

SHARP

Worksheet 10 Memorandum: Construction of Geometric Figures

Grade 9 Mathematics

For each of the answers below, we give the steps to complete the task given. We've used the following resources if you would like to refer to them yourself:

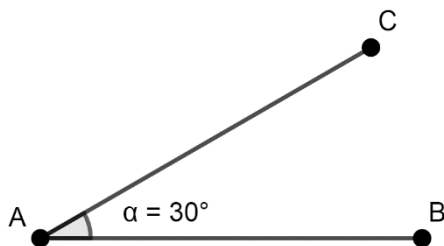
- www.mathopenref.com (images for question 2a – d)

Also note that, there is more than one way to do most of these constructions.

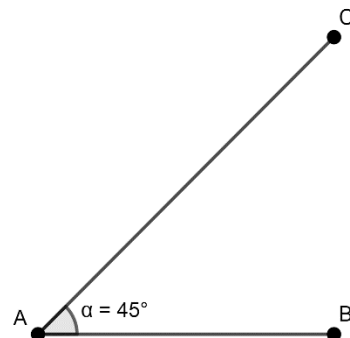
1. For this question, the protractor should be used, and angles marked clearly. Labels should also be drawn/ written in.

*Suggestion for marking – have another student measure these angles with their protractors. This will also give them practice on measuring angles. *

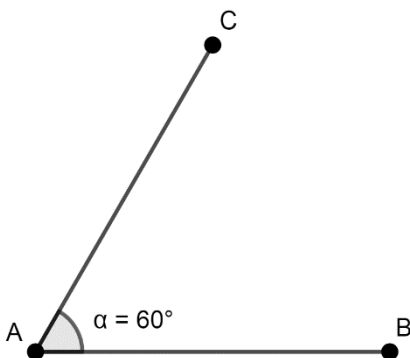
- a) an angle of 30°



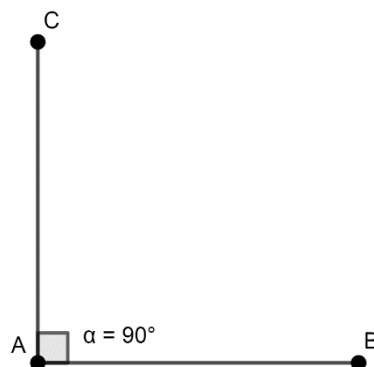
- b) an angle of 45°



- c) angle of 60°

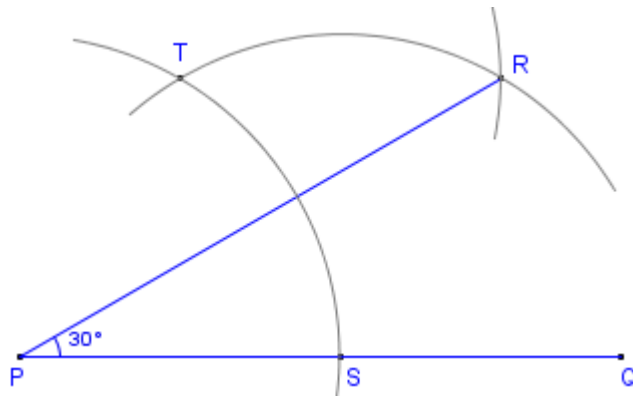


- d) an angle of 90°



2. a) an angle of 30°

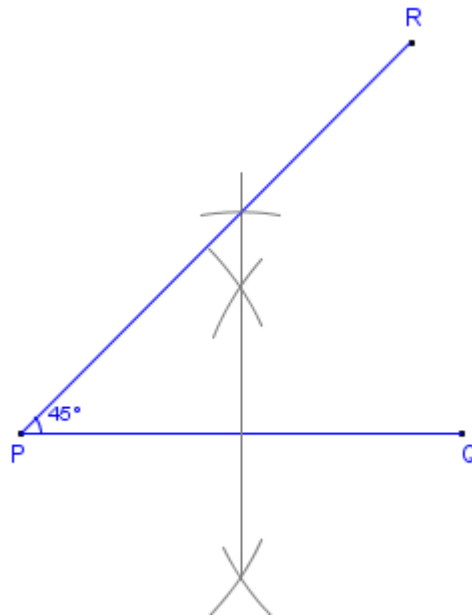
1. Draw a line segment and label e.g. PQ
2. Place the compass point on P and set its length to something convenient.
3. Draw an arc through PQ and up above P. Label the point where the arc crosses PQ as S.
4. Without changing the compasses width, place the point on S and draw another arc that crosses the first one and goes across towards Q. Label the point where the arcs cross as T.
5. Place the compass point on T, and draw an arc through the second arc. Label this point of intersection as R.
6. Draw a line from P to R. This angle ($\angle QPR$) is 30°



