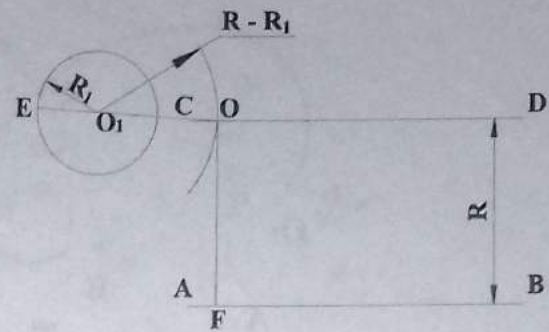Figure 2.31(c)

Figure 2.31(d)
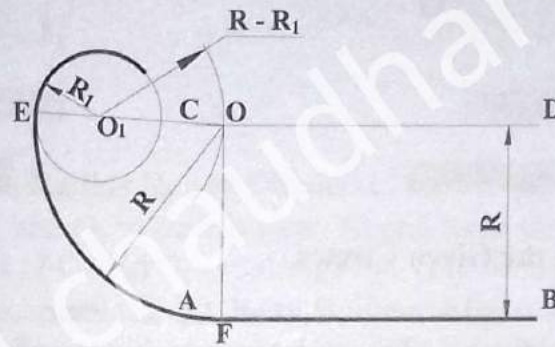

Figure 2.31(e)

2.3.6 To Draw an Arc of Radius R and Tangent to Given Two Circles (or Circular Arcs)

(a) Outside to the Given Circles

- Draw circles with O_1 and O_2 as their centers, R_1 and R_2 as their radii respectively. The relative positions of O_1 and O_2 are also given. *(Figure 2.32(a))*
- Draw arcs with O_1 as center and $R + R_1$ as radius and O_2 as center and $R + R_2$ as radius respectively. Intersection of these arcs gives the center O of the required arc. *(Figure 2.32(b))*
- Join O and O_1 and O and O_2 to get the point of tangencies A and B respectively. *(Figure 2.32(c))*
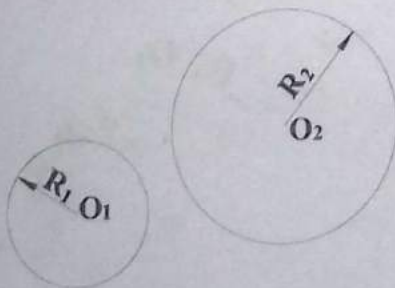- Draw the required arc with O as center and OA $(= OB = R)$ as radius. *(Figure 2.32(d))*
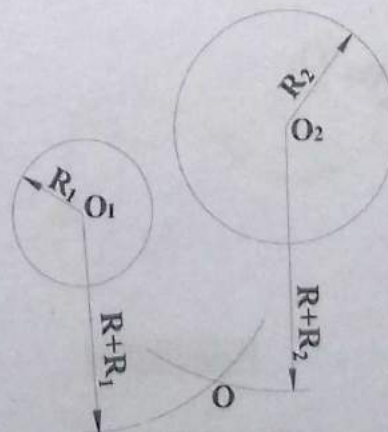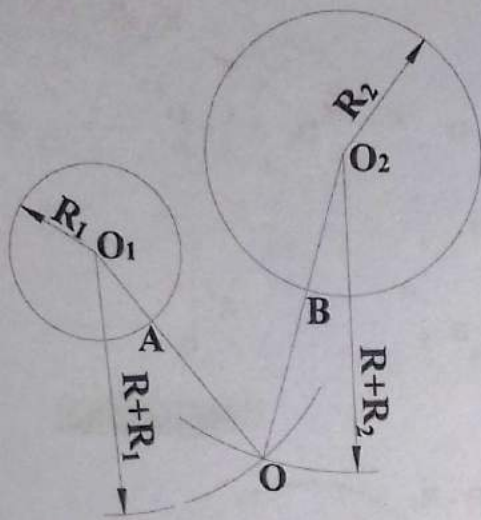

Figure 2.32(a)

Figure 2.32(b)

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Figure 2.32(c)

Figure 2.32(d)

(b) Including the Given Circles

- Draw circles with O_1 and O_2 as their centers, R_1 and R_2 as their radii respectively. The relative positions of O_1 and O_2 are also given. (Figure 2.33(a))

- Draw arcs with O_1 as center and $R - R_1$ as radius and O_2 as center and $R - R_2$ as radius respectively. Intersection of these arcs gives the center O of the required arc. (Figure 2.33(b))

- Join O and O_1 and O and O_2 and extend to get the point of tangencies A and B respectively. (Figure 2.33(c))

- Draw the required arc with O as center and OA $(= OB = R)$ as radius. (Figure 2.33(d))

