Chapter 10 § 5

Tangents

Theorems:

(10-8) – If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.

(10-9) Converse of Theorem 9-8 – In a plane, if a line is perpendicular to a radius of a circle at the endpoint on the circle, then the line is a tangent of the circle.

(10-10) – If two segments from the same exterior point are tangent to a circle, then they are congruent.

Definitions:

Tangent – a line in the plane of the circle that intersects the circle in exactly one point.

Point of tangency – the point of intersection of a tangent and a circle.

Interior of a Circle – All the points in a plane that are located inside of the circle.

Exterior of a Circle – All the points in a plane that are located outside of the circle.

Definitions:

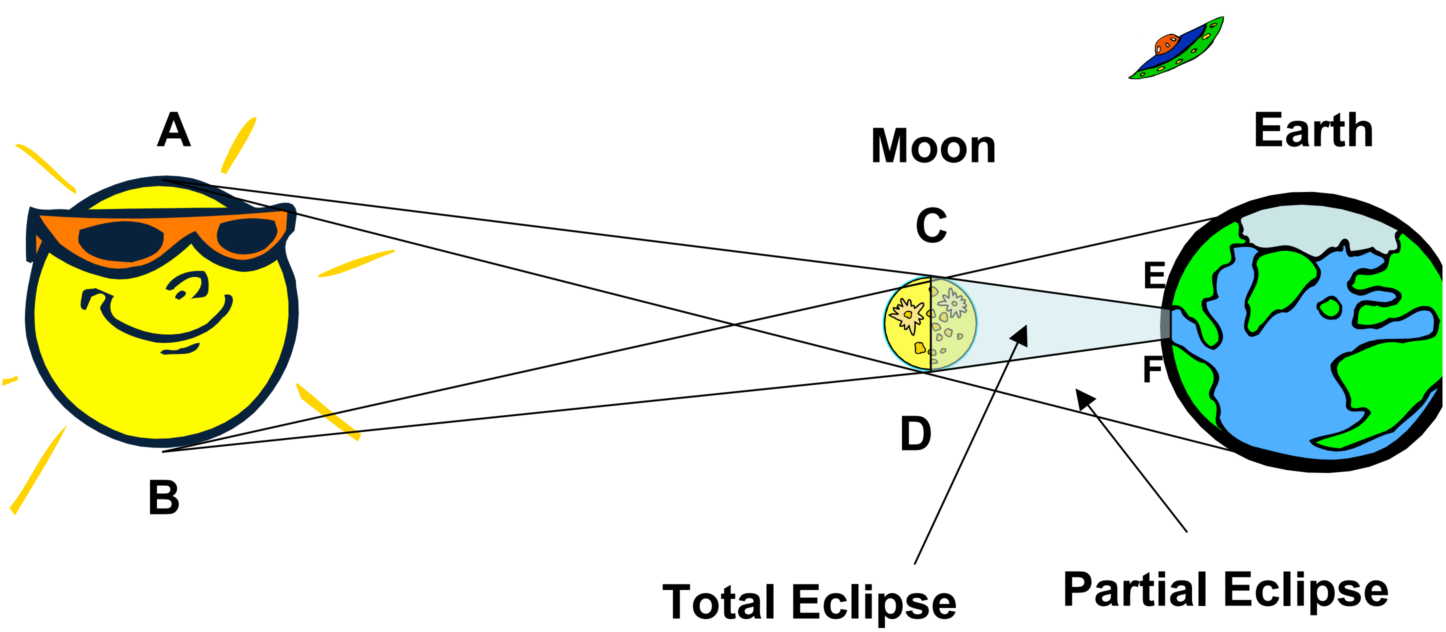
Common Tangent – A line or line segment that is tangent to two circles in the same plane.

Common External Tangents – A line or line segment that does not intersect the segment whose endpoints are in the centers of the circles.

