

VISUAL-SPATIAL MATHLYMPICS

EXEMPLAR PAPER

Section A comprises 5 MCQ questions of 2 marks each.
 Section B comprises 5 Open-ended questions of 3 marks each.
 Section C comprises 5 Open-ended questions of 4 marks each.
 Section E comprises 5 Open-ended questions of 5 marks each.
 Section F comprises 5 Open-ended questions of 6 marks each.

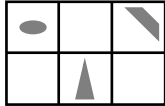
Diagrams are not drawn to scale unless otherwise stated.
Calculators may NOT be used.

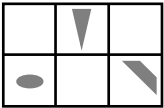
Give your answer in the unit assigned.

Section A:

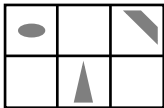
Each of the questions 1 to 5 carries 2 marks each.

1. Identify the reflection of the given figure.

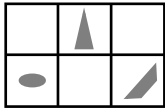




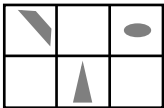
(A)



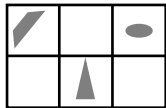
(B)



(C)




(D)



(E)

2. The given figure appears to be made up of 26 stacking cubes. At most how many cubes, stacked face-on-face against these cubes, could possibly be completely hidden from view?



(A) 6


(B) 8

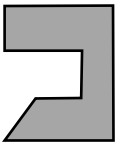
(C) 10

(D) 12

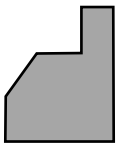
(E) 14

3. Identify the figure that cannot be formed by combining the 3 shapes below.

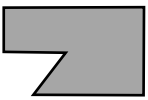




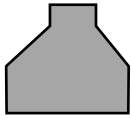
(A)



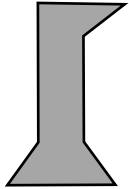
(B)



(C)

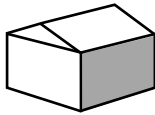
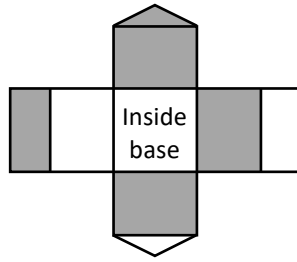


(D)

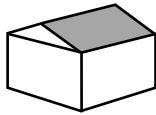


(E)

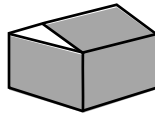
4. Identify the 3D solid that is formed from the given net.



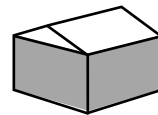
(A)



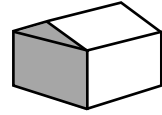
(B)



(C)

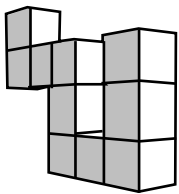
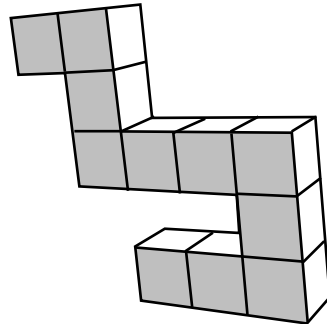


(D)

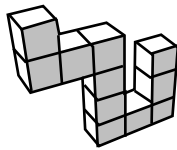


(E)

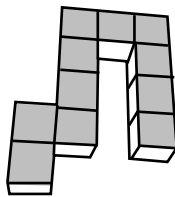
5. Identify another view of the 3D solid below.



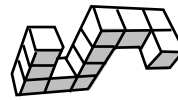
(A)



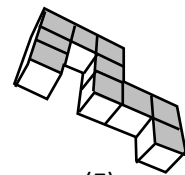
(B)



(C)



(D)



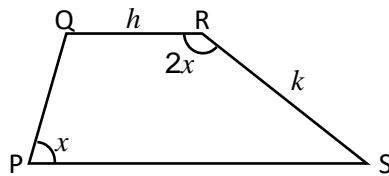
(E)

Section B:

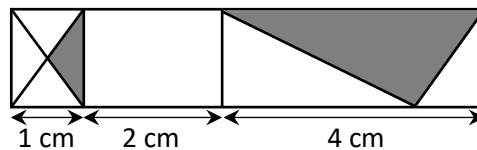
Each of the questions 6 to 10 carries 3 marks each.

