

# Answer Key

Suggested Methods:

27

List the labeled sides from shortest to longest.

28

Find the indicated squares.

1.  $11^2$  121    2.  $8^2$  64    3.  $4^2$  16    4.  $(\frac{1}{2})^2$   $\frac{1}{4}$   
 5.  $1.1^2$  1.21    6.  $1^2$  1    7.  $5^2$  25    8.  $6^2$  36  
 9.  $2.3^2$  5.29    10.  $1.2^2$  1.44    11.  $(\frac{2}{3})^2$   $\frac{4}{9}$     12.  $(\frac{1}{4})^2$   $\frac{1}{16}$

Find the indicated square roots.

13.  $\sqrt{4}$  2    14.  $\sqrt{81}$  9    15.  $\sqrt{100}$  10    16.  $\sqrt{64}$  8  
 17.  $\sqrt{121}$  11    18.  $\sqrt{25}$  5    19.  $\sqrt{9}$  3    20.  $\sqrt{49}$  7  
 21.  $\sqrt{16}$  4    22.  $\sqrt{1.44}$  1.2    23.  $\sqrt{\frac{1}{9}}$   $\frac{1}{3}$     24.  $\sqrt{\frac{4}{25}}$   $\frac{2}{5}$

Simplify each of the following. Circle the answer in each row of problems that does not belong. Write the corresponding letter above the problem number below.

25. N  $\sqrt{200}$   $10\sqrt{2}$  L  $4\sqrt{50}$   $20\sqrt{2}$  S  $2\sqrt{50}$   $10\sqrt{2}$   
 26. T  $\sqrt{720}$   $12\sqrt{5}$  A  $12\sqrt{60}$   $24\sqrt{15}$  Q  $4\sqrt{45}$   $12\sqrt{5}$   
 27. R  $10\sqrt{45}$   $30\sqrt{5}$  M  $3\sqrt{50}$   $15\sqrt{2}$  P  $\sqrt{450}$   $15\sqrt{2}$   
 28. Q  $\sqrt{180}$   $6\sqrt{5}$  A  $3\sqrt{20}$   $6\sqrt{5}$  I  $2\sqrt{60}$   $4\sqrt{15}$   
 29. U  $2\sqrt{32}$   $8\sqrt{2}$  D  $\sqrt{96}$   $4\sqrt{6}$  W  $4\sqrt{8}$   $8\sqrt{2}$   
 30. C  $3\sqrt{18}$   $9\sqrt{2}$  E  $\sqrt{216}$   $6\sqrt{6}$  R  $2\sqrt{54}$   $6\sqrt{6}$

A  $\sqrt{\quad}$  is truly  $\frac{R}{27}$   $\frac{A}{26}$   $\frac{D}{29}$   $\frac{I}{28}$   $\frac{C}{30}$   $\frac{A}{26}$   $\frac{L}{25}$  !

29

13. To go from Dukeville to Kartton, you can travel along the two main highways or the direct route along Valley Road.

a. How long is the highway route? 84 miles  
 b. How long is the Valley Road route? 60 miles  
 c. How many miles do you save by taking the direct route? 24 miles

30

# Answer Key

Find the areas of the right triangles below.

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Find the missing side.

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Cross out the correct answers each time they appear below. Use the remaining letters to complete the statement.

28	24	15	10√3	10	90	8	16	6	24
P	S	Y	D	T	H	E	A	R	K
17	5	4√5	20	26	13	36	9	18	45
G	O	R	M	E	A	U	N		
49	7	15	4	120	10	6	60	23	2√15
T	R	I	P	E	L	X	E	S	

Sets of numbers like 3, 4, 5 and 5, 12, 13 are called **PYTHAGOREAN TRIPLES**

Why is this term appropriate? The numbers satisfy the Pythagorean Theorem.

31

Find the missing sides.

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32

Find the missing sides.

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Cross out the correct answers. The remaining letters (one per space) complete the statement.

