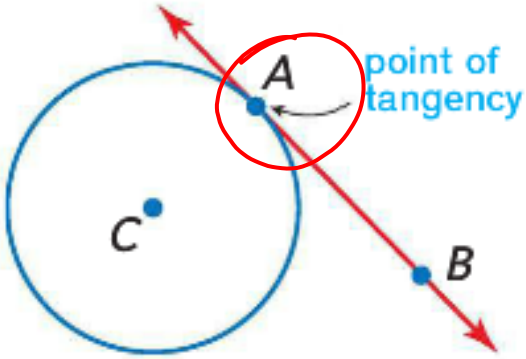
Tangents

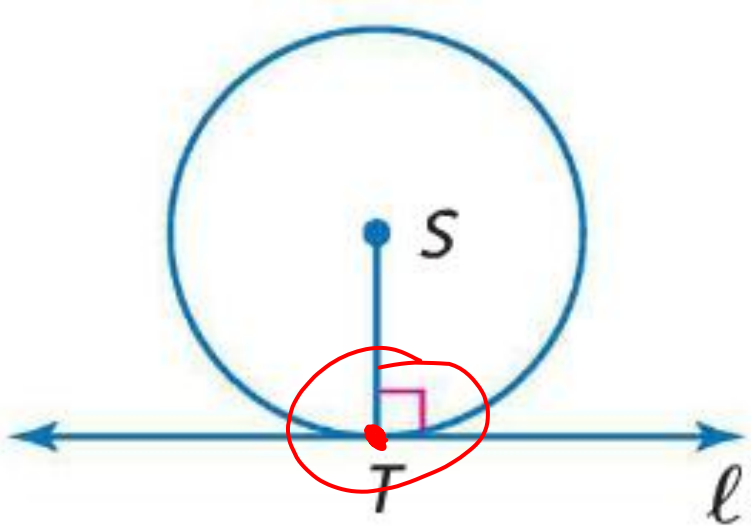
Tangent

- A tangent is a line in the same plane as a circle that intersects the circle in exactly one point, called the point of tangency.
- A common tangent is a line, ray, or segment that is tangent to two circles in the same plane.



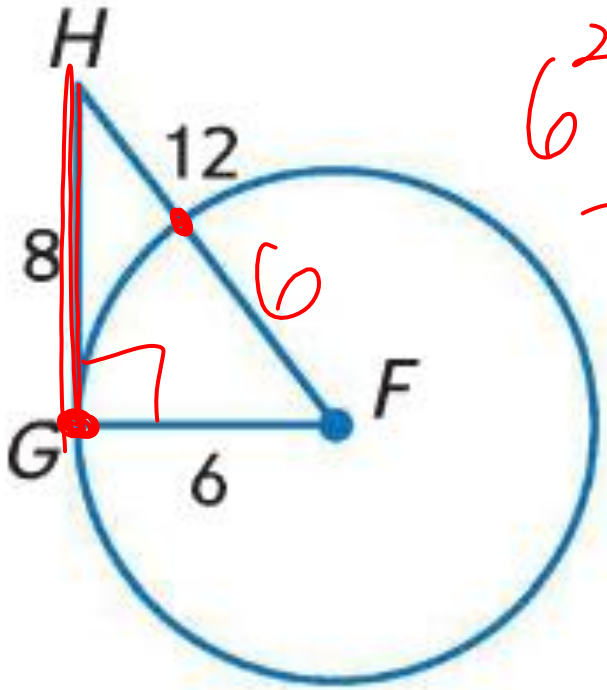
Tangent Theorem

- In a plane, a line is tangent to a circle if and only if it is perpendicular to a radius drawn to the point to tangency.



Examples

- Determine whether GH is tangent to ⊙F. Justify your answer.



