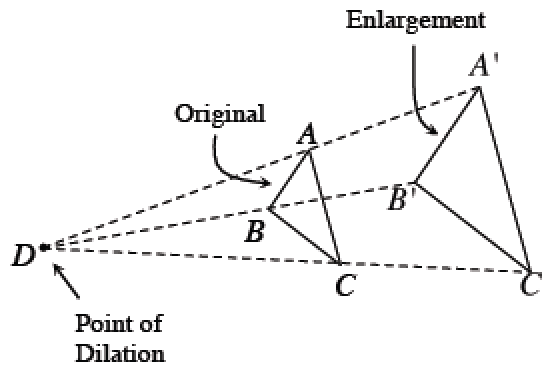
3.1.1 What do these shapes have in common?

Dilations

METHODS AND MEANINGS

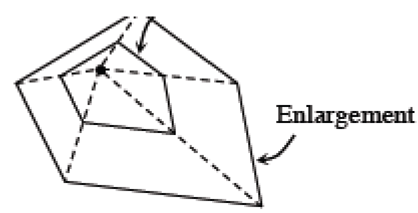
MATH NOTES

Dilations



The transformations you studied in Chapter 1 (translations, rotations, and reflections) are called rigid transformations because they all maintain the size and shape of the original figure.

However, a **dilation** is a transformation that maintains the shape of a figure but multiplies its dimensions by a chosen factor. In a dilation, a shape is stretched proportionally from a particular point, called the **point of dilation** or **stretch point.** For example, in the diagram at right, ΔABC is dilated to form $\Delta A'B'C$. Notice that while a dilation changes the size and location of the original figure, it does not rotate or reflect the original.



Note that if the point of dilation is located inside a shape, the enlargement encloses the original, as shown below right.

3-5. Plot triangle *ABC* formed with the points *A*(0, 0), *B*(3, 4), and *C*(3, 0), on graph paper. Use the method used in problem 3-2 to enlarge it from the origin by a factor of 2 (using two "rubber bands"). Label this new triangle *A'B'C'*.

a. What are the side lengths of the original triangle, ΔABC?

b. What are the side lengths of the enlarged triangle, $\Delta A'B'C'$?

c. Find the area and the perimeter of $\Delta A'B'C'$.

3-6. Solve each equation below for *x*. Show all work and check your answer by substituting it back into the equation and verifying that it makes the equation true.

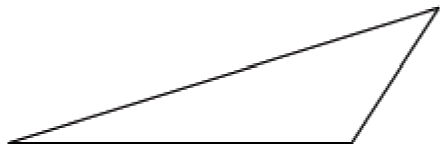
a. $\frac{x}{3} = 6$

c. $\frac{x}{4} = \frac{9}{6}$

b. $\frac{5x+9}{2} = 12$

d. $\frac{5}{x} = \frac{20}{8}$

3-7. Examine the triangle below.



a. Estimate the measure of each angle of the triangle above.

b. Given only its shape, what is the best name for this triangle?

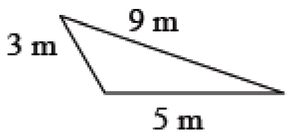
3-8. On graph paper, graph line $\overleftrightarrow{MU}$ if $M(-1, 1)$ and $U(4, 5)$.

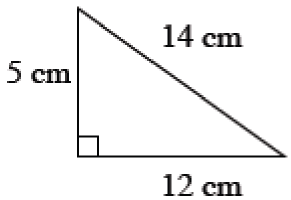
a. Find the slope of $\overleftrightarrow{MU}$.

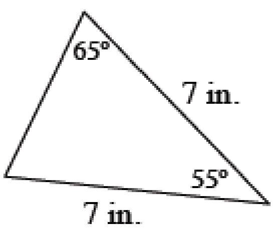
b. Find MU (the distance from M to U).

c. Are there any similarities to the calculations used in parts (a) and (b)? Any differences?

3-9. Examine each diagram below. Identify the error in each diagram.

a. 

b. 

c. 

3-10. Rewrite the statements below into conditional ("If …, then …") form.

a. All equilateral triangles have 120° rotation symmetry.

b. A rectangle is a parallelogram.

c. The area of a trapezoid is half the sum of the bases multiplied by the height.

3.1.2 How can I maintain the shape?

Similarity

METHODS AND MEANINGS

MATH NOTES

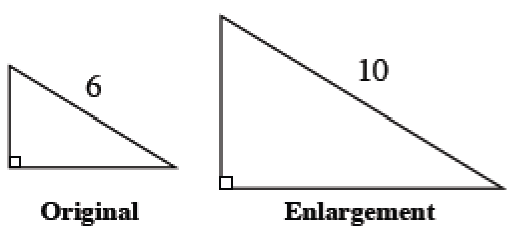
Ratio of Similarity and Zoom Factor

The term ratio was introduced in Chapter 1 in the context of probability. But ratios are very important when comparing two similar figures. Review what you know about ratios below.

A comparison of two quantities (numbers or measures) is called a **ratio**. A ratio can be written as:

$$a{:}b \quad \text{or} \quad \frac{a}{b} \quad \text{or} \quad \text{"}a \text{ to } b\text{"}$$

Each ratio has a numeric value that can be expressed as a fraction or a decimal. For the two similar right triangles below, the ratio of the small triangle's hypotenuse to the large triangle's hypotenuse is $\frac{6}{10}$ or $\frac{3}{5}$. This means that for every three units of length in the small triangle's hypotenuse, there are five units of length in the large triangle's hypotenuse.

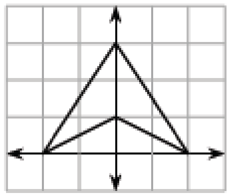


$\frac{6}{10}$ → means 6 units of length on one hypotenuse compared to 10 units on the other hypotenuse

The ratio between any pair of corresponding sides in similar figures is called the **ratio of similarity**.

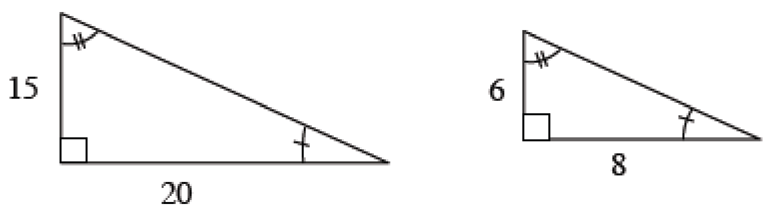
When a figure is enlarged or reduced, each side is multiplied (or divided) by the same number. While there are many names for this number, this text will refer to this number as the **zoom factor**. To help indicate if the figure was enlarged or reduced, the zoom factor is written as the ratio of the new figure to the original figure. For the two triangles above, the zoom factor is $\frac{10}{6}$ or $\frac{5}{3}$.

3-18. Use the method from problem 3-2 to enlarge the shape below from the origin by a zoom factor of 4.



3-19. The ratios Casey wrote from part (a) of problem 3-15are common ratios between **corresponding sides** of the two shapes. That is, they are ratios between the matching sides of two shapes.

a. Look at the two similar shapes below. Which sides correspond? Write common ratios with the names of sides and lengths.



b. Find the hypotenuse of each triangle above. Is the ratio of the hypotenuses equal to the ratios you found in part (a)?

