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Constructing Angles of 60^o, 120^o, 30^o, 15^0, 90^o and 45^0

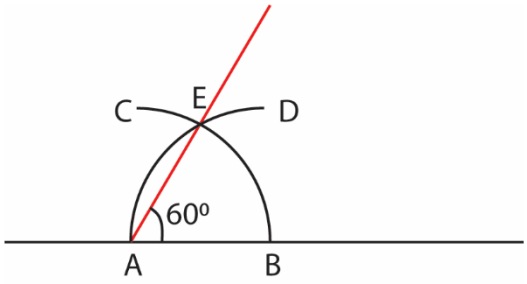
(a) How to construct an angle of 60^0.

(i) Draw a line and select point A.

(ii) With a compass placed at A make an arc BC.

(iii) Without adjusting the compass, place the compass at B and make an arc Ad to intersect with arc BC at E

(iv) Connect A to E and angle BAE = 60^0



(b) How to construct angle 30^0

By bisecting angle 30^0.

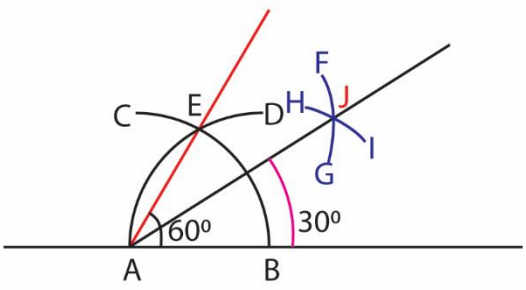
(i) Construct angle 60^0 as in (a) and bisect it as follows

(ii) Place a protractor at E and make an arc FG

(iii) Without adjusting the size of protractor; place it at B and make an arc HI to intersect at J

(iv) Draw a line from A through J

(v) Angle JAB = 30^0



(c) How to prepare angle 15

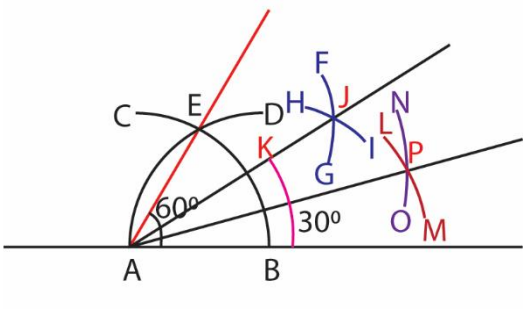
(i) By bisecting angle 30^0

(ii) Place a protractor at K and make an arc NO

(iii) Without adjusting the size of protractor; place it at B and make an arc LM to intersect at P

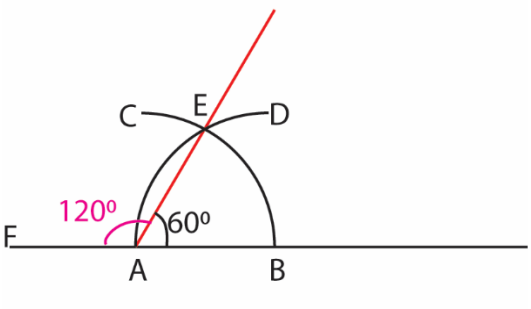
(iv) Draw a line from A through P

(v) Angle JAB = 30^0

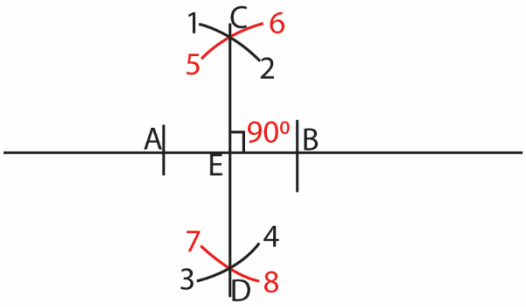


(d) How to prepare 120^0

(i) Prepare 600 as shown in (a) the remaining angle FAE



(e) How to construct angle 90^0



(i) Draw a straight line and mark points AB

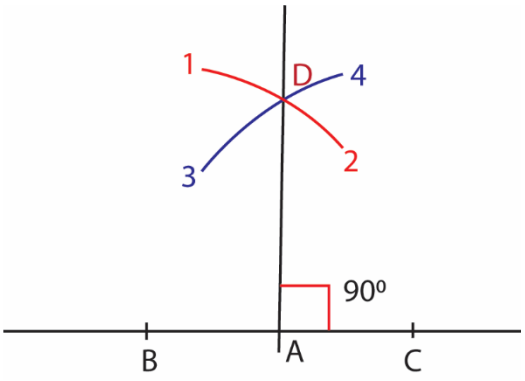
(ii) Place a protractor at point A and make arcs1-2 and 3-4.

(iii) Without adjusting the protractor, place it at point B and make arcs 5-6 and 7-8.

(iv) Draw through the intersection of arcs at C and D to meet line AB at E

(v) Angle CEB = 90^0.

Or



(i) Draw a line and mark point A

(ii) Using a protractor mark points Band C equidistant from A

(iii) Place a protractor at point B and make an arc 1-2.

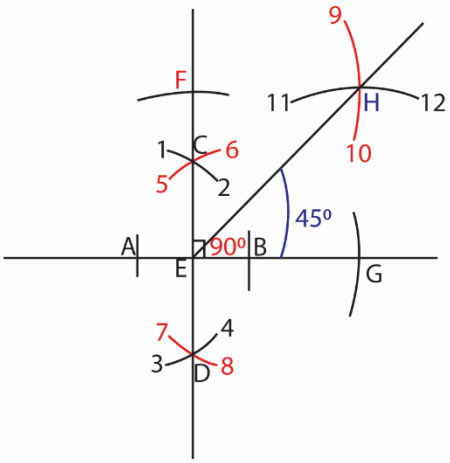
(iv) Without adjusting the length of a protractor, place it at C and make an arc 3-4 to intersect with arc 1-2 at D.

(v) Draw a line at A through D

(vi) Angle DAC = 90^0.

(f) How to prepare 45^0

By bisecting angle 90^0



(i) Prepare an angle 90^0 as in (e).

(ii) Place a protractor at E and mark points F and G.

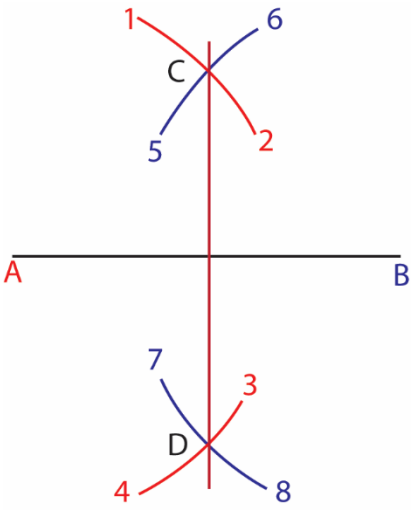
(iii) Place a protractor at F and make an arc 9-10.

(iv) Without adjusting the protractor place it at G and make an arc 11- 12 to intersect with arc 9 – 10 at H.

(v) Connect E to H

(vi) Angle HEG = 45^0

(g) How to bisect a line AB



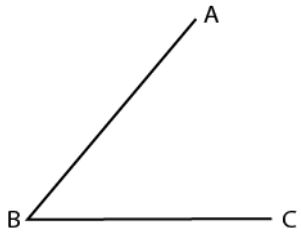
(i) Place a protractor at A and make arcs 1-2 and 3-4.

(ii) Without adjusting the size of the protractor place it at B and arc 5-6 to intersect arc 1-2 t C; then make arc 7-8 to intersect arc 3-4 at D.

(iii) Draw a perpendicular bisector through C and D.

Example 1

1. Without using a protractor, bisect angle ABC, in the diagram below.



Fix the compass at B

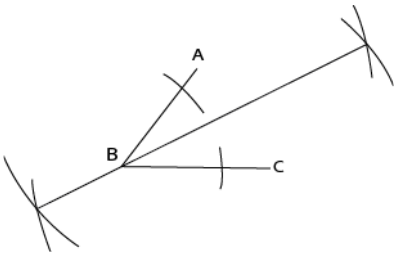
Adjust the compass and make two arcs between BC and BA respectively.

