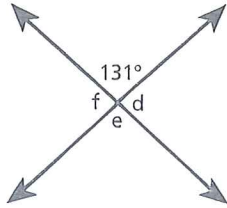


# Determine Missing Angles

Use what you know about complementary, supplementary, and vertical angles to determine the missing angle measures.

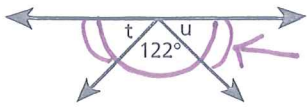


Vertical angles are congruent.  
Therefore,  $e = 131^\circ$ .

The sum of linear supplemental angles is equal to  $180^\circ$ .  
Therefore,  $e + f = 180^\circ$ .  
 $131^\circ + f = 180^\circ$ .  
 $f = 49^\circ$

Angles  $f$  and  $d$  are vertical.  
Therefore,  $d = 49^\circ$ .

1



straight angle

$$t + 122 + u = 180^\circ$$

We know  $t \cong u$   
so use the same variable

$$\angle t \cong \angle u$$

$$m\angle t = \underline{29^\circ}$$

$$m\angle u = \underline{29^\circ}$$

$$x + 122 + x = 180^\circ$$

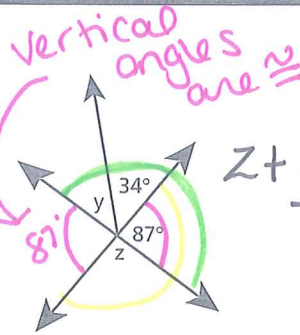
$$2x + 122 = 180$$

$$2x = 58$$

$$\frac{2x}{2} = \frac{58}{2}$$

$$\boxed{x = 29}$$

2



Linear Pairs are suppl.

$$z + 87 = 180$$

$$-87 \quad -87$$

$$\boxed{z = 93^\circ}$$

$$y + 34 + 87 = 180$$

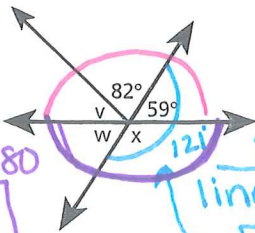
$$y + 121 = 180$$

$$y = 59^\circ$$

$$m\angle y = \underline{59^\circ}$$

$$m\angle z = \underline{93^\circ}$$

3



Find x  
linear pairs are suppl.

$$w + 121 = 180$$

$$\boxed{w = 59^\circ}$$

$$59 + x = 180^\circ$$

$$\boxed{x = 121^\circ}$$

$$m\angle v = \underline{39^\circ}$$

$$m\angle x = \underline{121^\circ}$$

$$m\angle w = \underline{59^\circ}$$

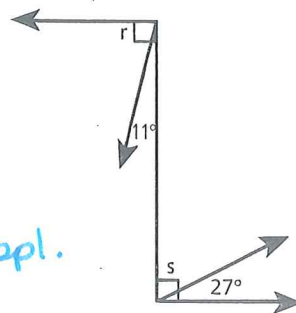
find v

$$v + 82 + 59 = 180$$

$$v + 141 = 180^\circ$$

$$\boxed{v = 39^\circ}$$

4



Right angle compl.

$$r + 11 = 90^\circ$$

$$\boxed{r = 79^\circ}$$

$$s + 27 = 90^\circ$$

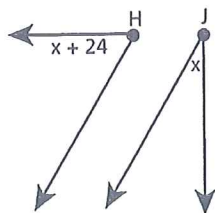
$$\boxed{s = 63^\circ}$$

$$m\angle r = \underline{79^\circ}$$

$$m\angle s = \underline{63^\circ}$$

# Angles and Algebra

Use algebraic equations to find a missing angle measure.



$\angle J$  and  $\angle H$  are complementary.

$$m\angle J = x$$

$$m\angle H = x + 24$$

$$x + x + 24 = 90^\circ$$

$$2x + 24 = 90^\circ$$

$$2x = 66^\circ$$

$$x = 33^\circ$$

$$m\angle J = 33^\circ, m\angle H = 57^\circ$$

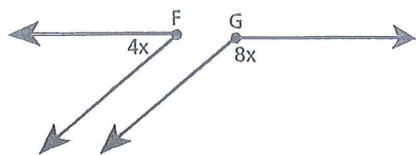
Write and solve an equation to find the value of  $x$ .

①  $\angle F + \angle G = 180^\circ$  def of Suppl.

$\angle F$  and  $\angle G$  are supplementary.

$$4x + 8x = 180 \quad \boxed{x=15}$$

$$12x = 180$$



$$m\angle F = 4x$$

$$m\angle G = 8x$$

$$4x + 8x = 180^\circ$$

$$m\angle F = 60^\circ, m\angle G = 120^\circ$$

$$\angle F = 4(15) \quad \angle G = 8(15)$$

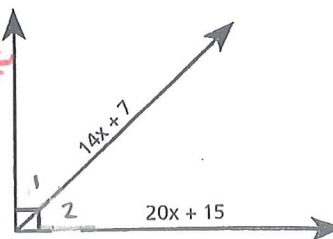
②  $\angle L$  and  $\angle M$  are complementary.

