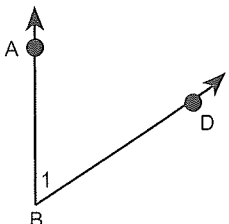
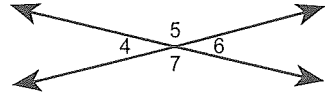


Angles (\angle)

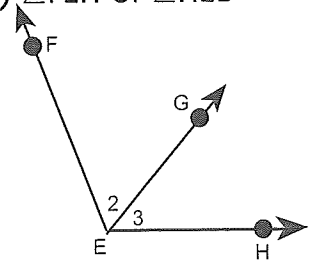


B is the vertex.
 \overrightarrow{BA} & \overrightarrow{BD} are the sides.
 4 names for the angle:
 $\angle 1$, $\angle B$, $\angle ABD$, $\angle DBA$

Names for each angle:
 1) $\angle 2$ or $\angle FEG$ or $\angle GEF$
 2) $\angle 3$ or $\angle GEH$ or $\angle HEG$
 3) $\angle FEH$ or $\angle HEB$

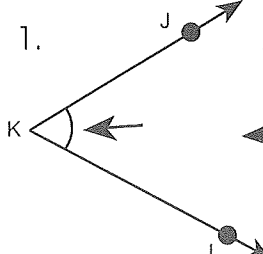


Vertical angle pairs:
 $\angle 4$ & $\angle 6$; $\angle 5$ & $\angle 7$
 Adjacent angle pairs:
 $\angle 4$ & $\angle 5$; $\angle 6$ & $\angle 7$

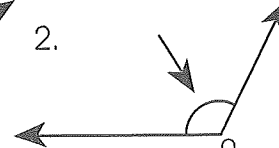


Name the indicated angle.

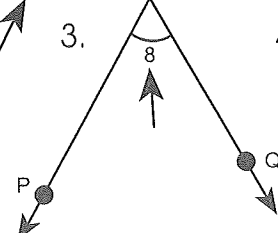
1.



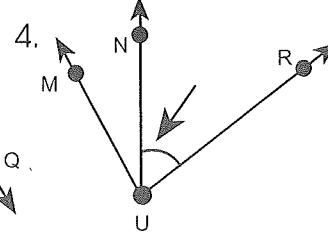
2.



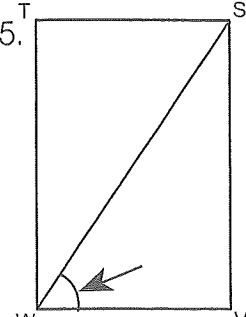
3.



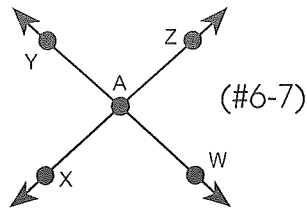
4.



5.

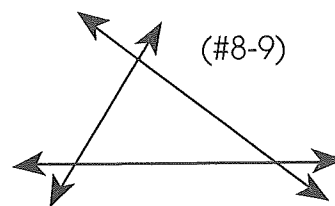


6. Name 2 pairs of vertical angles.



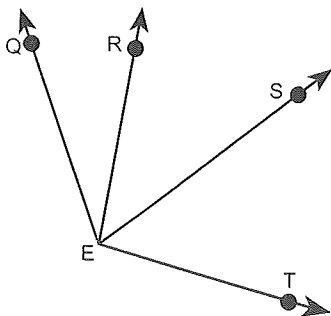
7. Name 4 pairs of adjacent angles.

