Mathematics

(Chapter – 10) (Practical Geometry)
(Class – VII)

Exercise 10.1

Question 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.
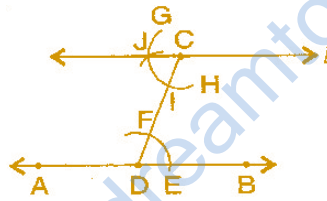
Answer 1:

To construct: A line, parallel to given line by using ruler and compasses.

Steps of construction:

(a) Draw a line-segment AB and take a point C outside AB.

(b) Take any point D on AB and join C to D.

(c) With D as centre and take convenient radius, draw an arc cutting AB at E and CD at F.

(d) With C as centre and same radius as in step 3, draw an arc GH cutting CD at I.

(e) With the same arc EF, draw the equal arc cutting GH at J.

(f) Join JC to draw a line l.

This the required line $AB \parallel l$.

Question 2:
Draw a line l. Draw a perpendicular to l at any point on l. On this perpendicular choose a point X, 4 cm away from l. Through X, draw a line m parallel to l.
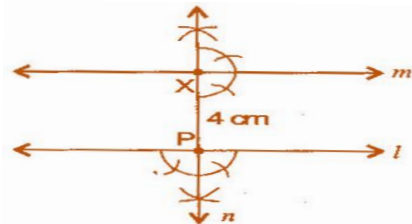
Answer 2:

To construct: A line parallel to given line when perpendicular line is also given.

Steps of construction:

(a) Draw a line l and take a point P on it.

(b) At point P, draw a perpendicular line n.

(c) Take PX = 4 cm on line n.

(d) At point X, again draw a perpendicular line m.

It is the required construction.

Question 3:

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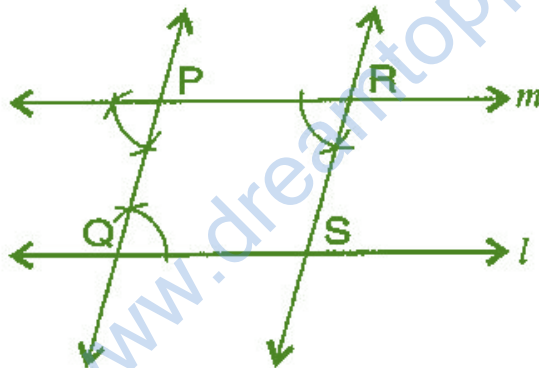
Answer 3:

To construct: A pair of parallel lines intersecting other part of parallel lines.

Steps of construction:

(a) Draw a line l and take a point P outside of l.

(b) Take point Q on line l and join PQ.

(c) Make equal angle at point P such that $\angle$ Q = $\angle$ P.

(d) Extend line at P to get line m.

(e) Similarly, take a point R online m, at point R, draw angles such that $\angle$ P = $\angle$ R.

(f) Extended line at R which intersects at S online l. Draw line RS.

Thus, we get parallelogram PQRS.

Exercise 10.2

Question 1:

Construct △XYZ in which XY = 4.5 cm, YZ = 5 cm and ZX = 6 cm.

Answer 1:
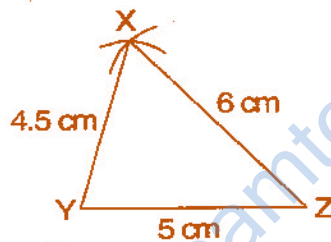
To construct: △XYZ, where XY = 4.5 cm, YZ = 5 cm and ZX = 6 cm.

Steps of construction:

(a) Draw a line segment YZ = 5 cm.

(b) Taking Z as centre and radius 6 cm, draw an arc.

(c) Similarly, taking Y as centre and radius 4.5 cm, draw another arc which intersects first arc at point X.

(d) Join XY and XZ.

It is the required △XYZ.

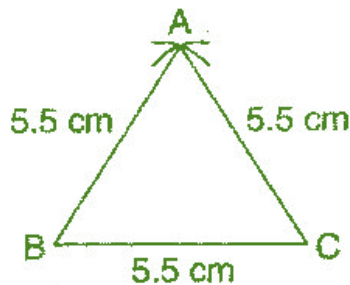## Question 2:

Construct an equilateral triangle of side 5.5 cm.

