CONCEPT APPLICATION LEVEL - I   [NCERT Questions]

EXERCISE - 1

Q.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
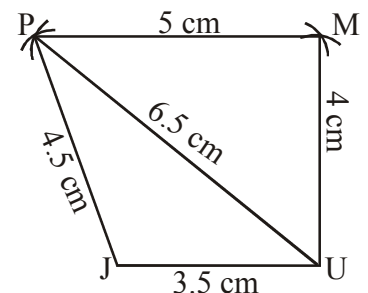
Sol.   **(i)**   **Steps of construction**

      1.   Draw AB = 4.5 cm

      2.   With A as centre and radius AC = 7 cm, draw an arc.

      3.   With B as centre and radius BC = 5.5 cm, draw another arc to the intersect the arc of step (2) at C.

      4.   With A as centre and radius AD = 6 cm, draw an arc on the side of AC, opposite to that of B.

      5.   With C as centre and radius CD = 4 cm, draw another arc to intersect the arc of step (4) at D.

      6.   Join BC, CD, DA and AC.
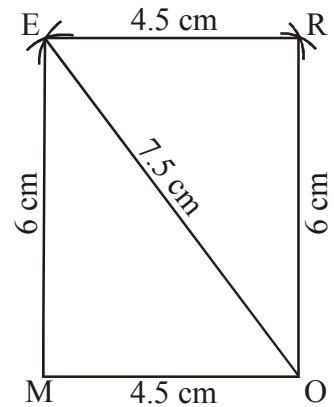
      Then,   ABCD is the required quadrilateral.
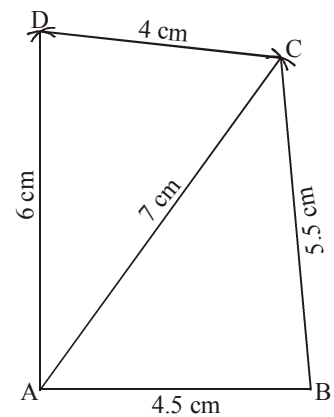
    (ii)   **Steps of construction**

      1.   Draw JU = 3.5 cm

      2.   With J as centre and radius JP = 4.5 cm, draw an arc.

      3.   With U as centre and radius UP = 6.5 cm, draw another arc to intersect the arc of step 2 at P.

      4.   With U as centre and radius UM = 4 cm, draw an arc on the side of PU opposite to that of J.

      5.   With P as centre and radius PM = 5 cm, draw another arc to intersect the arc of step 4 at M.

      6.   Join UM, MP, PJ and UP.

      Then,   JUMP is the required quadrilateral.
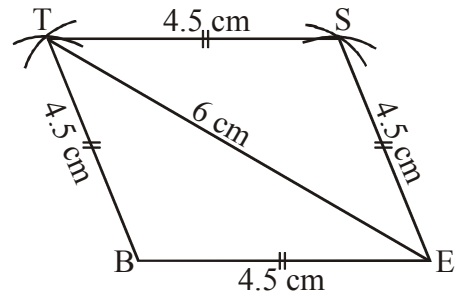
(iii)   Steps of Construction

1.   Draw MO = 4.5 cm
2.   With M as centre and radius ME = 6 cm, draw an arc.
3.   With O as centre radius OE = 7.5 cm, draw an arc to intersect the arc of step 2 at E.
4.   With O as centre and radius OR = 6 cm, draw an arc on the side of OE opposite to that of M.
5.   With E as centre and radius ER = 4.5 cm, draw another arc to intersect the arc of step 4 at the E.
6.   Join OR, RE, EM and EO.

Then, MORE is the required parallelogram.

(iv)   Steps of Construction

1.   Draw BE = 4.5 cm
2.   With B as centre and BT = 4.5 cm, draw an arc.
3.   With E as centre and radius ET = 6 cm, draw another arc to intersect arc of step 2 at T.
4.   With E as centre and radius ES = 4.5 cm, draw an arc on the side of ET opposite to that of B.
5.   With T as centre and radius TS = 4.5 cm, draw another arc to intersect the arc of step 4 at S.
6.   Join ES, ST, TB and TE.

Then, BEST is the required rhombus.

