x, y) = 85x(50y + 150000)$$

Part 1 - $85x$

Part 2 - $50y + 150000$ (From the question, Part 2 will be constant throughout.)

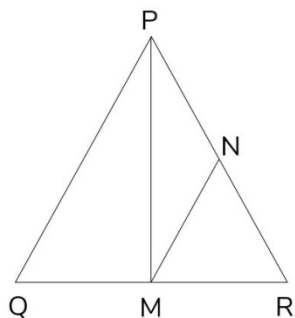
Multiply part 1 with random numbers,

$$85 \times 1 = 85$$

$$85 \times 2 = 170 \text{ (there is increase)}$$

Part 1 indicates the increase in P. Hence the answer is 85.

33. Triangle PQR is isosceles with $PQ = PR = 20\text{cm}$. A perpendicular MN is drawn from M, the midpoint of QR to the side PR dividing it in the ratio 4:1. What is the length of the altitude PM?



- a. 8 b. 16 c. $8\sqrt{5}$ d. $16\sqrt{5}$

Answer: c. $8\sqrt{5}$

Explanation:

In $\triangle MNR$
 $\tan x = \frac{MN}{NR} = \frac{MN}{4}$ — (1)

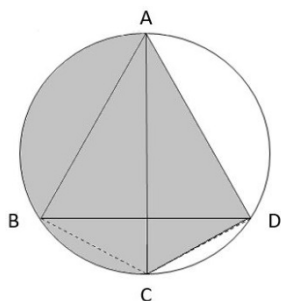
In $\triangle PMN$
 $\tan(90-x) = \frac{MN}{16}$

Let $x = \frac{MN}{16}$

$\frac{1}{\tan x} = \frac{MN}{16}$
 Using (1) $\frac{4}{MN} = \frac{MN}{16}$

In $\triangle PMN$
 $(PM)^2 = (PN)^2 + (MN)^2$
 $= (16)^2 + (8)^2$
 $= 256 + 64$
 $= 320$
 $PM = \sqrt{320}$
 $= 8\sqrt{5}$

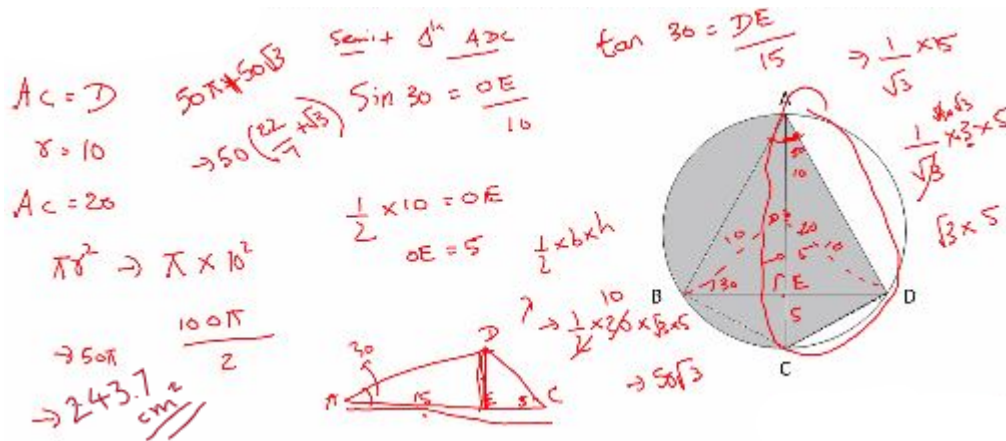
34. An equilateral triangle ABD is inscribed in a circle as shown in the figure. AC is a diameter of the circle. If the radius of the circle is 10 cm, what is the area of the shaded portion?



- a. 243.7 cm^2 b. 192.4 cm^2 c. 221.4 cm^2 d. 273.1 cm^2

Answer: 243.7 cm^2

Explanation:



35. Ms. Trikonapriya wants to decorate her abode's frontage with a triangular lawn. The two sides of this lawn are of 5 m and 6 m, subtending an angle of 30° . If the lawn maintainer charges Rs.10 per square meter, how much would Trikonapriya pay to him for the entire lawn?

a. Rs. 75 b. Rs. 80 c. Rs. 60 d. Rs. 65

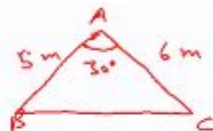
Answer: a. Rs. 75

Explanation:

$$A_{\Delta ABC} = \frac{1}{2} \times AB \times AC \times \sin 30^\circ$$

$$= \frac{1}{2} \times 5 \times 6 \times 0.5$$

$$= 7.5 \text{ m}^2$$



$$\text{Total charges} = \text{Rs. } 10 \times 7.5 \text{ m}^2$$

$$= \text{Rs. } 75$$

36. There is a circular bookshelf under a stair in a Government library. The wall is 6 m height, the distance of the base of the stairs from the corner of the room is 8m. What is the radius of the circular bookshelf in feet?

a. 1 m b. 3 m c. 2 m d. 4 m

Answer: c. 2

Explanation:

