XAT 2025

Quant

1. There are 25 rooms in a hotel. Each room can accommodate at the most three people. For each room, the single occupancy charge is Rs. 2000 per day, the double occupancy charge is Rs. 3000 per day, and the triple occupancy charge is Rs. 3500 per day.
If there are 55 people staying in the hotel today, what is the maximum possible revenue from room occupancy charges today?

A Rs. 72500

B Rs. 82500

C Rs. 77500

D Rs. 92500

E Rs. 87500

2. The market value of beams, made of a rare metal, has a unique property: the market value of any such beam is proportional to the square of its length. Due to an accident, one such beam got broken into two pieces having lengths in the ratio 4:9. Considering each broken piece as a separate beam, how much gain or loss, with respect to the market value of the original beam before the accident, is incurred?

A 74.23% gain

B 42.60% loss

C 31.77% loss

D 57.40% loss

E No gain or loss

3. ABCD is a rectangle, where the coordinates of C and D are (- 2,0) and (2,0), respectively.

If the area of the rectangle is 24, which of the following is a possible equation representing the line $\overleftrightarrow{AB}$?

A 4x + 6y = 24

B None of the other options is correct.

C y = 6

D x = 6

E x + y =12

4. Adu and Amu have bought two pieces of land on the Moon from an e-store. Both the pieces of land have the same perimeters, but Adu's piece of land is in the shape of a square, while Amu's piece of land is in the shape of a circle.
The ratio of the areas of Adu's piece of land to Amu's piece of land is:

A $1:1$

B $\pi^2:4$

C $1:\pi$

D $\pi:4$

E $\pi:2$

5. Ramesh bought a mobile from a local store. He paid 1/6 of the price via UPI and 1/3 of the price via cash. He agreed to pay the balance amount a year later. While paying back the balance amount, Ramesh paid 10% interest on the balance amount.
If the interest paid was Rs. 6000, what was the original price of the mobile?

A Rs. 120000

B Rs. 110000

C Rs. 100000

D Rs. 90000

E Rs. 150000

6. A straight line L_1 has the equation $y = k(x-1)$, where k is some real number. The straight line L_1 intersects another straight line L_2 at the point (5, 8).
If L_2 has a slope of 1, which of the following is definitely FALSE?

A The distance between the y-intercepts of the two lines is 6

B The distance from the origin to one of the lines is $\frac{3}{\sqrt{2}}$

C The line L_1 passes through the point (1, 0)

D The distance between the x-intercepts of the two lines is 4

E The distance from the origin to one of the lines is $\frac{2}{\sqrt{5}}$

7. In a computer game, each move requires pressing a button. When the button is pressed for the first time, as a move, the computer randomly chooses a cell from a 4x4 grid of sixteen cells and puts an “X” mark on that cell. When the button is pressed subsequently, the computer randomly chooses a cell from the remaining unmarked cells and puts an “X” mark on that cell. This goes on till the end of the game. The game ends when either all the cells in any one row, or all the cells in any one column, are marked with “X”.
What is the maximum possible number of times a player has to press the button to finish the game?

A 16

B 10

C 6

D 13

E 4

8. If a, b, and c are all positive integers, with 4a > b, then which of the following conditions is BOTH NECESSARY AND SUFFICIENT for the expression $\sqrt[3]{(3)^a(21)^{(3a-b)}(49)^{(2b+c)}}$ to be a positive integer?

A a - b + 2c is divisible by 3

B None of the other conditions is both necessary and sufficient

C a, b, and c are divisible by 3

D a - b = c

E (a - b) and c are divisible by 3

9. A soild trophy, consisting of two parts, has been designed in the following manner: the bottom part is a frustum of a cone with the bottom radius 30 cm, the top radius 20 cm, and height 40 cm, while the top part is a hemisphere with radius 20 cm. Moreover, the flat surface of the hemisphere is the same as the top surface of the frustum.
If the entire trophy is to be gold-plated at the cost of Rs. 40 per square cm, what would the cost for gold-plating be closest to?

A Rs. 1,12,000

B Rs. 3,60,000

C Rs. 4,73,000

D Rs. 5,23,000

E Rs. 3,72,000

10. An industrial robot manufacturing company is tasked to design humanoid robots to be used in warehouses where the robots need to pick items from a stack of shelves. The height of the topmost shelf from the ground is 7 feet. To operate, the robot has to move on a track, running parallel to the stack of shelves. The track is fixed 1 foot away from the base of the stack of shelves. Further, the robot cannot raise its arms by more than 60° from the horizontal plane.
If the robot's arms are attached to its shoulder, what should be the minimum height of the robot from the ground to the shoulder for its arms to reach the topmost shelf?

A $\sqrt{3}$ feet

B 7 feet

C $7 - \sqrt{3}$ feet

D None of the other options is correct

E $6 + \sqrt{3}$ feet

11. There are five dustbins along a circular path at different places. Ramesh takes multiple rounds of the path every morning, always at the same speed. He noticed that it took him a different number of steps to walk between any two consecutive dustbins. Ramesh also noticed that starting from any of the dustbins, it took a minimum 800 steps to reach every second dustbin. On the other hand, starting from any of the dustbins, it

took a maximum 1260 steps to reach every third dustbin.
If Ramesh's one step is 0.77 metre, and the width of the path is negligible, which the following can be the radius of the circular path?

A 230 metres

B 240 metres

C 260 metres

D 250 metres

E 220 metres

12. For how many distinct real values of x does the equation below hold true? (Consider $a > 0$.)

$$\frac{x^2 \log_a(16)}{\log_a(32)} - \frac{\log_a(64)}{\log_a(32)} - x = 0$$

A 1

B Infinitely many

C 2

D 0

E Depends on the value of a

13. A farmer has a quadrilateral parcel of land with a perimeter of 700 feet. Two opposite angles of that parcel of land are right angles, while the remaining two are not. The farmer wants to do organic farming on that parcel of land. The cost of organic farming is Rs. 400 per square foot.
Consider the following two additional pieces of information:
I. The length of one of the sides of that parcel of land is 110 feet.
II. The distance between the two corner points where the non-perpendicular sides of that parcel of land intersect is 255 feet.
To determine the amount of money the farmer needs to spend to do organic farming on the entire parcel of land, which of the above additional pieces of information is/are MINIMALLY SUFFICIENT?

A II only

B I only

C I and II together only

D Either of I or II, by itself

E The amount cannot be determined even with the additional pieces of information.

14. Consider the quadratic function $f(x) = ax^2 + bx + a$ having two irrational roots, with a and b being two positive integers, such that $a, b \leq 9$.
If all such permissible pairs (a, b) are equally likely, what is the probability that a + b is greater than 9?

A $\frac{7}{16}$

B $\frac{5}{8}$

C None of the other answers is correct.

D $\frac{7}{15}$

E $\frac{2}{3}$

15. Eight employees of an organization have been rated on a scale of 1 to 50 for their performance. All ratings are integers. The overall average rating of the eight employees is 30. While the five employees with the highest ratings average 38, the three employees with the lowest ratings average 25.
Which of the following, about the ratings obtained by the eight employees, is DEFINITELY FALSE?

A The second highest rating obtained is 38.

B The median of the eight ratings is 37.5.

C The lowest rating obtained is 1.

D The highest rating obtained is 40.

E The third lowest rating obtained is 37.

16. Arun selected an integer x between 2 and 40, both inclusive. He noticed that the greatest common divisor of the selected integer x and any other integer between 2 and 40, both inclusive, is 1.
How many different choices for such an x are possible?

A 4

B 8

C 1

D 12

E 0

Instructions [17 - 19]

Read the following scenario and answer the THREE questions that follow.

