

To draw a circle to touch a given circle C and to pass through two given points A and B.

- (1) Join A to B and extend.
- (2) Bisect AB (chord).
- (3) Draw any circle on this bisector such that it passes through AB and cuts through circle C in two places, D and E.
- (4) Join D to E and produce to intersect AB produced. This locates point F.
- (5) From F draw a tangent to the given circle. The normal is also drawn.
- (6) The normal extended will intersect the bisector at G which will be the centre of the required circle.

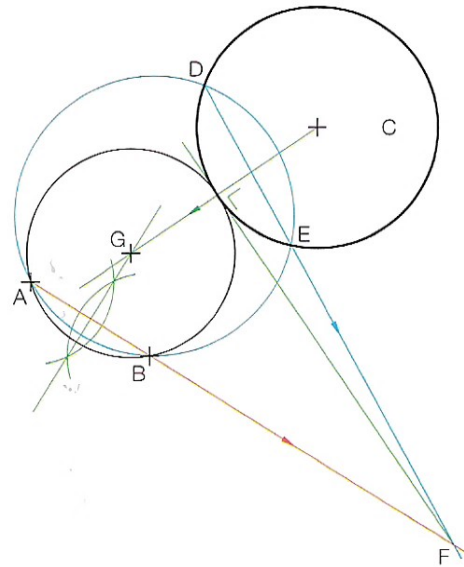


Fig. 1.76

Use of Loci

Many of the previous problems can be solved by the use of loci.

Definition: A locus is the path followed by a point while obeying certain conditions.

A circle, for example, is the locus/path of a point that remains a set distance (the radius) from another point (the centre).

To draw a circle to pass through two given points A and B and to touch a given line GH.

This problem was solved by an alternative method in Fig. 1.73.

- (1) Join A and B and bisect.

The bisector of a line is the locus of all points which are equidistant from the end points of that line.

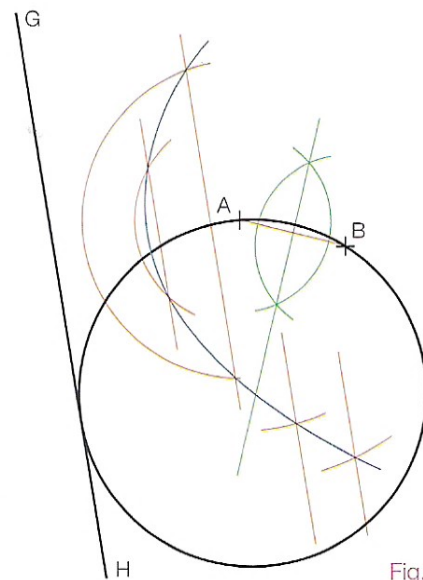


Fig. 1.77

- (2) Draw the locus of points which are equidistant from A and the line GH.
 Draw a line 20 mm from GH and parallel to it. Draw an arc of radius 20 mm having point A as centre. Arc and line cross giving a point on the locus. Repeat as above but drawing the line 30 mm from GH and the arc of radius 30 mm.
 Repeat until the locus is long enough to cross the bisector of chord AB.
 Join all the points to give a smooth curve.
- (3) Where the bisector and locus cross gives the centre of the required circle.

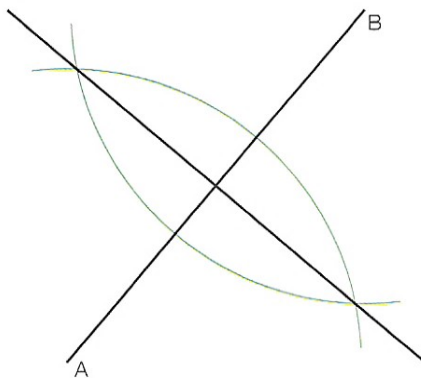


Fig. 1.78

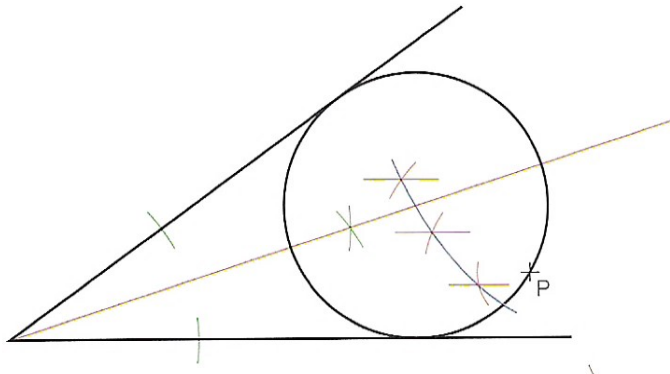


Fig. 1.79

To draw a circle to touch the two arms of an angle and a given point P.