$A^2 + B^2 = C^2$

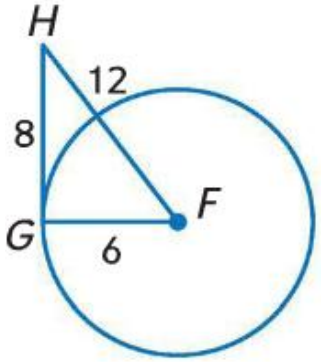
$6^2 + 8^2 = 18^2$

$36 + 64 \neq 324$

$100 \neq 324$

Examples

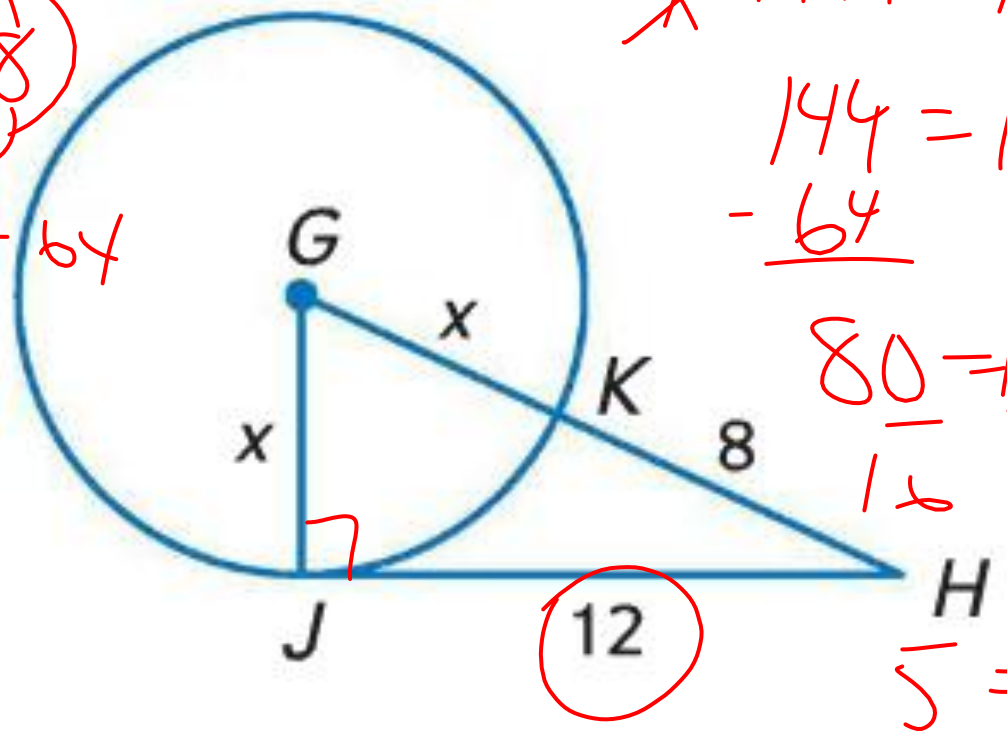
- Determine whether GH is tangent to ⊙F. Justify your answer.



- $6^2 + 8^2 = (6 + 12)^2$
- $36 + 64 = 18^2$
- $100 = 324$
- Not tangent

Examples

- JH is tangent to ⊙G at J. Find x.