Remove the compass and at each of the arcsmade above and draw new arcs between A and C and behind B.

Draw a line from B through the intersection ofarcs drawn above.

The line drawn is the bisector of angie ABC

Solution



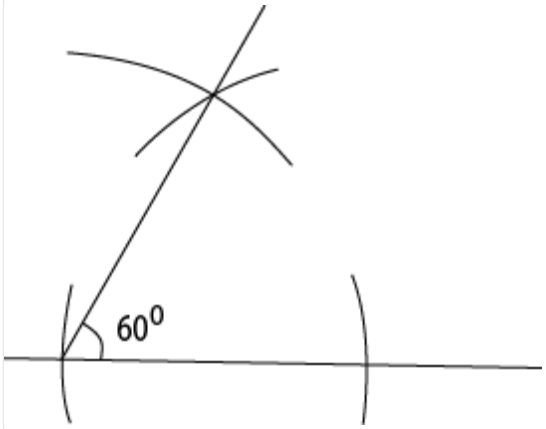
Example 2

Using a ruler and a pair of compasses only, construct an angle of 60^0 the space provided.

Construction **Steps taken**

- Draw a horizontal line
- With a compass placed at one end, make an arc at one side of the line and another arc above the line.
- Remove the compass and place at the point where the arc meets the line on the other side and draw an arc at the former point and another one to cut the arc drawn above the fine.
- Draw a line through the intersection of the two arcs above .

The angle between this line and the original line is 60^0



Revision questions

1. Follow the instructions below and construct a parallelogram in the space provided:

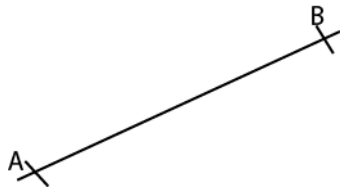
   Draw a horizontal line AB of length 7 cm. Draw a perpendicular bisector line AB. Mark the point O where the bisect meets line AB. Measure a length of 3 cm from 0 along the bisector. Mark this point D. Join point A to point D. Lines AD and AB form two sides of the parallelogram.

   (a) Complete the construction of the parallelogram ADCB

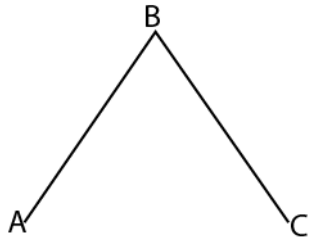
   (b) Measure OC

   (c) Measure angle BOC.

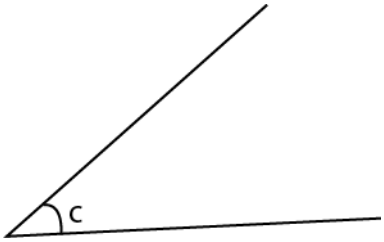
2. Using a pair of compasses and a ruler only, construct a perpendicular bisector of the line AB below



3. Using a pair of compass and a ruler only, construct a line bisecting angle ABC below:

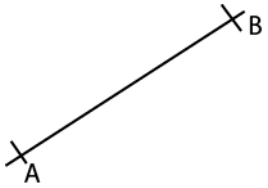


4. Using a protractor, measure the angle marked c in the diagram below.



Angle c is 48^0

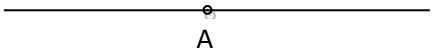
5. Using a ruler and a pair of compasses only, construct an angle of 60° at A



6. Using a ruler and a pair of compasses only, construct an angle of 30° at P.

7. The diagonals of a parallelogram bisect each other. Using a pair of compasses and a ruler, construct a parallelogram PQRT, given that PQ=7cm, PR=10cm and QT=8cm. Measure QR.

8. Using a pair of compasses and a ruler only, construct an angle of 15° at point A



9. (a) Using a ruler and a pair of compasses only, construct a triangle KPR such that angle KPR = 90°, angle PRK = 30° and PR = 5.8cm

(b) Measure KR = ……cm

10. Using a pair of compasses and a ruler bisect the angle given below:



11. (a) Using a ruler and a pair of compass only, construct a triangle XYZ such that:

XY = YZ = 6 cm and angle XYZ = 90°.

(b)Measure the length of XZ = ……cm

12. Using a pair of compasses, a pencil and a ruler only, construct an angle of 45° at point K below.

13. (a) Using a pair of Compasses, pencil and a ruler only construct a triangle PQR in which QR = 6cm, and the point P lies on the perpendicular bisector of QR. Point P is 5cm above QR.

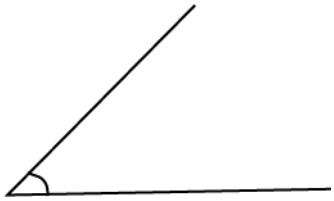
(b) Measure PQ

(c) Measure angle PQR = ……cm

14. a) Using a pair of compasses, pencil and ruler only, construct triangle ABC, in which AB = 8cm, angle ABC = 60°, angle CAB = 45°

b) Measure AC = ……..cm

15. Using a pair of compasses, ruler and pencil, bisect the angle given below:



16. Using a pair of compasses, a ruler and a pencil only, construct an angle of 30° in the space provided below.

17. a) Using a pair of compasses, a ruler and a pencil only, construct a triangle ABC such that BC = 8 cm, angle ABC = 120°andAB=6cm.

(b) Measure length AC = …….cm

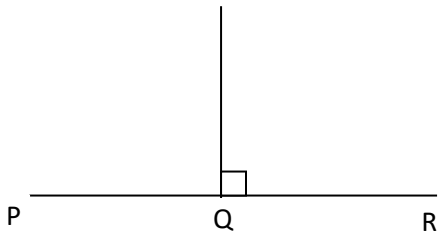
(c) Measure angle BCA =……

18. Using a pencil, ruler and a pair of compasses only, construct triangle ABC in which BC = 6cm, angle ABC = 90 and angle BCA = 30°

a. Measure the length of AC = ……..cm

b. Measure the length of AB = ……..cm

19. Using a pair of compasses, ruler and a pencil only, construct an angle of $22\frac{1}{2}^0$ at point Q in the



20. (a) Using a ruler and a pair of compasses only, construct a triangle KPR such that angle KPR = 90°, angle PRK = 30° and PR = 5.8cm

(a) KR = ……..cm

21. (a) Using a pair of compasses, rulers and a pencil only, construct a triangle XYZ in which YZ=6cm angle XYZ=30^0 and angle YZX =120^0

Measure XY

22. Using a rule, a pencil and a pair of compasses only, construct an angle of 120^0 in the provided below.

23. (a) using a ruler, a pencil and a pair of compasses only, construct triangle *KLM* in which *KM* =6.5cm angle *KML*=45^0 ANGLE *LKM*=60^0

(4 marks)

(b) Measure *ML = …….cm* (1 marks)

24. Using a ruler, a pencil and a pair of compasses only, construct an angle of 90^0 in the space

25. Using a ruler, a pencil and a pair of compasses only, construct a parallel gram KLMN in which KL =4cm, LM= 6 cm and angle NKL=60^0

(06 marks)

(b) Length KM = 9.0cm

26. (a) Using a pair of compasses, a pencil and ruler only.

(i) Construct a triangle EFG in which EF = 8cm, angle GEF = 60^0 and angle EFG = 45^0. From G, drop a perpendicular FG to meet EF at H. (4marks)

(ii). Measure *GH*: **5cm** (1mark)

(b). Using GH as the height, find the area of triangle EFG (2marks)

Area $= \frac{1}{2}\ x\ EF\ x\ HG$

$= \frac{1}{2}\ x\ 8\ x\ 5 = 20cm^2$

27. Using a ruler, pencils and a pair of compasses only, construct a triangle in which angle PQR = 30^0 and PRQ = 45^0 and line QR = 10cm, the base of the triangle. (03 marks)

b) Measure:

i. PQ = ……..cm (01 mark)

ii. PR= ……cm (01 mark)

c) Find the perimeter of triangle PQR. (01 mark)

Perimeter = ……..cm

28. Using a pair of compasses, a ruler and a pencil only, bisect the line below.

_____

29. (a) using a ruler, a pencil and a pair of compasses only construct a rectangle ABCD in which AB=8cm, and BC=7cm (4marks)

(b)Measure the length of diagonal AC: ……cm (1mark)

(c) Measure the angle BAC…… (1mark)

30. Using a pair of compasses, a ruler and pencil only, draw an angle 60^0 in the space provided below.

31. (a) Using a pair of compasses, a ruler and pencil only, construct a triangle PQR in which PQ=6cm, angle RPQ=60^0 and angle PQR=45^0. Construct a perpendicular from R to meet PQ at Y. (5marks)

(b)Measure RY: (1mark)

32. Using a pair of compasses, a ruler and a pencil only, construct an angle of 120 in the space provided below.

.

