EXERCISE 11.1

1. With the help of a ruler and a compass it is not possible to construct an angle of:

(*a*) 37.5° (*b*) 40° (*c*) 22.5° (*d*) 67.5°

Sol. With the help of a ruler and a compass it is not possible to construct an angle of 40°.

Hence, (*b*) is the correct answer.

2. The construction of a triangle ABC, given that BC = 6 cm, $\angle B = 45^\circ$ is not possible when difference of AB and AC is equal to:

(*a*) 6.9 cm (*b*) 5.2 cm (*c*) 5.0 cm (*d*) 4.0 cm

Sol. We are given BC= 6 cm and a base angle $\angle B$, the difference between other two sides AB and AC should not be equal to or greater than BC. Hence, the correct answer is (*a*) 6.9 cm.

3. The construction of a triangle ABC, given that BC = 3 cm, $\angle C = 60^\circ$ is possible when difference of AB and AC is equal to:

(*a*) 3.2 cm (*b*) 3.1 cm (*c*) 3 cm (*d*) 2.8 cm

Sol. The correct answer is (*d*) 2.8 cm.

EXERCISE 11.2

Write **True** or **False** in each of the following. Give reasons for your answer.

1. An angle of 52.5^{o} can be constructed.

Sol. Since, $52.5° = \frac{1}{4} \times 210°$ and $210^{o} = 180^{o} + 30^{o}$ which can be constructed.

Hence, the given statement is correct.

2. An angle of 42.5^{o} can be constructed.

Sol. Since $42.5° = \frac{1}{2} \times 85°$ and 85^{o} cannot be constructed by using ruler and compass.

3. A triangle ABC can be constructed in which AB = 5 cm, $\angle A = 45°$ and $BC + AC = 5$ cm.

Sol. Since sum of two sides of a triangle is always greater than the third side, so we can not construct a triangle in which AB = BC + AC.

4. A triangle can be constructed in which BC = 6 cm, $\angle C = 30°$ and $AC - AB = 4$ cm.

Sol. Because AC – AB (= 4 cm) < BC (= 6 cm). i.e., AC < AB + BC or AB + BC > AC which is true.

Hence, the given statement is true.

5. A triangle can be constructed in which $\angle B = 105°$, $\angle C = 90°$ and $AB + BC + AC = 10$ cm.

Sol. The given statement is false, because $\angle B + \angle C = 105° + 90° = 195° > 180°$.

6. A triangle ABC can be constructed in which $\angle B = 60°$, $\angle C = 45°$ and $AB + BC + AC = 12$ cm.

Sol. The given statement is true, because $\angle B + \angle C = 60° + 45° = 105° < 180°$.

EXERCISE 11.3

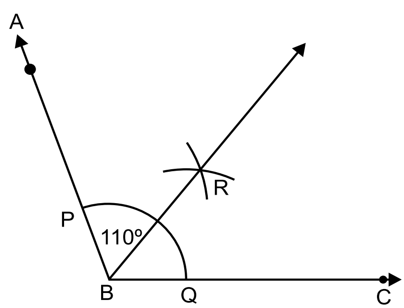
1. Draw an angle of 110° with the help of a protractor and bisect it. Measure each angle.

Sol. **Given:** An angle ABC = 110°

Required: To draw the bisector of $\angle ABC$

Steps of construction:

1. With B as centre and a convenient radius draw an arc to intersect the rays BA and BC at P and Q respectively.
2. With centre P and a radius greater than half of PQ, draw an arc.
3. With centre Q and the same radius (as in step 2), draw another arc to cut the previous arc at R.



4. Draw ray BR. This ray BR is the required bisector of $\angle ABC$.

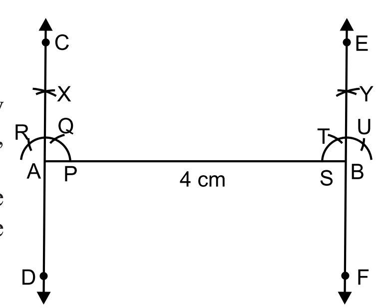
2. Draw a line segment AB of 4 cm in length. Draw a line perpendicular to AB through A and B respectively. Are these lines parallel?

Sol. **Given:** A line segment AB of length 4 cm.

Required: To draw perpendicular to AB through A and B, respectively.

