

Visual arts  
**Design & Create**

# Technical drawing

Level **I** **SECONDARY**

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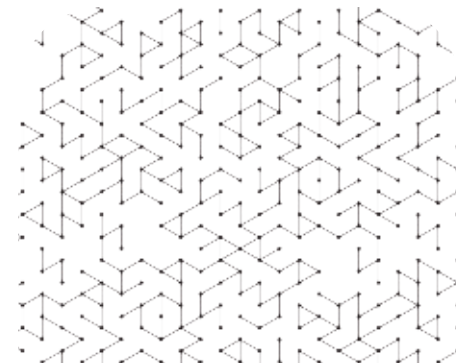
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# Technical drawing I

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](http://santillana.es/clil)

### 7 Regular polygons

**7** A polygon is a flat shape bounded by three or more straight lines. A regular polygon is a polygon in which 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:** A, B, C, D, E and F.
- **Diagonals:** These are segments that connect two non-adjacent 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**.

**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 C.  
**Step 3.** Use the point A and the length of the previous radius. Draw an arc that intersects the circumference at points B and D.  
**Step 4.** Use corner 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 FD to form a regular hexagon.  
**Step 6.** Join points A, C and E to form an equilateral triangle.

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

## 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**.

### PRACTISE

Draw parallel lines.

## 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**.

## 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**.

### CREATE

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

## 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**.

### GALLERY

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

# Contents

UNITS	
<b>1</b>	<ul style="list-style-type: none"> <li>• Draw lines at angles of 30°, 45° and 60°</li> <li>• Draw parallel lines</li> <li>• Construct shapes with set squares</li> <li>• Use set squares to draw angles greater than 90°</li> </ul>
<b>Using set squares</b>	5
<b>2</b>	<ul style="list-style-type: none"> <li>• Recommendations for using and looking after a compass</li> <li>• Draw perpendicular lines with a compass</li> <li>• Draw the perpendicular bisector of a segment</li> <li>• Draw a straight line parallel to another straight line</li> <li>• Divide a segment into equal parts</li> <li>• Construct figures with a compass</li> </ul>
<b>Using a compass</b>	13
<b>3</b>	<ul style="list-style-type: none"> <li>• Definition and classification of angles</li> <li>• How to construct angles: make an exact copy of an angle, bisect an angle and trisect a right angle</li> <li>• Construct figures with a compass and set squares</li> </ul>
<b>Angles</b>	19
<b>4</b>	<ul style="list-style-type: none"> <li>• The circumference and its elements</li> <li>• The circle and its divisions</li> <li>• Constructions using a compass: a circumference that passes through three given points; a figure formed by arcs of a circumference; and decorative figures formed by circumferences</li> </ul>
<b>The circumference and the circle</b>	27
UNITS	
<b>5</b>	<ul style="list-style-type: none"> <li>• Definition and classification of triangles</li> <li>• Notable lines and points of a triangle</li> <li>• How to construct triangles: given three sides; and given two sides and the angle they form</li> <li>• Construct figures with triangles</li> </ul>
<b>Triangles</b>	35
<b>6</b>	<ul style="list-style-type: none"> <li>• Definition and classification of quadrilaterals</li> <li>• How to construct parallelograms: construct a rhomboid and a diamond given its diagonals</li> <li>• Construct isosceles trapeziums given the sides and the height; construct trapeziums given one of the sides, the diagonals and the height; and construct trapezoids given the four sides and a diagonal</li> <li>• Construct figures and landscapes using quadrilaterals</li> </ul>
<b>Quadrilaterals</b>	43
<b>7</b>	<ul style="list-style-type: none"> <li>• Elements of a polygon</li> <li>• How to construct a regular polygon: a triangle, a hexagon, a square and an octagon inscribed in a circumference</li> <li>• Construct decorative shapes with polygons</li> </ul>
<b>Regular polygons</b>	51
<b>Final activities</b>	<ul style="list-style-type: none"> <li>• An activity bringing together all the points covered in this book</li> <li>• Digital resources: draw a star with Inkscape</li> <li>• Create a design and add figures to it using Inkscape</li> </ul>
<b>Final activities</b>	59
<b>Glossary</b>	<ul style="list-style-type: none"> <li>• Technical drawing terms that are used in this material</li> </ul>
<b>Glossary</b>	63

