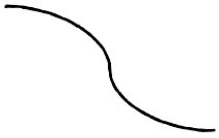
6 Shape and Space

A. Lines and Angles

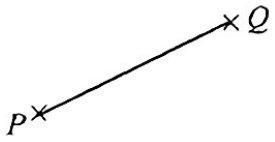
Type of Lines

Straight line

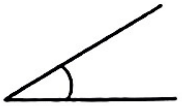


Curve

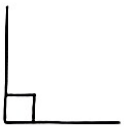
Note: A line segment is a part of a line which has two end points and a fixed length. If a line segment has P and Q as its end points, the line segment can be named as PQ (or QP).



Type of Angles



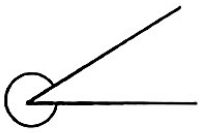
Acute angle
(Greater than 0° and less than 90°)



Right angle
(90°)

Obtuse angle
(Greater than 90° and less than 180°)

Straight angle
(180°)

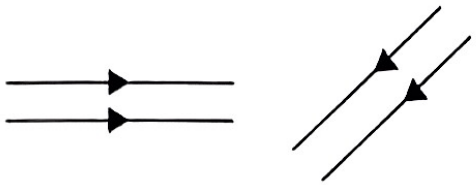


Reflex angle
(Greater than 180° and less than 270°)

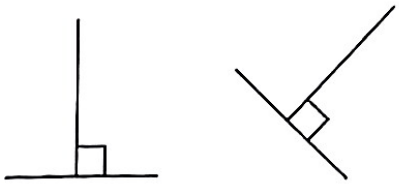
Round angle
(360°)

Note: The unit in measuring the size of an angle is degree and the symbol for degree is '°'.

Parallel Lines and Perpendicular Lines



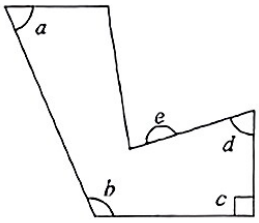
Parallel lines



Perpendicular lines

Example 1

Name the types of angles marked in the figure.



Solution

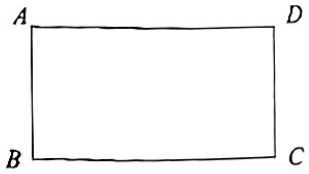
a: acute angle
b: obtuse angle
c: right angle
d: acute angle
e: straight angle

Example 2

In the figure, *ABCD* is a rectangle. Name all the line segments which satisfy each of the following conditions:

(a) parallel to *AD*

(b) perpendicular to *CD*

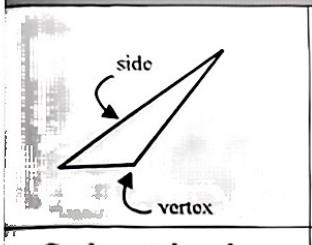
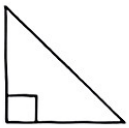
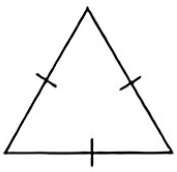


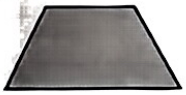
Solution

(a) *BC*

(b) *AD* and *BC*

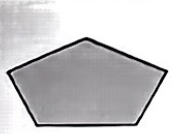
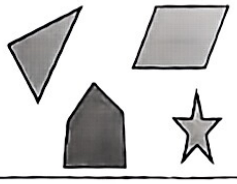
Plane Figures

Triangles			
			
Scalene triangle	Right-angled triangle	Isosceles triangle	Equilateral triangle

Quadrilaterals and their properties		
	Square	• Four sides are equal. • Four angles are right angles. • Two pairs of opposite sides are parallel.
	Rectangle	• Two pairs of opposite sides are equal. • Four angles are right angles. • Two pairs of opposite sides are parallel.
	Parallelogram	• Two pairs of opposite sides are equal. • Two pairs of opposite sides are parallel.
	Rhombus	• Four sides are equal. • Two pairs of opposite sides are parallel.
	Trapezium	• Only one pair of opposite sides is parallel.