8. How many pairs of vertical angles are pictured?

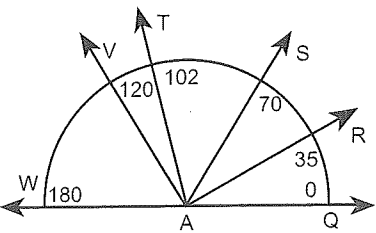


9. How many pairs of adjacent angles are pictured?

10. Name 2 angles adjacent to $\angle RES$.



Congruence of Angles and Addition Properties



Angle Measures

$m\angle QAT = 102 - 0 = 102$

$m\angle TAR = 102 - 35 = 67$

$m\angle WAV = 180 - 120 = 60$

Congruence

$m\angle SAR = 35, m\angle RAQ = 35$

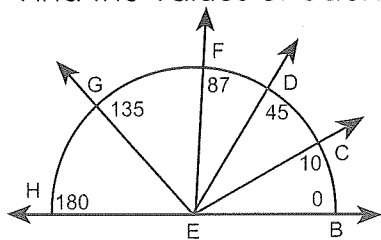
$\angle SAR \cong \angle RAQ$

Angle Addition

$m\angle VAT + m\angle TAS = m\angle VAS$

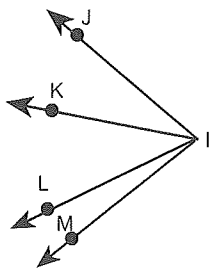
$18 + 32 = 50$

Find the values of each of the following.



1. $m\angle CEB =$ _____
2. $m\angle FED =$ _____
3. $m\angle BEG =$ _____
4. $m\angle HEF =$ _____
5. $m\angle BEC + m\angle CEF =$ _____

6. $m\angle DEF + m\angle GEF =$ _____
7. $m\angle HEG + m\angle CED =$ _____
8. $m\angle GEB - m\angle DEB =$ _____
9. $m\angle GED + m\angle DEC =$ _____
10. $m\angle HEG + m\angle FEC =$ _____
11. $m\angle HEF - m\angle HEG =$ _____
12. $m\angle GED + m\angle DEC - m\angle FED =$ _____
13. $m\angle HEG + m\angle CEF - m\angle BEC =$ _____
14. $m\angle BEG - m\angle FED - m\angle BEC =$ _____
15. Name a pair of congruent angles. _____



16. Name the angle with the greatest measure. _____
17. $m\angle JIK + m\angle KIL =$ _____
18. $m\angle MIL + m\angle LIJ =$ _____
19. $m\angle KIJ = 28$ & $m\angle LIK = 39$; $m\angle LIJ =$ _____

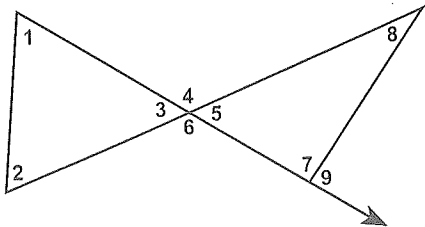
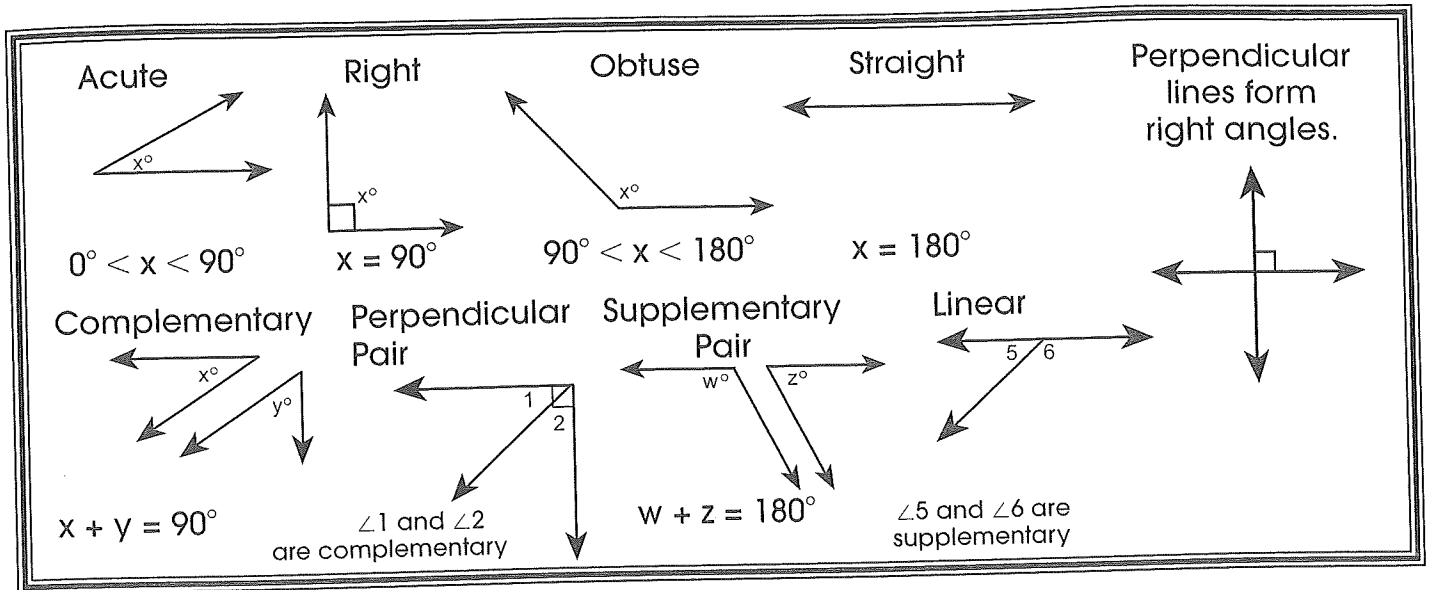
20. $m\angle MIJ = 81$ & $m\angle MIL = 12$; $m\angle LIJ =$ _____