This problem was solved by an alternative method in Fig. 1.71.

- (1) Bisect the angle.

The bisector of an angle is the locus of all points which are equidistant from both arms of the angle.

- (2) Draw the locus of points which are equidistant from point P and one of the arms of the angle.
- (3) The locus and bisector cross at the circle centre.

To draw a circle to touch a given circle C and to pass through two given points A and B.

Already answered using alternative method, Fig. 1.76.

- (1) Join A to B and bisect.
- (2) Draw a locus of points which are equidistant from one of the points (e.g. B) and the circumference of the circle.
With B as centre draw an arc of radius 20 mm.
With centre of circle C as centre add 20 mm to the radius of circle C and draw an arc.
The two arcs intersect giving points on the locus.
Repeat with larger measurements to plot the locus.
- (3) The locus and the bisector of AB intersect at the centre of the required circle.

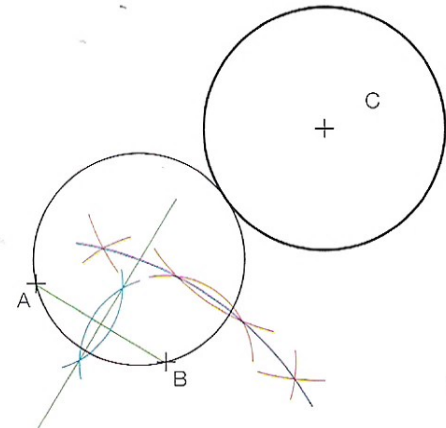


Fig. 1.80

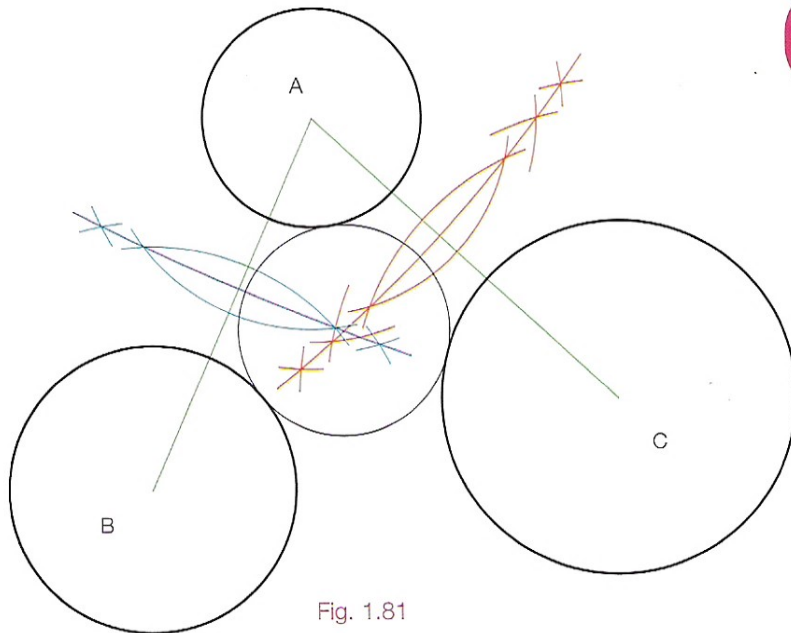


Fig. 1.81

To draw a circle to touch three given circles A, B and C.

- (1) Plot the locus of points that are equidistant from the circumference of circle A and circle B.
- (2) Plot a second locus of all points that are equidistant from the circumference of circle A and circle C.
- (3) Where these two loci cross gives a point which is equidistant from the circumference of all three circles. The centre of the required circle.
- (4) Draw the circle.