Answer 2:

To construct: A △ABC where AB = BC = CA = 5.5 cm

Steps of construction:

(a) Draw a line segment BC = 5.5 cm

(b) Taking points B and C as centers and radius 5.5 cm, draw arcs which intersect at point A.

(c) Join AB and AC.

It is the required △ABC.

Question 3:
Draw $\triangle$ PQR with PQ = 4 cm, QR = 3.5 cm and PR = 4 cm. What type of triangle is this?
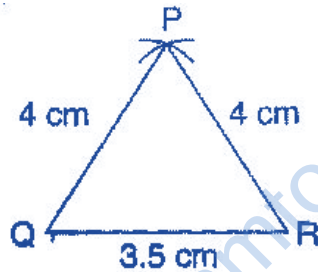
Answer 3:

To construction: $\triangle$ PQR, in which PQ = 4 cm, QR = 3.5 cm and PR = 4 cm.

Steps of construction:

(a) Draw a line segment QR = 3.5 cm.

(b) Taking Q as centre and radius 4 cm, draw an arc.

(c) Similarly, taking R as centre and radius 4 cm, draw an another arc which intersects first arc at P.

(d) Join PQ and PR.

It is the required isosceles $\triangle$ PQR.

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

Answer 4:

To construct: $\triangle$ ABC in which AB = 2.5 cm, BC = 6 cm and AC = 6.5 cm.

Steps of construction:

(a) Draw a line segment BC = 6 cm.

(b) Taking B as centre and radius 2.5 cm, draw an arc.

(c) Similarly, taking C as centre and radius 6.5 cm, draw another arc which intersects first arc at point A.

(d) Join AB and AC.

(e) Measure angle B with the help of protractor.

It is the required $\triangle$ ABC where $\angle$ B = 80°.

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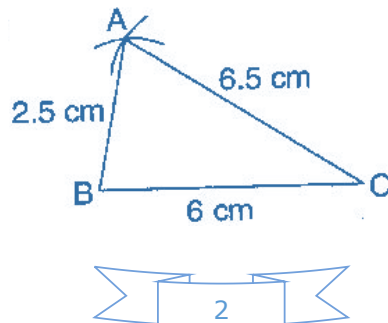
Exercise 10.3

Question 1:

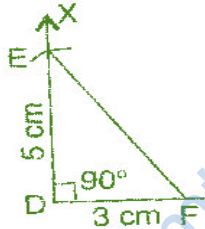Construct $\triangle$DEF such that DE = 5 cm, DF = 3 cm and $m\angle$EDF = 90°.

Answer 1:

To construct: $\triangle$DEF where DE = 5 cm, DF = 3 cm and $m\angle$EDF = 90°.

Steps of construction:

(a) Draw a line segment DF = 3 cm.

(b) At point D, draw an angle of 90° with the help of compass i.e., $\angle$XDF = 90°.

(c) Taking D as centre, draw an arc of radius 5 cm, which cuts DX at the point E.

(d) Join EF.

It is the required right angled triangle DEF.

Question 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°.
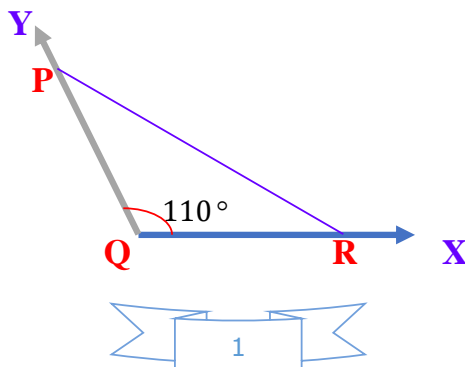
Answer 2:

To construct: An isosceles triangle PQR where PQ = RQ = 6.5 cm and $\angle$Q = 110°.

Steps of construction:

(a) Draw a line segment QR = 6.5 cm.

(b) At point Q, draw an angle of 110° with the help of protractor, i.e., $\angle$YQR = 110°.

(c) Taking Q as centre, draw an arc with radius 6.5 cm, which cuts QY at point P.

(d) Join PR

It is the required isosceles triangle PQR.