Find x.

21. $m\angle KIL = 2x$; $m\angle LIM = x$; $m\angle KIM = 4x - 17$ $x =$ _____

22. $m\angle JIK = x$; $m\angle KIL = 3x + 5$; $m\angle JIL = 5x - 15$ $x =$ _____

Classifying Angles



In the figure, $m\angle 7 = 90^\circ$

- Name the angles which appear to be:
 - acute
 - obtuse
 - right

- Name five pairs of supplementary angles. _____
- $\angle 7$ and $\angle 9$ form a _____.

$\angle 10$ and $\angle 11$ are complementary angles.

- $m\angle 10 = 32^\circ$; $m\angle 11 = \underline{\hspace{2cm}}$
- $m\angle 11 = 72^\circ$; $m\angle 10 = \underline{\hspace{2cm}}$
- $m\angle 10 = 4x$; $m\angle 11 = 2x$; $x = \underline{\hspace{2cm}}$
- $m\angle 10 = x$; $m\angle 11 = x + 20$; $x = \underline{\hspace{2cm}}$

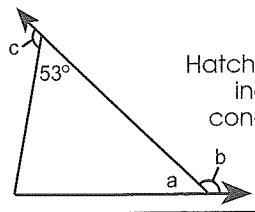
$\angle 12$ and $\angle 13$ are supplementary angles.

- $m\angle 12 = 2y$; $m\angle 13 = 3y - 15$; $y = \underline{\hspace{2cm}}$
- $m\angle 12 = y + 10$; $m\angle 13 = 3y + 10$; $y = \underline{\hspace{2cm}}$
- The measure of $\angle 12$ is five times the measure of $\angle 13$. Find the measure of each angle.

$\angle 13$ and $\angle 14$ are complementary angles, and $\angle 14$ and $\angle 15$ are supplementary angles.

- $m\angle 13 = 47^\circ$; $m\angle 14 = \underline{\hspace{2cm}}$; $m\angle 15 = \underline{\hspace{2cm}}$
- $m\angle 14 = 78^\circ$; $m\angle 13 = \underline{\hspace{2cm}}$; $m\angle 15 = \underline{\hspace{2cm}}$
- $m\angle 15 = 135^\circ$; $m\angle 13 = \underline{\hspace{2cm}}$; $m\angle 14 = \underline{\hspace{2cm}}$

Mixed Practice with Angles



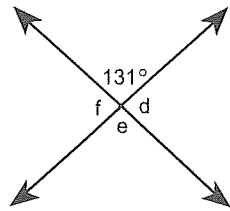
Find the measure of the lettered angles.

Hatch marks indicate congruent parts.

$c = 180 - 53 = 127^\circ$

$b = c = 127^\circ$

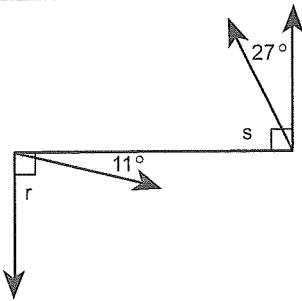
$a = 180 - b = 180 - 127 = 53^\circ$

1. 

