HW Check: 2-31 to 2-36

2-31.

a. −2, 3

b. (−2, 3); yes

2-32.

a. 20 square units

b. 2,600 square units; subtract the x- and y-coordinates to find the length of the two sides.

2-33.

a. We do not know if the angle measures are equal, because we do not know if $\overleftrightarrow{BD} \parallel \overleftrightarrow{EG}$.

b. The diagram does not have parallel line marks.

2-34.

a. $x = 17.5$ (corresponding angles)

b. $x = 5$ (multiple relationships possible)

2-35.

a. 12 boys

b. 22 girls

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

d. 7 boys left, 23 students, so $\frac{7}{23}$

2-36.

a. an isosceles triangle

b. a rectangle

Team Quiz Time: 9/25/17

- Use *Marking the Prompt*
- **Show all work.**
- **Use your INB, pencil, eraser, scientific calculator; consult your teammates.**
- ***No phones out when quizzes are out***
- **Assemble all quizzes from team in one stack for me to collect, & then preview Lesson 2.1.4.**
- ***I will score one quiz from each team. Ensure that your teammates will be satisfied with the score your quiz earns.***

Quiz Review:

Please ...

- **Phones away until after I've collected all returned quizzes & review has ended;**
- **See *Rubric* on back of *Course Outline*;**
- **Let me collect all quizzes from tables;**
- **Ask me to put any on top for which you want to follow-up during *Office Hours*.**

Objective(s): You will find & verify in multiple ways a rule for the sum of the *m*∡s in a triangle.

Agenda:

- HW Review (Teams)
- Team Quiz
- Quiz Review
- Toolkit Review (2-30)
- 2.1.4 Activity (Teams)
  - > 2-37ab on *2.1.4 RP* (which will go in INB)
  - > 2-37c on *RP*
  - > 2-37d in spiral (copy diagram & state geometric & angle measure relationships for: d, b & e; a & d; c & e; then combine)
  - > Triangle Tear (see special instructions)
  - > 2-38, 2-39 in spiral (as always, show diagrams & work: write & solve equations)
  - > Hot Potato?
- Assign HW (Class)

September 25, 2017

2-30. ANGLE RELATIONSHIPS TOOLKIT

Core

Obtain a Lesson 2.1.3 Resource Page ("Angle Relationships Toolkit") from your teacher. This will be a continuation of the Geometry Toolkit you started in Chapter 1. Think about the new angle relationships you have studied so far in Chapter 2. Then, in the space provided, add a diagram and a description of the relationship for each special angle relationship you know. Be sure to specify any relationship between the measures of the angle (such as whether or not they are always congruent). In later lessons, you will continue to add relationships to this toolkit, so be sure to keep this resource page in a safe place. At this point, your Toolkit should include:

- Vertical angles
  ALWAYS SAME (≅)
- Corresponding angles
  (≅) SAME WHEN ||
- Same-side interior angles
  SUPP, WHEN ||
- Straight angles
  AKA, LINEAR PR.
  ALWAYS SUPP
- Alternate interior angles
  (≅) SAME WHEN ||

Geometric Angle Relationships printed;

Angle Measure Relationships written

2-31. The set of equations at right is an example of a **system of equations**. Read the Math Notes box for this lesson on how to solve systems of equations. Then answer the questions below.

$y=-x+1$

$y=2x+7$

$m=-1=\frac{-1}{1}$ (0,1)

$m=2=\frac{2}{1}$ (0,7)

a. Graph the system on graph paper. Then write its solution (the point of intersection) in (x, y) form.

b. Now solve the system using an algebraic method of your choice. Did your solution match your result from part (a)? If not, check your work carefully and look for any mistakes in your algebraic process or on your graph.

$$-x+1=2x+7$$
$$-2x-1 \quad -2x-1$$
$$\frac{-3x}{-3}=\frac{6}{-3}$$
$$x=-2$$
$$y=2(-2)+7$$
$$y=-4+7=3$$

$\boxed{(-2,3)}$

September 25, 2017

2-28. THE REFLECTION OF LIGHT

Core

You know enough about angle relationships now to start analyzing how light bounces off mirrors. Examine the two diagrams below. Diagram A shows a beam of light emitted from a light source at A. In Diagram B, someone has placed a mirror across the light beam. The light beam hits the mirror and is reflected from its original path.