$A^2+B^2=C^2$

$x^2+12^2=(x+8)^2$

$x^2+144=x^2+16x+64$

$144=16x+64$

$-64 \quad -64$

$80=16x$

$\frac{80}{16}=\frac{16x}{16}$

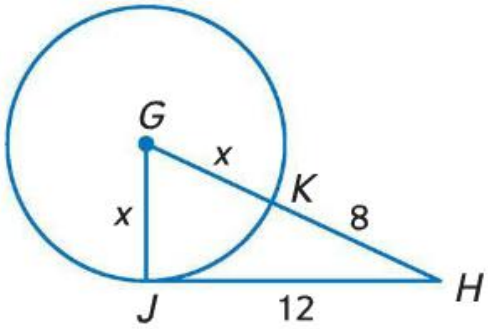
$5=x$

$(x+8)(x+8)$

$x^2+8x+8x+64$

Examples

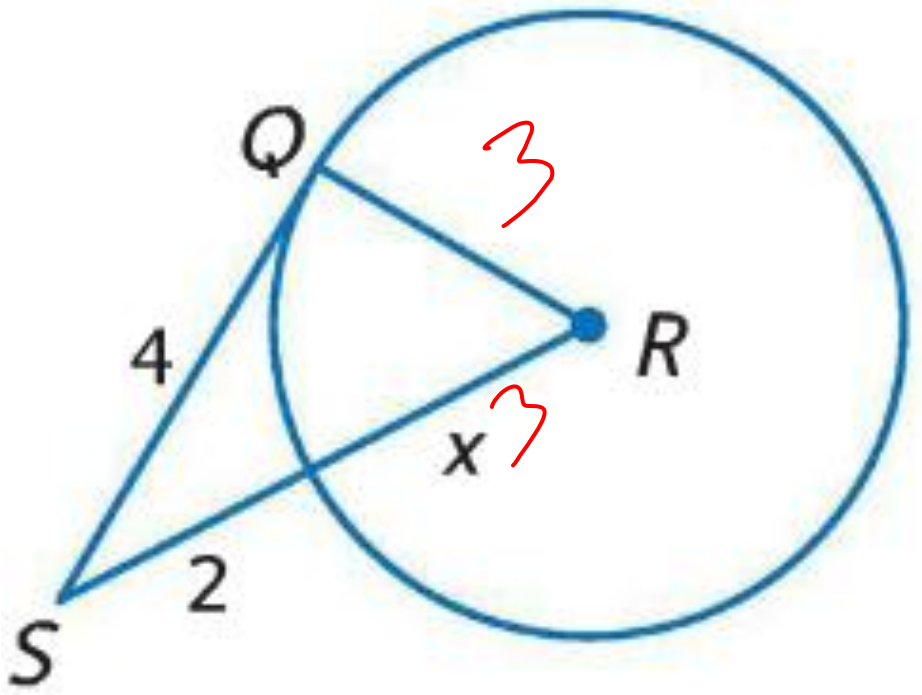
- JH is tangent to ⊙G at J. Find x.



- $x^2 + 12^2 = (x + 8)^2$
- $x^2 + 144 = x^2 + 16x + 64$
- 80 = 16x
- 5 = x
- 5, 12, 13 is a Pythagorean Triple
- Tangent

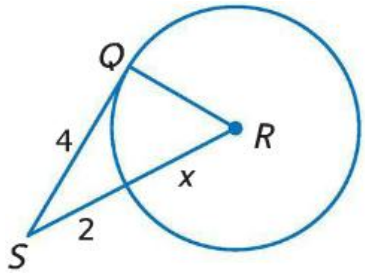
Examples

- QS is tangent to ⊙R at Q. Find x.



Examples

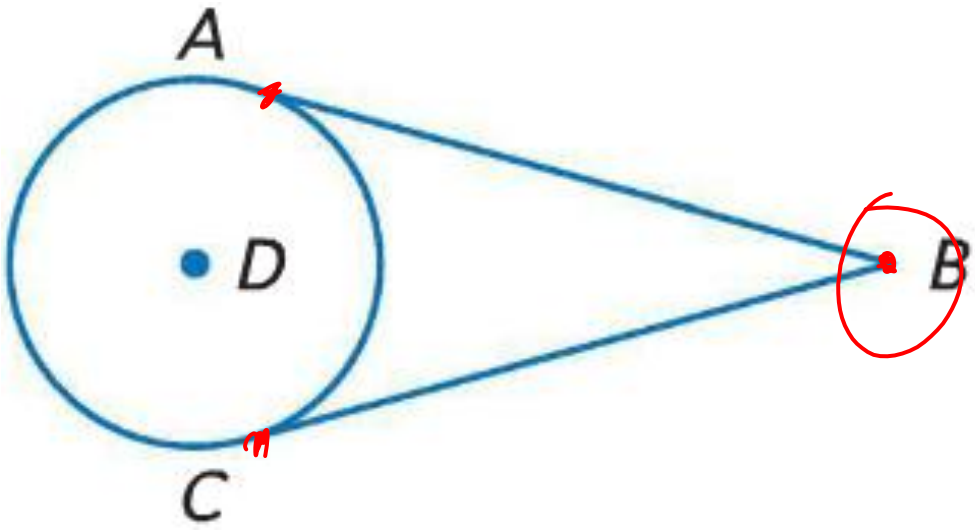
- QS is tangent to ⊙R at Q. Find x.