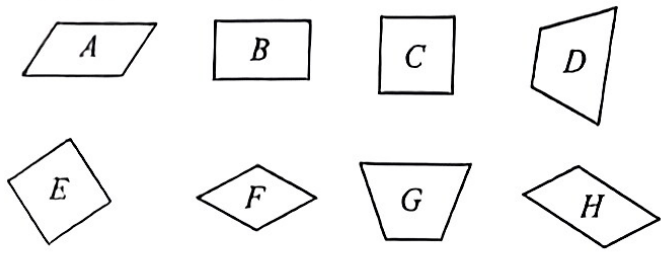
Note that:

1. **All squares are rectangles.**
2. **All squares, rectangles and rhombuses are parallelograms.**
3. **All squares are rhombuses.**

Other			
			
Pentagon	Hexagon	**Polygon(s)**	Circle

Example 3

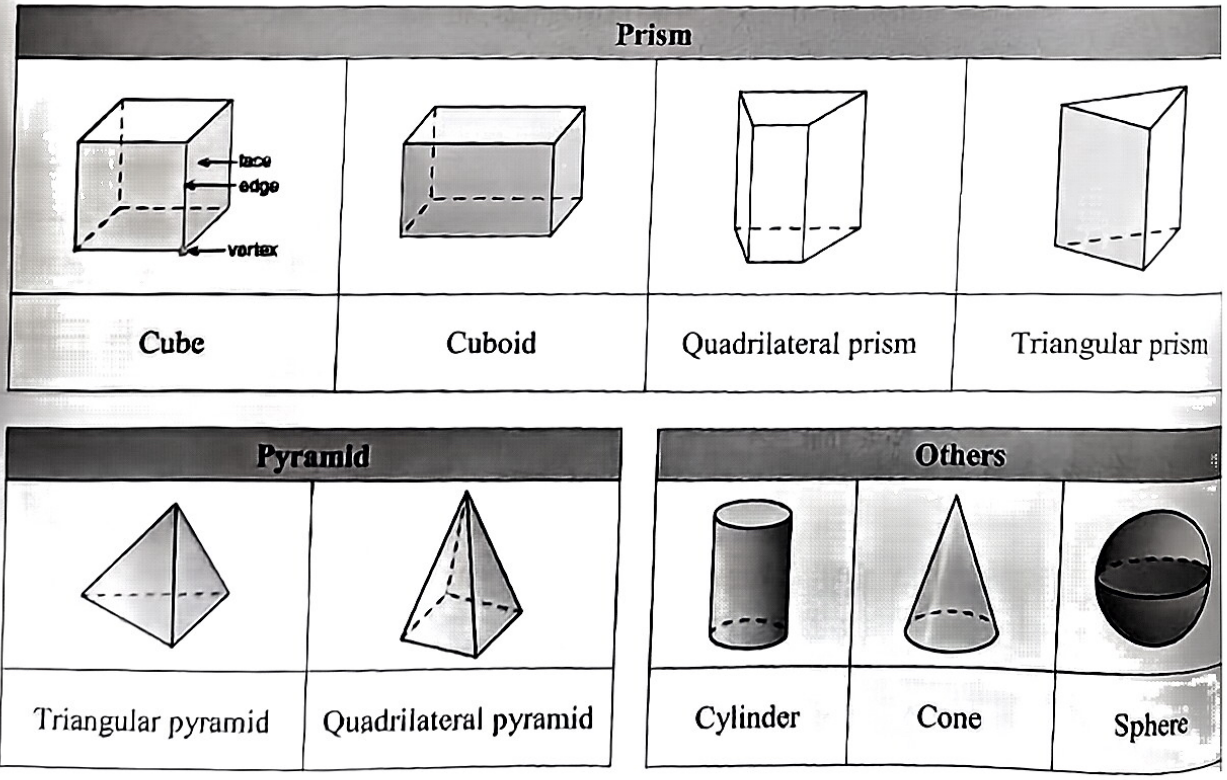
Classify the following quadrilaterals.



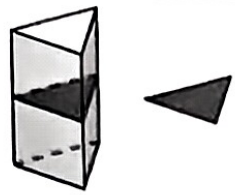
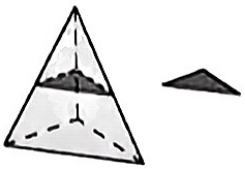
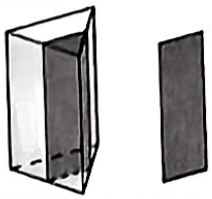
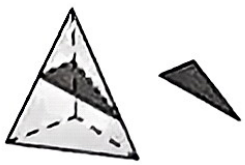
Solution

Square:	*C* and *E*
Rectangle:	*B*
Parallelogram:	*A* and *H*
Rhombus:	*F*
Trapezium:	*D* and *G*

C. Solids



A cylinder does not have a vertex, while a sphere has neither a vertex nor an edge.