Comprehension:
In an 8-week course, a professor administered a test at the end of each week. Each of the eight tests was scored out of 4 marks, and a student could only receive a non-negative integer score.
Two students, Ravi and Sumana, took the eight tests.
In the first test, Ravi and Sumana scored the same marks. From the second to eighth tests, Ravi scored the exact same non-zero marks. Sumana scored the same marks as Ravi from the fifth test onwards. Ravi's total marks in the first three tests was the same as Sumana's total marks in the first two tests. Also, Sumana's marks in the first test, total marks of the first two tests, and total marks of the eight tests are in a geometric progression.

17. Which of the following CAN be true?

A Ravi scored 4 marks in the third test

B Sumana scored 2 marks in the first test

C Ravi scored 0 marks in the fifth test

D Sumana scored 3 marks in the second test

E Sumana scored 4 marks in the eighth test

18. If Ravi scored 4 marks in the first test, how many marks did Sumana score in the third test?

A 3

B 0

C 1

D 4

E 2

19. If Ravi scored 1 mark in the second test, what is the maximum possible value of Sumana's total marks in all the eight tests together?

A 10

B 12

C 9

D Cannot be uniquely determined from the given information

E 8

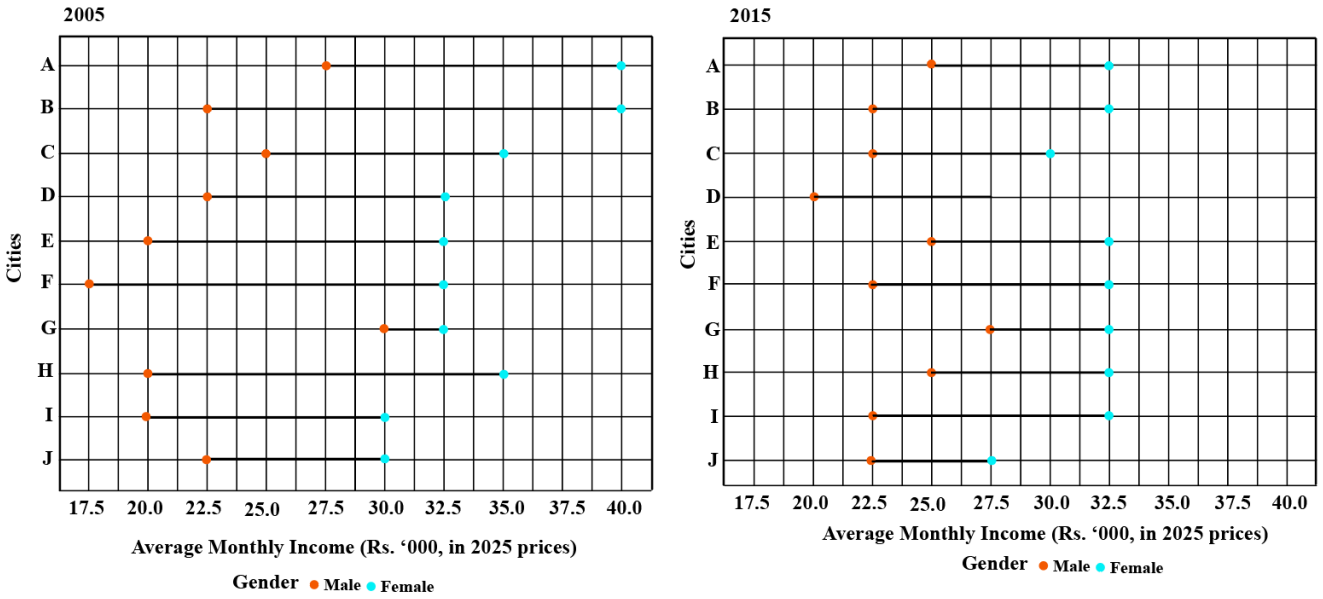
Instructions [20 - 22]

Read the following scenario and answer the THREE questions that follow.

Comprehension:

The plots below depict and compare the average monthly incomes (in Rs. '000) of males and females in ten cities of India in the years 2005 and 2015. The ten cities, marked A-J in the records, are of different population sizes. For a fair comparison, to adjust for inflation, incomes for both the periods are scaled to 2025 prices.

Each red dot represents the average monthly income of females in a particular city in a particular year, while each blue dot represents the average monthly income of males in a particular city in a particular year. The gender gap for a city, for a particular year, is defined as the absolute value of the average monthly income of males, minus the average monthly income of females, in that year.



20. In which city did the gender gap, in terms of 2025 prices, change the least, from 2005 to 2015, in terms of percentage?

A J

B I

C D

D E

E C

21. Which of the following statements, about the average monthly incomes of the 10 cities, as represented in the plots, is DEFINITELY FALSE?

A In terms of 2025 prices, the average gender gap of the 10 cities combined in 2015 was less compared to the average gender gap of the 10 cities combined in 2005.

B In terms of 2025 prices, the median monthly income of men of the 10 cities combined were higher than the median monthly income of women of the 10 cities combined, both in 2005 and 2015.

C In terms of 2025 prices, the average monthly income of men of the 10 cities combined was less than Rs. 30,000 in 2005.

D In terms of 2025 prices, in more than half of the 10 cities, average monthly incomes of men were more in 2005, compared to 2015.

E In terms of 2025 prices, the average monthly income of women of the 10 cities combined was less than Rs. 22,000 in 2015.

22. Rs.100 in 2025 is worth Rs. 60 in 2015 prices, and Rs. 25 in 2005 prices. Based on the given plots, which of the following statements, about the unscaled incomes, i.e., the incomes before scaling to 2025 prices, CANNOT be correct? (All statements refer to people represented in the given plots.)

A Average unscaled income for both genders increased in all 10 cities from 2005 to 2015

B Average unscaled income of women was about Rs. 15,000 in 2015 in City H

C Average unscaled income of men in City E increased by about 140% from 2005 to 2015

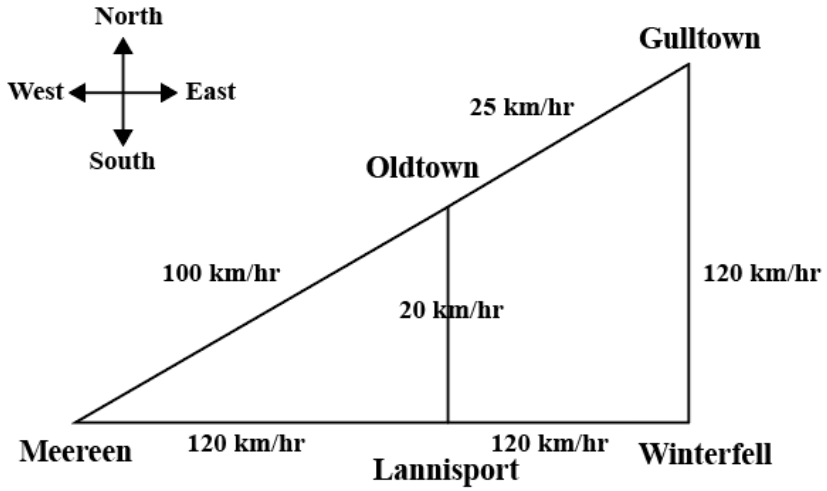
D Average unscaled income of women in City G increased by about 120% from 2005 to 2015

E The unscaled gender gaps reduced in all 10 cities from 2005 to 2015

Instructions [23 - 25]

Read the following scenario and answer the THREE questions that follow.