Geo:  $\angle 1 + \angle 2 = 90^\circ$  Justification: def of Right  $\angle$  OR Compl.

$$14x + 7 + 20x + 15 = 90 \text{ Subst.}$$

$$34x + 22 = 90 \text{ CLT}$$

$$34x = 68 \quad \boxed{x=2}$$



$$m\angle 1 = 35^\circ, m\angle 2 = 55^\circ$$

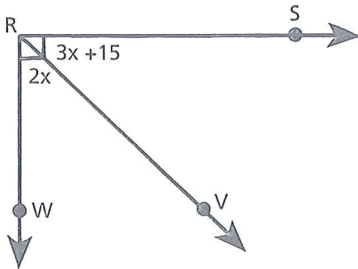
$$\angle 1 = 14(2) + 7 \quad \angle 2 = 20(2) + 15$$

Name Key Date \_\_\_\_\_

# More Applications of Algebra

Use properties of angles to write and solve algebraic equations.

1



$x = 15$

$\angle SRV$  and  $\angle WRV$  are complementary. *def of compl.*

$m\angle SRV + m\angle WRV = 90^\circ$  *def of compl.*

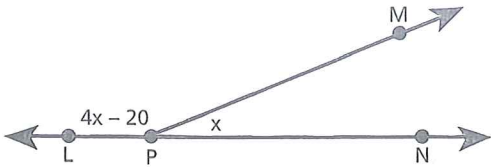
$3x + 15 + 2x = 90^\circ$

$5x + 15 = 90^\circ$

$5x = 75 \quad x = 15$

$m\angle SRV = \underline{40^\circ}$ ,  $m\angle WRV = \underline{30^\circ}$   
 $= 3(15) + 15 \qquad = 2(15)$

2



$x = 40$

$\angle MPN + \angle LPM = 180^\circ$  *linear pairs are suppl.*

$\angle MPN$  and  $\angle LPM$  are linear.

$4x - 20 + x = 180^\circ$

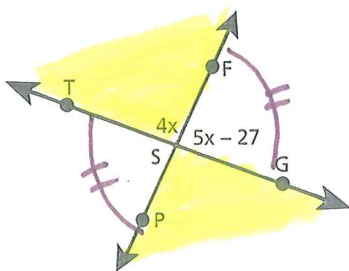
$5x - 20 = 180$

$5x = 200$

$x = 40$

$m\angle MPN = \underline{40^\circ}$ ,  $m\angle LPM = \underline{140^\circ}$   
 $= x \qquad 4(40) - 20$

3



$x = 23$

$\overleftrightarrow{TG}$  and  $\overleftrightarrow{FP}$  intersect at Point S.

$\angle TSF + \angle FSG = 180$  *linear pairs are suppl.*

$4x + 5x - 27 = 180$

$9x - 27 = 180$

$9x = 207$

$x = 23$

$m\angle FSG = \underline{88^\circ}$ ,  $m\angle FST = \underline{92^\circ}$   
 $5(23) - 27 \qquad 4(23)$

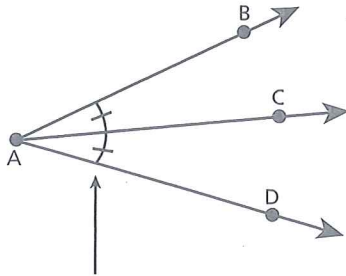
$m\angle PSG = \underline{92^\circ}$ ,  $m\angle PST = \underline{88^\circ}$

$\angle PSG \cong \angle FST$  *Vertical  $\angle$ s are  $\cong$*   
 $\angle PST \cong \angle FSG$  *Vertical  $\angle$ s are  $\cong$*



# Angle Bisectors

An **angle bisector** is a segment or ray in the interior of an angle that divides it into two congruent angles.



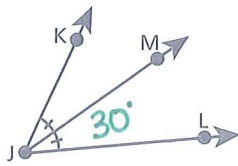
The matching arcs identify congruent angles.

Ray AC bisects angle BAD.  
AC bisects  $\angle BAD$

$$m\angle BAC = m\angle CAD$$

If  $m\angle BAD = 42^\circ$ ,  
then  $m\angle BAC = 21^\circ$   
and  $m\angle CAD = 21^\circ$ .

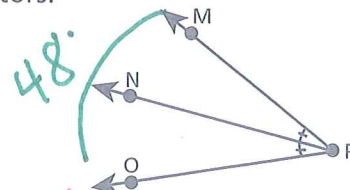
Use the diagrams to answer the questions about angle bisectors.