b) an angle of 45°

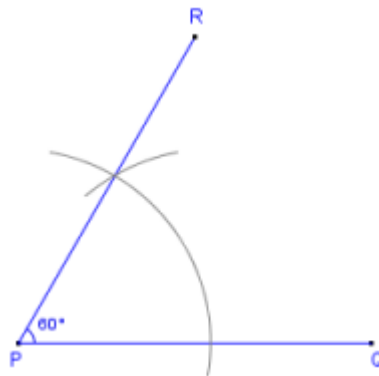
1. Draw a line segment and label e.g. PQ
2. Set the compass's width to just over half of PQ.
3. With the compass's point on P, draw an arc above the line, and another one below the line.
4. Repeat step 3, from point Q, so that the arcs above and below the line intersect.
5. Draw a line between the two arc intersections. (This gives you a perpendicular bisector of the line PQ).
6. With the compass's point on the intersection of the perpendicular line, put the pencil end on P.

7. Draw an arc through the perpendicular line and label this intersection C.
8. Draw a line from P to C. This gives you a 45° angle ($Q\hat{P}C$)



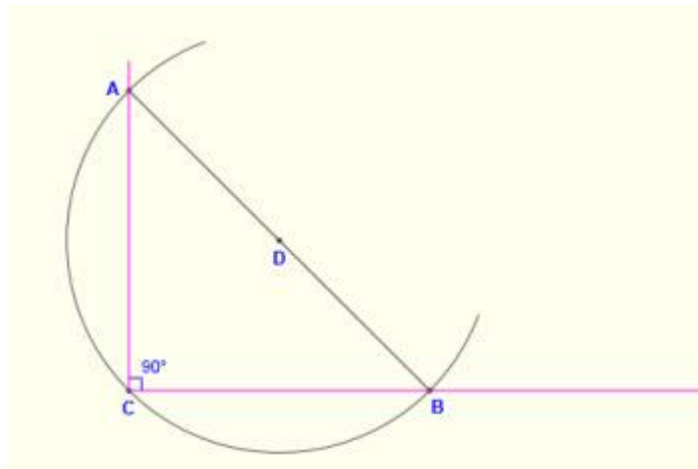
c) an angle of 60°

1. Draw a line segment and label e.g. PQ
2. Place the point of the compass on P, and set its length to shorter than PQ.
3. Draw an arc through PQ and above P.
4. Keep the compass's width the same, and move the compass point to the place where the first arc intersects with PQ and make an arc that crosses the first arc.
5. Draw a line from P through the intersection of the two arcs, label this R.
6. Angle $R\hat{P}Q$ is 60°

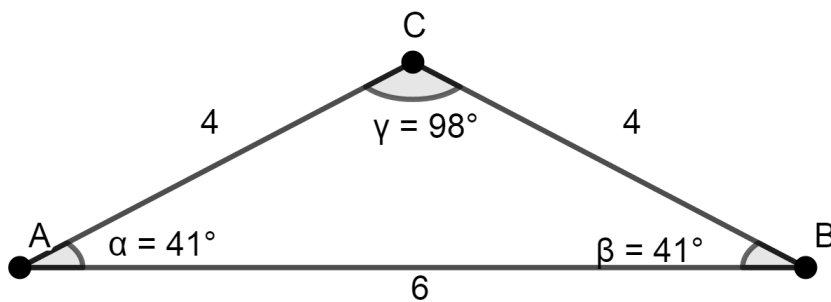


d) an angle of 90°

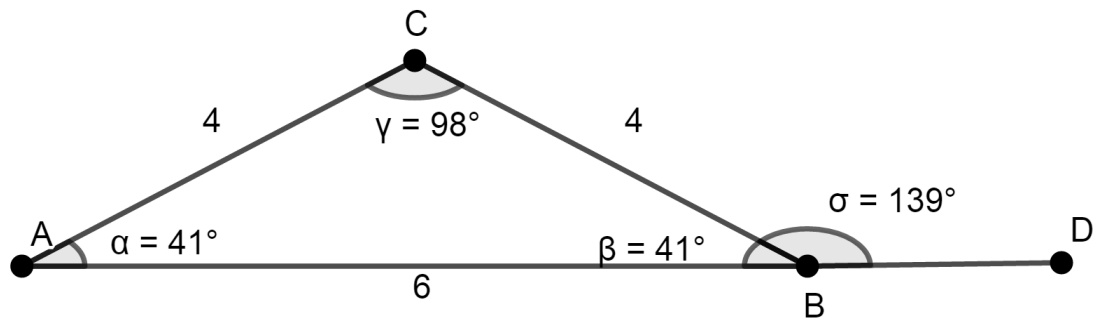
1. Draw a line and label one end-point C.
2. Place a point above C and to the right and label it D.
3. Place the point of the compass on D and the other end on point C.
4. Draw a circle with D at the center.
5. Draw a diameter through D and the point where the circle crosses the line (not C). Label this point B, and the other point above C, A.
6. Draw a line from C to A.
7. The angle $\hat{ACB}$ is a 90° angle.