Steps of construction:

1. Draw AB = 4 cm.
2. With A as centre and any convenient radius, draw an arc, cutting AB at P.
3. With P as centre and the same radius, draw an arc cutting the arc drawn in step 2 at Q.



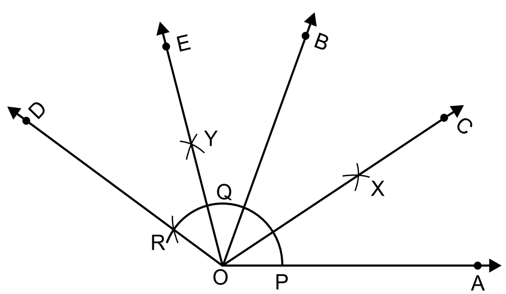
4. With Q as centre and the same radius as in steps 2 and 3, draw an arc, cutting the arc drawn in step 3 at R.
5. With Q as centre and the same radius, draw an arc.
6. With R as centre and the same radius, draw an arc, cutting the arc drawn in step 5 at X.
7. Draw OX and produce it to C and D.
8. Now, repeat the steps from 2 to 7 to draw the line EF perpendicular through B.

Yes, these lines are parallel because sum of the interior angles on the same side of the transversal is 180°]

3. Draw an angle of 80° with the help of protractor. Then construct angles of (*i*) 40°, (*ii*) 160° and (*iii*) 120°.

Sol. Steps of Construction:

1. Draw a ray OA.
2. With the help of a protractor, construct $\angle BOA = 80°$
3. Taking O as centre and any suitable radius, draw an arc to intersect rays OA and OB at points P and Q respectively.



4. Bisect $\angle BOA$ as done in Q1. Let ray OC be the bisector of $\angle BOA$,

   then $\angle ROA = \frac{1}{2}\angle BOA = \frac{1}{2} \times 80° = 40°$.
5. With Q as centre and radius equal to PQ, draw an arc to cut the extended arc PQ at R. Join OR and produce it to form ray OD, then $\angle DOA = 2\angle BOA = 2\times 80° = 160°$.
6. Bisect $\angle DOB$ as in Q1. Let OE be the bisector of $\angle DOB$ is then

$$\angle EOA = \angle EOB + \angle BOA = \frac{1}{2}\angle DOB + \angle BOA$$

$$= \frac{1}{2}(80°) + 80° = 40° + 80° = 120°$$

4. Construct a triangle whose sides are 3.6 cm, 3.0 cm and 4.8 cm. Bisect the smallest angle and measure each part.

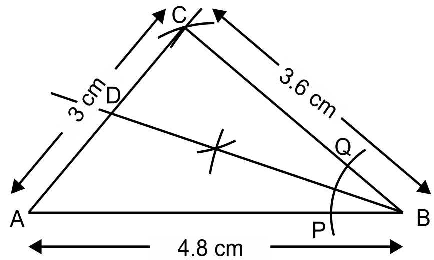
Sol. Steps of Construction:

Step1: Draw a line AB = 4.8 cm.

Step 2: Now, take radius of 3 cm and center 'A' draw an arc. And take radius of 3.6 cm and center 'B' draw an arc that intersect our previous arc at 'C'.

Step 3: Join CA and CB we get required triangle ABC.

Now, we measure all internal angles and we get $\angle ABC$ is smallest angle, So, we bisect $\angle ABC$.



Step 4: Take any radius (Less than half of AB) and center 'B' draw an arc that intersect our line AB at P and line BC at Q.

Step 5: With same radius and centre 'P' and 'Q' draw arcs which intersect at 'R'.

Step 6: Join BR and extend BR that line intersect AC at 'D'.

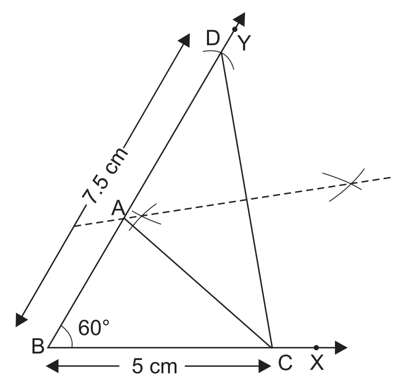
Now, we can easily measure each angle with the help of protractor.