Question 3:

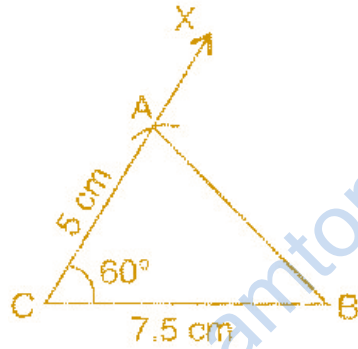Construct $\triangle ABC$ with BC = 7.5 cm, AC = 5 cm and $m\angle C = 60°$.

Answer 3:

To construct: $\triangle ABC$ where BC = 7.5 cm, AC = 5 cm and $m\angle C = 60°$.

Steps of construction:

(a) Draw a line segment BC = 7.5 cm.

(b) At point C, draw an angle of $60°$ with the help of protractor, i.e., $\angle XCB = 60°$.

(c) Taking C as centre and radius 5 cm, draw an arc, which cuts XC at the point A.

(d) Join AB

It is the required triangle ABC.
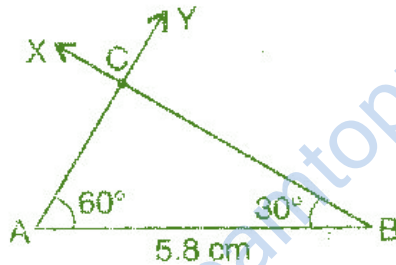
Exercise 10.4

Question 1:

Construct $\triangle ABC$, given $m\angle A = 60°$, $m\angle B = 30°$ and AB = 5.8 cm.

Answer 1:

To construct: $\triangle ABC$ where $m\angle A = 60°$, $m\angle B = 30°$ and AB = 5.8 cm.

Steps of construction:

(a) Draw a line segment AB = 5.8 cm.

(b) At point A, draw an angle $\angle YAB = 60°$ with the help of compass.

(c) At point B, draw $\angle XBA = 30°$ with the help of compass.

(d) AY and BX intersect at the point C.

It is the required triangle ABC.

Question 2:

Construct $\triangle PQR$ if PQ = 5 cm, $m\angle PQR = 105°$ and $m\angle QRP = 40°$.

Answer 2:

Given: $m\angle PQR = 105°$ and $m\angle QRP = 40°$

We know that sum of angles of a triangle is 180°.

$\therefore \quad m\angle PQR + m\angle QRP + m\angle QPR = 180°$

$\Rightarrow \quad 105° + 40° + m\angle QPR = 180°$

$\Rightarrow \quad 145° + m\angle QPR = 180°$
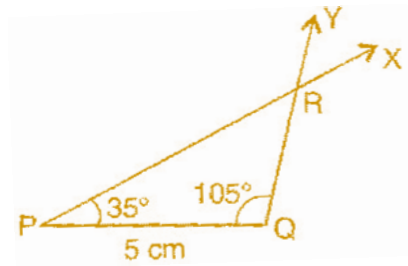
$\Rightarrow \quad m\angle QPR = 180° - 145°$

$\Rightarrow \quad m\angle QPR = 35°$

To construct: $\triangle PQR$ where $m\angle P = 35°$, $m\angle Q = 105°$ and PQ = 5 cm.

Steps of construction:

(a) Draw a line segment PQ = 5 cm.

(b) At point P, draw $\angle XPQ = 35°$ with the help of protractor.

(c) At point Q, draw $\angle YQP = 105°$ with the help of protractor.

(d) XP and YQ intersect at point R.

It is the required triangle PQR.

Question 3:

Examine whether you can construct $\triangle DEF$ such that EF = 7.2 cm, $m\angle E = 110°$ and $m\angle F$ = 80°. Justify your answer.

Answer 3:

Given: In $\triangle DEF$, $m\angle E = 110°$ and $m\angle F = 80°$.

Using angle sum property of triangle

$$\angle D + \angle E + \angle F = 180°$$
$$\Rightarrow \angle D + 110° + 80° = 180°$$
$$\Rightarrow \angle D + 190° = 180°$$
$$\Rightarrow \angle D = 180° - 190° = -10°$$

Which is not possible.

