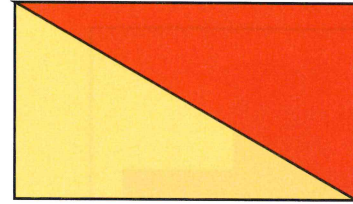# Chapter 5

Quadrilaterals

A **quadrilateral** is a plane figure having four sides and four angles. The sum of the angles in a quadrilateral is 360°, as every quadrilateral can be divided into two triangles.

> The sum of the angles in a quadrilateral is 360°.

Types of Quadrilaterals

There are six different shapes of quadrilateral, each having a special name.

1. A **parallelogram** is a quadrilateral having opposite sides parallel and opposite angles equal.

2. A **square** is a parallelogram having four equal sides and four right angles.

3. A **rectangle** is a parallelogram having two pairs of equal sides and four right angles. The longer side is called the **length** and the shorter side is called the **width**.
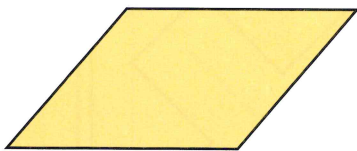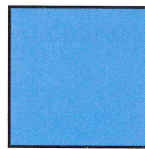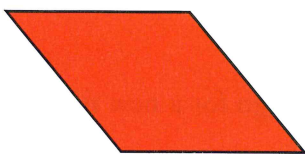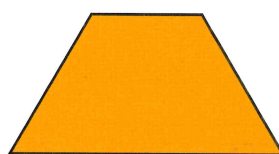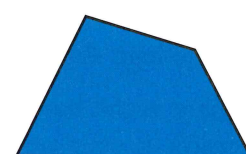
| Parallelogram | Square | Rectangle |

4. A **rhombus** is a parallelogram having four equal sides. It is like a square pushed out of shape.

5. A **trapezium** is a quadrilateral having two, and only two, parallel sides.

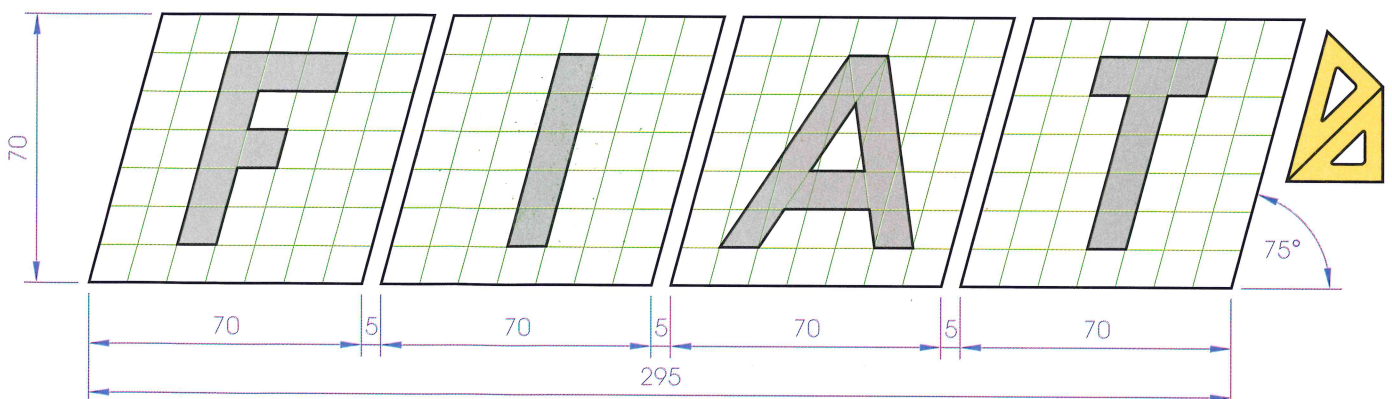6. A **trapezoid** is a quadrilateral having no sides equal or parallel.

| Rhombus | Trapezium | Trapezoid |

Exercises

1. The **Fiat** sign consists of four **parallelograms**. A letter of the company name is inscribed in each of the **parallelograms**. Make a drawing of the sign. Use shading to enhance your drawing.

2. The **First Aid** sign (below) and the **Level Crossing Ahead** road sign (across) are straightforward, bold designs based around a square.

Make a drawing of each.