5. Construct a triangle ABC in which BC = 5 cm, $\angle B = 60°$ and AC + AB = 7.5 cm.

Sol. **Given:** In ΔABC, BC = 5 cm, AC + AB = 7.5 cm and $\angle B = 60°$

Required: To construct ΔABC

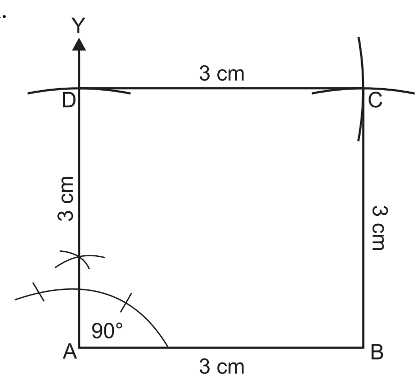
Steps of Construction:



1. Draw a ray BX and cut off a line segment BC = 5 cm from it.
2. At B, construct $\angle XBY = 60°$.
3. With B as centre and radius = 7.5 cm, draw an arc to meet BY at D.
4. Join CD.
5. Draw the perpendicular bisector of CD, intersecting BD at A.
6. Join AC. Then, ABC is the required triangle.

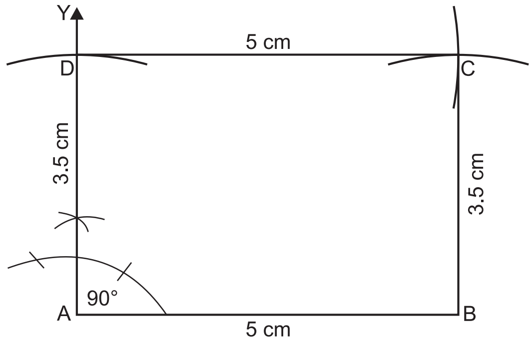
6. Construct a square of side 3 cm.

Sol. **Steps of construction.**



1. Take AB = 3 cm.
2. At A, draw AY $\perp$ AB .
3. With A as centre and radius = 3 cm, describe an arc cutting AY at D.
4. With B and D as centres and radii equal to 3 cm, draw arcs intersecting at C.
5. Join BC and DC. ABCD is the required square.

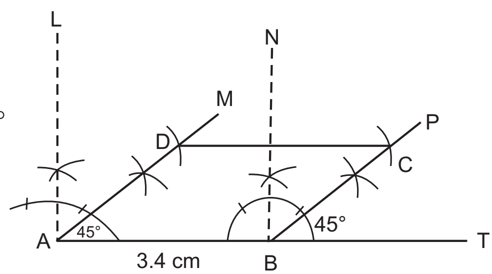
7. Construct a rectangle whose adjacent sides are of lengths 5 cm and 3.5 cm.



Sol. Steps of construction:

1. Take AB = 5 cm.
2. Draw AY ⊥ AB.
3. With A as centre and radius = 3.5 cm, describe an arc cutting AY at D.
4. With D as centre and radius 5 cm, describe an arc and with B as centre and radius 3.5 cm, describe another arc intersecting the first arc at C.
5. Join BC and DC. ABCD is the required rectangle.

8. Construct a rhombus whose side is of length 3.4 cm and one of its angle is 45º.



Sol. Steps of construction:

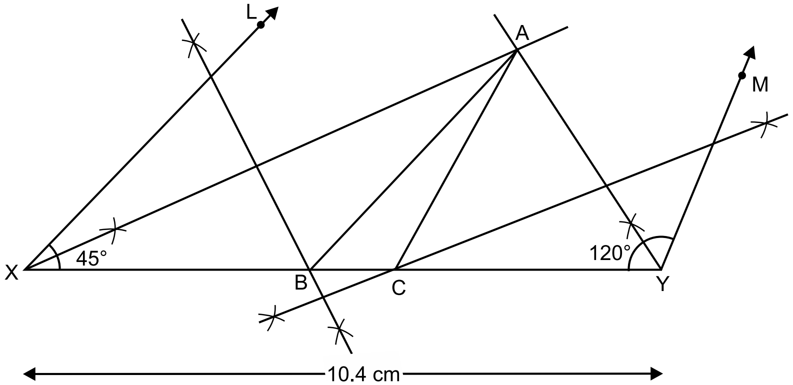
1. Take AB = 3.4 cm.
2. At A and B, construct ∠BAM = 45° and ∠TBP = 45° respectively.
3. From AM cut off AD = 3.4 cm and from BP cut off BC = 3.4 cm
4. Join AD, DC and BC.
   ABCD is the required rhombus.

