

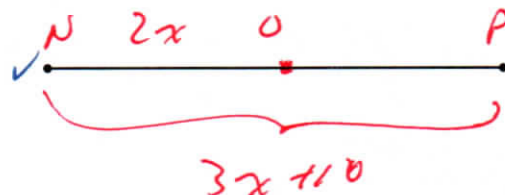
3.9 Exam: Area, volume, perimeter; line segments and angles

Do Not Solve!

Label the drawing completely and write an equation in terms of x modeling the situation.

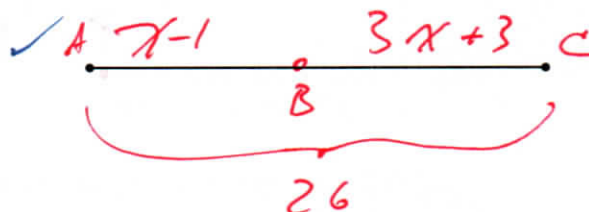
1. Given that O bisects \overline{NP} . $NO = 2x$, $NP = 3x + 10$. Find x .

$$2(2x) = 3x + 10 \quad \checkmark$$



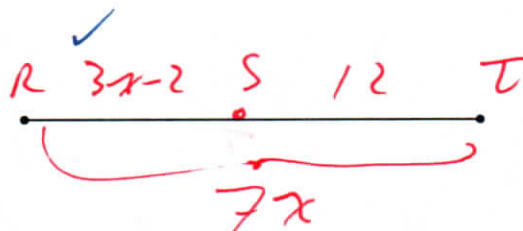
2. Given \overline{ABC} , with $AB = x - 1$, $BC = 3x + 3$, and $AC = 26$. Find AB .

$$x - 1 + 3x + 3 = 26 \quad \checkmark$$



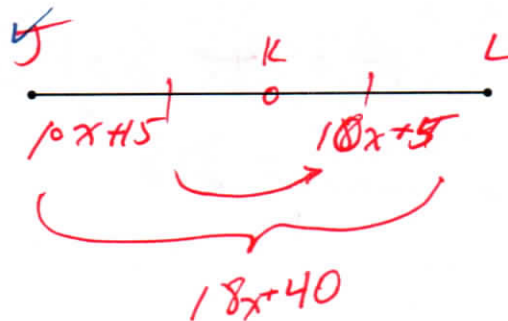
3. The points R , S , and T are collinear, with $RS = 3x - 2$ and $ST = 12$. If $RT = 7x$, find RT .

$$3x - 2 + 12 = 7x \quad \checkmark$$

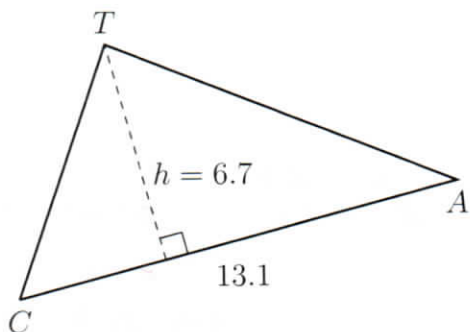


4. The point K is the midpoint of \overline{JL} , $JK = 10x + 15$, and $JL = 18x + 40$. Find JK .

$$2(10x + 15) = 18x + 40 \quad \checkmark$$



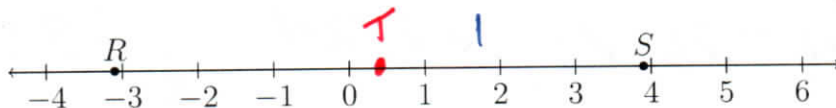
5. Find the area of $\triangle CAT$. The altitude h of the triangle is 6.7 centimeters and the base $CA = 13.1$ cm. Show work by writing an equation before making the calculation.



$$A = \frac{1}{2}(13.1)(6.7)$$

$$= 43.885$$

6. Given \overleftrightarrow{RS} as shown on the number line, with $R = -3.1$ and $S = 3.9$.



- (a) What is the exact distance on the number line between the points R and S ?

$$RS = |3.9 - (-3.1)| = 7.0$$

- (b) The point T bisects \overleftrightarrow{RS} . Find the value of T , and mark and label it on the numberline \overleftrightarrow{RS} shown above.