7 equal divisions
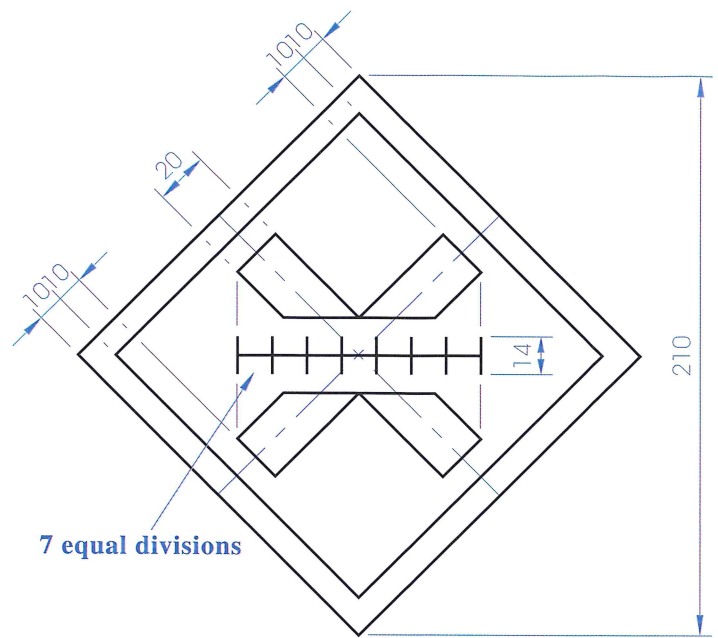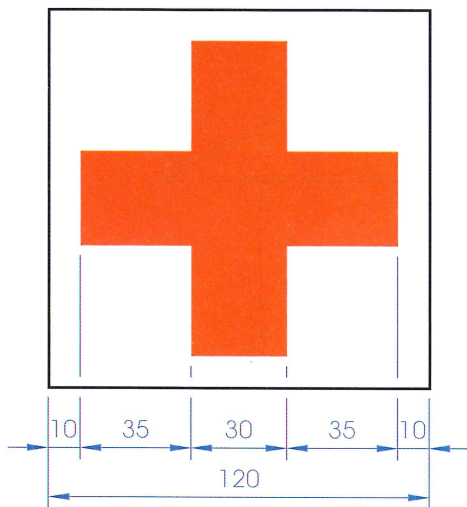
3. Shown across is a drawing of the **hazard warning** graphical symbol found on containers of hazardous substances. It is a simple and effective design based on a **square**.

   (a) Make a drawing of this graphical symbol.

   (b) You have been asked to design a new graphical symbol for hazardous materials, still based on a **square**. Sketch out a series of ideas, and then make a drawing of your best one.
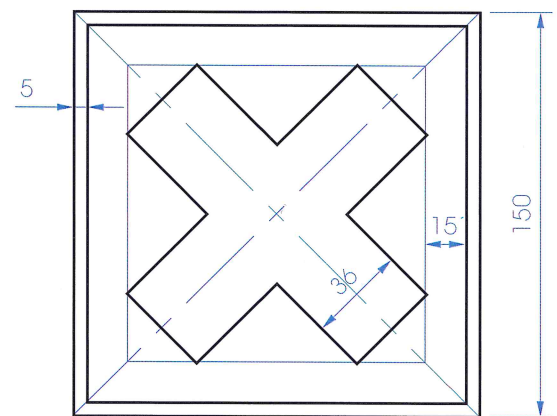
4. The **Tile Savers** logo is made up of three identical **squares**.

   (a) Reproduce the logo showing all construction lines.