Comprehension:
The diagram below represents a road network connecting five towns, namely Meereen, Lannisport, Winterfell, Oldtown, and Gulltown. The maximum speed limits along any stretch of road are as shown in the diagram. The straight road that connects Meereen to Gulltown passes through Oldtown. Another straight road, running west to east, connecting Meereen to Winterfell, passes through Lannisport. Further, two straight roads, one from Lannisport to Oldtown and another from Winterfell to Gulltown, are perpendicular to the road joining Meereen to Winterfell, and run from south to north.



Consider a car always travelling at the maximum permissible speed, and always taking the shortest route. It takes 1 hour to reach Oldtown from Meereen, 2 hours to reach Gulltown from Oldtown, and 45 minutes to reach Winterfell from Gulltown. (For this problem, always consider the shortest route in terms of distance.)

23. Tyrion Lannister drove from Meereen to Oldtown, then from Oldtown to Lannisport, and finally from Lannisport to Winterfell, always taking the shortest paths. He always drove at a speed 10 km/hr below the maximum speed limits for the stretches he took.
What was his total driving time closest to?

A 3 hrs 19 mins

B 4 hrs 20 mins

C 7 hrs 28 mins

D 6 hrs 42 mins

E 7 hrs 50 mins

24. Missandei starts from Gulltown towards Oldtown by the shortest path, driving at the maximum permissible speed. From Oldtown, she drives at a speed of 10 km/hr towards Lannisport. When Missandei starts from Gulltown, Varys starts at the same time from Lannisport to Oldtown along the shortest path, always driving at the maximum permissible speed.
If they don't stop anywhere, at what point will they meet?

A Approximately 13.33 km south of Oldtown.

B Approximately 54.33 km north of Lannisport.

C Approximately 57.33 km north of Lannisport.

D Approximately 6.67 km south of Oldtown.

E Cannot be uniquely determined from the given information.

25. The capital city, King's Landing, located 40 km to the south of Gulltown on the road connecting Gulltown to Winterfell, did not have a straight road, connecting to Meereen. Now, a new expressway is being built to connect these two towns by a straight road.

What should be the maximum speed limit allowed on this expressway so that it cuts down the travel time, from Meeren to King's Landing, from the fastest possible route through the road network shown in the diagram, by 20 minutes?

A 100 km/hr

B 130 km/hr

C 139 km/hr

D 120 km/hr

E 157 km/hr

Instructions [26 - 28]

Read the following scenario and answer the THREE questions that follow.

Comprehension:
GadRev is a firm that reviews different latest gadgets through a team of four reviewers (R1, R2, R3, and R4). Recently the reviewers reviewed four different tech gadgets (A, B, C, and D) on a scale of 1 to 5 (all integer values) where 1 denotes poor and 5 denotes excellent. These review ratings were then tabulated. However, due to a technical glitch, some of these ratings got deleted. The average rating given by each reviewer, and the average rating given to each gadget were earlier communicated to the team management in a separate email and hence can be useful to retrieve the deleted ratings. The available ratings along with the average ratings are represented in the following table:

	A	B	C	D	Average
R1		4		3	4
R2	3		4		4
R3				5	4
R4		4	5		4.25
Average	4	4	4	4.25	

26. What rating provided by Reviewer R1 to Gadget A can help determining the remaining ratings uniquely?

A 1

B 4

C 2

D 5

E 3

27. In how many different ways could Reviewer R2 have rated Gadget B so that the ratings lead to the same averages for the gadgets and the reviewers as shown in the table?

A 1

B 5

C 2

D 4

E 3

28. How many different valid combinations of the missing ratings are possible?

A 4

B 1

C 5

D 2

E 3

Answers

1.**C**	2.**B**	3.**C**	4.**D**	5.**A**	6.**A**	7.**D**	8.**E**
9.**C**	10.**C**	11.**D**	12.**E**	13.**C**	14.**D**	15.**D**	16.**A**
17.**B**	18.**B**	19.**C**	20.**B**	21.**C**	22.**E**	23.**C**	24.**D**
25.**D**	26.**B**	27.**C**	28.**E**				

Explanations

1. **C**

So, there are 25 rooms in total and 55 people need to be occupied in the these 25 rooms. We need to maximize the revenue.

The cost of a single, double and triple occupancy room is Rs. 2,000, Rs. 3,000 and Rs. 3,500 respectively.

Now, if we look at the per person cost from a single, double and triple occupancy room, it will be Rs. 2,000, Rs. 1,500 and Rs. 1,166.67

Now, we clearly see that the per person cost is maximum for single occupancy room but we know that there are only 25 rooms which are not sufficient. Hence, we will aim to adjust all the 55 people to the maximum possible single occupancy then double occupancy and then triple occupancy room.

Let the number of single, double and triple occupancy rooms used are x, y and z respectively.

We know $x + y + z = 25$ as the total number of rooms are 25.

Further, $x + 2y + 3z = 55$ I.e. total number of people.

If z = 1, y = 28 which is not possible as the number of rooms are limited to 25.

If z = 2, y = 26 which is again not possible.

If z = 3, y = 24 which is again not possible.

If z = 4, y = 22 which is again not possible.

If z = 5, y = 20 which is possible.

Hence, to maximize the revenue, we have to use 20 room of double occupancy and 5 rooms of triple occupancy.

Hence, the total revenue will be $20 \times 3,000 \ + 5 \times 3.500 = 77,500$

2. **B**

Given that the beam got broken into two pieces, with length in a ratio of 4 : 9.

Let the lengths of the new beams be $4x$ and $9x$ respectively.

So, the length of the original beam is $13x$.

Now, given the value is proportional to the square of its length.

Value of the original beam = $k\left(13x\right)^2 = 169kx^2$, where k is the constant of proportionality.

The value of new beams is $k\left(4x\right)^2 + k\left(9x\right)^2 = 16kx^2 + 81kx^2 = 97kx^2$

Hence, the gain/loss with respect to the original beam is $169kx^2 - 97kx^2 = 72kx^2$

In percentage terms, Loss % = $\frac{72kx^2}{169kx^2} \times 100 = 42.60\%$

Hence, the answer is 42.60% loss

3. **C**

CD is on of the side of the rectangle. So, two of the remaining 3 sides will be perpendicular to CD.

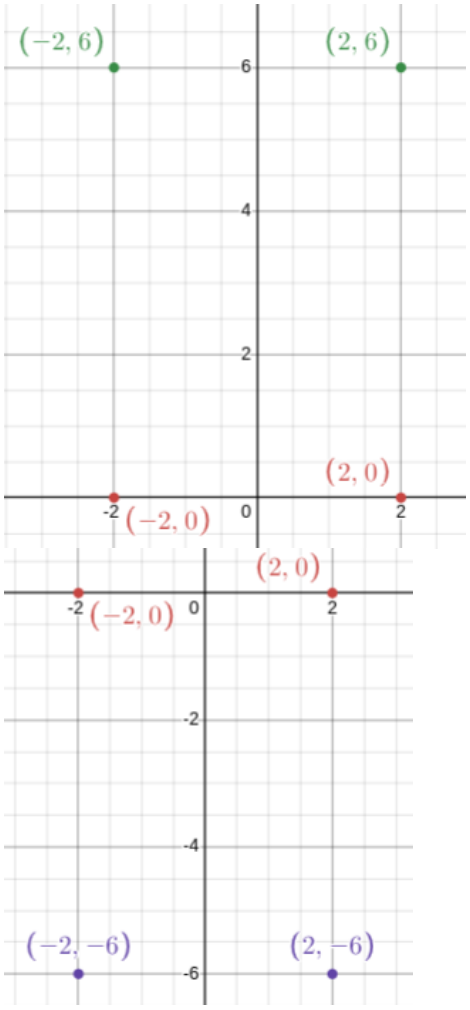
Length of CD is 4. We are told that area is 24.