EXERCISE - 2

Q.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, DE = 6.5 cm
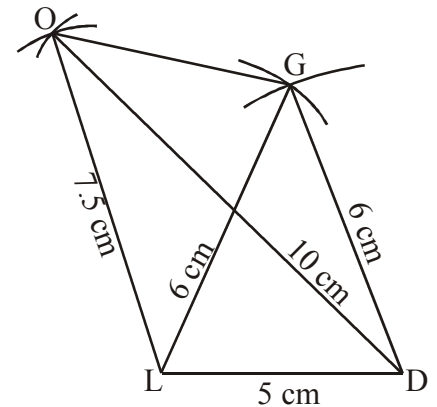
Sol.   **(i)**   **Steps of construction**

1.   Draw LI = 4 cm.

2.   With L as centre and radius LT = 2.5 cm, draw an arc.

3.   With I as centre and radius IT = 4 cm, draw another arc to intersect the arc of step 2 at T.

4.   With I as centre and radius IF = 3 cm, draw an arc.

5.   With L as centre and radius LF = 4.5 cm, draw another arc to intersect the arc of step 4 at F.

6.   Join IF, FT, TL, LF and IT.

Then, LIFT the required quadrilateral.
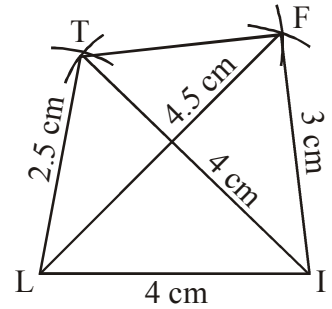
(ii)   **Steps of construction**

1.   Draw LD = 5 cm.

2.   With L as centre and radius LG = 6 cm, draw an arc.

3.   With D as centre and radius DG = 6 cm, draw another arc to intersect the arc of step 2 at G.

4.   With L as centre and radius LO = 7.5 cm, draw an arc.

5.   With D as centre and radius DO = 10 cm, draw another arc to intersect the arc of step 4 at O.

6.   Join DG, GO, OL, LG and DO.

Then GOLD is the required quadrilateral.

(iii)   **Steps of Construction**

1.   Draw DE = 6.5 cm.

2.   Draw perpendicular bisector PQ of DE. Let M be the mid-point of DE.

3.   Cut MN = $\frac{1}{2}$ × 5.6 cm = 2.8 cm from MP.

4.   Cut MB = $\frac{1}{2}$ × 5.6 cm = 2.8 cm from MQ.

5.   Join DN, NE, EB and BD.

Then, BEND is the required rhombus.
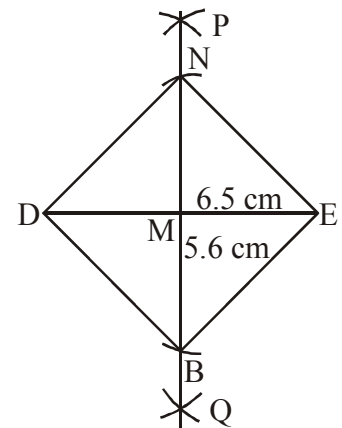
EXERCISE - 3

**Q.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= 7cm, KA = 5 cm

Sol.   (i)   Steps of construction

1.   Draw MO = 6 cm.
2.   At O, draw ray OX such that ∠MOX = 105°
3.   Cut OR = 4.5 cm from ray OX.
4.   At M, draw ray MY such that ∠OMY = 60°
5.   At R, draw ray RZ such that ∠ORZ = 105°
   Let the rays. MY and RZ meet at E.

Then, MORE is the required quadrilateral.
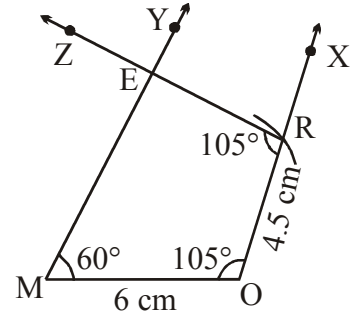
(ii)   Steps of construction

1.   Draw PL = 4 cm.
2.   At L, draw ray LX such that ∠PLX = 75°.
       By Angle-sum property of quadrilateral,
       ∠P + ∠A + ∠N + ∠L = 360°
       $\Rightarrow$ 90° + 110° + 85° + ∠L = 360°
       $\Rightarrow$ 285° + ∠L = 360°
       $\Rightarrow$ ∠L = 360° − 285° = 75°
3.   Cut LA = 6.5 cm from ray LX.
4.   At A, draw ray AY such that ∠LAY = 110°.
5.   At P, draw ray PZ such that ∠LPZ = 90°.
       Let the rays AY and PZ meet at N.