3.



- a) i) You should notice that the two angles under the sides that are equal are also equal.
- ii) angles under the sides that are equal are also equal.



b)

i) $\widehat{DBC} = 139^\circ$.

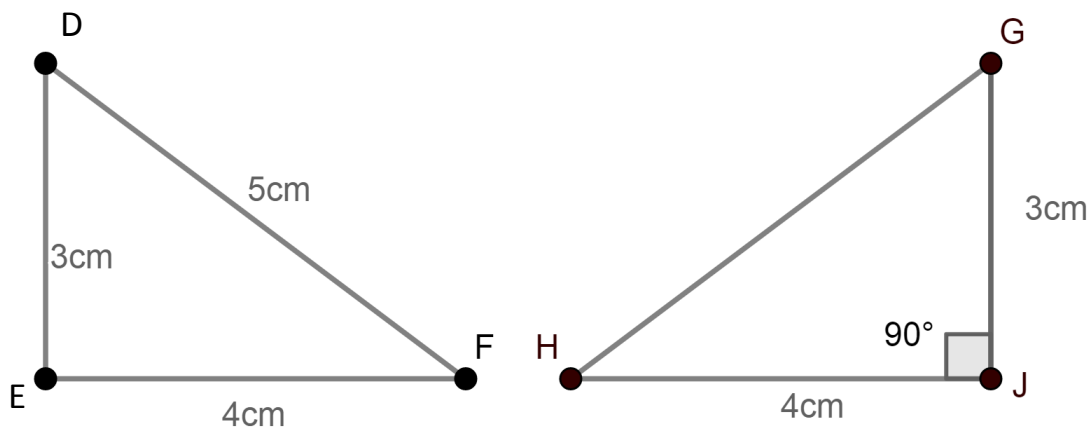
ii) there are several options here:

- Firstly, that the two adjacent angles ($\widehat{ABC}$ and $\widehat{DBC}$) add up to 180°
- Secondly, that the sum of the opposite two angles add up to the value of $\widehat{DBC}$

iii) Two rules:

- Angles on a straight line add up to 180°
- Opposite interior angles add up to the opposite exterior angle of the triangle.

4.

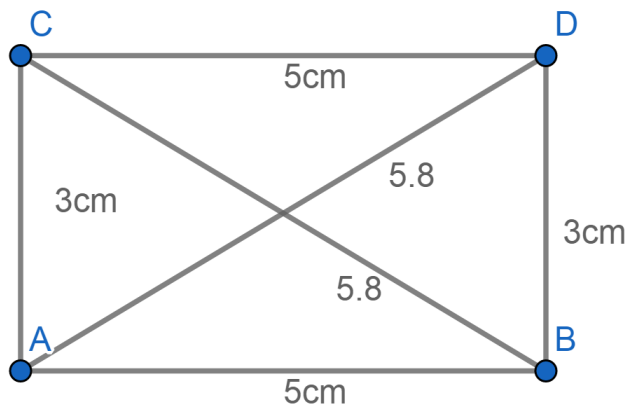


a) These two triangles are exactly the same (they are congruent).

