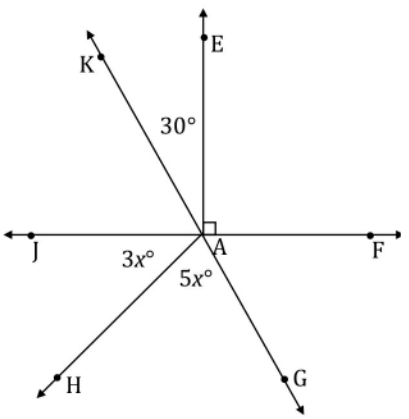
Name _____ Date_____

Angle Problems and Solving Equations

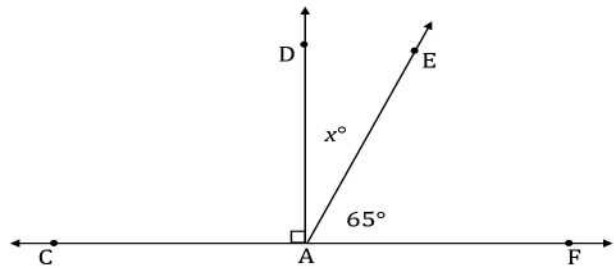
In a complete sentence, describe the relevant angle relationships in the following diagram. That is, describe the angle relationships you could use to determine the value of x.



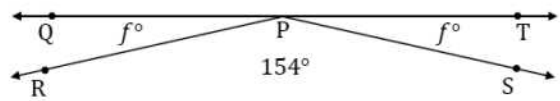
Use the angle relationships described above to write an equation to solve for x. Then, determine the measurements of $\angle JAH$ and $\angle HAG$.

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.

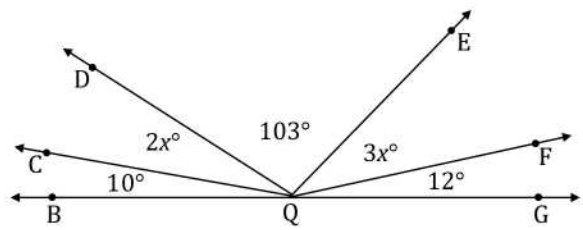
1. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measurement of $\angle DAE$.



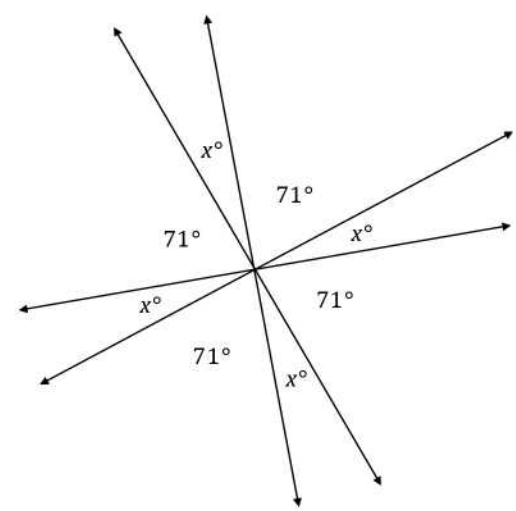
2. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measurement of $\angle QPR$.



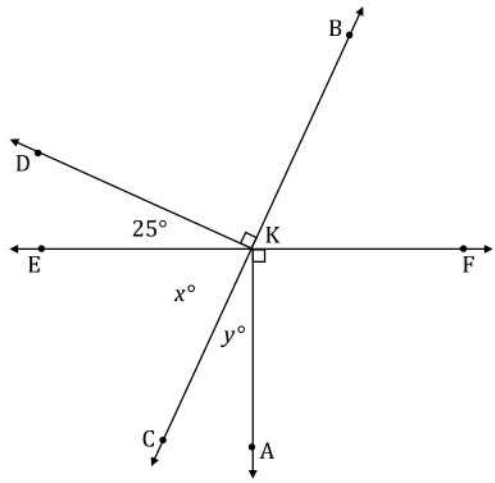
3. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measurements of $\angle CQD$ and $\angle EQF$.