$d =$ _____

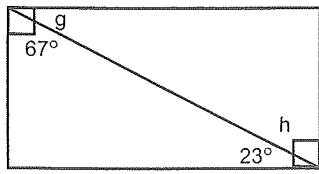
$e =$ _____

$f =$ _____

7. 

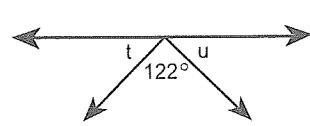
$r =$ _____

$s =$ _____

2. 

$g =$ _____

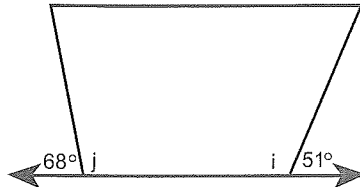
$h =$ _____

8. 

$\angle t \cong \angle u$

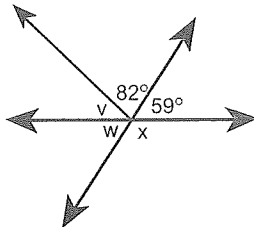
$t =$ _____

$u =$ _____

3. 

$i =$ _____

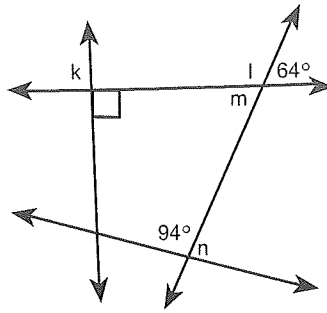
$j =$ _____

9. 

$v =$ _____

$w =$ _____

$x =$ _____

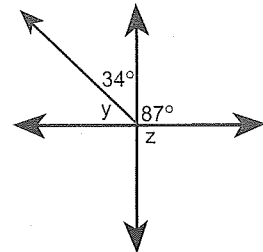
4. 

$k =$ _____

$l =$ _____

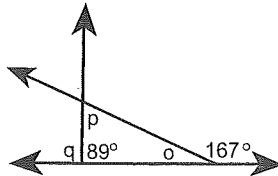
$m =$ _____

$n =$ _____

10. 

$y =$ _____

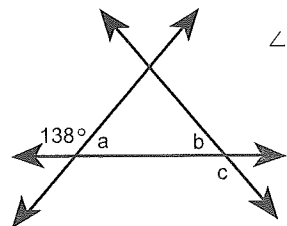
$z =$ _____

5. 

$o =$ _____

$p =$ _____

$q =$ _____

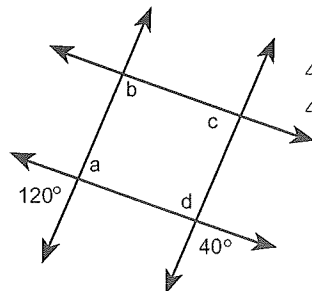
11. 

$\angle a$ is complementary to $\angle b$

$a =$ _____

$b =$ _____

$c =$ _____

6. 

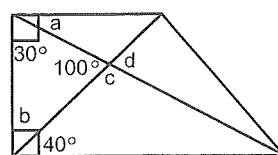
$\angle a$ is supplementary to $\angle b$

$\angle c$ is supplementary to $\angle d$

$a =$ _____

$b =$ _____

$c =$ _____

12. 

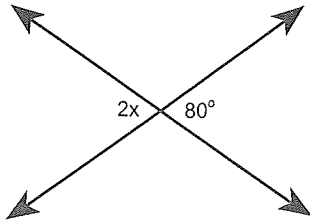
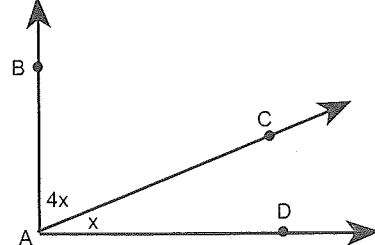
$a =$ _____