   (b) Using a square as the basis for your designs, see what other logos you can design for a new tile store that is opening in your area. Make accurate drawings of your ideas.
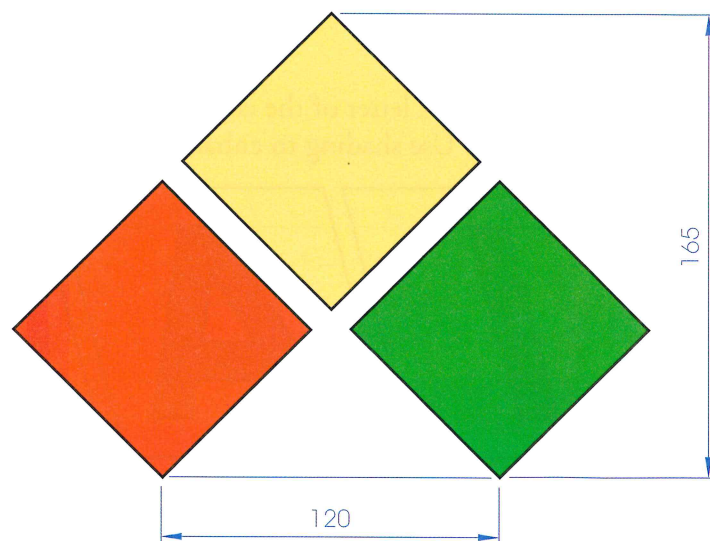
5. The **ERA** real estate agency logo is a design based on a house. It is composed of three **squares**, two **parallelograms** and an **isosceles triangle**.
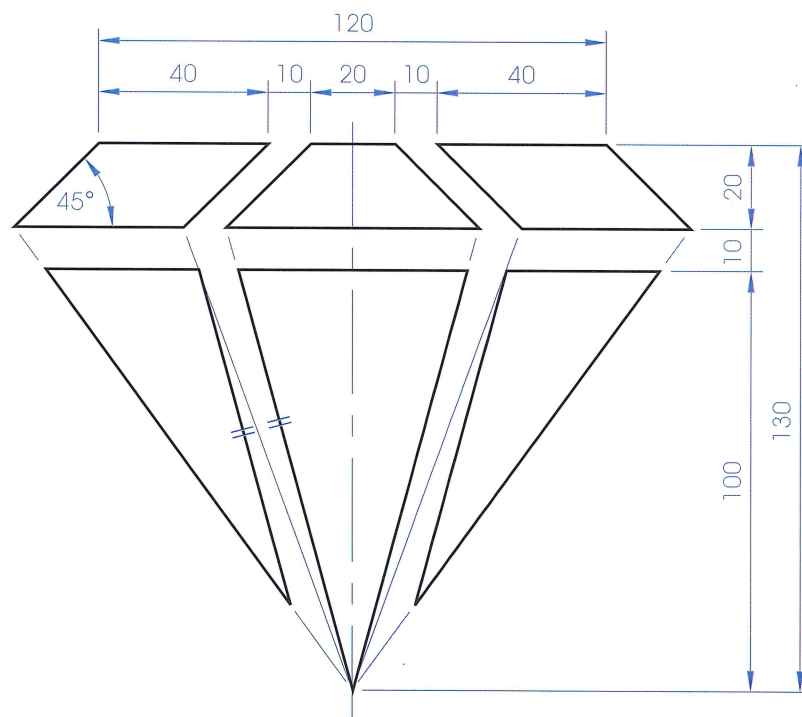
Make a full-size drawing of the logo to the given dimensions.
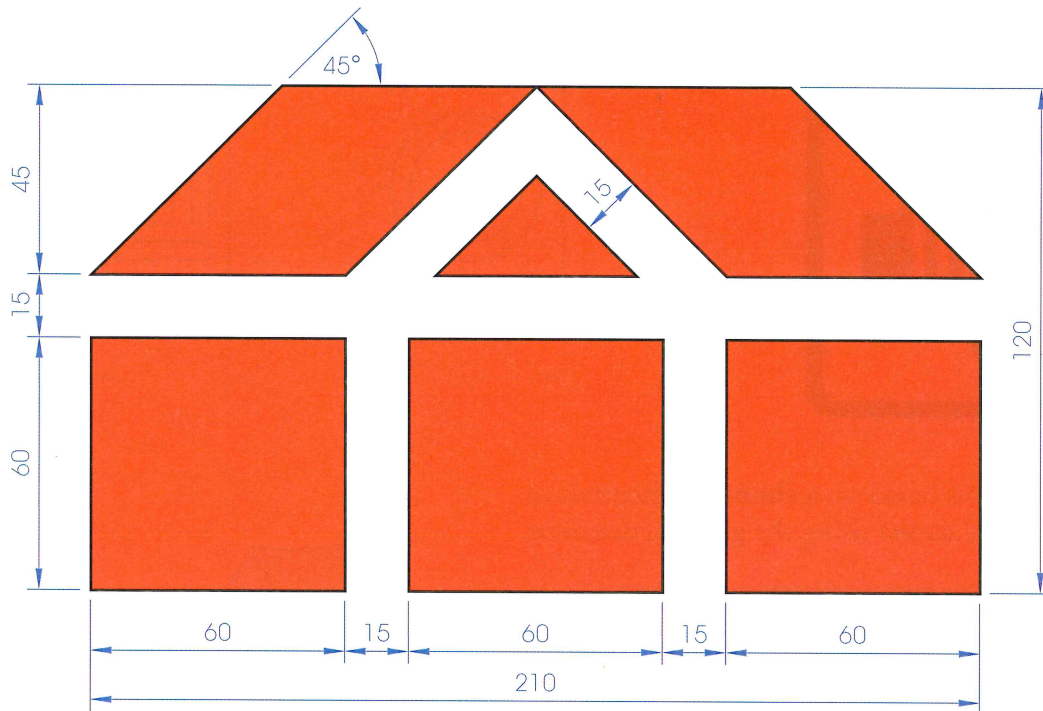
6. The drawing in the figure below is a logogram for a **jewellery store**. The logo uses **quadrilaterals** and **triangles** to indicate the diamond shape.

