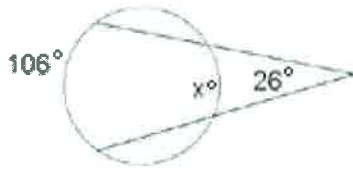


Please find the values of the variables.

1.



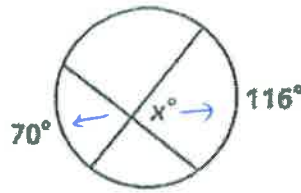
$$26 = \frac{1}{2}(106 - x)$$

$$52 = 106 - x$$

$$-54 = -x$$

$$x = 54^\circ$$

2.

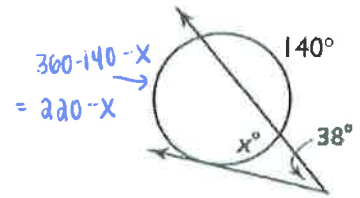


$$x = \frac{1}{2}(70 + 116)$$

$$x = \frac{1}{2}(186)$$

$$x = 93^\circ$$

3.



$$38 = \frac{1}{2}(220 - x - x)$$

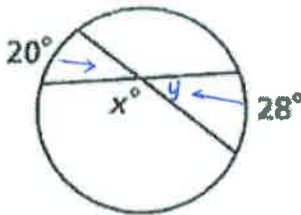
$$38 = \frac{1}{2}(220 - 2x)$$

$$76 = 220 - 2x$$

$$-144 = -2x$$

$$x = 72^\circ$$

4.



$$y = \frac{1}{2}(20 + 28)$$

$$y = \frac{1}{2}(48)$$

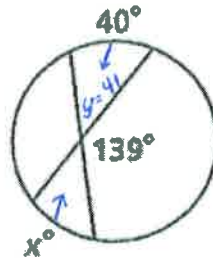
$$y = 24$$

$$y + x = 180 \text{ (Linear pair)}$$

$$24 + x = 180$$

$$x = 156^\circ$$

5.



$$y + 139 = 180$$

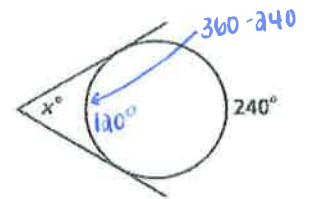
$$y = 41$$

$$41 = \frac{1}{2}(x + 40)$$

$$82 = x + 40$$

$$x = 42^\circ$$

6.

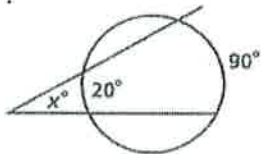


$$x = \frac{1}{2}(240 - 120)$$

$$x = \frac{1}{2}(120)$$

$$x = 60^\circ$$

7.

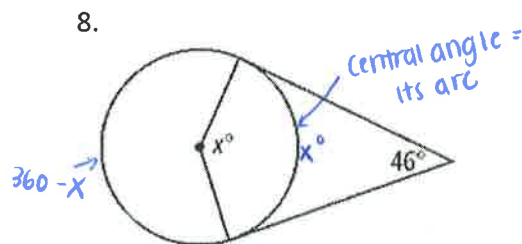


$$x = \frac{1}{2}(90 - 20)$$

$$x = \frac{1}{2}(70)$$

$$x = 35^\circ$$

8.



$$46 = \frac{1}{2}(360 - x - x)$$

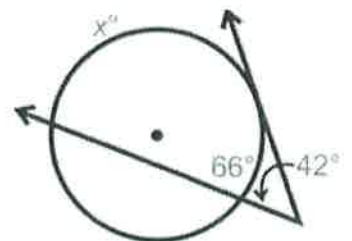
$$46 = \frac{1}{2}(360 - 2x)$$

$$92 = 360 - 2x$$

$$-268 = -2x$$

$$x = 134^\circ$$

9.

