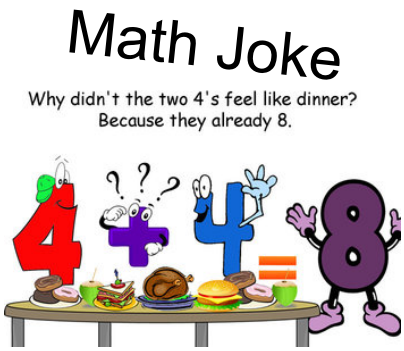
*"I know what we're going to do today."*

# Agenda:




1) Warm Up- go over hw w/ 1:00 buddy

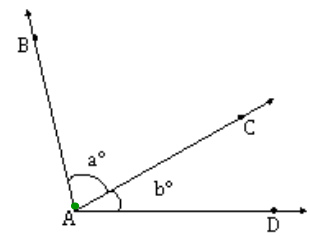
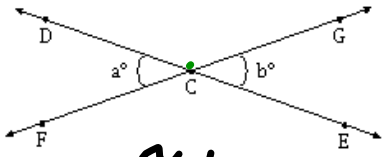
2) Unit 5 Geometry
Lesson 2:
What types of angles are there?
How do you solve problems involving angles?

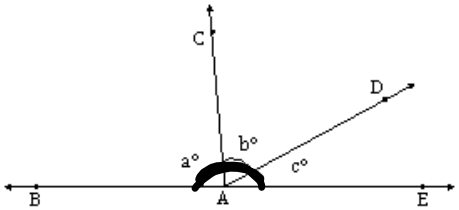
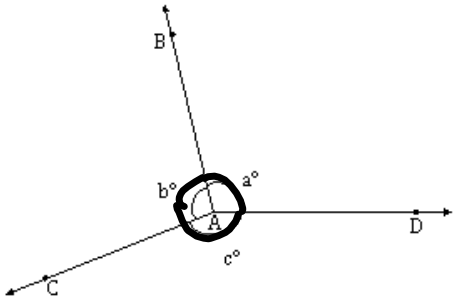
3) Homework: Lesson 2

# Lesson 1: Angle Problems and Solving Equations

Classwork

Angle Facts and Definitions

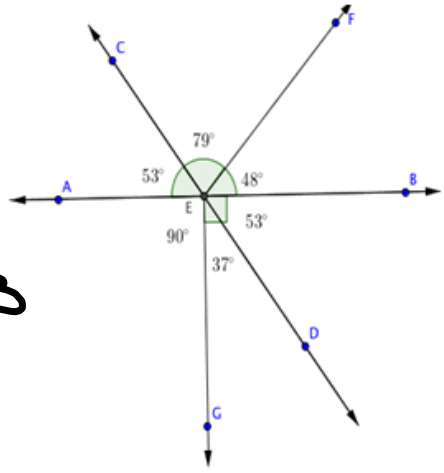
| Name of Angle Relationship | Angle Fact | Diagram |
|---|---|---|
| Adjacent Angles<br>adj. ∠s | - Share vertex Pt A<br>- share a ray (side) $\overrightarrow{AC}$ |  |
| Vertical Angles<br>(vert. ∠s ) | - share a vertex Pt C<br>- formed by intersecting lines<br>- equal in measure |  <br>$a \cong b$ |

| | | |
|---|---|---|
| Angles on a Line (∠s on a line) | - share a vertex<br>- add up to 180° (supplementary) |  |
| Angles at a Point (∠s at a point) pt. | - share a vertex<br>- add up to 360° |  |

**Opening Exercise**

Use a protractor, measure all the angles and complete the chart to follow.

| | Name the Angles that are |
|---|---|
| Vertical | ∠AEC and ∠BED |
| Adjacent | ∠CEF and ∠AEC |
| Angles on a Line | ∠CEF, ∠AEC, ∠FEB |
| Angles at a Point | ∠AEC ∠CEF ∠FEB ∠BED ∠DEG ∠GEA |

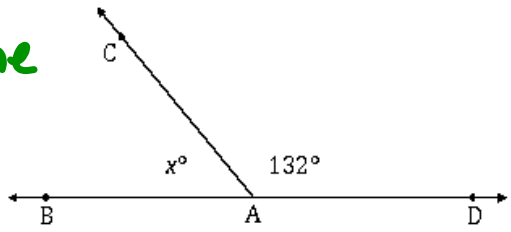


**Example 1**

Estimate the measurement of $x$ .

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

angles on a line add to 180




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.

$x + 132 = 180$

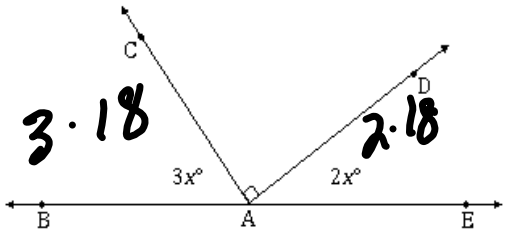
$-132 \quad -132$

$x = 48°$

**Exercise 1**

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

The angles are on a line
They add to 180°.