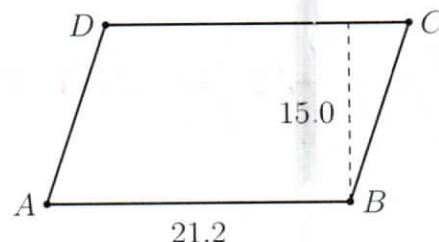
$$T = -3.1 + \frac{1}{2}(7.0)$$

$$= 0.4$$

7. Find the area of the parallelogram $ABCD$ shown below, with $AB = 21.2$ and height $h = 15.0$.

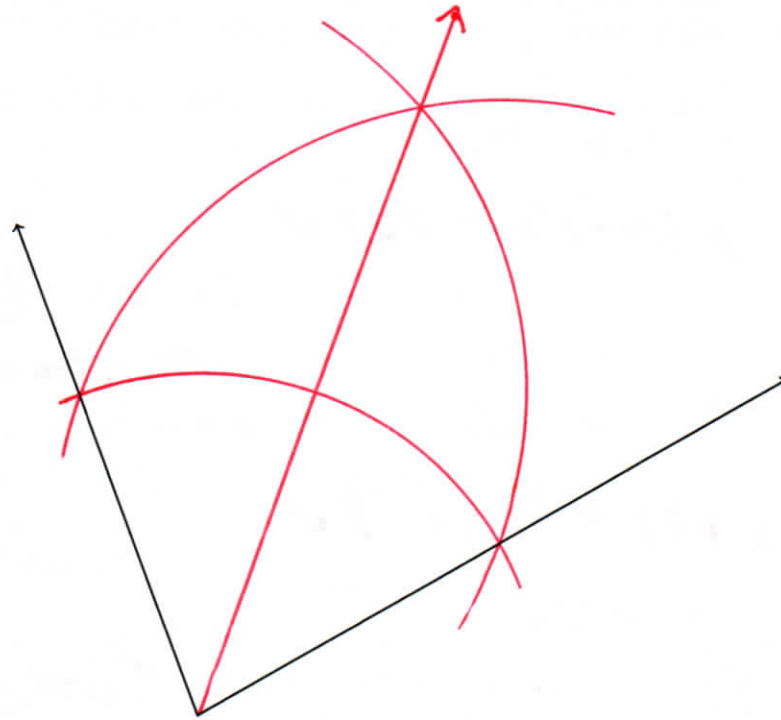
$$A = \frac{1}{2}(21.2)(15.0)$$

$$= 318$$



Name:

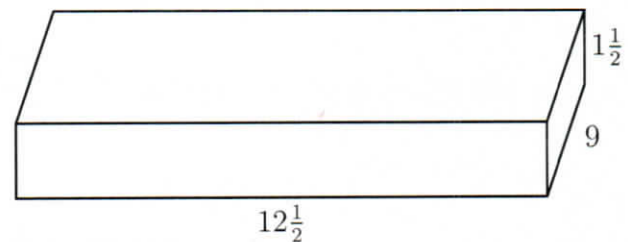
8. Complete the construction of the bisector of the given angle.



3

9. A cardboard mailing carton is $12\frac{1}{2}$ inches long, 9 inches wide, and $1\frac{1}{2}$ inches tall. Find the volume of the box. Show the calculation.

$$V = (12\frac{1}{2})(9)(1\frac{1}{2})$$
$$= 168.75$$



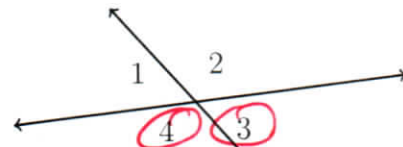
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Do Not Solve!

Model the situation with an equation in terms of x . State whether the angles are complementary, supplementary, or vertical angles.

10. Two lines intersect making four angles: $\angle 1$, $\angle 2$, $\angle 3$, and $\angle 4$. Given that $m\angle 3 = 2x + 50$ and $m\angle 4 = 6x + 50$, find x .