Then, PLAN is the required quadrilateral.
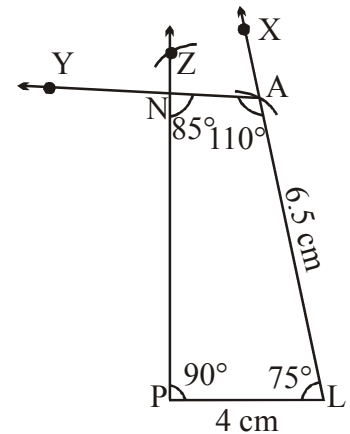
(iii)   Steps of construction

1.   Draw HE = 5 cm.
2.   At E, draw ray EX such that ∠HEX = 85°.
       Opposite angles of a parallelogram are equal.
3.   Cut EA = 6 cm from the ray EX.
4.   With A as centre and radius AR = 5 cm, draw
       an arc.
5.   With H as centre and radius HR = 6 cm, draw
       another arc to intersect the arc of step 4 at R.
6.   Join AR and HR.

Then, HEAR is the required parallelogram.
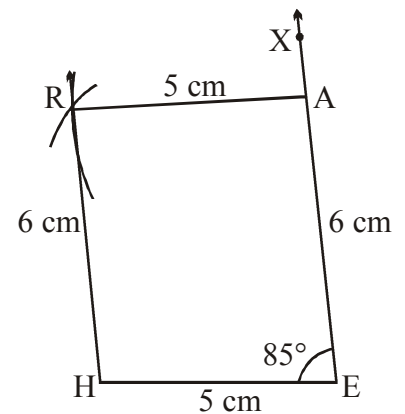
(iv) **Steps of construction**

1. Draw OK = 7 cm.

2. At K, draw ray KX such that ∠OKX = 90°.

3. Cut KA = 5 cm from ray KX.

4. Taking A as centre and radius AY = 7 cm, draw an arc.

5. Taking O as centre and radius OY = 5 cm, draw another arc to intersect the arc of step 4 at Y.

6. Join AY and OY.
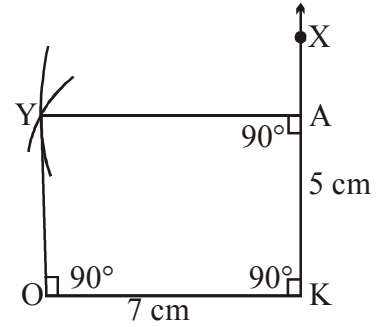
Then OKAY is the required rectangle.

EXERCISE - 4

Q.1 **Construct the following quadrilaterals:**
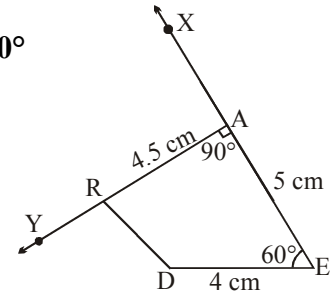
(i) **Quadrilateral DEAR**

DE = 4 cm, EA = 5 cm, AR = 4.5 cm, ∠E = 60°, ∠A = 90°

(ii) **Quadrilateral TRUE**

TR = 3.5 cm, RU = 3 cm, UE = 4 cm, ∠R = 75°, ∠U = 120°

[Sol. **(i)** **Steps of construction**
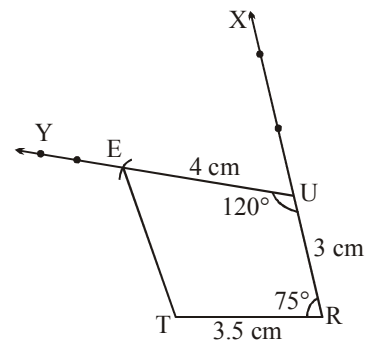
1. Draw DE = 4 cm.

2. At E draw ray EX such that ∠DEX = 60°.

3. From ray EX, cut EA = 5 cm.

4. At A, draw ray AY such that ∠EAY = 90°

5   Cut AR = 4.5 cm from ray AY.

6. Join RD.

Then, DEAR is the required quadrilateral.

(ii) **Steps of construction**

1. Draw TR = 3.5 cm.

2. At R, draw ray RX such that ∠TRX = 75°.

3. Cut RU = 3 cm from ray RX.

4. At U, draw ray UY such that ∠RUY = 120°.

5. Cut UE = 4 cm from ray UY.

6. Join ET.

Then, TRUE is the required quadrilateral.

