Practical Geometry



Exercise 10.1

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- 1. Draw a line, say, AB, take a point C outside it. Through C, draw a line parallel to AB using ruler and compasses only.
- Sol. Steps of Construction



- 1. Draw a line AB.
- 2. Take a point C outside it.
- 3. Take any point D an AB.
- 4. Join C to D.
- 5. With D as centre and a convenient radius, draw an arc cutting AB at F and CD at E.
- 6. Now with C as centre and the same radius as in step 5, draw an arc GH cutting CD at I.
- 7. Place the pointed tip of the compasses at F and adjust the opening so that the pencil tip is at E.
- 8. With the same opening as in step 7 and with I as centre, draw an arc cutting the arc GH at J.
- 9. Now join CJ to draw a line 'KL' then KL is the required line.

2. Draw a line *I*. Draw a perpendicular to *I* at any point on *I* on this perpendicular choose a point *X*, 4 cm away from *I*. Through *X*, draw a line m parallel to *I*.

Sol. Steps of Construction



1. Draw a line *l*.

- 2. Draw a perpendicular AB to I at any point A or I.
- 3. On this perpendicular, choose a point X that is 4 cm away from *l*.
- 4. Through X, draw a line m perpendicular to AB. Then line $m \parallel$ line I.

3. Let *I* be a line and P be a point not on *I*. Through P, draw a line m parallel to *I*. Now join P to any point Q on *I*. Choose any other point R on m. Through R, draw a line parallel to PQ. Let this meet *I* at S. What shape do the two sets of parallel lines enclose?

Sol. Steps of Construction



- 1. Draw a line I and a point P not on it.
- 2. Take any point A on *I*.
- 3. Join A to P.
- 4. With A as centre and a convenient radius, draw an arc cutting I at B and AP at C.
- 5. Now with P as centre and the same radius as in step 4, draw an arc DE cutting PA at T.
- 6. Place the pointed tip of the compasses at B and adjust the opening so that the pencil tip is at C.
- 7. With the same opening as in step 6 and with T as centre, draw an arc cutting the arc DE at F.
- 8. Now just PF to draw a line m.
- Then line $m \parallel$ line *I*.

9. Join P to any point Q on *I*.

- 10. Choose any point R on m.
- 11. Join R to Q.
- 12. With Q as centre and a convenient radius, draw an arc cutting PQ at L and RQ at M.
- 13. Now with R as centre and the same radius as in step 12, draw an arc GH cutting PQ at I.
- 14. Place the pointed tip of the compasses at L and adjust the opening so that the pencil tip is at M.
- 15. With the same opening as in step 14 and with I as centre, draw an arc cutting the arc GH at J.
- 16. Now join RJ to draw a line n. Then line $n \parallel$ line PQ.

Let the line n meet the line *l* at S. Then, the shape enclosed by the two sets of parallel lines is a **parallelogram.**

Exercise 10.2

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2. With Y as centre, draw an arc of radius 4.5 cm.

With Z as centre, draw an arc of radius 6 cm,
Mark the point of intersection of arcs as X.
Join XY and XZ.

 ΔXYZ is now ready.

2. Construct an equilateral triangle of side 5.5 cm.

Sol.



1. Draw a line segment BC of length 5.5 cm.

2. With B as centre, draw an arc of radius 5.5 cm.

3. With C as centre, draw an arc of radius 5.5 cm.

4. Mark the point of intersection of arcs as A.

5. Join AB and AC.

Equilateral $\triangle ABC$ is now ready.

3. Draw ΔPQR with PQ = 4 cm, QR = 3.5 cm and PR = 4 cm. What type of triangle is this?

Sol. Steps of construction



1. Draw a line segment QR of length 3.5 cm.

- 2. With Q as centre, draw an arc of radius 4 cm.
- 3. With R as centre, draw an arc of radius 4 cm.
- 4. Mark the point of intersection of arcs as P.
- 5. Join PQ and PR.

 ΔPQR is now ready.

- $\therefore PQ = PR$
- $\therefore \Delta PQR$ is isosceles.

4. Construct $\triangle ABC$ such that AB = 2.5 cm, BC = 6 cm and AC = 6.5 cm. Measure $\angle B$.

Sol. Steps of construction

A Ë 2.5 в 6 cm

- 1. Draw a line segment BC of length 6 cm.
- 2. With B as centre, draw an arc of radius 2.5 cm.
- 3. With C as centre, draw an arc of radius 6.5 cm.

