

4

Practical Geometry

Learn and Remember

- For constructing unique quadrilateral, the following measurements must be given:

In case of :

 - When four sides and one diagonal are given.
 - When two diagonals and three sides are given.
 - When two adjacent sides and three angles are given.
 - When three sides and two included angles are given.
 - Sometimes other properties are given to construct a quadrilateral.
 - Three measurements are enough to draw a triangle.
- When a rhombus is constructed, then draw a diagonal of given length and draw perpendicular bisector of its diagonal base.
 - Take half length of the given measurement, draw arcs up and down cutting down perpendicular lines taking centre at bisector point.
 - Join up and down cutting arcs to the end point of drawn first diagonal. It will be a required rhombus.
- Five measurements can determine a quadrilateral unique.
- Before constructing a quadrilateral, one must draw a rough sketch of given measurements.
- Trapezium, rhombus and square are different forms of a $\parallel\text{gm}$.
- A rhombus can be a parallelogram, but a parallelogram cannot be a rhombus.
- A square and a rhombus both have equal sides and a square can be a rhombus but a rhombus cannot be a square.

TEXTBOOK QUESTIONS SOLVED

EXERCISE 4.1 (Page - 60)

Q1. Construct the following quadrilaterals.

(i) Quadrilateral ABCD.

AB = 4.5 cm, BC = 5.5 cm, CD = 4 cm, AD = 6 cm, AC = 7 cm

(ii) Quadrilateral JUMP

JU = 3.5 cm, UM = 4 cm, MP = 5 cm, PJ = 4.5 cm, PU = 6.5 cm.

(iii) Parallelogram MORE

OR = 6 cm, RE = 4.5 cm, EO = 7.5 cm

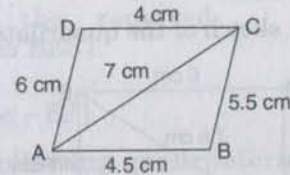
(iv) Rhombus BEST

BE = 4.5 cm, ET = 6 cm

Sol. (i) To construct a quadrilateral ABCD, the measurements have been given below

AB = 4.5 cm, BC = 5.5 cm, CD = 4 cm, AD = 6 cm and AC = 7 cm

Here is the rough sketch of quadrilateral ABCD.

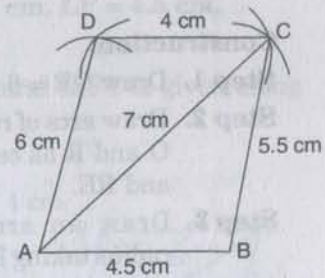


Construction:

Step 1. Draw AB = 4.5 cm.

Step 2. Draw an arc taking radius 5.5 cm from point B.

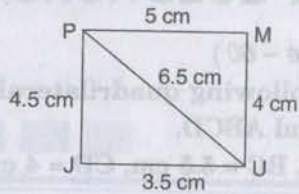
Step 3. Taking radius 7 cm, draw an another arc from point A which intersects the first arc at point C, join BC and AC.



Step 4. Now draw an arc of radius 6 cm from point A and draw another arc of radius 4 cm from point C which intersect at D. Join AD and CD.

It is required quadrilateral ABCD.

(ii) Here is the rough sketch of the quadrilateral JUMP :



Construction:

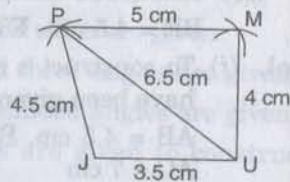
Step 1. Draw $JU = 3.5$ cm.

Step 2. Draw an arc of radius 4.5 cm taking centre J and then draw another arc of radius 6.5 cm taking U as centre, both arcs intersect at P.

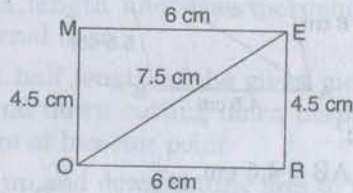
Step 3. Join PJ and PU.