5	9	3	10	3	3	12	3	12	3
HA	GA	TI	LF	HE	CA	RE	RE	RE	RE
25	25	25	25	20	3	36	36	36	36
TH	TH	AL	EH	BC	FI	YP	PA	PA	PA
11	4	16	5	32	2	7	7	7	7
OT	EN	EN	US	US	TH	E	EV	EV	EV

In a 30-60 degrees right triangle, the side opposite the 30-degree angle is **HALF THE HYPOTENUSE**

33

- Which angle is congruent to:  $\angle U = \angle X$ ,  $\angle T = \angle Y$ ,  $\angle V = \angle W$
  - Which side is congruent to:  $\overline{U} = \overline{YX}$ ,  $\overline{V} = \overline{YW}$ ,  $\overline{W} = \overline{XW}$
  - Write one correct congruence statement.  
 $\triangle TUV \cong \triangle YXW$
- Which angle is congruent to:  $\angle A = \angle X$ ,  $\angle B = \angle Z$ ,  $\angle C = \angle Y$
  - Which side is congruent to:  $\overline{AB} = \overline{XZ}$ ,  $\overline{BC} = \overline{ZY}$ ,  $\overline{CA} = \overline{XY}$
  - Write one correct congruence statement.  
 $\triangle ABC \cong \triangle XYZ$

Complete each congruence:

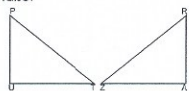
- $\triangle HGI \cong \triangle KLI$
  - $\triangle JKL \cong \triangle IHC$
  - $\triangle IGH \cong \triangle JLK$
  - $\triangle LJK \cong \triangle GIH$
- $\triangle ATM \cong \triangle EKV$
  - $\triangle TMA \cong \triangle KVE$
  - $\triangle MAT \cong \triangle VEK$
  - $\triangle TAM \cong \triangle KEV$

34

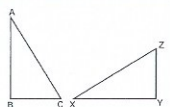
# Answer Key

State whether the following appear to be true or false.

5. a.  $\triangle PUT \cong \triangle RAZ$  T d.  $\triangle TPU \cong \triangle RZA$  F  
 b.  $\triangle TUP \cong \triangle RZA$  F e.  $\triangle UPT \cong \triangle ARZ$  T  
 c.  $\triangle PTU \cong \triangle ARZ$  F f.  $\triangle TUP \cong \triangle ZAR$  T



6. a.  $\triangle ABC \cong \triangle XYZ$  T d.  $\triangle ABC \cong \triangle ZYX$  F  
 b.  $\triangle ACB \cong \triangle YXZ$  F e.  $\triangle BCA \cong \triangle YXZ$  F  
 c.  $\triangle CAB \cong \triangle ZXY$  T f.  $\triangle BAC \cong \triangle YXZ$  T



In  $\triangle CMH$  name the angle included by each pair of sides.

7.  $\overline{CM}$  and  $\overline{HM}$   $\angle M$  8.  $\overline{CH}$  and  $\overline{MC}$   $\angle C$  9.  $\overline{CH}$  and  $\overline{HM}$   $\angle H$

In  $\triangle CMH$  name the side included by each pair of angles.

10.  $\angle C$  and  $\angle M$   $\overline{CM}$  11.  $\angle H$  and  $\angle C$   $\overline{HC}$  12.  $\angle M$  and  $\angle H$   $\overline{MH}$

In  $\triangle BFX$  name the angle included by each pair of sides.

13.  $\overline{BF}$  and  $\overline{XF}$   $\angle F$  14.  $\overline{BF}$  and  $\overline{BX}$   $\angle B$  15.  $\overline{FX}$  and  $\overline{XB}$   $\angle X$

In  $\triangle BFX$  name the side included by each pair of angles.

