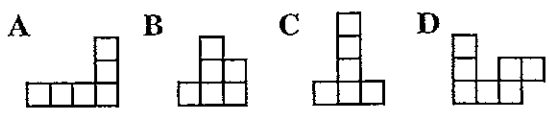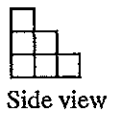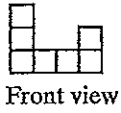**1** Elizabeth joined some cubes together to make a 3D object. The view from the front and from a side are shown:

Front view

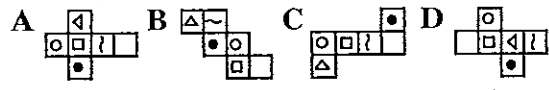Which **cannot** be a top view?

Side view

A   B   C   D

2 The number of edges of a 3D object is half as many again as the number of faces. Which could be the object?

A triangular pyramid
B triangular prism
C rectangular pyramid
D hexagonal prism

3 Here are two views of the same cube.
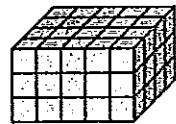
Which is the net of the cube?

A   B   C   D

4 George has some shapes (four equilateral triangles and four squares) that he places together to build 3D objects. The sides of the squares and triangles are all equal. George wants to build a triangular prism, a triangular pyramid and a square-based pyramid. Which statement is correct?

A He cannot build a triangular prism.
B He cannot build a triangular pyramid.
C He cannot build a square-based pyramid.
D He can build all three objects.

5 This prism is made from 60 small cubes that have been joined together. All 6 faces of the prism are painted blue. The prism is then pulled apart into its 60 individual cubes. Which statement is **not** correct?

A 6 cubes have no blue faces.
B 20 cubes have exactly 1 blue face.
C 24 cubes have exactly 2 blue faces.
D 8 cubes have exactly 3 blue faces.

6 The numbers on opposite faces of a cube add to 7.
This cube is rolled over its bottom front edge and then over its (new) bottom right side edge. What face is now on top?
A 2   B 4   C 5   D 6

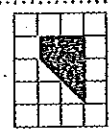**7** This pattern is formed by rotating the arrow in a clockwise direction.

→ ↖ ↓ ↗ ← ↘ ↑ ↙ →

Through how many degrees is the arrow rotated each time? ☐°

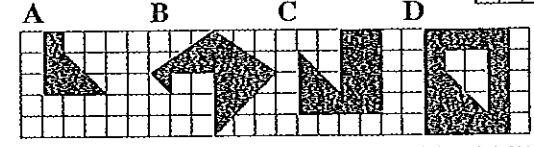**8** If a square is cut along one of its axes of symmetry, which of the following is **not** possible as a result?
A 2 rectangles
B 2 squares
C 2 right-angled triangles
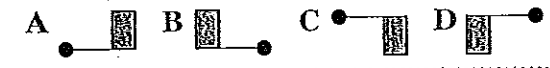D 2 isosceles triangles

9 Mia drew this shape.
Which shape cannot be added to Mia's shape to make a square?
A   B   C   D

10 A photo is 12 cm long and 8 cm wide. It is enlarged so that it is now 78 cm long. How wide is it now? ☐ cm

11 This shape is to be rotated 90° in an anticlockwise direction about the dot and then it is to be reflected in a vertical line. Which diagram shows the result?

A   B   C   D

12 Chiara has a cube and two square-based pyramids. All of the square faces are the same size. She sticks the square bases of the pyramids to opposite faces of the cube. How many more edges than faces has the resulting 3D object?
A 0   B 2   C 4   D 8

1 From the front view you know that the object is 4 blocks across. So the top view cannot be view B because it is at most 3 blocks across. The other choices could be:
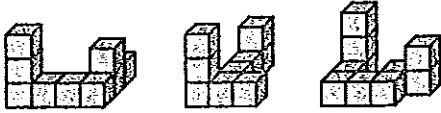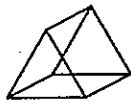
The centre object is viewed here from the side.