3-20. Are the lines represented by the equations at right parallel? Support your reasoning with convincing evidence.

$$y = -\frac{3}{5}x + 2$$
$$y = -\frac{3}{5}x - 3$$

3-21. Multiply the expressions below. Then simplify if possible.

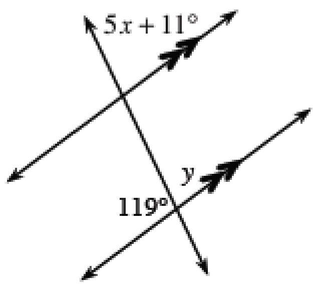
a. $2x(3x - 4)$

b. $(x + 3)(2x - 5)$

c. $(2x + 5)(2x - 5)$

d. $x(2x + 1)(x - 3)$

3-22. Examine the relationships in the diagram below. Then solve for x and y, if possible. Justify your work using angle relationships.



3-23. Read the following statements and decide if, when combined, they present a *convincing* argument. You may need to refer back to your Shape Toolkit as you consider the following statements and decide if the conclusion is correct. Be sure to justify your reasoning.

- **Fact #1:** A square has four sides of equal length.
- **Fact #2:** A square is a rectangle because it has four right angles.
- **Fact #3:** A rhombus also has four sides of equal length
- **Conclusion:** Therefore, a rhombus is a rectangle.

3.1.3 How are the figures related?

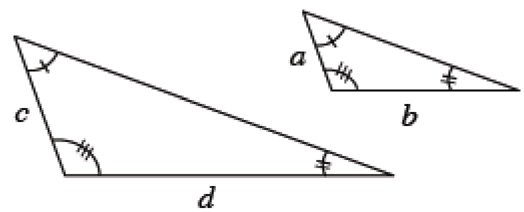
Using Ratios of Similarity

METHODS AND MEANINGS
MATH NOTES

Proportional Equations

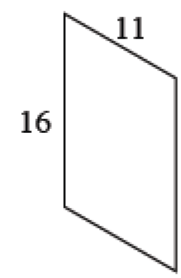
A **proportional equation** is one that compares two or more ratios. Proportional equations can compare two pairs of corresponding parts (sides) of similar shapes, or can compare two parts of one shape to the corresponding parts of another shape.

For example, the following equations can be written for the similar triangles at right:



$\frac{a}{c}=\frac{b}{d}$ or $\frac{a}{b}=\frac{c}{d}$

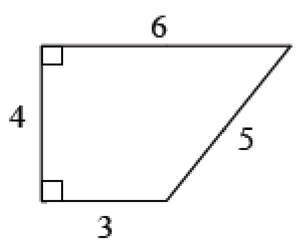
3-29. Rakisha is puzzled. She is working with the parallelogram drawn at right and wants to make it smaller instead of bigger.



a. What should she do if she wants the sides of her new figure to be *half as long* as the original sides? What zoom factor should she use? Find the dimensions of her new figure.

b. While drawing some other shapes, Rakisha ended up with a shape congruent to the original parallelogram. What is the common ratio between pairs of corresponding sides?

3-30. Enlarge the shape at right on graph paper using a zoom factor of 2. Then find the perimeter and area of both shapes. What do you notice when you compare the perimeters? The areas?



3-31. Solve each equation below. Show all work and check your answer.

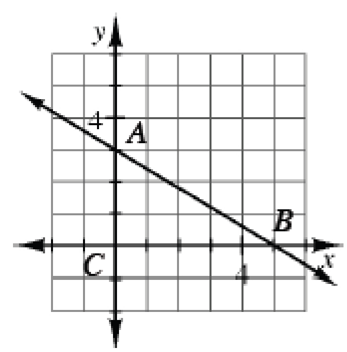
a. $\frac{14}{5} = \frac{x}{3}$

b. $\frac{10}{m} = \frac{5}{11}$

c. $\frac{t-2}{12} = \frac{7}{8}$

d. $\frac{x+1}{5} = \frac{x}{3}$

3-32. Examine the graph of line $\overleftrightarrow{AB}$ below.



a. Find the equation of $\overleftrightarrow{AB}$.

b. Find the area and perimeter of ΔABC.

c. Write an equation of the line through A that is perpendicular to $\overleftrightarrow{AB}$.

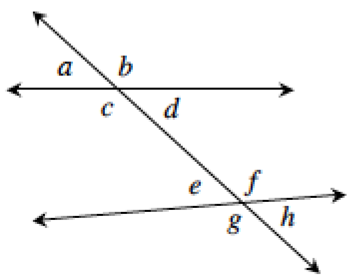
3-33. Rewrite the statements below into conditional ("If …, then …") form.

a. Lines with the same slope are parallel.

b. A vertical line has undefined slope.

c. The lines with slopes $\frac{2}{3}$ and $-\frac{3}{2}$ are perpendicular.

3-34. Examine the diagram below. Name the geometric relationships of the angles below.



a. *d* and *e*

b. *e* and *h*

c. *a* and *e*

d. *c* and *d*

METHODS AND MEANINGS

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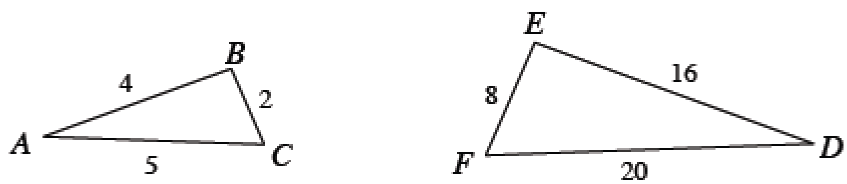
Writing a Similarity Statement

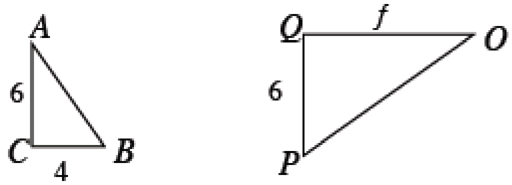
A **similarity transformation** is a sequence of transformations that can include rigid transformations, dilations, or both. Two figures are **similar** if there is a similarity transformation that takes one shape onto the other. Similarity transformations preserve angles, parallelism of two lines, and ratios of side lengths.

To represent the fact that two shapes are similar, use the symbol "~". For example, if there is a similarity transformation that takes ΔABC onto ΔDEF, then you know they are similar and this can be stated as $\Delta ABC \sim \Delta DEF$. The order of the letters in the name of each triangle determines which sides and angles correspond. For example, in the statement $\Delta ABC \sim \Delta DEF$, you can determine that $\angle A$ corresponds to $\angle D$ and that $\overline{BC}$ corresponds to $\overline{EF}$.

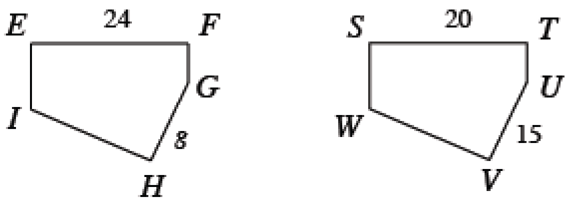


3-41. Solve for the missing lengths in the sets of similar figures below.