$b =$ _____

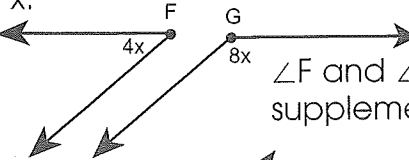
$c =$ _____

$d =$ _____

Algebra Applications with Angles

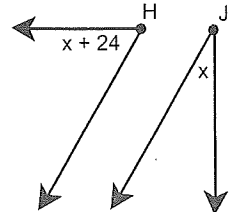
 <p style="text-align: center;">Find x. (Note: Vertical angles are congruent.)</p> <p style="text-align: center;">$2x = 80$ $x = 40$</p>	 <p style="text-align: right;">$m\angle BAD = 90$</p> <p style="text-align: center;">$x + 4x = 90$ $x = 18$</p>
---	---

1. Find x.



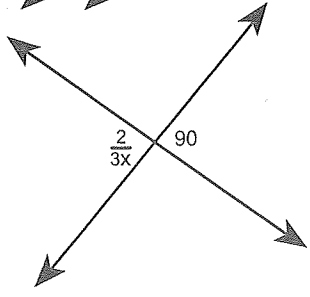
$\angle F$ and $\angle G$ are supplementary.

7.

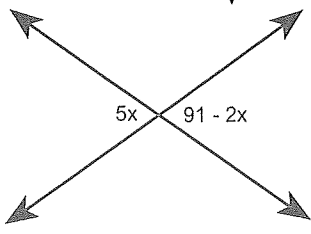


$\angle H$ and $\angle J$ are complementary.

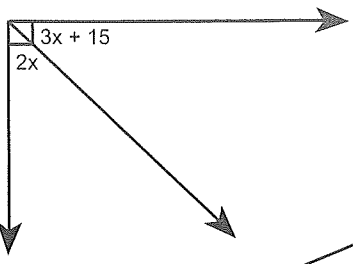
2.



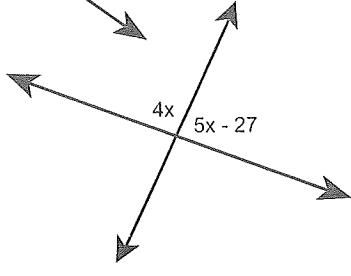
8.



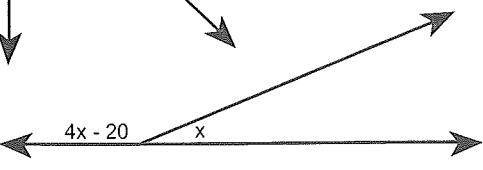
3.



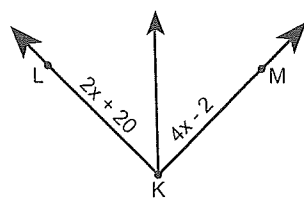
9.



4.

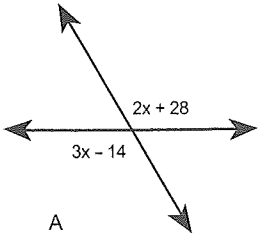


10.

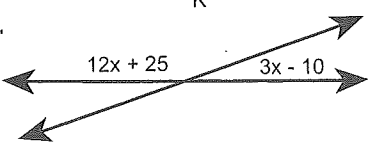


$\angle LKM$ is a right angle.

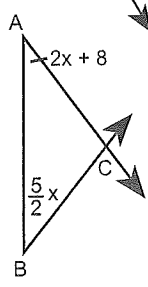
5.



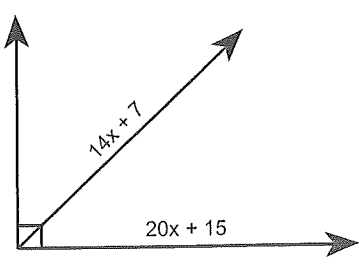
11.



6.



12.



Answer Key

9

Angles (\angle)

B is the vertex.
BA & BD are the sides.
4 names for the angle:
 $\angle 1, \angle B, \angle ABD, \angle DBA$

Names for each angle:
1) $\angle 2$ or $\angle FEG$ or $\angle GEF$
2) $\angle 3$ or $\angle GEH$ or $\angle HEG$
3) $\angle FEH$ or $\angle HEB$

Vertical angle pairs:
 $\angle 4$ & $\angle 6$; $\angle 5$ & $\angle 7$
Adjacent angle pairs:
 $\angle 4$ & $\angle 5$; $\angle 6$ & $\angle 7$

Name the Indicated angle.

