Visual arts
Design & Create

Technical drawing

Level **SECONDARY**

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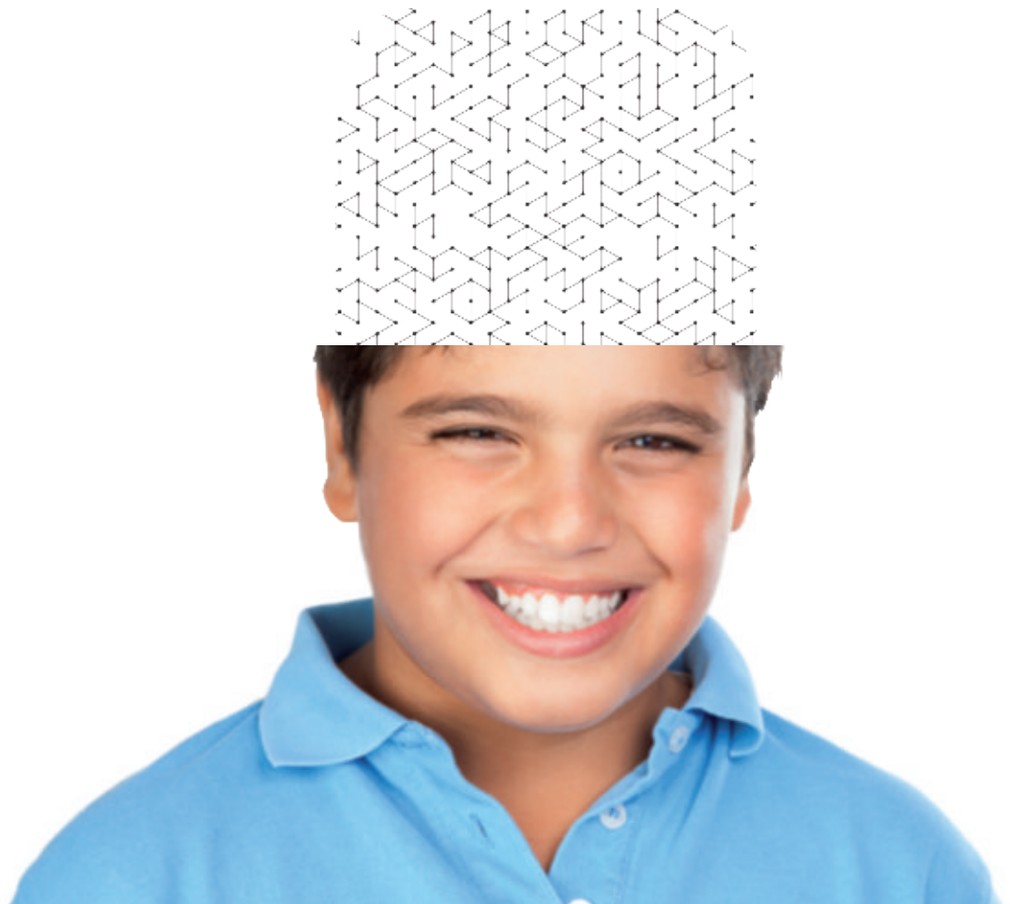


Richmond

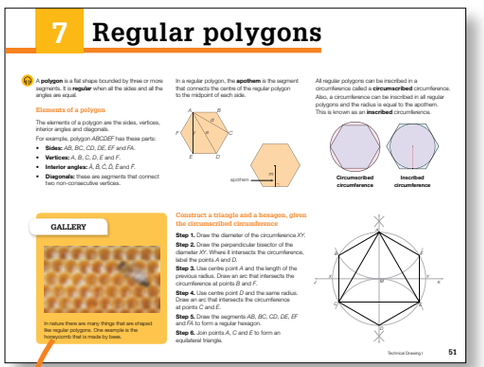
Santillana

Technical drawing I

Technical drawing I is organised into seven units, which aim to develop technical drawing skills.

Each unit contains the following sections:

Listen to the audio files at **santillana.es/clil**


7 Regular polygons

A **polygon** is a flat shape bounded by three or more segments. It is **regular** when all the sides and all the angles are equal.

Elements of a polygon

The elements of a polygon are the sides, vertices, interior angles and diagonals.

For example, polygon *ABCDEF* has these parts:

- **Sides:** *AB, BC, CD, DE, EF* and *FA*.
- **Vertices:** *A, B, C, D, E* and *F*.
- **Interior angles:** *Â, B̂, Ĉ, D̂, Ê* and *F̂*.
- **Diagonals:** these are segments that connect two non-consecutive vertices.