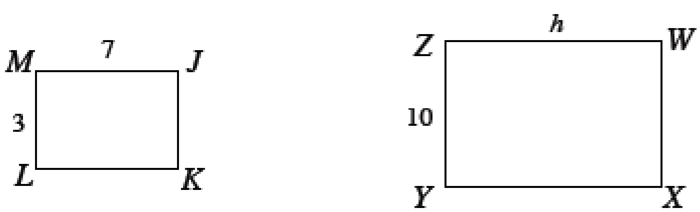
a. $\Delta ABC \sim \Delta OPQ$



b. $EFGHI \sim STUVW$

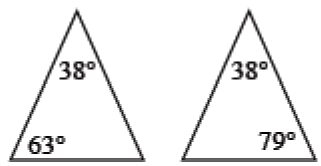


c. $JKLM \sim WXYZ$

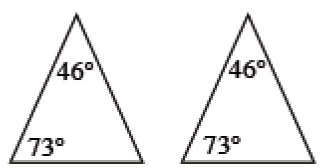


3-42. In recent lessons, you have learned that similar triangles have equal corresponding angles. Is it possible to have equal corresponding angles when the triangles do not appear to match? What if you are not given all three angle measures? Consider the two cases below.

a. Find the measure of the third angle in the first pair of triangles below. Compare the two triangles. What do you notice?



b. Examine the second pair of triangles below. Without calculating, do you know that the unmarked angles must be equal? Why or why not?



3-43. Frank and Alice are penguins. At birth, Frank's beak was 1.95 inches long, while Alice's was 1.50 inches long.

a. Frank's beak grows by 0.25 inches per year and Alice's grows by 0.40 inches per year. Write an equation to represent the length of each penguin's beak in *x* years.

b. How old will they be when their beaks are the same length?

3-44. Rewrite the statements below into conditional ("If …, then …") form.

a. The area of a rectangle with base x and height $2x$ is $2x^2$.

b. The perimeter of a rectangle with base x and height $3y$ is $2x + 6y$.

c. A rectangle with base 2 feet and height 3 feet has an area of 864 square inches.

3-45. Misty is building a triangular planting bed. Two of the sides have lengths of eight feet and five feet. What are the possible lengths for the third side?

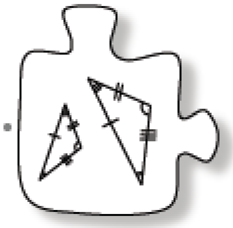
3-46. Plot *ABCDE* formed with the points $A(-3, -2)$, $B(5, -2)$, $C(5, 3)$, $D(1, 6)$, and $E(-3, 3)$ onto graph paper.

a. Use the method from problem 3-2 to enlarge it from the origin by a factor of 2. Label this new shape $A'B'C'D'E'$.

b. Find the area and the perimeter of both figures.

3.2.1 What information do I need?

Conditions for Triangle Similarity



METHODS AND MEANINGS

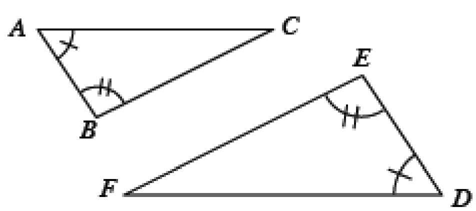
MATH NOTES

Conditions for Triangle Similarity

When two figures are similar, there is a similarity transformation that takes one onto the other. Since both dilations and rigid motions preserve angles, the corresponding angles must have equal measure. In the same way, since every similarity transformation preserves ratios of lengths, you know that corresponding sides must be proportional. For two shapes to be similar, corresponding angles must have equal measure and corresponding sides must be proportional.

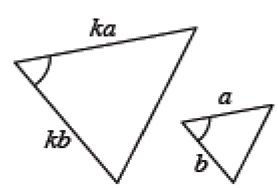
These relationships can also help you decide if two figures are similar. When two pairs of corresponding angles have equal measures, the two triangles must be similar. This is because the third pair of angles must also be equal. This is known as the **AA Triangle Similarity** condition (which can be abbreviated as "AA Similarity" or "AA ~" for short).

To prove that AA ~ is true for a pair of triangles with two pairs of congruent angles (like ΔABC and ΔDEF *below*), use rigid transformations to move the image A' to point D, the image B' to $\overrightarrow{DE}$ and C' to $\overrightarrow{DF}$. Then you know that $\overleftrightarrow{B'C'}$ and $\overleftrightarrow{EF}$ are parallel because corresponding angles are congruent. This means that the dilation of triangle $\Delta A'B'C'$ from point $D$to take the image B' to point E will also carry C' to point F. Therefore, $\Delta A'B'C'$ will move onto ΔDEF and you have found a similarity transformation taking ΔABC to ΔDEF.



AA ~: If two pairs of angles have equal measures, then the triangles are similar.

Another condition that guarantees similarity is referred to as the **SAS Triangle Similarity** condition (which can be abbreviated as "SAS Similarity" or "SAS ~" for short.) The "A" is placed between the two "S"s because the angle is*between* the two sides. Its proof is very similar to the proof for AA ~ above.



3-53. Assume that all trees are green.

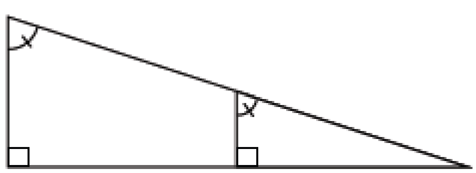
a. Does this statement mean that an oak tree must be green? Explain why or why not.

b. Does this statement mean that anything green must be a tree? Explain why or why not.

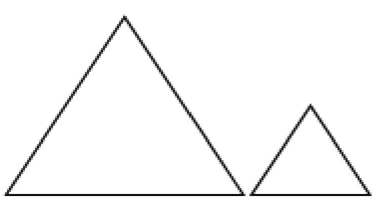
c. Are the statements "*All trees are green*" and "*All green things are trees*" saying the same thing? Explain why or why not.

3-54. Decide if each pair of triangles below is similar. If the triangles are similar, justify your conclusion by stating the similarity condition you used. Also describe a possible sequence of transformations that would carry one onto the other. If the triangles are not similar, explain how you know.

a.

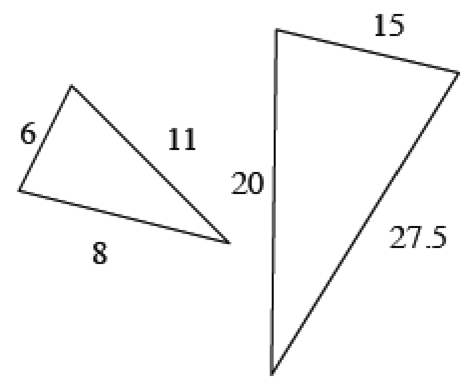


b.

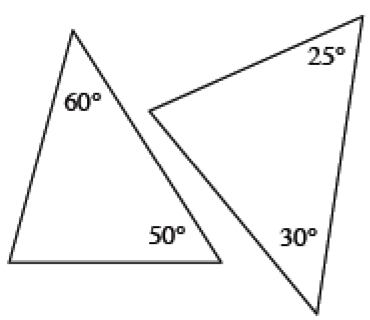


Equilateral Triangles

c.



d.