- $\angle JKL$ 2. $\angle LKJ$ 3. $\angle 8$ 4. $\angle RUN$ 5. $\angle SWV$
- $\angle LKJ$ 3. $\angle 8$ 4. $\angle RUN$ 5. $\angle SWV$
- $\angle LKJ$ 3. $\angle 8$ 4. $\angle RUN$ 5. $\angle SWV$
- $\angle LKJ$ 3. $\angle 8$ 4. $\angle RUN$ 5. $\angle SWV$
- $\angle LKJ$ 3. $\angle 8$ 4. $\angle RUN$ 5. $\angle SWV$

6. Name 2 pairs of vertical angles.
 $\angle YAZ$ & $\angle XAW$, $\angle YAX$ & $\angle ZAW$

7. Name 4 pairs of adjacent angles.
 $\angle WAX$ & $\angle XAY$, $\angle XAY$ & $\angle YAZ$
 $\angle YAZ$ & $\angle ZAW$, $\angle ZAW$ & $\angle WAX$

8. How many pairs of vertical angles are pictured?
6

9. How many pairs of adjacent angles are pictured?
12

10. Name 2 angles adjacent to $\angle RES$.
 $\angle QER$
 $\angle SET$

10

Congruence of Angles and Addition Properties

Angle Measures
 $m\angle QAT = 102 - 0 = 102$
 $m\angle TAR = 102 - 35 = 67$
 $m\angle WAW = 180 - 120 = 60$

Congruence
 $m\angle SAR = 35$, $m\angle RAQ = 35$
 $\angle SAR \cong \angle RAQ$

Angle Addition
 $m\angle VAT + m\angle TAS = m\angle VAS$
 $18 + 32 = 50$

Find the values of each of the following.

- $m\angle CEB = 10^\circ$ 3. $m\angle BEG = 135^\circ$
- $m\angle FED = 42^\circ$ 4. $m\angle HEF = 93^\circ$
- $m\angle BEC + m\angle CEF = 87^\circ$
- $m\angle DEF + m\angle GEF = 90^\circ$ 7. $m\angle HEG + m\angle CED = 80^\circ$
- $m\angle GEB$ $m\angle DEB = 90^\circ$ 9. $m\angle GED + m\angle DEC = 125^\circ$
- $m\angle HEG + m\angle FEC = 122^\circ$ 11. $m\angle HEF - m\angle HEG = 48^\circ$
- $m\angle GED + m\angle DEC - m\angle FED = 83^\circ$
- $m\angle HEG + m\angle CEF$ $m\angle BEC = 112^\circ$
- $m\angle BEG - m\angle FED$ $m\angle BEC = 83^\circ$
- Name a pair of congruent angles. $\angle HEG \cong \angle DEB$
- Name the angle with the greatest measure. $\angle JIM$
- $m\angle JIK + m\angle KIL = m\angle JIL$
- $m\angle MIL + m\angle LIJ = m\angle MIJ$
- $m\angle KIJ = 28$ & $m\angle LIK = 39$; $m\angle LIJ = 67^\circ$
- $m\angle MIJ = 81$ & $m\angle MIL = 12$; $m\angle LIJ = 69^\circ$

Find x.

- $m\angle KIL = 2x$; $m\angle LIM = x$; $m\angle KIM = 4x$ 17 $x = 17^\circ$
- $m\angle JIK = x$; $m\angle KIL = 3x + 5$; $m\angle JIL = 5x$ 15 $x = 20^\circ$

11

Classifying Angles

Acute
 $0^\circ < x < 90^\circ$

Right
 $x = 90^\circ$

Obtuse
 $90^\circ < x < 180^\circ$

Straight
 $x = 180^\circ$

Perpendicular lines form right angles.