- $x^2 + 4^2 = (x + 2)^2$
- $x^2 + 16 = x^2 + 4x + 4$
- $16 = 4x + 4$
- $12 = 4x$
- $3 = x$

Congruent Tangents

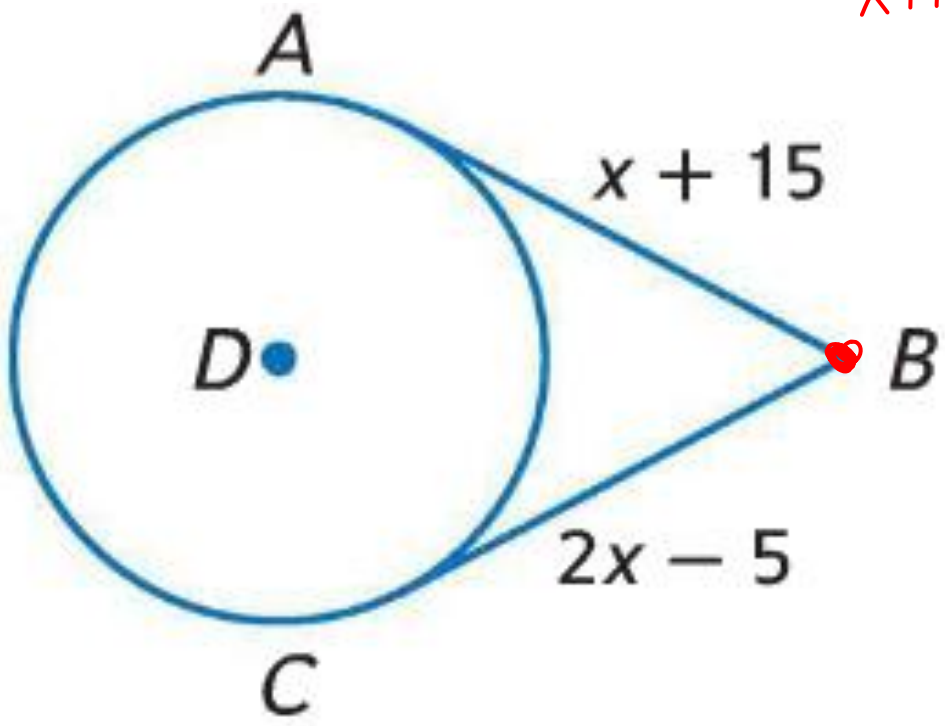
- If two segments from the same exterior point are tangent to a circle, then they are congruent.



Examples

- AB and CB are tangent to ⊙D. Find the value of x.

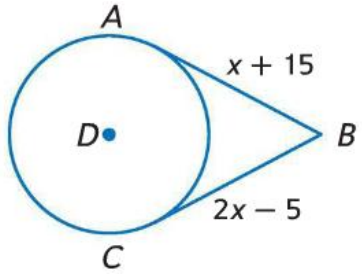
$x + 15 = 2x - 5$



Examples

- AB and CB are tangent to ⊙D. Find the value of x.

