Exercise 4.1

1. 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

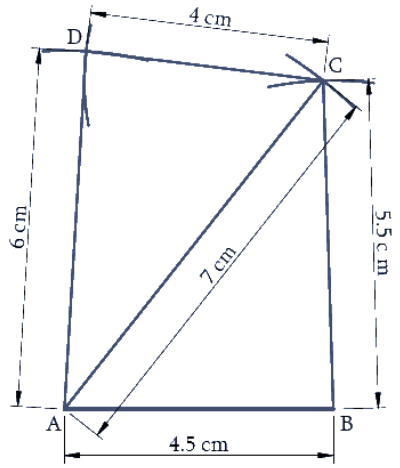
(iv) Rhombus BEST, BE = 4.5 cm, ET = 6 cm

Answer:

- Based on the given information, the five given measurements are of 4 sides and one diagonal. When measurements of 4 sides and one diagonal of a quadrilateral is given, we can construct a quadrilateral
- Using the concept opposite sides of parallelogram are parallel and equal, the five measurements can be found.
- All sides of a rhombus are equal and opposite sides are parallel, measurements of all sides can be found.

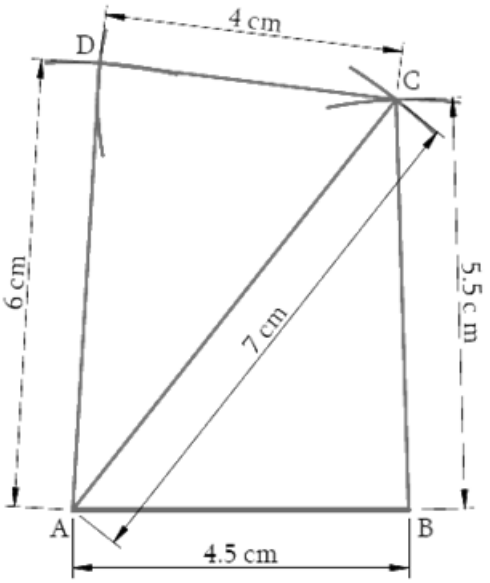
(i) Quadrilateral ABCD

Let us first draw a rough sketch of quadrilateral.



Construction of quadrilateral can be done in two parts. First construct triangle ABC and then triangle ACD. Let us find based on given measurements whether it is possible to construct the triangles.

In ΔABC,



5.5 + 4.5 > 7 and 5.5 - 4.5 < 7

7 + 4.5 > 5 and 7 - 4.5 < 5.5

5.5 + 7 > 4.5 and 7 - 5.5 < 4.5

It is possible to draw triangle ABC.

In ΔACD

7 + 4 > 6 and 7 - 4 < 6

6 + 7 > 4 and 7 - 6 < 4

6 + 4 > 7 and 6 - 4 < 7

So, construction of triangle ACD is also possible.

Let us construct the quadrilateral.

Step 1: Draw line segment AB = 4.5 cm.

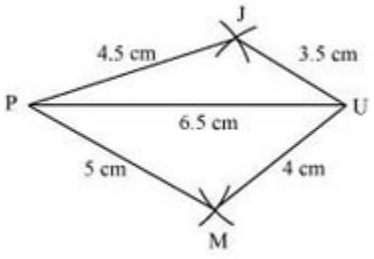
Step 2: With B as center and radius 5.5 cm draw an arc. With A as center and radius 7 cm draw another arc cutting the former arc.

Step 3: C is the intersecting point of arcs. Join BC and AC.

Step 4: Based on rough diagram, it is easy to find that AC is the diagonal. Therefore, the fourth vertex D should be on the opposite to B with reference to AC.

Step 3: With A as center and radius 6 cm draw an arc on the opposite side of point B. With C as center and radius 4 cm draw another arc cutting the former arc. D is the intersecting point of the arcs. Join AD and CD. ABCD is the required quadrilateral.

(ii) Quadrilateral JUMP



Step 1: Draw line segment JU = 3.5 cm.