We know area of rectangle is lb. 4*l = 24

l = 6

So, the other two points should be such that when jined with C and D respectively, should be perpendicular to CD and lie at a distance of 6.

There will be two pair of such points. One pair is (-2,6), (2,6) and the other pair is (-2,-6), (2,-6)



So, there are two possible equations of AB. One is y = 6 and the other is y = -6.

4. **D**

It is given that the perimeters of areas are equal for both of them. Let the equal perimeter be P.

Adu's piece is a square, and the perimeter of the square = 4s = P

Side of the square $s = \frac{P}{4}$

Amu's piece is a circle, and the perimeter of the circle $2\pi r = P$

The radius of the circle $r = \frac{P}{2\pi}$

The ratio of areas is,

$$s^2 : \pi r^2 = \left(\frac{P}{4}\right)^2 : \pi \left(\frac{P}{2\pi}\right)^2 = \frac{P^2}{16} : \pi \times \frac{P^2}{4\pi^2} = \frac{1}{4} : \frac{1}{\pi} = \pi : 4$$

Hence, the correct answer is option D.

5. **A**

Let the total price of the mobile phone is Rs $60X$.

Ramesh paid 1/6 of the price via UPI i.e $60X \times \frac{1}{6} = 10X$

Further, he paid 1/3 of the price via cash i.e $60X \times \frac{1}{3} = 20X$

Remaining amount to be paid by Ramesh $= 60X - 10X - 20X = 30X$

Further, 10% interest charged on the balance amount = Rs. 6,000

Or, we can say, 10% of $30X = 6,000$

i.e. $3X = 6,000$

Or, $X = 2,000$

Since the total price of the mobile phone was 60X, the actual cost is $60 \times \ 2,000 \ = \ Rs. \ 1,20,000$

6. **A**

Given that the equation of line L_1 is $y = k(x - 1)$ and it intersects line L_2 at (5, 8).

So, the point (5, 8) must satisfy the equation of line L_1

We get $8 = k\,(5 - 1)$

or $k = 2$

Hence, the equation of line L_1 is $y = 2(x - 1) \ldots$ (1)

Now, L_2 has a slope of 1

Using slope form, the equation of line is $y = mx + c$, where m is the slope and c is the y-intercept

So, the equation of line L_2 is $y = x + c$

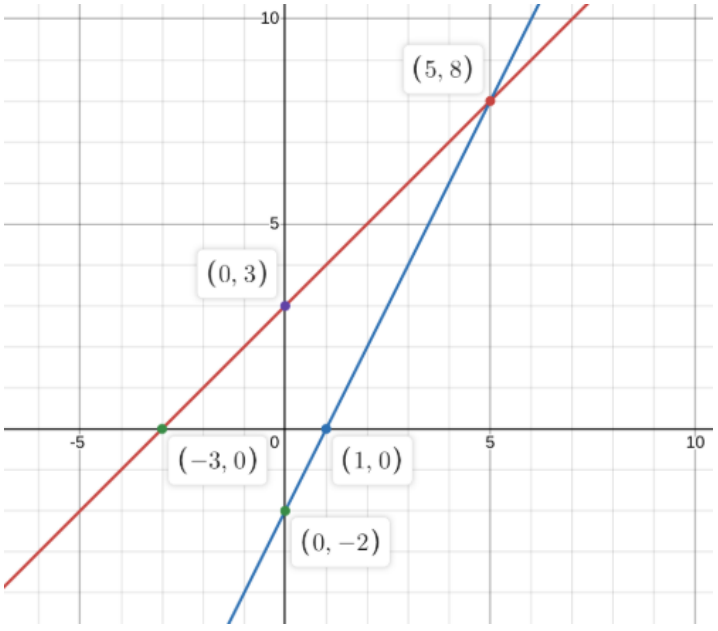
Now, as it passes through the point (5, 8), the equation must satisfy

Hence, $8 = 5 + c$

or, $c = 3$

Hence, the equation of line L_2 is $y = x + 3 \ldots$ (2)

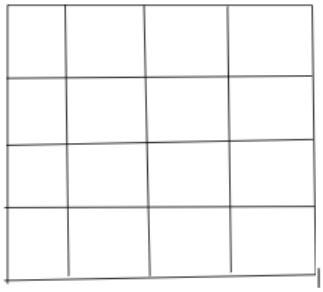
Plotting both lines on the graph, we get



From the graph we can clearly see that the distance between the y-intercepts of the two lines is 5 not 6.

Hence, the statement the distance between the y-intercepts of the two lines is 6 is definitely false.

7. **D**



In a 4*4 gird, If all 4 diagonal cells are ingored and the remaining cells are marked, no row or column will be filled. So, we can mark 12 cells without finishing the game. When we mark the 13th one, the game gets finished.

8. **E**

The given expression is, $\sqrt[3]{(3)^a(21)^{(3a-b)}(49)^{(2b+c)}}$ and it can also be written as,

$\sqrt[3]{(3)^a\ (3)^{3a-b}\ \ (7)^{3a-b}\ (7)^{4b+2c}} = \sqrt[3]{(3)^{4a-b}\ \ (7)^{3a+3b+2c}}$

For the above expression to be a positive integer, the power of the expression must be an integer after applying the cube root for the expression inside. This means that the power of the expression inside must be a multiple of 3.

The expression is,

$\sqrt[3]{(3)^{4a-b}\ \ (7)^{3a+3b+2c}} = 3^{\frac{(4a-b)}{3}} \times 7^{\frac{(3a+3b+2c)}{3}}$

The value $\frac{4a-b}{3} = \frac{3a+a-b}{3} = a + \frac{a-b}{3}$ must be an integer which means that a - b must be a multiple of 3.

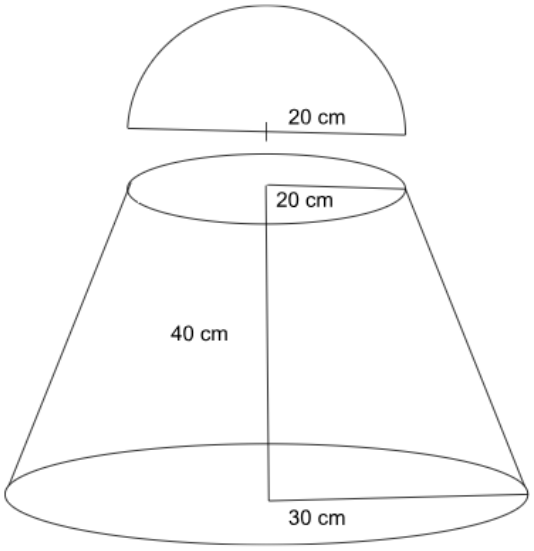
Similarly, the value $\frac{3a+3b+2c}{3} = a + b + \frac{2c}{3}$ must also be an integer which gives us the condition that c must be a multiple of 3.

So, the necessary and sufficient conditions are a - b and c must be a multiple of 3.

Hence, the correct answer is option E.

9. **C**

According to the question, we have the following figure:



According to the question, we have a frustrum and a semisphere with flat surface and we need to find the curved surface area of the frustrum along with the curved surface area of the hemisphere and the bottom flat area of the frustrum.

Curved surface area of the Frustrum = $\pi \times (r_1 + r_2) \times l$

Here, r1 and r2 refers to the two different radii and l refers to the slant height.