To draw a circle to touch two given circles A and B and to touch a given line CD.

- (1) Plot the locus of points that are equidistant from the circumference of A and the line CD.
- (2) Plot the second locus of points that are equidistant from the circumference of B and the line CD.
- (3) Where the loci cross is the centre of the required circle, Fig. 1.82.

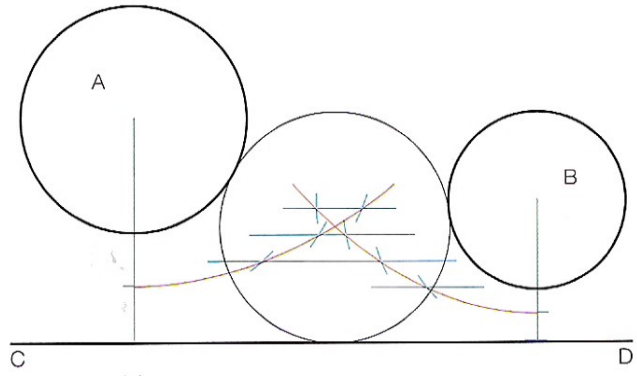


Fig. 1.82

Activities

Q1. Draw a circle of radius 18 mm to touch the two given circles, Fig. 1.83.

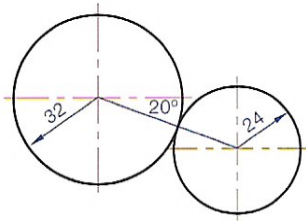


Fig. 1.83

Q2. Draw a circle to touch the two given circles and having a radius of 60 mm, Fig. 1.84.

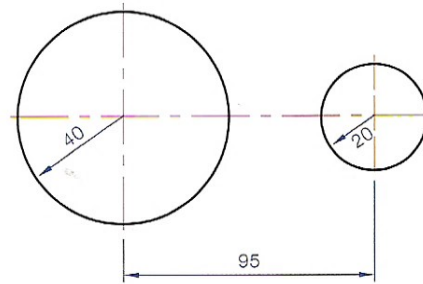


Fig. 1.84

Q3. Draw the machine part shown in Fig. 1.85.

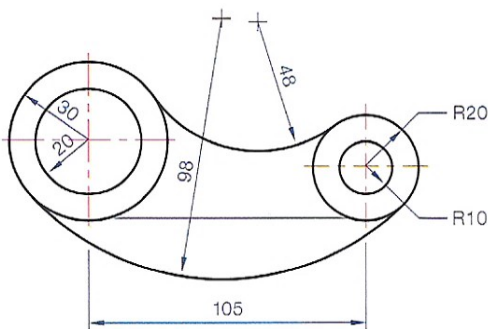


Fig. 1.85

Q4. Shown is the head of a spanner, Fig. 1.86. Construct this showing all centre points and points of contact.

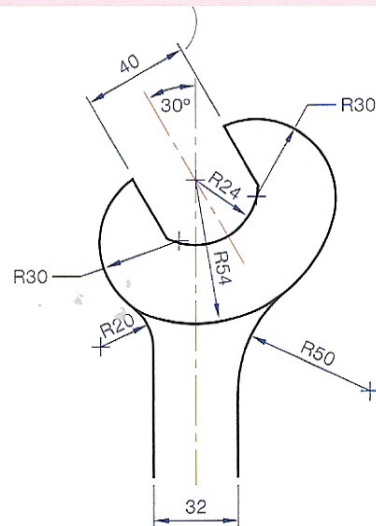


Fig. 1.86

Q5. Draw the door handle shown in Fig. 1.87.

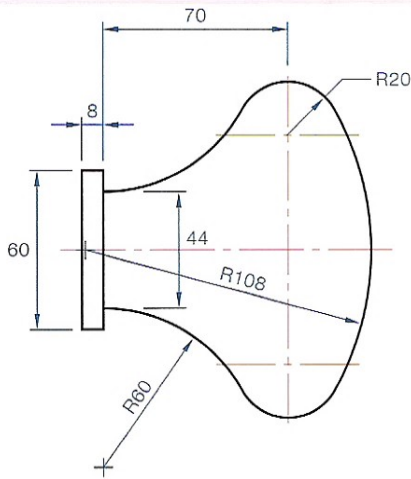


Fig. 1.87

Q7. Draw a circle to touch the two arms of the given angle and to touch point P, Fig. 1.89.