Step 2: With J as center and radius 4.5 cm draw an arc. With U as center and radius 6.5 cm draw another arc cutting the former arc.

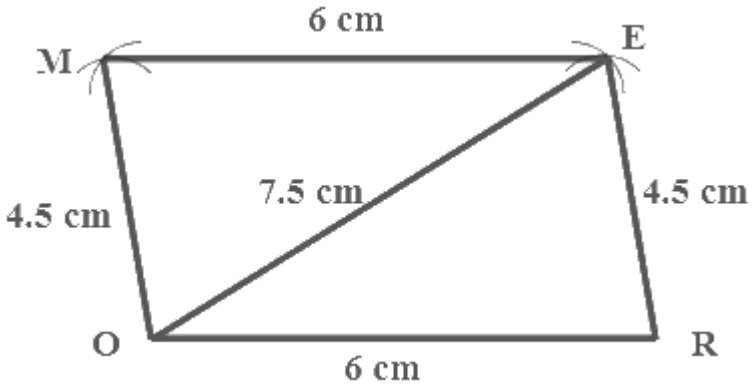
Step 3: P is the intersecting point of arcs. Join PJ and PU.

Step 4: Based on rough diagram, it is easy to find that PU is the diagonal. Therefore, the fourth vertex M should be on the opposite to J with reference to PU.

Step 3: With U as center and radius 4 cm draw an arc on the opposite side of point J. With P as center and radius 5 cm draw another arc cutting the former arc. M is the intersecting point of the arcs. Join PM and UM. JUMP is the required quadrilateral.

(iii) Parallelogram MORE

As we know that opposite sides of parallelogram are parallel and equal, the five measurements can be found.



ME = OR, MO = ER

Step 1: Draw a line segment OR = 6 cm.

Step 2: With R as radius and radius 4.5 draw an arc.

Step 3: With O as radius and radius 7.5 cm draw another arc cutting the former arc..

Step 4: E is the intersecting point. Join RE and OE.

Step 5: With E as centre and radius 6 cm draw an arc.

Step 6: With O as centre, draw another arc ad radius 4.5 cm cutting the former arc.at M.

Step 7: Join EM and OM.

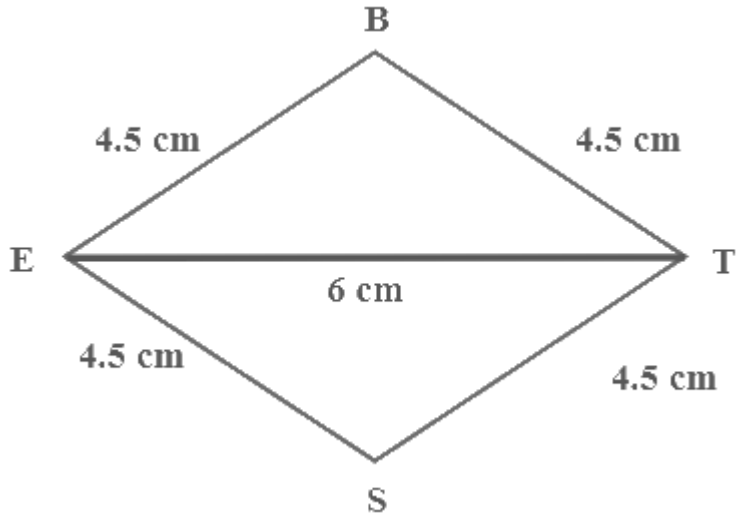
Thus, MORE is the required parallelogram.

(iv) Rhombus BEST

BE = 4.5 cm

ET = 6 cm

All sides of a rhombus are equal and opposite sides are parallel, measurements of all sides can be found.



Step 1: Draw a line segment ET = 6 cm.

Step 2: Taking E as centre and radius 4.5 cm, draw arcs on both sides of the line segment ET.

Step 3: Taking T as centre and radius 4.5 cm, draw arcs on both sides of the line segment ET cutting the former arcs.