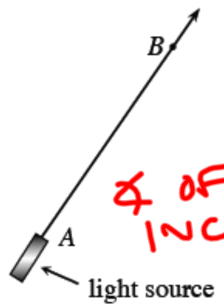
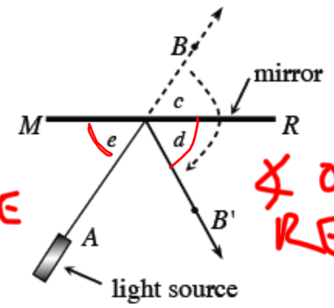


Diagram A

∡ OF INCIDENCE



∡ OF REFLECTION

Diagram B

a. What is the relationship between angles *c* and *d*? Why?

b. What is the relationship between angles *c* and *e*? How do you know?

c. What is the relationship between angles *e* and *d*? How do you know?

d. Use your conclusions from parts (a) through (c) to prove that the measure of the angle at which light hits a mirror equals the measure of the angle at which it bounces off the mirror.

2-28. THE REFLECTION OF LIGHT

Core

You know enough about angle relationships now to start analyzing how light bounces off mirrors. Examine the two diagrams below. Diagram A shows a beam of light emitted from a light source at A. In Diagram B, someone has placed a mirror across the light beam. The light beam hits the mirror and is reflected from its original path.

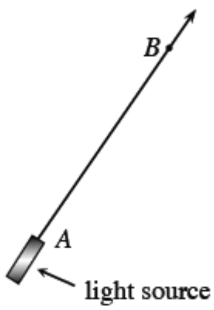


Diagram A

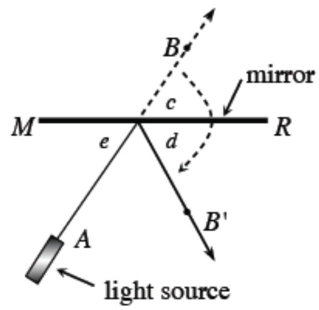


Diagram B

a. What is the relationship between angles *c* and *d*? Why?

b. What is the relationship between angles *c* and *e*? How do you know?

c. What is the relationship between angles *e* and *d*? How do you know?

d. Use your conclusions from parts (a) through (c) to prove that the measure of the angle at which light hits a mirror equals the measure of the angle at which it bounces off the mirror.

a. congruent b/c angle d is reflection of angle c.

b. congruent b/c they are vertical.

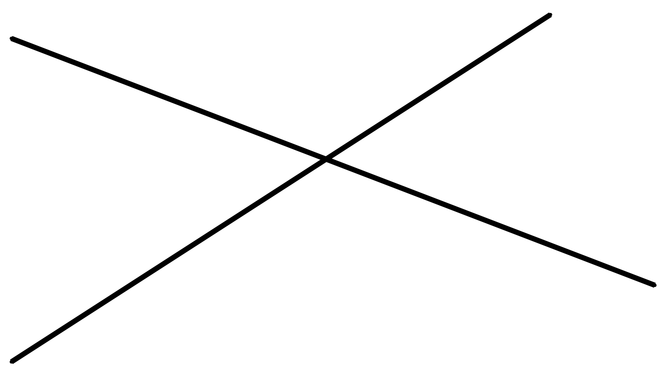
c. congruent b/c if c=d & c=e then d=e by substitution.

d. Since c is = to both d & e then d=e

2.1.4 How can I use it?

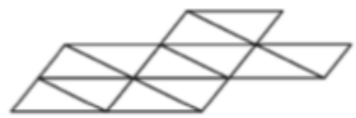
Angles in a Triangle

So far in this chapter, you have investigated the angle relationships created when two lines intersect, forming vertical angles. You have also investigated the relationships created when a transversal intersects two parallel lines. Today you will study the angle relationships that result when three non-parallel lines intersect, forming a triangle.



This RP will go in your INB.

2-37. Marcos decided to change his tiling from problem 2-14 by drawing diagonals in each of the parallelograms. Find his pattern, shown at right, on the Lesson 2.1.4 Resource Page.



a. Copy one of Marcos's triangles onto tracing paper. Use a colored pen or pencil to shade one of the triangle's angles on the tracing paper. Then use the same color to shade every angle on the resource page that is equal to the shaded angle.