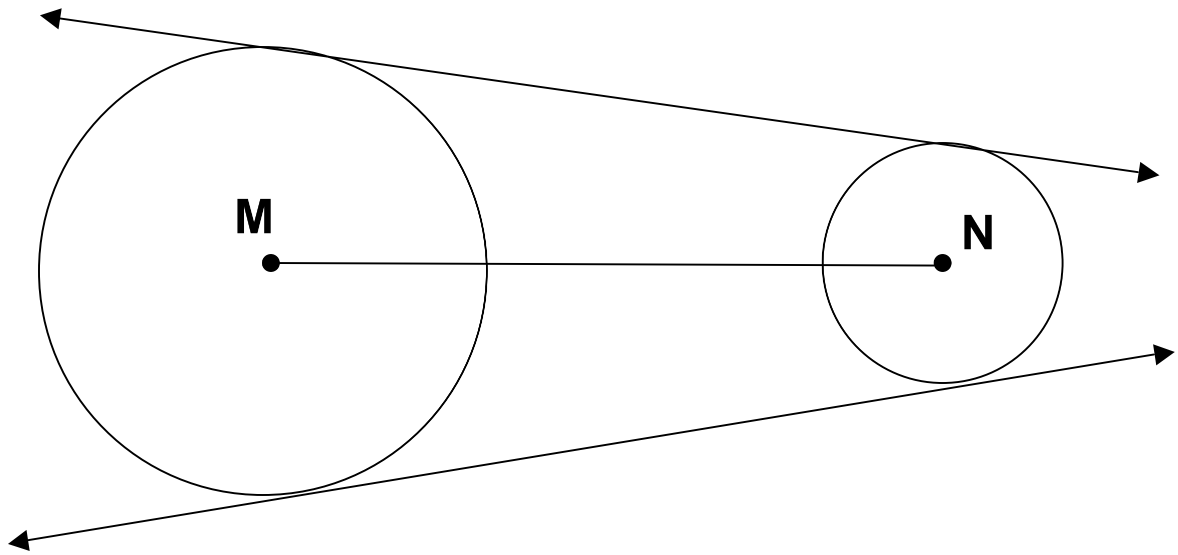
Common Internal Tangents – A line or line segment that intersects the segment whose endpoints are in the centers of the circles.

Tangent Segment – A segment AB such that one endpoint is on the circle, the other is outside the circle, and the line AB is tangent to the circle.

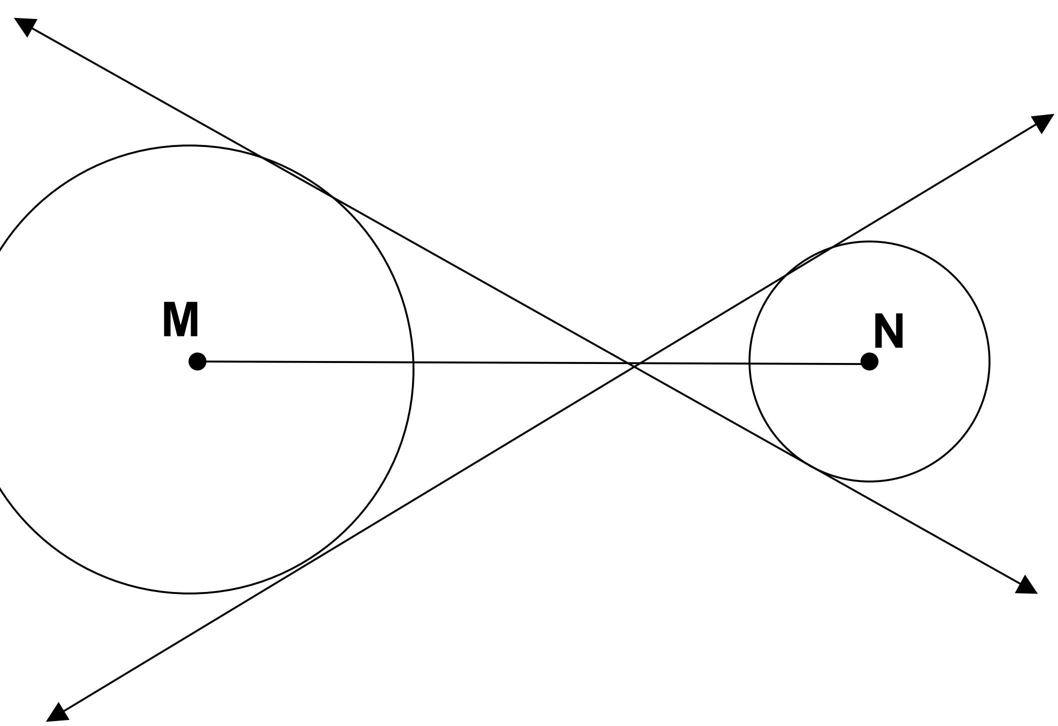
Circumscribed Polygons – each side of the polygon is tangent to the circle.



