PRACTICAL GEOMETRY

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- Construction of Quadrilateral

➢ CONSTRUCTION OF QUADRILATERAL

(1) When four sides and one diagonal are given.

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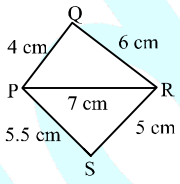
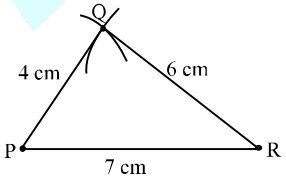
◈ When the lengths of four sides and a diagonal are given

Ex.1 Construct a quadrilateral PQRS where PQ = 4 cm, QR = 6 cm, RS = 5 cm, PS = 5.5 cm and PR = 7 cm.



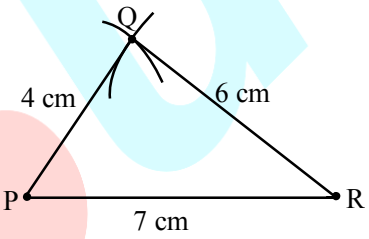
Sol. A rough sketch will help us in visualising the quadrilateral. We draw this first and mark the measurements.

Step 1 : From the rough sketch, it is easy to see that ΔPQR can be constructed using SSS construction condition. Draw ΔPQR

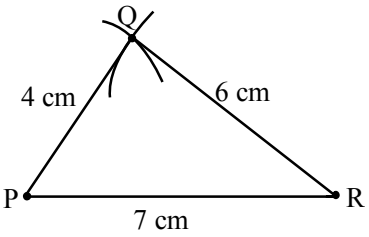


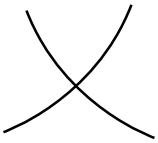
Step 2 : Now, we have to locate the fourth point S. This 'S' would be on the side opposite to Q with reference to PR. For that, we have two measurements.

S is 5.5 cm away from P. So, with P as centre, draw an arc of radius 5.5 cm. (The point S is somewhere on this arc!).

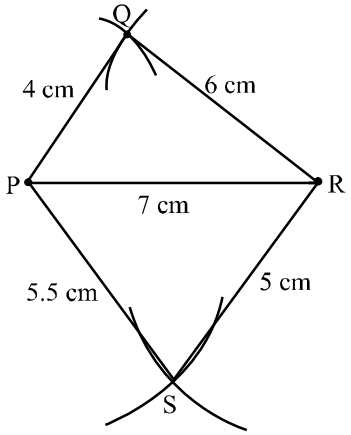


Step 3 : S is 5 cm away from R. So with R as centre, draw an arc of radius 5 cm (The point S is somewhere on this arc also!)





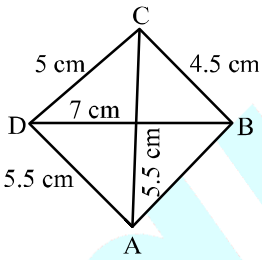
Step 4 : S should lie on both the arcs drawn. So it is the point of intersection of the two arcs. Mark S and complete PQRS. PQRS is the required quadrilateral.



◈ When two diagonals and three sides are given

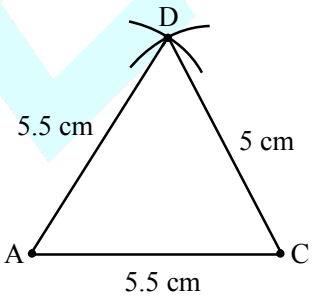
When four sides and a diagonal were given, we first drew a triangle with the available data and then tried to locate the fourth point. The same technique is used here.

Ex.2 Construct a quadrilateral ABCD, given that BC = 4.5 cm, AD = 5.5 cm, CD = 5 cm the diagonal AC = 5.5 cm & diagonal BD = 7 cm.

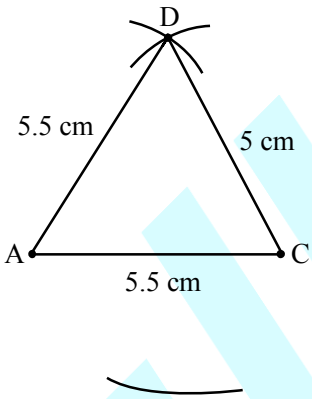


Sol. Here is the rough sketch of the quadrilateral ABCD. Studying this sketch, we can easily see that it is possible to draw ΔACD first.