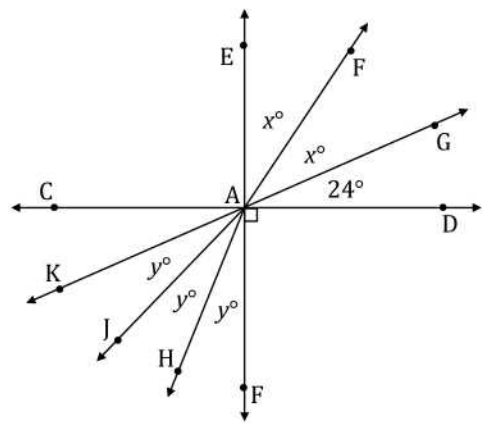
4. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measure of x.



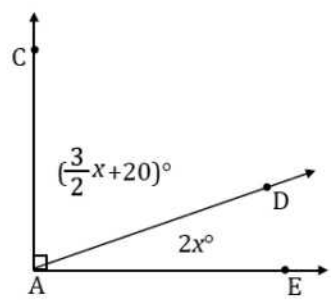
5. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measures of x and y.



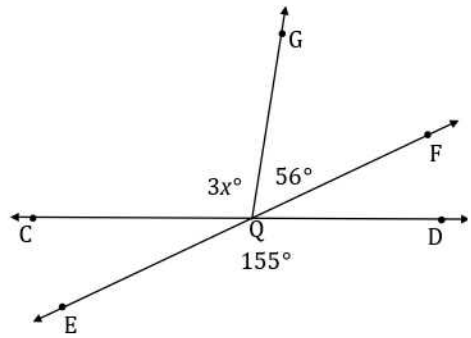
6. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measures of x and y.



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



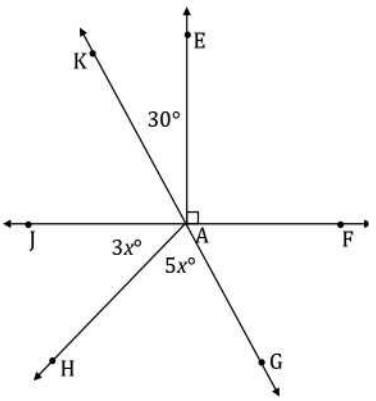
8. In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measure of $\angle CQG$.



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.

In a complete sentence, describe the relevant angle relationships in the following diagram. That is, describe the angle relationships you could use to determine the value of x.



$\angle KAE$ and $\angle EAF$ are adjacent angles whose measurements are equal to $\angle KAF$; $\angle KAF$ and $\angle JAG$ are vertical angles and are of equal measurement.

Use the angle relationships described above to write an equation to solve for x. Then, determine the measurements of $\angle JAH$ and $\angle HAG$.

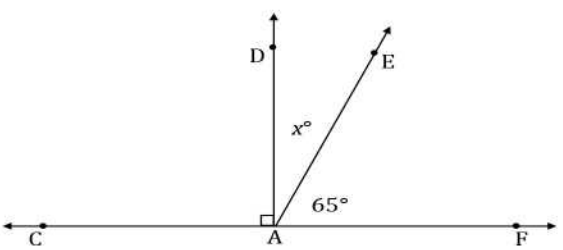
$$5x + 3x = 90 + 30$$
$$8x = 120$$
$$\left(\frac{1}{8}\right)(8x) = \left(\frac{1}{8}\right)(120)$$
$$x = 15$$

$m\angle JAH = 3(15°) = 45°$

$m\angle HAG = 5(15°) = 75°$

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 $\angle DAE$.**

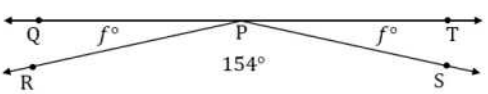


One possible response: $\angle CAD$, $\angle DAE$, and $\angle FAE$ are angles on a line and sum to $180°$.