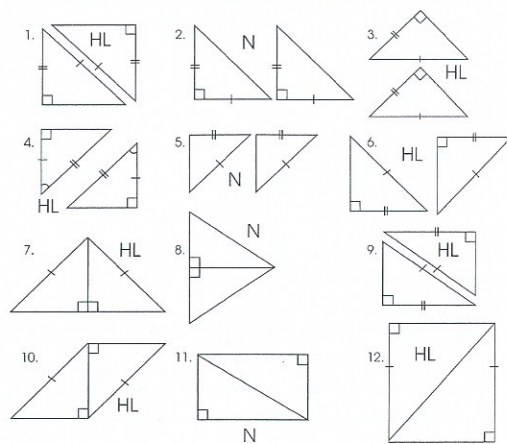
16.  $\angle B$  and  $\angle F$   $\overline{BF}$  17.  $\angle B$  and  $\angle X$   $\overline{BX}$  18.  $\angle X$  and  $\angle F$   $\overline{XF}$

19. If  $\triangle ABC \cong \triangle DEF$ , name the three pairs of corresponding sides and the three pairs of corresponding angles.  
 $\angle A \cong \angle D, \angle B \cong \angle E, \angle C \cong \angle F$   
 $AB \cong DE, BC \cong EF, AC \cong DF$

20. If  $\triangle ABC \cong \triangle XYZ$ , name the three pairs of corresponding sides and the three pairs of corresponding angles.  
 $\angle A \cong \angle X, \angle B \cong \angle Y, \angle C \cong \angle Z$   
 $AB \cong XY, AC \cong XZ, BC \cong YZ$

35

State whether these pairs of triangles are congruent by HL. If not, write N.



36

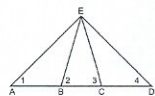


1. If the  $m\angle 2 = 65^\circ$ ,  $m\angle 3 = 65^\circ$   
 2. If the  $m\angle 1 = 106^\circ$ ,  $m\angle 3 = 74^\circ$   
 3. If the  $m\angle 1 = 109^\circ$ ,  $m\angle 5 = 38^\circ$

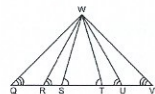


4. If the  $m\angle 5 = 42^\circ$ ,  $m\angle 2 = 69^\circ$ ,  $m\angle 4 = 111^\circ$   
 5. If the  $m\angle 4 = 121.5^\circ$ ,  $m\angle 3 = 58.5^\circ$ ,  $m\angle 5 = 63^\circ$   
 6. If the  $m\angle 1 = 120^\circ$ ,  $m\angle 3 = 60^\circ$ ,  $m\angle 5 = 60^\circ$   
 7. If the  $m\angle 3 = 55.5^\circ$ ,  $m\angle 1 = 124.5^\circ$ ,  $m\angle 5 = 69^\circ$   
 8. If the  $m\angle 2 = x^\circ$ ,  $m\angle 4 = 180^\circ - x$ ,  $m\angle 5 = 180^\circ - 2x$   
 9. If the  $m\angle 4 = y^\circ$ ,  $m\angle 2 = 180^\circ - y$ ,  $m\angle 5 = 180^\circ - 2y$   
 10. If the  $m\angle 5 = z^\circ$ ,  $m\angle 2 = 180^\circ - z$ ,  $m\angle 4 = 180^\circ - z$

Name the correct sides to make the statements.



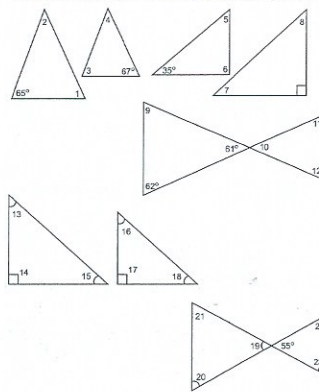
11. If  $\angle 1 \cong \angle 4$ ,  $\overline{AE} \cong \overline{DE}$   
 12. If  $\angle 2 \cong \angle 3$ ,  $\overline{BE} \cong \overline{CE}$   
 13. If  $m\angle 1 = 27^\circ$  and  $m\angle 4 = 27^\circ$ ,  $\overline{AE} \cong \overline{DE}$



14. Name 3 pairs of congruent segments.  $\overline{QW} \cong \overline{WV}$   
 $\overline{WR} \cong \overline{WU}$   
 $\overline{WS} \cong \overline{WT}$   
 15. If  $m\angle QWV = 75^\circ$ ,  $m\angle Q = 52.5^\circ$

37

The triangles are similar as they appear. Find the measure of angles 1-23.