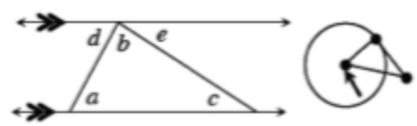
b. Repeat this process for the other two angles of the triangle, using a different color for each angle in the triangle. When you are done, every angle in your tiling should be shaded with one of the three colors.

c. Now examine your colored tiling. What relationship can you find between the three different-colored angles? You may want to focus on the angles that form a straight angle. What does this tell you about the angles in a triangle? Write a conjecture in the form of a conditional statement or an arrow diagram. If you write a conditional statement, it should begin, *"If a polygon is a triangle, then the measure of its angles…"*.

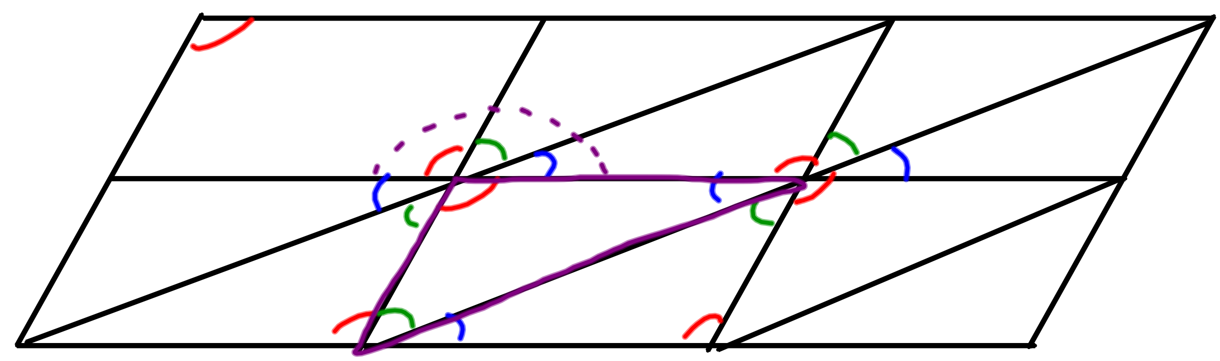
POLYGON = △ → http://www.cpm.org/flash/technology/triangleSum.swf

Copy diagram for Part d & refer to labels in your response.

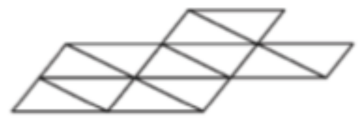
d. How can you convince yourself that your conjecture is true for all triangles? That is, given parallel lines (since the tiling was generated by translating parallelograms), why does $a = d$ and $c = e$ in the diagram at right? If technology is available, use it to test many different angle measures.



Then add this angle relationship to your Angle Relationships Toolkit from Lesson 2.1.3. This will be referred to as the **Triangle Angle Sum Theorem**. (A theorem is a statement that has been proven.)



2-37. Marcos decided to change his tiling from problem 2-14 by drawing diagonals in each of the parallelograms. Find his pattern, shown at right, on the Lesson 2.1.4 Resource Page.



a. Copy one of Marcos's triangles onto tracing paper. Use a colored pen or pencil to shade one of the triangle's angles on the tracing paper. Then use the same color to shade every angle on the resource page that is equal to the shaded angle.

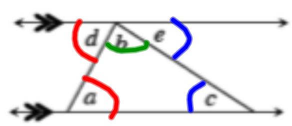
b. Repeat this process for the other two angles of the triangle, using a different color for each angle in the triangle. When you are done, every angle in your tiling should be shaded with one of the three colors.

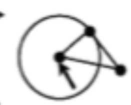
POLYGON IS △ → SUM OF m∠s = 180°

c. Now examine your colored tiling. What relationship can you find between the three different-colored angles? You may want to focus on the angles that form a straight angle. What does this tell you about the angles in a triangle? Write a conjecture in the form of a conditional statement or an arrow diagram. If you write a conditional statement, it should begin, "*If a polygon is a triangle, then the measure of its angles…*". HAS A SUM = 180°

http://www.cpm.org/flash/technology/triangleSum.swf

d. How can you convince yourself that your conjecture is true for all triangles? That is, given parallel lines (since the tiling was generated by translating parallelograms), why does $a = d$ and $c = e$ in the diagram at right? If technology is available, use it to test many different angle measures.





