



GMAT QUANT

[PROBLEM SOLVING]
- Solutions

1. Solution:

Topic: Geometry

Concept Tested: Coordinate Geometry

Type of Question: Problem Solving (PS)

Given: The centre of the circle is (10, -4). The point (2, -4) is inside the circle and (10, 14) is outside the circle. The radius of the circle is r which is an integer.

Question: How many possible values are there for 'r'?

Using the distance formula, we can find the distances between the points that they have mentioned in the question which lies outside and inside the circle.

Approach: Distance formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$\begin{aligned} \text{Distance between the centre of the circle (10,-4) and (2, -4)} &= \sqrt{(2 - 10)^2 + (-4 + 4)^2} \\ &= \sqrt{(-8)^2 + (0)^2} = 8. \end{aligned}$$

Distance between the centre of the circle (10,-4) and (10, 14) =

$$\begin{aligned} &\sqrt{(10 - 10)^2 + (14 + 4)^2} \\ &= \sqrt{(0)^2 + (18)^2} = 18. \end{aligned}$$

Since they have given in the question that the point (2, -4) lies inside the circle, therefore radius of the circle will be greater than 8 and also given that point (10, 14) lies outside the circle the radius of the circle will be less than 18.

i.e.; $8 < r < 18$

Now since 'r' is an integer, possible integer's values of "r" are (9, 10, 11, 12, 13, 14, 15, 16, and 17).

Hence there are 9 such integer values that satisfy the condition of 'r'.

Hence, the answer is C.

2. Solution:

Topic: Data Analysis

Concept Tested: Permutation and Combination

Type of Question: Problem Solving (PS)

Given: The leftovers consist of 8 burgers, all with different sauces and 4 desserts

Question: In how many different ways can Alexa and Jasmine eat leftovers if they eat 2 burgers each and 1 dessert?

Approach: Combination. ${}^n C_r = \frac{n!}{(n-r)!r!}$

Number of ways in which Alexa and Jasmine can have dinner

= (Number of ways Alexa and Jasmine each have 2 burgers) \times (Number of ways Alexa and Jasmine each have 1 desserts)

$$= {}^8 C_2 \times {}^6 C_2 \times {}^4 C_1 \times {}^3 C_1$$

$$= 5040$$

Hence, the answer is E.

3. Solution:

Topic: Data Analysis

Concept Tested: Sets and Venn Diagram

Type of Question: Problem Solving (PS)

Question: What percent of the people have a diploma.

Approach: Table Method and plugging in for starting value.

	Job of their choice	Don't have job of their choice	Total
Diploma			
No Diploma			
Total			

Let the total be 100.

Given that 10% of the people do not have a diploma but have the job of their choice

	Job of their choice	Don't have job of their choice	Total
Diploma			
No Diploma	10		
Total			100

Given that 25% of the people who do not have the job of their choice have a diploma

Let the number of people who do not have a job of their choice be x .

25% of x do not have diploma among them.

	Job of their choice	Don't have job of their choice	Total
Diploma		$0.25x$	
No Diploma	10		
Total		x	100

Given that If 40% of the people have the job of their choice

	Job of their choice	Don't have job of their choice	Total
Diploma		0.25x	
No Diploma	10		
Total	40	x	100

In the fourth row, $40+x=100$

$$x=60$$

In the second column, the ones who had both the job of their choice and diploma is $40-10=30$

	Job of their choice	Don't have job of their choice	Total
Diploma	30	$0.25x=15$	
No Diploma	10		
Total	40	$x(60)$	100

	Job of their choice	Don't have job of their choice	Total
Diploma	30	$0.25x=15$?
No Diploma	10		
Total	40	$x(60)$	100

In the second row the ones who have a diploma = $30+15=45$.

	Job of their choice	Don't have job of their choice	Total
Diploma	30	$0.25x=15$?(45)
No Diploma	10		
Total	40	$x(60)$	100

From the last column, it is evident that 45% of the people do not have a diploma.

Hence, the answer is B.

4. Solution:

Topic: Number Theory

Concept Tested: Factorization

Type of Question: Problem Solving (PS)

Given:

$$h = 1 \times 2 \times 3 \times 4 \times \dots \times 12 = 12!$$

a, b, c, d and e are positive integers such that $h = 2^a 3^b 5^c 7^d 11^e$

Question: What is the value of $a - b + c - d + e$?

Approach: We need to see how many 2s, 3s, 5s, 7s and 11s are there in 12!