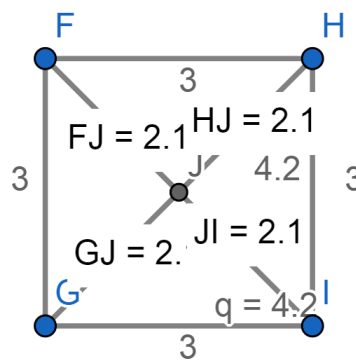
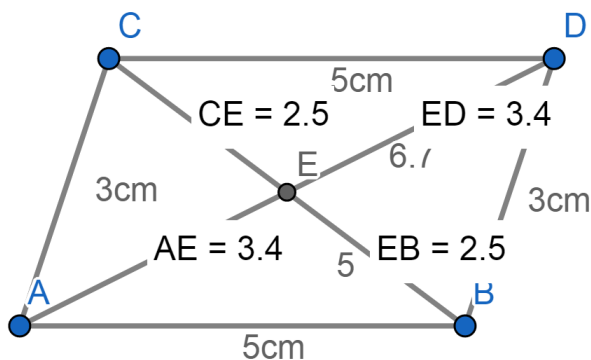
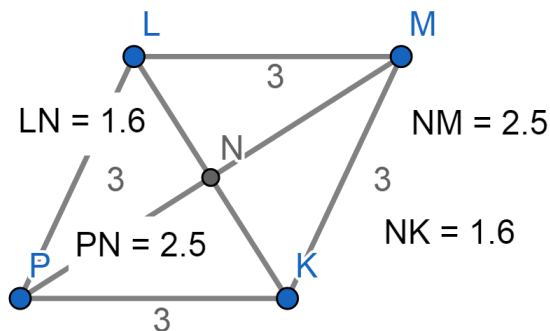
b) You could make the length 5cm and the two angles around it the same as these triangles.

You could draw the length 4cm, the same angle as F, and then the length of 5cm, it will also give the same triangle.

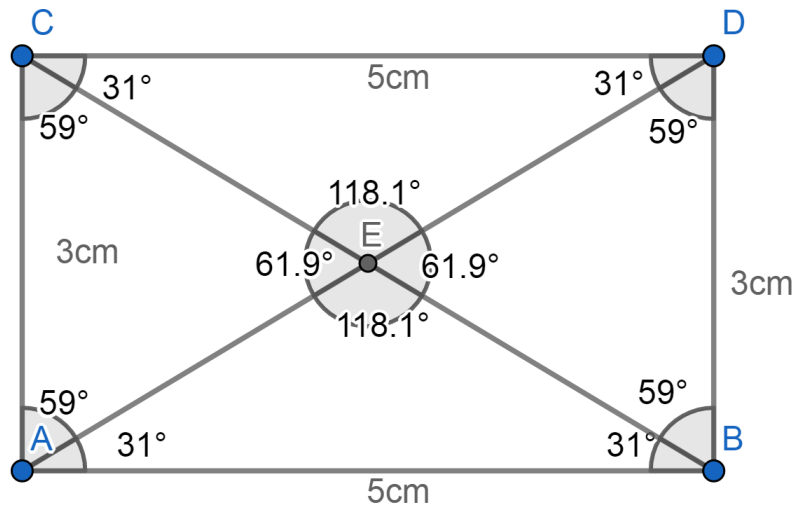
5. Construct a rectangle, the long sides should be 5cm and the short sides should be 3cm.



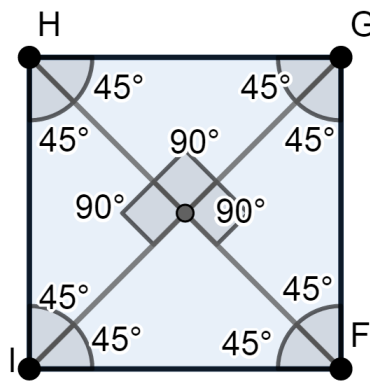
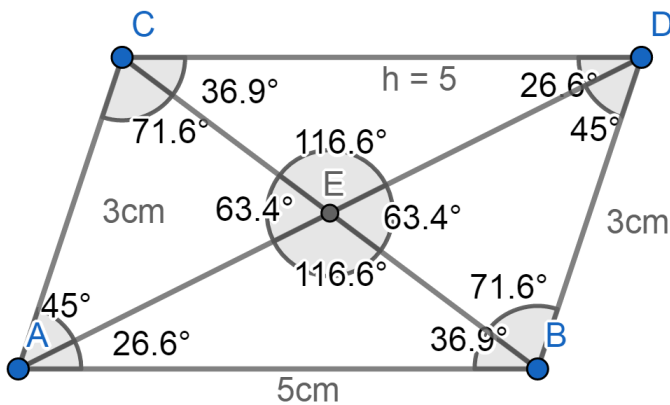
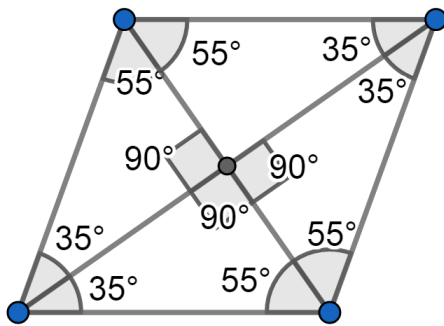
- a) i) The diagonals are the same length.
The diagonals also meet exactly half way.
- ii) Diagonals in rectangles are the same length.
Diagonals bisect each other (in other words, they cut each other in half).
- iii) Squares have both properties.
Parallelograms only have diagonals that bisect each other.
Rhombi only have diagonals that bisect each other.



b) Measure the angles that the diagonals make.