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

$m\angle DAE = 36°$

$3x + 90 + 2x = 180$

$5x + 90 = 180$

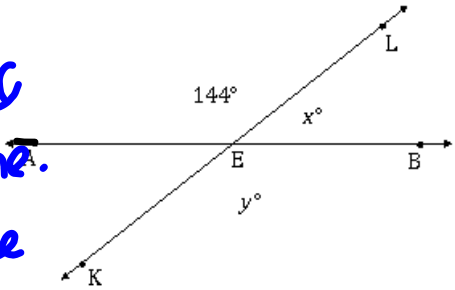
$-90 \quad -90$

$\frac{5x}{5} = \frac{90}{5}$

$x = 18$

**Example 2**

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




∠AEL and ∠KEB are vertical
∠LEB and ∠BEK are on a line.
∠AEL and ∠LEB are on a line

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

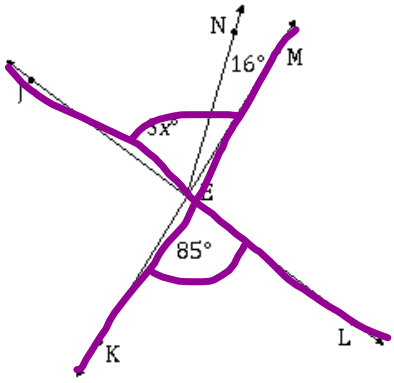
$y = 144°$

$144 + x = 180$
$-144 \quad -144$
$x = 36°$

**Exercise 2**

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

Vertical (equal)




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

$3x + 16 = 85$

$-16 \quad -16$

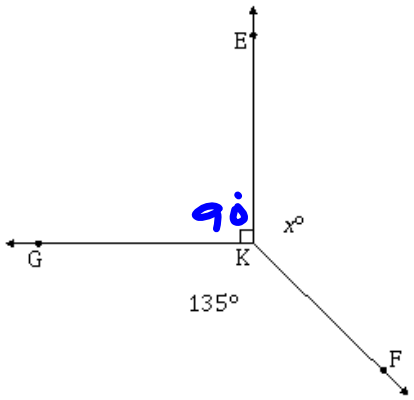
$\frac{3x}{3} = \frac{69}{3}$

$x = 23°$

**Example 3**

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

angles on 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.

$90+135+x=360$

$225+x=360$

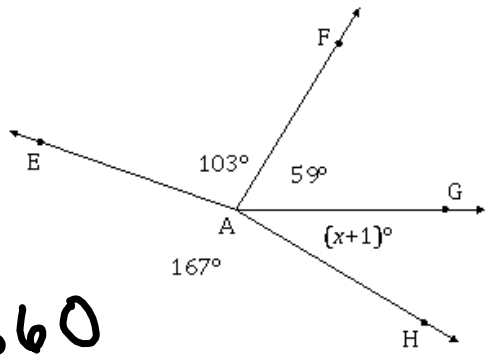
$-225 \quad -225$

$x=135°$

**Exercise 3**

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

angles at a pt add up to 360°




Find the measurement of $\angle GAH$ .

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

$330+x=360$

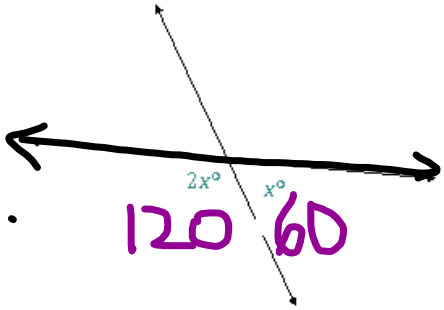
$x=30$

$m\angle GAH=31°$

**Example 4**

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

They are supplementary.




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.

$2x + 1x = 180$

$3x = 180$

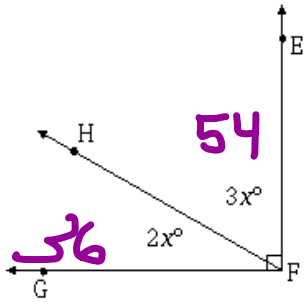
$x = 60$

2x, 3x

**Exercise 4**

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

They are complementary. (add to 90°)




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

$2x + 3x = 90$

$\frac{5x}{5} = \frac{90}{5}$

$x = 18$

18 × 3 = 54

18 × 2 = 36

**Relevant Vocabulary**

**Adjacent Angles:** Two angles $\angle BAC$ and $\angle CAD$ with a common side $\overrightarrow{AC}$ 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.

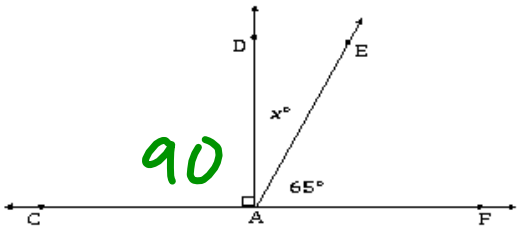
**Angles on a Line:** The sum of the measures of adjacent angles on a line is $180°$.

**Angles at a Point:** The sum of the measures of adjacent angles at a point is $360°$.

## Problem Set

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 $\angle DAE$ .




