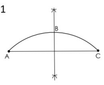
Exercise 13.1

Q1. Divide an arc of any length.

(i) Into two equal parts.



Solution:

Steps of construction:

1. Draw an arc $\overset{\frown}{AC}$.
2. Join A with C
3. Draw the right bisector of $\overline{AC}$ which intersects the arc $\overset{\frown}{AC}$ at point B.
4. Therefore, the given arc $\overset{\frown}{AC}$ has been divided into two equal arcs $\overset{\frown}{AB}$ and $\overset{\frown}{BC}$.

(ii) Into four equal parts

Solution:

Steps of construction:

1. Draw an arc $\overset{\frown}{AC}$.
2. Join A with C
3. Draw the right bisector of $\overline{AC}$ which intersects the arc $\overset{\frown}{AC}$ at point B.
4. Join B with A and C.
5. Draw the right bisectors of $\overline{AB}$ and $\overline{BC}$ which intersect the arc $\overset{\frown}{AC}$ at points D and E respectively.

6. Therefore, the given arc $\overset{\frown}{AC}$ has been divided into four equal arcs $\overset{\frown}{AD}$, $\overset{\frown}{DB}$, $\overset{\frown}{BE}$ and $\overset{\frown}{EC}$.

2. Practically find the centre of an arc ABC.

Solution:

Steps of Construction:

1. Draw an arc $\overset{\frown}{ABC}$.
2. Join A with B and B with C.
3. Draw LM and PQ right Bisectors of AB and BC respectively. LM and PQ intersect at point O.
4. O is the required centre of an arc ABC.

3. (i) If | $\overline{AB}$ | = 3 cm and | $\overline{BC}$ | = 4 cm are the lengths of two chords of an arc, then locate the centre of the arc.

Solution:

Steps of Construction:

1. Draw an arc $\overset{\frown}{ABC}$.
2. Draw | $\overline{AB}$ | = 3 cm and | $\overline{BC}$ | = 4
3. Draw $\overline{LM}$ and $\overline{PQ}$ right bisectors of $\overline{AB}$ and $\overline{BC}$ respectively. $\overline{LM}$ and $\overline{PQ}$ intersect at point O.
4. O is the required centre of an arc ABC.

(ii) If | $\overline{AB}$ | = 3.5 cm and | $\overline{BC}$ | = 5 cm are the lengths of two chords of an arc, then locate the centre of the arc.

Solution:

Steps of Construction:

1. Draw an arc $\overset{\frown}{ABC}$.
2. Draw | AB | = 3.5 cm and |BC| = 5 cm.
3. Draw $\overline{LM}$ and $\overline{PQ}$ right bisectors of $\overline{AB}$ and $\overline{BC}$ respectively. $\overline{LM}$ and $\overline{PQ}$ intersect at pint O.
4. O is the required centre of an arc ABC.

4. For an arc draw two perpendicular bisectors of the chords $\overline{PQ}$ and $\overline{QR}$ of this arc, construct a circle through P, Q and R.

Solution:

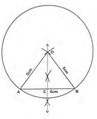
Steps of Construction:

1. Draw an arc $\overset{\frown}{PQR}$.
2. Join P with Q and Q with R.
3. Draw $\overline{LM}$ and $\overline{AB}$ right bisectors of $\overline{PQ}$ and $\overline{QR}$

respectively. $\overline{LM}$ and $\overline{AB}$ intersect at point O.

4. O is the required centre of an arc $\overset{\frown}{PQR}$.
5. Draw a circle with radius $\overline{OP}$ = $\overline{OQ}$ = $\overline{OR}$ having centre at O, which is the required circle.

5. Describe circle of radius 5 cm passing through points A and B, 6 cm apart. Also find distance from the centre to the line segment AB.



Solution:

Steps of Construction:

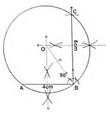
1. We draw a line segment AB of length 6cm
2. We draw right bisector of Ab intersecting it at point C.
3. from points A and B we draw arcs of radius 5cm each, intersecting the bisector at point O.
4. Taking O as centre we draw a circle of radius 5cm passing through the points A and B.