Step 4. Now draw arc of radius 5 cm and 4 cm taking P and U as centres respectively. Which intersect at M and join MP and MU.

It is a required quadrilateral JUMP.



(iii) Here is the rough sketch of the quadrilateral MORE.



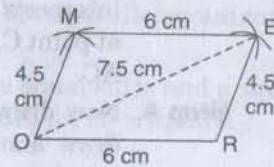
Construction:

Step 1. Draw $OR = 6$ cm.

Step 2. Draw arcs of radius 7.5 cm and radius 4.5 cm taking O and R as centres, which intersect at E. Join OE and RE.

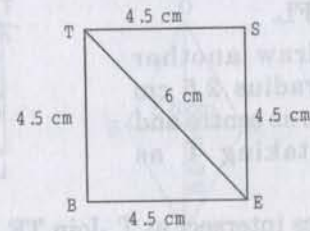
Step 3. Draw an arc of 6 cm radius taking E as centre.

Step 4. Draw another arc of 4.5 cm radius taking O as centre, which intersect at M.



Join OM and EM. It is required parallelogram MORE.

(iv) Here is the rough sketch of the quadrilateral BEST.



Construction:

Step 1. Draw $TE = 6$ cm and bisect it into two equal parts.

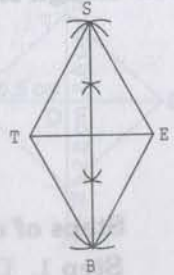
Step 2. Draw up and down perpendiculars to TE.

Step 3. Draw two arcs of 4.5 cm taking T and E as centres which intersect at S.

Step 4. Again draw two arcs of 4.5 cm taking E and T as centres, which intersect at B.

Join TS, ES, BT and EB.

It is the required rhombus BEST.



EXERCISE 4.2 (Page - 62)

1. Construct the following quadrilaterals.

(i) Quadrilateral LIFT.

$LI = 4$ cm, $IF = 3$ cm, $TL = 2.5$ cm, $LF = 4.5$ cm,

$IT = 4$ cm.

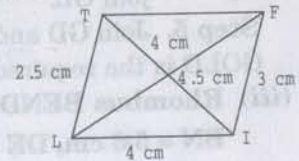
Here rough sketch of the quadrilateral LIFT is given along side.

Construction :

Step 1. Draw a line segment $LI = 4$ cm.

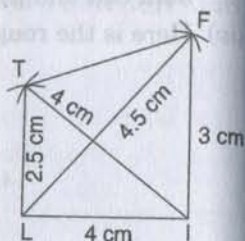
Step 2. Taking radius 4.5 cm, draw an arc taking L as centre.

Step 3. Draw an arc of 3 cm taking I as centre



which intersects the first arc at F and join FI and FL.

- Step 4.** Now, draw another arc of radius 2.5 cm taking L as centre and 4 cm taking I as centre.



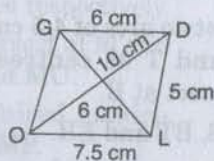
Both arcs intersect at T. Join TF, TL and TI.

LIFT is the required quadrilateral.

(ii) Quadrilateral GOLD

OL = 7.5 cm, GL = 6 cm, GD = 6 cm, LD = 5 cm, OD = 10 cm

Sol. Rough sketch of GOLD

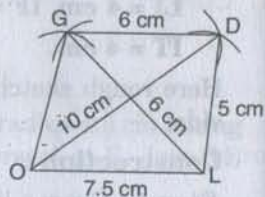


Steps of construction :

Step 1. Draw a line segment OL = 7.5 cm.

Step 2. Draw an arc of radius 5 cm taking L as centre and another arc of radius 10 cm taking O as centre which intersect the first arc point at D and join LD and OD.

Step 3. Now draw an arc of radius 6 cm from D and draw another arc of radius 6 cm taking L as centre.