- 1 =  $67^\circ$  12 =  $62^\circ$   
 2 =  $48^\circ$  13 =  $45^\circ$   
 3 =  $65^\circ$  14 =  $90^\circ$   
 4 =  $48^\circ$  15 =  $45^\circ$   
 5 =  $55^\circ$  16 =  $45^\circ$   
 6 =  $90^\circ$  17 =  $90^\circ$   
 7 =  $35^\circ$  18 =  $45^\circ$   
 8 =  $55^\circ$  19 =  $55^\circ$   
 9 =  $57^\circ$  20 =  $55^\circ$   
 10 =  $61^\circ$  21 =  $70^\circ$   
 11 =  $57^\circ$  22 =  $70^\circ$   
 23 =  $55^\circ$

38

# Answer Key

Find the lengths of sides a-f.

$a = 6$     $d = 10.6$   
 $b = 12$     $e = 5$   
 $c = 3.5$     $f = 4.5$

Find each missing measure. The triangles are similar as they appear.

1.  $x = 6$

2.  $x = 21$

3. A flagpole casts a shadow 27 feet long. A person standing nearby casts a shadow 8 feet long. If the person is 6 feet tall, how tall is the flagpole?  $20 \frac{1}{4}$  feet

4. Christopher wants to reduce a triangular pattern with sides 16, 16 and 20 centimeters. If the longest side of the new pattern is to be 15 centimeters, how long should the other 2 sides be?  $12 \text{ cm each}$

5. A 9 foot ladder leans against a building 7 feet above the ground. At what height would a 15 foot ladder touch the building if both ladders form the same angle with the ground?  $11 \frac{2}{3}$  feet

6. A flagpole casts a shadow 24 feet long. A flower standing nearby casts a shadow 3 feet long. If the flagpole is 12 feet tall, how tall is the flower?  $1 \frac{1}{2}$  feet

7. Sam wants to enlarge a triangle with sides 3, 6 and 6 inches. If the shortest side of the new triangle is 13 inches, how long will the other two sides be?  $26 \text{ inches}$

8. A 6 foot ladder leans against a building 4 feet above the ground. At what height would a 15 foot ladder touch the building if both ladders form the same angle with the ground?  $10 \text{ feet}$

39

1.  $x=43^\circ$

2.  $x=28^\circ$ ,  $y=89^\circ$ , not similar

3.  $x=50^\circ$ ,  $y=52^\circ$ ,  $z=78^\circ$ , AA~

Note: Vertical angles are =

4.  $x=36^\circ$ ,  $y=120^\circ$ , not similar

5.  $x=29^\circ$ ,  $y=121^\circ$ ,  $z=29^\circ$ , AA~

6.  $x=66^\circ$ ,  $y=48^\circ$ , AA~

7.  $a=52^\circ$ ,  $b=38^\circ$ , AA~

8.  $a=79^\circ$ ,  $b=47^\circ$ , not similar

9.  $a=55^\circ$ ,  $b=35^\circ$ ,  $c=55^\circ$ , AA~

10.  $a=62^\circ$ ,  $b=62^\circ$ ,  $c=28^\circ$ , not similar

$m\angle ABC = m\angle BCD = 90^\circ$   
 $m\angle CDA = m\angle DAB = 90^\circ$

40

Find the perimeter.

1.  $P = 22$

2.  $P = 36$

3.  $P = 62$

4.  $P = 12$

5.  $P = 24$

6.  $P = 41$

For each pair of similar triangles, find the ratio of the perimeter of the large figure to the perimeter of the smaller.

7.  $\frac{4}{3}$

8.  $\frac{2}{1}$

9.  $\frac{5}{3}$

10.  $\frac{7}{2}$

11.  $\frac{2}{1}$

12.  $\frac{3}{2}$

41

Below is the first stage of a fractal called the **Sierpinski Triangle**. It is created by dividing a triangle into four congruent triangles and shading the center triangle.

Stage 2: Connect the midpoints of the sides of each of the three unshaded triangles. Shade the center triangle of each section.

Stage 3: Repeat the steps of Stage 2 for each of the unshaded triangles.

Stage 4: Repeat the steps of Stage 2 for each of the unshaded triangles.

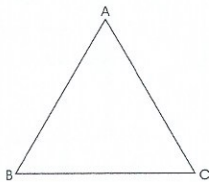
How does the number of unshaded triangles change from step to step?  
Increases by a factor of 3 from step to step.