$l = \sqrt{h^2 + (r_1 - r_2)^2}$

$l = \sqrt{1600 + 100} = \sqrt{1700} = 10\sqrt{17}$

Hence, curved surface area of the frustrum $= \pi \times (20 + 30) \times 10\sqrt{17}$

$\pi \times 50 \times 10\sqrt{17}$

$500\sqrt{17}\pi$

Now, curved surface area of the hemisphere $= 2\pi r^2 = 2 \times \pi \times (20)^2 = 800\pi$

And the flat bottom area of the frustrum $= \pi r^2 = \pi \times (30)^2 = 900\pi$

Hence, the total surface area of the trophy $= 500\sqrt{17}\pi + 800\pi + 900\pi = 500\sqrt{17}\pi + 1700\pi$

The cost of gold coating is Rs. 40 per square cm

Hence, the total cost of coating $= 40 \times \left(500\sqrt{17}\pi + 1700\pi\right)$

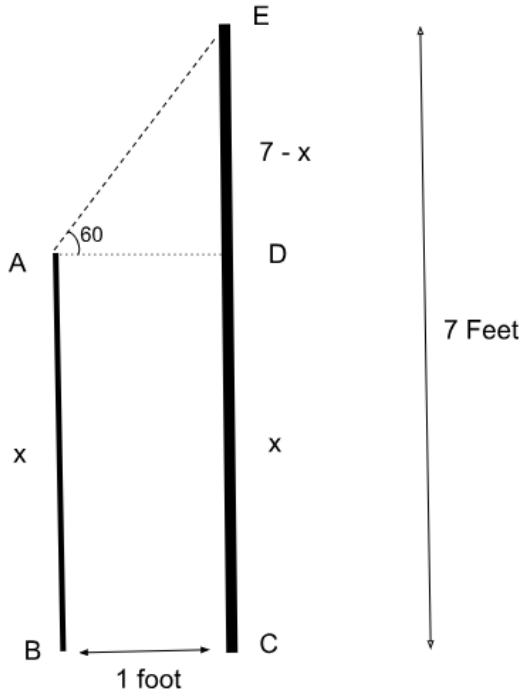
$40 \times \frac{22}{7} \times \left(500\sqrt{17} + 1700\right)$

$40 \times \frac{22}{7} \times \left(2061.55 + 1700\right)$

$40 \times \frac{22}{7} \times 3761.55 = Rs.\ 4,72,880.571 \approx Rs.\ 4,73,000$

10. **C**

According to the question, we can draw the following table:



Here, EC refers to the shelf which is 7 feet and AB refers to the height of the robot. Here, AE reflects the hand of the robot. Since we need to find the minimum possible height, we need to maximize the length of the hands of the robot. The hands of the robot can be tilted to the maximum angle of 60, hence, we will assume that the hands of the robot tilt to exactly 60°.

Let the height of the robot i.e. AB be x feet.

Now, we need to find the value of x.

Since, BC = 1 foot, AD is also 1 foot.

In triangle ADE, $\tan\ 60^\circ = \frac{ED}{AD}$

$\tan\ 60^\circ\ = \frac{7-x}{1}$

$\sqrt{3} = \frac{7-x}{1}$

$x = 7 - \sqrt{3}$

11. **D**

Let's assume that all the dustbins are at equal distances and the distance between two dustbin's be l.

We are told that a minimum 800 steps to reach every second dustbin.

800$\leq$2l $\Rightarrow$ 400 $\leq$ l

Similarly, we are also told that a maximum 1260 steps to reach every third dustbin.

So, 3l$\leq$1260

400$\leq$l$\leq$420

The circumference will be 5l.

2000$\leq$ 5l $\leq$ 2100

2000 and 2100 are both in steps of Ramesh.

We are told that each of his step is 0.77m.

So, 2000 steps = 2000*0.77= 1540m

2100 steps = 2100*0.77 = 1617

So, the circumference will lie between 1540 and 1617.

1540 $\leq 2\pi r\ \leq$ 1617.

$\frac{1540}{2\pi} \leq r \leq \frac{1617}{2\pi}$

$245.22 \leq r \leq\ 257.48$

So, 250m is the correct option.

12. **E**

In the given equation $\frac{x^2 \log_a(16)}{\log_a(32)} - \frac{\log_a(64)}{\log_a(32)} - x = 0$

We know the property of log that $\frac{\log_a b}{\log_a c} = \log_c b$

So, $\frac{\log_a 16}{\log_a 32} = \log_{32} 16 = \log_{2^5} 2^4 = \frac{4}{5}$

Similarly, $\frac{\log_a 64}{\log_a 32} = \log_{32} 64 = \log_{2^5} 2^6 = \frac{6}{5}$

Hence, the equation can be written as

$\frac{4}{5}x^2 - \frac{6}{5} - x = 0$

or, $4x^2 - 6 - 5x = 0$

Evaluating the discriminant we get

$D = b^2 - 4ac = (-5)^2 - 4\,(4)\,(-6)$

or, $D = 121 > 0$

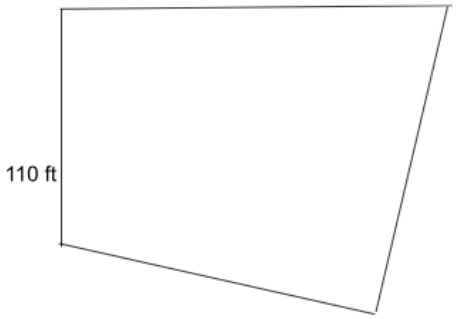
Hence, the equation has two distinct real roots.

But as the question mentions $a > 0$, so it can take the value $a = 1$, for which the log term will not be defined, hence there will be no defined solution.

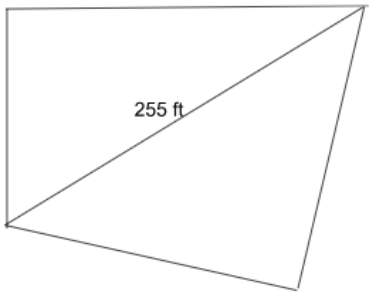
Hence, the answer is Depends on the value of a

13. **C**

Considering statement 1: We can only get one of the sides lenght of the land. But that is not sufficient to get the area.



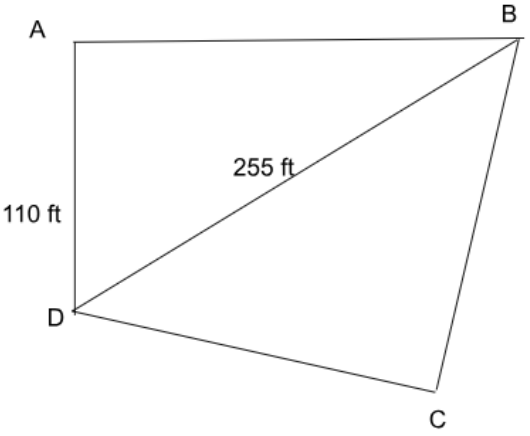
Considering statement 2:



We are given the diagonal length.

With this information and the perimeter it is not possible to find the area of land.

Considering both 1 and 2 statements.



Now we have two right angle triangles. We know the hypotenues of both the triangles.

$AB^2 + AD^2 = BD^2$

$110^2 + AB^2 = 255^2$

AB$\approx$ 230

Let DC = x, BC = 700 - 110-230-x = 360-x.

$x^2 + (360 - x)^2 = 255^2$

Upon solving this we get x = 180$\pm \frac{15}{\sqrt{2}}$

360-x = 180$\pm \frac{15}{\sqrt{2}}$

Area of triangle ABD = $\frac{1}{2} \cdot 110 \cdot 230 = 12650$

Area of triangle BDC = $\frac{1}{2}\left(180 + \frac{15}{\sqrt{2}}\right)\left(180 - \frac{15}{\sqrt{2}}\right) = 16143.75$

So, total area = 12650+16143.75 = 28793.75

Cost = 28793.75*400 = Rs. 11517500.