6. The sides of a 4-sided polygon are 3 units, 4 units, 5 units and w units long. If w is a whole number, what is the longest possible perimeter of the polygon?

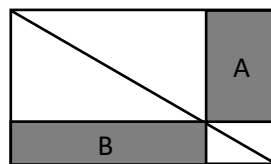
7. In the trapezium PQRS, $\angle QRS$ is twice angle $\angle QPS$, QR has a length h and RS has a length k . What is the length of PS in terms of h and k .



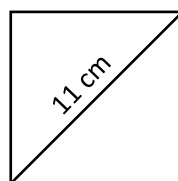
8. What fraction of the figure is shaded?



9. What is the ratio of the area of A to the area of B?



10. Given that the length of the diagonal of the given square is 11 cm, what is the area of the square?

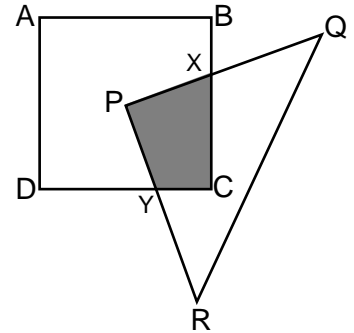


Section C:

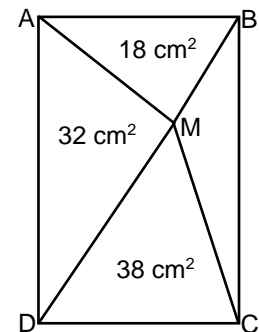
Each of the questions 11 to 15 carries 4 marks each.

11. If the diagonal of a large square is twice as long as the diagonal of a small square, then the area of the small square is ____% of the area of the large square?

12. ABCD is a square of side 10 cm and PQR is a right-angle triangle. The corner P of the triangle PQR is placed at the centre of square ABCD. Find the area of quadrilateral PXCY.

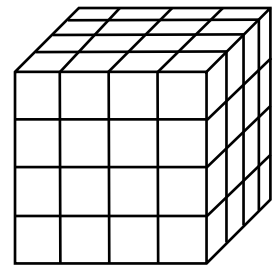


13. In the figure shown, what is the area of triangle BCM?

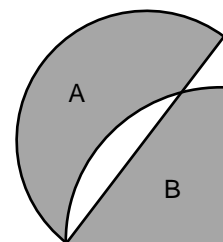


14. A wooden cube 4 cm by 4 cm by 4 cm is painted so that one pair of opposite faces are blue, one pair of opposite faces are green and one pair of opposite faces are red. The cube is then sliced into 64 cubes of side 1 cm each.

How many of the small 1-cm cubes have exactly one face painted blue and one face painted green?



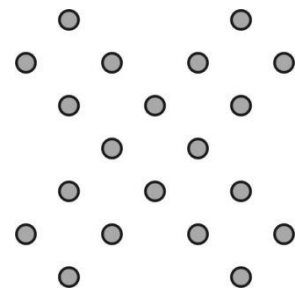
15. The figure given is made up of a semicircle, a quadrant and a triangle. The areas of these shapes are 39.25 cm^2 , 28.26 cm^2 and 24 cm^2 respectively. What is the difference of the areas of the shaded parts A and B?



Section D:

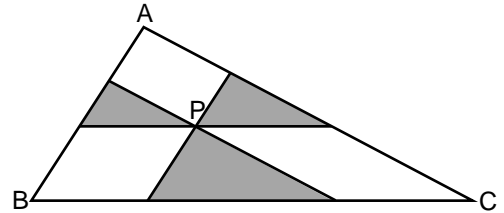
Each of the questions 16 to 20 carries 5 marks each.