Step 4: B and S are points of intersections of arcs.

Step 5: Join EB, ES, BT and TS.

Thus, BEST is the required rhombus.

Exercise 4.2

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

(ii) Quadrilateral GOLD

OL = 7.5 cm, GL = 6 cm

GD = 6 cm, LD = 5 cm, OD = 10 cm

(iii) Rhombus BEND

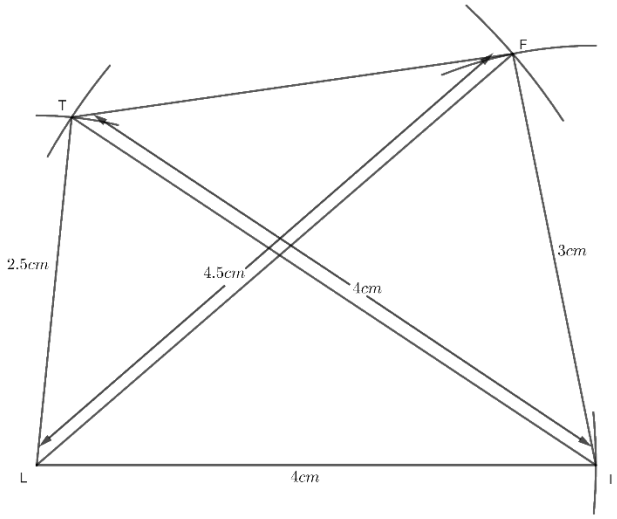
BN = 5.6 cm and DE = 6.5 cm

Answer:

- Based on the given information, the five given measurements are of 4 sides and one diagonal. When measurements of 4 sides and one diagonal of a quadrilateral is given, we can construct a quadrilateral.
- All sides of a rhombus are equal and opposite sides are parallel, measurements of all sides can be found.

(i) Quadrilateral LIFT

Let us first draw a rough sketch of quadrilateral.



The construction can be done in two parts. First draw ΔLIF and then daw ΔLTF and then join the other side. Let us see whether it is possible

In ΔLIF,

4 + 3 > 4.5 and 4 - 3 < 4.5

4.5 + 3 > 4 and 4.5 - 3 < 4

4.5 + 4 > 3 and 4.5 - 4 < 3

In ΔLTF,

4 + 4 > 2.5 and 4 - 4 < 2.5

4 + 2.5 > 4 and 4 - 2.5 < 4

4 + 2.5 > 4 and 4 - 2.5 < 4

In both cases, it is possible to form triangle.

Let us construct the quadrilateral.

Step 1: Construct Line LI=4 cm. With L as center and 4.5 cm as radius draw an arc. With I as center and 3 cm as radius draw an arc cutting the former one. The intersection point is F. Join IF and LF.

Step 2: With L as center and radius 2.5 cm draw an arc. With I as center and 4 cm as radius draw an arc cutting the former one at T. Join LT and IT.

Step 3: Join FT.

Step 4: LIFT is the required quadrilateral.

(ii) Quadrilateral GOLD

Step 1: Draw a line segment OL = 7.5 cm

Step 2: With O as centre and radius 10 cm draw an arc.

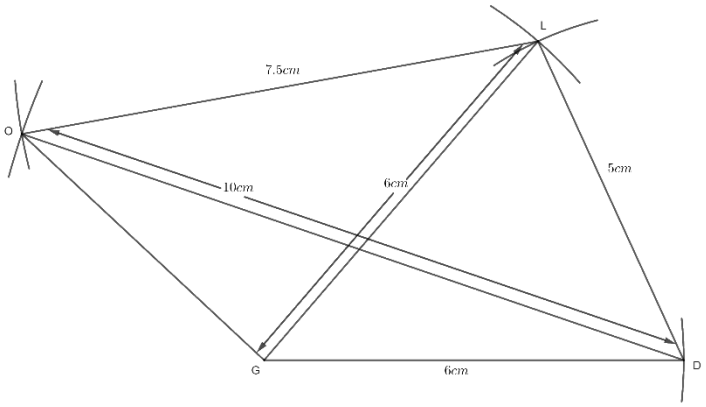
Step 3: With L as centre and radius 5cm draw another arc to meet the former arc at D.

