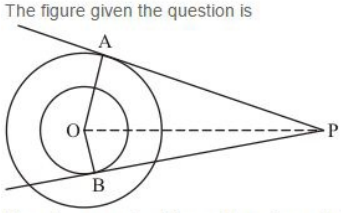
Circles Ex 10.2 Q20

Answer :

The figure given the question is



From the property of tangents we know that the radius of the circle will always be perpendicular to the tangent at the point of contact. Therefore, *OA* is perpendicular to *AP* and triangle *OAP* is a right triangle. Therefore,

$$OP^2 = AP^2 + OA^2$$
$$= 12^2 + 5^2$$
$$= 144 + 25$$
$$OP = \sqrt{169}$$
$$= 13$$

Now consider the smaller circle. Here again the radius OB will be perpendicular to the tangent BP. Therefore, triangle OBP is a right triangle. Hence we have,

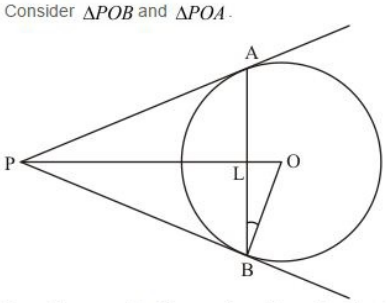
$$BP^2 = OP^2 - OB^2$$
$$= 13^2 - 3^2$$
$$= 169 - 9$$
$$BP = \sqrt{160}$$
$$= 4\sqrt{10}$$

Thus we have found that the length of BP is $4\sqrt{10}$.

Circles Ex 10.2 Q21

Answer :

Consider ΔPOB and ΔPOA.



From the property of tangents we know that the length of two tangents drawn form an external point will be equal. Therefore we have,

PA = *PB*

OB = *OA* (They are the radii of the same circle)

PO is the common side

Therefore, from SSS postulate of congruency, we have,

$$\Delta POA \cong \Delta POB$$

Hence,

$$\angle OPA = \angle OPB \quad \ldots\ldots (1)$$

Now consider ΔPLA and ΔPLB. We have,

$\angle OPA = \angle OPB$ (From (1))

PA is the common side.

From the property of tangents we know that the length of two tangents drawn form an external point will be equal. Therefore we have,

PA = *PB*

From SAS postulate of congruent triangles, we have,

$\Delta PLA \cong \Delta PLB$

Therefore,

LA = *LB*

It is given that AB = 16. That is,

LA + *LB* = 16

LA + *LA* = 16

2LA = 16

LA = 8

LB = 8

Also, *ALB* is a straight line. Therefore,

$\angle ALB = 180°$

That is,

$\angle PLA + \angle PLB = 180°$

Since $\Delta PLA \cong \Delta PLB$,

$\angle PLA = \angle PLB$

Therefore,

$2\angle PLB = 180°$

$\angle PLB = 90°$

Now let us consider ΔOLB. We have,

$OL^2 = OB^2 - OL^2$

$OL^2 = 10^2 - 8^2$

$OL^2 = 100 - 64$

$OL^2 = 36$

$OL = 6$

Consider ΔOPB. Here,

$\angle OBP = 90°$ (Since the radius of the circle will always be perpendicular to the tangent at the point of contact)

Therefore,

$PB^2 = OP^2 - OB^2$ ..... (1)

Now consider ΔPLB

$PB^2 = PL^2 + LB^2$ ..... (2)

Since the Left Hand Side of equation (1) is same as the Left Hand Side of equation (2), we can equate the Right Hand Side of the two equations. Hence we have,

$OP^2 - OB^2 = PL^2 + LB^2$ ..... (3)

From the figure we can see that,

OP = *OL* + *LP*

Therefore, let us replace *OP* with *OL* + *LP* in equation (3). We have,

$(OL + PL)^2 - OB^2 = PL^2 + LB^2$

We have found that *OL* = 6 and *LB* = 8. Also it is given that *OB* = 10. Substituting all these values in the above equation, we get,

$(6 + PL)^2 - 10^2 = PL^2 + 8^2$

$36 + PL^2 + 2 \times 6 \times PL - 100 = PL^2 + 64$

$12PL = 128$

$PL = \frac{32}{3}$

Now, let us substitute the value of *PL* in equation (2). We get,

$PB^2 = \left(\frac{32}{3}\right)^2 + 8^2$

$PB^2 = \frac{1024}{9} + 64$

$PB^2 = \frac{1600}{9}$

$PB = \sqrt{\frac{1600}{9}}$

$PB = \frac{40}{3}$

We know that tangents drawn from an external point will always be equal. Therefore,

PB = *PA*

Hence, we have,

PA = $\frac{40}{3}$

********** END **********