1 JM bisects  $\angle KJL$ .

2  $\angle KJM = \angle MJL$

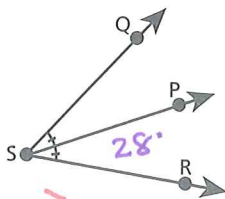
3 If  $m\angle MJL = 30^\circ$ , then  
 $m\angle KJL = 60^\circ$  and  
 $m\angle KJM = 30^\circ$



4 PN bisects  $\angle MPO$ .

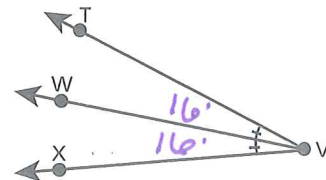
5  $\angle MPN = \angle NPO$

6 If  $m\angle MPO = 48^\circ$ , then  
 $m\angle MPN = \frac{1}{2} 48 = 24^\circ$  and  
 $m\angle NPO = 24^\circ$



7 SP bisects  $\angle QSR$ .

8 If  $m\angle PSR = 28^\circ$ , then  
 $m\angle QSR = 56^\circ$  and  
 $m\angle QSP = 28^\circ$

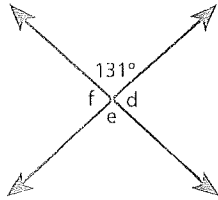


9  $\angle TVW = \angle WVX$

10 If  $m\angle TVW = 16^\circ$ , then  
 $\angle WVX = 16^\circ$  and  
 $\angle TVX = 32^\circ$

# Determine Missing Angles

Use what you know about complementary, supplementary, and vertical angles to determine the missing angle measures.



Vertical angles are congruent. ←

Therefore,  $e = 131^\circ$ .

The sum of linear supplemental angles is equal to  $180^\circ$ .

Therefore,  $e + f = 180^\circ$ .

$$131^\circ + f = 180^\circ$$

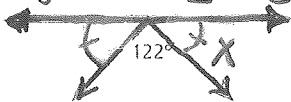
$$f = 49^\circ$$

Angles  $f$  and  $d$  are vertical.

Therefore,  $d = 49^\circ$ .

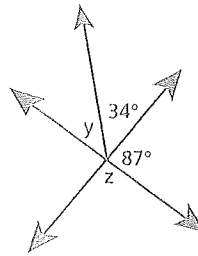
Find the missing  $\angle$  measures. Show the geometry + justification.

1



$$x = \underline{\hspace{2cm}}$$

2



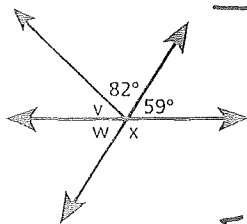
$$m\angle y = \underline{\hspace{2cm}}$$

$$m\angle z = \underline{\hspace{2cm}}$$

Find z

Justification

3



$$m\angle v = \underline{\hspace{2cm}}$$

$$m\angle x = \underline{\hspace{2cm}}$$

$$m\angle w = \underline{\hspace{2cm}}$$

Find x

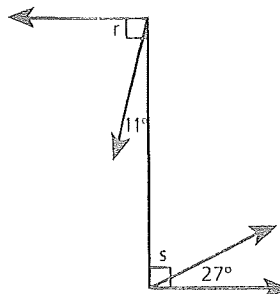
Justification:

Find v:

Justification:

Find w:

Justification:

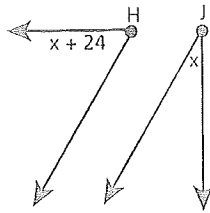


$$m\angle r = \underline{\hspace{2cm}}$$

$$m\angle s = \underline{\hspace{2cm}}$$

# Angles and Algebra

Use algebraic equations to find a missing angle measure.



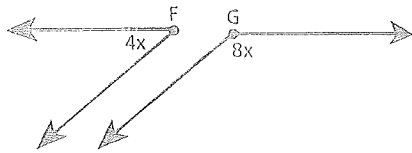
$\angle J$  and  $\angle H$  are complementary.

Geometry:  $\angle J + \angle H = 90$  Justification: def of compl.  
 $m\angle J = x$   
 $m\angle H = x + 24$   
 $x + x + 24 = 90^\circ$   
 $2x + 24 = 90^\circ$   
 $2x = 66^\circ$   
 $x = 33^\circ$   
 $m\angle J = 33^\circ, m\angle H = 57^\circ$

Write and solve an equation to find the value of  $x$ . Show geometry + justifications!