16. The given figure shows an arrangement of 20 pebbles. How many ways do 4 of these pebbles mark out the 4 corners of a square?

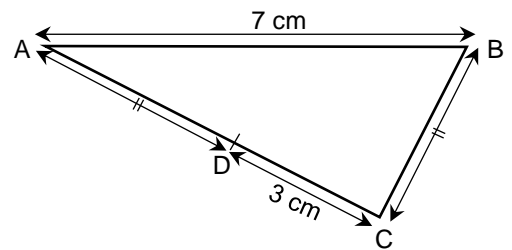


17. In the diagram below (not drawn to scale), P is a point inside the triangle ABC. Lines parallel to the sides of the triangle are drawn through P.

The areas of the three resulting triangles with a vertex at P have areas 4 cm^2 , 9 cm^2 and 49 cm^2 . What is the area of triangle ABC?

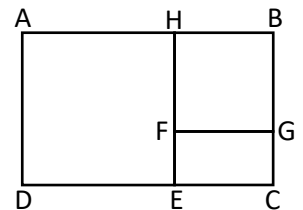


18. The figure shows a right-angled triangle, ABC. $AB = 7 \text{ cm}$, $CD = 3 \text{ cm}$ and $AD = BC$. Find the area of triangle ABC.

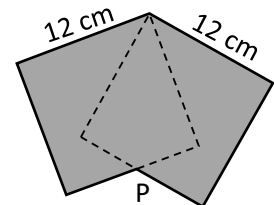


19. Rectangle ABCD consists of two squares ADEH and FGBH, and a rectangle CEFG.

The perimeter of rectangle CEFG is $\frac{3}{8}$ of the perimeter of ABCD. Express the length of GC as a fraction of the length of BC.



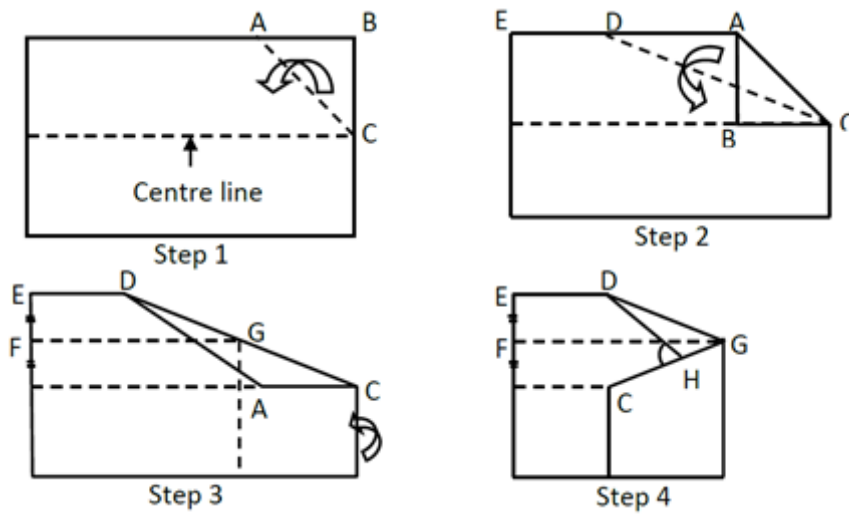
20. The given figure is made up of two overlapping equal squares. P is the midpoint on the sides of both squares. What is the area of the figure?



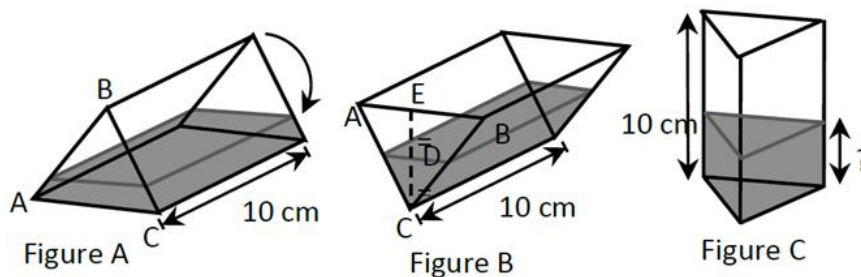
Section E: (6 marks each)

Each of the questions 21 to 25 carries 6 marks each.