Exercise 10.5

Question 1:

Construct the right angled $\triangle$PQR, where $m\angle Q = 90°$, QR = 8 cm and PR = 10 cm.
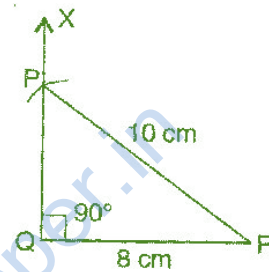
Answer 1:

To construct:

A right angled triangle PQR where $m\angle Q = 90°$, QR = 8 cm and PQ = 10 cm.

Steps of construction:

(a) Draw a line segment QR = 8 cm.

(b) At point Q, draw QX ⊥ QR.

(c) Taking R as centre, draw an arc of radius 10 cm.

(d) This arc cuts QX at point P.

(e) Join PQ.

It is the required right angled triangle PQR.

Question 2:

Construct a right angled triangle whose hypotenuse is 6 cm long and one the legs is 4 cm long.
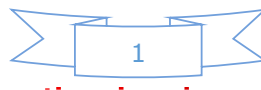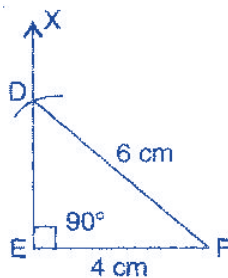
Answer 2:

To construct:

A right angled triangle DEF where DF = 6 cm and EF = 4 cm

Steps of construction:

(a) Draw a line segment EF = 4 cm.

(b) At point Q, draw EX ⊥ EF.

(c) Taking F as centre and radius 6 cm, draw an arc. (Hypotenuse)

(d) This arc cuts the EX at point D.

(e) Join DF.

It is the required right angled triangle DEF.

Question 3:

Construct an isosceles right angled triangle ABC, where $m\angle ACB = 90°$ and AC = 6 cm.

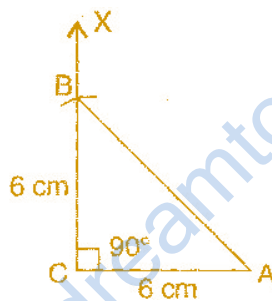### Answer 3:

To construct:

An isosceles right angled triangle ABC where $m\angle C = 90°$, AC = BC = 6 cm.

Steps of construction:

(a) Draw a line segment AC = 6 cm.

(b) At point C, draw XC $\perp$ CA.

(c) Taking C as centre and radius 6 cm, draw an arc.

(d) This arc cuts CX at point B.

(e) Join BA.

It is the required isosceles right angled triangle ABC.

Miscellaneous Questions

Questions:

Below are given the measures of certain sides and angles of triangles. Identify those which cannot be constructed and say why you cannot construct them. Construct rest of the triangle.

Triangle	Given measurements		
1. $\triangle$ABC	$m\angle$A = 85° ;	$m\angle$B = 115° ;	AB = 5 cm
2. $\triangle$PQR	$m\angle$Q = 30° ;	$m\angle$R = 60° ;	QR = 4.7 cm
3. $\triangle$ABC	$m\angle$A = 70° ;	$m\angle$B = 50° ;	AC = 3 cm
4. $\triangle$LMN	$m\angle$L = 60° ;	$m\angle$N = 120° ;	LM = 5 cm
5. $\triangle$ABC	BC = 2 cm;	AB = 4 cm;	AC = 2 cm
6. $\triangle$PQR	PQ = 3.5 cm;	QR = 4 cm;	PR = 3.5 cm
7. $\triangle$XYZ	XY = 3 cm;	YZ = 4 cm;	XZ = 5 cm
8. $\triangle$DEF	DE = 4.5 cm;	EF = 5.5 cm;	DF = 4 cm

Answer 1:

In $\triangle$ABC, $m\angle$A = 85°, $m\angle$B = 115°, AB = 5 cm

Construction of $\triangle$ABC is not possible because $m\angle$A = 85° + $m\angle$B = 200°, and we know that the sum of angles of a triangle should be 180°.
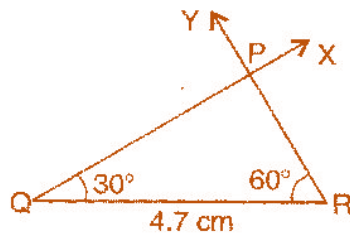
Answer 2:

To construct: $\triangle$PQR where $m\angle$Q = 30˚, $m\angle$R = 60˚ and QR = 4.7 cm.