# 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

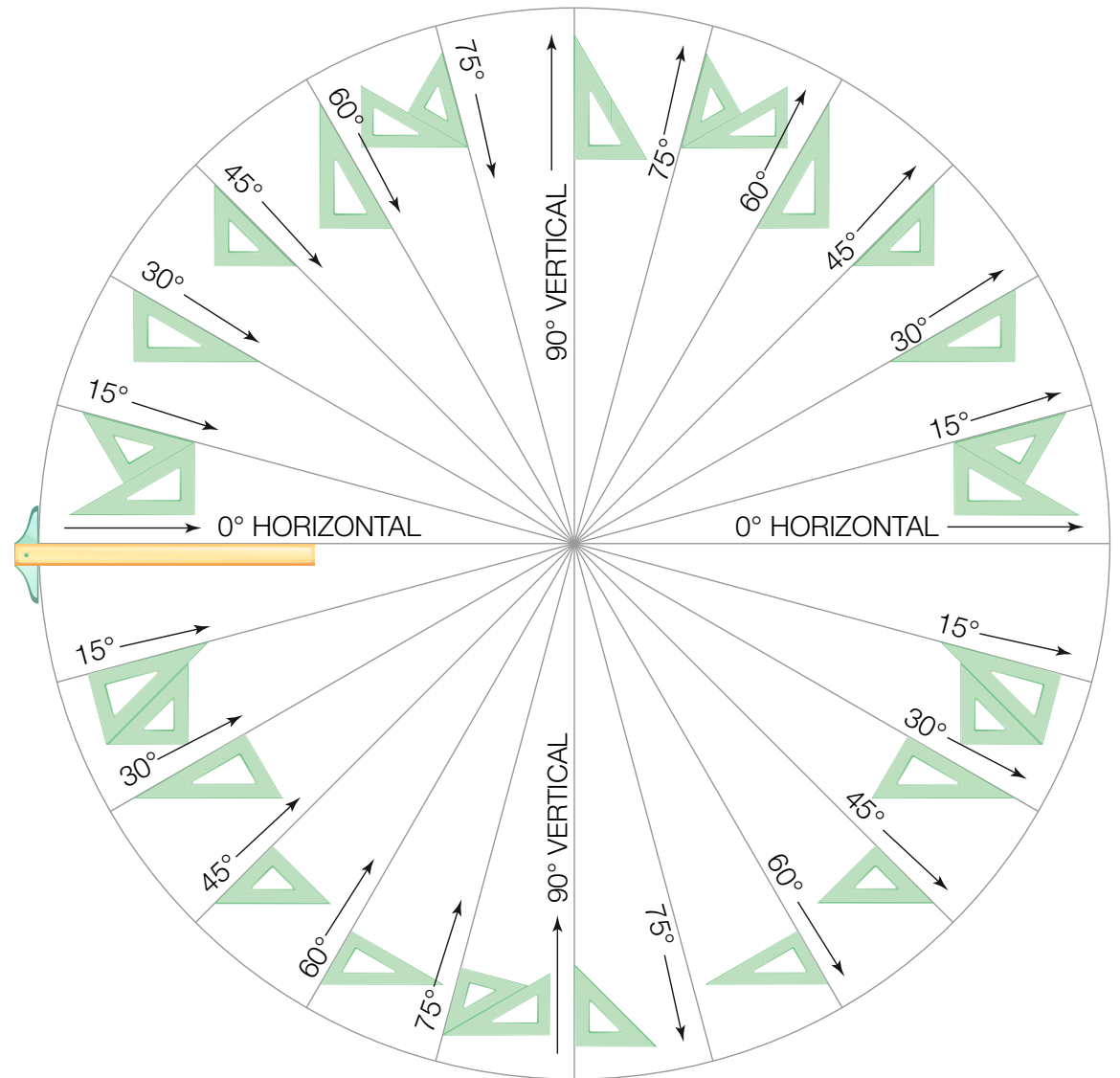
# Using set squares



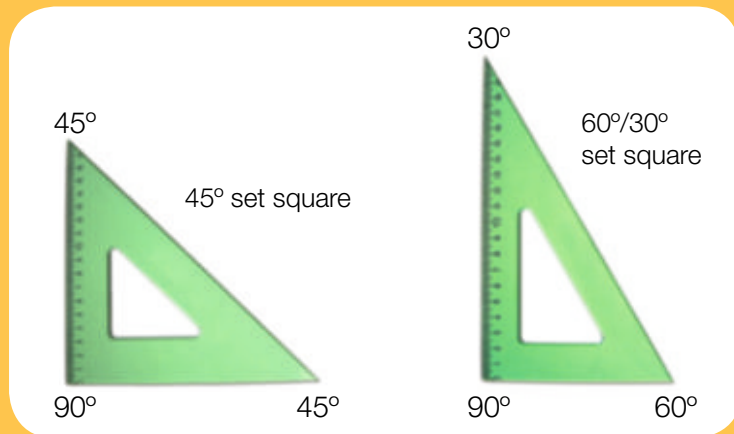
**Set squares** are templates in the form of a right-angled triangle. With the help of a ruler, they allow you to draw horizontal