42

# Answer Key

Work with a partner. Use a ruler and a number cube.

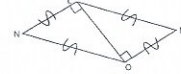
1. Mark any point in the triangle. That mark is the starting point.
2. Roll the number cube. For a roll of:
  - 1 or 2, use vertex A
  - 3 or 4, use vertex B
  - 5 or 6, use vertex C
3. Mark the point halfway between the starting point and the vertex from step 2.
4. Repeat step 2. Mark the point halfway between the point marked in step 3 and the vertex determined by rolling the number cube.
5. Repeat the process approximately 100 times; roll the number cube, mark the point halfway between the last marked point and the appropriate vertex.
6. Describe the resulting pattern. Result will look like a Sierpinski triangle.



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Complete.

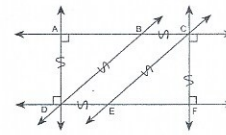
1.  $\overline{LN} \parallel \overline{MO}$
2.  $\overline{ON} \parallel \overline{ML}$
3.  $\overline{OM} \perp \overline{OL}$
4.  $\overline{NL} \perp \overline{OL}$



Tell whether each pair of segments or rays is parallel, perpendicular or neither.

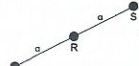
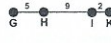


11.  $\overline{AC}$  and  $\overline{DE}$   $\parallel$
12.  $\overline{CE}$  and  $\overline{CF}$   $\perp$
13.  $\overline{CF}$  and  $\overline{AC}$   $\perp$
14.  $\overline{CF}$  and  $\overline{AD}$   $\parallel$
15.  $\overline{DF}$  and  $\overline{AD}$   $\perp$
16.  $\overline{BD}$  and  $\overline{BC}$   $\perp$
17.  $\overline{DF}$  and  $\overline{EC}$   $\parallel$
18.  $\overline{BC}$  and  $\overline{AD}$   $\perp$
19.  $\overline{CE}$  and  $\overline{DB}$   $\parallel$
20.  $\overline{AB}$  and  $\overline{EF}$   $\parallel$



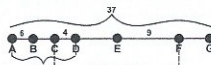
5.  $\overline{QS}$  and  $\overline{TV}$   $\parallel$
6.  $\overline{QP}$  and  $\overline{RQ}$   $\perp$
7.  $\overline{RT}$  and  $\overline{TV}$   $\perp$
8.  $\overline{TU}$  and  $\overline{VT}$   $\perp$
9.  $\overline{QR}$  and  $\overline{TV}$   $\parallel$
10.  $\overline{RU}$  and  $\overline{QP}$   $\parallel$

44



1. If  $RF = 7$ ,  $DF =$  9
2.  $GI =$  14
3. If  $QS = 21$ ,  $RS =$  10.5
4. If  $DF = 5$ ,  $RF =$  3

5. If  $RS = 4.6$ ,  $QR =$  4.6
6.  $\overline{DR} \cong$   $\overline{IK}$
7. If  $QR = 9.7$ ,  $QS =$  19.4
8. If  $RF = 4\frac{3}{8}$ ,  $FD =$   $6\frac{3}{8}$

