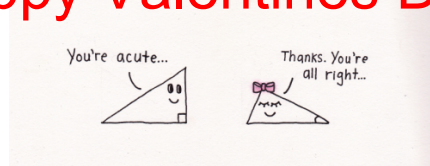


Agenda:

Happy Valentines Day



- 1) Bell Ringer: find the mistake
- 2) Go over homework with 8:00 buddy
- 3) Unit 5 Geometry
Lesson 2:
How do you solve equations involving angles?
- 4) Homework: pgs 23-24
Take Home Test 3 assigned on edoctrina

Lesson 2: Angle Problems and Solving Equations

Lesson 2: Angle Problems and Solving Equations

Classwork

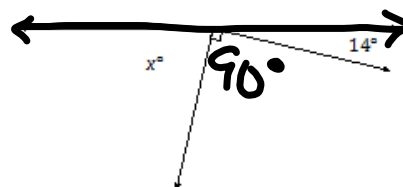
Opening Exercise

- a. supplementary In a complete sentence, describe the angle relationship in the diagram. Write an equation for the angle relationship shown in the figure and solve for x . Confirm your answers by measuring the angle with a protractor.

$$x + 90 + 14 = 180$$

$$\begin{array}{r} x + 104 = 180 \\ -104 \quad -104 \\ \hline \end{array}$$

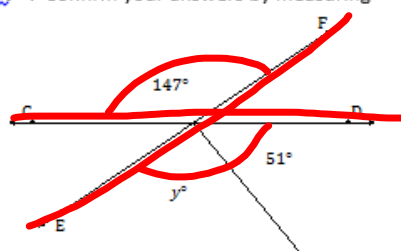
$$x = 76$$



- b. vertical CD and EF are intersecting lines. In a complete sentence, describe the angle relationship in the diagram. Write an equation for the angle relationship shown in the figure and solve for y . Confirm your answers by measuring the angle with a protractor.

$$\begin{array}{r} 147 = y + 51 \\ -51 \quad -51 \\ \hline 96 = y \end{array}$$

$$y = 96$$



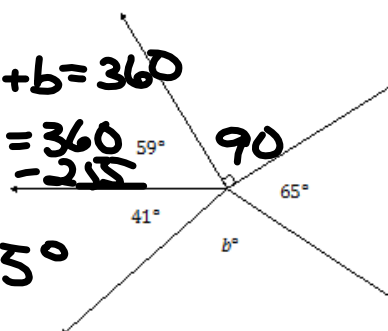
angles at a pt. add up to 360°

- c. In a complete sentence, describe the angle relationship in the diagram. Write an equation for the angle relationship shown in the figure and solve for y . Confirm your answers by measuring the angle with a protractor.

$$\begin{array}{r} 90 \\ 59 \\ 41 \\ + 65 \\ \hline 255 \end{array}$$

$$\begin{array}{r} 360 \\ - 255 \\ \hline 105 \end{array}$$

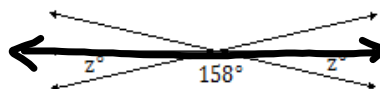
$$\begin{array}{r} 59 + 65 + 41 + 90 + b = 360 \\ 255 + b = 360 \\ - 255 \\ \hline b = 105 \end{array}$$



angles on a line are supplementary

- d. The following figure shows three lines intersecting at a point. In a complete sentence, describe the angle relationship in the diagram. Write an equation for the angle relationship shown in the figure and solve for z . Confirm your answers by measuring the angle with a protractor.

$$\begin{array}{r} 2z + 158 = 180 \\ -158 \quad -158 \\ \hline 2z = 22 \\ z = 11 \end{array}$$

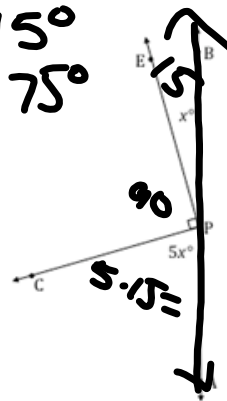


angles on a line are supplement.

