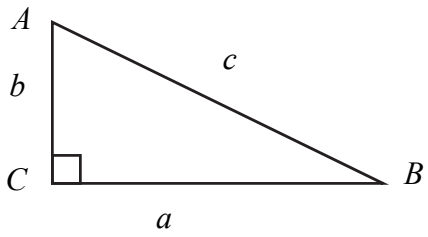
Honors Geometry A
Semester Exam Review

Pythagorean Theorem

In right triangle ABC with right angle at point C:

$$a^2 + b^2 = c^2$$



Trigonometry

In a right triangle with acute angle A:

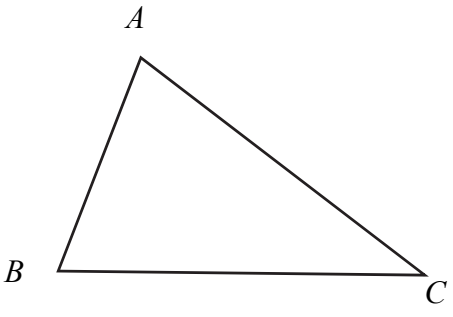
$$\sin A = \frac{\text{side opposite } \angle A}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{side adjacent to } \angle A}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{side opposite } \angle A}{\text{side adjacent to } \angle A}$$

In any triangle ABC:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \quad \text{or} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \text{The Law of Sines}$$



$$c^2 = a^2 + b^2 - 2ab\cos C \quad \text{The Law of Cosines}$$

Area of a triangle = $\frac{1}{2}ab\sin C$

Items on this review are grouped by Unit/Topic

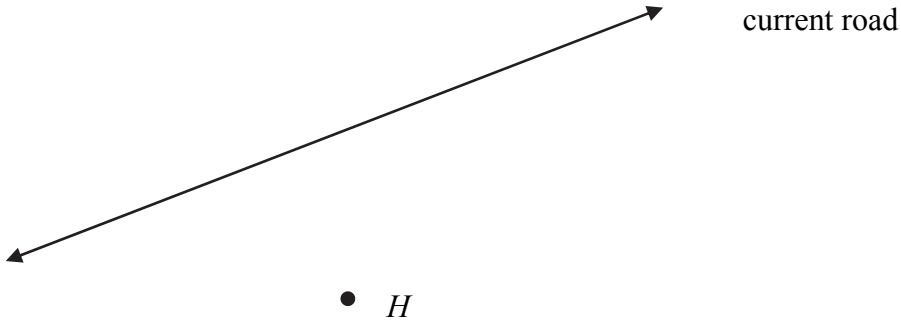
Unit 1, Topic 1

1. Write the three undefined terms in geometry.

2. Construct the angle bisector of angle *A* below.

3. Construct a 45^{o} angle using point *B* as the vertex of the angle.

4. A road construction crew wishes to construct a new road parallel to the current road, and passing through the town of Herkimer, marked by point *H* below. Construct the location of the road.



5. The perpendicular bisector of $\overline{AB}$ is constructed. What is true about every point on that perpendicular bisector?

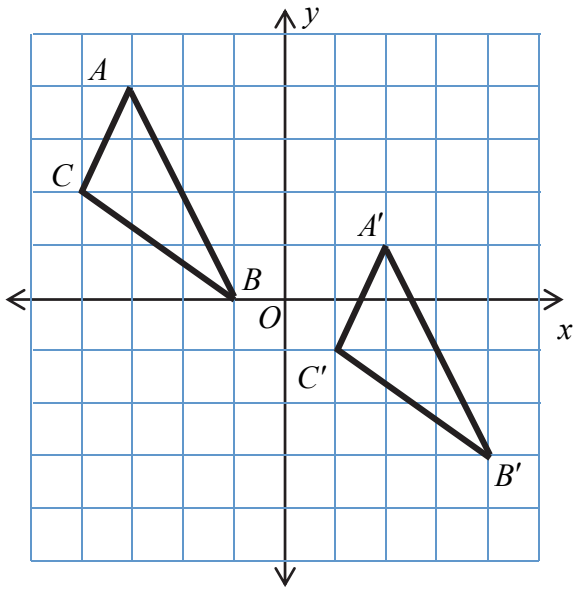
6. The angle bisector of $\angle CDE$ is constructed. What is true about every point on the angle bisector?