$$90 + x + 65 = 180$$
$$x + 155 = 180$$
$$x + 155 - 155 = 180 - 155$$
$$x = 25$$

$m\angle DAE = 25°$

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

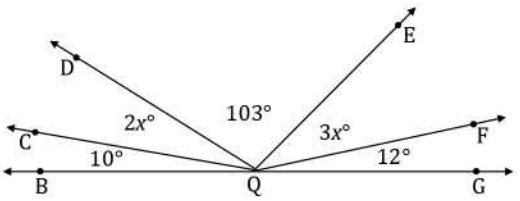


$\angle QPR$, $\angle RPS$, and $\angle SPT$ are angles on a line and sum to $180°$.

$$f + 154 + f = 180$$
$$2f + 154 = 180$$
$$2f + 154 - 154 = 180 - 154$$
$$2f = 26$$
$$\left(\frac{1}{2}\right)2f = \left(\frac{1}{2}\right)26$$
$$f = 13$$

$m\angle QPR = 13°$

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



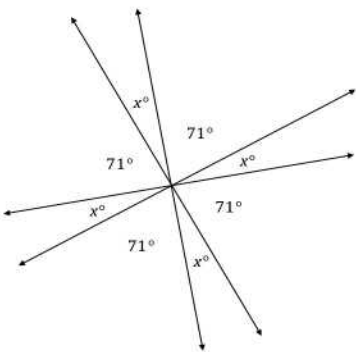
$\angle BQC$, $\angle CQD$, $\angle DQE$, $\angle EQF$, and $\angle FQG$ are angles on a line and sum to $180°$.

$$10 + 2x + 103 + 3x + 12 = 180$$
$$5x + 125 = 180$$
$$5x + 125 - 125 = 180 - 125$$
$$5x = 55$$
$$\left(\frac{1}{5}\right)5x = \left(\frac{1}{5}\right)55$$
$$x = 11$$

$m\angle CQD = 2(11°) = 22°$

$m\angle EQF = 3(11°) = 33°$

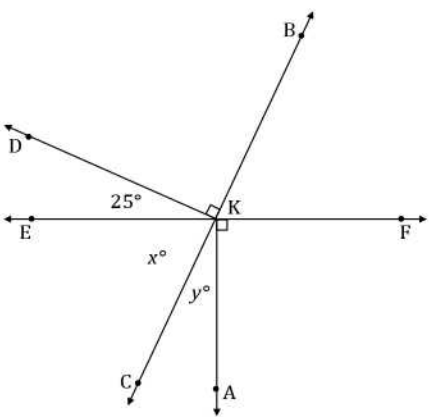
4. **In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measure of x.**



All of the angles in the diagram are angles at a point and sum to $360°$.

$$4(x + 71) = 360$$
$$4x + 284 = 360$$
$$4x + 284 - 284 = 360 - 284$$
$$4x = 76$$
$$\left(\frac{1}{4}\right)4x = \left(\frac{1}{4}\right)76$$
$$x = 19$$

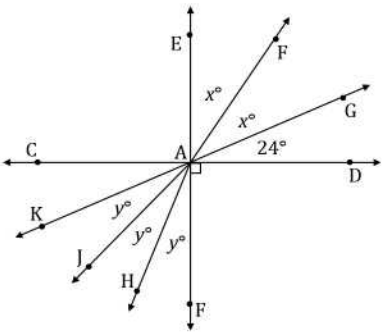
5. **In a complete sentence, describe the relevant angle relationships in the following diagram. Find the measures of x and y.**



$\angle CKE$, $\angle EKD$, and $\angle DKB$ are angles on a line and sum to $180°$. Since $\angle FKA$ and $\angle AKE$ form a straight angle and the measurement of $\angle FKA$ is $90°$, $\angle AKE$ is $90°$, making $\angle CKE$ and $\angle AKC$ form a right angle and have a sum of $90°$.

$$x + 25 + 90 = 180$$
$$x + 115 = 180$$
$$x + 115 - 115 = 180 - 115$$
$$x = 65$$
$$(65) + y = 90$$
$$65 - 65 + y = 90 - 65$$
$$y = 25$$