Step 4: Join OD and LD.

Step 5: With L and D as centre and equal radii 6 cm draw an arc to meet each other at G.

Step 6: Join LG and DG.

GOLD is the required quadrilateral.



(iii) Rhombus BEND

BN = 5.6 cm

DE = 6.5 cm

All sides of a rhombus are equal and opposite sides are parallel, measurements of all sides can be found.

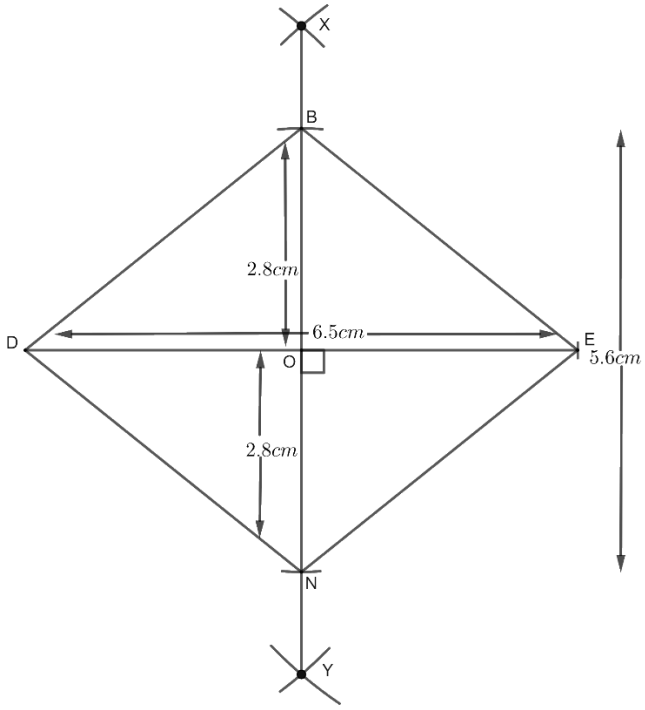
Step 1: Draw a line segment BN = 5.6 cm.

Step 2: Draw the perpendicular bisector of BN intersecting at O.

Step 3: Draw two arcs with centre O and radius 3.25 cm to meet the right bisector at D and E.

Step 4: Join BE, EN, ND and BD.

Thus, BEND is the required rhombus.



Exercise 4.3

1. Construct the following quadrilaterals.

(i) Quadrilateral MORE

MO = 6 cm, OR = 4.5 cm

∠M = 60°, ∠O = 105°, ∠R = 105°

(ii) Quadrilateral PLAN

PL = 4 cm, LA = 6.5 cm

∠P = 90°, ∠A = 110°, ∠N = 85°

(iii) Parallelogram HEAR

HE = 5 cm, EA = 6 cm

∠R = 85°

(iv) Rectangle OKAY

OK = 7 cm, KA = 5 cm

Answer:

(i) Quadrilateral MORE

i) Step 1: Draw a line segment MO= 6 cm.

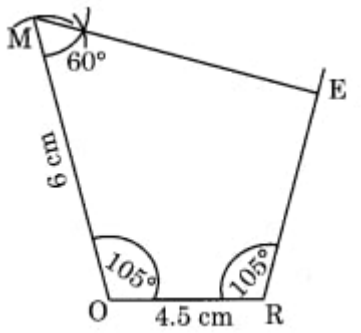
Step 2: With M as center draw angle of measure 60º.

Step 3: Draw 105º from O.

Step 4: With O as center and radius 4.5 cm draw an arc cutting the ray from O at R. OR = 4.5 cm

Step 5: Construct an angle of 105º from R as above. The ray from R meets the ray from M at a point. Mark the intersection point as E.

Step 6: MORE is the required quadrilateral.