In a regular polygon, the **apothem** is the segment that connects the centre of the regular polygon to the midpoint of each side.

All regular polygons can be inscribed in a circumference called a **circumscribed** circumference. Also, a circumference can be inscribed in all regular polygons and the radius is equal to the apothem. This is known as an **inscribed** circumference.

Circumscribed circumference

Inscribed circumference

GALLERY

In nature there are many things that are shaped like regular polygons. One example is the honeycomb that is made by bees.

Construct a triangle and a hexagon, given the circumscribed circumference

Step 1. Draw the diameter of the circumference *XY*.

Step 2. Draw the perpendicular bisector of the diameter *XY*. Where it intersects the circumference, label the points *A* and *D*.

Step 3. Use centre point *A* and the length of the previous radius. Draw an arc that intersects the circumference at points *B* and *F*.

Step 4. Use centre point *D* and the same radius. Draw an arc that intersects the circumference at points *C* and *E*.

Step 5. Draw the segments *AB, BC, CD, DE, EF* and *FA* to form a regular hexagon.

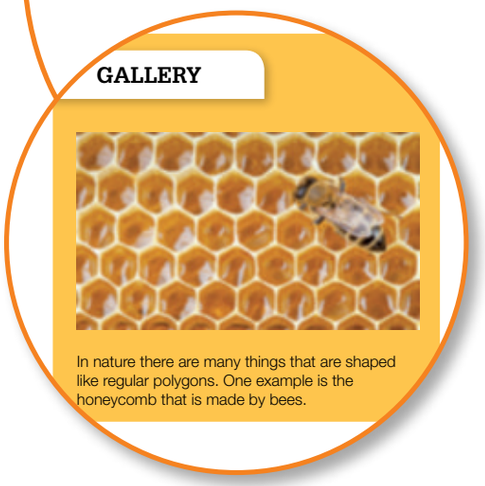
Step 6. Join points *A, C* and *E* to form an equilateral triangle.

Technical Drawing I 51

Content

The contents of the unit are introduced with examples that show you step-by-step how to draw geometric constructions.

These pages are intended to develop your **mathematical competence and competence in science, technology and engineering**.

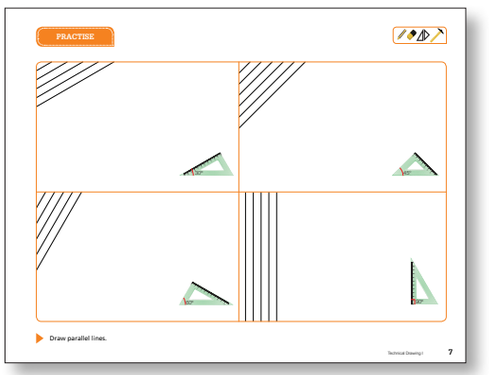

GALLERY

In nature there are many things that are shaped like regular polygons. One example is the honeycomb that is made by bees.

Gallery

This section further develops your knowledge of technical drawing. Some additional information about the use of technical drawing in other areas is also included.

In addition, you will also develop your **personal, social and learning to learn competence** and **citizenship competence**.


PRACTISE

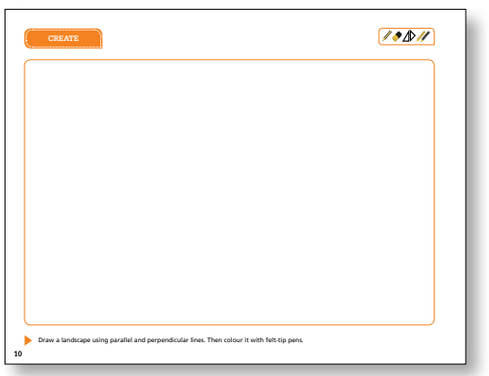
Draw parallel lines.

Technical Drawing I 7

Practise

These activities enable you to put into practice what you have learned in the unit.

By doing these worksheets, you will improve your **personal, social and learning to learn competence** and **digital competence**.


CREATE

Draw a landscape using parallel and perpendicular lines. Then colour it with felt-tip pens.

10

Create

These activities allow you to apply and to show what you have learned about the subject.

By doing these worksheets, you will improve your **entrepreneurship competence** and **cultural awareness and expression competence**.