33. (a). Using a ruler, a pair of compasses and a pencil only, construct a triangle ABC where line AB= 6.4 cm, angle CAB=60^0 and angle ABC=75^0 (05marks)

.

.

(c). Measure the length BC **……** (01mark)

34. (a) Using a ruler, a pencil and pair and compasses only

(i) Construct a parallelogram ABCD such that line AB= 7cm
BA=5cm and angle ABC=120^0

(ii) Drop a perpendicular from D to meet AB at M

(05mark)

(a) Measure the line ……cm

35. Using a pair of compasses, a ruler and a pencil only, construct an angle of 150^0 in the space below.

36. (a) Using a ruler, a pencil and a pair of compasses only, construct a quadrilateral ABCD where the line AB = 7cm. angle ABC = BAD = 60^0 and AD = BC = 3.5cm. (4marks)

.

(a) Measure the length DC …….. cm (01mark)

37. Using a ruler, a pencil and a pair of compasses only, construct an angle of 1350 in the space below

38. (a) using a pair of compasses and ruler only, construct a rhombus UVXY whose diagonals are 14 cm and 10cm. (04marks)

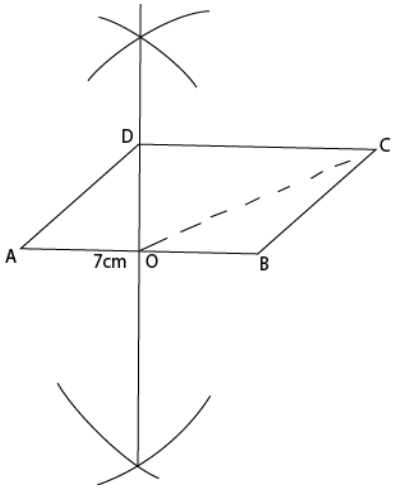
(b) Measure the length VX …….cm (01mark)

Suggested answers

1. Follow the instructions below and construct a parallelogram in the space provided:

   Draw a horizontal line AB of length 7 cm. Draw a perpendicular bisector line AB. Mark the point O where the bisect meets line AB. Measure a length of 3 cm from 0 along the bisector. Mark this point D. Join point A to point D. Lines AD and AB form two sides of the parallelogram.

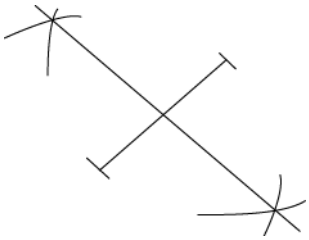
   (c) Complete the construction of the parallelogram APCB



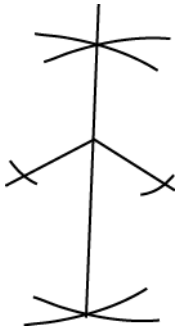
   (d) Measure OC = 7.5cm

Measure angle BOC. = 40^0.

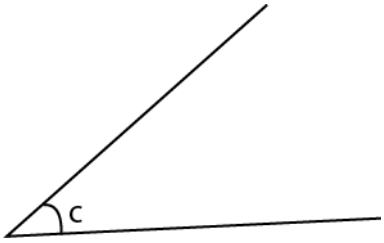
2. Using a pair of compasses and a ruler only, construct a perpendicular bisector of the line AB below



3. Using a pair of compass and a ruler only, construct a line bisecting angle ABC below:

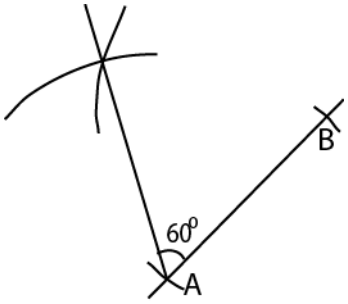


4. Using a protractor, measure the angle marked c in the diagram below.

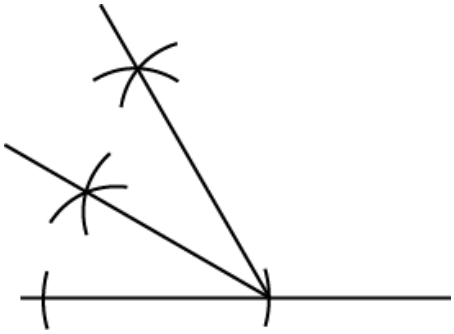


Angle c is 48^0

5. Using a ruler and a pair of compasses only, construct an angle of 60° at A

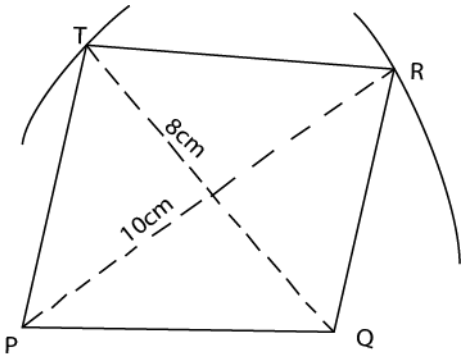


6. Using a ruler and a pair of compasses only, construct an angle of 30° at P.



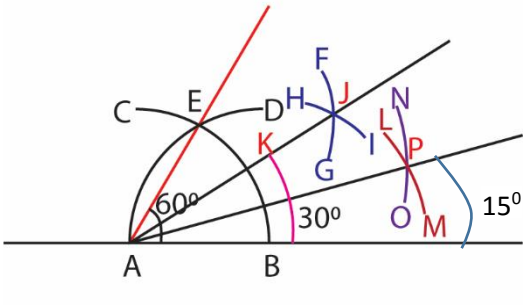
7. The diagonals of a parallelogram bisect each other. Using a pair of compasses and a ruler, construct a parallelogram PQRT, given that PQ=7cm, PR=10cm and QT=8cm. Measure QR.

(a) Draw a horizontal line PQ = 7 cm
(b) Place the compass at P and draw arc on the side of Q 10 cm away from P
(c) Place the compass at Q and draw an arc in space on the side of P away from Q.
(d) Place the ruler horizontally between the two arcs and measure 7cm to determine point T and R

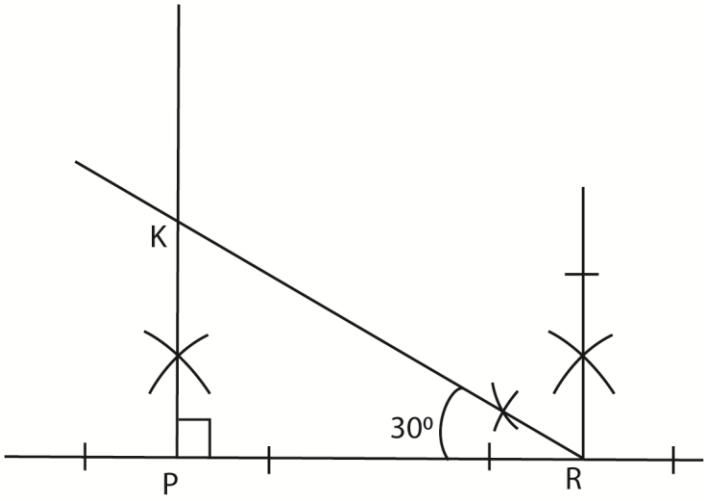


8. Using a pair of compasses and a ruler only, construct an angle of 15° at point A

Procedure: construct angle 60^0, bisect it to get 30^0; then bisect 30^0 to get 15^0