Cross-section of solids			
Cutting a prism or a pyramid in a direction parallel to the bases		Cutting a prism or a pyramid in other angles	
			
The cross-section has the same shape and size as the base of the prism.	The cross-section has the same shape but different sizes as the base of the pyramid.	Many different kinds of cross-sections will be obtained.	

All cross-sections of a sphere are circles.

Example 4

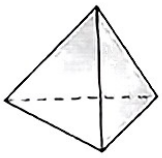
Write down the numbers of vertices, edges and faces of the following solids.

(a) Triangular pyramid

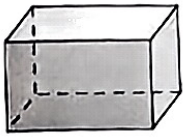
(b) Cuboid

Solution

(a) Number of vertices: 4
Number of edges: 6
Number of faces: 4



(b) Number of vertices: 8
Number of edges: 12
Number of faces: 6



Example 5

In the figure, if we cut the cylinder along the dotted line, what is the shape of the cross-section? Draw the cross-section.

Solution

The cross-section is a rectangle.

Key Terms / Phrases

Pronunciation

line	線	quadrilateral	四邊形	face	面
angle	角	polygon	多邊形	prism	角柱
plane figure	平面圖形	circle	圓形	pyramid	角錐
vertex	頂點	solid	立體圖形	sphere	球體
side	邊	edge	邊	cross-section	橫切面
triangle	三角形				

Useful Sentences

Write down the types of angle in the figure.	寫出圖中各角的類別。
All squares, rectangles and rhombuses are parallelograms.	所有正方形、長方形和菱形皆是平行四邊形。
$\angle ABC$ is read as angle ABC.	$\angle ABC$ 讀作角 ABC。
The cross-section of the solid is a square.	立體的橫切面是一個正方形。

Exercise 6

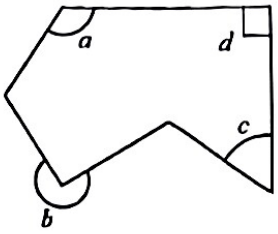
1. Write down the types of angles in the following figure.

a: _____

b: _____

c: _____

d: _____



Which of the following quadrilaterals have four equal sides? Put a '✓' or a '×' in each of the boxes.

(a) Square ☐ **(b)** Rhombus ☐

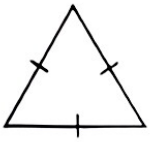
(c) Rectangle ☐ **(d)** Trapezium ☐

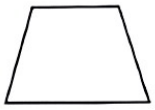
Which of the following quadrilaterals have two pairs of parallel opposite sides? Put a '✓' or a '×' in each of the boxes.

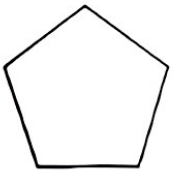
(a) Rectangle ☐ **(b)** Rhombus ☐

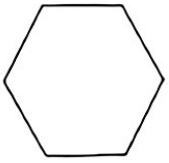
(c) Parallelogram ☐ **(d)** Trapezium ☐

Name the following plane figures.

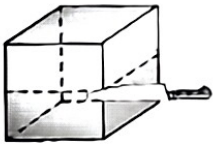
(a)  _____

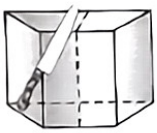
(b)  _____

(c)  _____

(d)  _____

5. Draw the cross-section obtained when each of the following solids is cut along the dotted line.

(a) 

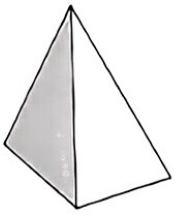
(b) 

6. Name the following solids.

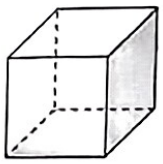
(a)  _____

(b)  _____

(c)  _____

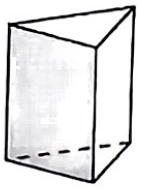
(d)  _____

7. The solid figure on the right is a _____.



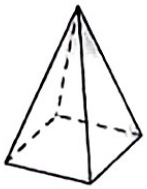
It has _____ vertices, _____ edges and _____ faces.

8. The solid figure on the right is a _____.



It has _____ vertices, _____ edges and _____ faces.

9. The solid figure on the right is a _____.



It has _____ vertices, _____ edges and _____ faces.