So, option C is the answer.

14.**D**

For the roots to be irrational, the value of D > 0 and D must not be a perfect square.

The value of D for the equation given is $= b^2 - 4 \times a \times a = b^2 - 4a^2$

The pairs (a. b) that satisfy the above conditions are,

b = 1 no value of a exists

b = 2 no value of a exists

b = 3, a = 1

b = 4, a = 1

b = 5, a = 1

b = 6, a = 1, 2

b = 7, a = 1, 2, 3

b = 8, a = 1, 2, 3

b = 9, a = 1, 2, 3, 4

There are a total of 15 pairs of (a, b) that satisfy the above condition and out of them, the value of a + b is greater than 9 for 7 of them.

So, the probability that a + b is greater than 9 is given by $\frac{7}{15}$.

Hence, the correct answer is option D.

15.**D**

It is given that the average of the first five highest-rated employees is 38. So, the sum of the ratings of the top 5 highest-rated employees is 38 * 5 = 190.

It is given that the average of the first five lowest-rated employees is 25. So, the sum of the ratings of the top 5 lowest-rated employees is 25 * 5 = 125.

The overall average rating of all the employees is given as 30. So, the sum of the ratings of all the employees is given as 30 * 8 = 240.

The sum of the 3 highest rated employees' ratings can be obtained by subtracting the sum of the 5 lowest rated players' ratings from the overall rating, which is 240 - 125 = 115.

The sum of the 3 lowest rated employees' ratings can be obtained by subtracting the sum of the 5 highest rated players' ratings from the overall rating, which is 240 - 190 = 50.

So, the sum of the 4th and 5th highest-rated employees is 190 - 115 = 75.

Now let us look at the options to eliminate the wrong option,

Option A)

It is given that the second-highest rating is 38. It is not an incorrect option because there is a possible case of the second highest being 38 and satisfying all the above conditions. The first 5, in that case, can be 39, 38, 38, 38, 37, which satisfies the above conditions.

Option B)

Same as the above case, we can have the 4th and 5th ratings to be 38 and 37, and in that case, the median of the ratings of the employees becomes $\frac{37 + 38}{2} = 37.5$. So, this is not an incorrect option.

Option C)

We know that the sum of the lowest three ratings is 50, and in that case, there are possibilities of the lowest rating being 1 and the sum of the three is 50. For example, 37, 12, 1 is one of the cases. Hence, this is not an incorrect option.

Option D)

The highest rating cannot be 40 because if it is 40, then the sum of the 2nd and 3rd becomes 75. In that case, the 3rd rated person's rating has to be less than or equal to 37, and we know that the 4th person's rating must be greater than or equal to 38. So, if the third person rating is 37 or less, then there is no possibility as the 4th person rating must be less than 3rd person rating. So, option D is incorrect.

Option E)

As explained in option C, the set of the last three rated employees can be 37, 12 and 1, and in this case, we can see that the third lowest player's rating is 37. So, E is not an incorrect option.

Hence, the correct answer is option D.

16. **A**

We know that if the greatest common divisor of two numbers is 1, they are co-prime to each other.

Given that the greatest common divisor of the selected integer x and any other integer between 2 and 40, both inclusive, is 1.

So, the selected number has to be a prime number, and that too greater than $\frac{40}{2}$ or 20 because prime numbers less than 20, like 17, will have the greatest common divisor = 17 with their multiple, like 34 which is also in the range of selected integers.

Hence, the only possible values of x are 23, 29, 31 and 37 i.e. a total of 4 values.

Explanation [17 - 19]:

According to the set, there are 8 tests and each test can have a maximum of 4 marks so any student can get a maximum of 32 marks.

Now, the number of marks received by any student in a test can be 0/1/2/3/4.

We are given information about two students, Ravi and Sumana.

In the first test, they both scored the same marks. Let the marks scored by both is x.

Further, from the second to eighth tests, Ravi scored the exact same non-zero marks. Let the marks scored by Ravi from second to eighth test is y where y can be 1/2/3/4. Also, Sumana scored the same marks as Ravi from the fifth test onwards.

With this, we get the following table:

Tests	Ravi	Sumana
Test 1	x	x
Test 2	y	
Test 3	y	
Test 4	y	
Test 5	y	y
Test 6	y	y
Test 7	y	y
Test 8	y	y

Ravi's total marks in the first three tests was the same as Sumana's total marks in the first two tests.

Let the marks of Sumana in the second test be z.

We are given that, $x + 2y = x + z$

Therefore, we can say, z = 2y.

We don't have any other information about their marks in specific tests so let the marks of Sumana in test 3 and test 4 be a and b respectively.

With this, we have:

Tests	Ravi	Sumana
Test 1	x	x
Test 2	y	2y
Test 3	y	a
Test 4	y	b
Test 5	y	y
Test 6	y	y
Test 7	y	y
Test 8	y	y

At last, we are given that Sumana's marks in the first test, total marks of the first two tests, and total marks of the eight tests are in a geometric progression.

i.e. x, (x + 2y) and (x + a + b + 6y) are in a geometric progression.

With this, we can infer that x can't be 0 as if x is 0, any number multiplied with it will be 0 and (x+2y) and (x + a + b + 6y) can't be in a geometric progression.

Hence, x can be 1 / 2 / 3 / 4.

Let's try to make all possible geometric progression with this information:

1. (1, 3, 9) when x = 1, y = 1 and a + b = 2

2. (2, 4, 8) when x = 2, y = 1 and a + b = 0

3. (2, 6, 8) when x = 2, y = 2 and a + b = 4

4. (4, 8, 16) when x = 4, y = 2 and a + b = 0

17. **B**

In the question, we need to answer which of the mentioned statements can be true:

A: Ravi scored 4 marks in the third test

y can't be 4 in any of the possible case. Hence, the statement **can't be true.**

B: Sumana scored 2 marks in the first test

Sumana scored x marks in the first test and x can be 2. Hence, this **can be true.**

C: Ravi scored 0 marks in the fifth test

y can't be 0 as we discussed above. Hence, this statement **can't be true.**

D: Sumana scored 3 marks in the second test

Sumana scored 2y in the second test and if 2y = 3, y will be a non integer number which is **not possible.**

E: Sumana scored 4 marks in the eighth test

y can't be 4 in any of the possible case. Hence, this **can't be true.**

18. **B**

p>According to the question, if Ravi scored 4 marks in the first test i.e. if x = 4, the possible case is case 4,

Hence, sumana scored a marks in the third test and we know that in case 4, a + b = 0. Hence, both a and b are 0.

19. **C**

p>If Ravi scored 1 mark in the second test i.e. y = 1, it can be either case 1 and case 2.

The total marks scored by Sumana across the tests according to case 1:

x + a + b + 6y = 1 + 2 + 6 = 9

The total marks scored by Sumana across the tests according to case 2:

x + a + b + 6y = 2 + 0 + 6 = 8

Hence, the maximum possible marks that can be scored by Sumana is 9.

20. **B**

2005			
	Female	*Male*	GAP
A	40	27.5	12.5
B	40	22.5	17.5
C	35	25	10
D	32.5	22.5	10
E	32.5	20	12.5
F	32.5	17.5	15
G	32.5	30	2.5
H	35	20	15
I	30	20	10
J	30	22.5	7.5

2015			
	Female	*Male*	GAP
A	32.5	25	7.5
B	32.5	22.5	10
C	30	22.5	7.5
D	27.5	20	7.5
E	32.5	25	7.5
F	32.5	22.5	10
G	32.5	27.5	5
H	32.5	25	7.5
I	32.5	22.5	10
J	27.5	22.5	5

Difference between the gap in 2015 and 2005 is least in I. That is 0.