Contents

Instruments and recommendations for Technical drawing

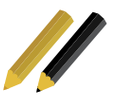
Protractor

French curve

Set squares

Rubber

Pencil



Coloured pencils

T-square

Compass

Ruler

Pencil sharpener

How to prepare the drawing instruments

- Keep the pencils sharpened.
- Clean the set squares and rulers before and after their use.
- Sharpen the lead point of the compass to get clear and precise measurements.
- Make sure the rubber has clean and sharp edges.

The drawing process

- Read the instructions carefully and refer to the images.
- Remember that each step of the process is given in a logical order.
- Draw the guidelines with a hard pencil (H), pressing lightly.
- Complete the final drawing lines with a soft pencil (B).
- Do not rub out the guidelines until the drawing is completely finished.

Take note

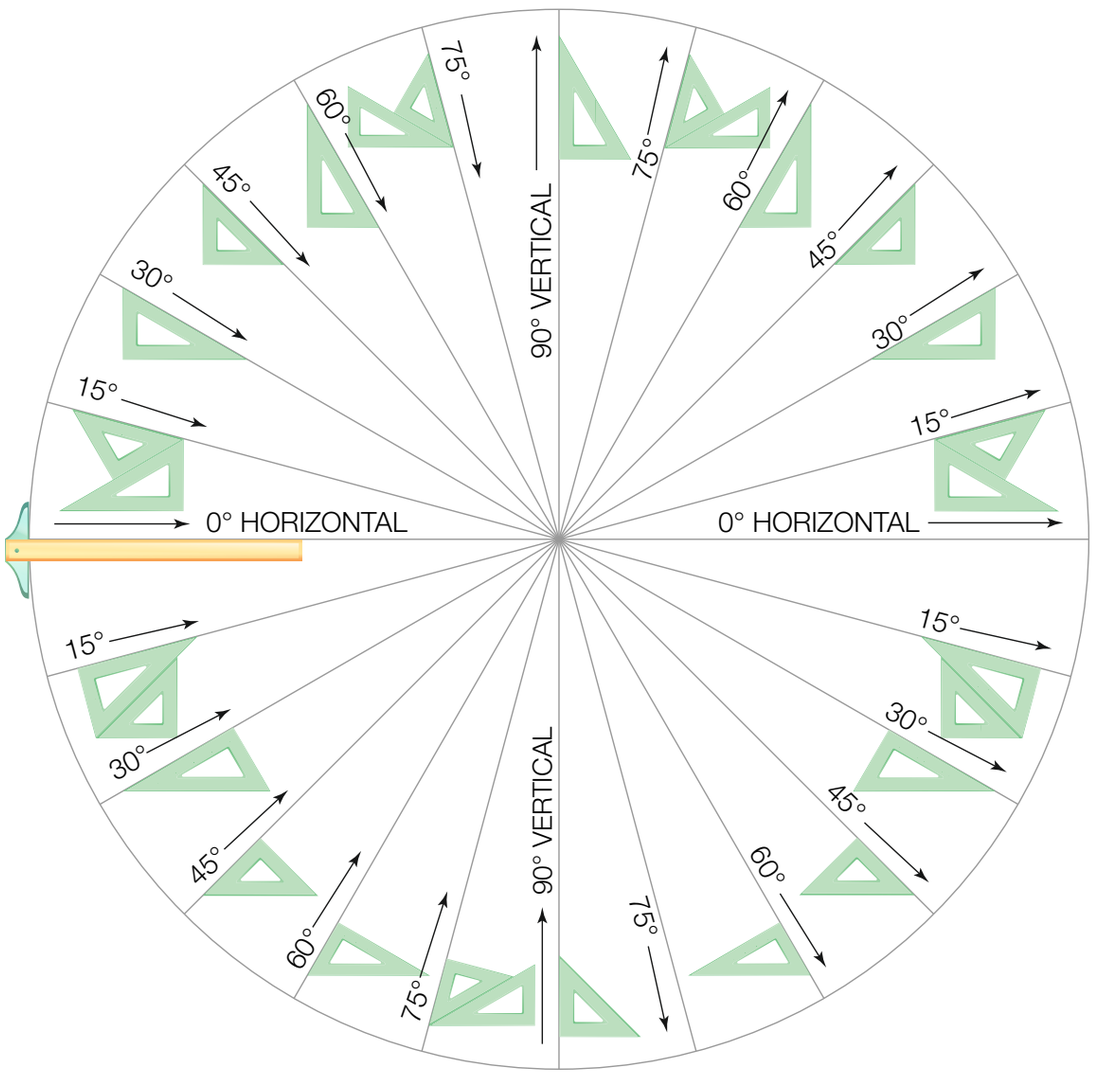
- Read the directions and instructions before starting the worksheet.
- Sign your worksheets with your name. Use technical lettering.
- Keep your desk and worksheets clean.