- e. Write an equation for the angle relationship shown in the figure and solve for x . In a complete sentence, describe the angle relationship in the diagram. Find the measurements of $\angle EPB$ and $\angle CPA$. Confirm your answers by measuring the angle with a protractor.

$$\begin{array}{r} x + 5x + 90 = 180 \\ -90 \quad -90 \\ \hline 6x = 90 \\ \frac{6}{6}x = \frac{90}{6} \\ x = 15 \end{array}$$

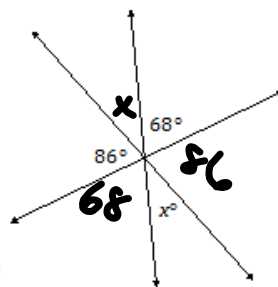
$$\begin{array}{l} \angle EPB = 15^\circ \\ \angle CPA = 75^\circ \end{array}$$



Example 1

The following figure shows three lines intersecting at a point. In a complete sentence, describe the angle relationship in the diagram. Write an equation for the angle relationship shown in the figure and solve for x . Confirm your answers by measuring the angle with a protractor.

$$\begin{aligned} 86 + 68 + x &= 180 \\ 154 + x &= 180 \\ \underline{-154} \quad \underline{-154} & \\ x &= 26 \end{aligned}$$

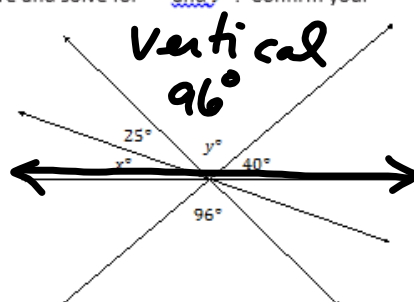


Exercise 1

angles on a line are supplementary.

The following figure shows four lines intersecting at a point. In a complete sentence, describe the angle relationships in the diagram. Write an equation for the angle relationship shown in the figure and solve for x and y . Confirm your answers by measuring the angle with a protractor.

$$\begin{aligned}
 &96 + 25 + 40 + x = 180^\circ \\
 &\quad 161 + x = 180 \\
 &\quad -161 \quad \quad -161 \\
 &\quad \quad \quad x = 19^\circ
 \end{aligned}$$

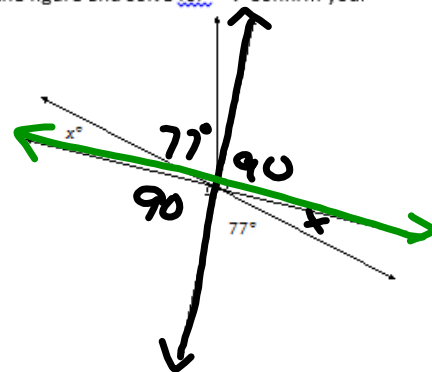


Example 2

angles on a line are supplementary.

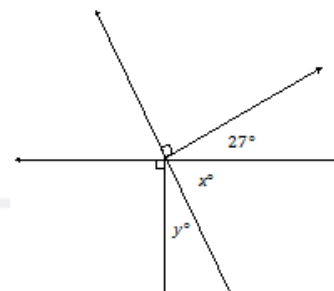
In a complete sentence, describe the angle relationships in the diagram. You may label the diagram to help describe the angle relationships. Write an equation for the angle relationship shown in the figure and solve for x . Confirm your answers by measuring the angle with a protractor.

$$\begin{array}{r} 90 + 77 + x = 180 \\ 167 + x = 180 \\ -167 \quad -167 \\ \hline x = 13^\circ \end{array}$$



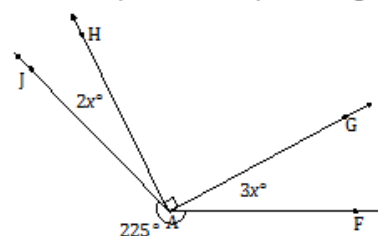
Exercise 2

In a complete sentence, describe the angle relationships in the diagram. Write an equation for the angle relationship shown in the figure and solve for x and y . Confirm your answers by measuring the angle with a protractor.



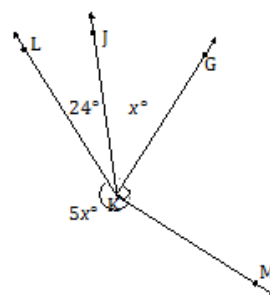
Example 3

In a complete sentence, describe the angle relationships in the diagram. Write an equation for the angle relationship shown in the figure and solve for x . Find the measures of $\angle JAH$ and $\angle GAF$. Confirm your answers by measuring the angle with a protractor.



