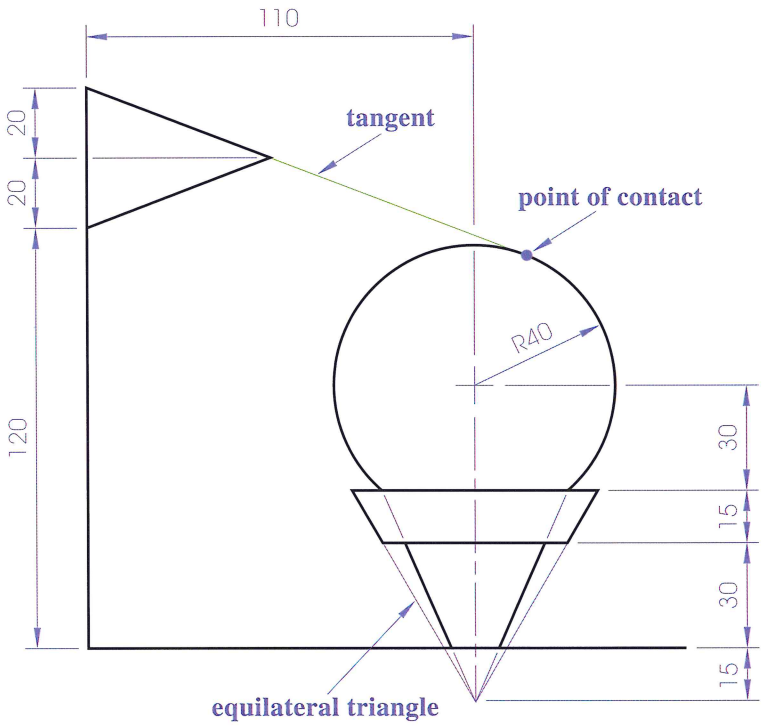
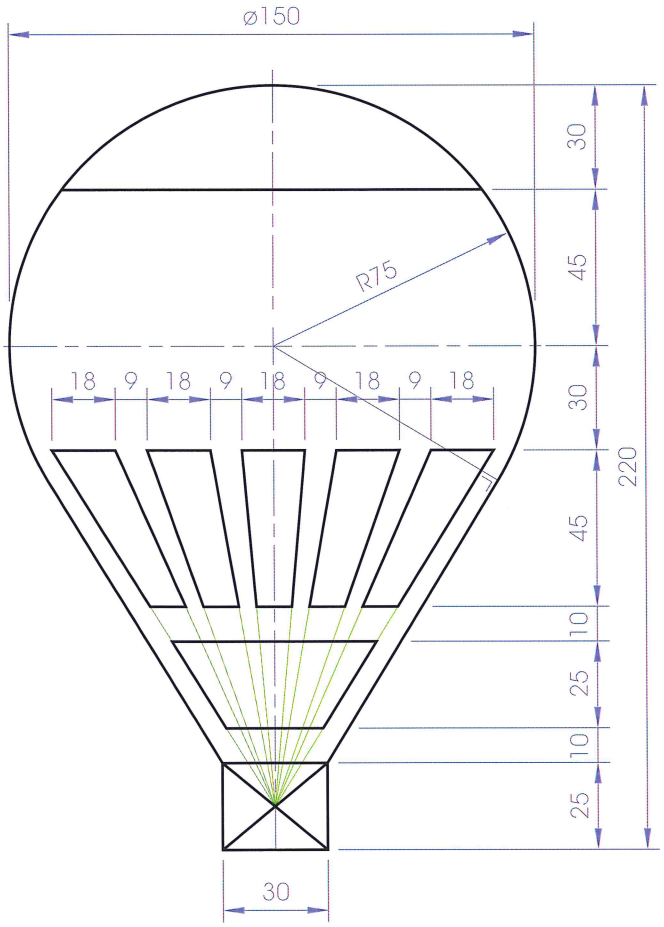
2. The figure across shows a sign for a **golf course**. Reproduce the drawing full-size showing clearly how the **tangent** to the arc is obtained.



3. Reproduce the given drawing of the logo for **Remax Auctioneers** showing clearly how the tangents to the circle are constructed.