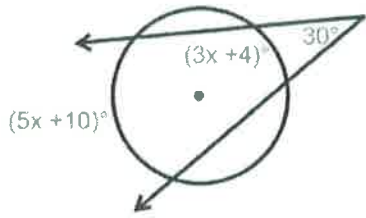


$$42 = \frac{1}{2}(x - 66)$$

$$84 = x - 66$$

$$x = 150^\circ$$

10.



$$30 = \frac{1}{2}(5x+10 - (3x+4))$$

$$30 = \frac{1}{2}(5x+10 - 3x - 4)$$

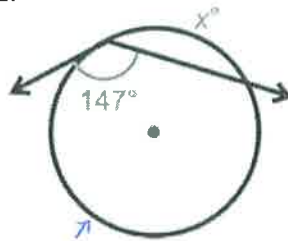
$$30 = \frac{1}{2}(2x+6)$$

$$60 = 2x+6$$

$$54 = 2x$$

$$\boxed{x=27}$$

11.

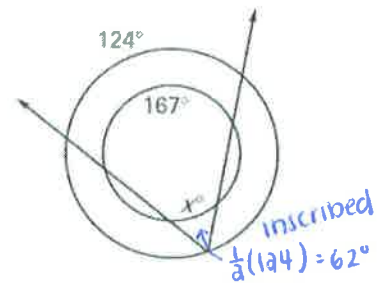


$$147 \times 2 = 294^\circ$$

$$x = 360 - 294$$

$$\boxed{x=66^\circ}$$

12.



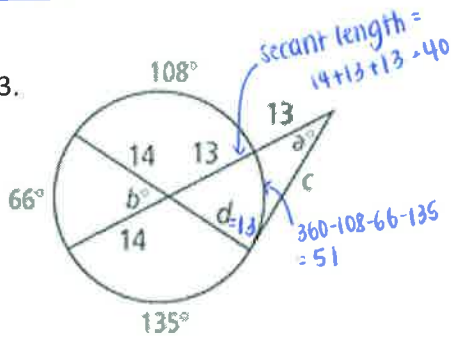
$$62 = \frac{1}{2}(167 - x)$$

$$124 = 167 - x$$

$$-43 = -x$$

$$\boxed{x=43^\circ}$$

13.



$$d = \frac{1}{2}(135 - 51)$$

$$a = \frac{1}{2}(84)$$

$$\boxed{a=42}$$

$$b = \frac{1}{2}(66 + 51) \quad (14)(13) = (14)(d)$$

$$b = \frac{1}{2}(117)$$

$$\boxed{b=58.5}$$

$$18a = 14d$$

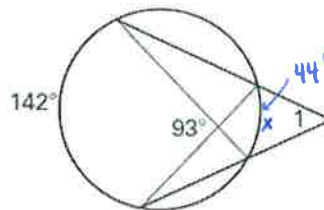
$$\boxed{d=13}$$

$$13(40) = (c)(c)$$

$$520 = c^2$$

$$c = \sqrt{520} = 2\sqrt{130} = c$$

14. Find $m\angle 1$.



$$93 = \frac{1}{2}(142 + x)$$

$$186 = 142 + x$$

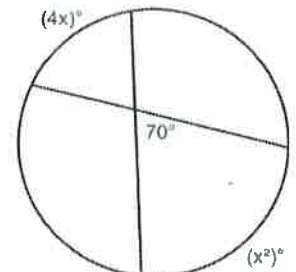
$$44 = x$$

$$m\angle 1 = \frac{1}{2}(142 - 44)$$

$$m\angle 1 = \frac{1}{2}(98)$$

$$\boxed{m\angle 1 = 49^\circ}$$

15.



$$70 = \frac{1}{2}(4x + x^2)$$

$$140 = 4x + x^2$$

$$0 = x^2 + 4x - 140$$

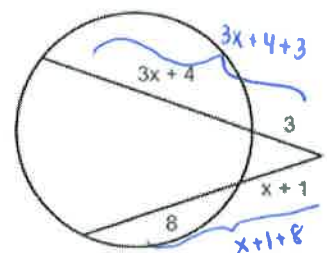
$$0 = (x+14)(x-10)$$

$$\cancel{x+14}, \boxed{x=10}$$

$$4(-14) = -56$$

no neg. lengths

18.



$$3(3x+7) = (x+1)(x+9)$$

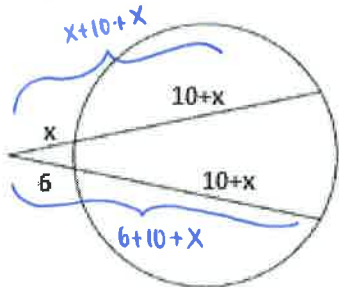
$$9x+21 = x^2+10x+9$$

$$0 = x^2+x-12$$

$$0 = (x+4)(x-3)$$

$$\cancel{x+4}, \boxed{x=3}$$

16.