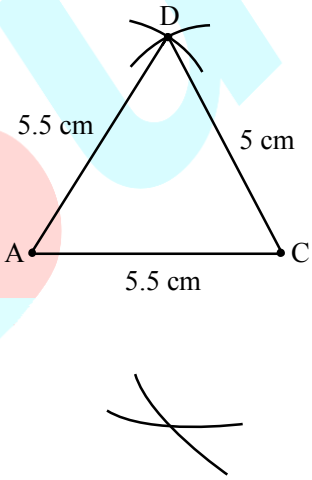
Step 1 : Draw ΔACD using SSS construction. (We now need to find B at a distance of 4.5 cm from C and 7 cm from D).



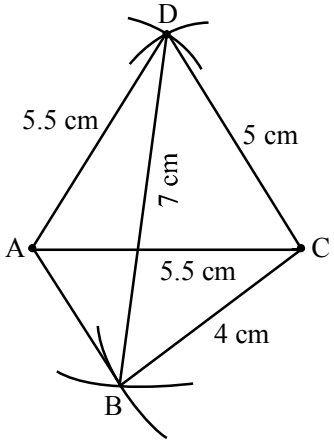
Step 2 : With D as centre, draw an arc of radius 7 cm. (B is somewhere on this arc)



Step 3 : With C as centre, draw an arc of radius 4.5 cm (B is somewhere on this arc also).



Step 4 : Since B lies on both the arcs, B is the point intersection of the two arcs. Mark B and complete ABCD. ABCD is the required quadrilateral.

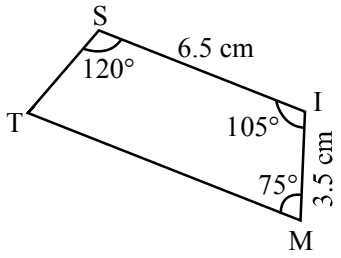


◈ When two adjacent sides and three angles are known

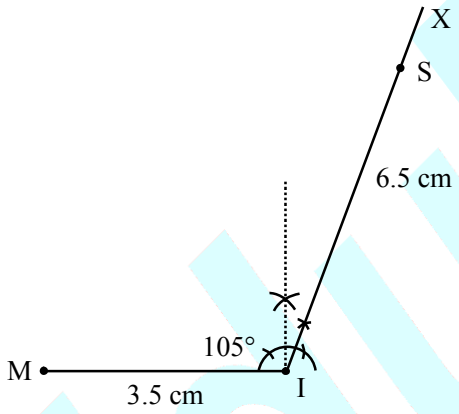
As before, we start with constructing a triangle and then look for the fourth point to complete the quadrilateral.

Ex.3 Construct a quadrilateral MIST where MI = 3.5 cm, IS = 6.5 cm, ∠M = 75°, ∠I = 105° and ∠S = 120°.

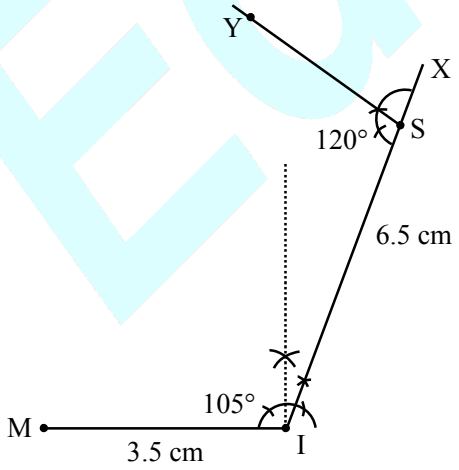
Sol. Here is a rough sketch that would help us in deciding our steps of construction. We give only hints for various steps.



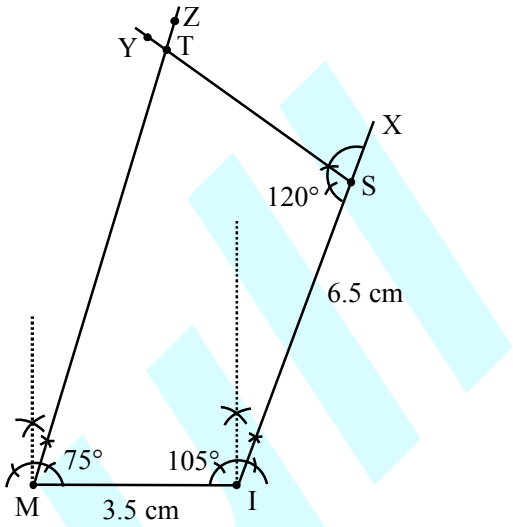
Step 1 : How do you locate the points? What choice do you make for the base and what is the first step?