Answer Worksheet 11C

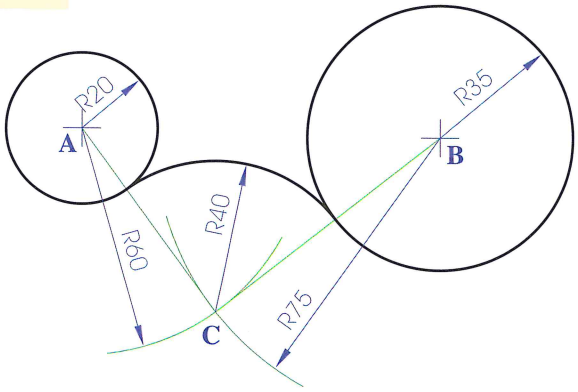
Tangential Circles

Two circles having one point in common are said to **touch** each other. Two circles touch **externally** when one is outside the other – two circles touch **internally** when one is inside the other.

The point at which they touch is called the **point of contact**.

Example 1

Draw an arc of radius 40 mm to touch two circles A and B externally.

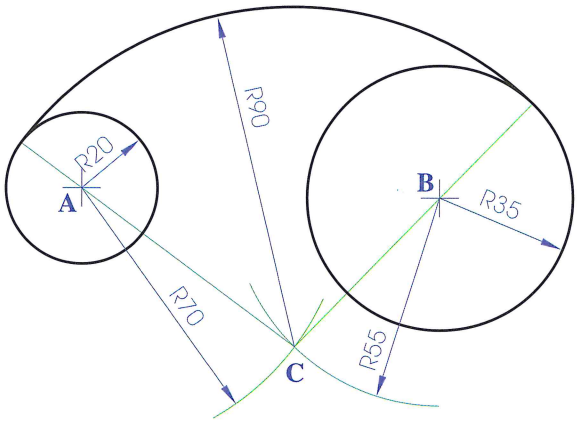


1. With centre A and R60 (20 + 40), draw an arc about circle A as shown in the figure across.
2. With B as centre and R75 (35 + 40), draw a second arc cutting the first at C.
3. Join AC and BC to obtain the points of contact.
4. Draw the arc of radius 40mm from C.

If two circles touch externally, the distance between their centres equals the sum of their radii.

Example 2

Draw an arc of radius 90 mm to touch two circles A and B internally.

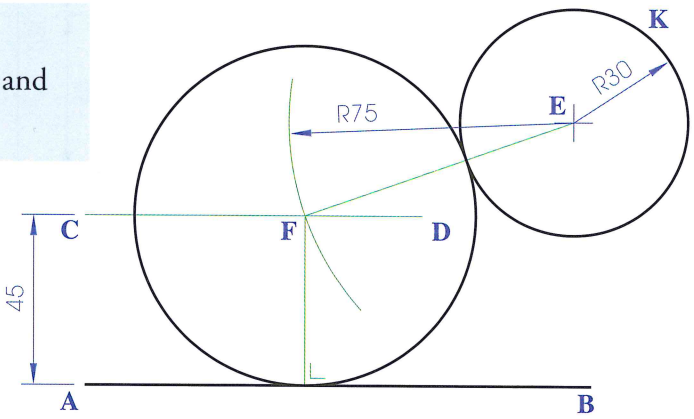


1. With centre A and R70 (90 – 20), draw an arc about circle A as shown in the figure over.
2. With B as centre and R55 (90 – 35), draw a second arc cutting the first at C.
3. Join AC and BC and extend to obtain the points of contact.
4. Draw the arc of radius 90 mm from C.

If two circles touch internally, the distance between their centres equals the difference of their radii.

Example 3

Draw a circle of radius 45 mm to touch a circle K and a straight line AB.