EXERCISE 11.4

Construct each of the following and give justification:

1. A triangle if its perimeter is 10.4 cm and two angles 45° and 120°.

Sol. Steps of Construction:

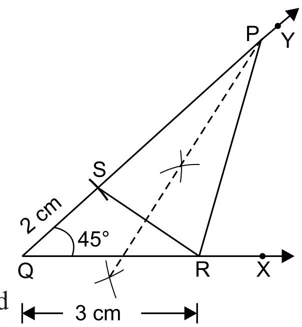


1. Draw XY = 10.4 cm.
2. Draw ∠LXY = 45° and ∠MYX = 120°.
3. Draw angle bisector of ∠LXY.
4. Draw angle bisector of ∠MYX such that it meets the angle bisector of ∠LXY at point A.
5. Draw the perpendicular bisector of AX such that it meets XY at B.
6. Draw the perpendicular bisector of AY such that it meets XY at C.
7. Join AB and AC.

Thus, ABC is the required triangle.

2. A triangle PQR given that QR = 3 cm, ∠PQR = 45° and QP – PR = 2 cm

1. Draw a ray QX and cut off a line segment QR = 3 cm.
2. At Q, construct ∠YQR = 45°.
3. From QY, cut off QS = 2 cm.
4. Join RS.
5. Draw perpendicular bisector of RS to meet QY at P.
6. Join PR. Then PQR is the required triangle.



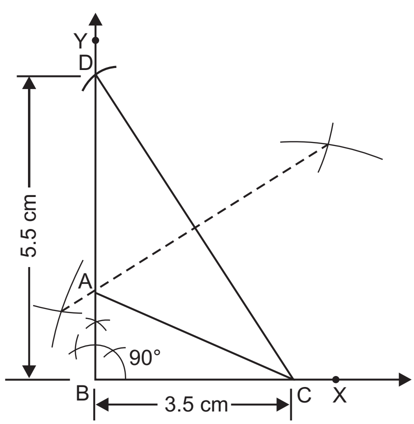
3. A right triangle when one side is 3.5 cm and sum of other sides and the hypotenuse is 5.5 cm.

Sol. Given: In ΔABC, base BC = 3.5 cm, the sum of other side and hypotenuse *i.e.*, AB + AC = 5.5 cm and ∠ABC = 90°.

Required: Construct the ΔABC.

Steps of Construction:

1. Draw a ray BX and cut off a line segment BC = 3.5 cm from it.
2. Construct ∠XBY = 90°.
3. From BY cut off a line segment BD = 5.5 cm.
4. Join CD.
5. Draw the perpendicular bisector of CD intersecting BD at A.



6. Join AC. Then, ABC is the required triangle.

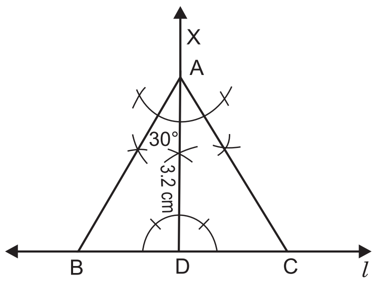
4. An equilateral triangle if its altitude is 3.2 cm.

Sol. Steps of Construction:

1. Draw a line *l*.

2. Mark any point D on the line l.

3. At point D, draw $\overrightarrow{DX} \perp l$ and cut $DA = 3.2$ cm from $\overrightarrow{DX}$.



4. At the point A, construct AB and AC which meets the l at points B and C respectively such that

$\angle DAB = 30°$ and $\angle DAC = 30°$

Then ΔABC is the required equilateral triangle

because $\angle ABC = 180° - (90° + 30°) = 60°$

$\angle ACB = 180° - (90° + 30°) = 60°$

and $\angle BAC = 30° + 30° = 60°$.

5. A rhombus whose diagonals are 4 cm and 6 cm in lengths.

Sol. Steps of construction:

1. Take $AC = 6$ cm.
2. Draw BD the right bisector of AC.
3. Cut off $MB = MD = 2$ cm.
4. Join AB, BC, CD and DA.
   Hence, ABCD is the required rhombus.