$$x(10+x) = 6(10+x)$$

$$10x+x^2 = 60+6x$$

$$2x^2+4x-60 = 0$$

$$\frac{2(x^2+2x-48)}{2} = \frac{0}{2}$$

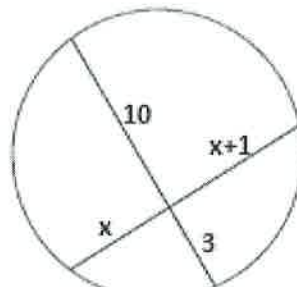
$$x^2+2x-48 = 0$$

$$(x+8)(x-6) = 0$$

$$\cancel{x+8}, \boxed{x=6}$$

↑
cant have
a neg. length

17.



$$(10)(3) = (x)(x+1)$$

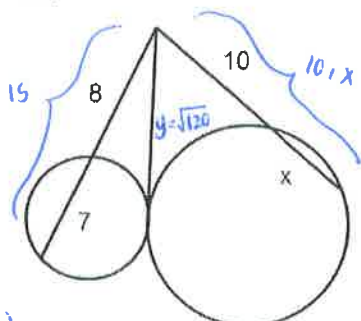
$$30 = x^2+x$$

$$0 = x^2+x-30$$

$$0 = (x+6)(x-5)$$

$$\cancel{x+6}, \boxed{x=5}$$

19.



$$8(15) = (y)(y)$$

$$120 = y^2$$

$$y = \sqrt{120}$$

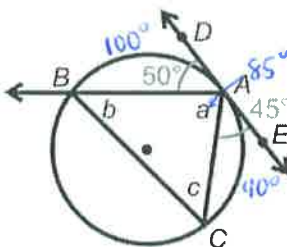
$$10(10+x) = (\sqrt{120})(\sqrt{120})$$

$$100 + 10x = 120$$

$$10x = 20$$

$$x = 2$$

20.



$$50 + a + 45 = 180 \quad b = \frac{1}{2}(40)$$

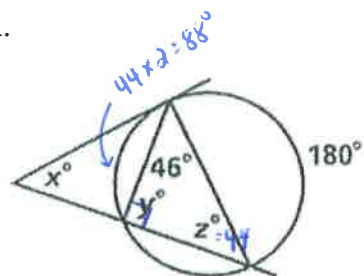
$$a + 95 = 180 \quad b = 45^\circ$$

$$a = 85^\circ$$

$$c = \frac{1}{2}(100^\circ)$$

$$c = 50^\circ$$

21.



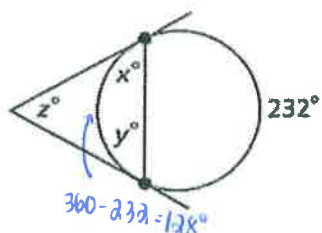
Inscribed
 $y = \frac{1}{2}(180)$
 $y = 90^\circ$

$$90 + 46 + z = 180 \quad x = \frac{1}{2}(180 - 88)$$

$$136 + z = 180 \quad x = \frac{1}{2}(92)$$

$$z = 44^\circ \quad x = 46^\circ$$

22.



$$z = \frac{1}{2}(232 - 128)$$

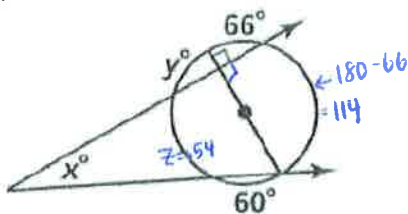
$$z = \frac{1}{2}(104)$$

$$z = 52^\circ$$

$$x = \frac{1}{2}(128) \quad y = \frac{1}{2}(128)$$

$$x = 64^\circ \quad y = 64^\circ$$

23.