Complementary Pair: $x + y = 90^\circ$ (1 and 2 are complementary)

Supplementary Pair: $w + z = 180^\circ$ (5 and 6 are supplementary)

Linear Pair: $x + y = 180^\circ$

In the figure, $m\angle 7 = 90^\circ$ a. $\angle 1, \angle 2, \angle 3, \angle 5, \angle 8$
b. $\angle 4, \angle 6$ c. $\angle 7, \angle 9$

- Name the angles which appear to be:
a. acute b. obtuse c. right
- Name five pairs of supplementary angles. 2. $\angle 3$ & $\angle 4, \angle 4$ & $\angle 5$,
3. $\angle 7$ and $\angle 9$ form a straight angle $\angle 5$ & $\angle 6, \angle 6$ & $\angle 3$
 $\angle 7$ & $\angle 9$
- $\angle 10$ and $\angle 11$ are complementary angles.
4. $m\angle 10 = 32^\circ$; $m\angle 11 = 58^\circ$
5. $m\angle 11 = 72^\circ$; $m\angle 10 = 18^\circ$
6. $m\angle 10 = 4x$; $m\angle 11 = 2x$; $x = 15$
7. $m\angle 10 = x$; $m\angle 11 = x + 20$; $x = 35$
- $\angle 12$ and $\angle 13$ are supplementary angles.
8. $m\angle 12 = 2y$; $m\angle 13 = 3y - 15$; $y = 39$
9. $m\angle 12 = y + 10$; $m\angle 13 = 3y + 10$; $y = 40$
10. The measure of $\angle 12$ is five times the measure of $\angle 13$. Find the measure of each angle. $\angle 13 = 30^\circ, \angle 12 = 150^\circ$
- $\angle 13$ and $\angle 14$ are complementary angles, and $\angle 14$ and $\angle 15$ are supplementary angles.
11. $m\angle 13 = 47^\circ$; $m\angle 14 = 43^\circ$; $m\angle 15 = 137^\circ$
12. $m\angle 14 = 78^\circ$; $m\angle 13 = 12^\circ$; $m\angle 15 = 102^\circ$
13. $m\angle 15 = 135^\circ$; $m\angle 13 = 45^\circ$; $m\angle 14 = 45^\circ$

12

Mixed Practice with Angles

Find the measure of the lettered angles.
Hatch marks indicate congruent parts

$c = 180 - 53 = 127^\circ$
 $b = c = 127^\circ$
 $a = 180 - b = 180 - 127 = 53^\circ$

- $d = 49^\circ$, $e = 131^\circ$, $f = 49^\circ$
- $g = 23^\circ$, $h = 67^\circ$
- $i = 129^\circ$, $j = 112^\circ$
- $k = 90^\circ$, $l = 116^\circ$, $m = 64^\circ$, $n = 86^\circ$
- $o = 13^\circ$, $p = 78^\circ$, $q = 91^\circ$
- $a = 120^\circ$, $b = 60^\circ$, $c = 140^\circ$
- $r = 79^\circ$, $s = 63^\circ$
- $t = 29^\circ$, $u = 29^\circ$
- $v = 39^\circ$, $w = 59^\circ$, $x = 121^\circ$
- $y = 59^\circ$, $z = 93^\circ$
- a is complementary to b , $a = 42^\circ$, $b = 48^\circ$, $c = 132^\circ$
- $a = 60^\circ$, $b = 50^\circ$, $c = 80^\circ$, $d = 100^\circ$

Answer Key

Algebra Applications with Angles 13

Find x .
(Note: Vertical angles are congruent.)

$2x = 80$ $x = 40$

$m\angle BAD = 90$
 $x + 4x = 90$ $x = 18$

Find x .

- $\angle F$ and $\angle G$ are supplementary. 33
 $\angle H$ and $\angle J$ are complementary.
- 13
- 23
- 12 $\angle LKM$ is a right angle.
- 11
- 2
- 11
- 11
- 2
- 11
- 2
- 2

Triangles (Δ) 14

Acute Δ : 3 acute \angle s
Obluse Δ : 1 obtuse \angle
Right Δ : 1 right \angle (90°), 2 legs (XZ & YZ), 1 hypotenuse (XY)
Equilateral Δ : 3 \cong sides (60°)
Scalene Δ : No \cong sides
Isosceles Δ : At least 2 \cong sides ($\overline{FE} \cong \overline{EV}$), Congruent sides - legs, Third side - base (PV), 1 and 2 - base angles, 3 - vertex angle

Classify each triangle by its angles and by its sides.