(ii) Quadrilateral PLAN

Step 1: Draw a line segment LA = 6.5 cm

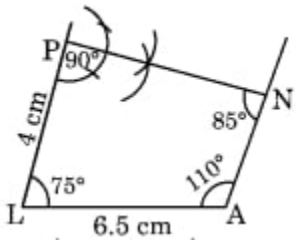
Step 2: Draw an angle of 75° at point L and 110° at point A with the help of a protractor.

[∵ 360° – (110° + 90° + 85°) = 75°]

Step 3: Cut LP = 4 cm.

Step 4: Draw an angle of 90° at point P which meets the angle line through point A at point N.

Thus PLAN is the required quadrilateral.



(iii) Parallelogram HEAR

Opposite sides of a parallelogram are equal.

Step 1: Draw a line segment HE = 5 cm.

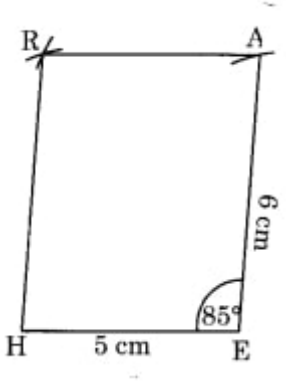
Step 2: Draw an angle of 85° at E and cut EA = 6 cm.

Step 3: With centre A and radius 5 cm draw an arc.

Step 4: Draw another arc with centre H and radius 6 cm to meet the former arc at R.

Step 5: Join the points HR and AR.

HEAR is the required parallelogram.



(iv) Rectangle OKAY

All the angles of the rectangle are of 90°.

Step 1: Draw a line segment KO = 7 cm.

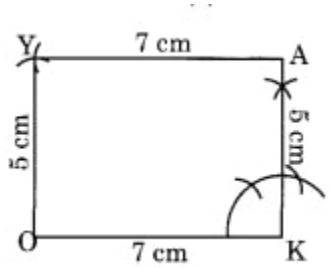
Step 2: Draw the angle of 90° at point K and cut KA = 5 cm.

Step 3: With centre O and radius 5 cm draw an arc.

Step 4: Draw another arc with centre A and radius 7 cm to meet the former arc at Y.

Step 5: Join points OY and AY.

OKAY is the required rectangle.



Exercise 4.4

1. Construct the following quadrilaterals. (i) Quadrilateral DEAR DE = 4cm, EA = 5cm, AR = 4.5cm ∠E = 60°, ∠A = 90° (ii) Quadrilateral TRUE TR = 3.5cm, RU = 3cm, UE = 4cm ∠R = 75°, ∠U = 120°

Answer:

(i) Quadrilateral DEAR

Let us construct the quadrilateral

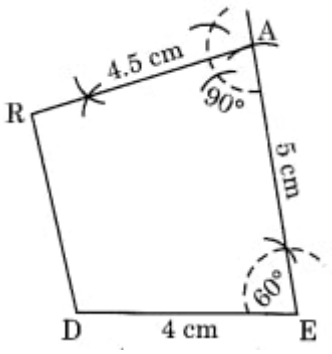
Step 1: Draw a line segment TR = 3.5 cm.

Step 2: With R as center construct an angle of 75°. With R as center and radius 3 cm draw an arc cutting the ray from R at U

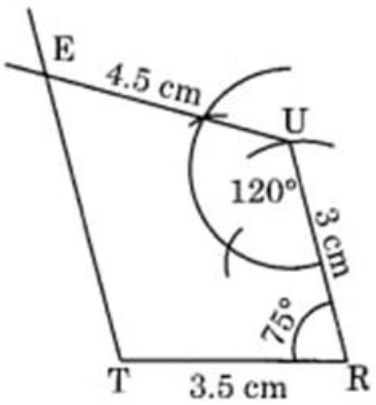
Step 3: With U as center construct an angle of 120°. With U as center and radius, 4 cm draw an arc cutting the ray from U at E.

Step 4: Join TE.

Step 5: TRUE is the required quadrilateral.