<div align="center">**EXERCISE - 5**</div>

Q.1   Draw the following:

1.   The square READ with RE = 5.1 cm.

2.   A rhombus where 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.

Sol.   (1)   Steps of construction

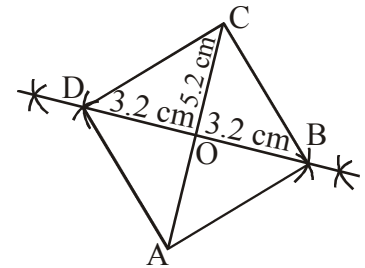1.   Draw RE = 5.1 cm.

2.   At R, draw a ray RX such that $\angle ERX = 90°$.

3.   From ray RX, cut RD = 5.1 cm.

4.   At E, draw a ray EY such that $\angle REY = 90°$.

5.   From ray EY, cut EA = 5.1 cm.

5.   Join AD.
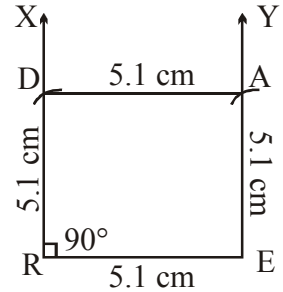
Then, READ is the required square.

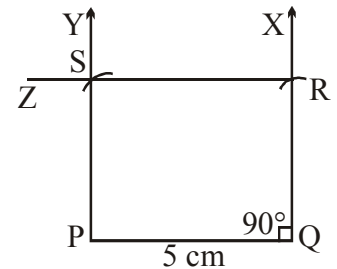**(2)   Steps of Construction**

1.   Draw AC = 5.2 cm.

2.   Construct its perpendicular bisector. Let them meet at O.

3.   Cut off $\dfrac{6.4}{2} = 3.2$ cm lengths on of the drawn bisector, we get B and D.

4.   Join AB, BC, CD and DA .

Then, ABCD is the required rhombus.

(3)   Steps of Construction

1.   Draw PQ =5 cm.

2.   At Q, draw a ray QX such that $\angle PQX = 90°$.

3.   From ray QX, cut QR = 4 cm.

4.   Through P, draw a ray PY parallel to QR.

5.   Through R, draw a ray RZ parallel to QP to meet the ray of step 4 at S.

Then, PQRS the required rectangle.

(4)   Steps of Construction

1.   Draw OK = 5.5 cm.

2.   At K, draw a ray KX.

3.   From ray KX, cut KA = 4.2 cm.

4.   Through A, draw a ray AT parallel to KO.

5.   Through O, draw a ray OZ parallel to KA to cut the ray of step 4 at Y.
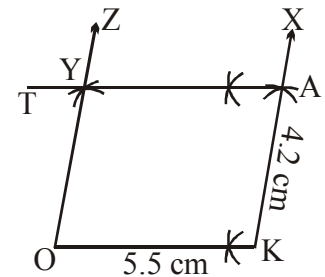
Then, OKAY is the required parallelogram.

TRY THESE

Q.1 **Arshad has five measurements of a quadrilateral ABCD. These are AB = 5 cm, ∠A = 50°, AC = 4 cm, BD = 5 cm and AD = 6 cm. Can he construct a unique quadrilateral? Give reasons for your answer.**

Sol. We cannot construct a unique quadrilateral because

(i) We can construct ΔABD but not ΔBCD

(ii) Neither we can construct ΔACD not ΔABC.

Q.2 (i) **We saw that 5 measurements of a quadrilateral can determine a quadrilateral uniquely. Do you think any five measurements of the quadrilateral can do this?**

(ii) **Can you draw a parallelogram BATS where BA = 5 cm, AT = 6 cm and AS = 6.5 cm? Why?**

(iii) **Can you draw a rhombus ZEAL where ZE = 3.5 cm, diagonal EL = 5 cm? Why?**

(iv) **A student attempted to draw a quadrilateral PLAY where PL = 3 cm, LA = 4 cm, AY = 4.5 cm, PY = 2 cm and LY = 6 cm, but could not draw it. What is the reason?**

Sol. (i) No! Any five measurements cannot determine a quadrilateral uniquely. To determine a quadrilateral uniquely, we require any one of the following sets of measurements.

(a) four sides and one diagonal.

(b) two sides and three diagonals.

(c) two adjacent sides and three angles.

(d) three sides and two included angles.