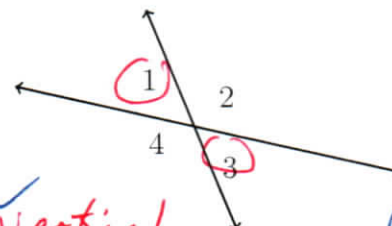
$$2x + 50 + 6x + 50 = 180 \checkmark$$



✓ Supplementary

11. Given that $m\angle 1 = 5x + 22$ and $m\angle 3 = 7x + 18$ as shown in the diagram, find $m\angle 2$.

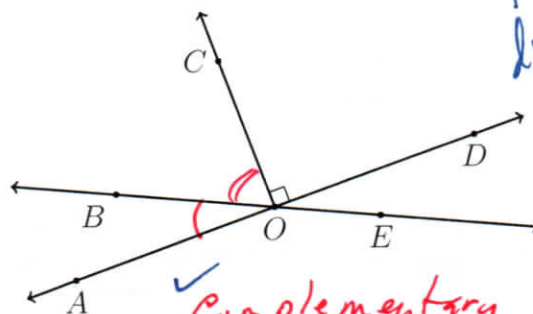
$$5x + 22 = 7x + 18 \checkmark$$



✓ Vertical

12. In the diagram below $m\angle AOB = 3x + 5$ and $m\angle COB = 4x + 15$. Find x .

$$3x + 5 + 4x + 15 = 90 \checkmark$$

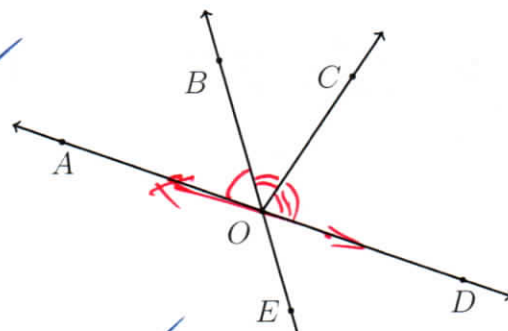


✓ Complementary

(1/2 credit for marking diagram w/o vocabulary)

13. In the diagram below $m\angle AOB = 65$, $m\angle BOC = 4x - 10$, and $m\angle DOC = 3x + 55^\circ$. Find $m\angle AOB$.

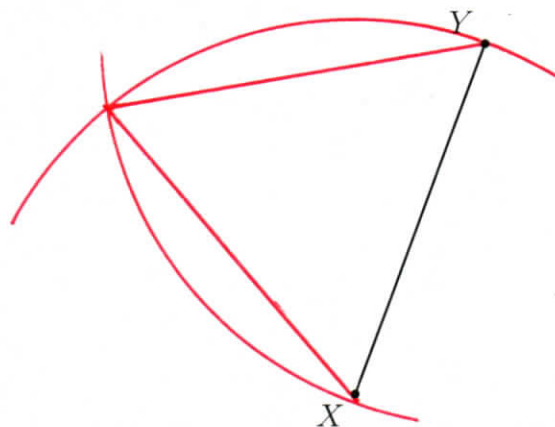
$$65 + 4x - 10 + 3x + 55 = 180 \checkmark$$



✓ Supplementary

8

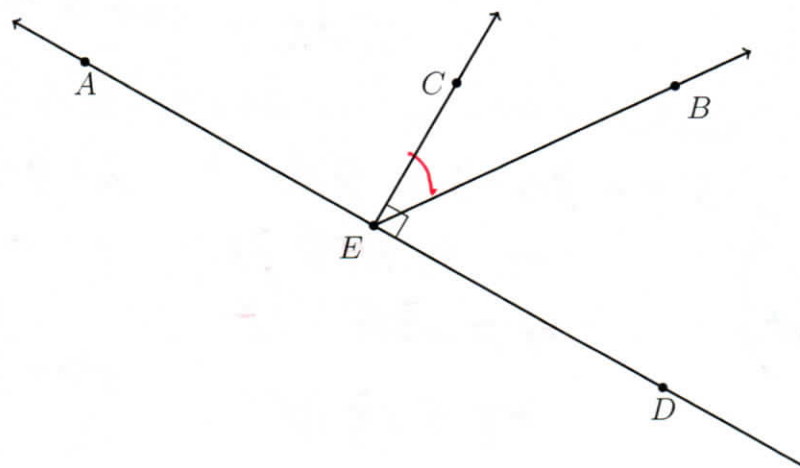
14. Complete the construction of an equilateral triangle with one side as \overline{XY} . Show all construction marks, but make no extra lines.