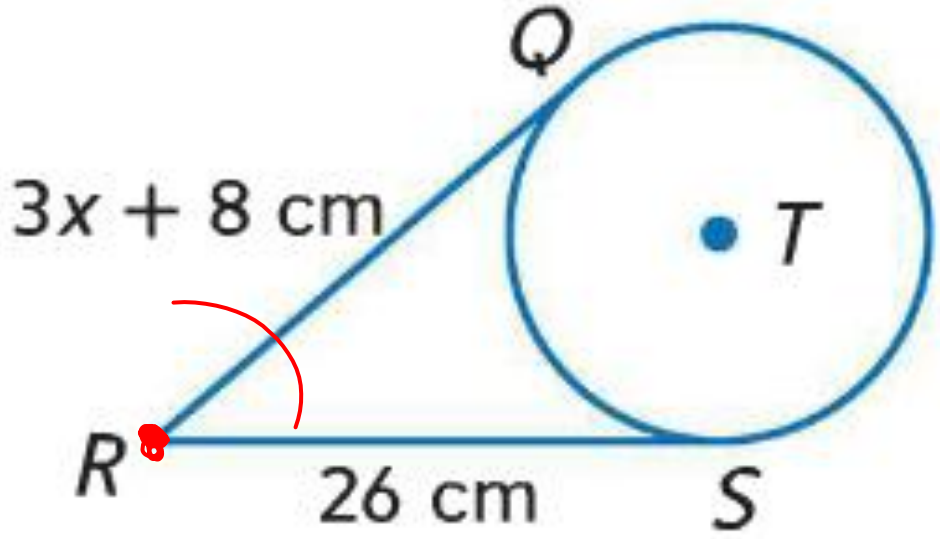
- $x + 15 = 2x - 5$
- $15 = x - 5$ Subtract x from both sides
- $20 = x$ Add 5 to both sides



Examples

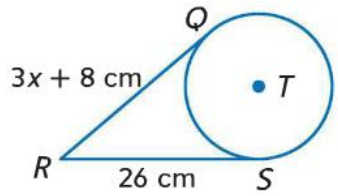
- Find the value of x. Assume that segments that appear to be tangent are tangent.

$3x + 8 = 26$



Examples

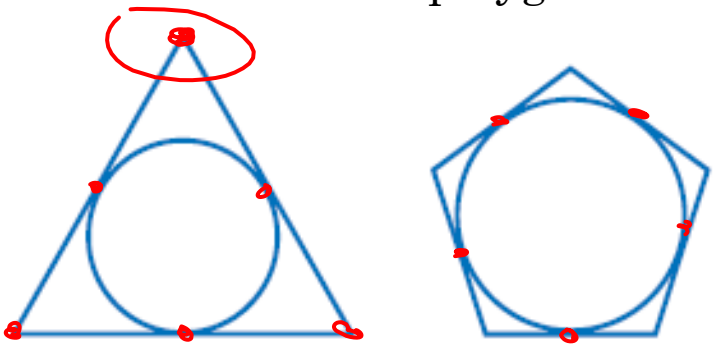
- Find the value of x. Assume that segments that appear to be tangent are tangent.



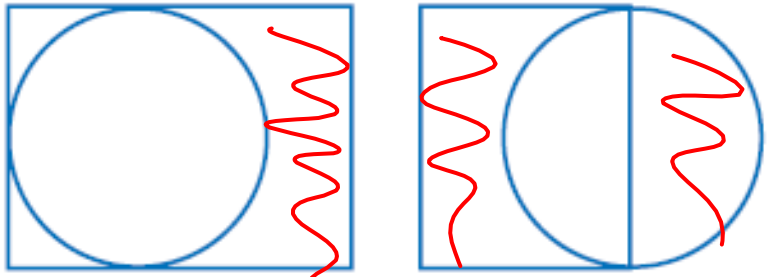
- 3x + 8 = 26
- 3x = 18 Subtract 8 from both sides
- x = 6 Divide by 3 on both sides

Circumscribed Polygons

- When a polygon is circumscribed about a circle, all of the sides of the polygon are tangent to the circle.



Polygons are circumscribed.