Short Cut: Keep dividing 12 by the prime factor (ignoring the remainders) until you get a number less than the divisor (prime factor). Then add all the quotient to get number of repetitions of the divisor.

To get $a =$ Number of 2s:

2	12	Ignore this
2	6	Add these three
2	3	
	1	

So, $6+3+2=10 \Rightarrow$ Number of 2s = $a = 10$

To get $b =$ Number of 3s:

3	12	Ignore this
3	4	Add these two
	1	

So, $4+1=5 \Rightarrow$ Number of 3s = $b = 5$

Similarly, find out number of 5s, 7s and 11s.

$$\Rightarrow c = 2, d = 1 \text{ and } e = 1$$

Therefore,

$$a - b + c - d + e = 10 - 5 + 2 - 1 + 1 = 7$$

Hence, the answer is D.

5. Solution:

Topic: Arithmetic

Concept Tested: Speed, Distance and Time

Type of Question: Problem Solving(PS)

Given:

Total distance given = 3000 miles

Speed of Michel = 100 mph

Speed of Jimmy = 45mph

Michel started at 3pm.

Jimmy started an hour later, i.e. at 4pm.

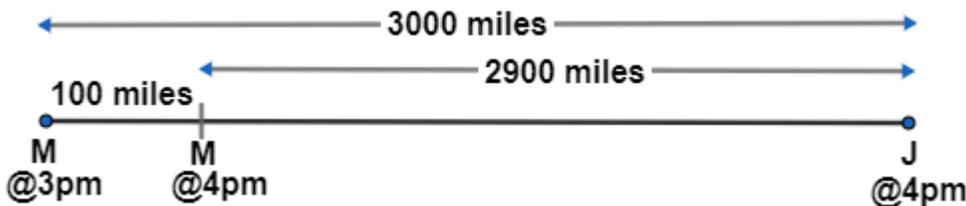
Both are travelling in opposite direction to meet at a point.

Question: At what will the two meet?

Approach: If two bodies are going in opposite direction, then add the speed to get the relative speed.

Note: It a good idea to draw the figure according to the scenario given to get more clarity.

Since, Jimmy started at 4pm, from 3pm to 4pm, the distance covered by Michel is calculated using $Distance = Speed \times Time = 100mph \times 1hour = 100miles$



Since, both are travelling in opposite direction to meet at some point, total distance to be covered is 2900 miles with a relative speed of $100 + 45 = 145mph$. (by adding the two speeds)

Then, time taken by both of them after 4pm is,

$$Time = \frac{Distance}{Speed} = \frac{2900}{145} = 20hours$$

That means, after 20hours they will meet.

$$\Rightarrow 4pm + 20hours = 12pm$$

Hence, the answer is A.

6. Solution:

Topic: Arithmetic

Concept Tested: Average and Percent

Type of Question: Problem Solving (PS)

Given: 30% of the employees in a factory are labourers and all the remaining employees are executives

The annual income of each labourer is \$400

The annual income of each executive is \$500

Question: What is the average annual income of all the employees in the factory together?

Approach: $Average = Total/Number\ of\ items$

Use plugging as the starting number is missing.

Let the total number of employees in a factory be 100.

Number of labourers = 30.

Number of executives = 70.

Then the total annual income of labourers = $30 \times 400 = 12000$

The total annual income of executives = $70 \times 500 = 35000$

Then, the total income from both labourers and executives = 47000

Average annual income of all the employees = $\frac{\text{total income}}{\text{total number of employees}} = \frac{47000}{100} = 470$

Hence, the answer is D.

7. Solution:**Topic: Arithmetic****Concept Tested: Percent****Type of Question: Problem Solving (PS)****Given:** Junior lawyer receives a commission of 10% of the cases that he has booked in a month.

The number of cases booked by the junior lawyer minus the junior's commission was \$25200.

Question: What is the commission received by the junior lawyer that month?**Approach:** Translation from English to Math

Let the number of cases be "x".

According to the statement,

$$x - 10\% \text{ of } x = 25200$$

solving for x,

$$x = 28000$$

Question is to find the commission received, which is 10% of 28000 = \$2800.