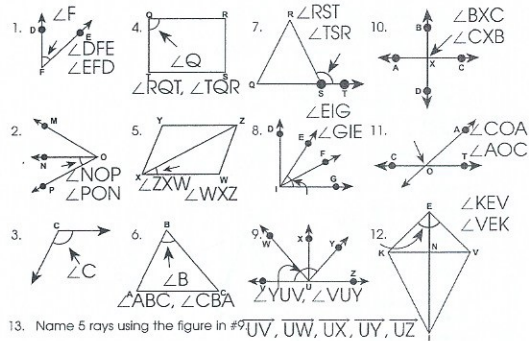


9.  $BC =$  5
10.  $DE =$  6

11.  $FG =$  7
12.  $AF =$  30

13.  $DG =$  22
14.  $\overline{BE} =$   $\overline{AD} = \overline{DF}$

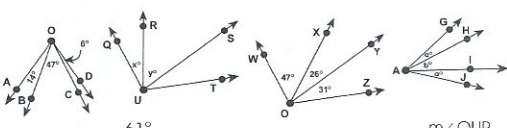
45



13. Name 5 rays using the figure in #9:  $\overrightarrow{UV}$ ,  $\overrightarrow{UW}$ ,  $\overrightarrow{UX}$ ,  $\overrightarrow{UY}$ ,  $\overrightarrow{UZ}$
14. Name 5 segments using the figure in #5:  $\overline{YX}$ ,  $\overline{YZ}$ ,  $\overline{ZW}$ ,  $\overline{WX}$ ,  $\overline{ZX}$
15. Name 8 rays using the figure in #10:  $\overrightarrow{XB}$ ,  $\overrightarrow{XC}$ ,  $\overrightarrow{XA}$ ,  $\overrightarrow{XD}$ ,  $\overrightarrow{BD}$ ,  $\overrightarrow{AC}$ ,  $\overrightarrow{CA}$ ,  $\overrightarrow{DB}$
16. Name 4 segments using the figure in #11:  $\overline{CO}$ ,  $\overline{OA}$ ,  $\overline{OT}$ ,  $\overline{CT}$
17. Name 10 segments using the figure in #12:  $\overline{KN}$ ,  $\overline{NV}$ ,  $\overline{KV}$ ,  $\overline{NE}$ ,  $\overline{NI}$ ,  $\overline{EI}$ ,  $\overline{KE}$ ,  $\overline{EV}$ ,  $\overline{VI}$ ,  $\overline{KI}$

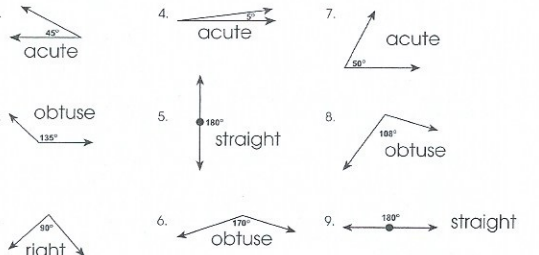
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# Answer Key



- $m\angle AOC = 61^\circ$
- $m\angle BOD = 53^\circ$
- $m\angle AOD = 67^\circ$
- If  $m\angle QUS = 72^\circ$  and  $y = 46^\circ$ ,  $m\angle RUQ = 26^\circ$
- If  $m\angle SUR = 46^\circ$  and  $m\angle SUT = 31^\circ$ ,  $m\angle RUT = 77^\circ$
- If  $m\angle QUR = 26^\circ$  and  $m\angle RUT = 77^\circ$ ,  $m\angle QUT = 103^\circ$
- $m\angle WOZ = 47^\circ$
- $m\angle XOZ = 57^\circ$
- $m\angle YOZ = 57^\circ$
- $m\angle WOZ = m\angle WOY + m\angle YOZ$
- $m\angle XOY + m\angle YOZ = 57^\circ$  or  $m\angle XOZ$
- $m\angle WOY = \frac{m\angle WOZ}{m\angle XOZ} + m\angle XOY$
- If  $m\angle GAH = 15^\circ$ ,  $m\angle IAJ = 15^\circ$
- $m\angle GAZ = m\angle GAL + m\angle LAJ$

47



- acute
- obtuse
- right
- acute
- straight
- obtuse
- acute
- obtuse
- straight

Figure 1

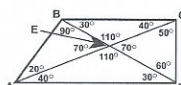
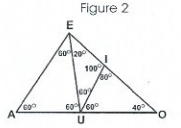


Figure 2

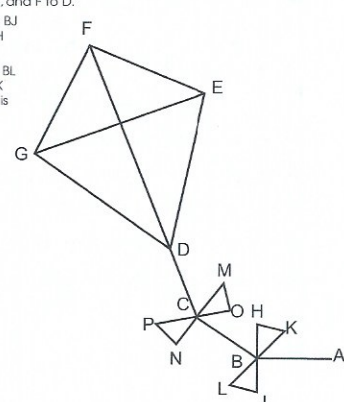


- List 5 acute angles:  $\angle EBC, \angle BCE, \angle ECD, \angle BAE, \angle CDE, \angle EDA$
- List 2 right angles:  $\angle ABE, \angle BCD$
- List 2 obtuse angles:  $\angle AED, \angle BEC$
- List 2 straight angles:  $\angle AEC, \angle BED$
- List 5 acute angles:  $\angle EUA, \angle AEU, \angle EAU, \angle UEI, \angle UIO$
- List 2 obtuse angles:  $\angle AUI, \angle EIU$
- List 2 straight angles:  $\angle EIO, \angle AUO$

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Use a ruler and protractor.

