S3.1 Constructing triangles

objectives

- Use the labelling conventions for lines, angles and shapes.
- Use a ruler and protractor to:
  - measure and draw lines to the nearest millimetre and angles to the nearest degree;
  - construct a triangle given two sides and the included angle or two angles and the included side.
- Solve problems and investigate in shape, space and measures.

starter

Vocabulary
triangle
isosceles
pentagon
regular
vertex
vertices

Resources
OHT S3.1a
Resource S3.1b

Show **OHT S3.1a**. Trace round the perimeter of the pentagon and ask:

Q What is the name of this shape?

Tell the class that the shape is a *regular pentagon*, and that 'regular' means that all the sides are the same length, and all the angles are equal. Write *regular pentagon* on the board. Say that an equilateral triangle is regular, and so is a square.

Explain that each corner or vertex of the pentagon is labelled by a letter, and that the pentagon is the shape ABCDE. Trace round one of the triangles in the pentagon, such as triangle ABG.

Q What would we call this triangle using the letters?

Explain that ABG, BGA or GAB represent the same triangle.

Q How many different triangles can you see in the pentagon?

Give each pupil a copy of **Resource S3.1b**. Get pupils to work in pairs and to record different triangles by drawing them and labelling the vertices of the triangle on the diagram. Stress that the triangles can be different sizes and shapes. Allow the pairs several minutes to discover as many as possible of the 11 different triangles, then bring the class together. Refer to triangle ABE on **OHT S3.1a**.

Q What kind of triangle is triangle ABE? (isosceles) **Can you explain why?**

Establish that triangle ABE must be isosceles because two of its sides are equal, since they are also sides of the regular pentagon.

Q Which two angles must be equal? (angle ABE and angle BEA)
Q Are any other triangles that you found isosceles?

Ask pupils to respond using the letter labels. Ask them to justify their conclusions by identifying which sides and which angles are equal.

main activity

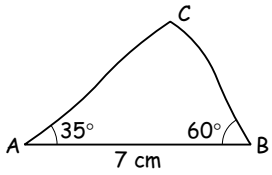
Vocabulary
construct

Resources
blank OHTs
transparent ruler and protractor
rulers and protractors for pupils
Resources S3.1c, S3.1d

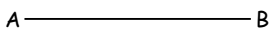
Show the class how to construct a triangle, given two angles and the included side. Write on the board:

Construct triangle ABC.
AB = 7 cm angle A = 35° angle B = 60°

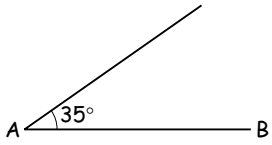
Start by sketching the triangle on a blank OHT.



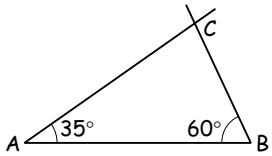
Use a ruler to draw a line AB 7 cm long.



Use a protractor to draw an angle of 35° at A.



Use a protractor to draw an angle of 60° at B. Label point C.

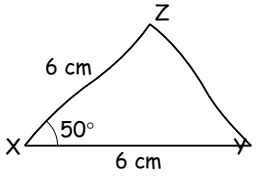


Give pupils **Resource S3.1c**. Ask them to use their rulers and protractors to construct the two triangles.

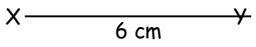
Write on the board:

Construct triangle XYZ.
XY = 6 cm XZ = 6 cm angle X = 50°

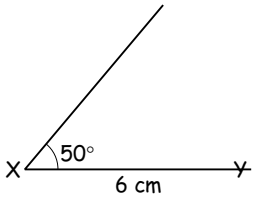
Start by sketching the triangle on a blank OHT.



Use a ruler to draw a line XY 6 cm long.



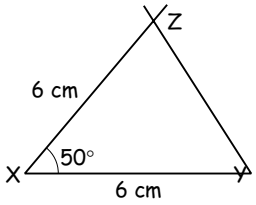
Use a protractor to draw an angle of 50° at X.



Measure from X a distance of 6 cm and mark it on the line.

Label this point Z.

Join ZY.



Give pupils **Resource S3.1d**. Ask them to use their rulers and protractors to construct the two triangles.

other tasks

Springboard 7
Unit 14

Unit 14 section 4: Drawing angles

1 Constructing accurate triangles page 460
Star challenge 7: More triangles page 462

You may wish to provide some further examples of constructing triangles.

plenary

Vocabulary
perimeter

Resources
seven sticks or straws of equal length to place on the OHP

Place six of the seven sticks on the projector. Invite a pupil to the projector to make a triangle using all six sticks (with sides 2, 2, 2).