9. (a) Using a ruler and a pair of compasses only, construct a triangle KPR such that angle KPR = 90°, angle PRK = 30° and PR = 5.8cm



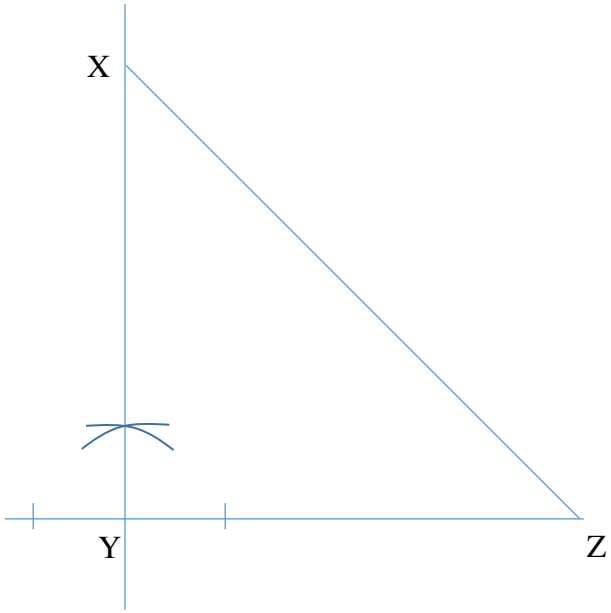
(e) Measure KR = 6.7 cm

10. Using a pair of compasses and a ruler bisect the angle given below:



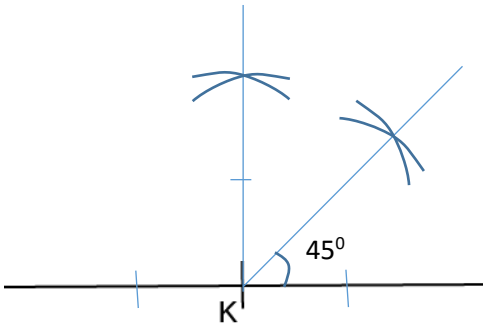
11. (a) Using a ruler and a pair of compass only, construct a triangle XYZ such that:

XY = YZ = 6 cm and angle XYZ = 90°.



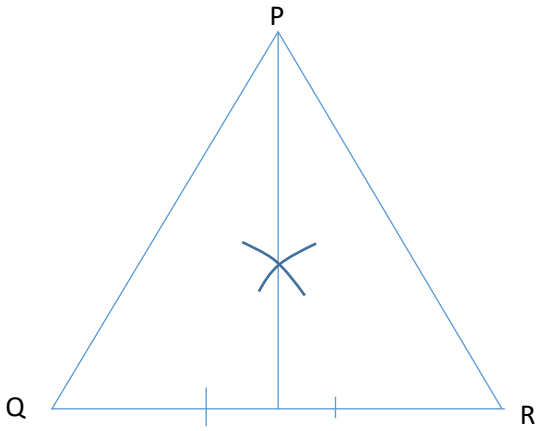
(b)Measure the length of XZ = 8.5cm

12. Using a pair of compasses, a pencil and a ruler only, construct an angle of 45° at point K below.



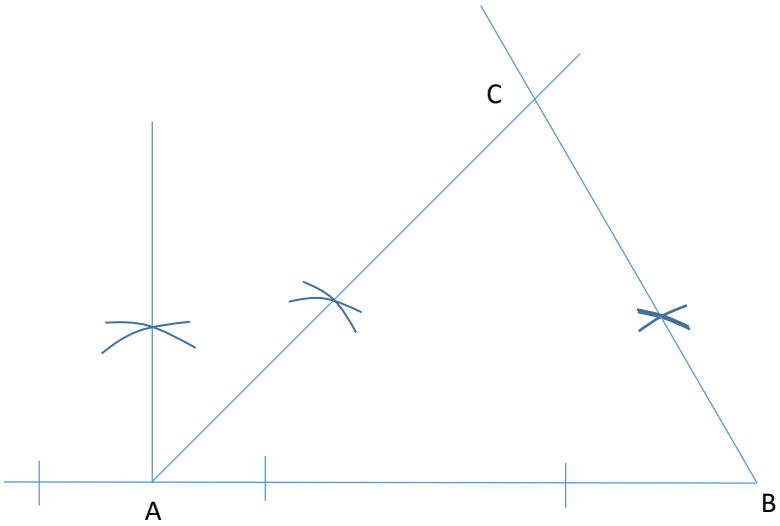
13. (a) Using a pair of Compasses, pencil and a ruler only construct a triangle PQR in which QR = 6cm, and the point P lies on the perpendicular bisector of QR. Point P is 5cm above QR.

(b) Measure PQ



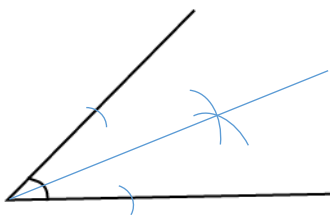
(c) Measure angle PQR = 5.8cm

14. a) Using a pair of compasses, pencil and ruler only, construct triangle ABC, in which AB = 8cm, angle ABC = 60°, angle CAB = 45°

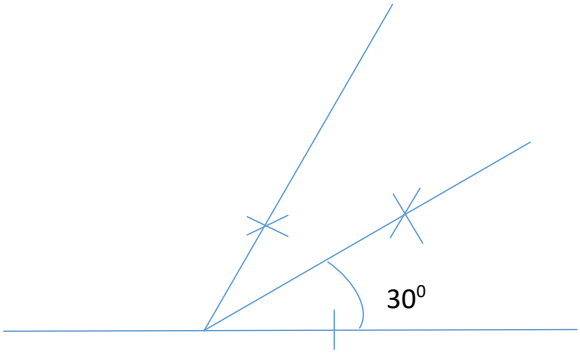


b) Measure AC = 7.2cm

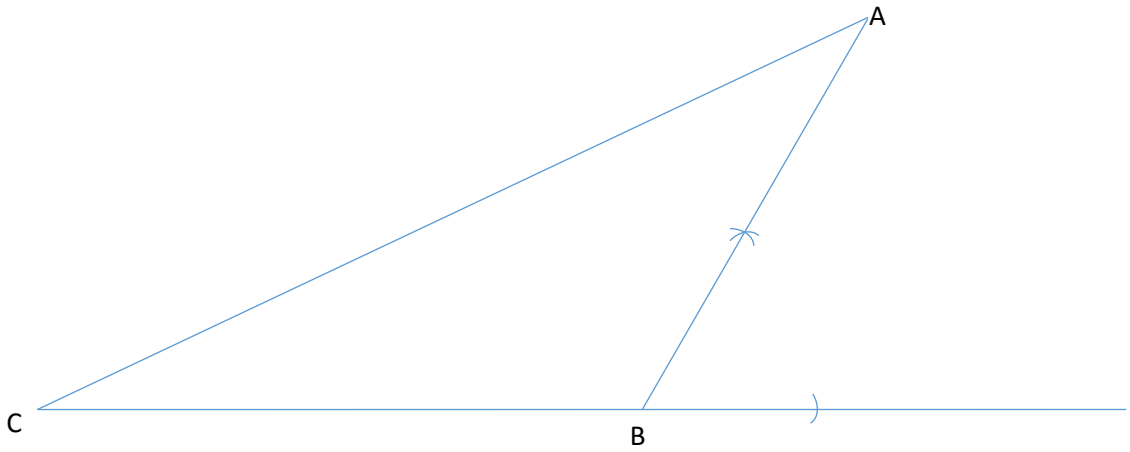
15. Using a pair of compasses, ruler and pencil, bisect the angle given below:



16. Using a pair of compasses, a ruler and a pencil only, construct an angle of 30° in the space provided below.



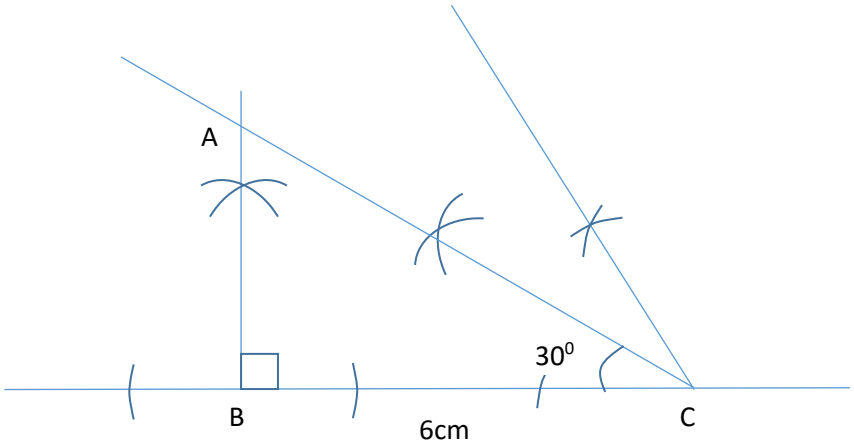
17. a) Using a pair of compasses, a ruler and a pencil only, construct a triangle ABC such that BC = 8 cm, angle ABC = 120°andAB=6cm.



