CBSE Test Paper 03

CH-11 Constructions

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1. If two parallel lines are intersected by a transversal, the bisectors of the interior angles form a __________.
   a. rectangle
   b. square
   c. rhombus
   d. parallelogram
2. A rotating ray after making a complete rotation coincides with its initial position. The angle thus formed is______.
   a. straight angle
   b. complete angle
   c. right angle
   d. reflex angle
3. Two radii of same circle are always ___________to each other.
   a. parallel
   b. parallel and may inclined at an angle
   c. inclined at an angle
   d. perpendicular
4. With the help of a ruler and a compass, it is possible to construct an angle of _______.
   a. 37.5^0
   b. 65^0

c. 40^0

d. 50^0

5. With the help of a ruler and a compass, it is not possible to construct an angle of_______.

a. 22.5^0

b. 37.5^0

c. 80^0

d. 67.5^0

6. Construct a triangle XYZ in which $\angle Y = 30^0$, $\angle Z = 90^0$ and XY + YZ + ZX = 11 cm.

7. Draw a line segment 5.8 cm long and draw its perpendicular bisector.

8. Construct a right triangle when one side is 3.5 cm and the sum of the other side and hypotenuse is 5.5 cm.

9. Construct an angle of 60^0.

10. Construct a triangle $\triangle ABC$ in which BC = 8 cm. $\angle B = 45^0$ and AB - AC = 3.5 cm.

11. Construct an equilateral triangle, given its side and justify the construction.

12. Construct $\triangle ABC$ in which BC = 3.6 cm, AB + AC = 4.8 cm and $\angle B = 60^0$.

13. Construct an angle of 45° at the initial point of a given ray and justify the construction.

14. Construct a square of side 3 cm.

15. Draw the perpendicular bisector of a line segment of length 7 cm and justify the construction.

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Solution

1. (a) rectangle

   Explanation: Let, Two parallel lines AB & CD are intersected by a transversal line L at P & R respectively.

   PQ, RQ, RS & PS are bisectors of $\angle APR, \angle PRC, \angle PRD, \angle BPR$ respectively.

   Since, $AB \parallel CD$ and L is a transversal

   $\implies \angle APR = \angle PRD$ (alternate interior angles)

   $\implies \frac{1}{2}\angle APR = \frac{1}{2}\angle PRD \qquad \implies \angle QPR = \angle PRS$

   But these are alternate interior angles.

   $\therefore PQ \parallel RS. Similarly, QR \parallel PS$

   $\therefore PQRS$ is a parallelogram.

   Also, $\angle APR + \angle BPR = 180^0$ (LINEAR PAIR)

   $\implies \frac{1}{2}\angle APR + \frac{1}{2}\angle BPR = 90^0 \qquad \implies \angle QPR + \angle SPR = 90^0$
   $\implies \angle QPS = 90^0$

   Hence, PQRS is a rectangle.

2. (b) complete angle

   Explanation: If a rotating ray after making a complete rotation coincides with the iinitial position, then, the angle thus formed will be of and this angle is known as Complete angle

3. (c) inclined at an angle

   Explanation: The radius of any circle is defined as the distance of any point on the circumference of the circle from the Centre of the circle. Since, Centre of any circle is only one. Thus, any radius will always be drawn from Centre , hence, both radii will meet and inclined at an angle.

4. (a) 37.5^0

   Explanation: With the help of ruler & compass, it is not possible to construct an angle which is not a multiple of As we know , 37.5^0 is a multiple of 15^0 . Hence, we can construct an angle of 37.5^0 with the help of ruler and compass.

5. (c) 80^0

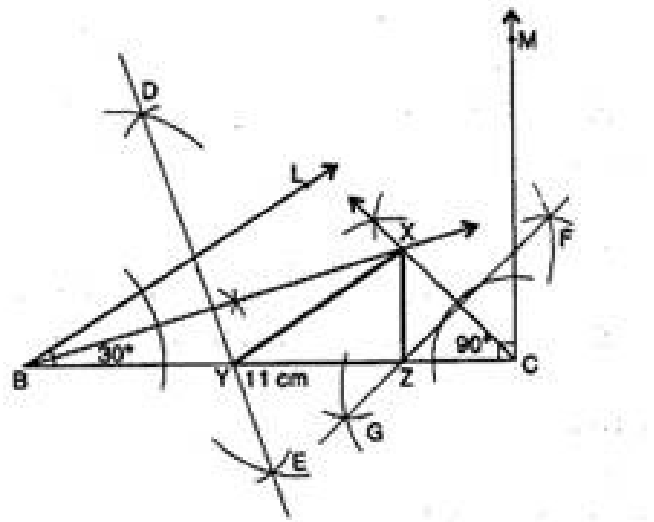
   Explanation: With the help of a ruler and a compass, it is not possible to construct an angle which is not a multiple of 15^0 and as here 80^0 is not a multiple of 15^0, so, we can not construct it.