$\overline{AE}$ and $\overline{BF}$ are Tangent to the circles of the Sun and the Moon.

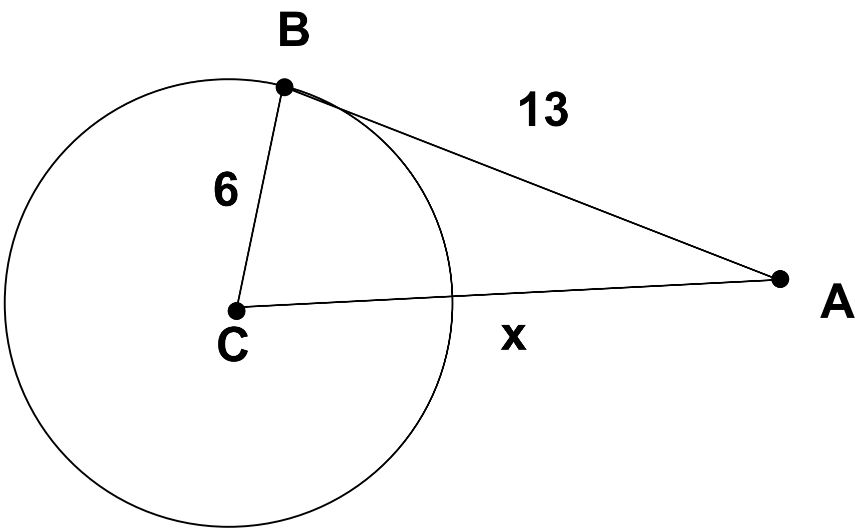


Common External Tangents



Common Internal Tangents

Refer to ⊙C with tangent AB. Find x.