2

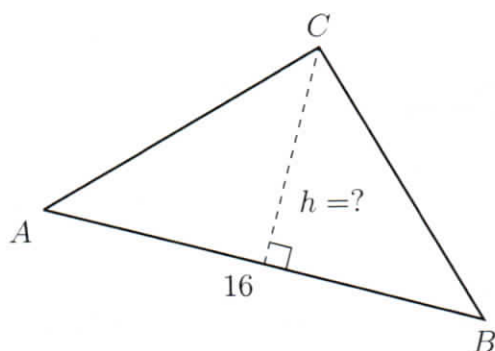
15. Given the diagram shown below.

- (a) Measure the angle AEB . $m\angle AEB = 125^\circ \checkmark$
- (b) Name an angle that is complementary to $\angle BEC$: $\angle CED \checkmark$
- (c) Name a pair of opposite rays: $\overrightarrow{EA}, \overrightarrow{ED} \checkmark$



5

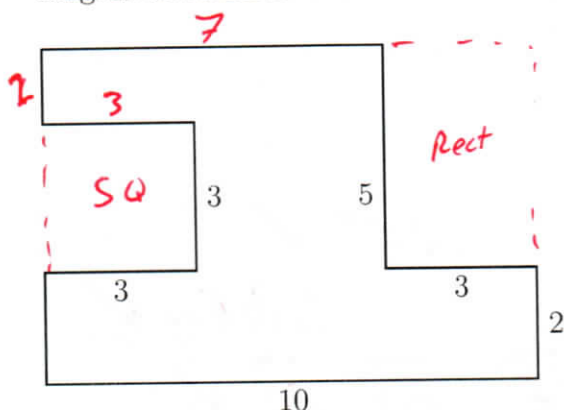
16. One side of the $\triangle ABC$ has a length $AB = 16$. The triangle's area is 96. Find the length of the altitude h of the triangle to vertex C and perpendicular to side \overline{AB} .



$$A = \frac{1}{2} (16)(h) = 96(\checkmark)$$

$$h = 12 \quad \checkmark$$

17. The shape shown below is composed of straight lines and right angles, with some lengths as marked. Find the area of the figure. (the figure is not drawn to scale)



$$A_{sq} = 3 \cdot 3 = 9$$

$$A_{rect} = 5 \times 3 = 15$$

$$A_{89} = 10.7 = 70$$

$$A_{\text{fig}} = 70 - 9 - 15 - (\checkmark)(2 \text{ of three})$$
$$= 46 \checkmark$$

$$\text{or } A_{f_1} = 14 + 12 + 20$$

18. Given two complementary angles, $m\angle A = 54$ and $m\angle B = 3x - 3$. Find x . Check your solution.

$$54 + 3x - 3 = 90 (\checkmark)$$

$$MLB = 3(13) - 3$$
$$= 36$$

$$\} x = \cancel{14} \cancel{6} 39$$

~~$x = 3713$~~

$$x = 13 \quad \checkmark$$

$$54 + 36 = 90 \checkmark$$

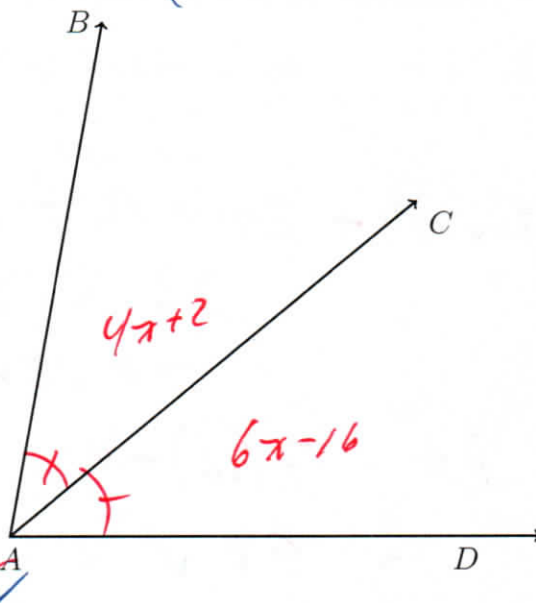
(Supplement
 $X=43$ 1pt)