5. To find the distance of centre O from AB we consider right angle OAC.

By Pythagoras theorem,

$$\left(m\overline{OC}\right)^2 + \left(m\overline{AC}\right)^2 = \left(m\overline{OA}\right)^2$$
$$\left(m\overline{OC}\right)^2 + (3)^2 = (5)^2$$
$$\left(m\overline{OC}\right)^2 = 25 - 9$$
$$\left(m\overline{OC}\right)^2 = 16$$
$$m\overline{OC} = 4\text{cm}$$

6. If | $\overline{AB}$ | = 4 cm and | $\overline{BC}$ | = 6 m, such that $\overline{AB}$ is perpendicular to $\overline{BC}$, construct a circle through points A, B and C. Also measure its radius.



Solution:

Steps of Construction:

1. Draw $\overline{AB}$ = 4 cm and $\overline{BC}$ = 6 m, such that $\overline{AB}$ is perpendicular to $\overline{BC}$.
2. We draw right bisectors of $\overline{AB}$ and $\overline{BC}$, intersecting each other at point O.

3. Taking O as centre we draw a circle of radius $m\overline{OA} = m\overline{OB} = m\overline{OC}$ passing through the points A, B and C.
4. The radius is measured to be 3.6 cm
5. By Pythagoras theorem

$$r^2 = 2^2 + 3^2$$
$$r^2 = 4 + 9$$
$$r = \sqrt{13}$$
$$r = 3.6cm$$

Mathematics

2) Circumcentre is centre above a given triangle

Given

Triangle ABC

Steps of Construction

- Draw AD, BE perpendicular bisectors for sides AC, BC
- Cross PQR, is passed and also bisects at side AC
- Cross RST, is passed and also bisects at side BC
- With centre O and radius
- Draw a circle passing through A, B and C
- This circle passes through A, B and C. Intersect of the circle at the circumcentre.

Conclusion

The circle passing through the vertices of triangle ABC is known as **circumcircle**. Its centre is **circumcentre** and its radius is **circumradius**.

3) Incentre is centre in a given triangle

Given

Triangle ABC

Steps of Construction

- Draw AD, BE, CF bisectors of angles A, B and C
- Cross bisectors of angles angles ABC, and CAB
- Cross bisectors intersect at angles angles
- Cross bisectors intersect at angles angles. Intersect of the circle at the incentre of the circle with centre O.
- Draw a circle passing through the point of intersection of the sides of the triangle. Intersect of the circle touches the sides of the triangle.

Conclusion

The circle touching the sides of the triangle internally and the point where it touches is called **incircle**. Its centre is known as **incentre**.

4) Orthocentre an equilateral triangle is centre of a given circle.

Given

Triangle ABC

Steps of Construction

- Draw AD, BE, CF the altitudes of the triangle
- Cross AD, BE, CF
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

5) Incentre an equilateral triangle is centre circle.

Given

Triangle with centre O

Steps of Construction

- Draw one perpendicular AB of the sides.
- Intersect at one of sides of the sides point A. The arc, cuts the sides at point C.
- Draw

- Join the points C, D and E to form equilateral triangle ABC. AB, BC, and AC are the equilateral triangle perpendicular. Draw.

6) Circumcentre an equal circle is given circle.

Given

Triangle with centre O

Steps of Construction

- Draw AD, BE, CF the altitudes of the triangle
- Cross AD, BE, CF
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

7) Incentre an equilateral triangle is given circle.

Given

Triangle with centre O

Steps of Construction

- Draw one perpendicular AB of the sides.
- Intersect at one of sides of the point A. The arc, cuts the sides at point C.
- Draw

- Join the points C, D and E to form equilateral triangle ABC. AB, BC, and AC are the equilateral triangle perpendicular. Draw.

8) Orthocentre is equal to given circle.

Given

Triangle with centre O

Steps of Construction

- Draw AD, BE, CF the altitudes of the triangle
- Cross AD, BE, CF
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

9) Incentre is equal to given circle.