3-55. Remember that two figures are similar whenever there is a sequence of transformations (including dilation) that carries one onto the other.

a. Explain why all circles must be similar. That is, describe a sequence of transformations that will always carry one circle onto another.

b. Can you think of any other shapes that are always similar? If you can, draw an example and explain why they are always similar.

3-56. When you list *all* of the possible outcomes in a sample space by following an organized system (an orderly process), it is called a **systematic list**. There are different strategies that may help you make a systematic list, but what is most important is that you methodically follow your system until it is complete.

To get home, Renae can take one of four buses: #41, #28, #55, or #81. Once she is on a bus, she will randomly select one of the following equally likely activities: listening to her MP3 player, writing a letter, or reading a book.

a. Create the sample space of all the possible ways Renae can get home and do one activity by making a systematic list.

b. Use your sample space to find the following probabilities:

i. P(Renae takes an odd-numbered bus)

ii. P(Renae does not write a letter)

iii. P(Renae catches the #28 bus and then reads a book)

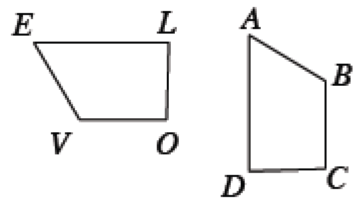
c. Does her activity depend on which bus she takes? Explain why or why not.

3-57. Graph the following points and connect them in the order given. Then find the area and perimeter of the shape. Show all work.

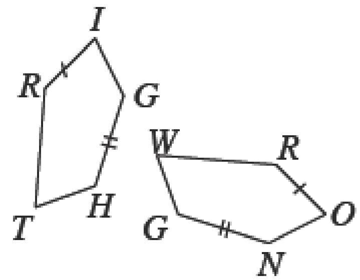
$A(-2, -3)$, $B(-6, 5)$, $C(11, 5)$, $D(7, 2)$, $E(7, -3)$

3-58. Assume that each pair of figures below is similar. Write a similarity statement to illustrate which parts of each shape correspond. Remember: letter order is important!

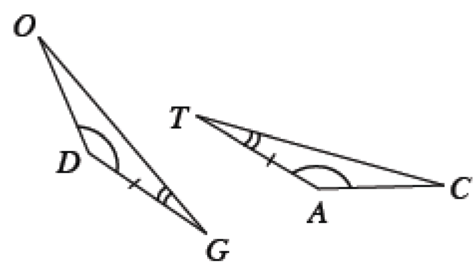
a. *ABCD* ~ ?



b. *RIGHT* ~ ?

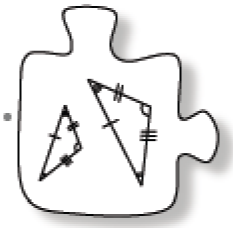


c. Δ____ ~ Δ____



3.2.2 How can I organize my information?

Creating a Flowchart



METHODS AND MEANINGS

MATH NOTES

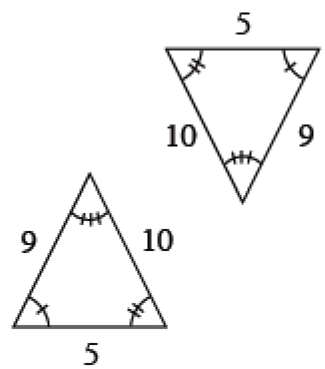
Congruent Shapes

If two figures have the same shape and are the same size, they are **congruent**. Since the figures must have the same shape, they must be similar. Two figures are congruent if they meet both of the following conditions:

Two figures are congruent if they meet both of the following conditions:

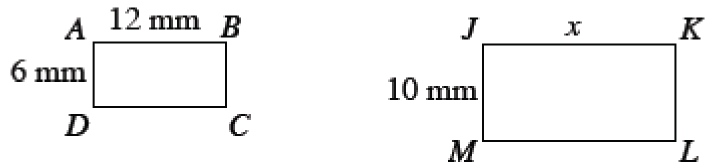
- The two figures are similar, and
- Their side lengths have a common ratio of 1.

Another way to prove that two shapes are congruent is to show that there is a rigid motion that takes one exactly onto the other.

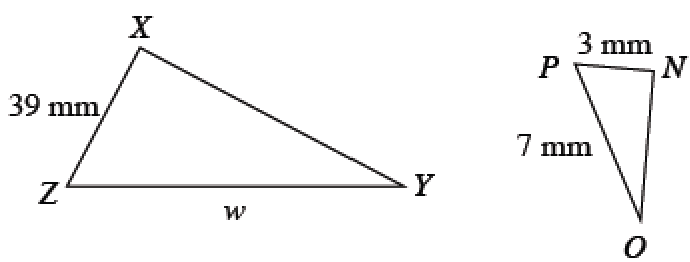


3-65. Solve for the missing lengths in the sets of similar figures below. You may want to set up tables to help you write equations.

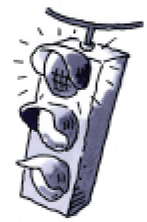
a. *ABCD* ~ *JKLM*



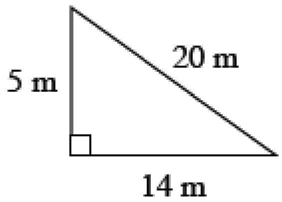
b. Δ*NOP* ~ Δ*XYZ*



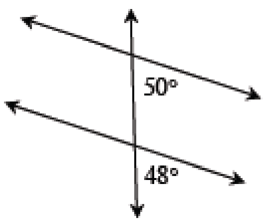
3-66. Examine each diagram below. Which diagrams are possible? Which are impossible? Justify each conclusion.



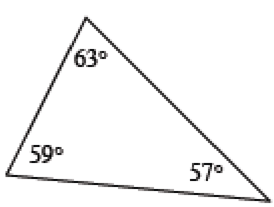
a.



b.

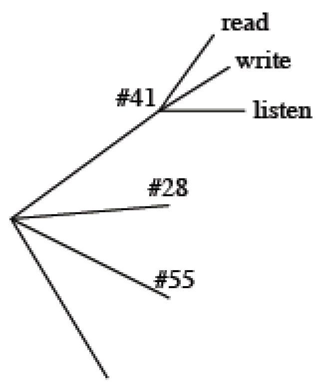


c.



3-67. Recall from problem 3-56 that Renae can take one of four buses to get home: #41, #28, #55, or #81. Once she is on a bus, she will randomly select one of the following equally likely activities: listening to her MP3 player, writing a letter, or reading a book.

Creating a **tree diagram**, like the one started below, is one way to organize all the outcomes of a sample space. This structure organizes the list by connecting each bus with each activity.

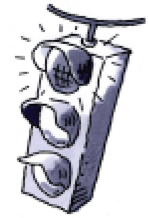


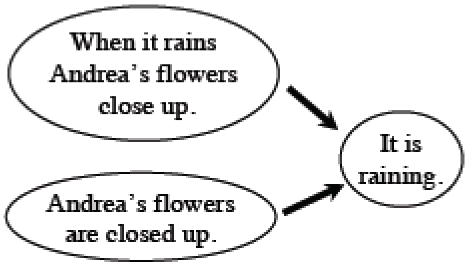
In this tree, the first set of branches represents the bus options. At the end of each of these branches are branches representing the activities. For example, if you follow the bold branches, Renae will take the #41 bus and will listen to her MP3 player.

a. On your paper, complete this tree diagram to show all of the different travel options that Renae could take. What is the probability that Renae does not read on the way home?

b. Renae's cousin, Greg, can get home using the #101 bus or by going with his older brother. On the way home, Greg can listen to his MP3 player, play video games on his MP3 player, read his novel for English, or talk to the person next to him. Make a tree diagram for all the possible outcomes. What is the probability Greg uses his MP3 player?