Step 4. Which intersect at G. And join GL.

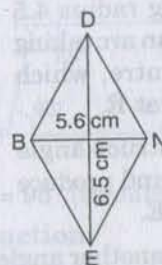
Step 5. Join GD and GO.

GOLD is the required quadrilateral.

(iii) Rhombus BEND

BN = 5.6 cm, DE = 6.5 cm

Sol. Rough sketch of BEND is given below :



Steps of construction:

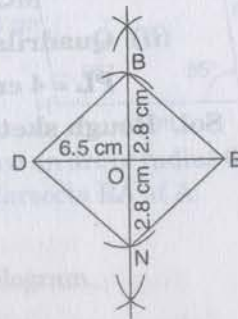
Sol. Step 1. Draw DE = 6.5 cm.

Step 2. Draw perpendicular bisector of line segment DE.

Step 3. Draw two arcs of radius 2.8 cm from intersection point O, which intersects the line BN at B and N.

Step 4. Join BE, BD as well as ND and NE.

BEND is the required rhombus.



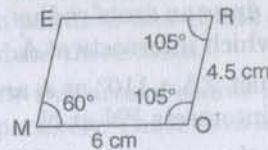
EXERCISE 4.3 (Page - 64)

Q1. Construct the following quadrilaterals.

(i) Quadrilateral MORE

MO = 6 cm, OR = 4.5 cm, $\angle M = 60^\circ$, $\angle O = 105^\circ$, $\angle R = 105^\circ$

Sol. Rough sketch of MORE



Steps of construction:

Step 1. Draw a line-segment MO = 6 cm.

Step 2. Construct $\angle O = 105^\circ$ and taking radius 4.5 cm, draw an arc taking O as a centre, which intersects at R.

Step 3. Now, construct angle 105° at R and produce the side RE.

Step 4. Construct another angle 60° at point M and produce its side ME.

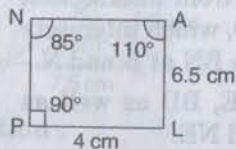
Both sides ME and RE intersect at E.

MORE is the required quadrilateral.

(ii) Quadrilateral PLAN

$PL = 4 \text{ cm}$, $LA = 6.5 \text{ cm}$, $\angle P = 90^\circ$, $\angle A = 110^\circ$, $\angle N = 85^\circ$

Sol. Rough sketch of PLAN



Before constructing this figure, we must get the value of

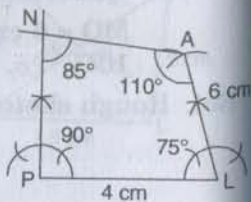
$$\begin{aligned}\angle L &= 360^\circ - (90^\circ + 85^\circ + 110^\circ) \\ &= 360^\circ - 285^\circ = 75^\circ\end{aligned}$$

Steps of construction:

Step 1. Draw a line segment of $PL = 4 \text{ cm}$.

Step 2. Construct angle 90° at P and produce the side PN.

Step 3. Construct another angle of 75° at L and with L as centre, draw an arc of radius 6 cm, which intersects at A.

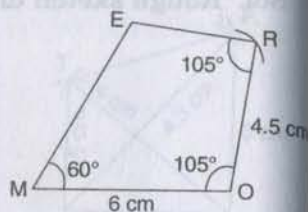


Step 4. Construct $\angle A = 110^\circ$ at A and produce the side AN which intersects PN at N.

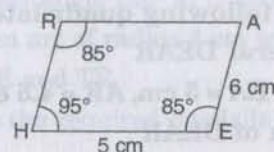
Hence, PLAN is the required quadrilateral.