Then add this angle relationship to your Angle Relationships Toolkit from Lesson 2.1.3. This will be referred to as the **Triangle Angle Sum Theorem**. (A theorem is a statement that has been proven.)

d.

<u>AIA's & || Lines:</u>

a & d; e & c

a = d; e = c

<u>Form Straight Angle:</u>

d & b & e

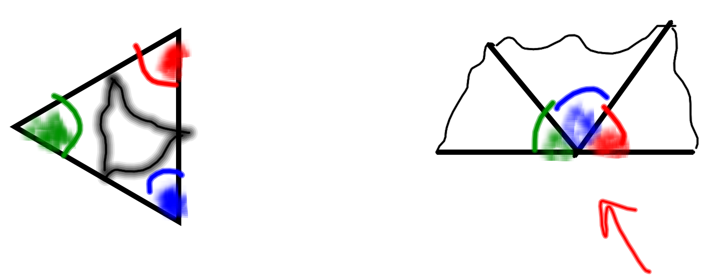
d + b + e = 180 deg

<u>Substitute:</u>

a + b + c = 180 deg

Triangle Tear:

1. Read instructions completely before beginning.
2. Receive a triangle from your instructor (or, make one yourself).
3. Mark the interior of each angle.
4. Now tear triangle into 3 chunks so each chunk includes 1 corner of the triangle and rearrange the 3 "angles" so that their vertices meet at one point with no overlap. What does this tell you about sum of the angles in the triangle?

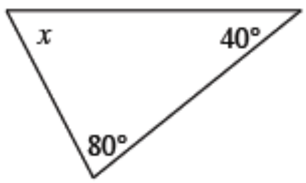


- **Glue 2.1.4 RP & Triangle Tear onto INBp55**

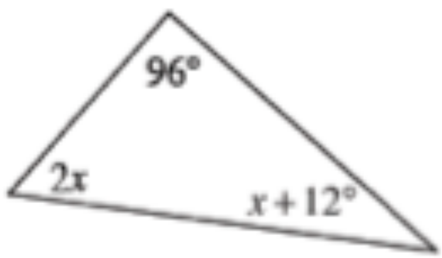
2-38. Use your theorem from problem 2-37 about the angles in a triangle to find x in each diagram below. Show all work.

WRITE & SOLVE EQUATIONS. (INCLUDE DIAGRAMS)

a.



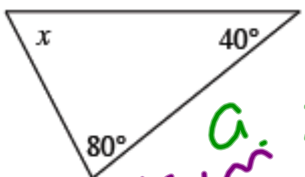
b.



2-38. Use your theorem from problem 2-37 about the angles in a triangle to find x in each diagram below. Show all work. GEOM: $\triangle$ sum

$m\measuredangle: a+b+c=180°$

a.



∡ sum

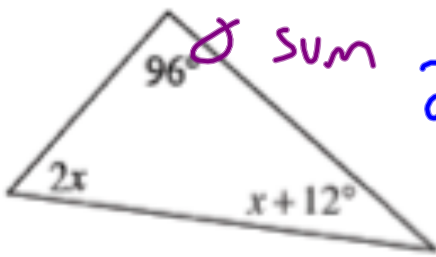
a. $x+40°+80°=180°$

$x+120°=180°$

$-120° \quad -120°$

$\boxed{x=60°}$

b.



∡ sum

$2x+x+12°+96°=180°$

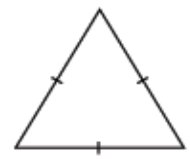
$3x+108°=180°$

$-108° \quad -108°$

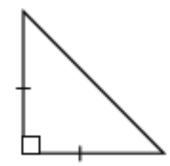
$\frac{3x}{3}=\frac{72°}{3}$

$\boxed{x=24°}$

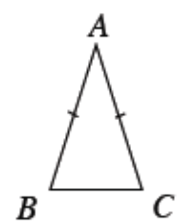
2-39. What can the Triangle Angle Sum Theorem help you learn about special triangles?



a. Find the measure of each angle in an equilateral triangle. Justify your conclusion.