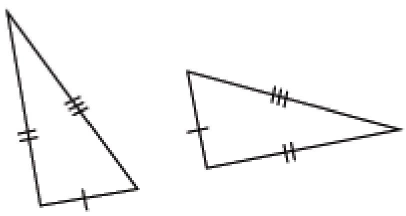
3-68. Determine whether or not the reasoning in the flowchart below is correct. If it is wrong, redo the flowchart to make it correct.



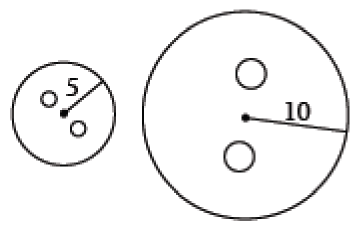


3-69. Describe a sequence of transformations that can show the figures below are similar. Remember that there can be more than one way.

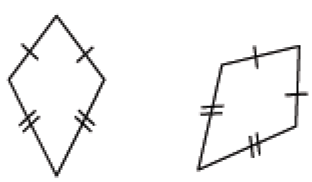
a.



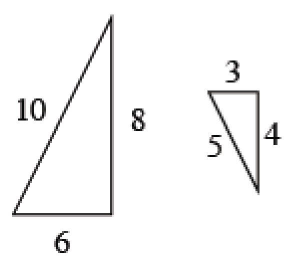
c.



b.



d.



3-70. Sketch each triangle if possible. If not possible, explain why not.

a. Right isosceles triangles

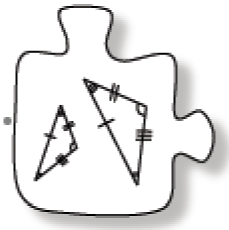
b. Right obtuse triangles

c. Scalene equilateral triangles

d. Acute scalene triangles

3.2.3 How can I use equivalent ratios?

Triangle Similarity and Congruence



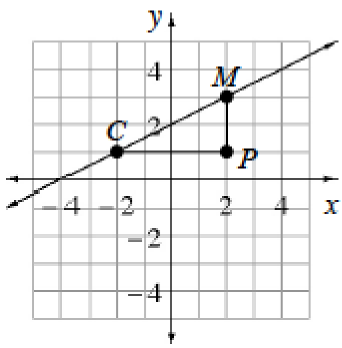
3-76. On graph paper, plot *ABCD* if *A*(0, 3), *B*(2, 5), *C*(6, 3), and *D*(4, 1).

a. Rotate *ABCD* 90° clockwise (↻) about the origin to form *A′B′C′D′*. Name the coordinates of *B′*.

b. Translate *A′B′C′D′* up 8 units and left 7 units to form *A″B″C″D″*. Name the coordinates of *C″*.

c. After rotating *ABCD* 180° to form *A‴B‴C‴D‴*, Arah noticed that *A‴B‴C‴D‴* position and orientation was the same as *ABCD*. What was the point of rotation? How did you find it?

3-77. Examine the graph of line $\overleftrightarrow{CM}$ below.

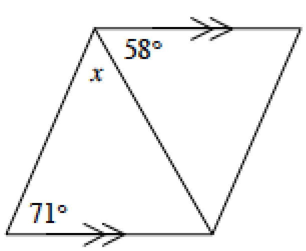


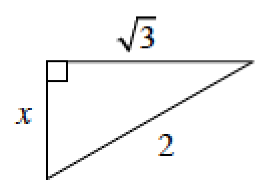
a. Find the equation of $\overleftrightarrow{CM}$.

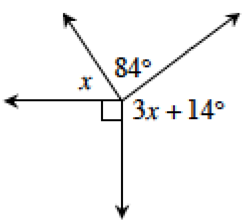
b. Find the area and perimeter of ΔCPM.

c. Write an equation of the line through point *M* that is perpendicular to $\overleftrightarrow{CM}$.

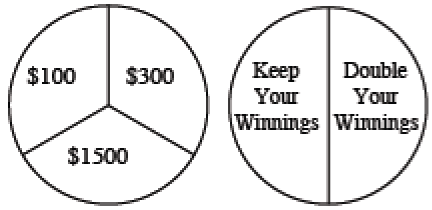
3-78. Use the relationships in each diagram below to solve for *x*. Justify your solution by stating which geometry relationships you used.

a. 

c. 

b. 

3-79. Congratulations! You are going to be a contestant on a new game show with a chance to win some money. You will spin the two spinners shown below to see how much money you will win. Test your ideas creating the situation below using the *Double Spinner* tool.



a. Make a tree diagram of all the possible outcomes of spinning the two spinners. At the ends of the branches, on the far right, write the amount you would win for each combination of spins.

b. Are each of the outcomes in the sample space equally likely?

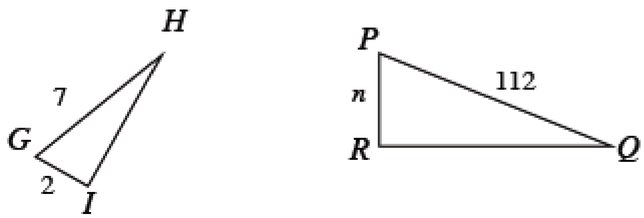
c. What is the probability that you will take home $200? What is the probability that you will take home more than $500?

d. What is the probability that you will double your winnings? Does the probability that you will double your winnings depend on the result of the first spinner?

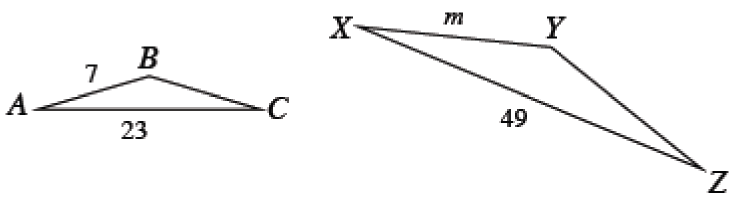
e. What if the amounts on the first spinner were $100, $200, and $1500? What is the probability that you would take home $200? Justify your conclusion.

3-80. Each pair of figures below is related by a single dilation. Solve for the missing lengths. Show all work.

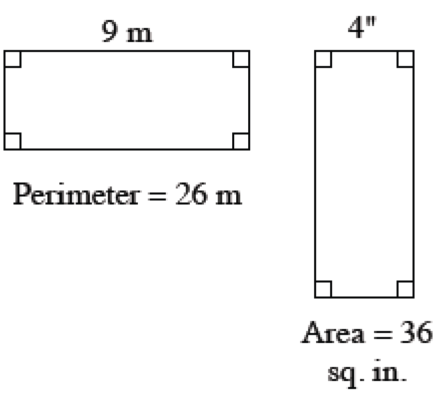
a. $\Delta GHI \sim \Delta PQR$



b. $\Delta ABC \sim \Delta XYZ$

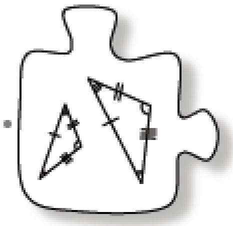


3-81. Explain why the shapes below are similar.