Exercise 3

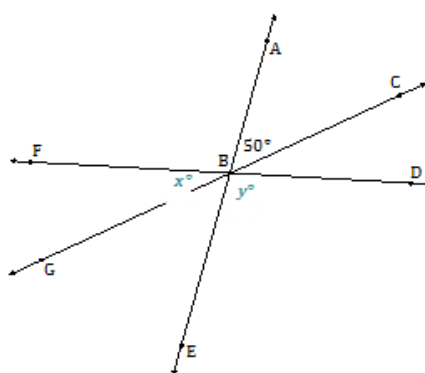
In a complete sentence, describe the angle relationships in the diagram. Write an equation for the angle relationship shown in the figure and solve for x . Find the measure of $\angle JKG$. Confirm your answers by measuring the angle with a protractor.



Example 4

In the accompanying diagram, $\angle DBE$ is four times the measure of $\angle FBG$.

- a. Label $\angle DBE$ as y° and $\angle FBG$ as x° . Write an equation that describes the relationship between $\angle DBE$ and $\angle FBG$.



- b. Find the value of x .

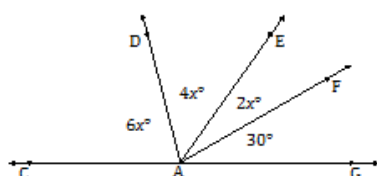
- c. Find the measures of $\angle FBG$, $\angle CBD$, $\angle ABF$, $\angle GBE$, $\angle DBE$.

- d. What is the measure of $\angle ABG$? Identify the angle relationship used to get your answer.

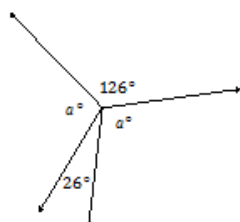
Problem Set

In a complete sentence, describe the angle relationships in each diagram. Write an equation for the angle relationship(s) shown in the figure, and solve for the indicated unknown angle. You can check your answers by measuring each angle with a protractor.

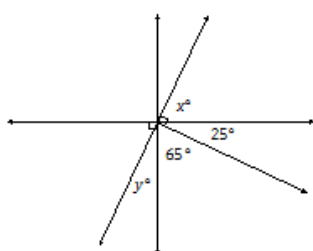
- Find the measure of $\angle EAF$, $\angle DAE$, and $\angle CAD$.



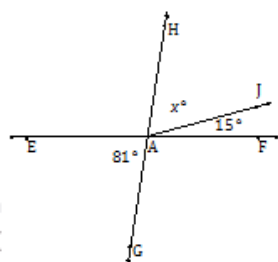
- Find the measure of a .



3. Find the measure of x and y .



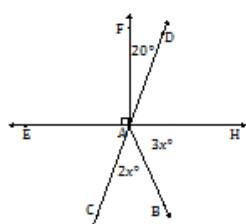
4. Find the measure of $\angle HAJ$.



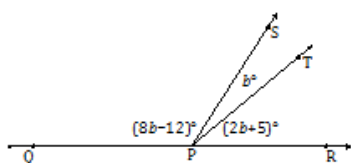
COMMON CORE

Items and Solving Equ.

5. Find the measure of $\angle HAB$ and $\angle CAB$.



6. The measure of $\angle SPT = b^\circ$. The measure of $\angle TPR$ is five more than two times $\angle SPT$. The measure of $\angle QPS$ is twelve less than eight times $\angle SPT$. Find the measures of $\angle SPT$, $\angle TPR$, and $\angle QPS$.



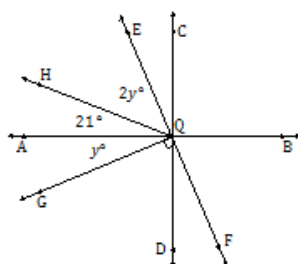
$$8b - 12 + b + 2b + 5 = 180$$

$$11b - 7 = 180$$

$$11b = 187$$

$$b = 17$$

7. Find the measure of $\angle HQE$ and $\angle AQG$.



8. The measures of three angles at a point are in the ratio of $2:3:5$. Find the measures of the angles.

360

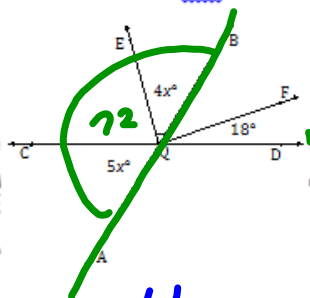
$$2x + 3x + 5x = 360$$

9. The sum of the measures of two adjacent angles is 72° . The ratio of the smaller angle to the larger angle is $1:3$. Find the measures of each angle.