⑦

Name:

19. An angle bisector is shown below, with \overrightarrow{AC} bisecting $\angle BAD$. Given $m\angle BAC = 4x + 2$ and $m\angle DAC = 6x - 16$, find $m\angle BAD$. (Show check)

(Not to scale)



$$4x + 2 = 6x - 16 \quad \checkmark$$

$$18 = 2x$$

$$x = 9 \quad \checkmark$$

$$m\angle BAD = m\angle BAC = 4(9) + 2 = 38$$

$$m\angle DAC = 6(9) - 16 = 38$$

$$38 = 38 \quad \checkmark$$

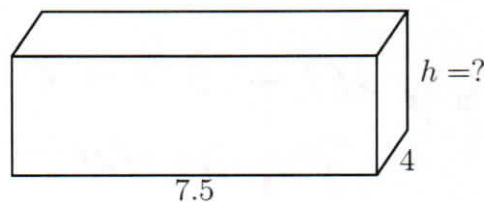
$$m\angle BAD = 38 + 38 = 76 \quad \checkmark$$

4

20. The volume of the rectangular prism shown is 105 cubic meters. Its length is 7.5 meters and depth 4 m. Find its height h . Show the calculation. (not drawn to scale)

$$V = (7.5)(4)h = 105 \quad \checkmark$$

$$= 3.5 \text{ m} \quad \checkmark$$



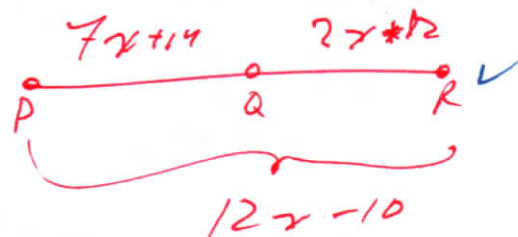
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Complete all steps for full credit: the drawing to the top right, an equation and solution for x on the left, followed by the answer to the question. Write the check to the bottom right.

21. Given the collinear points P , Q , and R , with $PQ = 7x + 14$, $QR = 2x + 12$, and $PR = 12x - 10$. Find PQ .

$$\begin{aligned} 7x + 14 + 2x + 12 &= 12x - 10 \\ 36 &= 3x \\ x &= 12 \end{aligned}$$

$$\begin{aligned} PQ &= 7(12) + 14 \\ &= 98 \end{aligned}$$



$$\begin{aligned} QR &= 2(12) + 12 \\ &= 36 \end{aligned}$$

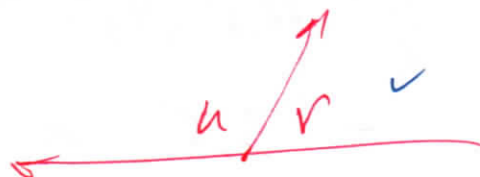
$$\begin{aligned} PR &= 12(12) - 10 \\ &= 134 \end{aligned}$$

$$98 + 36 = 134$$

22. Angles U and V are supplementary. $m\angle U = 5x + 61$ and $m\angle V = 3x - 17$. Find $m\angle V$.

$$\begin{aligned} 5x + 61 + 3x - 17 &= 180 \\ 8x + 44 &= 180 \\ 8x &= 136 \\ x &= 17 \end{aligned}$$

$$\begin{aligned} m\angle V &= 3(17) - 17 \\ &= 34 \end{aligned}$$



$$\begin{aligned} m\angle U &= 5(17) + 61 \\ &= 146 \end{aligned}$$

$$\begin{aligned} 34 + 146 &= 180 \end{aligned}$$

Early finishers, spicy

23. The shape shown below is a trapezoid. Its height is 3.2 cm and the longer base is 6.0 cm. The shorter side opposite the base is 4.8 cm.

Find the area of the figure.