Given

Triangle with centre O

Steps of Construction

- Draw AD, BE, CF the altitudes of the triangle
- Cross AD, BE, CF
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

10) Circumcentre is equal triangle is given circle

Given

Triangle with centre O

Steps of Construction

- Draw AD, BE, CF the altitudes of the triangle
- Cross AD, BE, CF
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

11) Incentre is equal triangle is given circle

Given

Triangle with centre O

Steps of Construction

- Draw AD, BE, CF the altitudes of the triangle
- Cross AD, BE, CF
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

Mathematics

Exercise 15.2

1. Circumcentre is a line above a triangle ABC with sides

Given

AB = 5 cm, BC = 6 cm, CA = 7 cm

Construct the circum circle.

Solution

Steps

- Draw AB = 5 cm, BC = 6 cm, CA = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 5 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

2. Incentre is a line in a given triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

3. Orthocentre is equal to given triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

4. Incentre is equal to given triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

5. Circumcentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

6. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

7. Circumcentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

8. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

9. Orthocentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

10. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

Mathematics

11) Circumcentre is a line above a triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

12. Incentre is a line in a given triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

13. Orthocentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

14. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

15. Circumcentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

16. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

17. Circumcentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

18. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

19. Orthocentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle passing through the vertices of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw perpendicular bisectors of AB and BC
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

20. Incentre is equal triangle ABC with sides of

Given

AB = 4 cm, BC = 6 cm, AC = 7 cm

Construct the circle.

Solution

Steps

- Draw AB = 4 cm, BC = 6 cm, AC = 7 cm

Response

- Draw a circle touching the three sides of triangle ABC

Steps of Construction

- Draw a line segment AB = 4 cm
- With A as centre and radius 7 cm and B as centre and radius 6 cm draw arcs intersecting each other at C. Join AB, BC and CA
- Draw bisectors of angles A and B
- Let O be the point of intersection of AB and BC
- With O as centre and radius OA draw a circle passing through A, B and C

Mathematics

21) Circumcentre

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

22) Incentre

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

23. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

24. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

25. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

26. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

27. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

28. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

29. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

30. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

Mathematics

31. Circumcentre is a line above a triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

32. Incentre is a line in a given triangle

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

33. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

34. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

35. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

36. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

37. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

38. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

39. Circumcentre is a line above a triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

40. Incentre is a line in a given triangle

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

Mathematics

41. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

42. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

43. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

44. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

45. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

46. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

47. Circumcentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

48. Incentre is equal triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, CF the altitudes of the triangle
- Intersect AD, BE and CF, respectively
- Cross AD, BE and CF, respectively
- Intersect the sides of the triangle
- Intersect at one of sides ABC with centre O
- Draw a circle passing through A, B and C
- Intersect the perpendicular bisector
- Intersect the sides of the circle at points D, E and F.
- Draw tangent intersect at points D, E and F.

49. Circumcentre is a line above a triangle ABC

Given

Triangle ABC

Steps of Construction

- Construct a right angle triangle ABC
- Cross AD, BE, C

Exercise 13.3

1. In an arc ABC the length of the chord $\overline{BC}$ = 5 cm. Draw a secant $\overline{PBC}$ = 8 cm, where P is the point outside the arc. Draw a tangent through point P to the arc.

Steps of Construction:

(1) Draw an arc $\overset{\frown}{BAC}$

(2) Take a chord $\overline{BC}$ = 3cm.

(3) Produce $\overline{CB}$ towards B and take point P that $\overline{PBC}$ secant in 8cm.

(4) Find M, the midpoint of $\overline{CP}$.

(5) Take M as centre and draw a semi-circle.

(6) Draw $\overline{BR} \perp \overline{CP}$ which meets the semi-circle at point D.

(7) Take P as centre and draw an arc of radius $\overline{PD}$. this arc intersects the given arc at T.

(8) Join P to T and produce it.