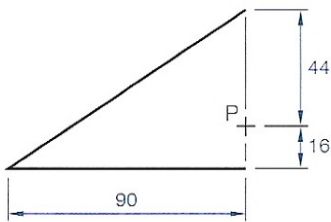


Fig. 1.89

Q9. To draw a line to pass through the two given points A and B and be tangential to the given line CD, Fig. 1.91.

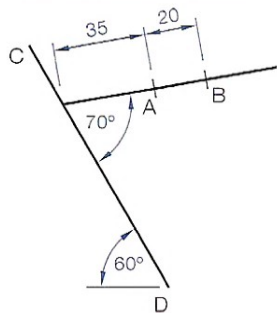


Fig. 1.91

Q6. Construct the vase shown in Fig. 1.88. The shape is symmetrical.

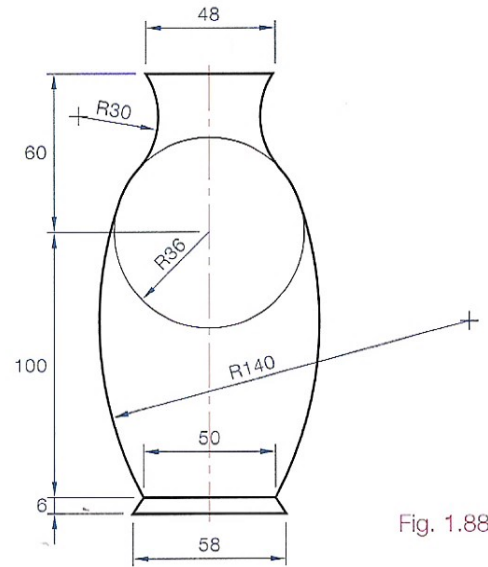


Fig. 1.88

Q8. Given a line, a point A on the line and a point P off the line. Draw a circle tangential to the given line at A and to pass through point P, Fig. 1.90.

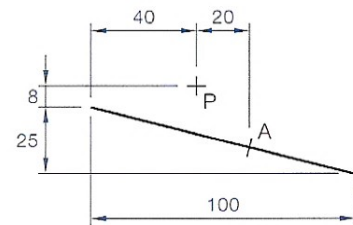


Fig. 1.90

Q10. Draw a circle to touch the given circle and a point P outside the circle, Fig. 1.92.

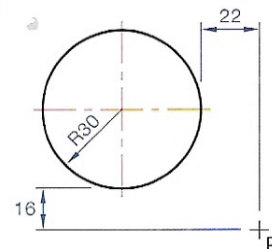


Fig. 1.92

Q11. Draw a circle to touch the given circle and pass through a point P outside the circle, Fig. 1.93.

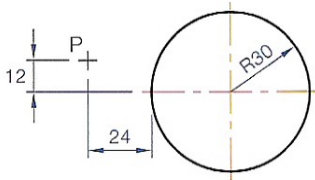


Fig. 1.93

Q12. For both Figures 1.94a and 1.94b draw a circle to touch the given circle at point A and to pass through point P.

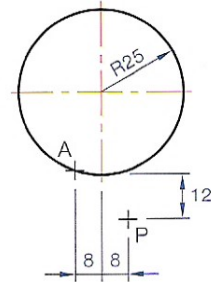


Fig. 1.94a

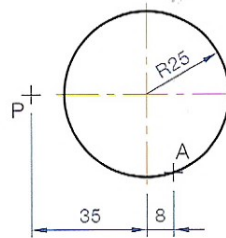


Fig. 1.94b

Q13. Draw a circle to pass through points P_1 and P_2 and to touch a given circle, Fig. 1.95.