6. Given : In triangle XYZ, ∠Y = 30°, ∠Z = 90 ° and XY + YZ + ZX = 11 cm.

   Required: To construct XYZ.

   Construction :

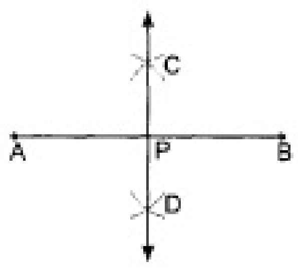
   i. Draw a line segment BC = XY + YZ + ZX = 11 cm.
   ii. Make ∠LBC = ∠Y = 30° and ∠MCB = ∠Z = 90°
   iii. Bisect ∠LBC and ∠MCB. Let these bisectors meet at a point X.
   iv. Draw perpendicular bisectors DE of XB and FG of XC.



   v. Let DE intersects BC at Y and FG intersects BC at Z.
   vi. Join XY and XZ.

   XYZ is the required triangle.

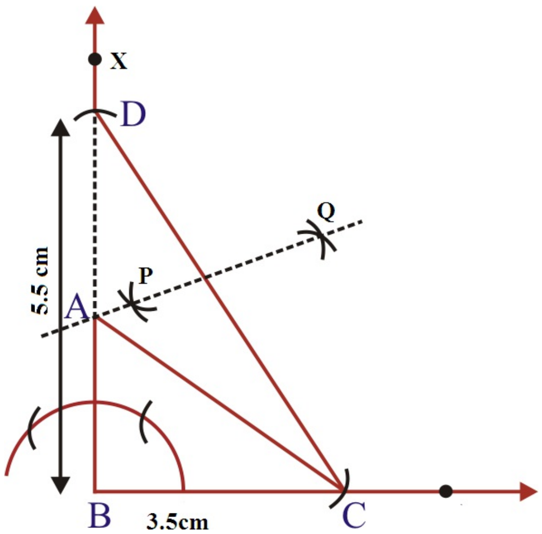
7. Steps of Construction



i. Draw a line segment AB = 5.8 cm.
ii. Taking A as centre and radius more than half of AB, draw one arc above and other arc below line AB.
iii. Similarly, with B as centre draw two arcs cutting the previous drawn arcs and name the points obtained as C and D respectively.
iv. Join CD, intersecting AB at point P.
Then, line CD is the required perpendicular bisector of AB.
And AP = PB = 2.9 cm

8. Given : In right triangle ABC, BC = 3.5 cm, $\angle B = 90^{o}$ and AB + AC = 5.5
Required : To construct the right triangle ABC.
Steps of construction :

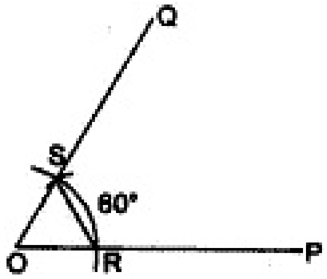
i. Draw the base BC = 3.5 cm.
ii. At the point B, make an angle, say XBC = 90^{o}
iii. Cut a line segment BD equal to AB + AC = 5.5 cm. on the ray BX.
iv. Join DC.
v. Draw the perpendicular bisector PQ of CD to intersect BD at a point A.
vi. Join AC.



ABC is the required right triangle.

9. Steps of construction :

    i. Draw any line OP
    ii. With O as centre and any suitable radius, draw an arc to meet OP at R.
    iii. With R as centre and same radius as in step above, draw an arc to meet the previous arc at S.
    iv. Join OS and produce it to Q, then $\angle POQ = 60^o$.



Justification : Join SR

In $\triangle$ORS,

OR = OS = RS . . . [by construction]

$\triangle$ORS is an equilateral triangle.

Hence $\angle ROS = 60^o$

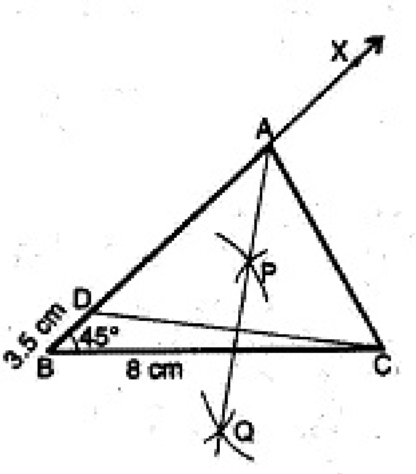
So $\angle POQ = 60^o$

10. Given: In $\triangle$ABC, BC = 8 cm, $\angle B = 45^o$ and AB - AC = 3.5 cm.

Required: To construct the triangle ABC.