(d) Measure length AC = 12.1cm

(e) Measure angle BCA =25^0

18. Using a pencil, ruler and a pair of compasses only, construct triangle ABC in which BC = 6cm, angle ABC = 90 and angle BCA = 30°

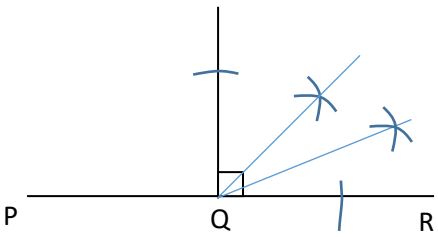


a. Measure the length of AC = 7.0cm

b. Measure the length of AB = 3.5cm

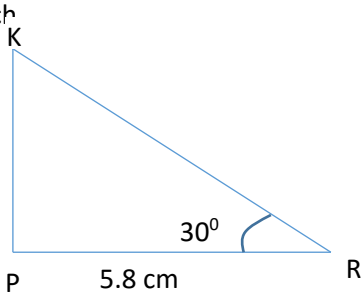
19. Using a pair of compasses, ruler and a pencil only, construct an angle of $22\frac{1}{2}^0$ at point Q .

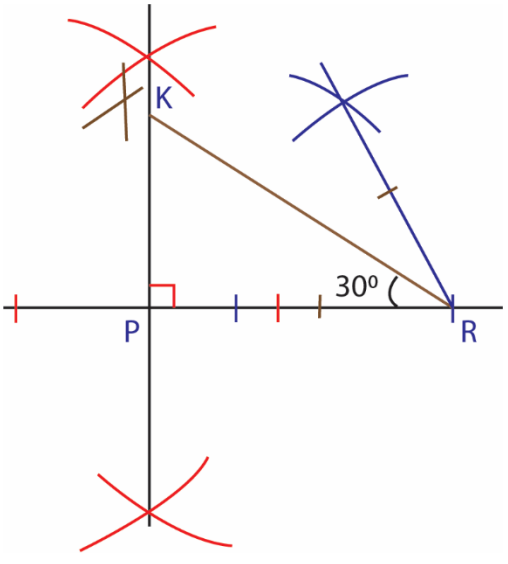
Procedure: bisect 90^0 to give 45^0; then bisect 45^0 to get $22\frac{1}{2}^0$



20. (a) Using a ruler and a pair of compasses only, construct a triangle KPR such that angle KPR = 90°, angle PRK = 30° and PR = 5.8cm

Sketch



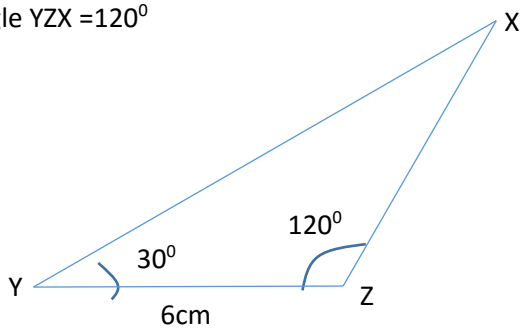


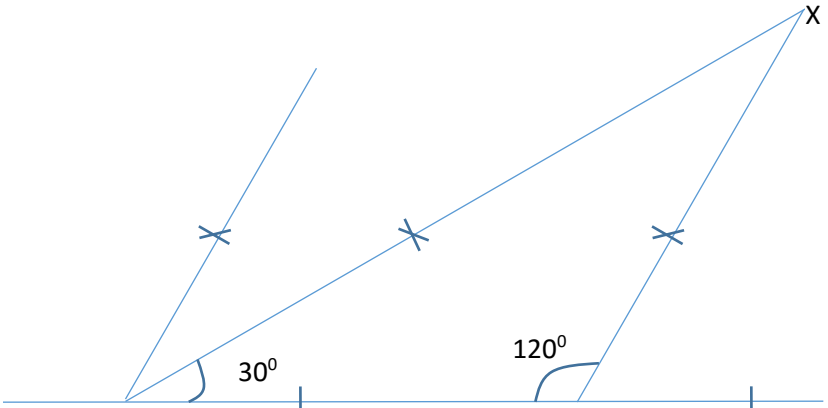
(b) KR = 5.7cm

21. (a) Using a pair of compasses, rulers and a pencil only, construct a triangle XYZ in which YZ=6cm angle XYZ=30^0 and angle YZX =120^0

Measure XY

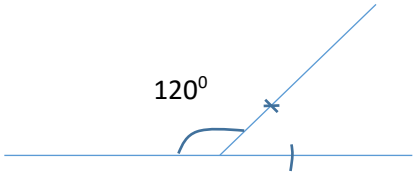
Sketch





XY = 10.4cm

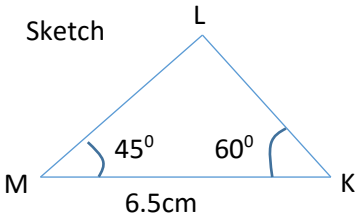
22. Using a rule, a pencil and a pair of compasses only, construct an angle of 120^0 in the provided below.

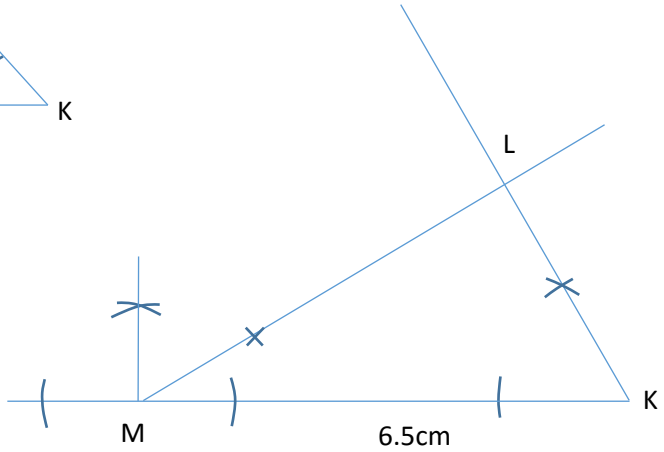


23. (a) using a ruler, a pencil and a pair of compasses only, construct triangle *KLM* in which *KM* =6.5cm angle *KML*=45^0 ANGLE *LKM*=60^0

(4 marks)

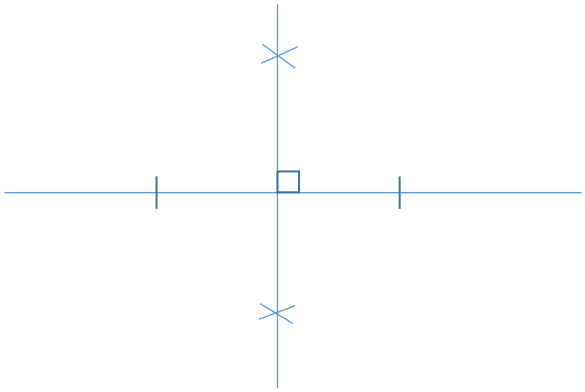
Sketch





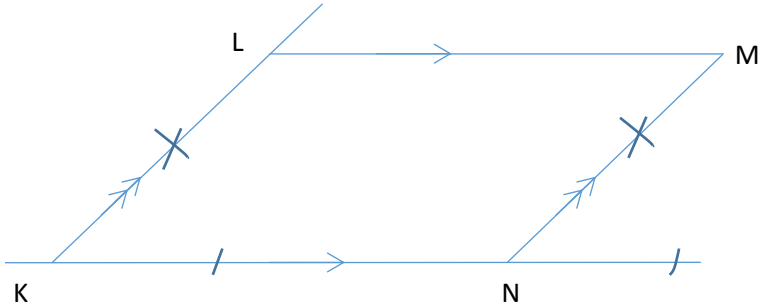
(b) Measure *ML = 5.8cm* (1 marks)