7. A line is constructed parallel to a given line. What is true about the lines?

Unit 1, Topic 2

8. Point $A(-1,-4)$ is to be transformed to point A' using the translation rule $(x,y)\rightarrow(x-3,y+6)$. What are the coordinates of point A'?

9. Triangle ABC has been transformed to triangle $A'B'C'$.



a. State in words, the transformation(s) that produce triangle $A'B'C'$.

b. Write a function rule that represents this transformation.

c. Why must $\Delta ABC \cong \Delta A'B'C'$?

d. On the coordinate plane above, sketch the reflection of ΔABC across the x-axis. Label the triangle DEF. Write the function rule for this transformation.

10. Let (x, y) be a point on the coordinate plane. Write the coordinates of the image point if (x, y) undergoes the following transformations.

a. Reflected across the *x*-axis.

b. Reflected across the *y*-axis.

c, Translated six units to the right and two units downward.

d. Rotated clockwise 90 degrees about the origin.

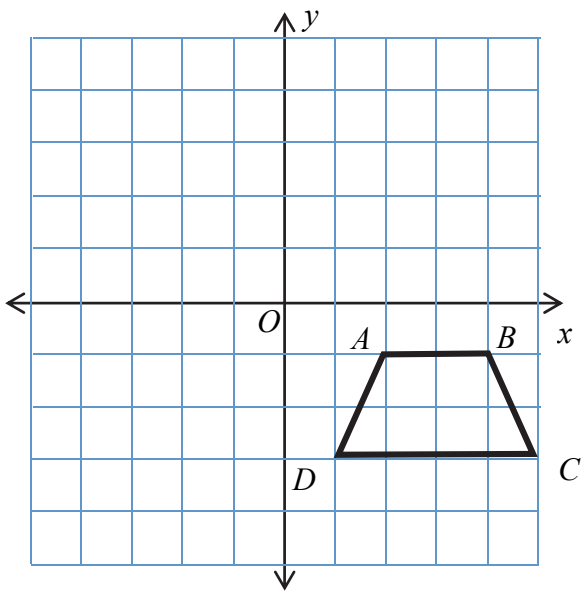
e. Rotated 180 degrees about the origin.

f. Rotated counter-clockwise 90 degrees about the origin.

g. Translated two units down, then reflected about the *x*-axis.

h. Reflected across the line $x = 1$.

11.



a. Reflect the figure above across the line $y = 1$. Label the image $A'B'C'D'$.

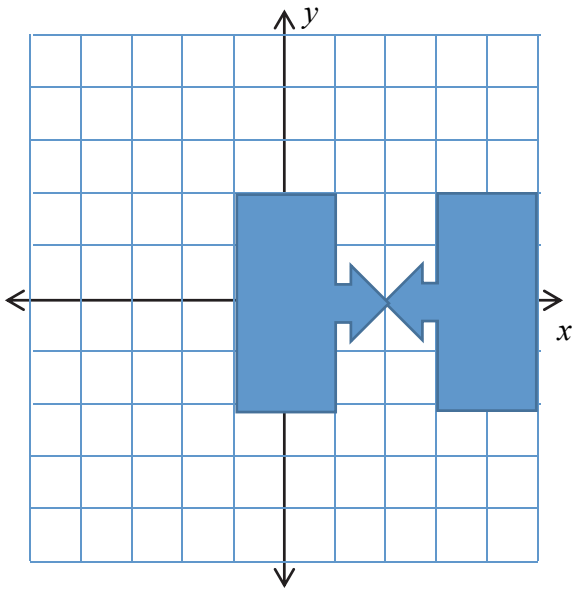
b. Does this transformation preserve lengths and angle measurements? Justify your answer.

c. If the figure was reflected across the *x*-axis, then translated two units upward, would the result be the same as the transformation in part a) ?