Step 2 : Make ∠ISY = 120° at S.



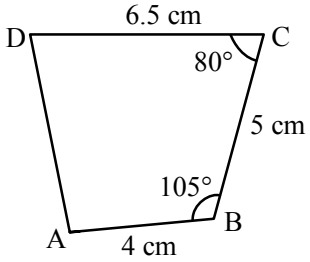
Step 3 : Make ∠IMZ = 75° at M. (where will SY and MZ meet ?) Mark that point as T. We get the required quadrilateral MIST.



◈ When three sides and two included angles are given

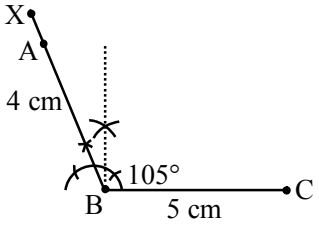
Under this type, when you draw a rough sketch, note carefully the ''included'' angles in particular.

Ex.4 Construct a quadrilateral ABCD, where AB = 4 cm, BC = 5 cm, CD = 6.5 cm and ∠B = 105° and ∠C = 80°.

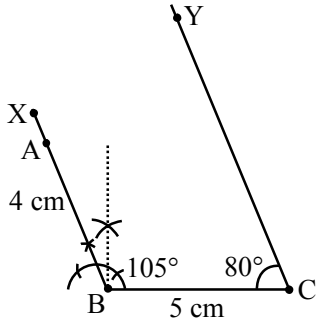


Sol. We draw a rough sketch, as usual, to get an idea of how we can start off. Then we can devise a plan to locate the four points.

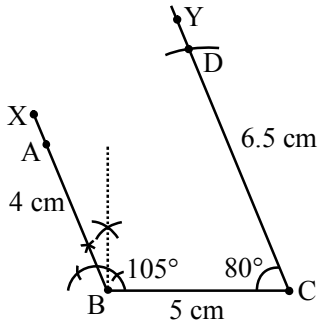
Step 1 : Start with taking BC = 5 cm on B. Draw an angle of 105° along BX. Locate A 4 cm away on this. We now have B, C and A.



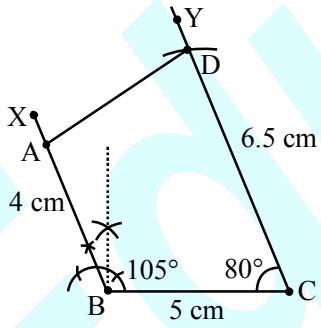
Step 2 : The fourth point D is on CY which is inclined at 80° to BC. So make ∠BCY = 80° at C on BC.



Step 3 : D is at a distance of 6.5 cm on CY. With C as centre, draw an arc of length 6.5 cm. It cuts CY at D.



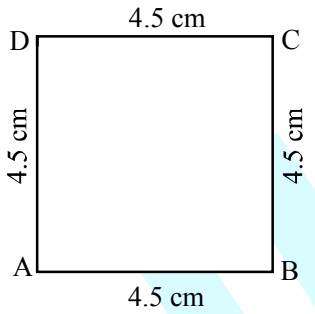
Step 4 : Complete the quadrilateral ABCD. ABCD is the required quadrilateral.



Ex.5 Draw a square of side 4.5 cm.

Sol. Initially it appears that only one measurement has been given. Actually we have many more details with us, because the figure is a special quadrilateral, namely a square. We now know that each of its angles is a right angle. (See the rough figure).

Rough figure



This enables us to draw Δ ABC using SAS condition. Then D can be easily located. Try yourself now to draw the square with the given measurements.

Ex.6 Is it possible to construct a rhombus ABCD where AC = 6 cm and BD = 7 cm? Justify your answer.

Sol. Only two (diagonal) measurements of the rhombus are given. However, since it is a rhombus, we can find more help from its properties.

The diagonals of a rhombus are perpendicular bisectors of one another.

So, first draw AC = 7 cm and then construct its perpendicular bisector. Let them meet at 0. Cut off 3 cm lengths on either side of the drawn bisector. You now get B and D.

Draw the rhombus now, based on the method described above.

Rough figure