Steps of construction:

(a) Draw a line segment QR = 4.7 cm.

(b) At point Q, draw $\angle$XQR = 30˚ with the help of compass.

(c) At point R, draw $\angle$YRQ = 60˚ with the help of compass.

(d) QX and RY intersect at point P.

It is the required triangle PQR.

Answer 3:
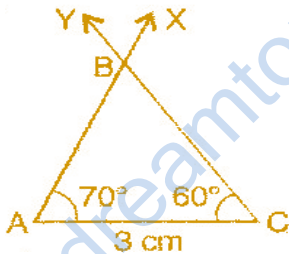
We know that the sum of angles of a triangle is 180°.

$$\therefore \quad m\angle A + m\angle B + m\angle C = 180°$$
$$\Rightarrow \quad 70° + 50° + m\angle C = 180°$$
$$\Rightarrow \quad 120° + m\angle C = 180°$$
$$\Rightarrow \quad m\angle C = 180° - 120°$$
$$\Rightarrow \quad m\angle C = 60°$$

To construct: $\triangle ABC$ where $m\angle A = 70°$, $m\angle C = 60°$ and AC = 3 cm.

Steps of construction:

(a) Draw a line segment AC = 3 cm.

(b) At point C, draw $\angle YCA = 60°$.

(c) At point A, draw $\angle XAC = 70°$.

(d) Rays XA and YC intersect at point B

It is the required triangle ABC.

Answer 4:

In $\triangle LMN$, $m\angle L = 60°$, $m\angle N = 120°$, LM = 5 cm

This $\triangle LMN$ is not possible to construct because $m\angle L + m\angle N = 60° + 120° = 180°$ which forms a linear pair.

Answer 5:

$\triangle ABC$, BC = 2 cm, AB = 4 cm and AC = 2 cm

This $\triangle ABC$ is not possible to construct because the condition is

Sum of lengths of two sides of a triangle should be greater than the third side.

$$AB < BC + AC$$
$$\Rightarrow \quad 4 < 2 + 2$$
$$\Rightarrow \quad 4 = 4,$$

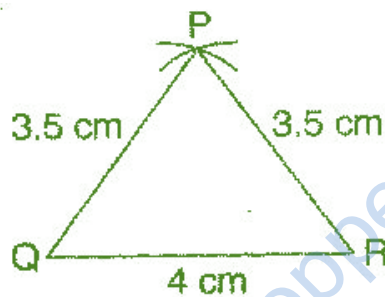## Answer 6:

To construct: △ PQR where PQ = 3.5 cm, QR = 4 cm and PR = 3.5 cm

Steps of construction:

(a) Draw a line segment QR = 4 cm.

(b) Taking Q as centre and radius 3.5 cm, draw an arc.

(c) Similarly, taking R as centre and radius 3.5 cm, draw an another arc which intersects the first arc at point P.
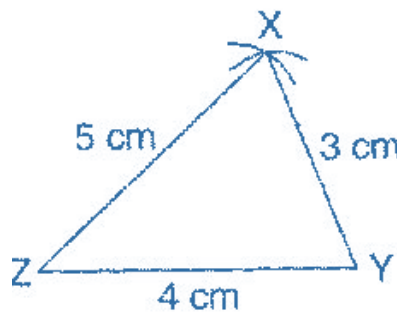
It is the required triangle PQR.

Answer 7:

To construct: A triangle whose sides are XY = 3 cm, YZ = 4 cm and XZ = 5 cm.

Steps of construction:

(a) Draw a line segment ZY = 4 cm.

(b) Taking Z as centre and radius 5 cm, draw an arc.

(c) Taking Y as centre and radius 3 cm, draw another arc.

(d) Both arcs intersect at point X.

It is the required triangle XYZ.

Answer 8:

To construct:

A triangle DEF whose sides are DE = 4.5 cm, EF = 5.5 cm and DF = 4 cm.

Steps of construction:

(a) Draw a line segment EF = 5.5 cm.

(b) Taking E as centre and radius 4.5 cm, draw an arc.

(c) Taking F as centre and radius 4 cm, draw an another arc which intersects the first arc at point D.

It is the required triangle DEF.