(ii) Quadrilateral TRUE



ii) Step 1: Draw a line segment TR = 3.5 cm

Step 2: Draw an angle of 75° at point R and cut RU = 3 cm.

Step 3: Draw an angle of 120° at point U and cut UE = 4.5 cm.

Step 4: Join TE.

TRUE is the required quadrilateral.

Exercise 4.5

Draw the following.

1. A square READ with RE = 5.1 cm.

2. A rhombus whose diagonals are 5.2 cm and 6.4 cm long.

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

4. A parallelogram OKAY where OK = 5.5 cm and KA = 4.2 cm. Is it unique?

Answer:

i) A square READ

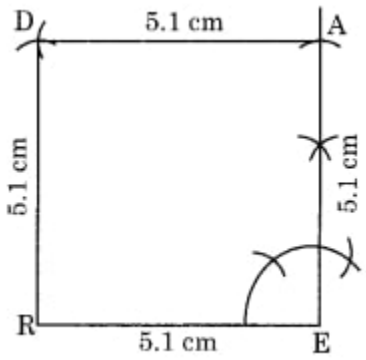
Step 1: Draw a line segment RE = 5.1 cm.

Step 2: Draw an angle of 90° at E and cut EA = 5.1 cm.

Step 3: Draw two arcs from A and R with radius 5.1 cm to cut each other at D.

Step 4: Join RD and AD.

READ is the required square.



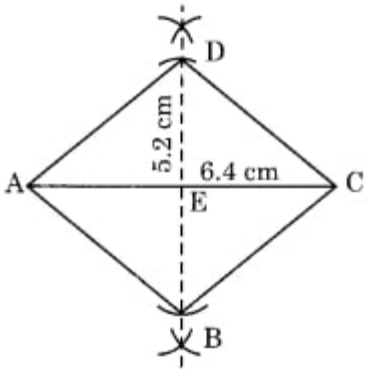
ii) Step 1: Draw a line segment AB=6.4 cm.

Step 2: Draw perpendicular bisector of AB meeting AB at O.

Step 3: 5.2 cm divided by 2 = 2.6 cm. Measure 2.6 cm from O on either side of AB on perpendicular bisector and mark them as C and D.

Step 4: Join AC, AD, BC and BD.

Step 5: ABCD is the required rhombus.



iii) Step 1: Draw a line segment PQ = 5 cm.

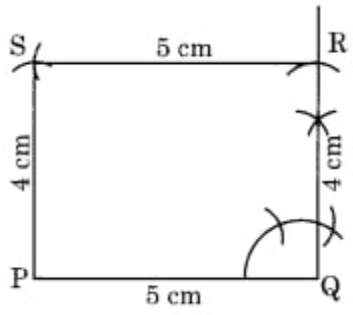
Step 2: Draw an angle of 90° at Q and cut QR = 4 cm.

Step 3: With centre R and radius 5 cm draw an arc.

Step 4: Draw another arc with centre P and radius 4 cm to meet the former arc at S.

Step 5: Join RS and PS.

Thus, PQRS is the required rectangle.



iv) A parallelogram OKAY

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

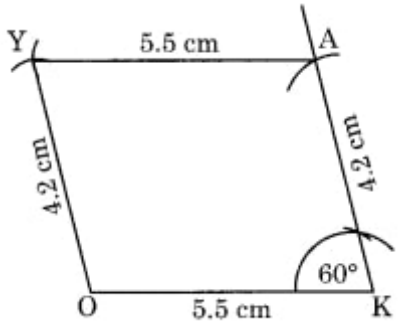
Step 2: Draw an angle of any measure (say 60°) at K and cut KA = 4.2 cm.

Step 3: With centre A and radius of 5.5 cm draw an arc.

Step 4: Draw another arc with centre O and radius 4.2 cm to cut thes former arc at Y.

Step 5: Join AY and OY.

OKAY is the required parallelogram.



It is not a unique parallelogram as the angle at K can be of measure other than 60°.