12. Write the three rigid transformations.

13. If a figure undergoes a rigid transformation, then the transformed figure must be _____ to the original figure.

14. Look at the figure below.

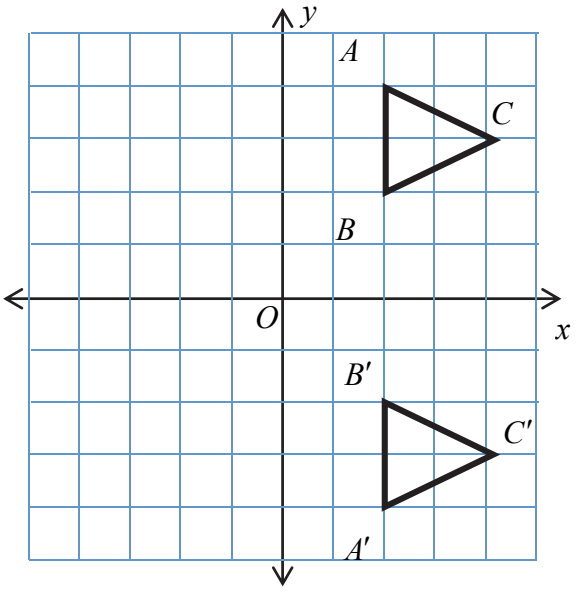


Complete each statement such that each transformation will map the triangle onto itself.

a. A reflection across the _____ axis or the line $x =$ _____ .

b. A rotation of _____ degrees about the point _____.

15. Triangle ABC undergoes a transformation to produce triangle $A'B'C'$. The triangles are shown below.

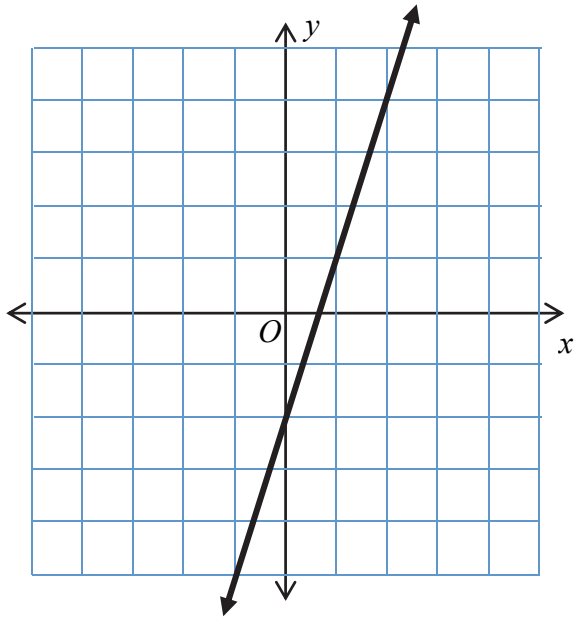


a. Is the transformation above a single reflection? Justify your answer.

b. Is the transformation above a translation? Justify your answer.

c. Determine a transformation with three reflections that will produce triangle $A'B'C'$.

16. The line $y = 3x - 2$ is graphed on the coordinate plane below.



Write the equation of the line if $y = 3x - 2$ is

a. reflected across the *x*-axis.

b. reflected across the *y*-axis.

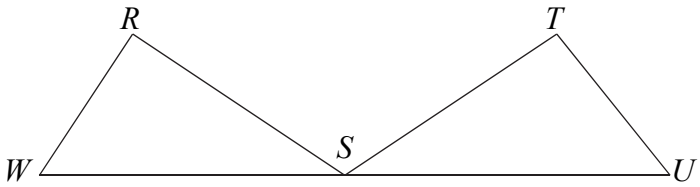
c. translated three units to the right and one unit up.