Draw the logogram to the given dimensions.

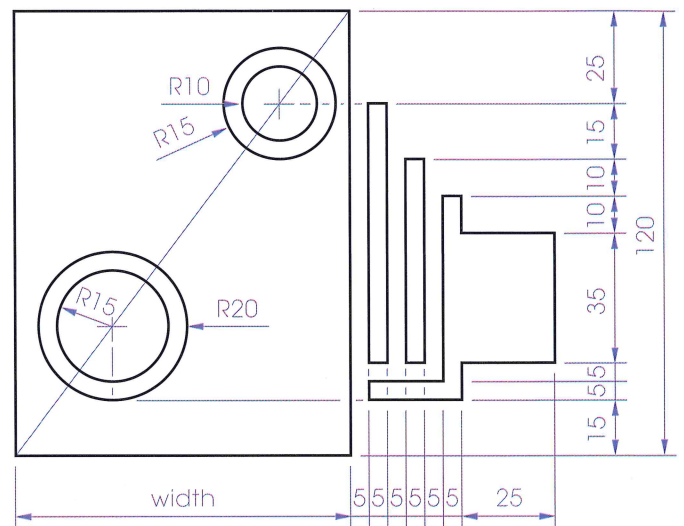Hint: Start your work by drawing the two **parallelograms** and the **trapezium**.
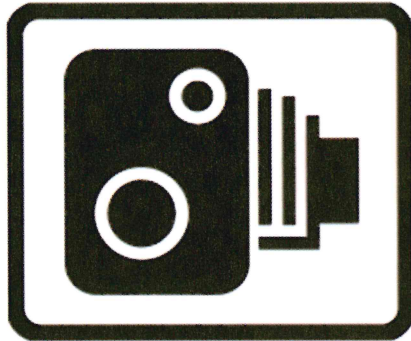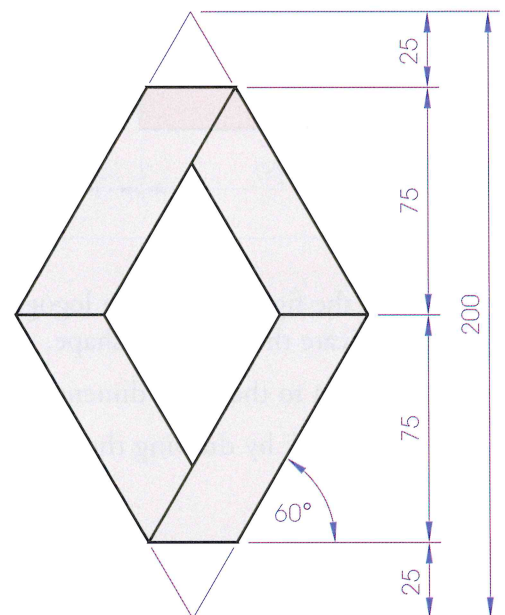
7. A drawing of a road sign for a **speed camera** is shown in the figure below. The diagonal of the rectangle is 150 mm long.
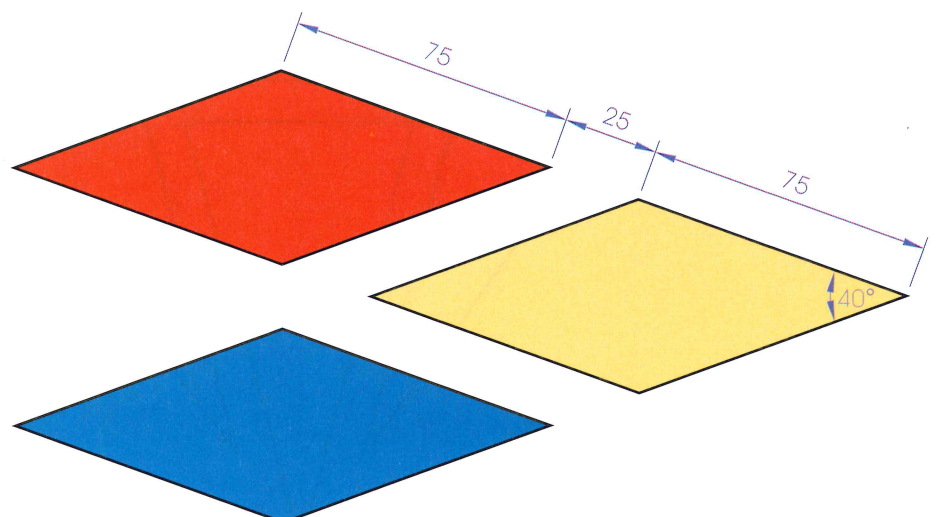
Copy the drawing showing clearly how the width of the rectangle is determined.