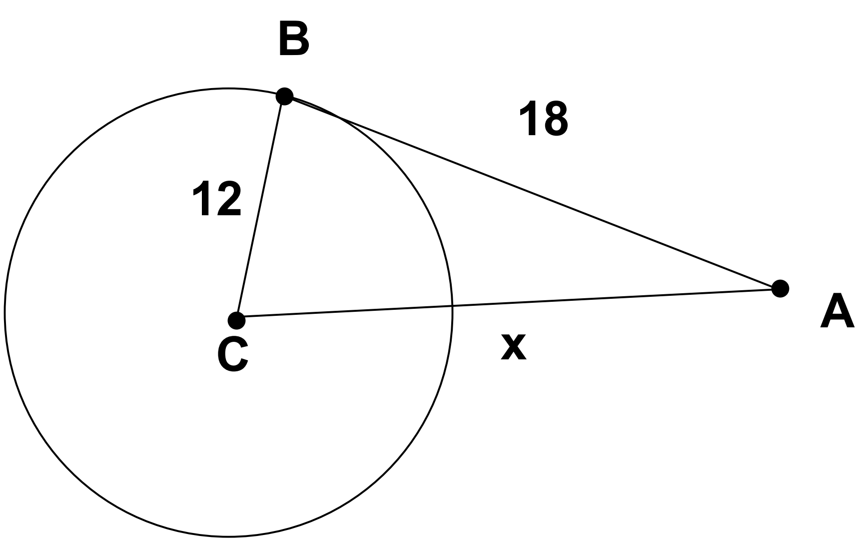


$$a^2 + b^2 = c^2$$

$$(6)^2 + (13)^2 = c^2$$

$$36 + 169 = c^2$$

$$\sqrt{205} = c$$



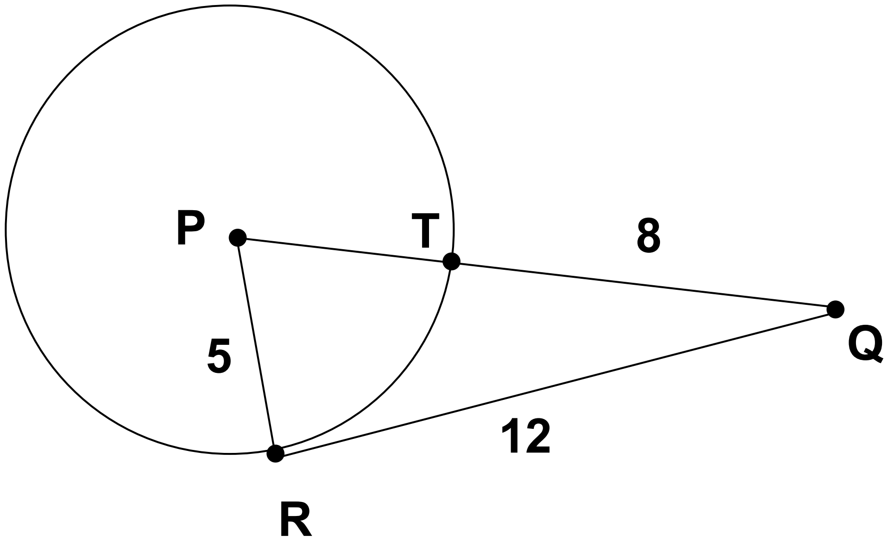
$$a^2 + b^2 = c^2$$

$$(12)^2 + (18)^2 = c^2$$

$$144 + 324 = c^2$$

$$\sqrt{468} = c$$

Refer to $\odot P$ with radius $\overline{PR}$. Show that $\overline{QR}$ is tangent to $\odot P$.



$a^2 + b^2 = c^2$

PT + QT = PQ

$(5)^2 + (12)^2 = (13)^2$

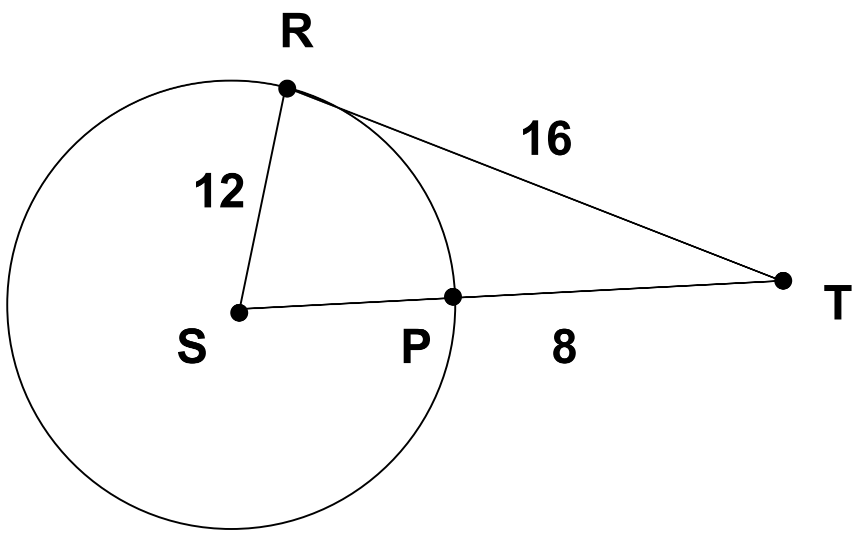
5 + 8 = 13

25 + 144 = 169

169 = 169

By the converse of the Pythagorean Theorem $\triangle PQR$ is a right triangle with $\overline{PR} \perp \overline{QR}$. By theorem (9-9), $\overline{QR}$ must be a tangent.