Hence I is the answer.

21. **C**

2005			
	Female	*Male*	GAP
A	40	27.5	12.5
B	40	22.5	17.5
C	35	25	10
D	32.5	22.5	10
E	32.5	20	12.5
F	32.5	17.5	15
G	32.5	30	2.5
H	35	20	15
I	30	20	10
J	30	22.5	7.5

2015			
	Female	*Male*	GAP
A	32.5	25	7.5
B	32.5	22.5	10
C	30	22.5	7.5
D	27.5	20	7.5
E	32.5	25	7.5
F	32.5	22.5	10
G	32.5	27.5	5
H	32.5	25	7.5
I	32.5	22.5	10
J	27.5	22.5	5

Option A: average gender gap of the 10 cities in 2005 = 11.25.

average gender gap of the 10 cities in 2015 = 7.75. Average in 2015 is less when compared to 2005.

Option B: Median of men's income in 2005 = 32.5

Median of women's income in 2005 = 22.5

Median of men's income in 2015 = 32.5

Median of women's income in 2015 = 22.5

Median of men's income is higher than median of women's income in both the years.

Option C: The average men's income in all 10 cities in 2005 is more than or equal to 30,000. So, there is not way a for the average to be less than Rs. 30,000.

So, option C is false.

Option D: We can clearly see that average montly income of men in 2005 in many cities is more than that in 2015.

Option E: There are some cities where the average income for women is less than Rs. 22,000.

Since the poopulation can be more in those cities, we can't say if the average income of women is less than Rs. 22,000. So, there is a case for this statement to be true.

22.**E**

We are told that Rs.100 in 2025 is worth Rs. 60 in 2015 prices, and Rs. 25 in 2005 prices

Option A: Average unscaled income for both genders increased in all 10 cities from 2005 to 2015

This is true. The average unscaled income of both male and female for all the 10 cities will be more in 2015 than 2005. Why? The unscaled income in 2005 is $\frac{1}{4}$th of value given in the graph. While in 2015 it is $\frac{3}{5}$th of value given in the graph. For allmost all the points the values in 2015 is more than that in 2005. And for those values that are lesser in 2015 than 2005, when the values when scaled as stated in the question, the value in 2015 will be more than 2005 as they don't have that much margin.

Option B: Average unscaled income of women was about Rs. 15,000 in 2015 in City H

The least value of average income of women in 2015 accross all cities is 27.5.

Its unscaled value = $\frac{27.5*60}{100}$ = 16.5. This is more than 15,000. So, this option is correct.

Option C: Average unscaled income of men in City E increased by about 140% from 2005 to 2015

Average income of men in City E in 2005 = 20,000

Its unscaled value will be$20000 \cdot \frac{25}{100}$ = 5,000

Average income of men in City E in 2015 = 25,000

Its unscaled value will be$25000 \cdot \frac{60}{100}$ = 12,000

$\frac{(12000-5000)}{5000} = 1.4$

So, option C is also correct.

Option D: Average unscaled income of women in City G increased by about 120% from 2005 to 2015

Average income of women in City G in 2005 = 32,500

Its unscaled value will be$32500 \cdot \frac{25}{100}$ = 8,125

Average income of women in City G in 2015 = 32,500

Its unscaled value will be$32500 \cdot \frac{60}{100}$ = 19,500

$\frac{(19500-8125)}{8125} = 1.2$

So, this is also a correct option.

Option E:

	2005		2015	
	GAP	Unscaled GAP	GAP	Unscaled GAP
A	12.5	3.125	7.5	4.5
B	17.5	4.375	10	6
C	10	2.5	7.5	4.5
D	10	2.5	7.5	4.5
E	12.5	3.125	7.5	4.5
F	15	3.75	10	0.6
G	2.5	0.625	5	3
H	15	3.75	7.5	4.5
I	10	2.5	10	6
J	7.5	1.875	5	3

Unscaled gap for city G in 2005 is more than in 2015.

So, this is an incorrect statement.

23.**C**

We are told that a car always travelling at the maximum permissible speed, and always taking the shortest route takes 1 hour to reach Oldtown from Meereen, 2 hours to reach Gulltown from Oldtown, and 45 minutes to reach Winterfell from Gulltown.

So, distance between Oldtown and Meereen is 100*1 = 100km

Distance between Gulltown and Oldtown is 25*2 = 50km.

Distance between Winterfell and Gulltown. is 120*3/4 = 90km.

Let the distance between Meereen and Winterfall be x.

Using the pythagoras theorem,$(100 + 50)^2 = 90^2 + x^2$

x = 120 km

For convience, we are refering the vertices as the starting letters of towns.

Using the similar triangle rule, MOL is similar to MGW.

So, $\frac{MO}{ML} = \frac{MG}{MW}$

$\frac{100}{ML} = \frac{150}{120}$

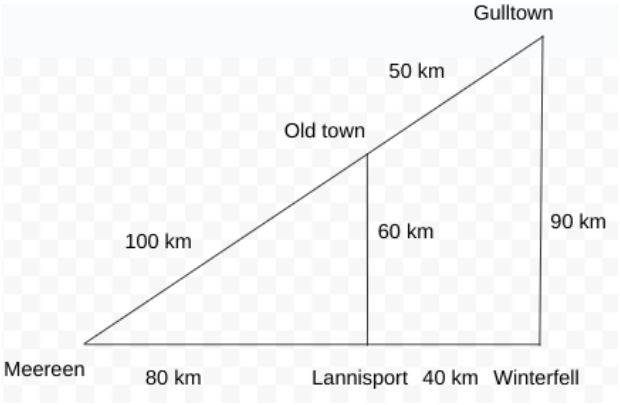
ML = 80 km.

LW = 40 km.

$\frac{MO}{LO} = \frac{MG}{WG}$

$\frac{100}{LO} = \frac{150}{90}$

LO = 60 km



The path Tyrion Lannister took is MO, OL, LW.

Distances of these path are 100, 60, 40. The respective speeds are 90, 10, 110.

So, the total time taken will be$\frac{100}{90} + \frac{60}{10} + \frac{40}{110} = 1.11 + 6 + 0.36 = 7.47$

0.47 of an hour is 28 mins.

So, answer will be 7 hr 28 mins

24.**D**

We are told that a car always travelling at the maximum permissible speed, and always taking the shortest route takes 1 hour to reach Oldtown from Meereen, 2 hours to reach Gulltown from Oldtown, and 45 minutes to reach Winterfell from Gulltown.

So, distance between Oldtown and Meereen is 100*1 = 100km

Distance between Gulltown and Oldtown is 25*2 = 50km.

Distance between Winterfell and Gulltown. is 120*3/4 = 90km.

Let the distance between Meereen and Winterfall be x.

Using the pythagoras theorem,$(100 + 50)^2 = 90^2 + x^2$

x = 120 km

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ML = 80 km.

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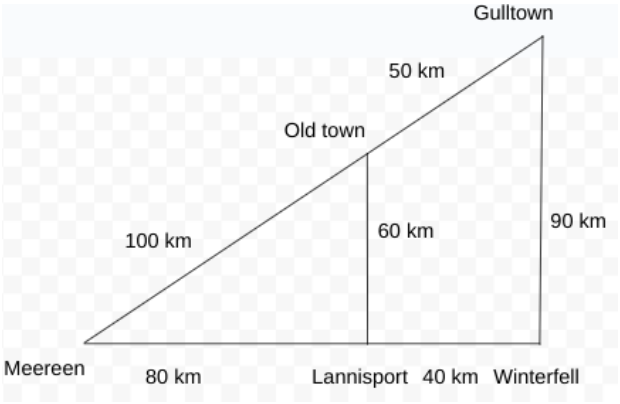
$\frac{100}{LO} = \frac{150}{90}$

LO = 60 km



Path taken by Missandei is GO, OL at a speed of 25 kmph and 10 kmph. Path taken by Varys is LO at a speed of 20 kmph.