(iii) Parallelogram HEAR

$HE = 5 \text{ cm}$, $EA = 6 \text{ cm}$, $\angle R = 85^\circ$



Sol. Rough sketch of HEAR

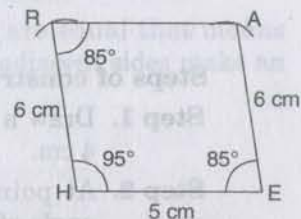


$\angle H = 180^\circ - 85^\circ = 95^\circ$ (as sum of adjacent angle is 180° .)

Steps of construction:

Sol. Step 1. Draw a line segment $HE = 5 \text{ cm}$.

Step 2. Construct $\angle H = 95^\circ$ and draw an arc of radius 6 cm with centre H. It intersects AR at R and join RH.



Step 3. Draw $\angle R = \angle E = 85^\circ$ and draw an arc of radius 6 cm with E as a centre which intersects RA at A.

Step 4. Join RA.

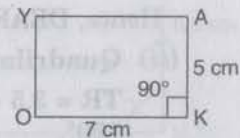
Hence, HEAR is the required parallelogram.

(iv) Rectangle OKAY

$OK = 7 \text{ cm}$, $KA = 5 \text{ cm}$

Sol. Rough sketch of OKAY

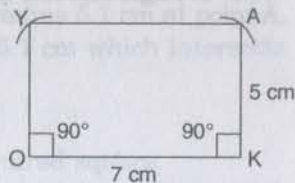
As we know that each angle of a rectangle is 90° , having opposite sides equal.



Steps of construction:

Step 1. Draw a line segment $OK = 7 \text{ cm}$.

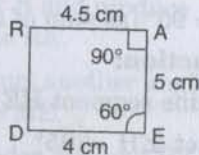
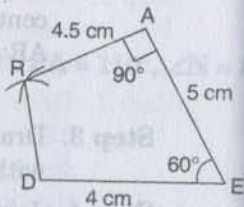
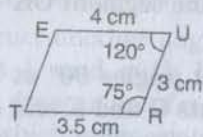
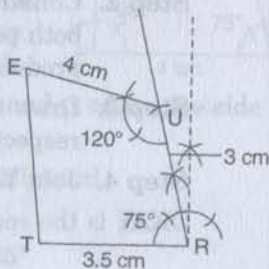
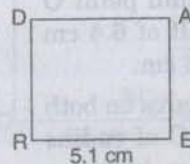
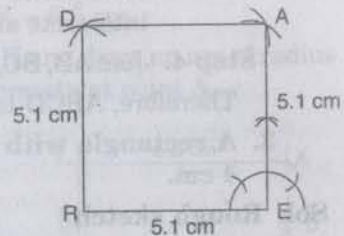
Step 2. Construct angles 90° at both points O and K and produce these sides.

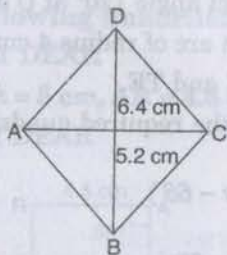


Step 3. Draw two arcs of radius 5 cm from points O and K respectively. These arcs intersect at Y and A.

Step 4. Join YA.

OKAY is the required rectangle.