$$\begin{aligned} 1x + 3x &= 72 \\ 4x &= 72 \\ x &= 18 \end{aligned}$$

$$\begin{aligned} 1x, 3x \\ 3 \cdot 18 &= 54 \end{aligned}$$

10. Find the measure of $\angle CQA$ and $\angle EQB$.



$$\begin{array}{r} 90 \\ + 18 \\ \hline 108 \\ 180 \\ - 108 \\ \hline 72 \end{array}$$

$$4x + 72 + 5x = 180$$

$$\begin{aligned} 9x + 72 &= 180 \\ 9x &= 108 \\ x &= 12 \end{aligned}$$

$$\begin{aligned} 5 \cdot 12 &= 60 \\ 4 \cdot 12 &= 48 \end{aligned}$$

Classwork

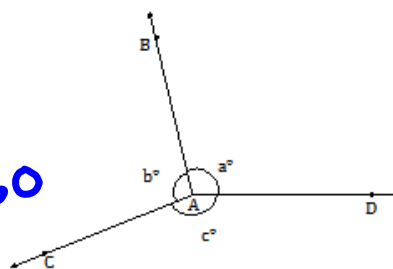
Angle Facts and Definitions

Name of Angle Relationship	Angle Fact	Diagram
Adjacent Angles	$\angle BAC$ & $\angle DAC$	
Vertical Angles (vert. \angle s)	$\angle a$ and $\angle b$ $m\angle a \cong m\angle b$	
Angles on a Line (\angle s on a line)	supplementary $m\angle a + m\angle b + m\angle c = 180^\circ$	

Angles at a Point
(\angle s at a point)

$$m\angle a + m\angle b + m\angle c = 360$$

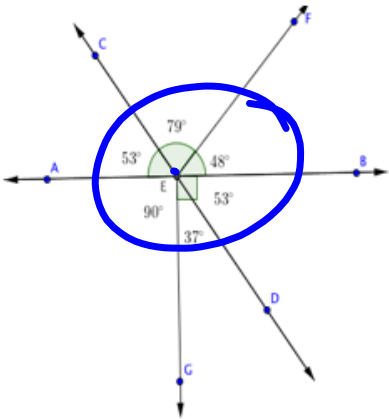
$$\angle BAD + \angle DAC + \angle CAB = 360$$



Opening Exercise

Use the diagram to complete the chart.

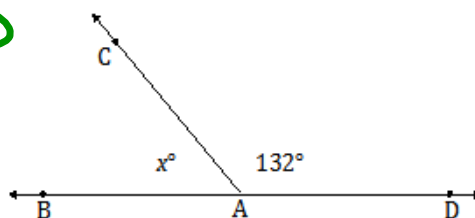
Name the Angles that are ...	
Vertical	
Adjacent	
Angles on a line	
Angles at a point	



Example 1Estimate the measurement of x . 48°

In a complete sentence, describe the angle relationship in the diagram.

These angles
are supplementary.



$$\begin{array}{r} x + 132 = 180 \\ - 132 \quad - 132 \\ \hline x = 48 \end{array}$$

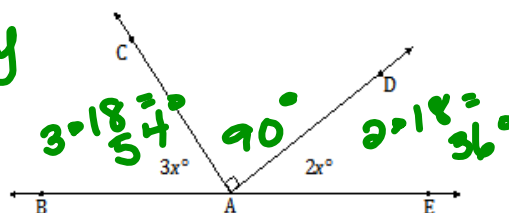
Write an equation for the angle relationship shown in the figure and solve for x . Then find the measures of $\angle BAC$ and confirm your answers by measuring the angle with a protractor.

$$x + 132 = 180$$

Exercise 1

In a complete sentence, describe the angle relationship in the diagram.

Supplementary



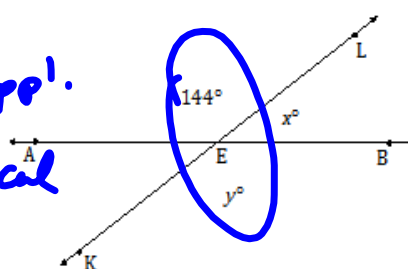
Find the measurements of $\angle BAC$ and $\angle DAE$.

$$\begin{aligned}
 3x + 2x + 90 &= 180 \\
 5x + 90 &= 180 \\
 \underline{-90} \quad \underline{-90} \\
 5x &= 90 \\
 \frac{5}{5}x &= \frac{90}{5} \\
 x &= 18
 \end{aligned}$$

Example 2

In a complete sentence, describe the angle relationship in the diagram.