Missandei reaches O 2hrs after he start. In the mean time, Varys travells 20 * 2 = 40km.

Now, both are travelling in opposite direction and 20 km far.

The speed of Varys is 20 and that of Missandei is 10 km.

The time taken for them to meet is 20/30 = 2/3 hr.

In 2/3 hr, travels Missandei 6.67 km and Varys travels 13.33 km.

So, they will meet at 6.67 km south of Oldtown.

25.**D**

We are told that a car always travelling at the maximum permissible speed, and always taking the shortest route takes 1 hour to reach Oldtown from Meereen, 2 hours to reach Gulltown from Oldtown, and 45 minutes to reach Winterfell from Gulltown.

So, distance between Oldtown and Meereen is 100*1 = 100km

Distance between Gulltown and Oldtown is 25*2 = 50km.

Distance between Winterfell and Gulltown. is 120*3/4 = 90km.

Let the distance between Meereen and Winterfall be x.

Using the pythagoras theorem,$(100+50)^2 = 90^2 + x^2$

x = 120 km

For convience, we are refering the vertices as the starting letters of towns.

Using the similar triangle rule, MOL is similar to MGW.

So, $\frac{MO}{ML} = \frac{MG}{MW}$

$\frac{100}{ML} = \frac{150}{120}$

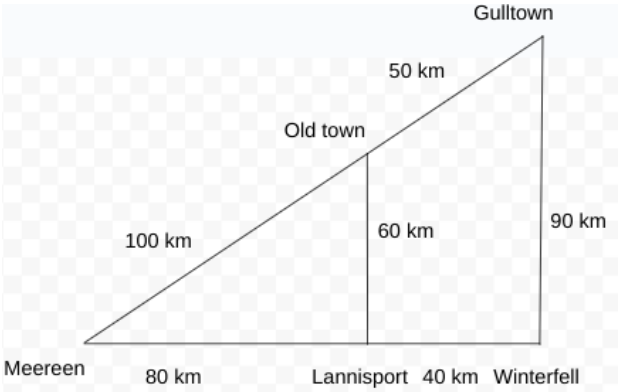
ML = 80 km.

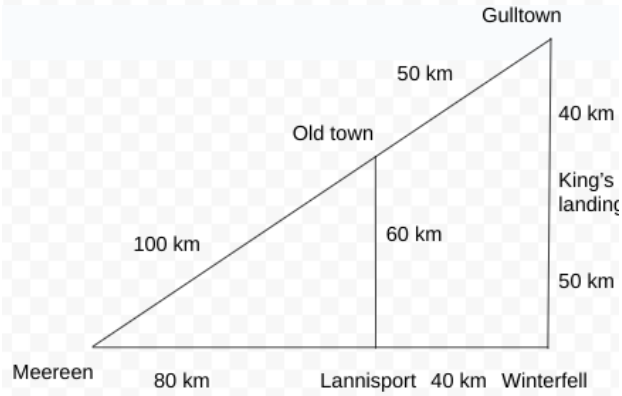
LW = 40 km.

$\frac{MO}{LO} = \frac{MG}{WG}$

$\frac{100}{LO} = \frac{150}{90}$

LO = 60 km





The direct path from M to K will$120^2 + 50^2 = 130^2$.

The shortest time taking path from Meereen to King's landing. Through M0GK, time taken $\frac{100}{100} + \frac{50}{25} + \frac{40}{120} = 1 + 2 + \frac{1}{3} = 3.33$

Through MWK, time taken =$\frac{120}{120} + \frac{50}{120} = 1.42$

So, the second case that is MWK is the fastest route. Time taken will be 1 hr 25 mins.

If the travel time cuts down by 20 mins, the new time will be 1 hr 5 mins.So, it should take 13/12 hrs.

speed = $\frac{130}{\frac{13}{12}} = 120kmph$

Explanation [26 - 28]:
The first thing we should do while solving this set is we should replace the average with the sum of the ratings as we have done in the following table:

	A	B	C	D	Average	Sum
R1		4		3	4	16
R2	3		4		4	16
R3				5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

We know that the ratings can be 1/2/3/4/5 only.

R1 has given 4 and 3 to B and D respectively and the sum of the ratings given by R1 in total is 16.

So, the sum of the ratings given by R1 to A and C is (16-4-3 = 9)

Now, this sum is only possible when he has given 4 to one of them and 5 to another.

Let's make both the cases:

Case - 1						
	A	B	C	D	Average	Sum
R1	5	4	4	3	4	16
R2	3		4		4	16
R3				5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Case - 2						
	A	B	C	D	Average	Sum
R1	4	4	5	3	4	16
R2	3		4		4	16
R3				5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Now, with this, we can derive the score given by R3 to C.

In case 1, it will be (16-4-4-5) = 3

In case 2, it will be (16-5-4-5) = 2

Now, R2 gave 3 and 4 score to A and C respectively. Hence, he would have given a sum of (16 - 3 - 4 = 9) to B and D. It could be possible when he gave 4 to one and 5 to the other one.

Hence, we can make the possible cases and sub cases:

Case - 1						
	A	B	C	D	Average	Sum
R1	5	4	4	3	4	16
R2	3	5	4	4	4	16
R3			3	5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Sub - Case - 1						
	A	B	C	D	Average	Sum
R1	5	4	4	3	4	16
R2	3	4	4	5	4	16
R3			3	5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Case - 2						
	A	B	C	D	Average	Sum
R1	4	4	5	3	4	16
R2	3	5	4	4	4	16
R3			2	5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Sub - Case - 2						
	A	B	C	D	Average	Sum
R1	4	4	5	3	4	16
R2	3	4	4	5	4	16
R3			2	5	4	16
R4		4	5		4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

With this only, we canfill the complete table. Hence, we get:

Case - 1						
	A	B	C	D	Average	Sum
R1	5	4	4	3	4	16
R2	3	5	4	4	4	16
R3	5	3	3	5	4	16
R4	3	4	5	5	4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Case - 2						
	A	B	C	D	Average	Sum
R1	4	4	5	3	4	16
R2	3	5	4	4	4	16
R3	6	3	2	5	4	16
R4	3	4	5	5	4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Sub - Case - 1						
	A	B	C	D	Average	Sum
R1	5	4	4	3	4	16
R2	3	4	4	5	4	16
R3	4	4	3	5	4	16
R4	4	4	5	4	4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

Sub - Case - 2						
	A	**B**	**C**	**D**	**Average**	**Sum**
R1	4	4	5	3	4	16
R2	3	4	4	5	4	16
R3	5	4	2	5	4	16
R4	4	4	5	4	4.25	17
Average	4	4	4	4.25		
Sum	16	16	16	17		

However, Case - 2 is not possible as there no reviewer can give 6 points to any gadget.

26. **B**

Now, according to the question, we have to find what rating R1 give to A so that we can find remaining ratings uniquely.

Now, R1 give 5 ratings according to two cases and 4 rating to A according to the one another.

If R1 gives 5 rating, we still can't figure out the remaining ratings uniquely. Hence, R1 has to give 4 to A in order to find the remaining ratings uniquely.

27. **C**

Now, according to the three possible cases, R2 give either 4 or 5 to B.

28. **E**

However, Case - 2 is not possible as there no reviewer can give 6 points to any gadget. Hence, there are only three possible combinations.