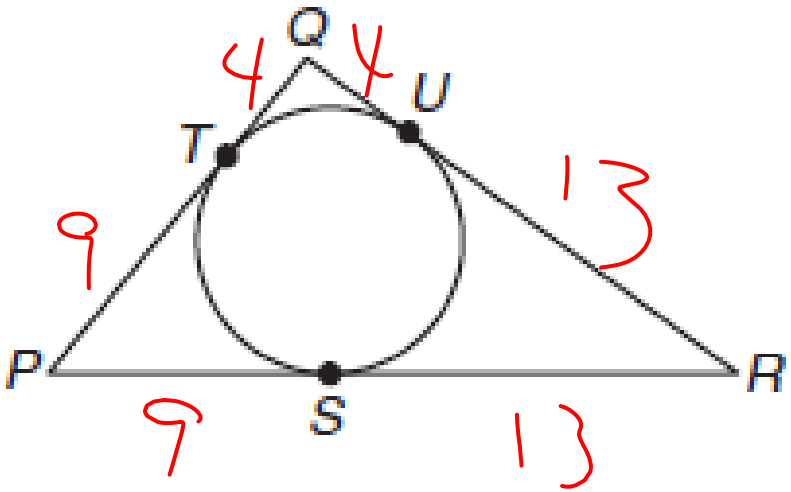


Polygons are *not* circumscribed.

Examples

- Find the perimeter of each polygon for the given information. Assume that segments that appear to be tangent are tangent.

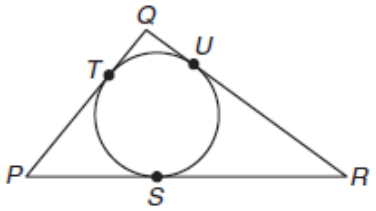
- $QT = 4$, $PT = 9$, $SR = 13$



Examples

- Find the perimeter of each polygon for the given information. Assume that segments that appear to be tangent are tangent.

- $QT = 4$, $PT = 9$, $SR = 13$

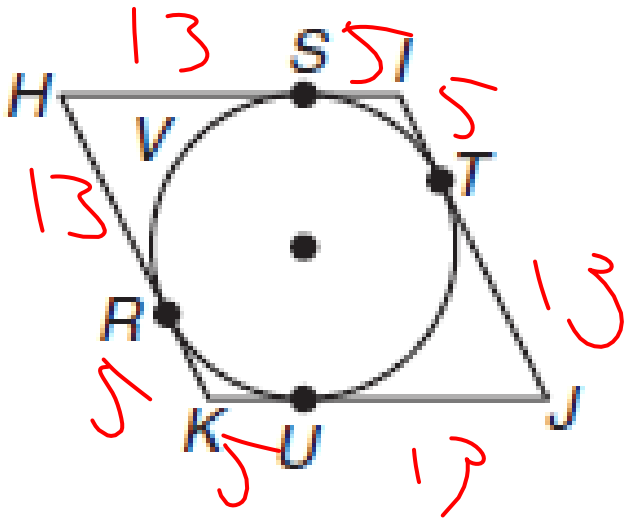


- QT = 4, QU = 4; PT = 9, PS = 9; RS = 13, RU = 13
- Perimeter = 4 + 4 + 9 + 9 + 13 + 13 = 52

Examples

- Find the perimeter of each polygon for the given information. Assume that segments that appear to be tangent are tangent.

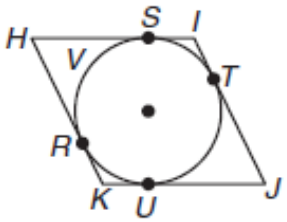
- *HIJK* is a rhombus, $SI = 5$, $HR = 13$



Examples

- Find the perimeter of each polygon for the given information. Assume that segments that appear to be tangent are tangent.

- *HIJK* is a rhombus, *SI* = 5, *HR* = 13



- SI = 5, TI = 5, RK = 5, UK = 5; HR = 13, HS = 13, JU = 13, JT = 13

- Perimeter = 5 + 5 + 5 + 5 + 13 + 13 + 13 + 13 = 72