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

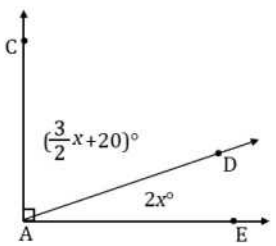


$\angle EAG$ and $\angle FAK$ are vertical angles and are of equal measurement.
$\angle EAG$ and $\angle GAD$ form a right angle and have a sum of $90°$.

$$2x + 24 = 90$$
$$2x + 24 - 24 = 90 - 24$$
$$2x = 66$$
$$\left(\frac{1}{2}\right)2x = \left(\frac{1}{2}\right)66$$
$$x = 33$$

$$3y = 66$$
$$\left(\frac{1}{3}\right)3y = \left(\frac{1}{3}\right)66$$
$$y = 22$$

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



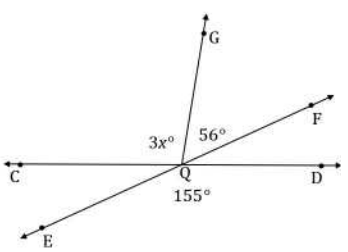
$\angle CAD$ and $\angle DAE$ form a right angle and have a sum of $90°$.

$$\left(\frac{3}{2}x + 20\right) + 2x = 90$$
$$\frac{7}{2}x + 20 = 90$$
$$\frac{7}{2}x + 20 - 20 = 90 - 20$$
$$\frac{7}{2}x = 70$$
$$\left(\frac{2}{7}\right)\frac{7}{2}x = 70\left(\frac{2}{7}\right)$$
$$x = 20$$

$$m\angle CAD = \frac{3}{2}(20) + 20 = 50°$$

$$m\angle DAE = 2(20) = 40°$$

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



$\angle DQE$ and $\angle CQF$ are vertical angles and are of equal measurement.
$\angle CQG$ and $\angle GQF$ are adjacent and sum to the measurement of $\angle CQF$.

$$3x + 56 = 155$$
$$3x + 56 - 56 = 155 - 56$$
$$3x = 99$$
$$\left(\frac{1}{3}\right)3x = \left(\frac{1}{3}\right)99$$
$$x = 33$$

$$m\angle CQG = 3(33°) = 99°$$

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.

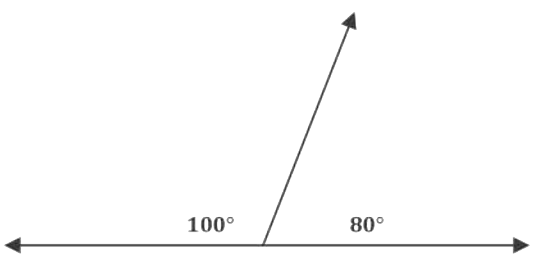
Angle 1 $= 4x$, *Angle 2* $= 5x$

$$\begin{aligned} 4x + 5x &= 180 \\ 9x &= 180 \\ \left(\frac{1}{9}\right)9x &= \left(\frac{1}{9}\right)180 \\ x &= 20 \end{aligned}$$

Angle 1 $= 4(20°) = 80°$

Angle 2 $= 5(20°) = 100°$

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.

Angle 1 $= 3x$, *Angle 2* $= 4x$, *Angle 3* $= 5x$

$$\begin{aligned} 3x + 4x + 5x &= 180 \\ 12x &= 180 \\ \left(\frac{1}{12}\right)12x &= \left(\frac{1}{12}\right)180 \\ x &= 15 \end{aligned}$$

Angle 1 $= 3(15°) = 45°$

Angle 2 $= 4(15°) = 60°$

Angle 3 $= 5(15°) = 75°$

b. Draw a diagram to scale of these adjacent angles. Indicate the measurements of each angle.

Angle 3 $= 5(15°) = 75°$

c. Draw a diagram to scale of these adjacent angles. Indicate the measurements of each angle.