Planner

Constructions (2)

- Constructing a triangle given the lengths of all three sides
- Constructing a shape made of triangles

Keywords

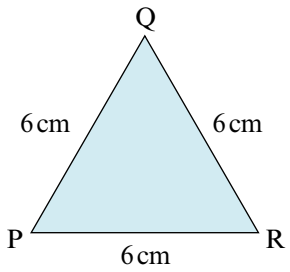
You should know

explanation 1a | explanation 1b | explanation 1c | explanation 1d | online

1 Construct each of these triangles.
Use a ruler and a pair of compasses. Do not use a protractor.

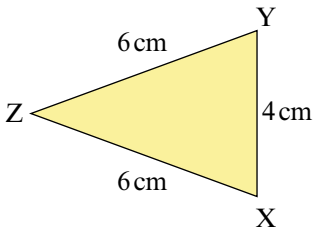
a **i** Triangle PQR
PQ = 6 cm, PR = 6 cm, QR = 6 cm

ii What type of triangle is PQR?



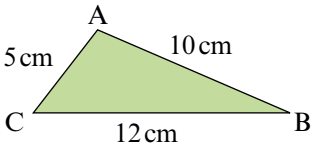
b **i** Triangle XYZ
XY = 4 cm, XZ = 6 cm, YZ = 6 cm

ii What type of triangle is XYZ?



c **i** Triangle ABC
AB = 10 cm, AC = 5 cm, BC = 12 cm

ii What type of triangle is ABC?



2 Using a ruler and a pair of compasses only, try to construct triangle LMN where LM = 10 cm, LN = 4 cm and MN = 3 cm.

Is it possible to construct triangle LMN? Explain your answer.

3 The table shows the side lengths of some triangles. Which triangles can be constructed?

Triangle	Dimensions
ABC	AB = 15 cm, AC = 9 cm, BC = 9 cm
DEF	DE = 10 cm, DF = 10 cm, EF = 10 cm
GHI	GH = 20 cm, GI = 9 cm, HI = 7 cm
JKL	JK = 7 cm, JL = 6 cm, KL = 15 cm
MNO	MN = 10 cm, MO = 4 cm, NO = 10 cm

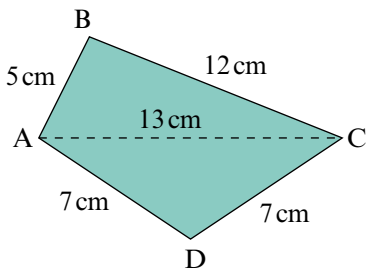
explanation 2a explanation 2b explanation 2c

4 Quadrilateral ABCD has these dimensions.

AC = 13 cm AD = 7 cm

AB = 5 cm CD = 7 cm

BC = 12 cm



a Using a ruler, draw the line AC.

b Using a pair of compasses, construct the quadrilateral ABCD.

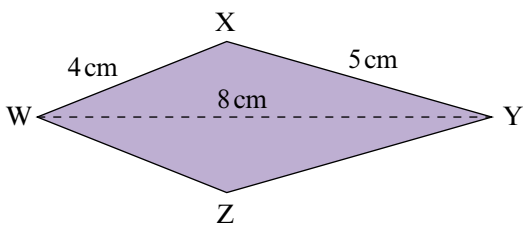
c Measure BD.

5 A kite WXYZ has these dimensions.

WY = 8 cm

WX = 4 cm

XY = 5 cm



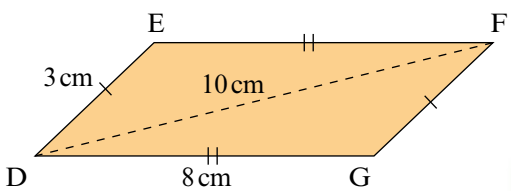
a Using a ruler, draw the line WY.

b Using a pair of compasses, construct kite WXYZ.

c Measure XZ.

6 A parallelogram DEFG has these dimensions.

DF = 10 cm DE = 3 cm DG = 8 cm

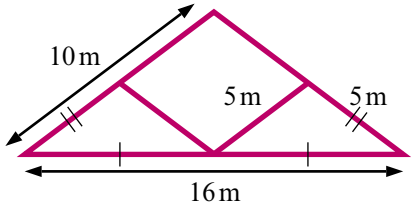


a Using a ruler, draw the diagonal DF.