3.2.4 What information do I need?

More Conditions for Triangle Similarity

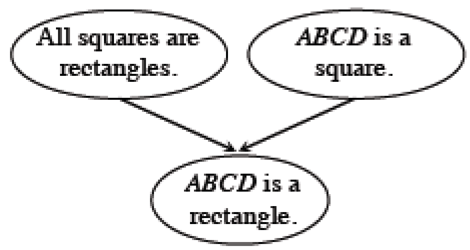


METHODS AND MEANINGS

MATH NOTES

Writing a Flowchart

A **flowchart** helps to organize facts and indicate which facts lead to a conclusion. The bubbles contain facts, while the arrows point to a conclusion that can be made from a fact or multiple facts.



For example, in the flowchart at right, two independent (unconnected) facts are stated: "*All squares are rectangles*" and "*ABCD is a square.*" These facts together lead to the conclusion that *ABCD* must be a rectangle. Note that the arrows point toward the conclusion.

3-88. If possible, draw a triangle that has exactly the following number of lines of symmetry. Then name the kind of triangle drawn.

a. 0

b. 1

c. 2

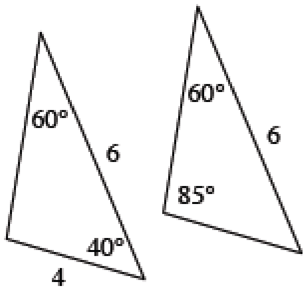
d. 3

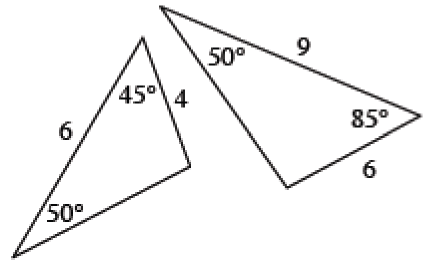
3-89. Do two lines always intersect? Consider this as you answer the questions below.

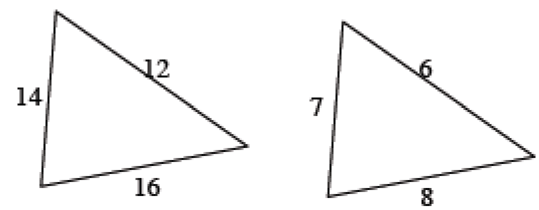
a. Write a system of linear equations that does not have a solution. Write each equation in your system in **slope-intercept form** ($y = mx + b$). Graph your system on graph paper and explain why it does not have a solution.

b. How can you tell algebraically that a system of linear equations has no solution? Solve your system of equations from part (a) algebraically and demonstrate how you know that the system has no solution.

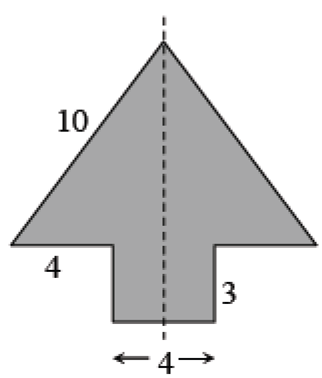
3-90. Determine which of the following pairs of triangles are similar. Explain your work.

a.


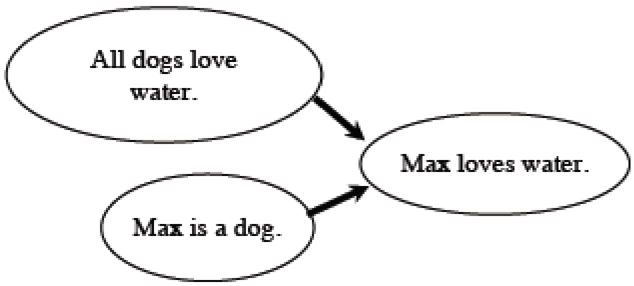
b.


c.


3-91. The dashed line below represents the line of symmetry of the shaded figure. Find the area and perimeter of the shaded region. Show all work.

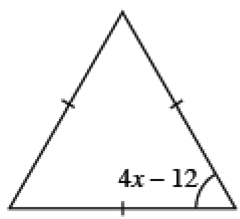


3-92. Determine whether or not the reasoning in the flowchart below is correct. If it is wrong, redo the flowchart to make it correct.

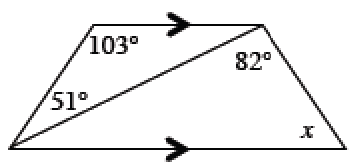


3-93. Examine the diagrams below. For each one, write and solve an equation to find x. Show all work.

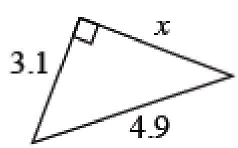
a.



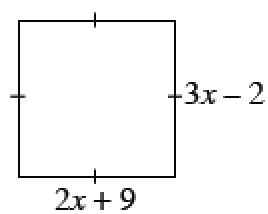
c.



b.

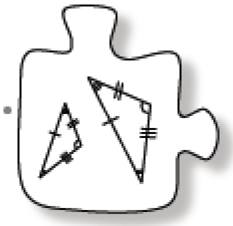


d.



3.2.5 Are the triangles similar?

Determining Similarity



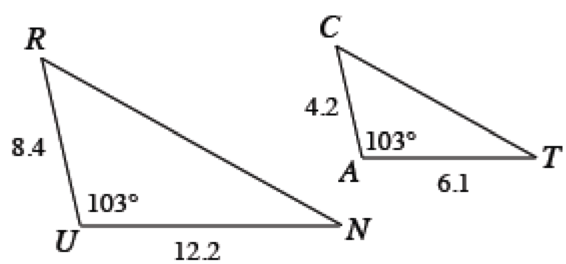
METHODS AND MEANINGS

MATH NOTES

Complete Conditions for Triangle Similarity

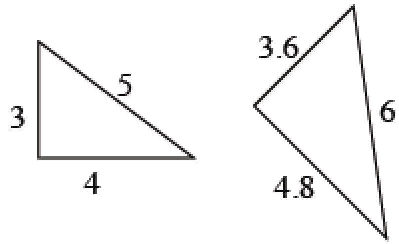
There are exactly three valid, non-redundant triangle similarity conditions that use only sides and angles. (A similarity condition is "redundant" if it includes more information than is necessary to establish triangle similarity.) They are abbreviated as: SSS ~, AA ~, and SAS ~. In the SAS~ condition, the "A" is placed between the two "S"s to indicate that the angle must be *between* the two sides used.

For example, ΔRUN and ΔCAT below are similar by SAS ~. $\frac{RU}{CA} = 2$ and $\frac{UN}{AT} = 2$, so the ratios of the side lengths of the two pairs of corresponding sides are equal. The measure of the angle *between* $\overline{RU}$ and $\overline{UN}$, $\measuredangle U$, equals the measure of the angle between $\overline{CA}$ and $\overline{AT}$, $\measuredangle A$, so the conditions for SAS ~ are met.