lines, vertical lines and lines at an angle to the horizon. There are two types of set squares:

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



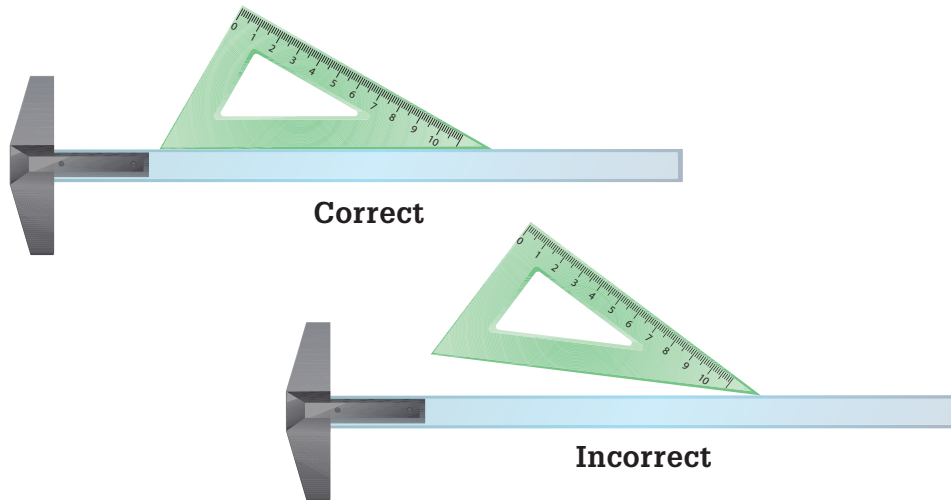
Set squares can be made from various materials, but they are usually made of clear plastic.