- Rt. isos.
- Rt. sca.
- Acu. sca.
- Obt. isos.
- Equ. Acu.
- Rt. sca.
- Obt. sca.
- Acu. sca.
- Equ. Acu.

10. a. Name all equilateral triangles.
b. Name all isosceles triangles.
c. Name all scalene triangles.

a. ΔPAR , ΔCMH
b. ΔPAR , ΔCMH
c. ΔRCH , ΔHMA , ΔCPM

11. True or false: an equilateral triangle is always isosceles.

Congruence of Triangles 15

$\triangle ABC \cong \triangle DEF$

Corresponding Parts \cong
 $\overline{AB} \cong \overline{DE}$ $\angle A \cong \angle D$
 $\overline{BC} \cong \overline{EF}$ $\angle B \cong \angle E$
 $\overline{AC} \cong \overline{DF}$ $\angle C \cong \angle F$

- $\angle X \cong \angle S$, $\angle Y \cong \angle T$, $\angle Z \cong \angle R$
- $\overline{XY} \cong \overline{ST}$, $\overline{XZ} \cong \overline{SR}$, $\overline{YZ} \cong \overline{TR}$
- 4, 5, 7, 8 are true. 6 is false.
- $\overline{ML} \cong \overline{BV}$, $\overline{LB} \cong \overline{VM}$, $\overline{MB} \cong \overline{BM}$, $\angle LMB \cong \angle VBM$, $\angle BLM \cong \angle MVB$, $\angle LBM \cong \angle VMB$
- $\overline{LM} \cong \overline{VB}$, $\overline{MP} \cong \overline{BP}$, $\overline{LP} \cong \overline{VP}$, $\angle LMP \cong \angle VBP$, $\angle MPL \cong \angle VPB$, $\angle PLM \cong \angle PVB$
- $\overline{LP} \cong \overline{VP}$, $\overline{PB} \cong \overline{PM}$, $\overline{LB} \cong \overline{VM}$, $\angle LPB \cong \angle VPM$, $\angle PBL \cong \angle PMV$, $\angle BLP \cong \angle LMV$
- $\overline{MJ} \cong \overline{TJ}$, $\overline{MB} \cong \overline{TC}$, $\overline{JB} \cong \overline{JC}$, $\angle MJB \cong \angle TJC$, $\angle JBM \cong \angle JCT$, $\angle BMJ \cong \angle CTJ$
- $\overline{TK} \cong \overline{MA}$, $\overline{KJ} \cong \overline{AJ}$, $\overline{TJ} \cong \overline{MJ}$, $\angle K TJ \cong \angle AMJ$, $\angle TJK \cong \angle MJA$, $\angle JKT \cong \angle JAM$, $\angle KTJ \cong \angle JMA$
- $\overline{CB} \cong \overline{DF}$, $\overline{CD} \cong \overline{DE}$, $\overline{BD} \cong \overline{EF}$, $\angle CBD \cong \angle DFE$, $\angle BDC \cong \angle FED$, $\angle DCE \cong \angle EDF$
- $\overline{BA} \cong \overline{BD}$, $\overline{BF} \cong \overline{BF}$, $\overline{AF} \cong \overline{DF}$, $\angle BAF \cong \angle BDF$, $\angle AFB \cong \angle DFB$, $\angle FBA \cong \angle FBD$
- $\overline{CB} \cong \overline{FB}$, $\overline{FD} \cong \overline{CD}$, $\overline{BD} \cong \overline{BD}$, $\angle CBD \cong \angle DFE$, $\angle BCD \cong \angle BFD$, $\angle CBD \cong \angle DBF$, $\angle BDC \cong \angle BDF$

Symmetry 16

Symmetry is a type of balance some figures have. If these figures are moved in a specified way, the image will coincide with the figure.

symmetric about line m symmetric about point Q

Identify the following as symmetric or not symmetric.

- symmetric
- Not
- Not
- Not
- symmetric
- symmetric
- symmetric
- symmetric
- Not
- symmetric