In ΔABC , by Pythagorean theorem

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

$$= (8)^2 + (6)^2$$

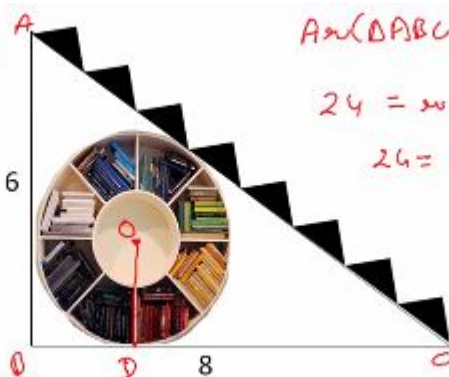
$$= 64 + 36$$

$$= 100$$

$$AC = \sqrt{100} = 10 \text{ m}$$

$$A_{\Delta ABC} = \frac{1}{2} \times b \times h$$

$$= \frac{1}{2} \times 8 \times 6 = 24 \text{ m}^2$$



$$A_{\Delta ABC} = \text{Area of circle} + \text{Area of semi-circle}$$

$$24 = \pi r^2 + \frac{1}{2} \pi (2r)^2$$

$$24 = \pi r^2 + \pi r^2$$

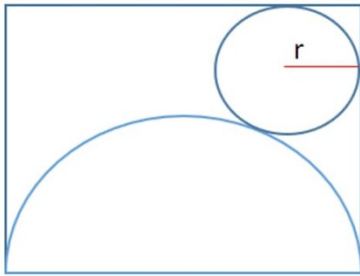
$$24 = 2\pi r^2$$

$$12 = \pi r^2$$

$$r^2 = \frac{12}{\pi}$$

$$r = 2 \text{ m}$$

37. A semicircle and a circle are drawn in a square of side 2 cm. The circle touches two adjacent sides of the square and the semicircle as given in the figure. What is the radius of the circle?



< - 2 cm ->

- a. $8-4\sqrt{3}$ b. $8+4\sqrt{3}$ c. $4+2\sqrt{3}$ d. $4-2\sqrt{3}$

Answer: d. $4-2\sqrt{3}$

Explanation:

fn $\triangle AOB$, By Pythagoras theorem

$$(OA)^2 = (OB)^2 + (AB)^2$$

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

$$1+x^2+2x = 4-x^2-2x+4+x^2-4x$$

$$x^2-8x+4=0$$

Roots of eqn = $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$$= \frac{8 \pm \sqrt{64-4(1)(4)}}{2}$$

$$= \frac{8 \pm \sqrt{48}}{2} = \frac{8 \pm 4\sqrt{3}}{2} = 4 \pm 2\sqrt{3} = 4+2\sqrt{3} \text{ X } = 4-2\sqrt{3}$$

< - 2 cm ->

38. Two alloys A and B are both made of iron and zinc. The ratios of iron to zinc in the two alloys are 5:3 and 1:2 respectively. A and B are combined in the ratio 4:3 to yield a new alloy C. What is the ratio of iron and zinc in C?

- a. 4:3 b. 2:3 c. 5:2 d. 1:1

Answer: d. 1:1

Explanation:

In alloy A - I:Z = 5:3

In alloy B - I:Z = 1:2

In alloy C - A:B = 4:3

Iron in A = $\frac{5}{8}$

Zinc in A = $\frac{3}{8}$

Iron in B = $\frac{1}{3}$

Zinc in B = $\frac{2}{3}$

When we combine,

Iron = $4(\frac{5}{8}) + 3(\frac{1}{3})$

$$\text{Zinc} = 4 \left(\frac{3}{8}\right) + 3 \left(\frac{2}{3}\right)$$

In alloy C - I:Z = 1:1

39. Sura, a strongly distilled alcoholic drink was used in ancient India as an anesthetic by surgeons. A 15 L cask initially contains pure Sura up to the brim. The Sura is diluted by removing 5 L and replacing that quantity with water. If Sura is diluted twice, what is the ration of Sura to water in the cask?

a. 2:1 b. 1:1 c. 1:2 **d. 4:5**

Answer: d. 4:5

Explanation:

Initially,

Sura = 15L

Water = 0L

After the first dilution,

Sura = 10L

Water = 5L

Ratio (S:W) = 10:5 = 2:1

After second dilution,

Sura = $10 - 5 \times \frac{2}{3}$

= $(30 - 10)/3$

= $20/3$

Water = $5 - 5 \times \frac{1}{3}$

= $(15 - 5)/3$

= $10/3$

Final amount of water = $10/3 + 5 = 25/3$

Final ratio,

Sura : Water = $(20/3)/(25/3) = 4/5 = 4:5$

40. 12 litres of water is poured into an aquarium of dimensions 50 cm length, 30 cm breadth and 40 cm height. By what height (in cm) will the water rise?

a. 10 b. 20 c. 6 **d. 8**

Answer: d. 8 cm

Explanation: Note: 1L = 1000 cm³

So, 12L = 12000 cm³

$12000 \text{ cm}^3 = 50 \times 30 \times h$

$12000 = 1500h$

$h = 8 \text{ cm}$