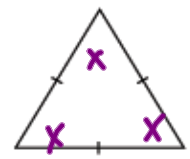
b. Consider the isosceles right triangle (also sometimes referred to as a "half-square") at right. Find the measures of all the angles in a half-square.



c. What if you only know one angle of an isosceles triangle? For example, if $m\angle A = 34°$, what are the measures of the other two angles?

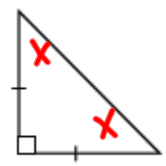
2-39. What can the Triangle Angle Sum Theorem help you learn about special triangles?

$3x = 180°$ . . .

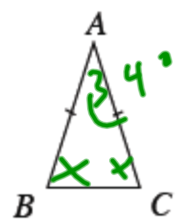


a. Find the measure of each angle in an equilateral triangle. Justify your conclusion.

$2x + 90° = 180°$



b. Consider the isosceles right triangle (also sometimes referred to as a "half-square") at right. Find the measures of all the angles in a half-square.



c. What if you only know one angle of an isosceles triangle? For example, if $m\angle A = 34°$, what are the measures of the other two angles?

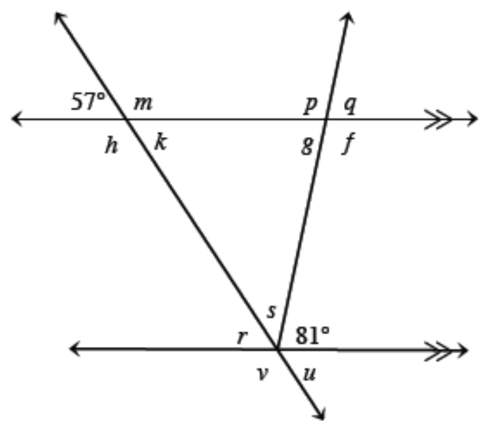
$2x + 34° = 180°$ . .

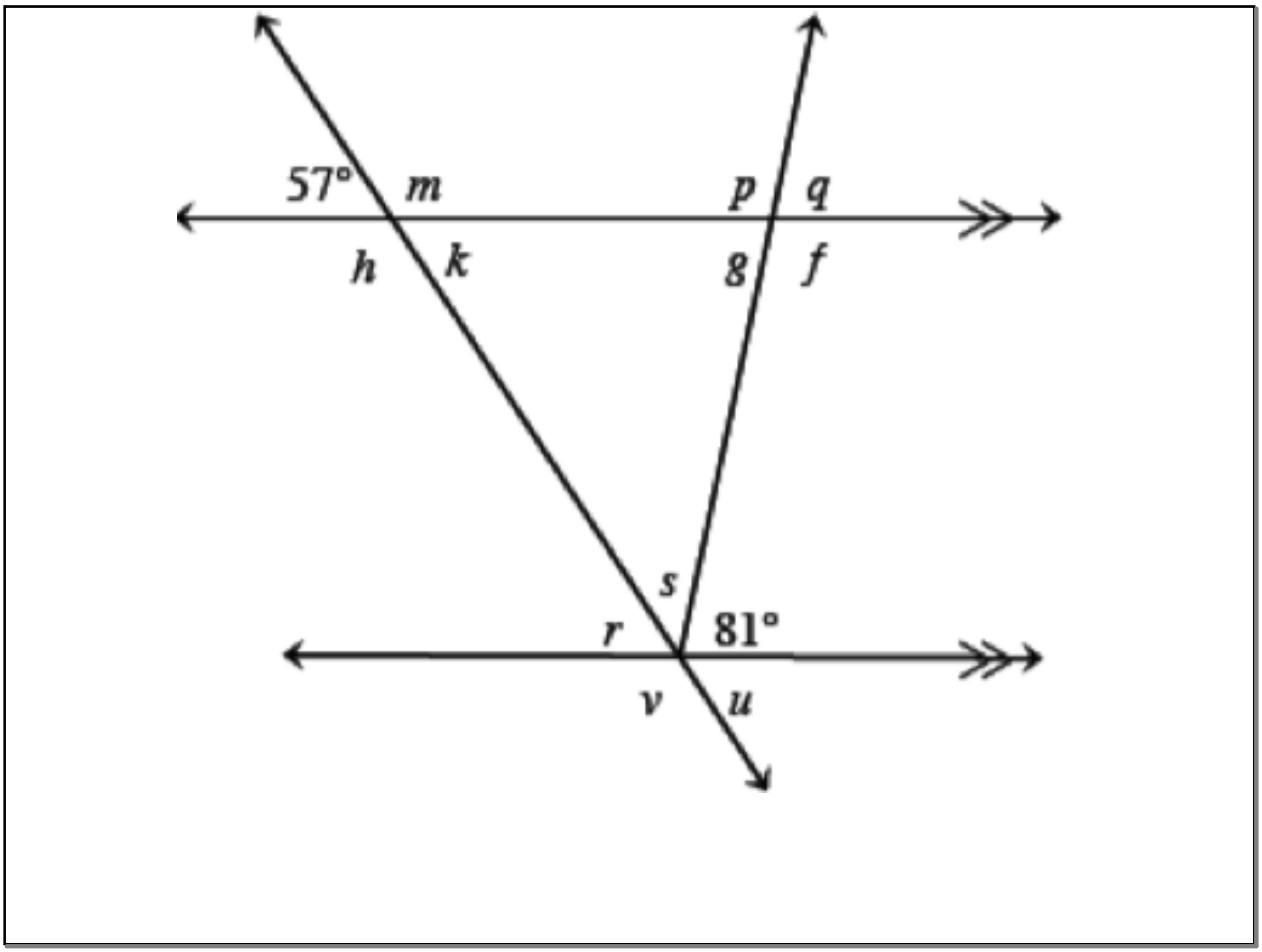
Each student participates in constructing an answer!