144 & x are supp.
144 & y are vertical



Write an equation for the angle relationship shown in the figure and solve for x and y . Find the measurements of $\angle LEB$ and $\angle KEB$.

$$\begin{array}{r} 144 \\ + 144 \\ \hline 288 \end{array} \quad \begin{array}{r} 360 \\ - 288 \\ \hline 72 \end{array}$$

$2 \overline{) 72}$

$$\begin{aligned} x &= 36^\circ \\ y &= 144^\circ \end{aligned}$$

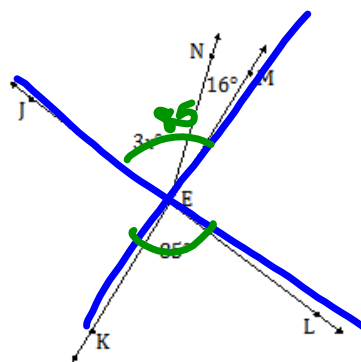
Vertical they are equal

Exercise 2

In a complete sentence, describe the angle relationships in the diagram.

$$\begin{array}{rcl} 3x + 16 & = & 85 \\ 3x & = & 69 \\ x & = & 23 \end{array}$$

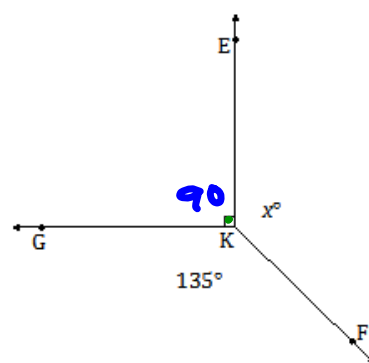
Write an equation for the angle relationship shown in the figure and solve for x .



Example 3

In a complete sentence, describe the angle relationships in the diagram.

*Angles at a point
add up to 360°*



Write an equation for the angle relationship shown in the figure and solve for x . Find the measurement of $\angle EKF$ and confirm your answers by measuring the angle with a protractor.

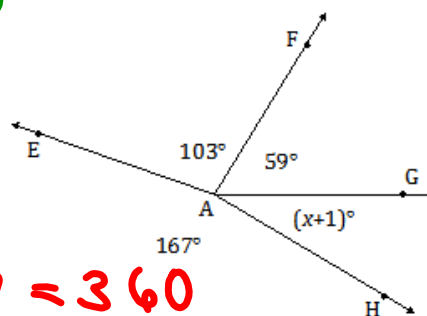
$$90 + x + 135 = 360$$

$$\begin{array}{r} x + 225 = 360 \\ - 225 \quad - 225 \\ \hline x = 135^\circ \end{array}$$

Exercise 3

In a complete sentence, describe the angle relationships in the diagram.

Point
add to 360°

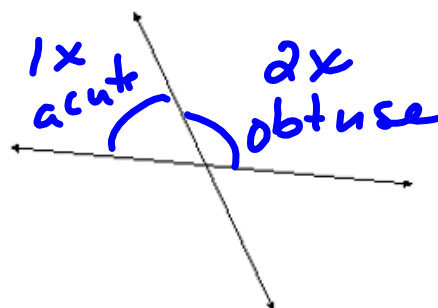


Find the measurement of $\angle GAH$.

$$103 + 59 + x + 1 + 167 = 360$$

Example 4

The following two lines intersect. The ratio of the measurements of the obtuse angle to the acute angle in any adjacent angle pair in this figure is $2 : 1$. In a complete sentence, describe the angle relationships in the diagram.



Label the diagram with expressions that describe this relationship. Write an equation that models the angle relationship and solve for x . Find the measurements of the acute and obtuse angles.

$$2x + 1x = 180$$

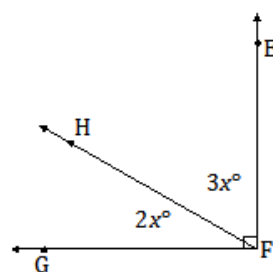
$$\frac{3x}{3} = \frac{180}{3}$$

$$x = 60$$

$$2x = 2 \cdot 60 = 120$$

Exercise 4

The ratio of $\angle GFH$ to $\angle EFH$ is $2 : 3$. In a complete sentence, describe the angle relationships in the diagram.



Find the measures of $\angle GFH$ and $\angle EFH$.

Relevant Vocabulary

ADJACENT ANGLES: Two angles $\angle BAC$ and $\angle CAD$ with a common side \overline{AC} are *adjacent angles* if C belongs to the interior of $\angle BAD$.