Result

$\overline{PT}$ is the required tangent.

2. Construct a circle with diameter 8 cm. Indicate a point C. 5 cm away from its circumference. Draw a tangent from point C to the circle without using its centre.

Steps of Construction:

(1) Draw a circle of radius $\frac{8}{2}$ = 4 cm with centre at O.

(2) Take a secant $\overline{OBC}$ such that point C is 5cm away from circumference of the circle.

(3) Find M, the midpoint of $\overline{BC}$.

(4) Draw a semi-circle of radius $\frac{1}{2}\overline{OM}$ = $\sqrt{OM}$ with centre at M.

(5) Draw a perpendicular at point B which meets the semi-circle at D.

(6) Draw an arc of radius ($\overline{OD}$) with centre at C. This arc cuts the given circle at point E.

(7) Join C with E.

Result

$\overline{CEF}$ is the required tangent.

3. Construct a circle of radius 2 cm. Draw two tangents making an angle of 60° with each other.

Steps of Construction:

(1) Take a point O.

(2) Take O as centre and draw a circle with radius 2 cm.

(3) Draw $\overline{AOB}$ any diameter.

(4) Draw m∠BOT = 60°

(5) Draw tangents at point A and T. These are $\overset{\leftrightarrow}{AQ}$ and $\overset{\leftrightarrow}{TP}$

Result

$\overset{\leftrightarrow}{AQ}$ and $\overset{\leftrightarrow}{TP}$ are the required tangents that meet at point Q at 60°.

4. Draw two perpendicular tangents to a circle of radius 3cm.

Steps of Construction:

(1) Take a point O.

(2) Take O as centre and a circle of radius 3 cm.

(3) Take $\overline{AOB}$ any diameter of the circle.

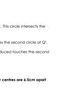
(4) Draw m∠BOC = 90°.

(5) Draw tangents at point A, C. These are $\overset{\leftrightarrow}{CP}$, $\overset{\leftrightarrow}{AQ}$

Result

$\overset{\leftrightarrow}{AQ}$, $\overset{\leftrightarrow}{CP}$ are the required tangents that meet at point D at 90°.

5. Two equal circles are of 8 cm apart. Draw two direct common tangents of this pair of circles.



Steps of Construction:

(1) Draw $\overline{OO'}$ = 8 cm.

(2) Draw two circles of equal size on O and O'.

(3) Draw $\overline{OL} \perp \overline{OO'}$ and produce towards O. $\overline{OL}$ produced meets the circle at C.

(4) Draw $\overline{O'B} \perp OO'$ and produce it towards O. $\overline{O'B}$ produced meets the circle at D.

(5) Join A with B and produce it both sides.

(6) Join C with D and produce both sides.

Result

$\overset{\leftrightarrow}{AB}$ and $\overset{\leftrightarrow}{CD}$ are the common external tangents.

6. Draw two equal circles of each radius 2.4 cm. If the distance between their centres is 6 cm then draw their transverse tangents.

(1) Draw m$\overline{OO'}$ = 6 cm.

(2) Draw two circles of 2.4 cm radius on O and O'.

(3) Find M, the midpoint of $\overline{OO'}$.

(4) Find N, the midpoint of $\overline{MO'}$.

(5) Draw a circle with centre at M and of radius $\overline{MO'}$. This circle intersects the circle at P and P'.

(6) Join P with M and produce towards M. It touches the second circle at Q'.

(7) Join P with M and produce towards M. $\overline{PM}$ produced touches the second circle at Q. $\overline{PQ}$, $\overline{PQ'}$ are the required tangents.

7. Draw two circles with radii 2.5 cm and 3.5 cm and their centres are 6 3cm apart then draw two direct common tangents.

Steps of Construction:

(1) Draw $\overline{OO'}$ of length 6.3 cm.

(2) Take O as centre and draw a circle with radius 3 cm.

(3) Take O' as centre and draw a circle with radius 2.5 cm.

(4) Find M, mid-point of $\overline{OO'}$. Take M as centre and draw a circle with radius m $\overline{MO'}$.