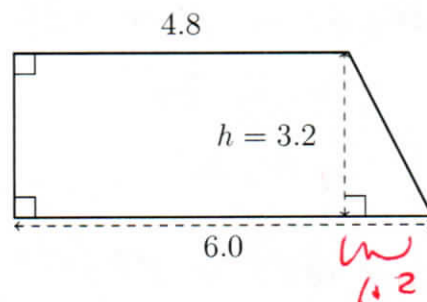
$$A_{\text{rect}} = 4.8 \times 3.2$$

$$= 15.36$$

$$A_{\text{tri}} = \frac{1}{2} (1.2) (3.2)$$

$$= 1.92$$

~~15.36~~



$$A_{\text{Total}} = 17.28 \checkmark$$

24. In the diagram below $m\angle BOC = 3x + 15$ and $m\angle DOE = 6x - 6$. Find x .

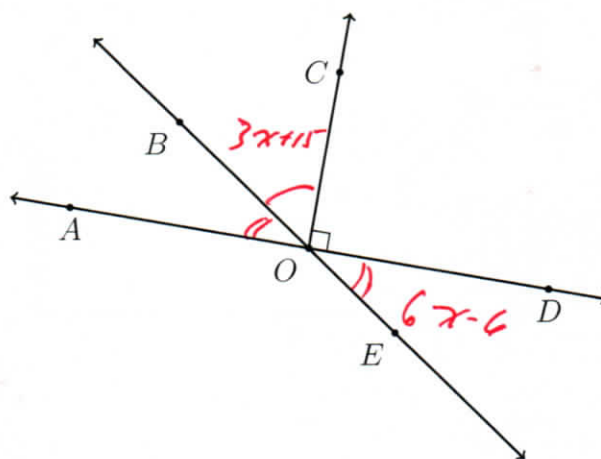
$$3x + 15 + 6x - 6 = 90$$

$$9x + 9 = 90$$

$$x = 9$$

$$m\angle DOE = 6(9) - 6$$

$$= 48 \checkmark$$



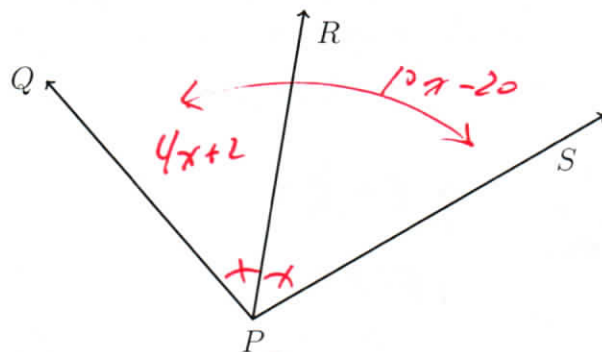
25. An angle bisector is shown below, with \overrightarrow{PR} bisecting $\angle QPS$. Given $m\angle QPR = 4x + 2$ and $m\angle QPS = 10x - 20$, find $m\angle QPS$.

$$2(4x + 2) = 10x - 20$$

$$24 = 2x$$

$$x = 12$$

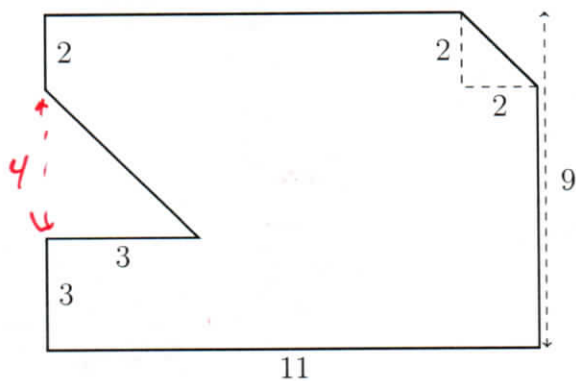
$$m\angle QPS = 10(12) - 20 = 100$$



$$m\angle QPR = 4(12) + 2 = 50$$

$$50 + 50 = 100$$

26. A rectangle has two triangular cutouts as shown with lengths marked. Find the area of the figure. (the figure is not drawn to scale)



$$A_{\Delta_1} = \frac{1}{2}(2)(4) = 2$$

$$A_{\Delta_2} = \frac{1}{2}(4)(3) = 6$$

$$A_R = 9 \cdot 11 = 99$$

$$A_{Fig} = 99 - 2 - 6 = 91$$

Write the term that best completes each statement.