(ii) Yes, we can draw a parallelogram BATS, where BA = 5 cm, AT = 6 cm and AS = 6.5 cm because the opposite sides of a parallelogram are equal in length.

(iii) Yes! we can draw a rhombus ZEAL because all the four sides of a rhombus are equal in length.

(iv) The students could not draw it because PL + PY < LY. Actually the sum of the lengths of any two sides of a triangle must always be greater than the length of the third side.

Q.3 **How will you construct a rectangle PQRS if you know only the lengths PQ and QR?**

Sol. **Steps of construction**

1. Draw PQ of given length.

2. At Q, draw a ray QX such that ∠PQX = 90°.

3. From ray QX, cut QR of given length.

4. Through P, draw a ray PY parallel to QR.

5. Through R, draw a ray RZ parallel to QP to meet the ray of step 4 at S.

Then, PQRS the required rectangle.
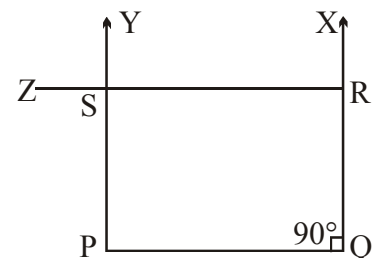
Q.4 **Construct the kite EASY, if AY = 8 cm, EY = 4 cm and SY = 6 cm. Which properties of the kite did you use in the process.**

Sol. Kite EASY cannot be constructed with the given measurements as a kite has two pairs of equal consecutive sides. Here,

AE = EY = 4 cm

AY = 8 cm

∴ AE + EY = 8 cm = AY

which is not possible as the sum of the lengths of any two sides of a triangle must be greater than the third side.

CONCEPT APPLICATION LEVEL - II

Q.1 **Construct a quadrilateral ABCD having given AB = 3.5 cm, BC = 4 cm, CD = 4.5 cm, DA = 5 cm and ∠B = 60°.**

Sol. **Steps of Construction:**

1. Draw AB = 3.5 cm.
2. At B draw ∠ABY = 60°.
3. Cut off from BY, a segment BC = 4 cm
4. With A as centre and radius 5 cm draw an arc.
5. With C as centre and radius 4.5 cm draw an arc cutting the first arc at D.
6. Join A to D and also C to D. Then ABCD is the required quadrilateral.
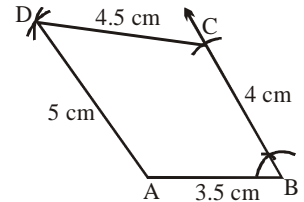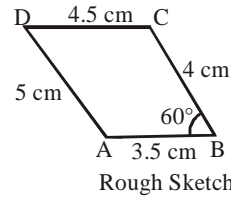
Q.2 **Construct a quadrilateral ABCD, given AB = 4 cm, BC = 3 cm, AD = 3.5 cm, diagonal AC = 5 cm and diagonal BD = 6 cm.**
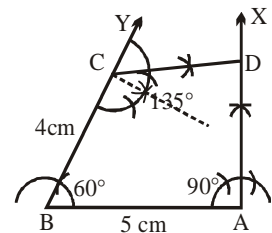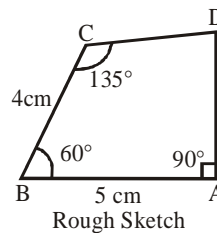
Sol. **Steps of Construction:**

1. Draw BC = 3 cm.
2. With B as centre and radius 4 cm draw an arc.
3. With C as centre and radius 5 cm draw an arc cutting the first arc at A.
4. Join B to A and also C to A.
5. With A as centre and radius 3.5 cm draw an arc.
6. with B as centre and radius 6 cm draw an arc cutting the first arc at D.
7. Join C to D, B to D and also A to D.

Then ABCD is the required quadrilateral.
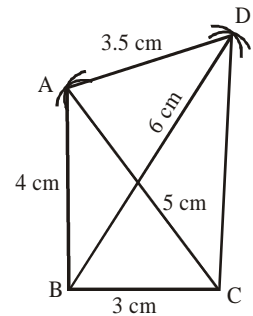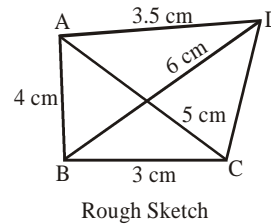
Q.3 **Construct a quadrilateral ABCD, given AB = 5 cm, BC = 4 cm, ∠B = 60°, ∠A = 90° and ∠C = 135°.**