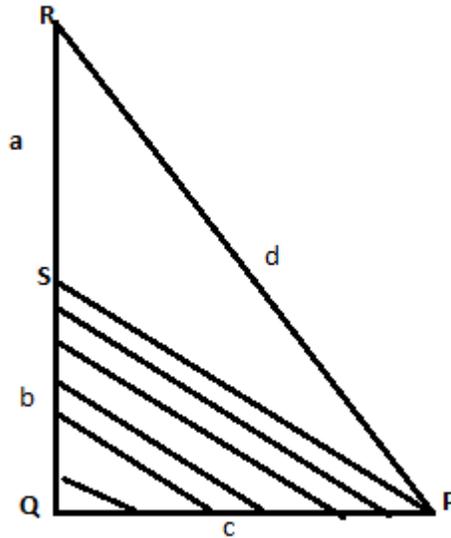
Hence, the answer is B.

8. Solution:

Topic: Triangles and circles

Concept Tested: Triangles

Type of Question: Problem Solving (PS)



Given: Triangle PQR shown above is a right angled triangle at Q.

The shaded area is one half the area of the triangle PQR.

Question: What is the length of the line segment PS?

Approach: Translation from English to Math and Using Pythagoras Theorem.

$$\text{Area of triangle PQR} = \frac{1}{2} \times c \times (a + b)$$

$$\text{Area of triangle PQS} = \frac{1}{2} \times c \times b$$

According to the statements,

$$\text{Area of triangle PQS} = 2 * \text{Area of triangle PQR.}$$

$$\frac{1}{2} \times c \times b = \frac{1}{2} \times \frac{1}{2} \times c \times (a + b)$$

Solving the above equation, we get $a=b$.

Length of PS can be calculated using Pythagoras theorem,

$$PS = \sqrt{c^2 + b^2}$$

This is not seen in the above choices,

$$\text{In triangle PQR, Length of PR} = d = \sqrt{c^2 + (a + b)^2}$$

We know that $a=b$,

$$d = \sqrt{c^2 + 4b^2}$$

$$d^2 = c^2 + 4b^2$$

$$c^2 = d^2 - 4b^2$$

$$PS = \sqrt{d^2 - 4b^2 + b^2}$$

$$PS = \sqrt{d^2 - 3b^2}$$

Hence, the answer is C.

9. Solution:**Topic: Algebra****Concept Tested: Patterns and Sequences****Type of Question: Problem Solving (PS)****Given:**

$$g(x) = -(-1/2^x)$$

let's write first few terms,

$$g(1) = -(-1/2^1) = 1/2$$

$$g(2) = -(-1/2^2) = 1/4$$

$$g(3) = -(-1/2^3) = 1/8$$

$$g(4) = -(-1/2^4) = 1/16$$

....

$$g(10) = -(-1/2^{10}) = 1/1024$$

Question:

Sum of the first 10 terms

Approach: Approximation.

We can clearly see that, none of the above terms are negative. So, sum of the first ten terms also won't be negative.

So, we can eliminate answer choices A and B.

Also, if we notice first term is $\frac{1}{2}$ and since all the other terms are positive sum will be more than $\frac{1}{2}$.**Hence, the answer is E.**

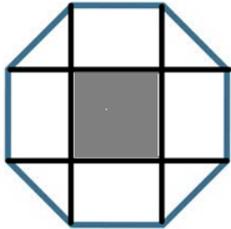
10. Solution:

Topic: Geometry

Concept Tested: Higher Polygons

Type of Question: Problem Solving (PS)

Given:



The above figure is a regular octagon.

Regular polygon means all sides and angles are equal.

So here, all the eight sides and eight angles are equal.

And each angle is 135 degrees.

Because,

Sum of interior angles of a polygon = $(n-2) * 180$

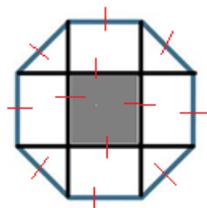
Sum of 8-sided polygon = 1080.

So, each angle is 135 degrees.

The shaded region is a square and it's area is 4 square units.

So, side of the square is 2 units.

Then each side of the octagon is also 2 units.



Question:

Area of the octagon?

Approach:

Using the smaller shapes, we can arrive at the area of the entire octagon.

There are 4 triangles (equal area) and 4 rectangles (equal area) and square in the entire octagon.

Area of each triangle = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times \sqrt{2} \times \sqrt{2} = 1$

So, Area of four triangles = 4.

Area of each rectangle = length \times breadth = $2 \times \sqrt{2} = 2\sqrt{2}$.

Area of four rectangles = $8\sqrt{2}$.

So, area of octagon = area of 4 triangles + area of 4 rectangles + square

$$= 4 + 8\sqrt{2} + 4.$$

$$= 8 + 8\sqrt{2}$$

Hence, the answer is D.

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