21. Four folds were made to a rectangular piece of paper as shown in Steps 1 to 4. Find $\angle DHC$ in Step 4.



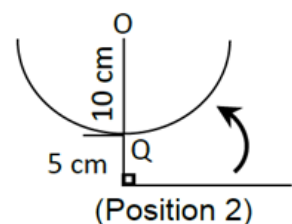
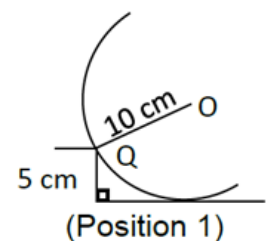
22. Figure A shows some water sealed inside a triangular prism. Triangle ABC of the prism is an equilateral triangle. Figure B shows that when the prism is rotated such that it is pointing downwards, and AB is horizontal, the depth of water CD is half of the triangle's vertical height, CE. What is the depth of the water when the prism is positioned as shown in Figure C?



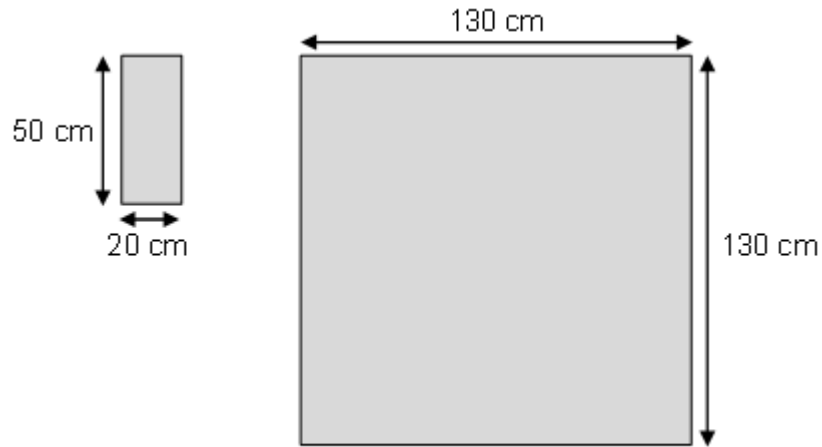
23. A wheel of radius OQ of 10 cm rests against a step 5 cm high as shown in Position 1.

The wheel is rotated about Q until its centre O is directly above Q as shown in Position 2.

What is the angle through which the wheel has been rotated about Q?



24. Mrs Zhang has a piece of cloth measuring 130 cm by 130 cm. What is the maximum number of rectangular strips of cloth of dimensions 50 cm by 20 cm that she can cut from the cloth?



25. A very long travelator moves at a constant speed of 1.5 m/s. Grandma steps onto the travelator and stands still. Grandpa steps onto the travelator 2 seconds later and continues to walk on it at 1 m/s. 2 seconds after that, Grandson reaches the start of the travelator, but he did not get on it but jogs beside it at 2 m/s. After a certain time, Grandpa is ahead of Grandma, who is exactly halfway between Grandpa and Grandson. Find the distance between the start of the travelator and Grandma at that moment.

Answers

Section A:

1. (E)
2. (D)
3. (D)
4. (D)
5. (B)

Section B:

6. 23 cm
7. $h + k$
8. $\frac{9}{28}$
9. 1:1
10. 60.5 cm^2

Section C:

11. 25%
12. 25 cm^2
13. 24 cm^2
14. 8 cubes
15. 10.99 cm^2

Section D:

16. 21 ways
17. 144 cm^2
18. 10 cm^2
19. $\frac{1}{3}$
20. 216 cm^2

Section E:

21. 67.5°
22. 2.5 cm
23. 60°
24. 16
25. 13m