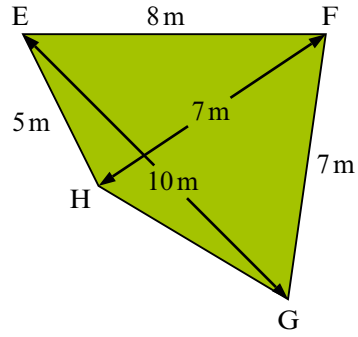
b Using a pair of compasses, construct parallelogram DEFG.

7 The diagram shows a triangular timber roof frame.

Using a ruler and a pair of compasses, construct a diagram of the frame.
Use a scale of 1 : 200.



8 The diagram shows a garden EFGH.
EG = 10 m and FH = 7 m

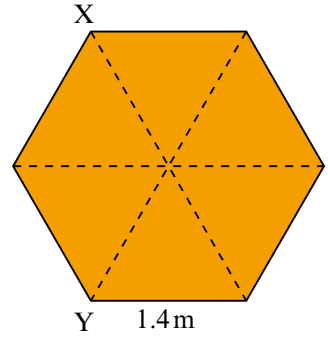


a Using a ruler and a pair of compasses, construct a diagram of the garden.
Use a scale of 1 : 125. Begin by constructing the triangle EFG.

b Measure the length GH on your diagram.

c What is the length GH in the real garden?

9 A garden designer has drawn a patio in the shape of a regular hexagon.



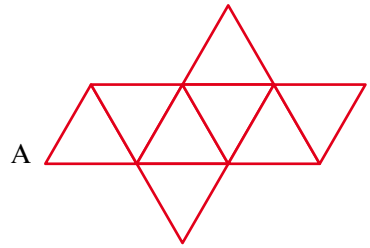
a Using a ruler and a pair of compasses, construct a scale drawing of the patio.
Use a scale of 1 : 35.

b What is the distance XY on the real patio?

10 You can make a model of a regular octahedron by constructing a net made from 8 equilateral triangles.

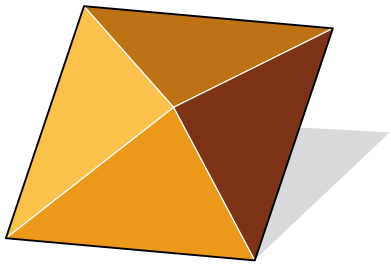
Construct the net shown on a sheet of A4 card.

The net fits onto A4 card if the length of one side of the equilateral triangle is 7 cm and you place vertex A 7 cm up from the bottom left corner of the card.

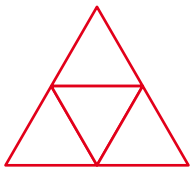


Add tabs where necessary, cut out the net and make it into an octahedron.

11 An octahedron does not have to be regular. This octahedron is made from 8 triangles that have sides of 5 cm, 6 cm and 7 cm. Using a ruler and compasses, draw a net for this octahedron and make it.



12 A regular tetrahedron is made from 4 equilateral triangles.



Here is a net of a regular tetrahedron.

What happens if the triangles are not equilateral?

Can you always, sometimes or never make a tetrahedron if the triangles are not equilateral?

Using ruler and compasses, draw nets and test your hypothesis.

13 These formulae give the side lengths, a, b and c, of a triangle in centimetres.

$$a = \frac{n(2m + n)}{2} \qquad b = m(m + n) \qquad c = \frac{(m + n)^2 + m^2}{2}$$

a $m = 1$ and $n = 3$. Find the sides a, b, and c. Construct the triangle.

b Choose three different pairs of whole-number values of m and n. For each pair, find the sides a, b and c. Construct the triangles.

c What type of triangle do you get each time?

14 **a** **i** Construct a triangle with side lengths 6.5 cm, 7 cm and 7.5 cm.

ii Construct a triangle with side lengths 2 cm, 6.5 cm and 7.5 cm.

iii Construct a triangle with side lengths 2.8 cm, 9.1 cm, and 10.5 cm.

b Use your answers to part **a** to help explain why the following information is not enough to describe triangle ABC completely.

AB = 7.5 cm AC = 6.5 cm ∠ABC = 53°

c Use your answers to part **a** to help explain why the following information is not enough to describe triangle DEF completely.

∠DEF = 113° ∠EFD = 53° ∠EDF = 14°