1. Each team has a sheet of paper and each student has a different colored pencil.
2. The team is given a problem to solve.
3. The first person **writes the first step** of the solution process, **explaining aloud**, and passes the paper on to the next person.
4. The next person **makes any corrections** and **adds the next step**, explaining aloud, & passes the paper.
5. ***Process continues until the problem is competed.***
6. Team discusses completed problem, **each student signs off** that they understand and agree with everything written down.

2-40. TEAM REASONING CHALLENGE

How much can you figure out about the figure at right using your knowledge of angle relationships? Work with your team to find the measures of all the labeled angles in the diagram at right. Justify your solutions with the name of the angle relationship you used. Carefully record your work as you go and be prepared to share your reasoning with the rest of the class.



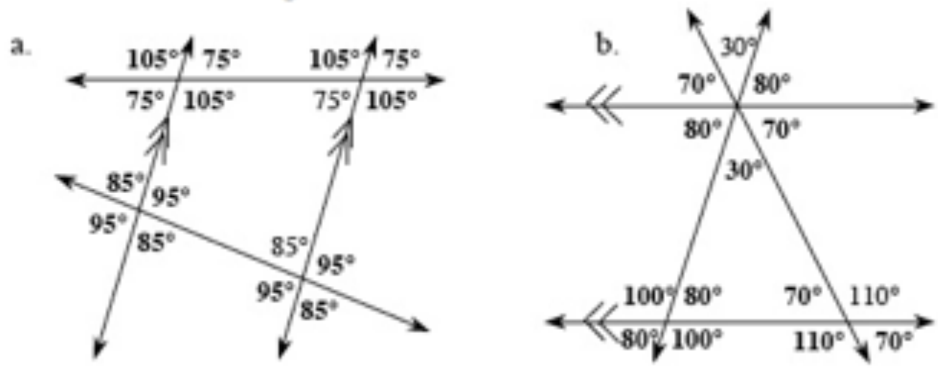

57°
m
p
q
h
k
g
f
s
r
81°
v
u

HW:

- 2-41 to 2-45;
- Glue 2.1.4 RP & Triangle Tear onto INB p55;
- MN More Angle Pair Relationships (CPM 100) on INB p53;
- Questions & Summary for MN;
- Ch 1 Quiz 9/28

HW Check: **2-41 to 2-45**

2-41. **See solutions in diagram.**



2-42. The slopes are $\frac{1}{2}$ and $-\frac{3}{2}$. Since the slopes are not opposite reciprocals, the lines cannot be perpendicular.

2-43. $(3, -1), (7, -1)$

2-44. They used different units.

2-45. The lines are parallel, so they do not intersect. Therefore, there is no solution.

2-43