Sol. **Steps of Construction:**

1. Draw AB = 5 cm.
2. At B draw ∠ABY = 60°
3. From BY cut off BC = 4 cm
4. At A draw ∠BAX = 90°.
5. At C draw ∠BCD = 135°, so that its arm CD cuts AX at D.
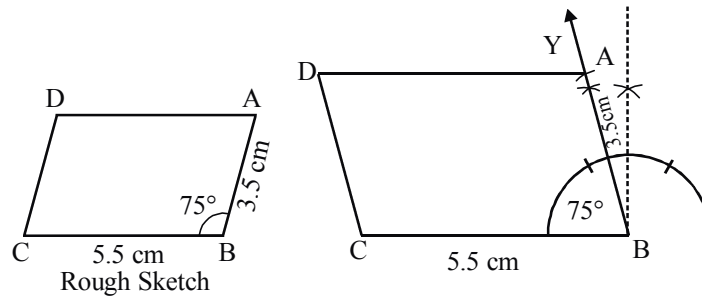
Then ABCD is the required quadrilateral.

Q.4   **Construct a parallelogram ABCD, given that AB = 3.5 cm, BC = 5.5 cm and ∠B = 75°.**

Sol.   **Steps of Construction:**

1.   Draw BC = 5.5 cm.
2.   At B draw ∠CBY = 75°.
3.   From BY, cut off BA = 3.5 cm.
4.   With A as centre and radius 5.5. cm draw an arc.
5.   With C as centre and radius 3.5 cm draw another arc cutting the first arc at D.
6.   Join A to D and C to D. Then ABCD is the required parallelogram.

Q.5   **Construct a parallelogram ABCD, given that AB = 5.5 cm, AD = 4 cm and diagonal BD = 6.5 cm.**
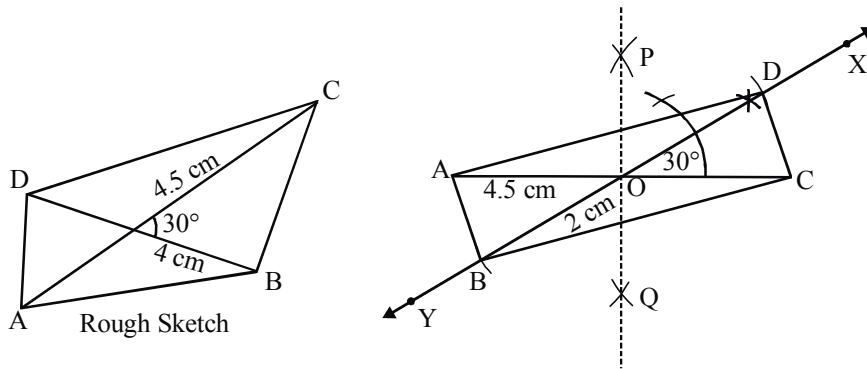
Sol.   **Steps of Construction:**

1.   Draw AB = 5.5 cm.
2.   With A as centre and radius 4 cm draw an arc.
3.   With B as centre and radius 6.5 cm draw another arc cutting the first arc at D.
4.   Joint A to D
5.   Now with D as centre and radius 5.5 cm (= AB) draw an arc.
6.   With B as centre and radius 4 cm (= AD) draw another arc cutting the arc of step 5 at C.
7.   Join D to C and also B to C.