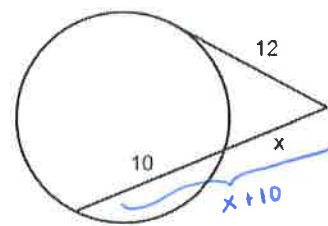


$$90 = \frac{1}{2}(y + 114) \quad x = \frac{1}{2}(114 - 54)$$

$$180 = y + 114 \quad x = \frac{1}{2}(60)$$

$$y = 66^\circ \quad x = 30^\circ$$

24.



$$x(x+10) = (12)(12)$$

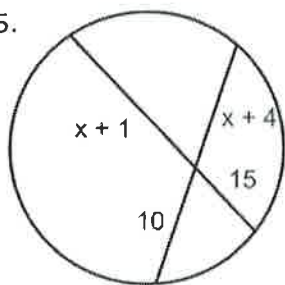
$$x^2 + 10x = 144$$

$$x^2 + 10x - 144 = 0$$

$$(x+18)(x-8) = 0$$

$$x = 18, x = 8$$

25.



$$(15)(x+1) = (10)(x+4)$$

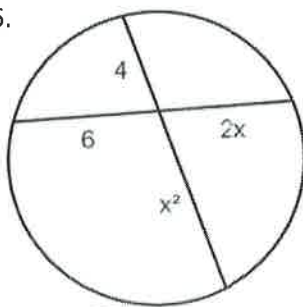
$$15x + 15 = 10x + 40$$

$$5x + 15 = 40$$

$$5x = 25$$

$$x = 5$$

26.



$$(4)(x^2) = (6)(2x)$$

$$4x^2 = 12x$$

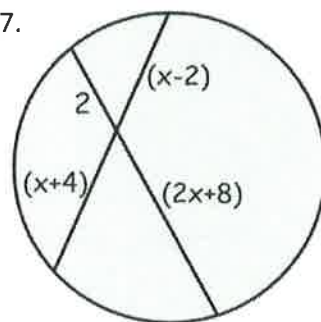
$$4x^2 - 12x = 0$$

$$4x(x-3) = 0$$

$$x \neq 0, x = 3$$

no zero lengths

27.



$$(2)(2x+8) = (x+4)(x-2)$$

$$4x + 16 = x^2 + 2x - 8$$

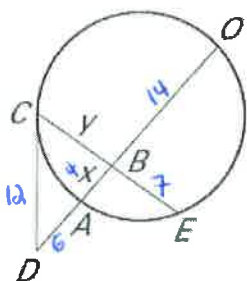
$$0 = x^2 - 2x - 24$$

$$0 = (x-6)(x+4)$$

$$x = 6, x = -4$$

no neg. lengths

28. In the diagram below, $BE = 7$, $BO = 14$, $AD = 6$, and $CD = 12$. Find the values of x and y .



$$6(6+x+14) = (12)(12)$$

$$6(x+20) = 144$$

$$6x + 120 = 144$$

$$6x = 24$$

$$\boxed{x = 4}$$

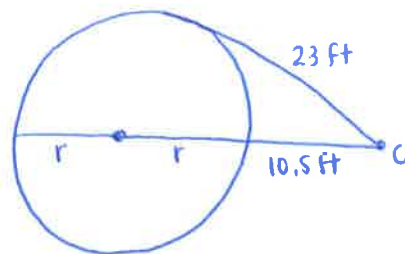
$$(4)(14) = (y)(7)$$

$$56 = 7y$$

$$\boxed{y = 8}$$

29. **Water Tank** You want to estimate the diameter of a circular water tank. You stand at a location 10.5 feet from the edge of the circular tank. From this position, your distance to a point of tangency on the tank is 23 feet.

- a. Draw a diagram of the situation. Label your position as C and the radius of the tank as r .



- b. Find the length of the radius to the nearest tenth of a foot.

$$(10.5)(10.5+r+r) = (23)(23)$$

$$(10.5)(10.5+2r) = 529$$

$$110.25 + 21r = 529$$

$$21r = 418.75$$

$$\boxed{r = 19.9 \text{ ft}}$$

30. Two secant segments meet at point A outside a circle. One secant segment passes through the center of the circle and has an external segment length of 10 centimeters. The external and internal segment lengths of the other secant segment are x and $x - 6$ respectively. Given that the radius of the circle is 8 centimeters, find the value of x .

$$(10)(10+8+8) = (x)(x+x-6)$$

$$10(26) = x(2x-6)$$

$$260 = 2x^2 - 6x$$

$$0 = 2x^2 - 6x - 260$$

$$0 = \frac{2(x^2 - 3x - 130)}{2}$$

$$0 = x^2 - 3x - 130$$

$$0 = (x-13)(x+10)$$

$$\boxed{x = 13}, \quad x = -10$$