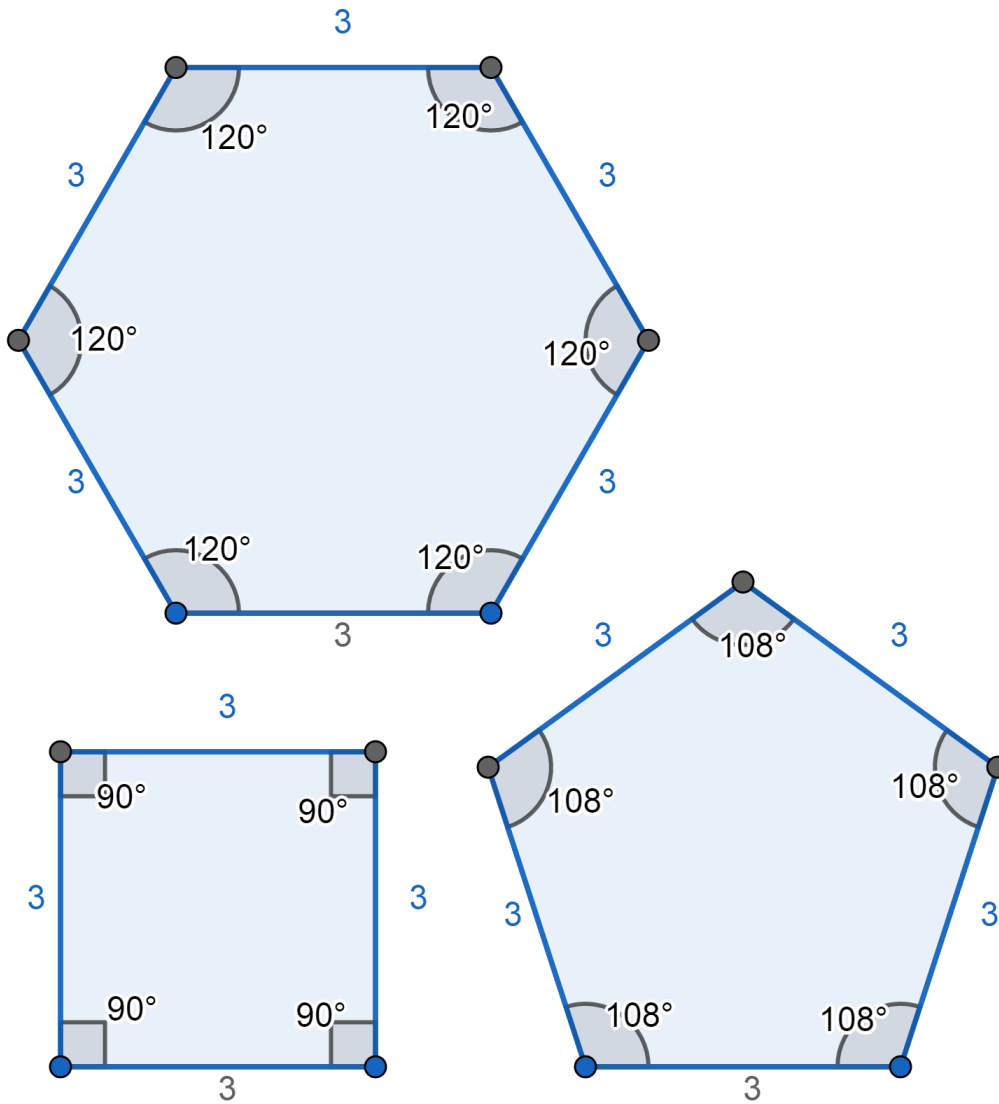


- i) The alternating angles are equal.
- ii) The diagonals create alternating angles.
- iii) Square, rhombus and parallelogram.



- iv) In a square, the diagonals bisect the angles.

6.



- a) Squares have 90° angles
Pentagons have 108° angles
Hexagons have 120° angles.
- b) Square = 360°
Pentagon = 540°
Hexagon = 720°
- c) When you add an additional side to a regular polygon, you add an additional 180° to the sum of your interior angles.