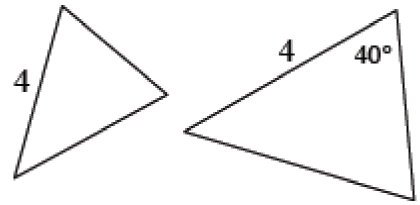


3-99. Determine which similarity conjectures (AA ~, SSS ~, or SAS ~) could be used to establish that the following pairs of triangles are similar. List as many as you can.

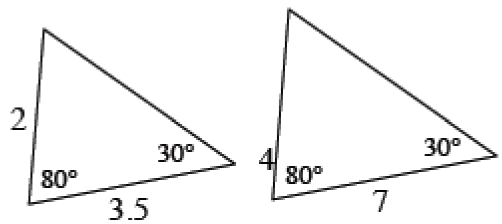
a.



c.



b.



3-100. You are feeling kind of crazy, so you are going to have the owner of the pet store randomly pick a fish for your aquarium at home.

a. A tank at the pet store contains 9 spotted guppies, 14 red barbs, 10 red tetras, and 7 golden platys. What is the probability (expressed as a percent) of getting a red-colored fish from this tank?

b. In a different tank that contains only golden platys, the probability of getting a female fish is 30%. If there are 18 female fish in the tank, how many total fish are in the tank?

3-101. Multiply the expressions in parts (a) and (b). Solve the equations in parts (c) and (d).

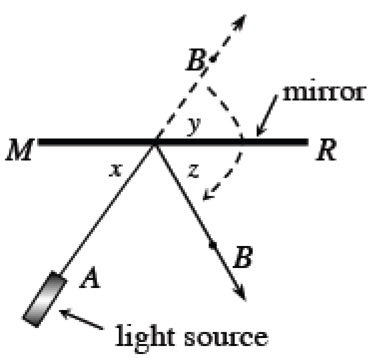
a. $(3x + 2)(4x - 5)$

b. $(4x - 1)^2$

c. $2x(x + 3) = (x + 1)(2x - 5)$

d. $3^2 + (x + 1)^2 = (x + 2)^2$

3-102. A laser light is pointed at a mirror as shown below. If $\angle x$ measures 48°, what are the measures of $\angle y$ and $\angle z$. Justify your reasons.



3-103. On graph paper, graph line $\overleftrightarrow{LD}$ if *L*(–2, 1) and *D*(4, –4).

a. Find the slope of $\overleftrightarrow{LD}$.

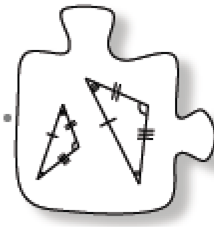
b. Find *LD* (the distance from *L* to *D*).

c. Describe how you might determine the lengths of the sides of the slope triangle without using graph paper.

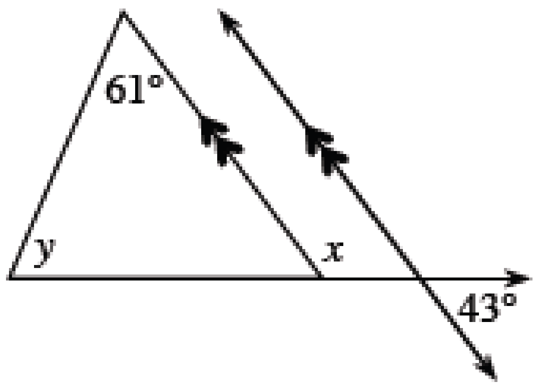
3-104. On graph paper, sketch a rectangle with side lengths of 15 units and 9 units. Shrink the rectangle by a zoom factor of $\frac{1}{3}$. Make a table showing the area and perimeter of both rectangles.

3.2.6 What can I do with similar triangles?

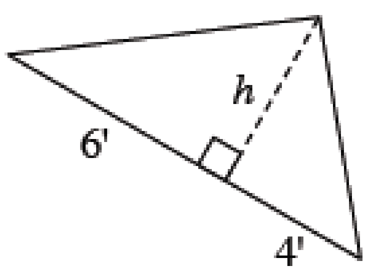
Applying Similarity



3-108. Use the relationships in the diagram below to solve for *x* and *y*. Justify your solutions..



3-109. The area of the triangle below is 25 square units. Find the value of *h*. Then find the perimeter of the entire triangle. Show all work.



3-110. You help out at the bowling alley on weekends. One of the arcade games has a bin filled with stuffed animals. A robotic arm randomly grabs a stuffed animal as a prize for the player. You are in charge of filling the bin.

a. You are told that the probability of getting a stuffed giraffe today is $\frac{2}{5}$. If there are 28 giraffes in the bin, what is the total number of stuffed animals in the bin?

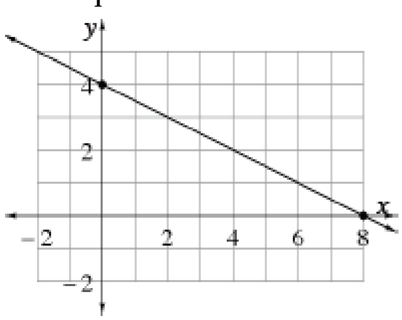
b. The next weekend, you arrive to find the bin contains 22 unicorns, 8 gorillas, 13 striped fish, and 15 elephants. A shipment of stuffed whales arrives. What is the probability of getting a sea animal (whale or fish) if you add 17 whales to the bin? Express the probability as a percent.

c. You are told that the probability of selecting a stuffed alligator needs to be 5%. One weekend you arrive to find there are exactly 3 alligators left. How many total animals should be in the bin to maintain the probability of 5% for an alligator?

3-111. This problem is a checkpoint for writing linear equations from multiple representations. It will be referred to as Checkpoint 3.

Write a linear equation that represents each situation.

a. An equation for the line below.



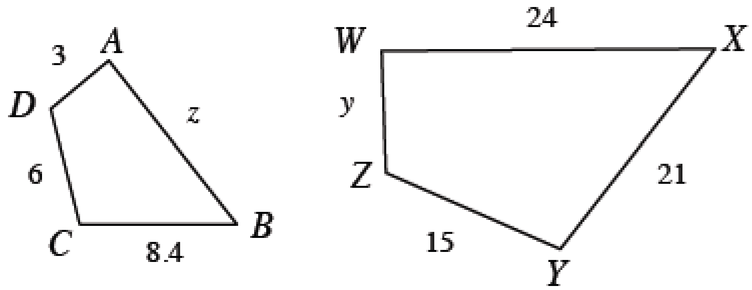
b. An equation for a line perpendicular to the line at right and passing through the point $(-1, -3)$.

c. An equation of the line passing through the points $(4, 3)$ and $(-1, 1)$.

d. At the concert, Elite Parking charges $15 for the first hour and $7 for each additional hour of parking. Write an equation to represent the cost (C) for parking (t) hours.

3-112. Patti lives 20 miles northeast of Matt. Simone lives 15 miles due south of Patti. If Matt lives due west of Simone, approximately how many miles does he live from Simone? Draw a diagram and show all work.