1 Using set squares

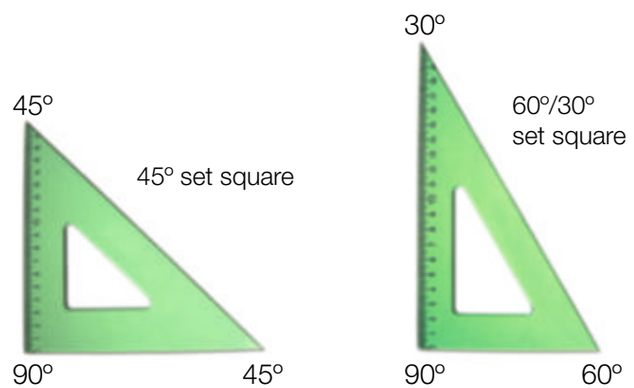
Set squares are templates in the form of a right-angled triangle. With the help of a ruler, they allow you to draw horizontal lines, vertical lines and lines at an angle to the horizon. There are two types of set squares:

- The **45º set square** has two angles of 45º and one right angle of 90º. This shape forms an isosceles triangle because two of its sides and two of its angles have the same measurements.
- The **60º/30º set square** has two acute angles of 60º and 30º, and one right angle of 90º. This shape forms a scalene triangle because all of its sides and angles have different measurements.

Set squares are used to form angles of different sizes. To do this, you place the T-square horizontally and put the set squares in the positions you can see on the right.



GALLERY



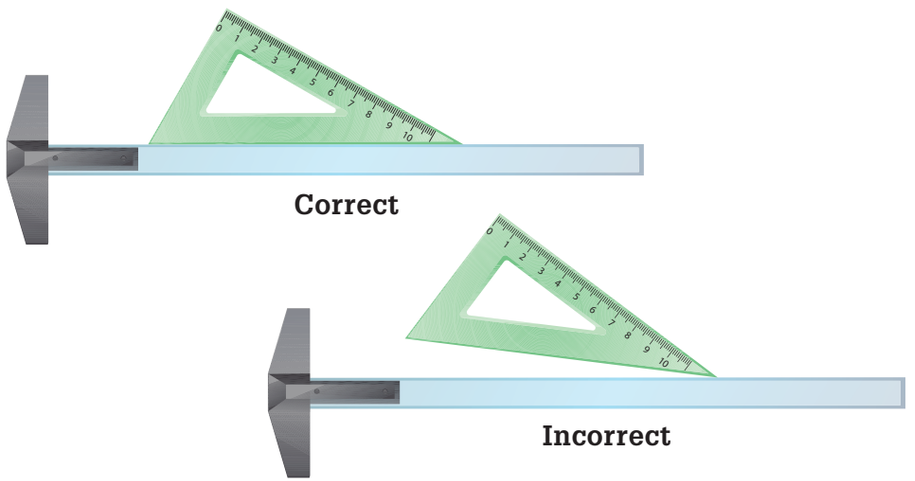
Set squares can be made from various materials, but they are usually made of clear plastic.

Draw straight lines at angles of 30°, 45° and 60°

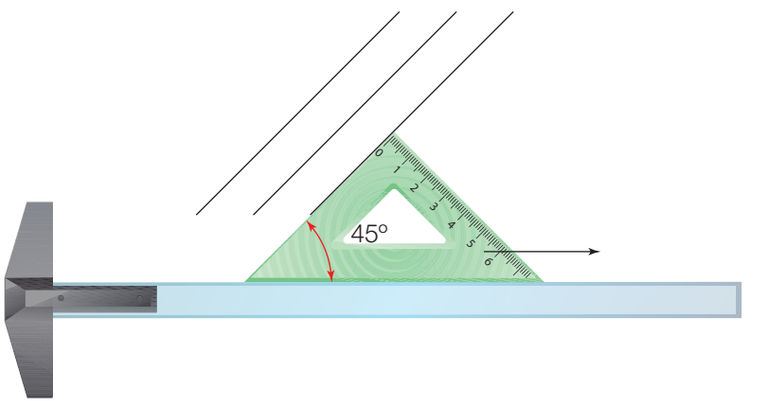
When constructing angles with the set squares, check they are in the correct position on the T-square.