# Draw straight lines at angles of $30^\circ$ , $45^\circ$ and $60^\circ$

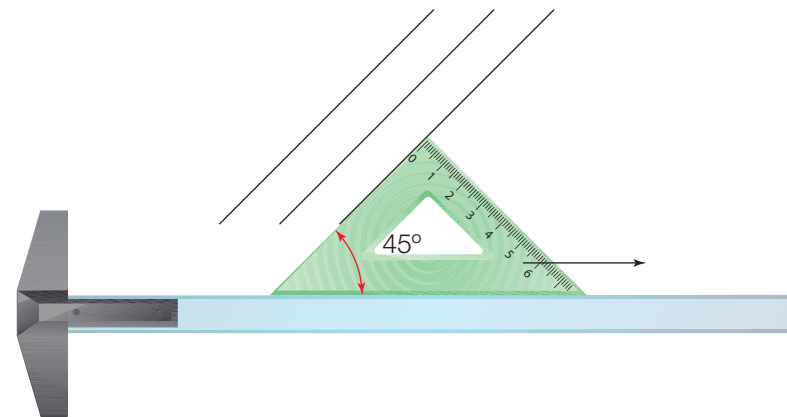
When constructing angles with the set squares, check they are in the correct position on the T-square.

- To draw a straight line at an angle of  $30^\circ$ , use a  $60^\circ/30^\circ$  set square.
- To draw a straight line at an angle of  $45^\circ$ , use a  $45^\circ$  set square.
- To draw a straight line at an angle of  $60^\circ$ , use a  $60^\circ/30^\circ$  set square.

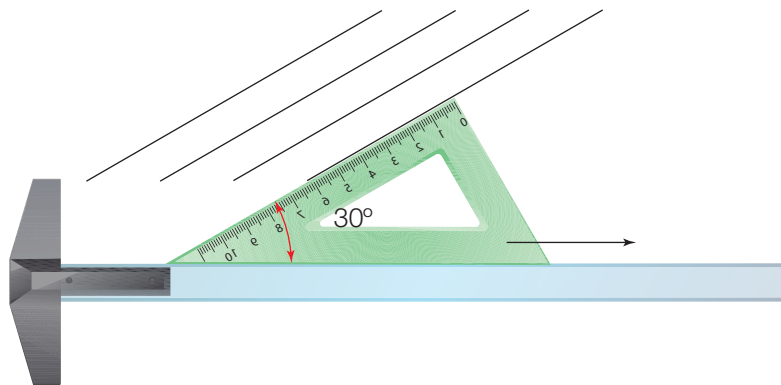
## Position of the set squares



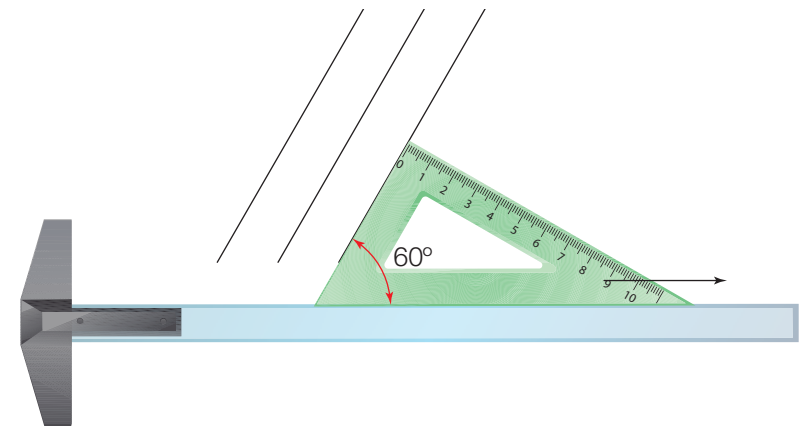
## How to draw a line at an angle of $45^\circ$