$90 + x + 65 = 180$

$x + 155 = 180$

$-155 \quad -155$

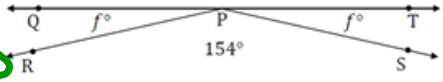
$x = 25$

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

$f+154+f=180$

$2f+154=180$

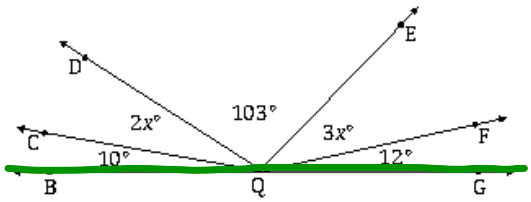
$-154 \quad -154$




$2f=26$

$f=13$

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




$113$

$+12$

$10+2x+103+3x+12=180$

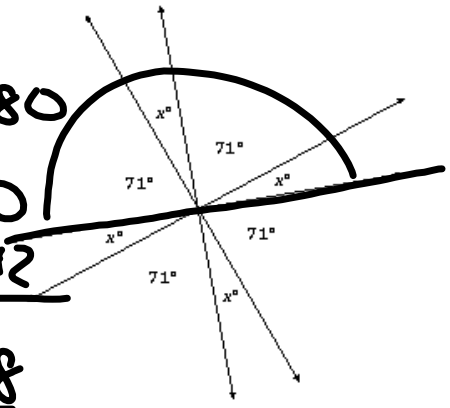
$5x \quad +125 \quad =180$

$-125 \quad -125$

$\frac{5x}{5}=\frac{55}{5}$

$x=11$

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




$71 + x + 71 + x = 180$

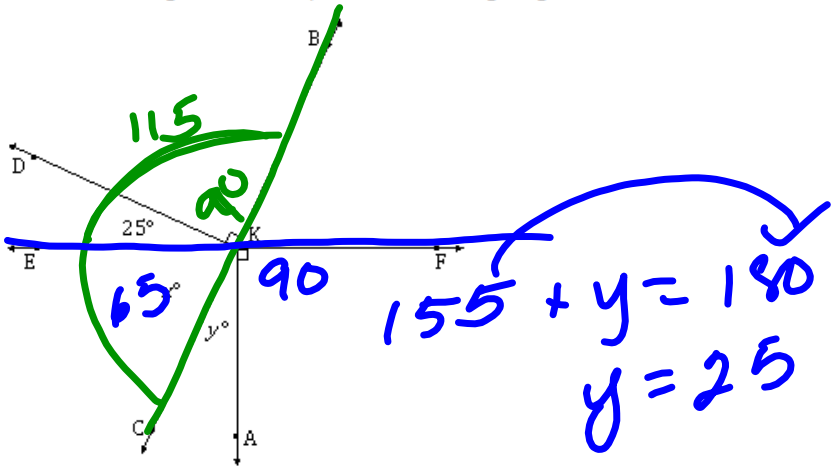
$2x + 142 = 180$

$-142 \quad -142$

$\frac{2x}{2} = \frac{38}{2}$

$x = 19$

5. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measure of $x$ and $y$.




$x + 115 = 180$

$x = 65$

115

90

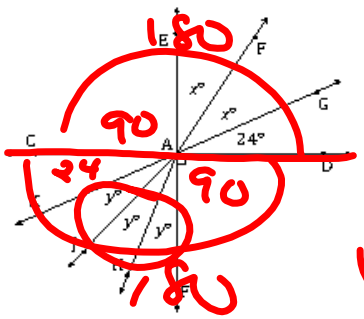
65

90

$155 + y = 180$

$y = 25$

6. In a complete sentence, describe the following diagram. Find the measure of $x$ and $y$.




the relevant angle relationships in

$90 + 24 + 2x = 180$

$114 + 2x = 180$

$2x = 66$

$x = 33$

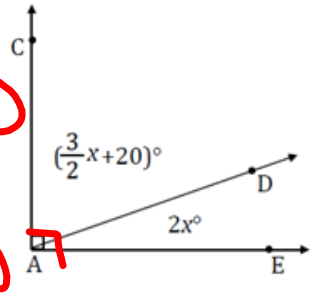
$24 + 90 + 3y = 180$

$114 + 3y = 180$

$3y = 66$

$y = 22$

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




$3\frac{1}{2}x+20+2x=90$

$3\frac{1}{2}x+20=90$

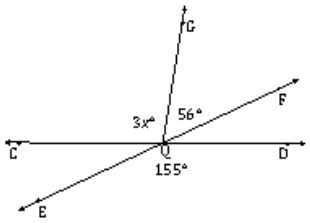
$\frac{3\frac{1}{2}x}{3\frac{1}{2}}=\frac{70}{3\frac{1}{2}}$

$70\div 3\frac{1}{2}$

$70\div\frac{7}{2}$

$10\cancel{70}\times\frac{2}{\cancel{7}_1}=20$

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




$4x + 5x = 180$

$\frac{9x}{9} = \frac{180}{9}$

$x = 20$

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.

180° 80, 100

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

180 3x 4x 5x

$3x + 4x + 5x = 180$

$\frac{12x}{12} = \frac{180}{12}$

$x = 15$