They touch in pairs externally at D, E and F. So that ΔABC is formed by joining the centres of these circles.

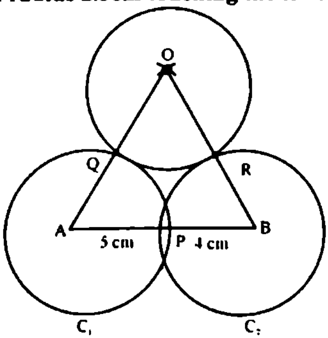
To prove:
Perimeter of ΔABC Sum of the diameters of these circles.

Proof:

Statements	Reasons
Three circles with centres A, B and C touch in pairs externally at the points, D, E and F.	Given
$m\overline{AB} = m\overline{AF} + m\overline{FB}$ (i)	
$m\overline{BC} = m\overline{BD} + m\overline{DC}$ (ii)	
and $m\overline{CA} = m\overline{CE} + m\overline{EA}$ (iii)	Adding (i), (ii) and (iii)
$m\overline{AB} + m\overline{BC} + m\overline{CA} = m\overline{AF} + m\overline{FB} + m\overline{BD}$	
$+ m\overline{DC} + m\overline{CE} + m\overline{EA}$	
$= (m\overline{AF} + m\overline{EA}) + (m\overline{FB} + m\overline{BD})$	
$+ (m\overline{CD} + m\overline{CE})$	$d_1 = 2r_1, d_2 = 2r_2$ and $d_3 = 2r_3$ are diameters of the circles.
Perimeter of $\Delta BC = 2r_1 + 2r_2 + 2r_3$	
$= d_1 + d_2 + d_3$	
= Sum of diameters of the circles.	

SOLVED EXERCISE 10.3

1. Two circles with radii 5cm and 4cm touch each other externally. Draw another circle with radius 2.5cm touching the first pair, externally.



Solution:

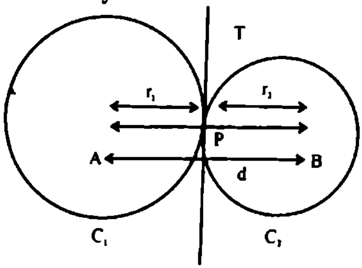
Construction:

1. Draw two circles C_1 and C_2 heaving radius 5cm and 4cm touch each. Other at point P.

2. Draw an are having radius of 7.5 cm from point. A and another arc from point B having radius 6.5cm cut each other at pt O.
3. With a radius of 2.5 draw a circle from point. 'O' which touches the circles C_1 and C_2 at 'Q' and 'R'.

   Hence it is required circle.

2. If the distance between the centres of two circles is the sum or the difference of their radii they will touch each other.



Solution:

Given:
Two circles with centres 'A' and 'B' touch each other at P.

To prove:
$d = r_1 + r_2$

Construction:
AP is the radius and PT, the common tangent at the point P to both the circles.

Proof:
Since AP is the radius at P and PT is tangent at the point 'P' therefore

$\angle APT = 90^\circ$ ________ (i)

and $\angle BPT = 90^\circ$ ________ (ii)

By adding (i) and (ii), we have

$\angle APT + \angle BPT = 180^\circ$

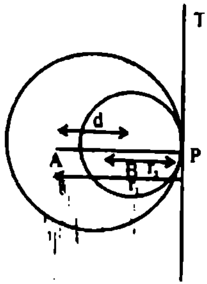
$\Rightarrow$ APB is a straight line.

If r_1 and r_2 are the radii of two circles and d, the distance between. The two centres. Then the two circles touch externally.

$$d = r_1 + r_2$$

Hence proved

(b) To prove, $d = r_1 - r_2$

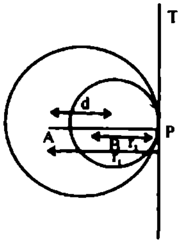


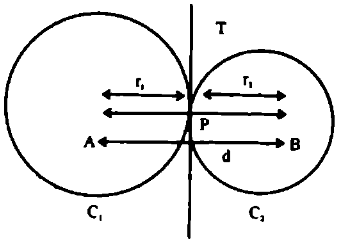
If r_1 and r_2 are the radii of two circles and d, the distance, between the two centres, then the two circle touch internally,

$$d = r_1 - r_2$$

Hence proved

3. The point of contact of two circles will be the point lying on the line of centres.





Solution:

Given:
Two circles with centres A and B touch each other at P.

To prove:
P lies on the line AB.

Construction:
Join AP and BP. Draw PT, the common tangent at the point P to both the circle.

Proof:
Give AP is the radius at P and PT is tangent at the point P therefore

$\angle APT = 90^\circ$ ________ (i)

and $\angle BPT = 90^\circ$ ________ (ii)

By Adding (i) and (ii), we get

$\angle APT + \angle BPT = 180^\circ$

$\Rightarrow$ ABP is a straight line.

Hence. A. B. D lie on a straight line.