Figure 2.33(a)
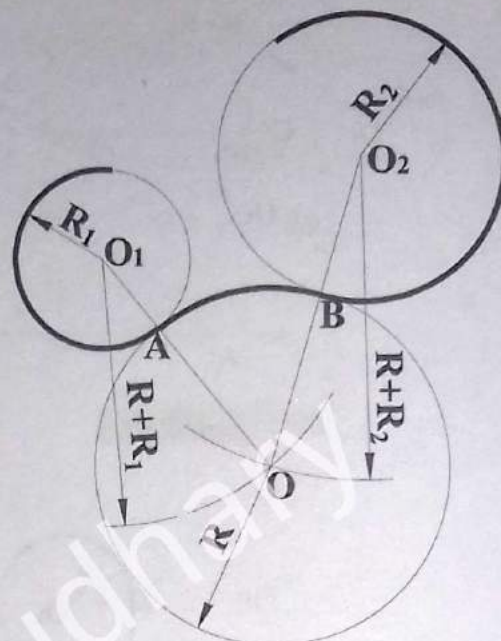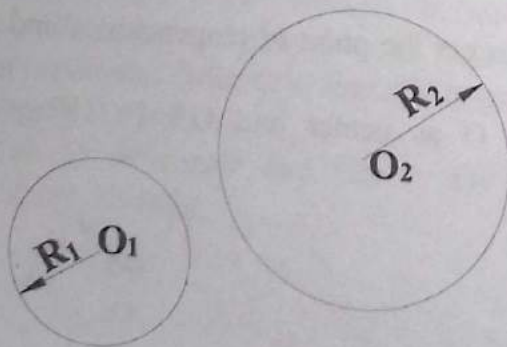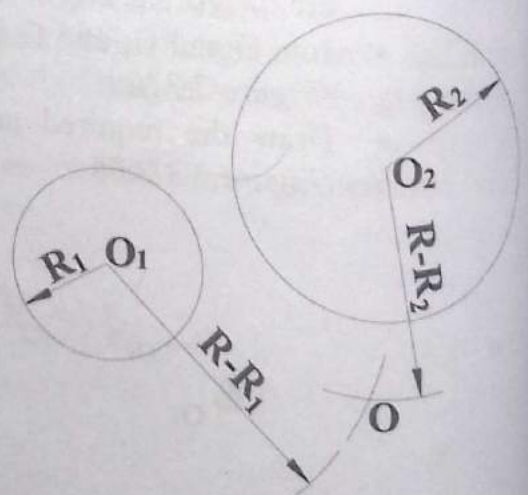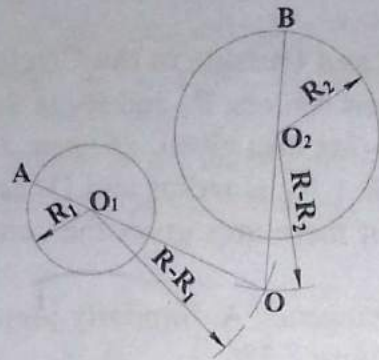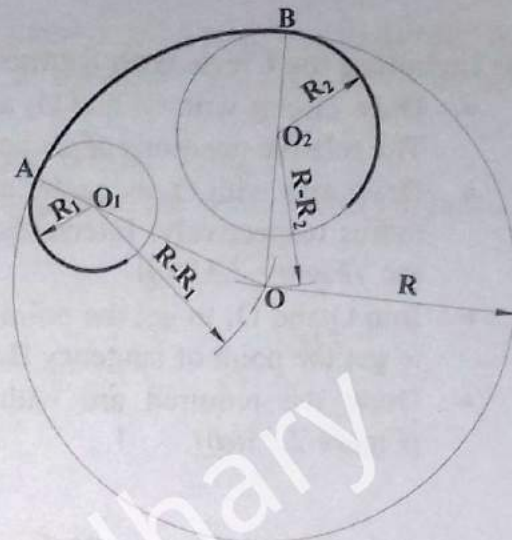

Figure 2.33(b)

Figure 2.33(c)

Figure 2.33(d)

(c) Including the Circle with Radius R_1 and Outside to the Circle with Radius R_2