- Locate point A 1 in. from the bottom and 1 in. from the right side of the page.
- Draw segment AB  $\frac{3}{4}$  in. long parallel to the bottom of the page so B is  $\frac{1}{2}$  in. from the right side of the page.
- Draw segment BC 1 in. long and  $m\angle ABC$  is  $150^\circ$ . (C is above segment AB.)
- Draw segment CD 1 in. long and  $m\angle BCD$  is  $150^\circ$ . (D is above segment BC.)
- Draw segment DE 2 in. long and  $m\angle CDE$  is  $150^\circ$ . (E is on the same side of segment CD as B.)
- Draw segment EF  $\frac{3}{4}$  in. long and  $m\angle DEF$  is  $100^\circ$ . (F and B are on opposite sides of segment DE.)
- Draw segment FG  $\frac{1}{2}$  in. long and  $m\angle EFG$  is  $90^\circ$ . (G and E are on opposite sides of segment CD.)
- Connect G to D, G to E, and F to D.
- Draw segments BH and BJ  $\frac{1}{2}$  in. long and  $m\angle ABH$  and  $m\angle ABJ$  are  $90^\circ$ .
- Draw segments BK and BL  $\frac{1}{2}$  in. long and  $m\angle CBK$  and  $m\angle CBL$  are  $90^\circ$ . (H is on the same side of segment AB as K.)
- Connect H to K and connect J to L.
- Draw segments CM and CN  $\frac{1}{2}$  in. long and  $m\angle BCM$  and  $m\angle BCN$  are  $90^\circ$ .
- Draw segments CO and CP  $\frac{1}{2}$  in. long and  $m\angle DCO$  and  $m\angle DCP$  are  $90^\circ$ . (M is on the same side of segment BS as Q.)
- Connect M to O and connect N to P.



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Figure 1

- Name the right angles:  $\angle BEC, \angle BEF, \angle GEF, \angle CED, \angle ACB, \angle DCE$ .
- Name 4 pairs of vertical angles:  $\angle ACD$  &  $\angle BCE, \angle CEG$  &  $\angle DEF$
- Name one pair of complementary angles:  $\angle FEG$  &  $\angle GEB$
- Name four pairs of supplementary angles with point C as the vertex:  $\angle ECB$  &  $\angle ACB, \angle ACD$  &  $\angle DCE, \angle DCA$  &  $\angle ACB, \angle DCE$  &  $\angle ECB$
- $m\angle BCE = 55^\circ, m\angle ECD = 125^\circ, m\angle ACD = 55^\circ$
- $m\angle FEG = x^\circ, m\angle BEG = 90 - x$

Figure 2

- Name the right angles:  $\angle AEI, \angle EIO, \angle OUI, \angle OUA, \angle EAO$  &  $\angle AEI, \angle AUO$  &  $\angle IOU$ .
- Name 3 pairs of supplementary angles:  $\angle AEI$  &  $\angle OUI$
- Name 3 pairs of complementary angles:  $\angle EAI$  &  $\angle EIA, \angle UOI$  &  $\angle UIO, \angle UOA$  &  $\angle UAO$
- $m\angle EAI = 25^\circ, m\angle EIA = 65^\circ$
- $m\angle UOI = 55^\circ, m\angle UIO = 35^\circ$

Figure 3

- Name 2 pairs of vertical angles:  $\angle ESV$  &  $\angle NSK, \angle ESK$  &  $\angle VSN$
- Name 2 pairs of supplementary angles. Answers will vary.  $\angle KNS$  &  $\angle SNI, \angle IVS$  &  $\angle EVS$

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