2 Consider each choice.
A triangular pyramid has 4 faces and 6 edges.

A triangular prism has 5 faces and 9 edges.

A rectangular pyramid has 5 faces and 8 edges.

A hexagonal prism has 8 faces and 18 edges.

Only the triangular pyramid has its number of edges half as many again as the number of faces. [$\frac{1}{2}$ of 4 is 2; 4 + 2 = 6]

3 In the two views of the cube a total of 5 different faces can be seen. The face that cannot be seen must be the one showing a square. The face opposite the blank face cannot be seen in either view, so that must be the face with the square. So Options B and D cannot be correct.
From the second view of the cube you can see that when the line is below the blank face the dot is on the right side. But in Option C the dot would be on the left side. The only possible option is Option A.

4 A triangular prism has 2 triangular faces and 3 rectangular (or square) faces. George can build a triangular prism.

A triangular pyramid has 4 triangular faces. George can build a triangular pyramid.
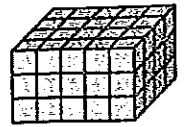
A square-based pyramid has 1 square face and 4 triangular faces. George can build a square-based prism.

George can build all three objects.

5 The six inside cubes will have no faces painted.
6 cubes in the top layer will have 1 face painted and also 6 in the bottom layer.
3 faces in the front layer and 3 in the back will have 1 face painted.
2 faces on the right side and 2 on the left will have 1 face painted.
Total with 1 face painted
= 6 + 6 + 3 + 3 + 2 + 2
= 22
The incorrect statement is '20 cubes have exactly 1 blue face.'

6 Numbers on opposite faces add to 7.

bottom edge   bottom right side edge

So 6 will be on the back of the original cube.
5 will be on the left side and 4 on the bottom.

When the cube rolls over the bottom edge, 1 will be on the bottom and 6 on the top. The front face will be 3 and the back 4. 2 will still be on the right face and 5 on the left face.
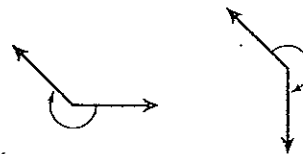
When the cube rolls over the bottom right side edge, 2 will move to the bottom and 5 to the top. The number on the top face will be 5.
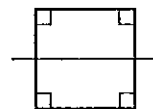
7 In 2 rotations the arrow turns $1\frac{1}{4}$ times.

$1\frac{1}{4}$ turns = 360° + 90°
             = 450°
Angle of rotation = 450° ÷ 2
                  = 225°

8 If a square is cut along a horizontal or vertical axis of symmetry the resulting two parts will be rectangles. The length of the rectangle will be twice the width.
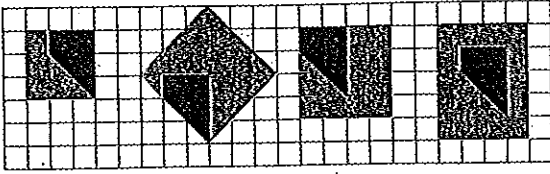
If a square is cut along a diagonal axis of symmetry the resulting two parts will be triangles. These triangles will be both right-angled and isosceles.
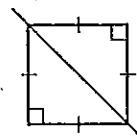
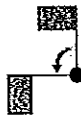If a square is cut along an axis of symmetry it is not possible to get 2 squares.

9 Every option will form a square except for option D, which will make a rectangle but not a square.

10 Number of times larger $= 78 \div 12$

$$= 6\frac{1}{2}$$

New width $= 6\frac{1}{2} \times 8$ cm

$$= (6 \times 8 + \frac{1}{2} \text{ of } 8) \text{ cm}$$

$$= 52 \text{ cm}$$

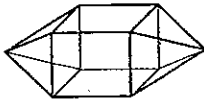**11** First the shape is rotated 90° in an anticlockwise direction:

Then it is reflected in a vertical line:

The resulting image is Option C.

12 The resulting object has 20 edges and 12 faces.

Difference $= 20 - 12$

$$= 8$$

The object has 8 more edges than faces.