EXERCISE 4.4 (Page - 67)**Q1. Construct the following quadrilaterals.****(i) Quadrilateral DEAR** $DE = 4 \text{ cm}$, $EA = 5 \text{ cm}$, $AR = 4.5 \text{ cm}$, $\angle E = 60^\circ$, $\angle A = 90^\circ$ **Sol. Rough sketch of DEAR****Steps of construction:****Step 1.** Draw a line-segment $DE = 4 \text{ cm}$.**Step 2.** At point E , construct an angle of 60° .**Step 3.** Taking radius 5 cm , draw an arc from point E which intersects at A .**Step 4.** Construct $\angle A = 90^\circ$, draw an arc of radius 4.5 cm with centre A which intersect at R .**Step 5.** Join RD .Hence, $DEAR$ is the required quadrilateral.**(ii) Quadrilateral TRUE** $TR = 3.5 \text{ cm}$, $RU = 3 \text{ cm}$, $UE = 4 \text{ cm}$, $\angle R = 75^\circ$, $\angle U = 120^\circ$.**Sol. Rough sketch of TRUE****Steps of construction:****Step 1.** Draw a line segment $TR = 3.5 \text{ cm}$.**Step 2.** Construct angle 75° at R and, draw an arc ofradius 3 cm with R as centre. Which intersect at U .**Step 3.** Construct angle 120° at U and produce the side UE .**Step 4.** Draw an arc of radius 4 cm with U as centre.**Step 5.** Join UE and TE .Hence, $TRUE$ is the required quadrilateral.**EXERCISE 4.5** (Page - 68)**Draw the following.****Q1. The square READ with $RE = 5.1 \text{ cm}$.****Sol.** As we know that sides of a square are equal that means $RE = EA = AD = DR = 5.1 \text{ cm}$ and adjacent sides make an angle of 90° .**Rough sketch of READ****Steps of construction:****Step 1.** Draw $RE = 5.1 \text{ cm}$.**Step 2.** At point E , construct an angle of 90° and draw an arc of radius 5.1 cm . Which intersects at A .**Step 3.** At point R , draw an arc of radius 5.1 cm at point A , draw another arc of radius 5.1 cm which intersects the first arc at D .**Step 4.** Join AD and RD .Therefore, $READ$ is the required square.**2. A rhombus whose diagonals are 5.2 cm and 6.4 cm long.**

Sol. Rough sketch**Steps of construction:**

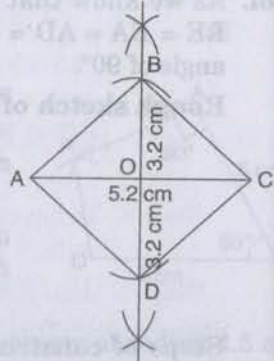
Step 1. Draw $AC = 5.2$ cm and draw perpendicular bisectors on AC .

Step 2. Since, diagonals bisect at mid point O so, get half of 6.4 cm that is 3.2 cm.

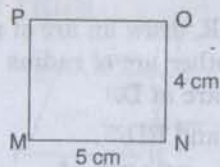
Step 3. Draw two arcs on both sides of AC of radius 3.2 cm from intersection point O . Which intersects at B and D .

Step 4. Join AB, BC, CD and DA which is required rhombus.

Therefore, $ABCD$ is the required rhombus.

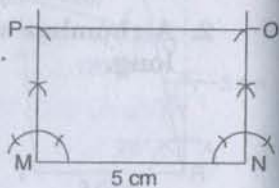


3. A rectangle with adjacent sides of length 5 cm and 4 cm.

Sol. Rough sketch**Steps of construction:**

Step 1. Draw a segment $MN = 5$ cm.

Step 2. At points M and N , draw perpendiculars of lengths 4 cm and produce them.



Step 3. Taking centres M and N , draw two arcs of 4 cm each, which intersect P and Q respectively.

Step 4. Now, join another side PO .

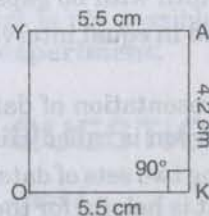
$MNOP$ is required rectangle.

4. A parallelogram OKAY where $OK = 5.5$ cm and $KA = 4.2$ cm.

Sol. For constructing a parallelogram.

There are 5 things essential but here only four things are given.

Since, rectangle is also a parallelogram.

Rough sketch of OKAY**Steps of construction:**

Step 1. Draw a line segment $OK = 5.5$ cm.

Step 2. Draw an angle of 90° at K and draw an arc of radius $KA = 4.2$ cm, which intersects at point A .

Step 3. Now draw another arc of radius $AY = 5.5$ cm and at point O , draw another arc of radius 4.2 cm which intersect at Y .

Step 4. Join AY and OY .

$OKAY$ is the required parallelogram.