24. Using a ruler, a pencil and a pair of compasses only, construct an angle of 90^0 in the space



25. Using a ruler, a pencil and a pair of compasses only, construct a parallel gram KLMN in which KL =4cm, LM= 6 cm and angle NKL=60^0

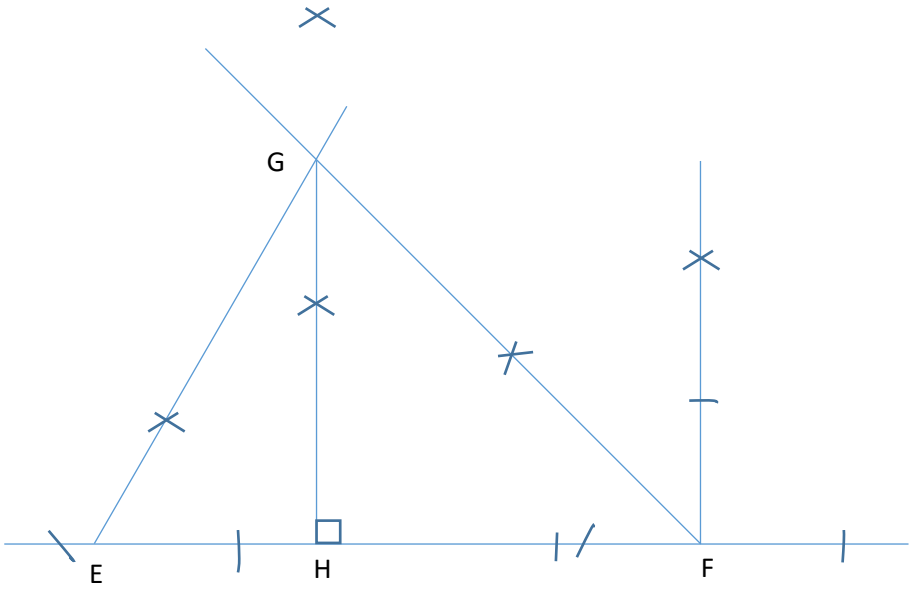
(06 marks)



(b) Length KM = 9.0cm

26. (a) Using a pair of compasses, a pencil and ruler only.

(i) Construct a triangle EFG in which EF = 8cm, angle GEF = 60^0 and angle EFG = 45^0. From G, drop a perpendicular FG to meet EF at H. (4marks)



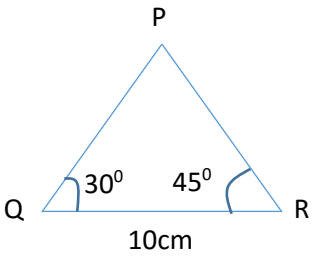
(ii). Measure *GH*: **5cm** (1mark)

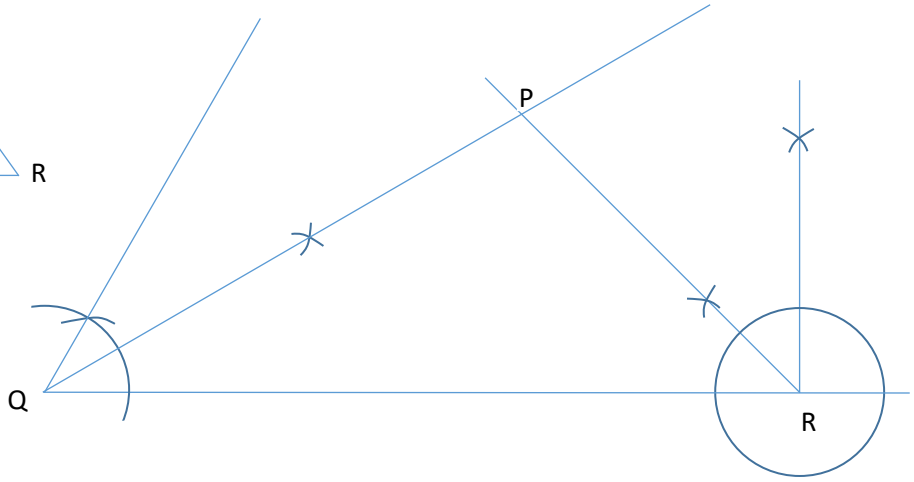
(b). Using GH as the height, find the area of triangle EFG (2marks)

Area $= \frac{1}{2}\ x\ EF\ x\ HG$

$= \frac{1}{2}\ x\ 8\ x\ 5 = 20cm^2$

27. Using a ruler, pencils and a pair of compasses only, construct a triangle in which angle PQR = 30^0 and PRQ = 45^0 and line QR = 10cm, the base of the triangle. (03 marks)





b) Measure:

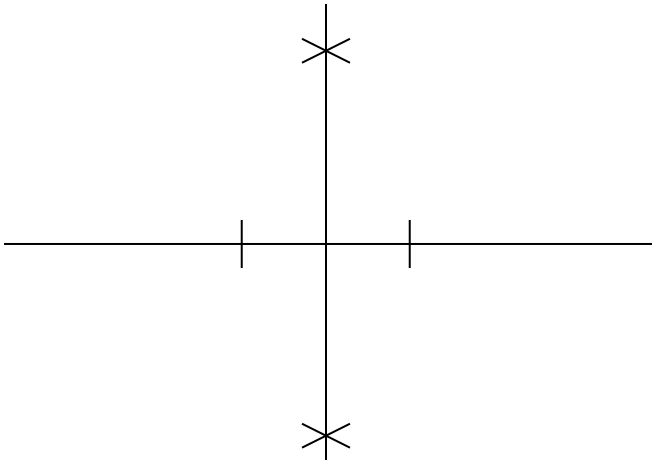
iii. PQ = 7.3cm (01 mark)

iv. PR= 5.2cm (01 mark)

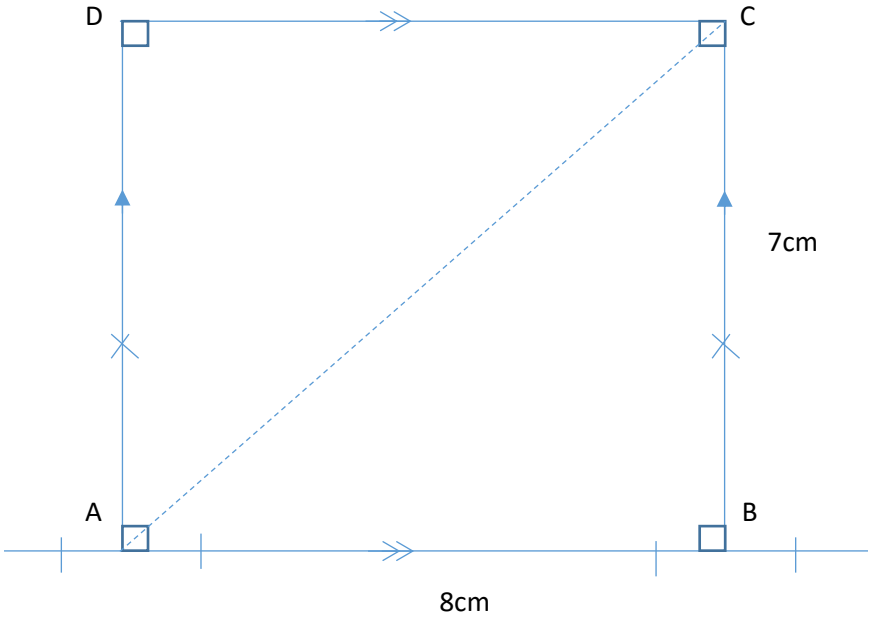
c) Find the perimeter of triangle PQR. (01 mark)