1

$\angle F$  and  $\angle G$  are supplementary. Geometry Justification



$m\angle F = \underline{\hspace{2cm}}, m\angle G = \underline{\hspace{2cm}}$

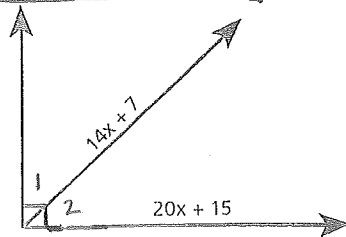
Geometry

Justification

2

$x = \underline{\hspace{2cm}}$

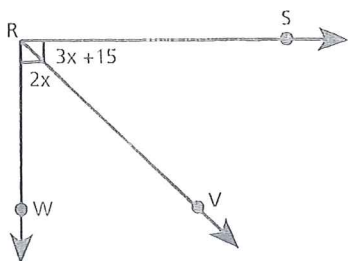
$m\angle 1 = \underline{\hspace{2cm}}, m\angle 2 = \underline{\hspace{2cm}}$



# More Applications of Algebra

Use properties of angles to write and solve algebraic equations. *Show your geometry AND Justifications!*

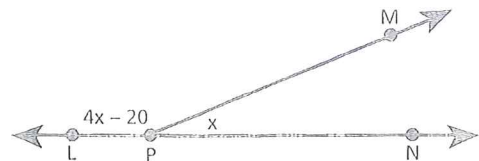
1



$m\angle SRV = \underline{\hspace{2cm}}, m\angle WRV = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$

2

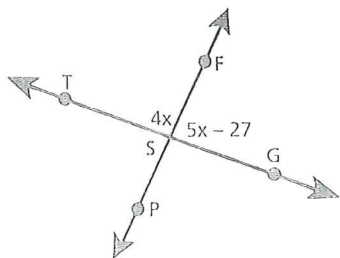


$m\angle MPN = \underline{\hspace{2cm}}, m\angle LPM = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$

3

$\overleftrightarrow{TG}$  and  $\overleftrightarrow{FP}$  intersect at Point S.



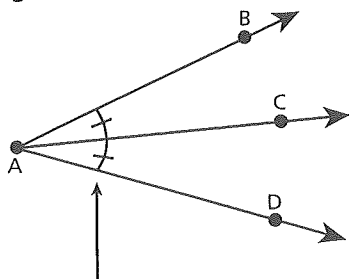
$m\angle FSG = \underline{\hspace{2cm}}, m\angle FST = \underline{\hspace{2cm}}$

$m\angle PSG = \underline{\hspace{2cm}}, m\angle PST = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$

# Angle Bisectors

An **angle bisector** is a segment or ray in the interior of an angle that divides it into two congruent angles.



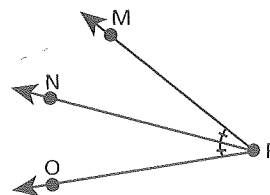
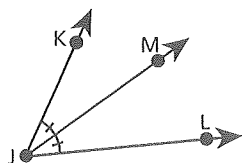
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 $\overrightarrow{AC}$  bisects  $\angle BAD$

$$m\angle BAC = m\angle CAD$$

If  $m\angle BAD = 42^\circ$ ,  
 then  $m\angle BAC = 21^\circ$   
 and  $m\angle CAD = 21^\circ$ .

Use the diagrams to answer the questions about angle bisectors.



1 \_\_\_\_\_ bisects  $\angle KJL$ .

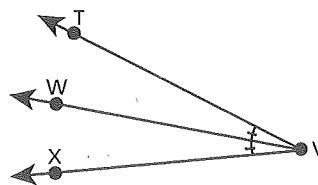
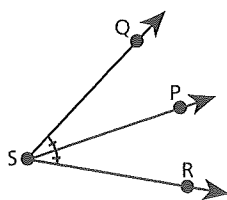
4 \_\_\_\_\_ bisects  $\angle MPO$ .

2 \_\_\_\_\_ = \_\_\_\_\_

5 \_\_\_\_\_ = \_\_\_\_\_

3 If  $m\angle MJL = 30^\circ$ , then  
 $m\angle KJL =$  \_\_\_\_\_ and  
 $m\angle KJM =$  \_\_\_\_\_

6 If  $m\angle MPO = 48^\circ$ , then  
 $m\angle MPN =$  \_\_\_\_\_ and  
 $m\angle NPO =$  \_\_\_\_\_



7 \_\_\_\_\_ bisects  $\angle QSR$ .

9 \_\_\_\_\_ = \_\_\_\_\_

8 If  $m\angle PSR = 28^\circ$ , then  
 $m\angle QSR =$  \_\_\_\_\_ and  
 $m\angle QSP =$  \_\_\_\_\_

10 If  $m\angle TVW = 16^\circ$ , then  
 $\angle WVX =$  \_\_\_\_\_ and  
 $\angle TVX =$  \_\_\_\_\_