Then ABCD is the required parallelogram.
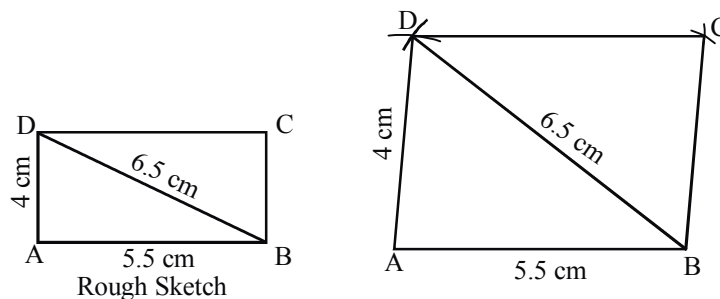
Q.6 **Construct a parallelogram ABCD, given that AC = 4.5 cm, BD = 4 cm and the angle between the diagonals is 30°.**
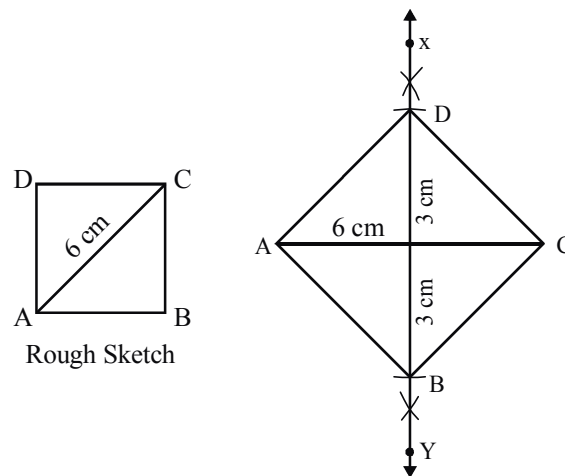
Sol. **Steps of Construction:**
1. Draw AC = 4.5 cm.
2. Draw PQ, the perpendicular bisector of AC meeting AC at O.
3. Through O draw a line XY making $\angle XOC = 30°$.
4. Cut off OD = OB = 2 cm $\left(= \dfrac{1}{2} BD \right)$ from XY.
5. Joint A to B, B to C, C to D and A to D.

Then ABCD is the required parallelogram.

Q.7 **Construct a square ABCD, given that diagnonal AC = 6 cm.**
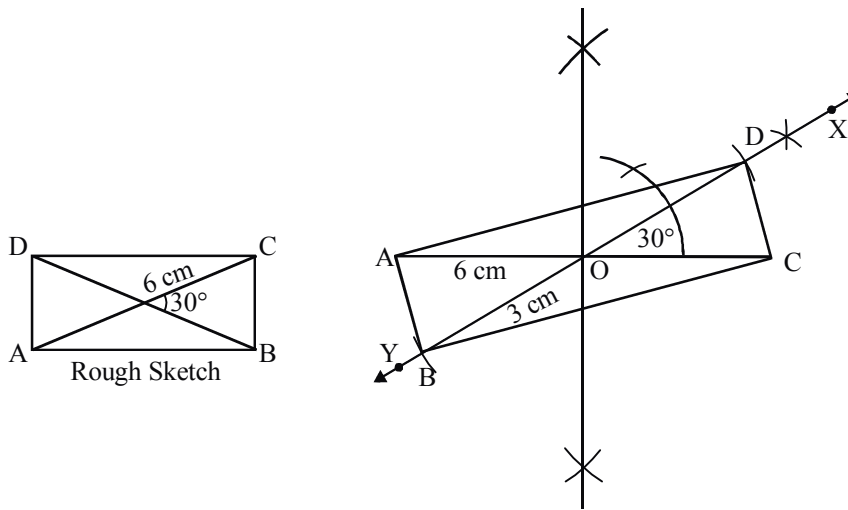
Sol. **Steps of Construction:**
1. Draw a segment AC = 6 cm.
2. Draw XY, the right bisector of AC meeting AC at O.
3. Cut off OD = OB = 3 cm $\left(= \dfrac{1}{2} AC \right)$ from OX and OY respectively.
4. Join A to B, B to C, C to D and A to D.

Then ABCD is the required square.

Q.8   **Construct a rectangle ABCD whose diagonal AC = 6 cm and the angle between the diagonals is 30°.**

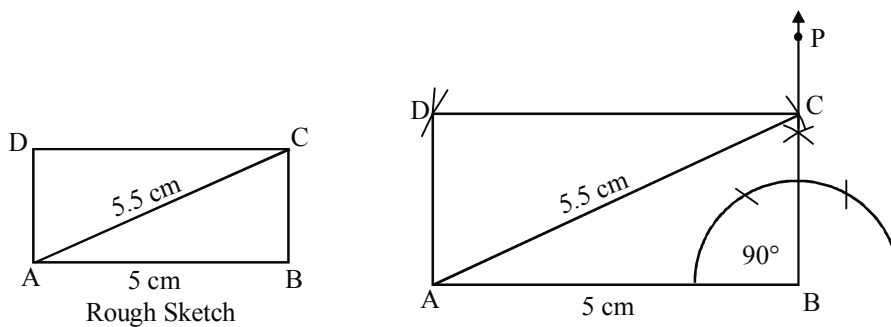**Sol.**   **Steps of Construction:**
1.   Draw AC = 6 cm.
2.   Bisect AC at O.
3.   At O, draw XY making ∠COX = 30°.
4.   Cut off OB = OD = 3 cm $\left(= \frac{1}{2} AC \right)$.
5.   Join A to B, B to C, C to D and A to D.
Then ABCD is the required rectangle.