Perimeter = 10 + 7.3 + 5.2 = 22.5cm

28. Using a pair of compasses, a ruler and a pencil only, bisect the line below.



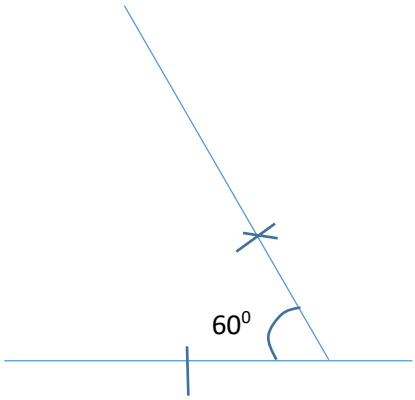
29. (a) using a ruler, a pencil and a pair of compasses only construct a rectangle ABCD in which AB=8cm, and BC=7cm (4marks)



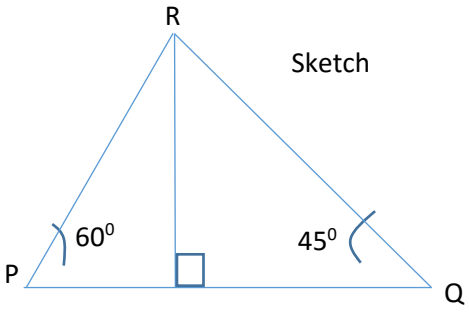
(b)Measure the length of diagonal AC: 10.6cm (1mark)

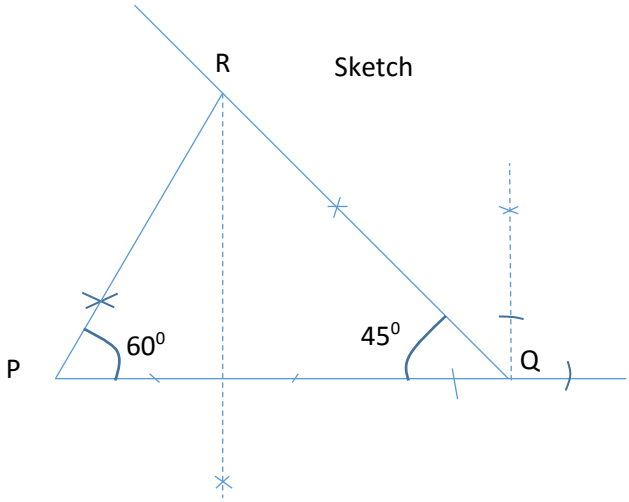
(c) Measure the angle BAC: 41^0 (1mark)

30. Using a pair of compasses, a ruler and pencil only, draw an angle 60^0 in the space provided below.



31. (a) Using a pair of compasses, a ruler and pencil only, construct a triangle PQR in which PQ=6cm, angle RPQ=60^0 and angle PQR=45^0. Construct a perpendicular from R to meet PQ at Y. (5marks)



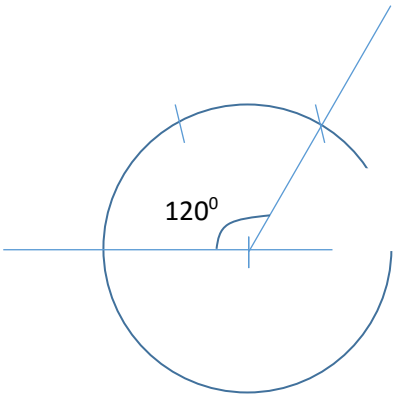


(b)Measure RY: 3.7-4.0cm (1mark)

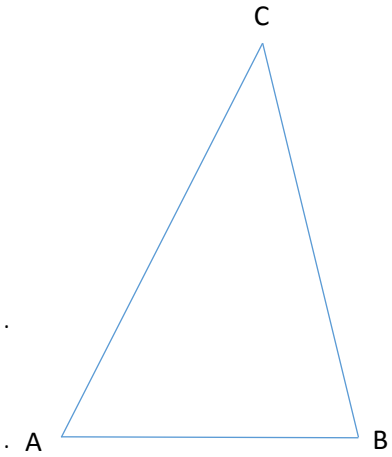
32. Using a pair of compasses, a ruler and a pencil only, construct an angle of 120^0 in the space provided below.

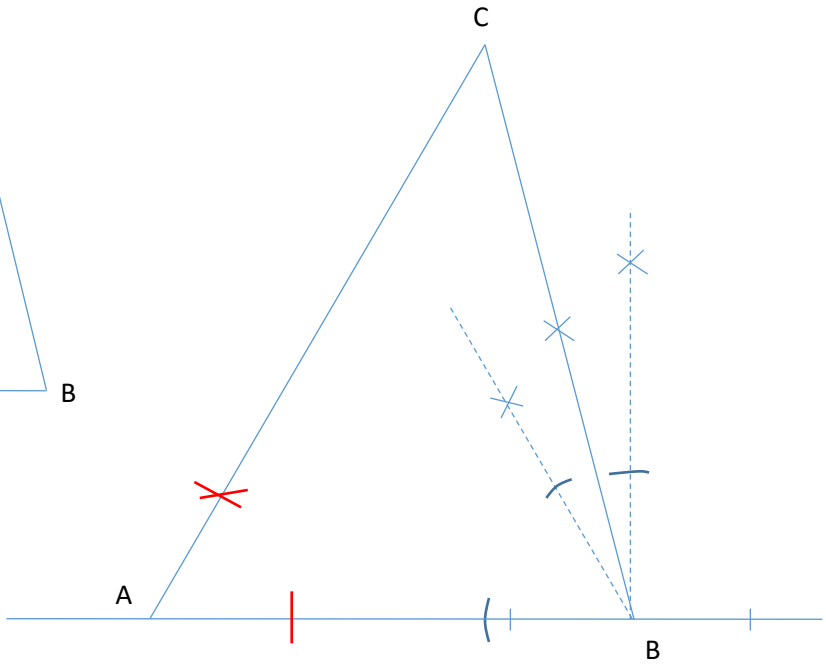
Procedure: $120^0 = 180^0 - 60^0$

.



33. (a). Using a ruler, a pair of compasses and a pencil only, construct a triangle ABC where line AB= 6.4 cm, angle CAB=60^0 and angle ABC=75^0 (05marks)



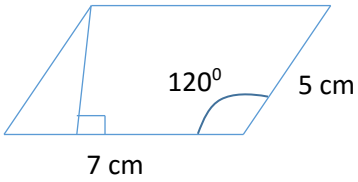


(c). Measure the length BC **7.8** (01mark)

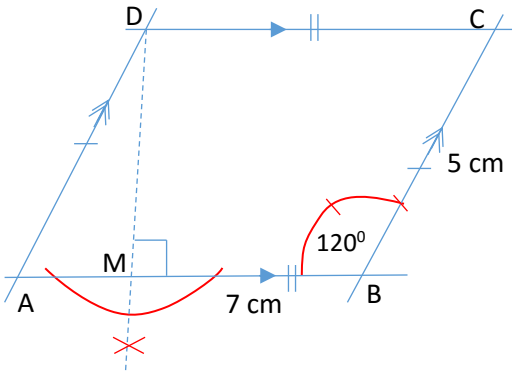
34. (a) Using a ruler, a pencil and pair and compasses only

(iii) Construct a parallelogram ABCD such that line AB= 7cm BD=5cm and angle ABC=120^0

Sketch



(iv) Drop a perpendicular from D to meet AB at M

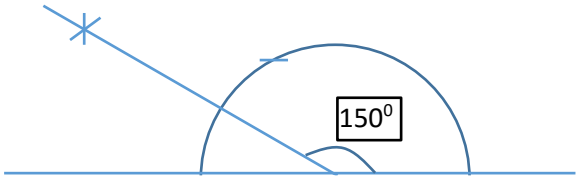


(05mark)

(b) Measure the line ……cm

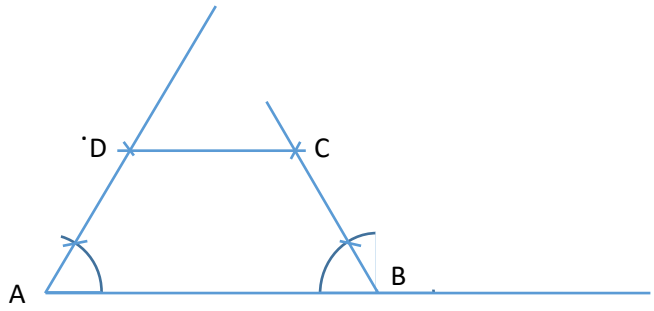
35. Using a pair of compasses, a ruler and a pencil only, construct an angle of 150^0 in the space below.