- To draw a straight line at an angle of 30°, use a 60º/30º set square.
- To draw a straight line at an angle of 45°, use a 45º set square.
- To draw a straight line at an angle of 60°, use a 60º/30º set square.

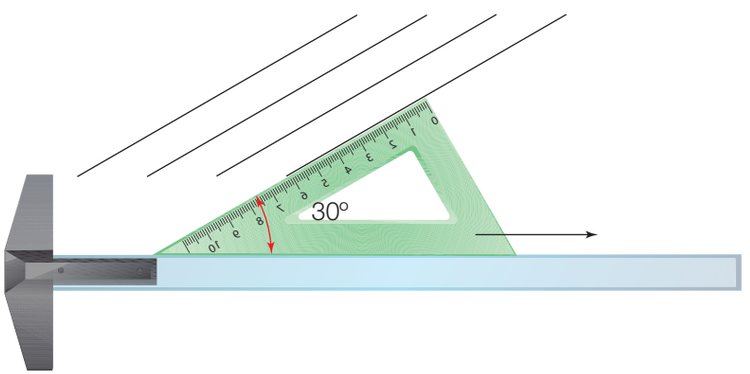
Position of the set squares



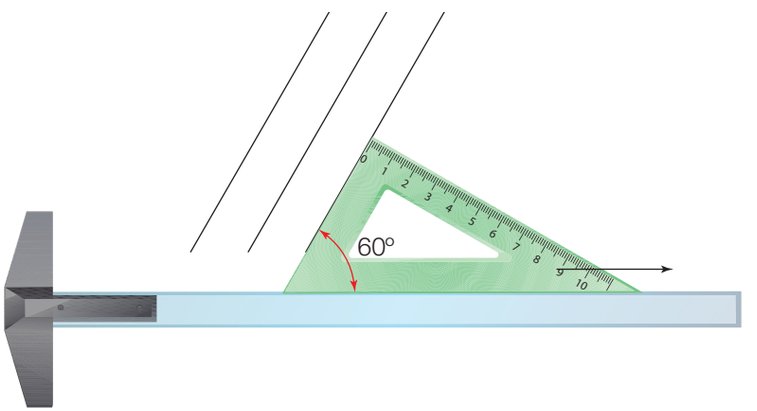
How to draw a line at an angle of 45°



How to draw a line at an angle of 30°

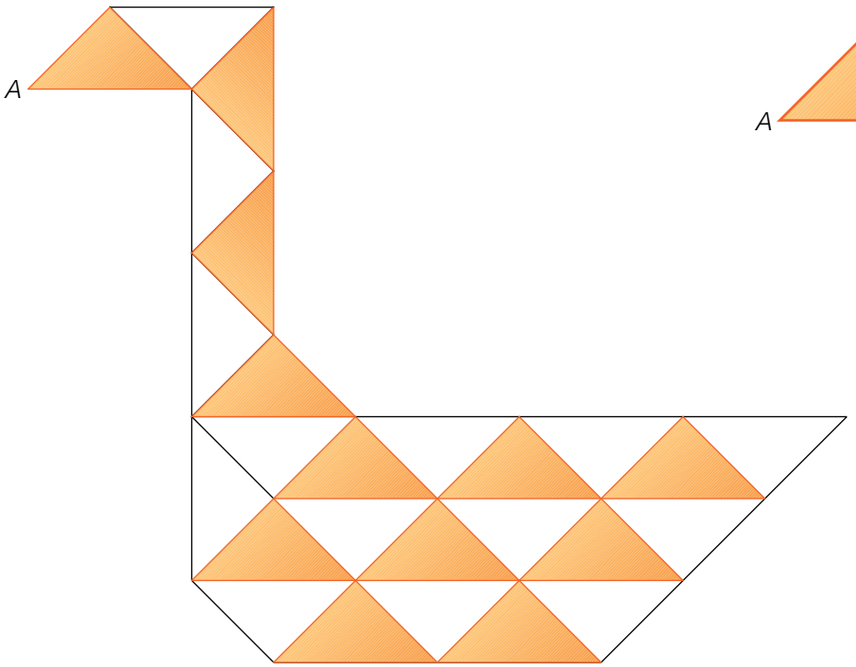


How to draw a line at an angle of 60°



Practise the activities on the previous page.