Determine whether $\overline{RT}$ is tangent to ⊙ S. Explain.



SR + PT = RT

12 + 8 = 20

$a^2 + b^2 = c^2$

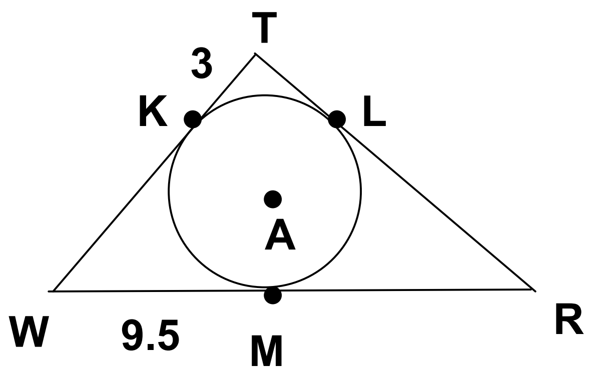
$(12)^2 + (16)^2 = (20)^2$

$144 + 256 = 400$

$400 = 400$

Yes $\overline{RT}$ if a tangent, since Δ RST is a right triangle.

Triangle TRW is circumscribed about ⊙A. If the perimeter of ∆ TRW is 50, TK = 3, and WM = 9.5, find TR.



P = WK + KT+ TL + LR + RM + WM

50 = 9.5 + 3 + 3 + x + x + 9.5

50 = 25 + 2x

25 = 2x

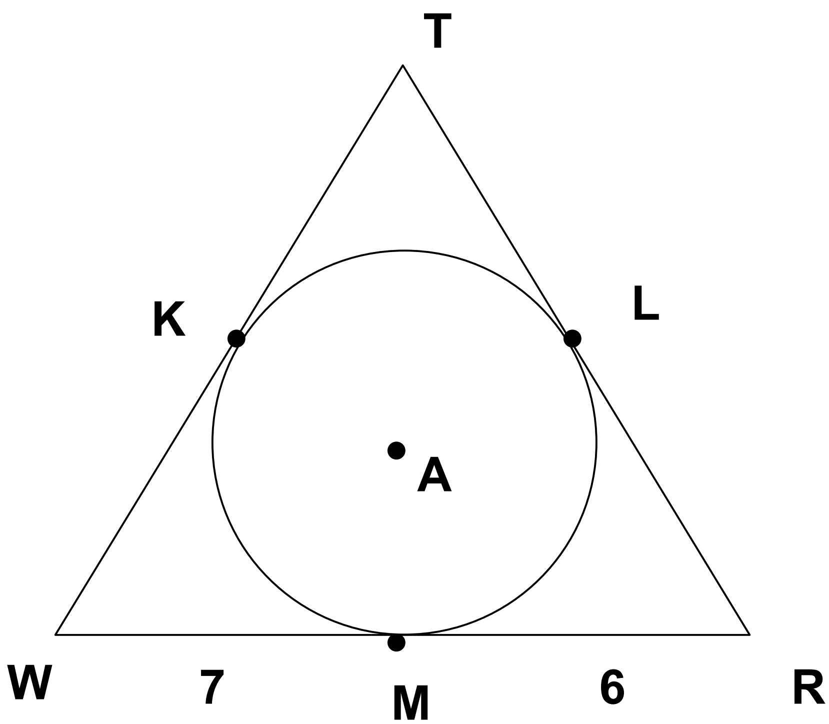
12.5 = x

TR = TL + LR

= 3 + 12.5

= 15.5

Δ TRW is circumscribed about $\odot$ A. If the perimeter of Δ TRW is 42, MR =6, and WM = 7, find TR.



P = WK + WM + RM + RL + TK + TL

42 = 7 + 7 + 6 + 6 + x + x

42 = 26 + 2x

16 = 2x

8 = x

TR = TL + LR

TR = 8 + 6

TR = 14