150 = 90 + 60 = 180 - 30



36. (a) Using a ruler, a pencil and a pair of compasses only, construct a quadrilateral ABCD where the line AB = 7cm. angle ABC = BAD = 60^0 and AD = BC = 3.5cm.

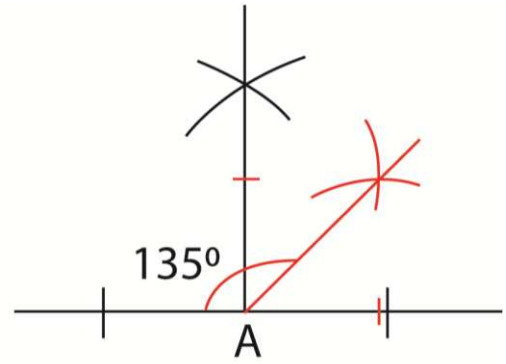
(4marks)



(c) Measure the length DC 3.5 cm (01mark)

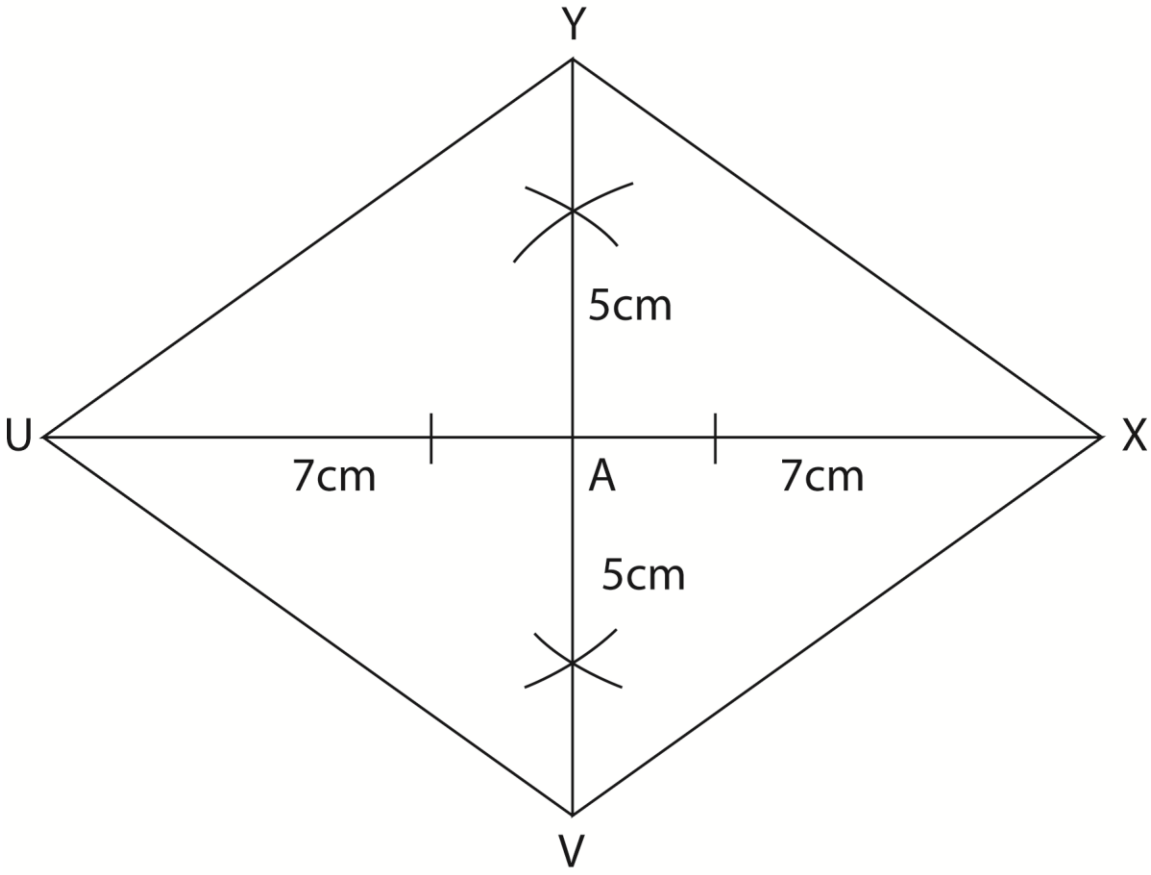
37. Using a ruler, a pencil and a pair of compasses only, construct an angle of 135^0 in the

space below: Procedure: Angle 1350 = 90^0 +45^0



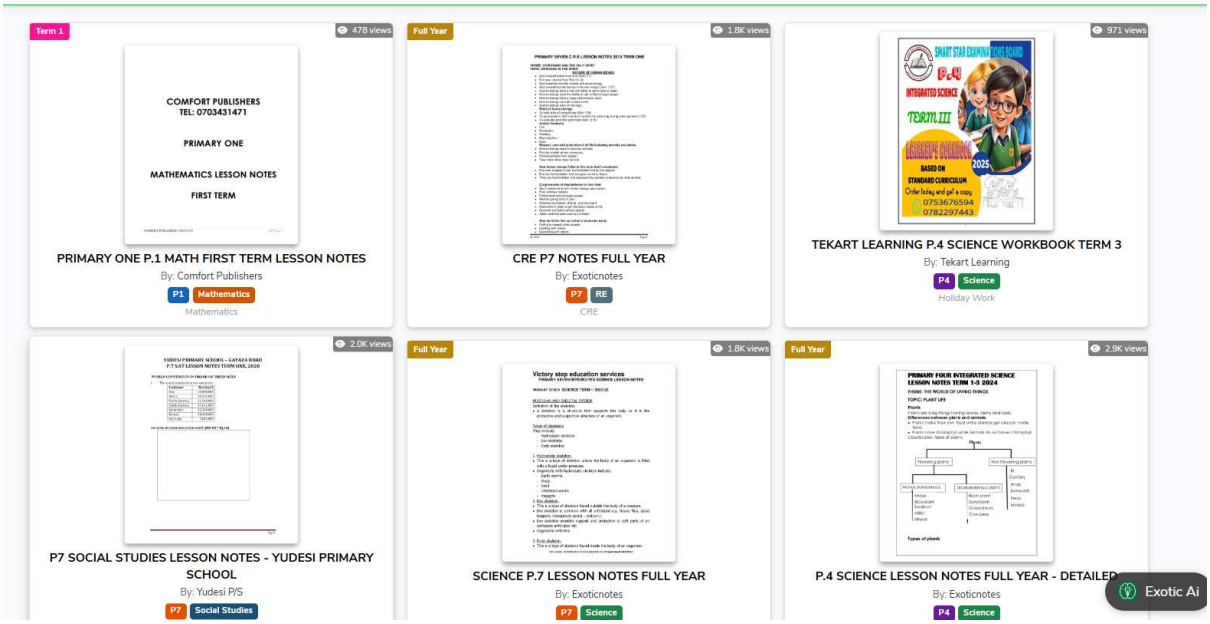
(a) Using a pair of compasses and ruler only, construct a rhombus UVXY whose diagonals are 14 cm and 10cm. (04marks)

Procedure: draw a perpendicular bisector on line UX= 14cm long. Mark 5cm on either side of the bisector. Join UVXY



(d) Measure the length VX = 8.6 cm (01mark)

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