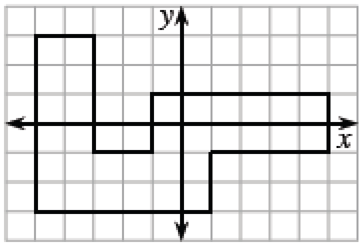
3-113. List a sequence of transformations that demonstrates $ABCD \sim WXYZ$, then find y and z.



Chapter 3 Closure What have I learned?

Reflection and Synthesis

CL 3-114. Examine the shape below.



a. Using the technique from problem 3-2, enlarge this shape from the origin by a factor of 3.

b. Now redraw the enlarged shape from part (a) using a zoom factor of $\frac{1}{2}$.

CL 3-115. Jermaine has a triangle with sides 8, 14, and 20. Sadie and Aisha both think that they have triangles that are similar to Jermaine's triangle. The sides of Sadie's triangle are 2, 3.5, and 5. The sides of Aisha's triangle are 4, 10, and 16. Decide who, if anyone, has a triangle similar to Jermaine's triangle. Be sure to explain how you know.

CL 3-116. For the points *R* (−2, 7) and *P* (2, 1) determine each of the following:

a. The slope of the line through the points.

b. The distance between the points.

c. An equation of the line $\overleftrightarrow{RP}$.

d. An equation of the line perpendicular to line $\overleftrightarrow{RP}$ and passing through point *P*.

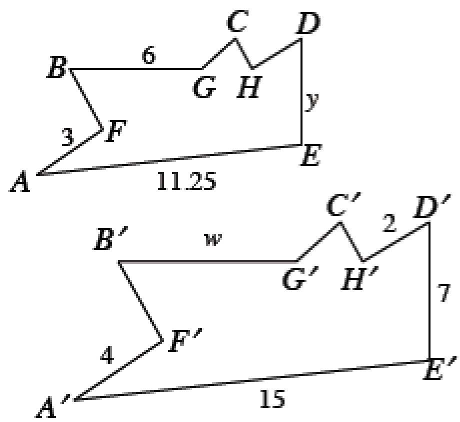
CL 3-117. For each given set of numbers, determine if a triangle with those side lengths can be made or not. If a triangle can be made, determine if the triangle is a right triangle. Justify all answers.

a. 8, 15, 17

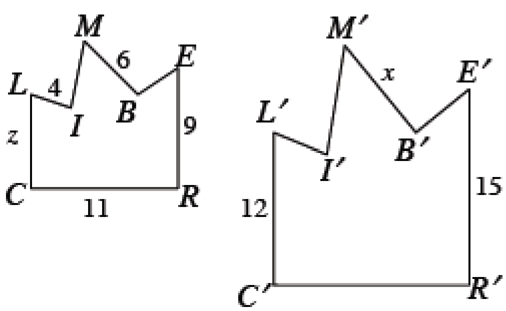
b. 8, 12, 4

CL 3-118. Each pair of figures below is similar. Find the lengths of the unknown sides that are marked with a variable.

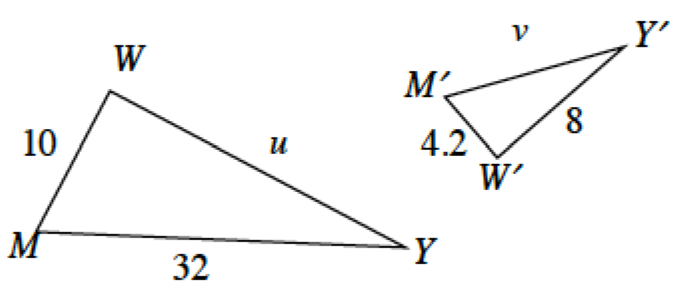
a.



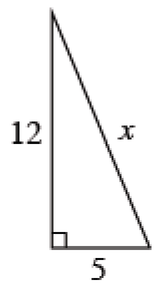
b.

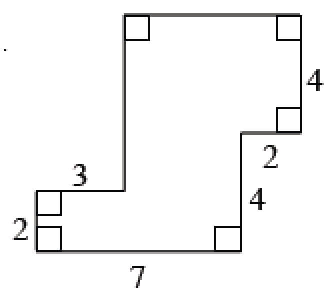


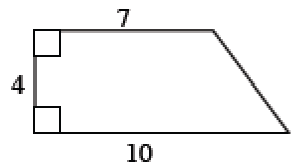
c.



CL 3-119. Find the perimeter and area of each figure.

a. 

b. 

c. 

CL 3-120. Solve each equation

a. $x(3x - 2) = (3x + 1)(x - 2)$

b. $(x + 1)(x + 2) = (x + 3)(x - 1)$

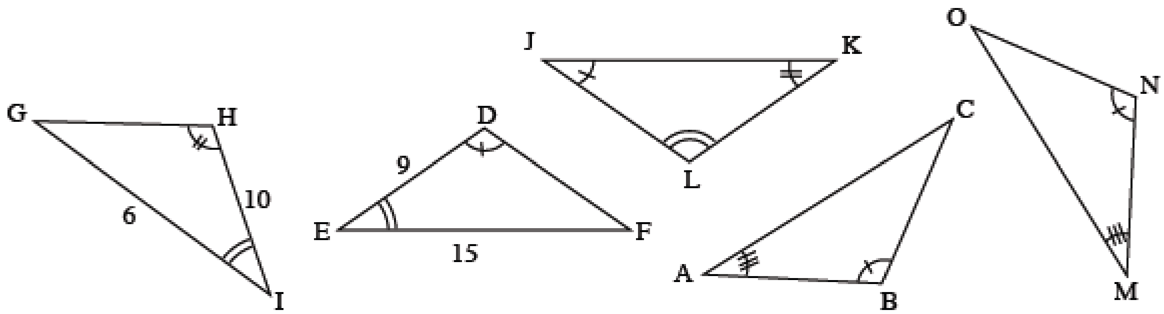
c. $\frac{x+1}{3} = \frac{x}{6}$

d. $\frac{3}{x} = \frac{2}{5}$

CL 3-121. Create a flowchart that represents the story:

Marcelle and Harpo live at Apt. I, 8 Logic St. Marcelle took his guitar to band practice across town and isn't back yet. Harpo hears guitar music in the hallway. He decides that someone else in the building also plays guitar.

CL 3-122. Among the triangles below are pairs of similar triangles. Find the pairs of similar triangles and state the triangle similarity condition that you used to determine that the triangles are similar.



CL 3-123. To help boost their healthy eating habits, Alyse and Haley are getting creative making juices. They are going to put fruits and vegetables in an ice chest, and then close their eyes to randomly pick fruits and vegetables to blend into juice. They hope to create something new and delicious!

a. The ice chest can hold 18 pieces of fruit or vegetables. For their first drink, Alyse and Haley want the probability of picking a carrot to be about 40%. How many carrots should they put in the ice chest?

b. For their second drink, there are 2 red apples, 5 apricots, 1 mango, 2 red tomatoes, 1 red grapefruit, 4 bananas, 2 nectarines, and 1 peach in the ice chest. What is the probability (expressed as a percent) that the first piece they pick is red?

c. Haley *loves* pomegranates. So she adds 7 pomegranates to the bin in in part (b). What is the probability (expressed as a percent) that the first fruit picked will be a pomegranate?