Steps of construction :

1. Draw the base BC = 8 cm.
2. At the point B construct an angle XBC = 45^o
3. Cut an arc of length 3.5 cm on the ray BX say D.



4. Join DC.
5. Draw the perpendicular bisector, of DC say PQ.
6. Let it intersect BX at a point A.
7. Join AC.

   ABC is the required triangle.

   Justification:

   A lies on the perpendicular bisector of CD.

   $\therefore$AD = AC

   Now BD = AB - AD

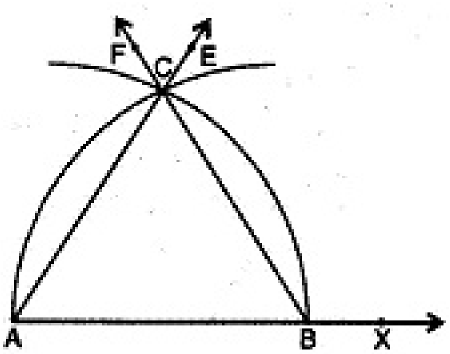
   $\Rightarrow$ BD = AB - AC = 3.5 cm

11. Given: side = (say) 6 cm of an equilateral triangle.

    Required: To construct the equilateral triangle and justify the construction.

    Steps of construction :

    i. Take a ray AX with initial point A. From AX, cut off AB = 6 cm.
    ii. Taking A as centre and radius (= 6 cm) draw an arc of a circle, which intersects AX, say at a point B.
    iii. Taking B as centre and with the same radius as before, draw an arc intersecting the previously drawn arc, say at point C.
    iv. Draw the ray AE passing through C.



v. Draw the ray BF passing through C.

$\triangle$ABC is the required triangle with side = 6 cm.

Justification :

AB = BC . . .[By construction]

AB = AC . . .[By construction]

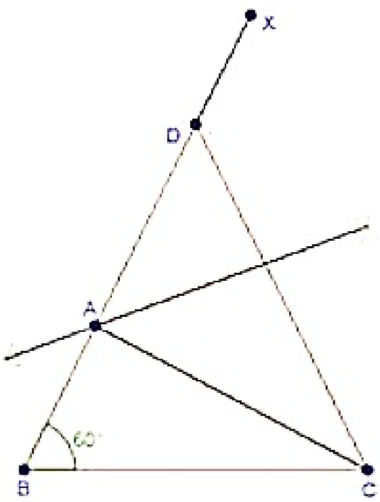
$\therefore$ AB = BC = CA

$\therefore$ $\triangle$ABC is an equilateral triangle.

12. Steps of construction:-

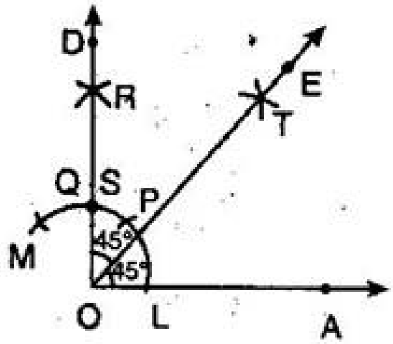
Hence, $\triangle$ABC is the required triangle.

i. Draw a line segment BC of 3.6 cm.
ii. At the point B, draw $\angle$XBC of 60°.
iii. With centre B and radius 4.8 cm, draw an arc which intersects XB at D.
iv. Join DC.
v. Draw the perpendicular bisector of DC which intersects DB at A.
vi. Join AC



13. Steps of construction:

Thus OE bisects $\angle$AOD and therefore $\angle$ AOE = $\angle$DOE = 45°



Justification:

Join LS then $\triangle$ OLS is isosceles right triangle, right angled at O.

$\therefore$ OL = OS

Therefore O lies on the perpendicular bisector of SL.