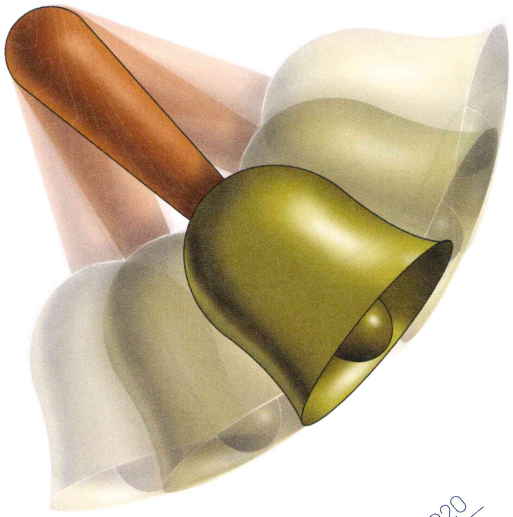


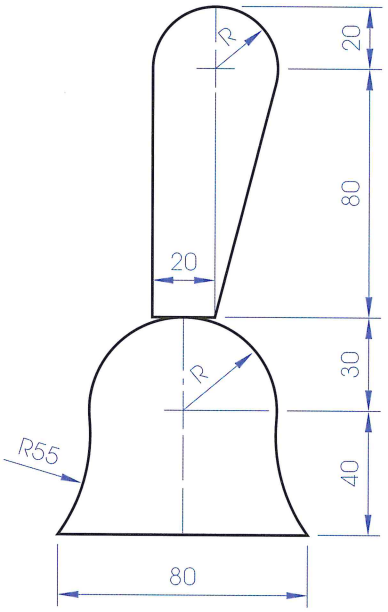
1. Draw a line CD 45 mm above AB.
2. With centre E and a radius equal to the sum of the radii of the two circles (30 + 45), draw an arc to cut CD at F. This is the centre of the required circle.
3. Join FE to obtain the point of contact between the two circles. Draw a line from F perpendicular to AB to obtain the point of contact between the circle and the line. Draw the circle.

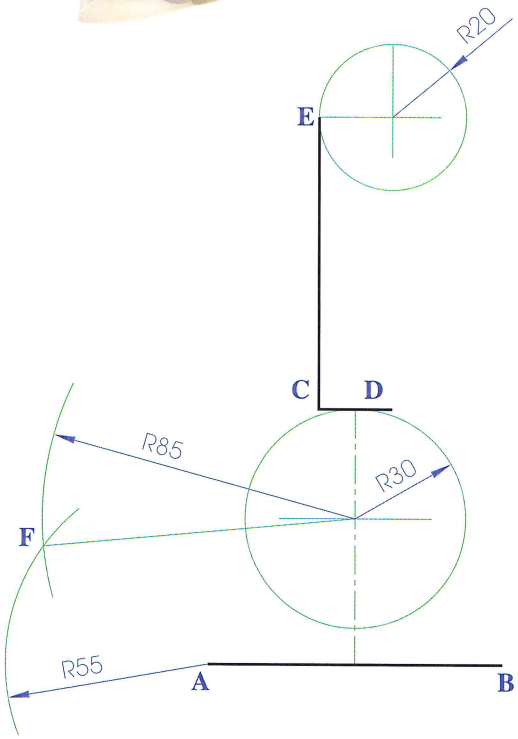
Answer Worksheets 11D and 11E

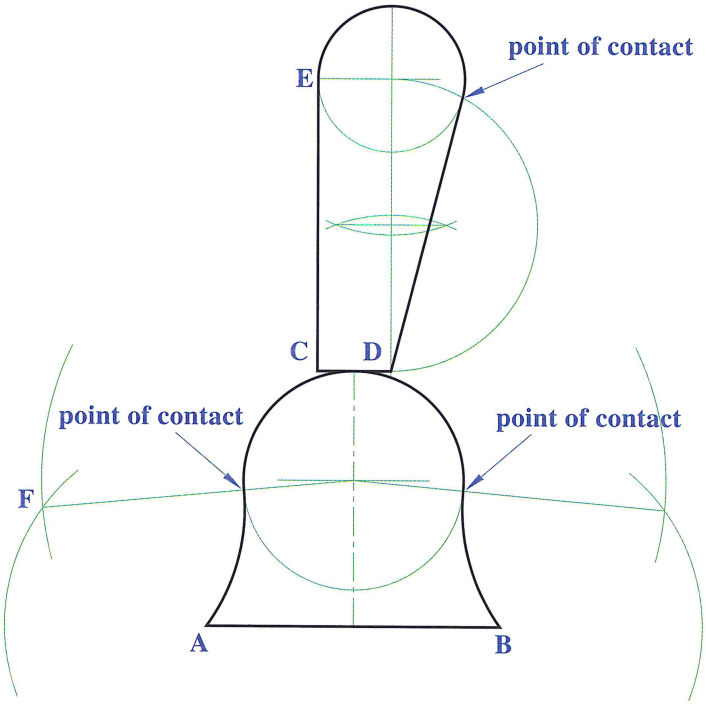
Example

A design for a **hand bell** is shown. Draw the given design, showing clearly all constructions and points of contact.