## How to draw a line at an angle of $30^\circ$



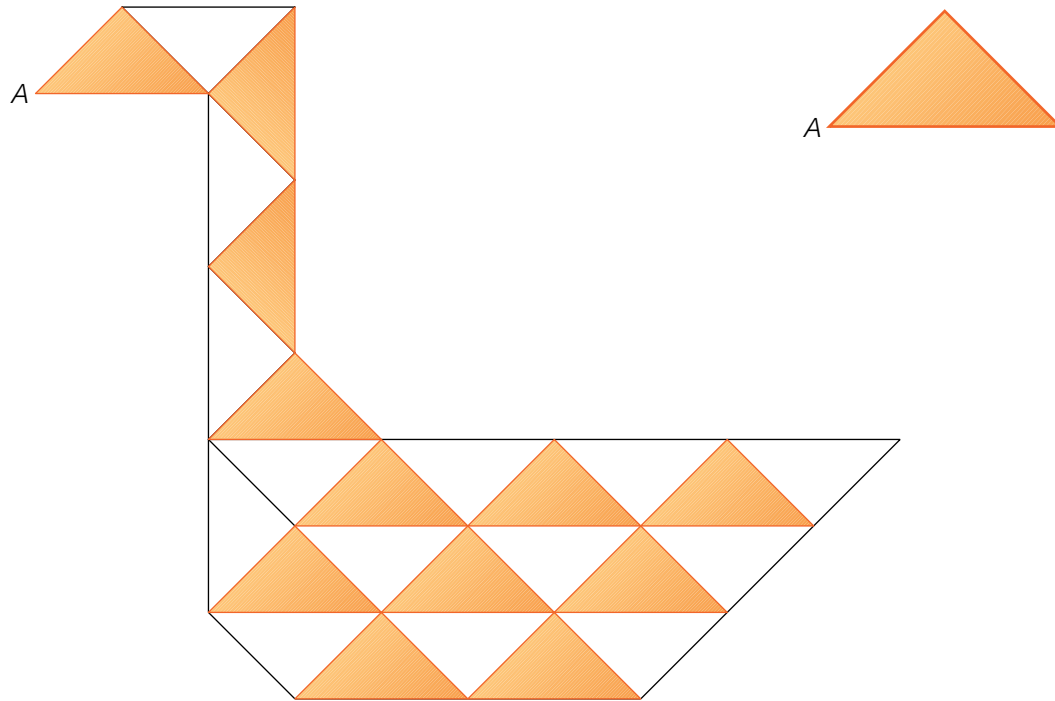
## How to draw a line at an angle of $60^\circ$





Practise the activities on the previous page.