(5) Cut m$\overline{OM}$ = 3.2-1.5 = 1 cm and take O as centre, draw the circle with radius m$\overline{OB}$. This circle intersects the circle C. of point A, A'.

(6) Join A with O and produce towards A. $\overline{OA}$ produced meets the circle at point P. Similarly, Join A' with O and produce it both sides. $\overline{OA'}$ produced intersect the larger circle at P' and Q.

(7) Draw $\overline{O'P'} \parallel \overline{OP}$ and $\overline{O'Q'} \parallel \overline{OQ}$.

(8) Join P with P' and Q with Q'.

Result

$\overline{PP'}$ and $\overline{QQ'}$ are the required tangents.

8. Draw two circles with radii 3.5 cm and 2 cm. If their centres are 6cm apart then draw two transverse common tangents.

Ans. Construction:

(1) Take a line segment of measure $\overline{AB}$ = 6cm.

(2) Draw two circles of radii 3.5 cm and 2 cm with centres of A and B respectively.

(3) Taking A as centre draw a circle of radius 3.5 + 2 = 5.5 cm.

(4) Bisect the line segment $\overline{AB}$ at point M.

(5) Take M as centre and draw a circle of radius $\overline{MA}$, which intersects the big circle at points C and D.

(6) Join A with C and D to produce it. Join and $\overline{AC}$, $\overline{AD}$ and $\overline{AC'}$ meet the inner circle at E and F.

(7) Draw $\overline{BG} \parallel \overline{AC}$ and $\overline{BF} \parallel \overline{AD}$.

(8) Join E with G and produce on both sides. Join F with F and produce on both sides.

Result

$\overset{\leftrightarrow}{EG}$ and $\overset{\leftrightarrow}{FH}$ are the required tangents.

9. Draw two common tangents to two touching circles of radii 2.5 cm and 3.5 cm.

Steps of Construction:

(1) Draw a line segment $\overline{OP}$ of measure 2.5 + 3.5 = 6.0 cm.

(2) Take O as centre and draw a circle with radius m$\overline{OA}$ = 3.5 cm.

(3) Take O' as centre and draw a circle with radius m$\overline{OB}$ = 2.5 cm. These circles touch each other at point M.

(4) Draw $\overline{PQ} \perp OO'$.

Result

$\overline{PQ}$ is the required common tangents.

10. Draw two common tangents to two intersecting circle of radii 3 cm and 4 cm.

Steps of Construction:

(1) Take a line segment $\overline{AB}$ that m$\overline{AB}$ = 3 + 4 = 7 cm.

(2) Draw two circles of radii = 4 cm and = 3cm with centres of A and B respectively.

(3) Taking A as centre draw a circle with radius 4 + 3 = 1 cm.

(4) Bisect the line segment $\overline{AB}$ at point M.

(5) Take M as centre and draw a circle of radius m$\overline{AB}$. this circle intersects circle with radius 1cm at point G.

(6) Join A with P and G and produce. $\overline{AP}$, $\overline{AG}$ to meet the larger circle at D, C.

(7) Draw $\overline{BF} \parallel \overline{GD}$ and $\overline{BE} \parallel \overline{GC}$.

(8) Join D with F and produce both sides.

(9) Join C with E and produce both sides.

Result

$\overset{\leftrightarrow}{DF}$ and $\overset{\leftrightarrow}{CE}$ are the required tangents.

11. Draw circles which touches both the arms of angles.

(1) 45° (2) 60°

(3) 45°

Steps of Construction:

(1) Draw an angle ABC of 45°.

(2) Draw $\overline{BP}$ bisector of angle ∠ABC.

(3) Take any point O on $\overline{BP}$.

(4) Drop $\overline{OM} \perp \overline{BA}$.

(5) Take O as centre and draw a circle with radius m$\overline{OM}$. This circle touches arm $\overline{BC}$ of ∠ABC also.

(3) 60°

Steps of Construction:

(1) Draw an angle ∠ABC of 60°.