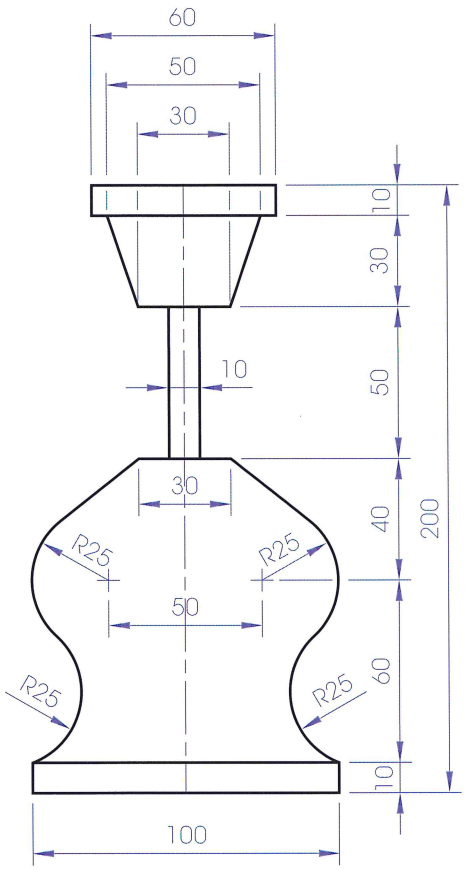




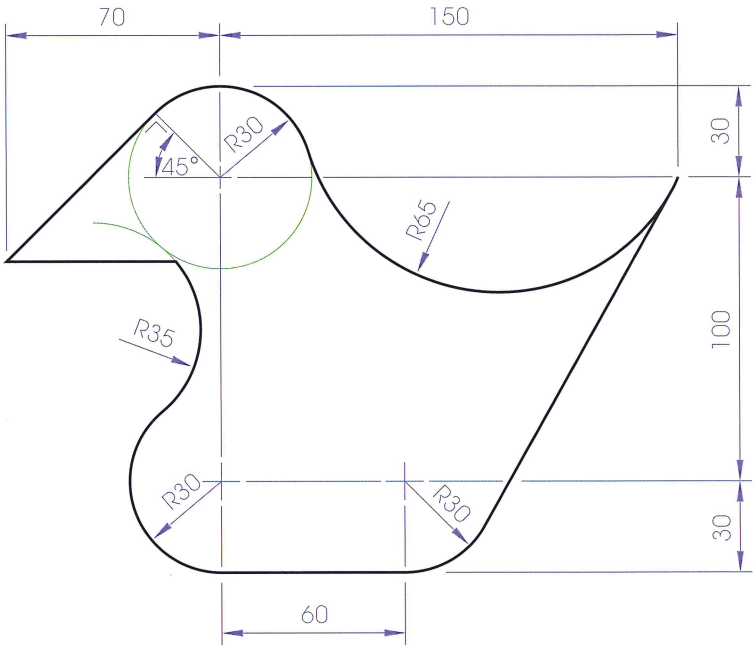
1. Draw the two horizontal lines AB and CD, and the vertical line CE. Locate the centres for the circles of radii 20 mm and 30 mm respectively. Draw these two circles.
2. With centre A and radius 55 mm, draw an arc as shown. Draw another arc of radius 85 mm (55 + 30) about the circle of radius 30 mm cutting the first arc at F.
3. Join F to the centre of the circle to obtain the point of contact. Draw the arc of radius 55 mm from F. Complete the right-hand side using the same procedure.
4. Construct a tangent from D to the circle of radius 20 mm, using the method outlined on page 98.
5. Complete the design by drawing in the outline of the figure.

Exercises

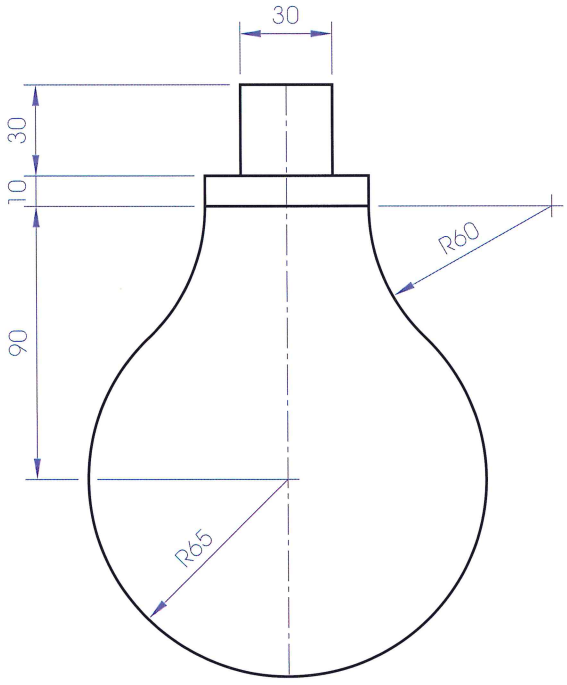
Draw each of the designs shown below showing clearly all constructions and points of contact.