8. The **Renault** badge is based on a **rhombus**. Reproduce the drawing (shown across) using the given dimensions.


9. A drawing of the **Celtic Linen** symbol is shown in the figure below. It is composed of three identical **rhombi** that are equally spaced. Copy the drawing using the given dimensions.

A Special Parallelogram

The **rhombus** is a special parallelogram. If you arrange four 30°/60° set squares to form a rhombus as shown in the figure across, you will notice that the diagonals bisect each other at 90°. This enables us to bisect a line and an angle.
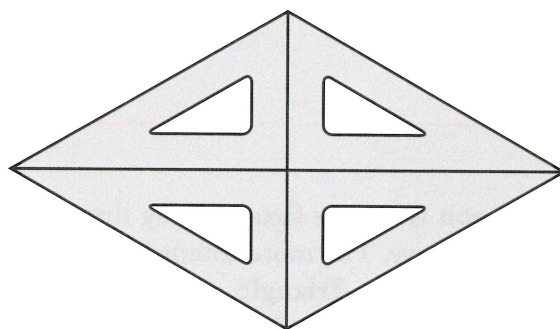
> The diagonals of a rhombus bisect each other at 90°.

Bisecting a Line

Example
Bisect the given line AB.

1. Place the compass point at A, open it to a distance greater than half the length of the line and draw arcs on either side of the line.

2. Place the compass point at B. Using the same radius, draw two more arcs cutting the first set of arcs at C and D respectively.

3. Join C and D. The line CD is called the perpendicular bisector of AB.
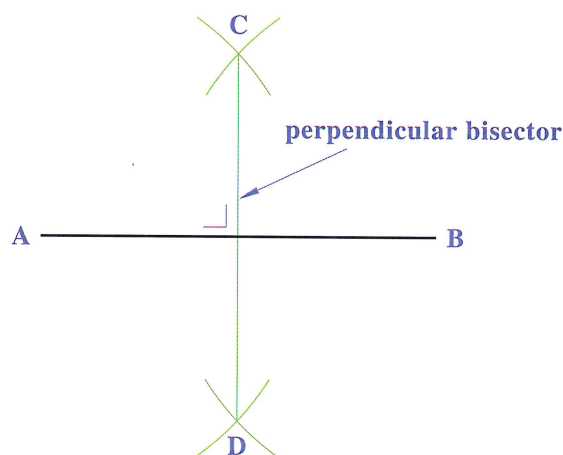
> A **perpendicular bisector** of a line is always at right angles to the line.
> Any point on the perpendicular bisector of a line segment AB is equidistant from A and B.

Bisecting an Angle

Example
Bisect the given angle LMN.

1. Place the compass point at the vertex M of the angle and draw an arc of any convenient radius to intersect the two arms of the angle at A and B.