$\therefore$ SF = FL

And $\angle$OFS = $\angle$OFL [Each 90°]

Now in $\triangle$ OFS and $\triangle$ OFL,

OF = OF [Common]

OS = OL [By construction]

SF = FL [Proved]

$\therefore$ $\triangle$ OFS $\cong$ $\triangle$OFL [By SSS rule]

$\Rightarrow$$\angle$ SOF = $\angle$ LOF [By CPCT]

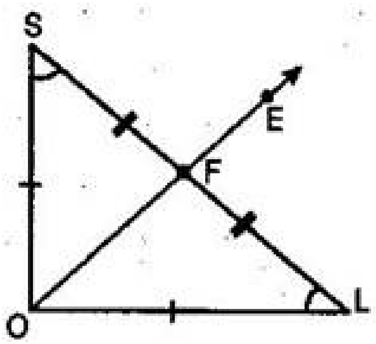
Now$\angle$ SOF + $\angle$ LOF =$\angle$SOL

$\Rightarrow$ $\angle$SOF + $\angle$LOF = 90°

$\Rightarrow$ 2$\angle$ LOF = 90°

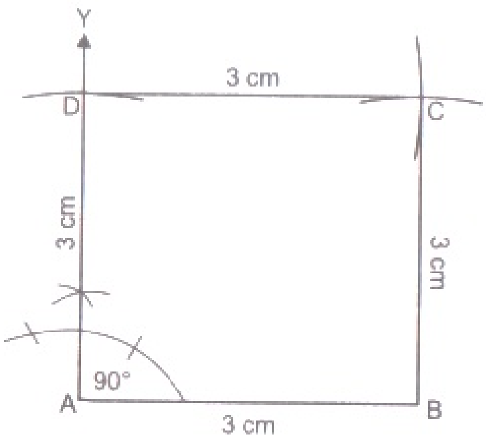
$\Rightarrow$ $\angle$ LOF = $\frac{1}{2} \times 90^{\circ} = 45^{\circ}$

And $\angle$AOE = 45°



1. Draw a ray OA.
2. With O as centre and convenient radius, draw an arc LM cutting OA at L.

3. Now with L as centre and radius OL, draw an arc cutting the arc LM at P.
4. Then taking P as centre and radius OL, draw an arc cutting arc PM at the point Q.
5. Join OP to draw the ray OB. Also join O and Q to draw the OC. We observe that: $\angle$ AOB =$\angle$ BOC = 60°
6. Now we have to bisect $\angle$ BOC. For this, with P as centre and radius greater than $\frac{1}{2}$ PQ draw an arc.
7. Now with Q as centre and the same radius as in step (f), draw another arc cutting the arc drawn in step 6 at R.
8. Join O and R and draw ray OD.Then $\angle$AOD is the required angle of 90°.
9. With L as centre and radius greater than $\frac{1}{2}$ LS, draw an arc.
10. Now with S as centre and the same radius as in step (i), draw another arc cutting the arc draw in step (i) at T.
11. Join O and T and draw ray OE.

14. 

Steps of construction:

1. Take AB = 3 cm.
2. At A, draw $AY \perp AB$.
3. With A as centre and radius = 3cm, describe an arc cutting AY at D.
4. With B and D as centres and radii equal to 3 cm, draw arc intersecting at C.
5. Join BC and DC. ABCD is the required square.

15. **Steps of Construction**

Justification :- Join AP, AQ, BP and BQ.

In $\triangle$PAQ and $\triangle$PBQ,

AP = BP [arcs of equal radii]

AQ = BQ [arcs of equal radii]

PQ = PQ [common sides]

$\therefore$ By SSS congruence rule, we can write that $\triangle PAQ \cong \triangle PBQ$

$\therefore \angle APM = \angle BPM$ [as corresponding parts of the congruent triangles are equal] ....(i)

Now, consider $\triangle PMA$ and $\triangle PMB$,

PM = PM [common sides]

$\angle APM = \angle BPM$ [from Equation (i)]

AP = BP [arcs of equal radii]

$\therefore$ By SAS congruence rule, we can write that $\triangle PMA \cong \triangle PMB$

AM = BM [arcs of equal radii]

and $\angle AMP = \angle BMP$ [as corresponding parts of the congruent triangles are equal] ...(ii)

Now, $\angle AMP + \angle BMP = 180^{o}$ [linear pair] ....(iii)

From Equations (ii) and (iii), we get $\angle AMP = \angle BMP = 90^{o}$

Hence, PQ is the required perpendicular bisector of the given line segment AB as it divides the line segment AB into 2 equal parts and angles on both sides of the bisector are of 90°.

i. Draw line segment AB = 7 cm. Then, draw two arcs each from both sides of the line segment AB with radius more than $\frac{1}{2}$ of AB (i.e. more than 3.5 cm) taking A and B as centre, respectively.
ii. Let arcs drawn in step (i) intersect each other at points P and Q.
iii. Join PQ which intersect AB at M.

Thus, line PQ is the required perpendicular bisector of AB.