Q.9   **Construct a rectangle ABCD given that side AB = 5 cm and the diagonal AC = 5.5 cm.**

Sol.   **Steps of construction:**
1.   Draw AB = 5 cm.
2.   At B, draw BP ⊥ AB.
3.   With A as centre and radius 5.5 cm draw an arc cutting BP at C.
4.   With C as centre and radius 5 cm draw an arc.
5.   With A as centre and radius equal to BC draw another arc cutting the first arc at D.
6.   Join A to D and also C to D.
Then ABCD is the required rectangle.

Q.10 Construct a rhombus ABCD given that side AB = 4.5 cm and a diagonal is 7 cm.
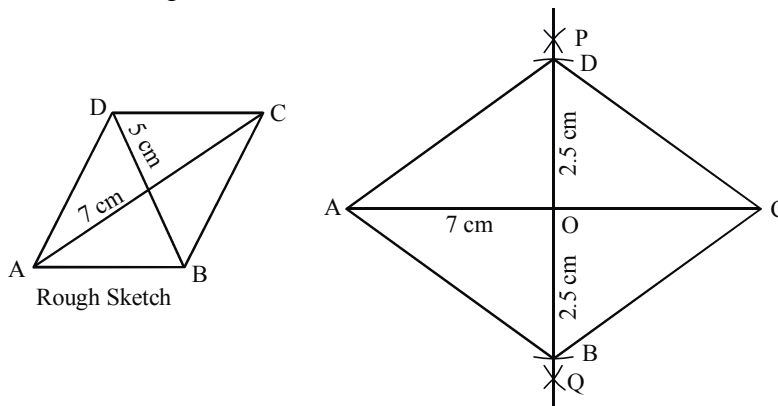**Sol.** **Step of Construction:**
1. Draw AC = 7 cm.
2. With A and C as centres and radius 4.5 cm draw arcs on both sides of AC, cutting each other at B and D.
3. Join A to B, C to B and C to D, A to D.
Then ABCD is the required rhombus.

Rough Sketch
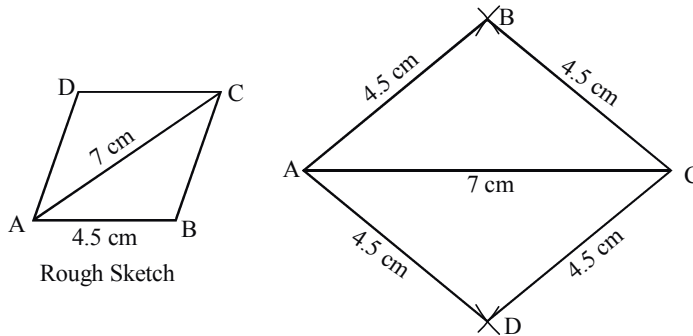
Q.11 Construct a rhombus ABCD whose diagonals AC and BD are 7 cm and 5 cm respectively.
Sol. **Step of Construction:**
1. Draw AC = 7 cm
2. Draw PQ, the perpendicular bisector of AC, meeting AC at O.
3. From OP and OQ cut off OD = OB = 2.5 cm $\left(= \frac{1}{2}BD\right)$ respectively.
4. Join A to B, B to C, C to D and D to A.
Then ABCD is the required rhombus.

Rough Sketch

Q.12 To construct a unique rectangle, the minimum number of measurements required is   **[IMO-2016]**
(A) 4   (B) 3   (C) 2   (D) 1

Q.13 Given below are the steps of construction to construct a quadrilateral ABCD where AB = 5.6 cm, BC = 4.1 cm, CD = 4.4 cm, AD = 3.3 cm and ∠A = 75°. Which of the following is INCORRECT step?
Step-I : Draw AB = 5.6 cm and construct ∠BAX = 75°.
Step-II: With A as centre and radius = 3.3 cm, cut off AD = 3.3 cm along AX.
Step-III : Join BD. With D as centre and radius = 4.1 cm, draw an arc.
Step-IV : With B as centre and radius = 4.1 cm, draw an arc to cut the arc drawn in above step at C. Join BC, CD to obtain the required quadrilateral ABCD.   **[IMO-2016]**
(A) Step-I   (B) Step-II   (C) Step-III   (D) Step-IV

ANSWER KEY →   Q.12   C   Q.13   C