2. Using A and B as centres and a convenient radius, draw two intersecting arcs at C.

3. Join M to C. The line MC is the bisector of the angle LMN.
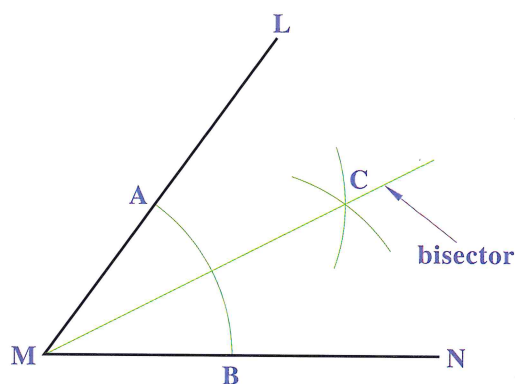
> Any point on the bisector of an angle is equidistant from the arms of the angle.
> The bisector of any acute or obtuse angle also bisects its reflex angle.

**Answer Worksheet 5A**

Chapter 6

Polygons

A **polygon** is a plane figure having three or more sides. Polygons are named according to the number of sides they have. The more common polygons have their own names:

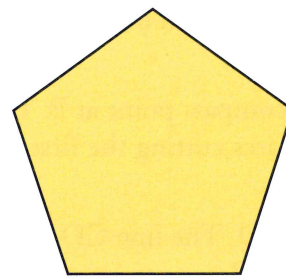|			
Triangle	3 sides	**Heptagon**	7 sides
Quadrilateral	4 sides	**Octagon**	8 sides
Pentagon	5 sides	**Nonagon**	9 sides
Hexagon	6 sides	**Decagon**	10 sides

Regular Polygons

When all the sides and all the angles of a polygon are equal, it is called a **regular polygon**. The figure below shows the first eight **regular polygons**. In this chapter, we will study the **regular pentagon**, the **regular hexagon**, the **regular octagon**, the **regular nonagon** and the **regular decagon**.
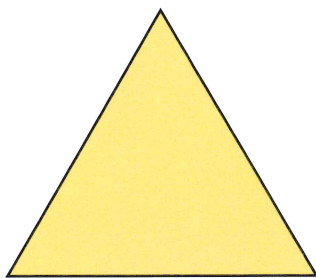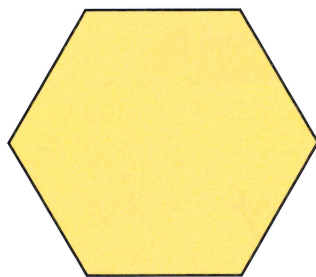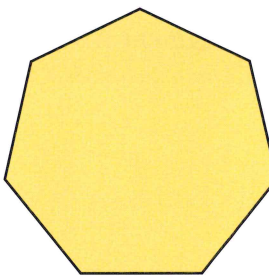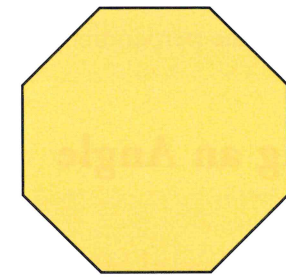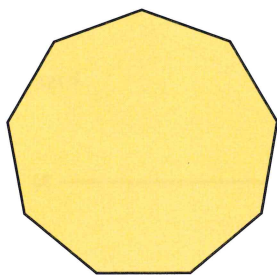
Equilateral Triangle   **Square**   **Pentagon**
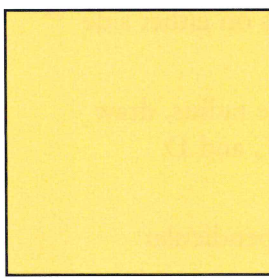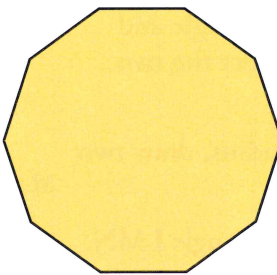
Hexagon   **Heptagon**   **Octagon**
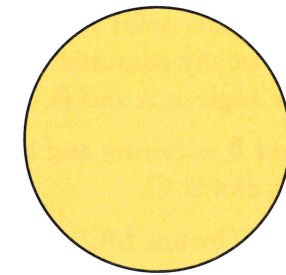
Nonagon   **Decagon**   **Circle**

A circle is also included. This is the limiting case, which results if we imagine that the number of sides of the regular polygon is increased to infinity. The polygon is now circular and the sides are points.

> A **regular polygon** has equal sides and equal angles.