Q **What type of triangle has been made?** (equilateral)

Q **What is its perimeter?** (6 units or sticks)

Q **Is it possible to make a triangle from the six sticks with one side 3 units long?**

Allow the pupil to experiment and to discover that it is impossible: the sum of the two shorter sides of a triangle must always be greater than the longest side, otherwise the two shorter sides would not meet.

Add one more stick. Invite a different pupil to make a triangle using all seven sticks (e.g. with sides 3, 3, 1). Ask another pupil to make a different triangle (e.g. 3, 2, 2). Point out that the perimeter of each triangle is 7 units long.

Q **Can you use the seven sticks to make a triangle with one side 4 units long?**

If pupils do not realise immediately that it would be impossible, allow a pupil to experiment. Stress again that the sum of the two shorter sides must be greater than the longest side.

Tell the class to work in pairs. Ask them to investigate the different triangles that they could make with a perimeter of 11 units. After a few minutes, gather the results, writing a list of the lengths of the sides on the board:

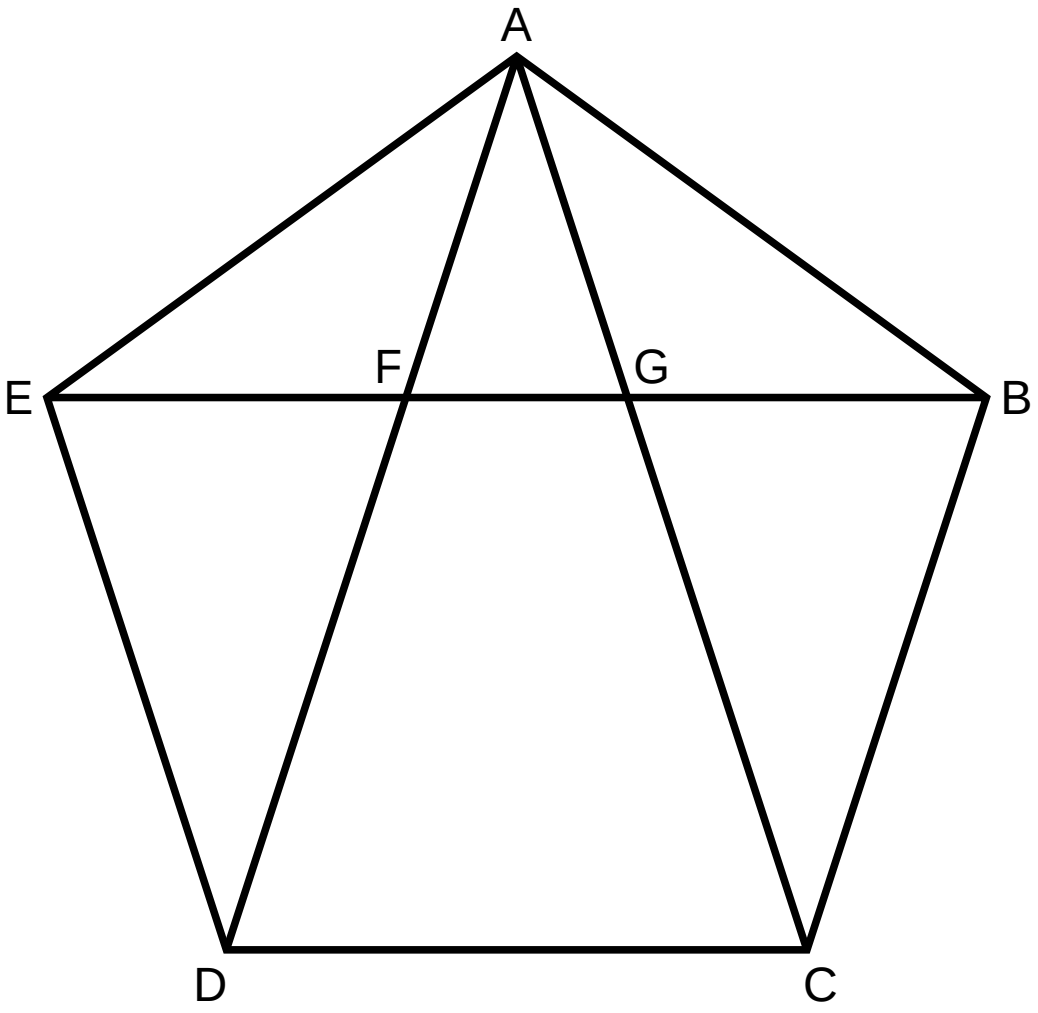
5, 5, 1
5, 4, 2
5, 3, 3
4, 4, 3

Check with the class that in each case the sum of the two shorter sides is greater than the longest side.