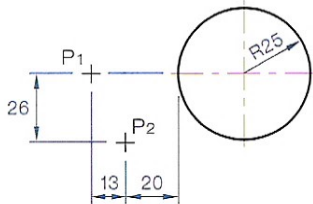


Fig. 1.95

Q14. Construct the figure shown in Fig. 1.96.
Hint: See Fig. 1.20 in this chapter.

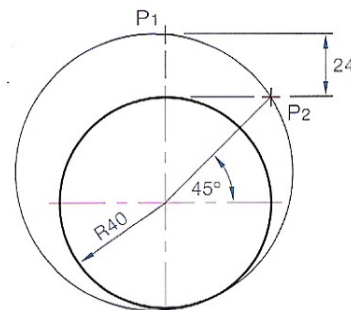


Fig. 1.96

Q15. Draw the figure shown in Fig. 1.97.

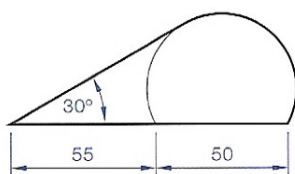


Fig. 1.97

Solve all the following problems by the use of loci.

Q16. Draw a circle to touch line AB and to pass through P_1 and P_2 , Fig. 1.98.

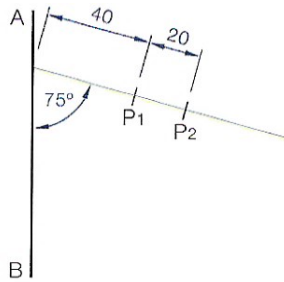


Fig. 1.98

Q17. Draw a circle to pass through a given point P and to touch the two arms of the angle, Fig. 1.99.

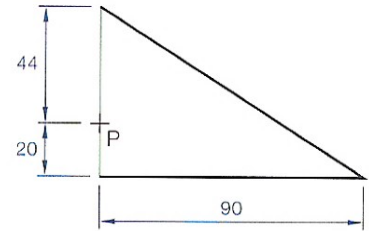


Fig. 1.99

Q18. Draw a circle to touch two given points and a given circle, Fig. 1.100.

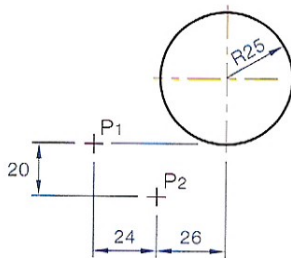


Fig. 1.100

Q19. Draw a circle to touch three given circles, Fig. 1.101.

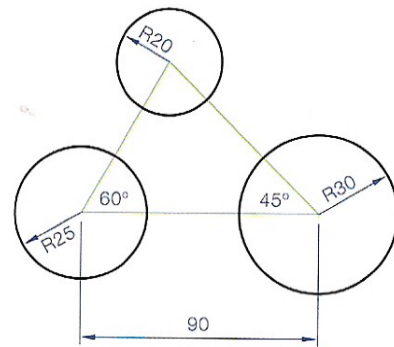


Fig. 1.101

Q20. Draw a circle to touch the two given circles and to touch the given line AB, Fig. 1.102.

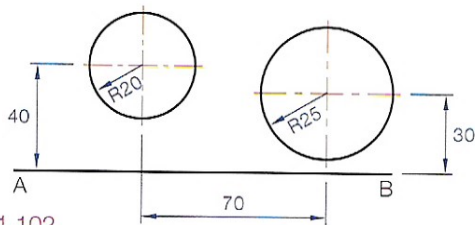


Fig. 1.102

Q21. Draw the figure shown in Fig. 1.103.

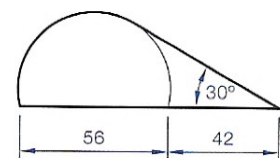


Fig. 1.103

Q22. Draw a circle to touch a given point P and two given circles, Fig. 1.104.

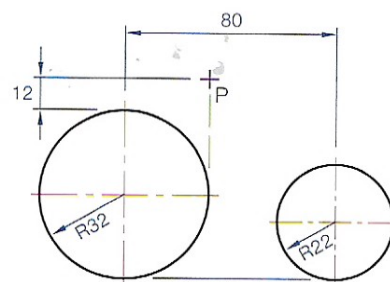


Fig. 1.104