(2) Draw $\overline{BP}$ bisector of angle ∠ABC.

(3) Take any point O on $\overline{BP}$.

(4) Drop $\overline{OM} \perp \overline{BA}$.

(5) Take O as centre and draw a circle with radius m$\overline{OM}$. this circle touches arm $\overline{BC}$ of ∠ABC also.

Miscellaneous Exercise - 13

Q1. Multiple Choice Questions:

Three possible answers are given for the following questions. Tick (✓) the correct answer.

(i) The circumference of a circle is called

(a) chord **(b)** segment **(c)** boundary

(ii) A line intersecting a circle is called:

(a) tangent **(b)** secant **(c)** chord

(iii) The portion of a circle between two radii and an arc is called

(a) sector **(b)** segment **(c)** chord

(iv) Angle inscribed in a semi-circle is

(a) $\frac{\pi}{2}$ **(b)** $\frac{\pi}{3}$ **(c)** $\frac{\pi}{4}$

(v) The length of the diameter of a circle is how many times the radius of the circle

(a) 1 **(b)** 2 **(c)** 3

(vi) The tangent and radius of a circle at the point of contact are

(a) parallel **(b)** not perpendicular **(c)** perpendicular

(vii) Circles having three points in common:

(a) over lapping **(b)** collinear **(c)** not coincide

(viii) If two circles touch each other, their centres and point of contact are

(a) coincident **(b)** non-collinear **(c)** collinear

(ix) The measure of the external angle of a regular hexagon is

(a) $\frac{\pi}{6}$ **(b)** $\frac{\pi}{3}$ **(c)** $\frac{\pi}{4}$

(x) If the incentre and circumcentre of a triangle coincide, the triangle is

(a) an isosceles **(b)** a right triangle **(c)** an equilateral

(xi) The measure of the external angle of a regular octagon is

(a) $\frac{\pi}{6}$ **(b)** $\frac{\pi}{3}$ **(c)** $\frac{\pi}{4}$

(xii) Tangents drawn at the end points of the diameter of a circle are

(a) parallel **(b)** perpendicular **(c)** intersecting

(xiii) The lengths of two transverse tangents to a pair of circles are

(a) unequal **(b)** equal **(c)** overlapping

(xiv) How many tangents can be drawn from a point outside the circle?

(a) 1 **(b)** 2 **(c)** 3

(xv) If the distance between the centres of two circles is equal to the sum of their radii, then the circles will:

(a) intersect **(b)** do not intersect **(c)** touch each other externally

(xvi) If the two circles touch externally, then the distance between their centres is equal to the

(a) difference of their radii **(b)** sum of their radii **(c)** product of their radii

(xvii) How many common tangents can be drawn for two touching circles?

(a) 2 **(b)** 3 **(c)** 4

(xviii) How many common tangents can be drawn for two disjoint circles?

(a) 2 **(b)** 3 **(c)** 4

Answers:

(i)	c	**(ii)**	b	**(iii)**	a	**(iv)**	a	**(v)**	b
(vi)	c	**(vii)**	b	**(viii)**	b	**(ix)**	b	**(x)**	c
(xi)	c	**(xii)**	b	**(xiii)**	a	**(xiv)**	c	**(xv)**	a
(xvi)	b	**(xvii)**	b	**(xviii)**	c				

Q2. Write short answers of the following questions:

(i) Define and draw the following geometric figures:

(a) The segment of a circle. **(b) The tangent to a circle.**

(c) The sector of a circle. **(d) The inscribed circle.**

(e) The circumscribed circle. **(f) The escribed circle.**

(a) The segment of a circle

Solution:

The area contained between a chord and the arc which it cuts off is called a segment of the circle.

(b) The tangent to a circle.

Solution:

A line that touch a circle at a single point is called its tangent. $\overleftrightarrow{QR}$ is tangent to the circle with centre O at point P.

(c) The sector of a circle.

Solution:

The area contained between two radii and the arc of the circle which they intercept, is called a sector of the circle.

(d) The inscribed circle.