4. Mark the point of intersection of arcs as A. 5. Join AB and AC. $\triangle ABC$ is now ready. On measurement, $\angle B = 90^{\circ}$

Exercise 10.3

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2. Construct an isosceles triangle in which the lengths of each of its equal sides is 6.5 cm and the angle between them is 110° .

Sol. Steps of construction



- 1. Draw a line segment QR of length 6.5 cm.
- 2. At Q, draw QX making 110° with QR.
- 3. With Q as centre, draw an arc of radius 6.5 cm. It cuts QX at P.
- 4. Join PR
- ΔPQR is now obtained.
- 3. Construct $\triangle ABC$ with BC = 7.5 cm, AC = 5 cm and $m \angle C = 60^{\circ}$.

Sol. Steps of construction



- 1. Draw a line segment BC of length 7.5 cm.
- 2. At C, draw CX making 60° with CB.
- 3. With C as centre, draw an arc of radius 5 cm. It cuts CX at A.
- 4. Join AB.
- ΔABC is now obtained.

Exercise 10.4

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- **1. Construct** $\triangle ABC$, given $m \angle A = 60^\circ$, $m \angle B = 30^\circ$ and AB = 5.8 cm.
- Sol. Steps of construction



- 1. Draw AB of length 5.8 cm.
- 2. At A, draw a ray AP making an angle of 60° with AB.
- 3. At B, draw a ray BQ making an angle of 30° with BA.
- 4. Mark the point of intersection of two rays as C. ΔABC is now completed.
- 2. Construct $\triangle PQR$ if PQ = 5cm, $m \angle PQR = 105^{\circ}$ and $m \angle QRP = 40^{\circ}$ (Hint: Recall angle-sum property of a triangle).

Sol. Steps of construction



- 1. Draw PQ of length 5 cm.
- 2. At Q, draw a ray QX making an angle.
- 3. At P draw a ray PY making an angle of 35° with PQ By angle-sum property of a triangle

 $m \angle RPQ + m \angle PQR + m \angle QRP = 180^{\circ}$

- $\Rightarrow m\angle RPQ + 105^\circ + 40^\circ = 180^\circ$
- $\Rightarrow m \angle RPQ + 145^\circ = 180^\circ$
- $\Rightarrow m \angle RPQ = 35^{\circ}$

4. Mark the point of intersection of two rays as R. ΔPQR is now completed.

- **3.** Examine whether you can construct $\triangle DEF$ such that EF = 7.2 cm, m $\angle E = 110^{\circ}$ and $m \angle F = 80^{\circ}$. Justify your answer.
- Sol. $m \angle E + m \angle F = 110^{\circ} + 80^{\circ} = 190^{\circ} > 180^{\circ}$ This is not possible since the sum of the measures of the three angles of a triangle is 180° . As such, the sum of two angles of a triangle cannot exceed 180° . Hence, ΔDEF cannot be constructed.

Exercise 10.5

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1.	Construct the right-angled	ΔPQR where	$m \angle Q = 90^\circ, QR = 8cm$	and PR = 10 cm.
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Sol. Steps of Construction



Draw QR of length 8 cm. At Q, draw $QX \perp QR$. 3. With R as centre, draw an arc of radius 10 cm. 4. Mark the meeting point of these two as P. ΔPQR is now obtained.

Construct a right-angled triangle whose hypotenuse is 6 cm long and one of the legs is 4 cm long.
Sol. Steps of Construction



- 1. Draw QR of length 4 cm.
- 2. At Q, draw $QX \perp QR$.
- 3. With R as centre, draw an arc of radius 6 cm.

4. Mark the meeting point of arc and QX as P. ΔPQR is now obtained.

3. Construct an isosceles right-angled triangle ABC where $m \angle ACB = 90^{\circ}$ and AC = 6 cm. Sol. Steps of Construction

x B 6 cmC 1. Draw AC of length 6 cm. 2. At C, draw CX \perp CA

3. With C as centre, draw an arc of radius 6 cm to intersect CX at B.

4. Join AB.

 $\Delta\!ABC$ is now obtained.