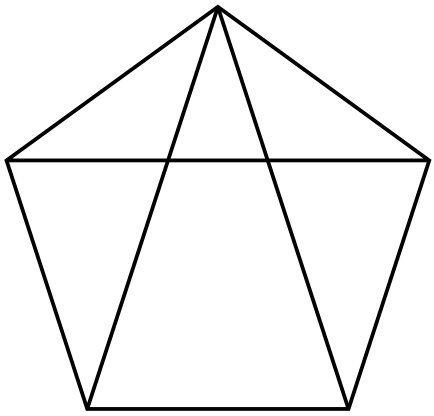
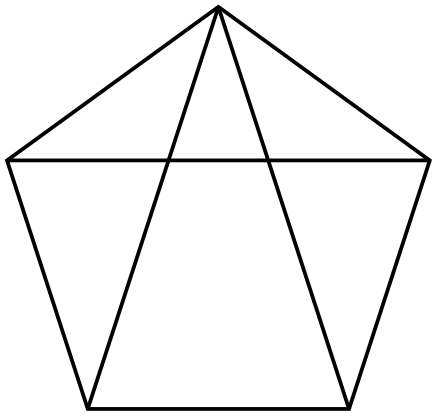
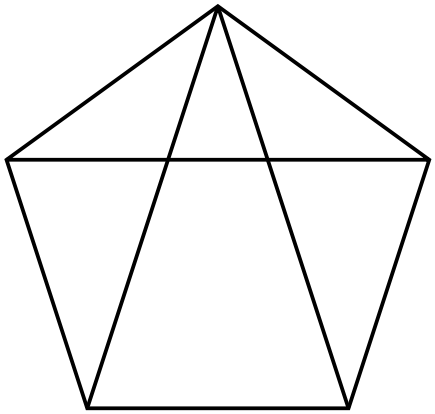
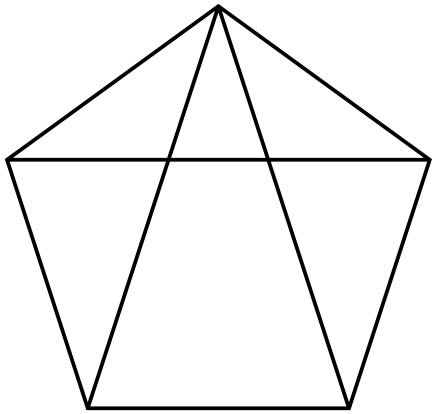
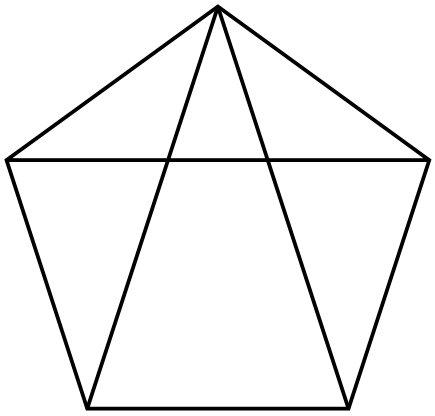
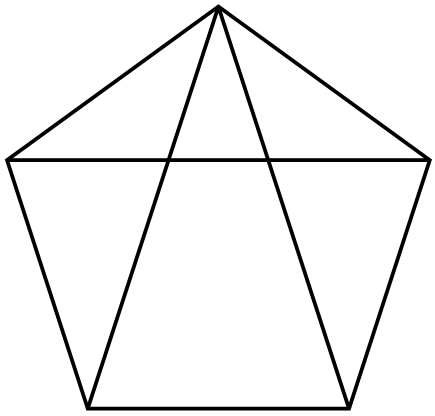
Remember

- The vertices of a polygon can be labelled with letters. You can use the letters to refer to sides and angles of the polygon.
- You can use a ruler and protractor to construct a triangle, given two sides and the included angle, or two angles and the included side.
- The sum of the two shorter sides of a triangle must be greater than the longest side.

OHT S3.1a



Resource S3.1b

Resource S3.1c

In the space below, construct triangle LMN.

LM = 8 cm angle L = 45° angle M = 30°

Measure side MN. What is its length? ..... cm

In the space below, construct triangle PQR.

PQ = 7.5 cm angle P = 25° angle Q = 105°

Measure side PR. What is its length? ..... cm

Resource S3.1d

In the space below, construct triangle DEF.

DE = 6.5 cm DF = 6.5 cm angle D = 70°

Measure angle E. What is its size? ..... °

In the space below, construct triangle ABC.

AB = 6 cm BC = 5 cm angle B = 120°

Measure angle A. What is its size? ..... °