PRACTISE



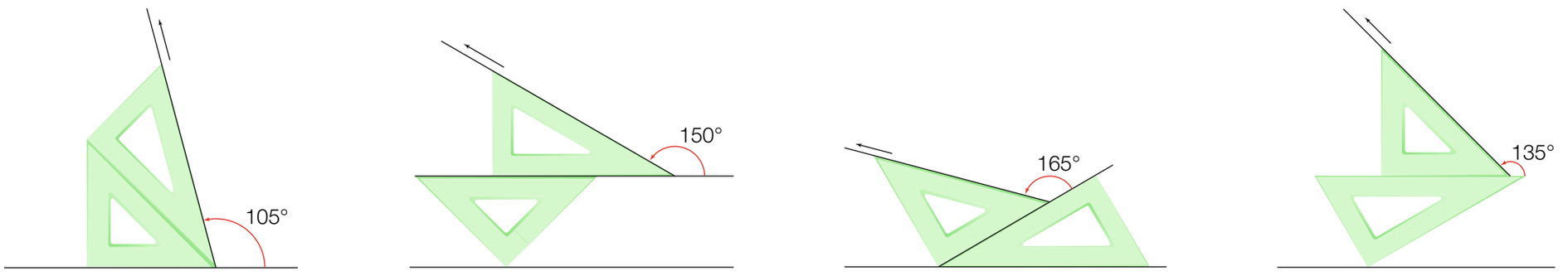
Construct this figure. Use a 45° set square.

CREATE

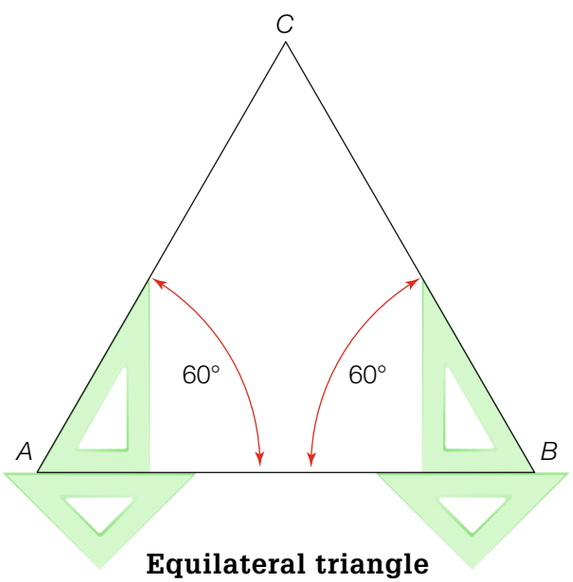
Draw a landscape using parallel and perpendicular lines. Then colour it with felt-tip pens.

Use set squares to draw angles greater than 90°

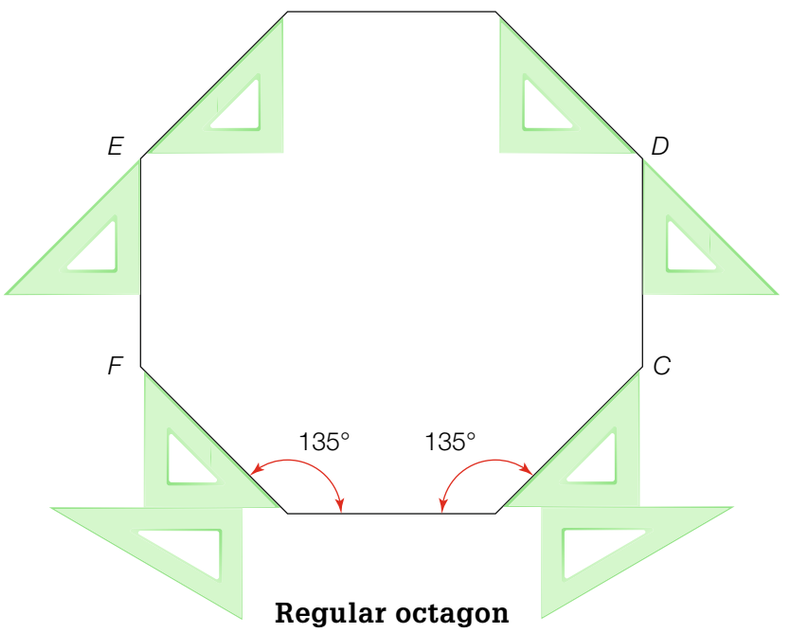
To draw **angles that are greater than 90°**, position a 60°/30° set square and a 45° set square as follows:



With a 60°/30° set square and a 45° set square, you can also **construct some regular polygons** given one of their sides.
For example, an equilateral triangle or an octagon.



Equilateral triangle



Regular octagon