- Draw circles with O_1 and O_2 as their centers, R_1 and R_2 as their radii respectively. The relative positions of O_1 and O_2 are also given. *(Figure 2.34(a))*
- Draw arcs with O_1 as center and $R - R_1$ as radius and O_2 as center and $R + R_2$ as radius respectively. Intersection of these arcs gives the center O of the required arc. *(Figure 2.34(b))*
- Join O and O_1 and extend to get the point of tangency A. Similarly join O and O_2 to get the point of tangency B. *(Figure 2.34(c))*
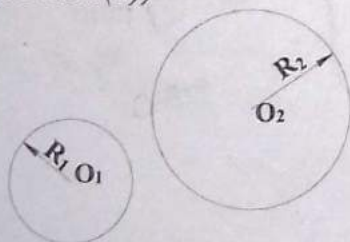- Draw the required arc with O as center and OA (= OB = R) as radius. *(Figure 2.34(d))*
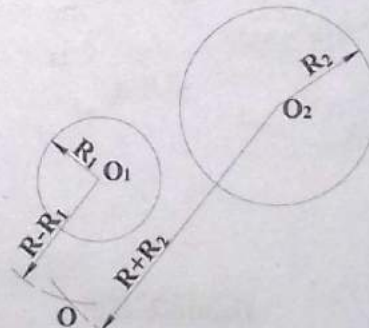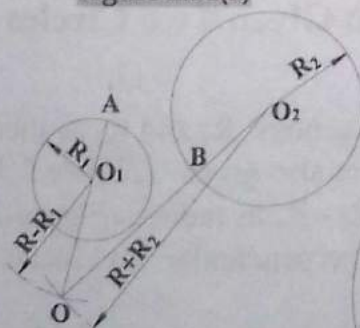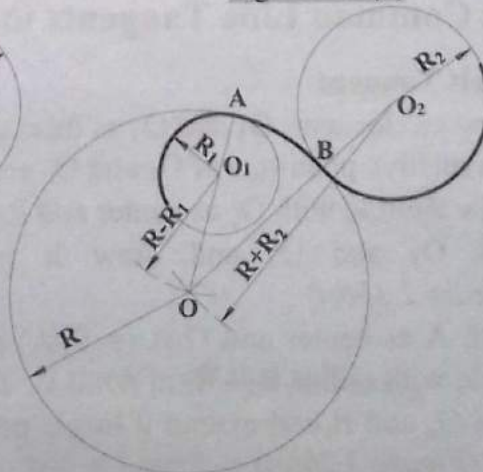

Figure 2.34(a)

Figure 2.34(b)

Figure 2.34(c)

Figure 2.34(d)

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(d) Including the Circle with Radius R_2 and Outside to the Circle with Radius R_1

- Draw circles with O_1 and O_2 as their centers, R_1 and R_2 as their radii respectively. The relative positions of O_1 and O_2 are also given. *(Figure 2.35(a))*
- Draw arcs with O_1 as center and $R + R_1$ as radius and O_2 as center and $R - R_2$ as radius respectively. Intersection of these arcs gives the center O of the required arc. *(Figure 2.35(b))*
- Join O and O_1 to get the point of tangency A. Similarly join O and O_2 and extend to get the point of tangency B. *(Figure 2.35(c))*
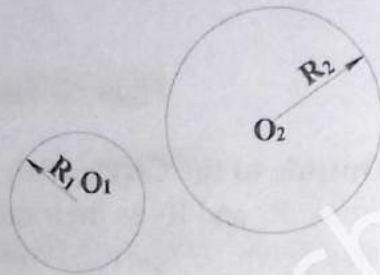- Draw the required arc with O as center and OA (= OB = R) as radius. *(Figure 2.35(d))*
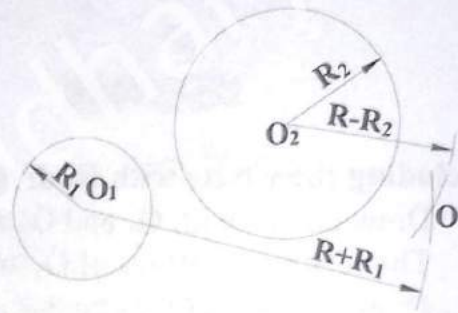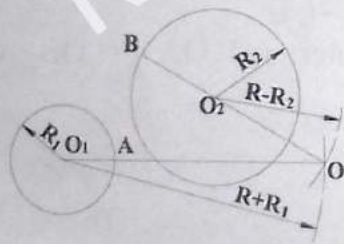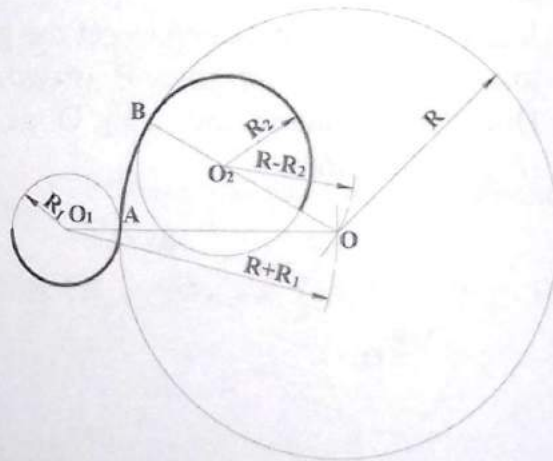
Figure 2.35(a)

Figure 2.35(b)

Figure 2.35(c)

Figure 2.35(d)

2.3.7 To Draw Common Line Tangents to Given Two Circles

(a) Open Belt Tangent

- Draw circles with O_1 and O_2 as their centers, R_1 and R_2 as their radii respectively. The relative positions of O_1 and O_2 are also given. *(Figure 2.36(a))*
- Draw a circle with O_2 as center and $R_2 - R_1$ as radius. *(Figure 2.36(b))*
- Join O_1 and O_2 and draw it perpendicular to locate its midpoint A. *(Figure 2.36(c))*
- With A as center and O_1A (= O_2A) as radius draw a circle which intersects the circle with radius $R_2 - R_1$ at point B. *(Figure 2.36(d))*
- Join O_2 and B and extend it to get point of tangency T_2 on the circle with radius R_2. *(Figure 2.36(e))*