VERTICAL ANGLES: Two angles are *vertical angles* (or *vertically opposite angles*) if their sides form two pairs of opposite rays.

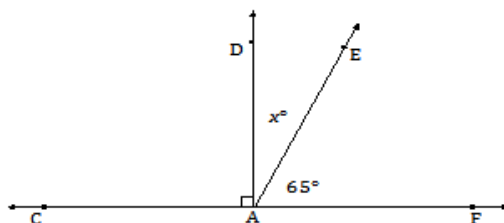
ANGLES ON A LINE: The sum of the measures of adjacent *angles on a line* is 180° .

ANGLES AT A POINT: The sum of the measures of adjacent *angles at a point* is 360° .

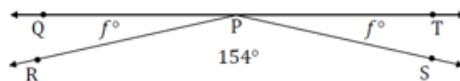
Homework

For each question, use angle relationships to write an equation in order to solve for each variable. Determine the indicated angles. You can check your answers by measuring each angle with a protractor.

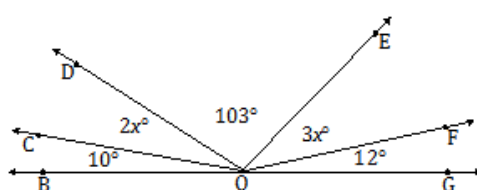
1. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measurement of $\angle DAE$.



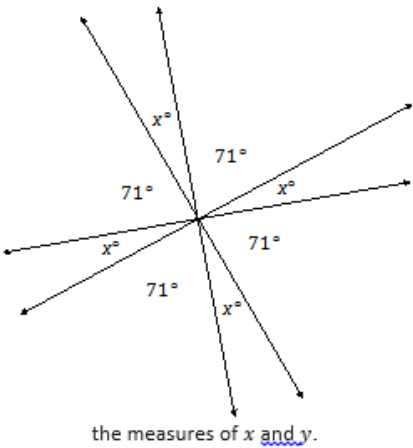
2. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measurement of $\angle QPR$.



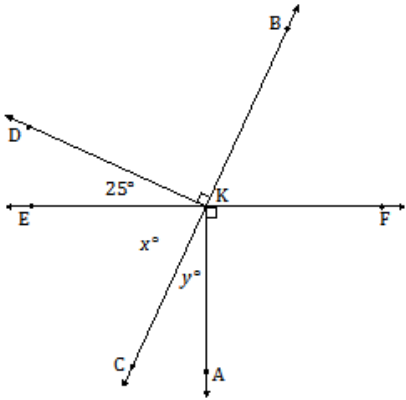
3. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measurements of $\angle CQD$ and $\angle EQF$.



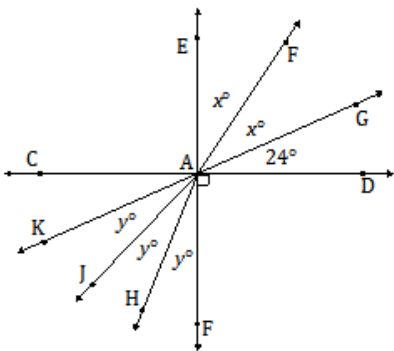
4. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measure of x .



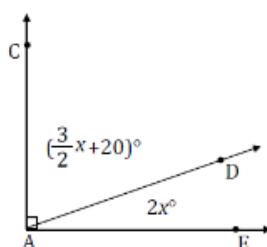
5. In a complete sentence, describe the relevant angle relationships in the following diagram. Find



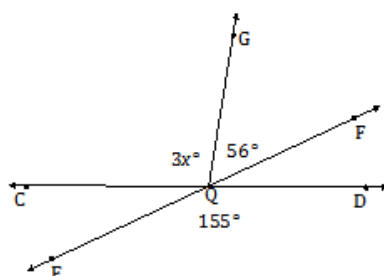
6. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measures of x and y .



7. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measures of $\angle CAD$ and $\angle DAE$.



8. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measure of $\angle CQG$.



9. The ratio of the measures of a pair of adjacent angles on a line is $4 : 5$.
 - a. Find the measures of the two angles.
 - b. Draw a diagram to scale of these adjacent angles. Indicate the measurements of each angle.

10. The ratio of the measures of three adjacent angles on a line is $3 : 4 : 5$.
 - a. Find the measures of the three angles.
 - b. Draw a diagram to scale of these adjacent angles. Indicate the measurements of each angle.
 - c. Draw a diagram to scale of these adjacent angles. Indicate the measurements of each angle.