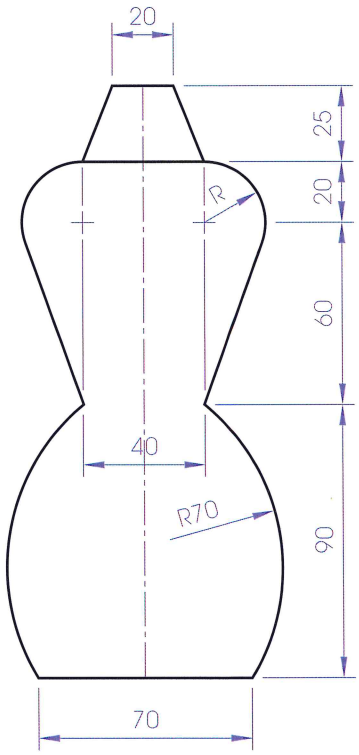
Ceiling light



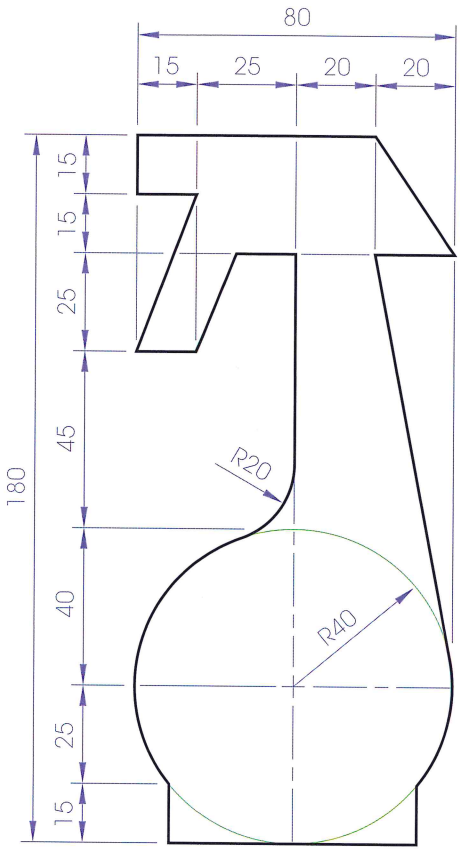
Child's toy

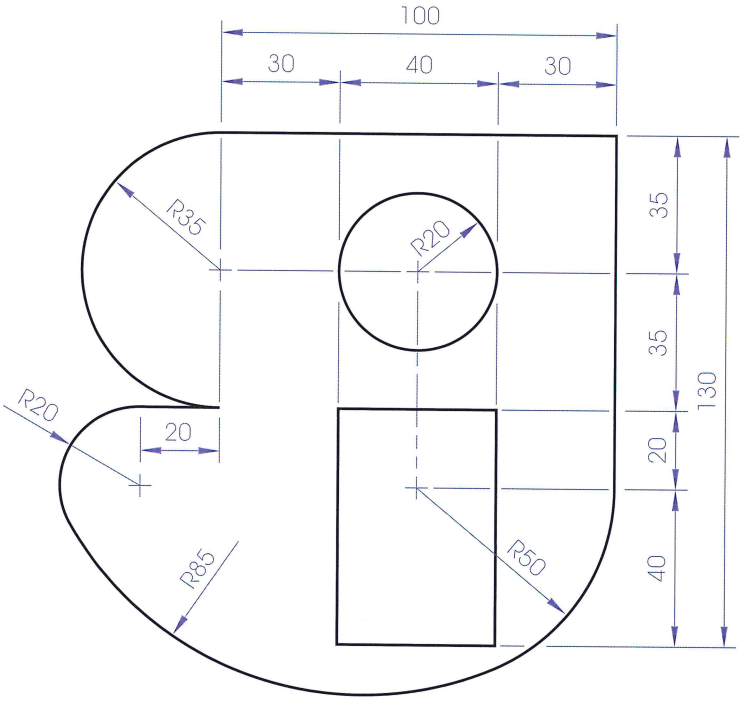


Light bulb



Perfume bottle





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