Solution:

The sides of triangle touch a circle internally, such a circle is called inscribed circle of the triangle.

(e) The circumscribed circle.

Solution:

A circle that passes through the vertices of a triangle is called circumscribed circle of the triangle.

(f) The escribed circle.

Sol-tion:

A circle that touches two sides of a triangle internally and one side externally is called a escribed circle.

(3) The length of each side of a regular octagon is 3 cm. Measure its perimeter.

Solution

Length of side = 3 cm

Number of sides of an octagon = 8

Perimeter = 3 x 8 = 24 cm

(3) Write down the formula for finding the angle subtended by the side of a n-sided polygon at the centre of the circle.

Ans.

$$\frac{360^\circ}{n}$$

(4) The length of the side of a regular pentagon is 5 cm what is its perimeter?

Solution

Length of each side = 5 cm

Number of sides = 5

Perimeter = 5 x 5 = 25 cm.

Q5. Fill in the blanks:

1) The boundary of a circle is called _____.

2) The circumference of a circle is called _____ of the circle.

3) The line joining the two points of circle is called _____.

4) The point of intersection of perpendicular bisectors of two non-parallel chords of a circle is called the _____.

5) Circles having three points in common will _____ .

6) The distance of a point inside the circle from its centre is _____ than the radius.

7) The distance of a point outside the circle from its centre is _____ than the radius.

8) A circle has only _____centre.

9) One and only one circle can be drawn through three _____ points.

10) Angle inscribed in a semi-circle is a _____ angle.

11) If two circles touch each other, the point of _____ and their _____ are collinear.

12) If two circles touch each other, their point of contact and centres are _____ .

13) From a point outside the circle _____ tangents can be drawn.

14) A tangent is _____ to the radius of a circle at its point of contact.

15) The straight line drawn l_1 to the radius of a circle is called the _____ to the circle.

16) Two circles cannot cut each other at more than _____ points.

17) The l_1 bisector of a chord of a circle passes through the _____ .

18) The length of two direct common tangents to two circles are _____ to each other.

19) The length of two transverse common tangents to two circles are _____ to each other.

20) The in-centre and circum-centre of a triangle coincide the triangle is _____ .

21) Two intersecting circles are not _____ .

22) The centre of an inscribed circle is called _____ .

23) The centre of a circumscribed circle is called _____ .

24) The radius of an inscribed circle is called _____ .

25) The radius of a circumscribed circle is called _____ .

Answer:

1	Circumference	2	Boundary	3	Chord	4	Centre	5	Concide
6	Less	7	Greater	8	One	9	Non-collinear	10	Right
11	Contact, centres	12	Collinear	13	Two	14	Perpendicular	15	Tangent
16	Two	17	Centre	18	Equal	19	Equal	20	Equilateral
21	Concentric	22	Incentre	23	Circumcentre	24	In-radius	25	Circumradius

Summary

✓ A circle of any radius can be traced by rotating a compass about fixed point.

✓ The perpendicular bisectors of two non-parallel chords of a circle intersect at a point which is known as centre of circle.

✓ A circle can be drawn through given three non-collinear points.

✓ When a part of circumference of a circle is given, the circle can be completed.

✓ If a triangle is given, the circumscribed circle, inscribed circle and escribed circle opposite to each vertex can be constructed.

✓ If a circle is given, then the circumscribed and inscribed equilateral triangles can be constructed.

✓ For a given circle, the circumscribed and inscribed squares can be drawn.

✓ For a given circle, the circumscribed and inscribed regular hexagon can be constructed.

✓ We can draw tangents to a given arc as its midpoint, if's any end point, and a point not on the arc.

✓ Tangents can be drawn, to a given circle, when a point is on its circumference and from a point outside the circle.

✓ Tangents to two unequal touching circles can be traced.

✓ Direct or transverse common tangents of two equal circles or two unequal circles can be drawn.

✓ We can construct a circle touching the arms of a given angle.

✓ A circle passing through a given point between two converging lines and touching each of them, can be traced.