27. Any two points are Collinear

28. Any three points are coplanar

29. The length of the given rectangle is 10 more than the width. Its area is 75. Find the length and width of the rectangle using an algebraic method.

(the drawing is not to scale)



$$(x+10)x = 75$$

$$x^2 + 10x - 75 = 0$$

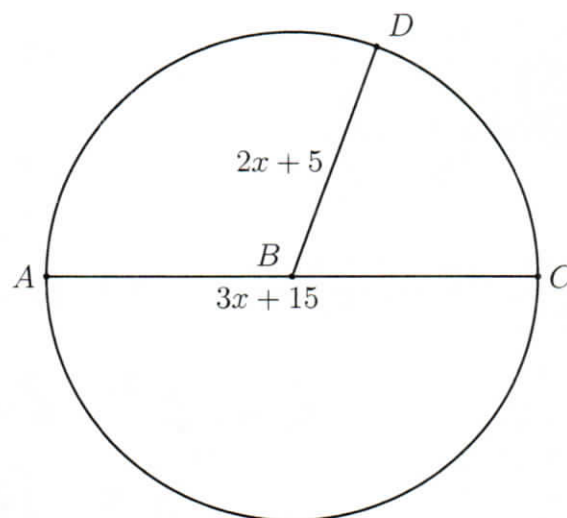
$$(x+15)(x-5) = 0$$

$$x = -15, +5 \quad \text{disregard negative distance}$$

$$l = 5$$

$$w = 15$$

30. The circle with center B is shown below with diameter \overline{AC} and radius \overline{BD} . Given $\overline{AC} = 3x + 15$ and $\overline{BD} = 2x + 5$. Find the diameter of the circle.



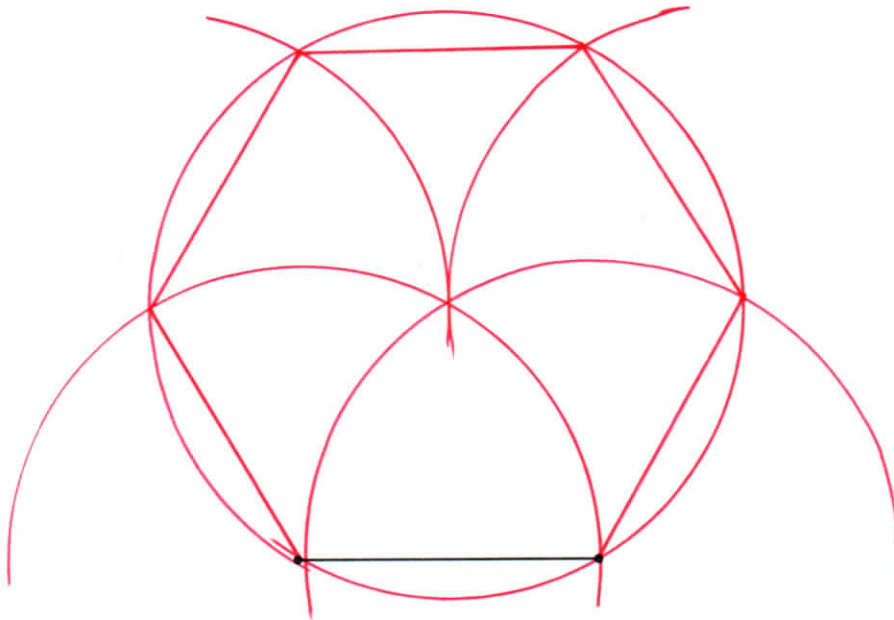
$$2(2x+5) = 3x+15$$

$$x = 5$$

$$\begin{aligned} AC &= 3(5) + 15 \\ &= 30 \end{aligned}$$

$$\begin{aligned} BD &= 2(5) + 5 \\ &= 15 \quad \checkmark \end{aligned}$$

31. Complete the construction of a hexagon with one side the given line segment. Show all construction marks, but make no extra lines.



32. The area of a square is 20 cm. Find the perimeter of the square.

$$A = s^2 = 20$$

$$s = \sqrt{20} = \sqrt{4 \cdot 5} \\ = 2\sqrt{5}$$

$$P = 4s = 4(2\sqrt{5}) = 8\sqrt{5}$$