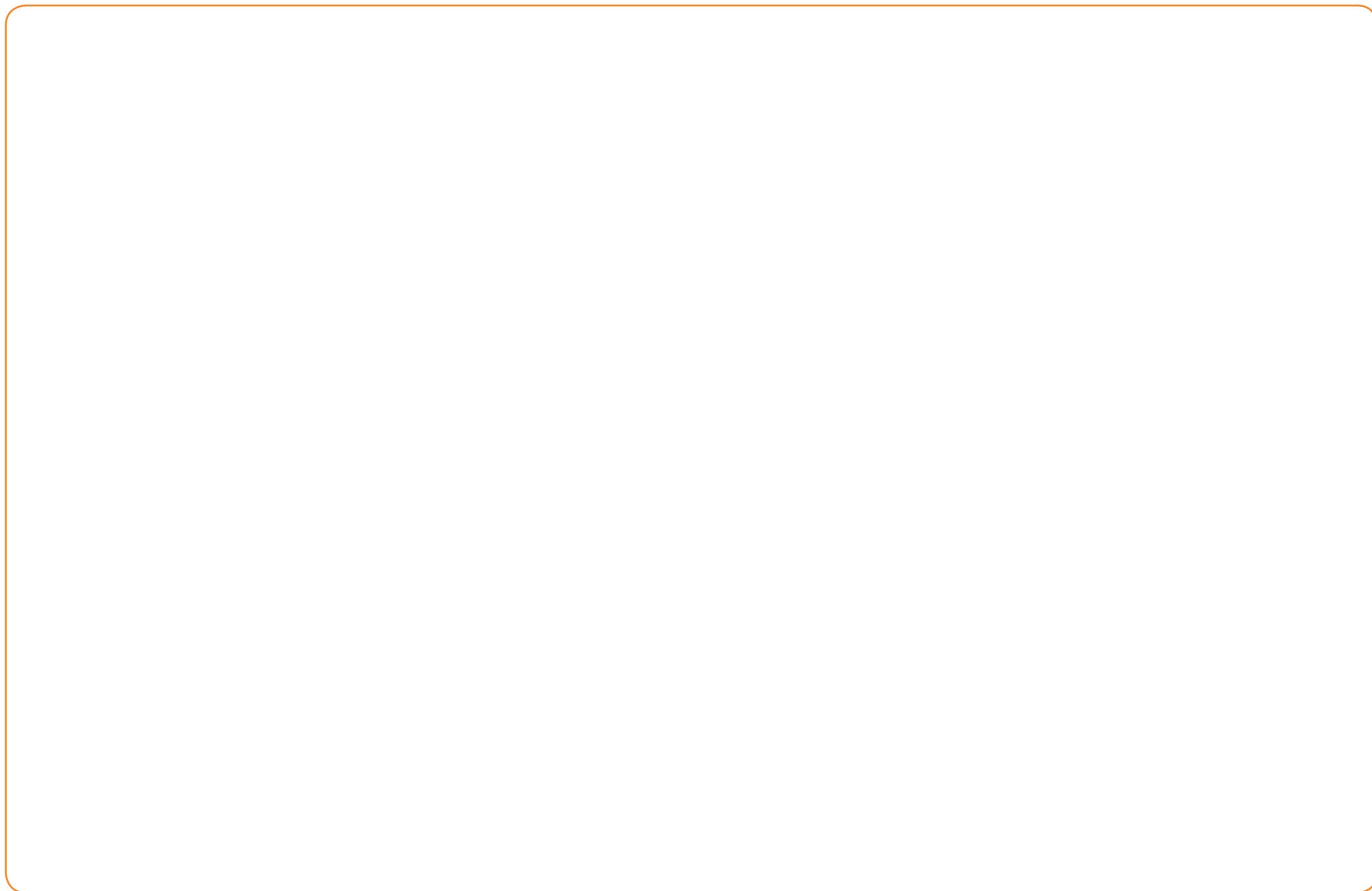
PRACTISE



► Construct this figure. Use a 45° set square.



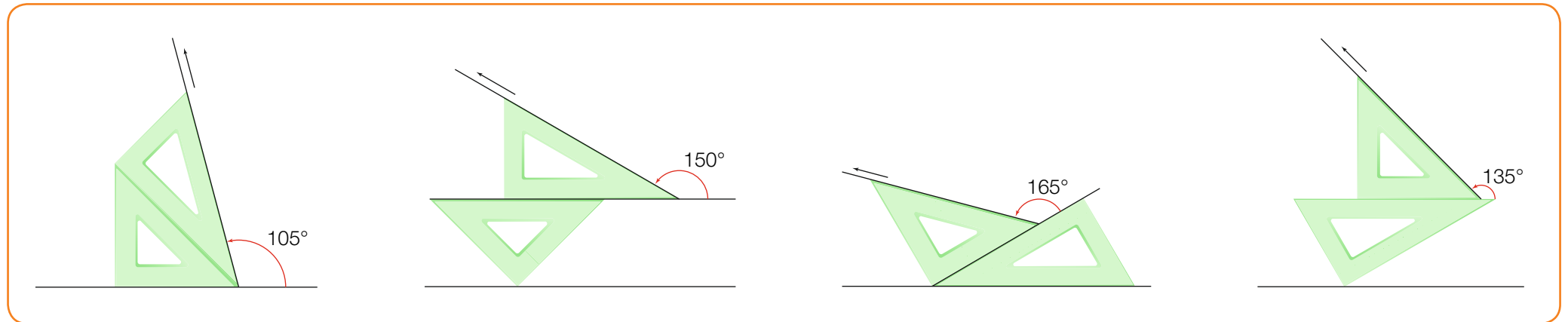
CREATE



▶ 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.