Unit 1, Topic 3

17. If figure $ABCD$ is congruent to figure *EFGH*, write all eight side and angle congruence statements.

18. If all corresponding sides of two figures are congruent, and all corresponding angles of the two figures are congruent, then the figures must be _____.

In the figure below, point *S* is the midpoint of $\overline{WU}$. Therefore $\overline{WS} \cong \overline{US}$.



You wish to prove $\Delta WSR \cong \Delta UST$.

19. To prove this congruence by SSS, what two additional congruence statements are needed?

20. To prove this congruence by SAS, what two additional congruence statements are needed?

21. To prove this congruence by ASA, what two additional congruence statements are needed?

22. To prove this congruence by AAS, what two additional congruence statements are needed?

23. State two additional congruence statements that will be insufficient to prove the triangles congruent.

24. Consuela wants to determine the length of a power line that will be stretched over a lake. She cannot walk through the lake. She was able to take some measurements, hoping to determine the length. Her measurements are shown below.

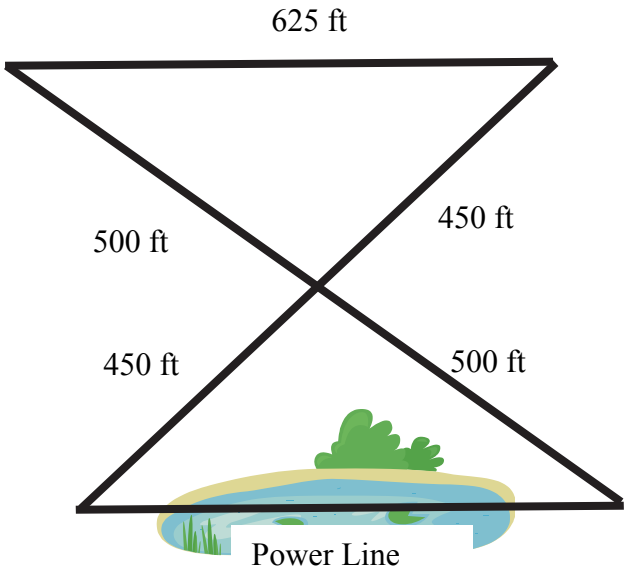
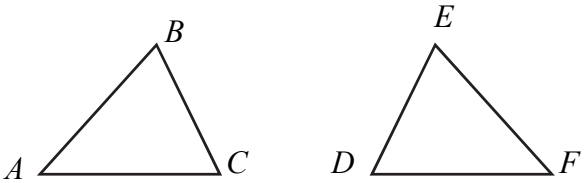


Figure NOT drawn to scale

Consuela believes that the length of the power line is 625 feet, but she's not sure how to explain this to her boss.

Using what you know about triangle congruence, help Consuela by writing a brief report as to why the length of the power line is 625 feet.

Look at triangles *ABC* and *FED* below.



In items 9 through 14 below, information is given about the two triangles. State whether the triangles can be proven congruent by ASA, SSS, AAS, or SAS. If the triangles cannot be proven congruent, state why.

25. $\overline{AB} \cong \overline{FE}$, $\overline{AC} \cong \overline{FA}$, $\angle A \cong \angle F$.

26. $\angle A \cong \angle F$, $\angle B \cong \angle E$, $\angle C \cong \angle D$.

27. $\angle A \cong \angle F$, $\angle B \cong \angle E$, $\overline{AB} \cong \overline{FE}$.

28. $\overline{AB} \cong \overline{FE}$, $\overline{AC} \cong \overline{FD}$, $\overline{BC} \cong \overline{ED}$.

29. $\angle B \cong \angle E$, $\overline{AC} \cong \overline{FD}$, $\overline{BC} \cong \overline{ED}$.

30. $\angle A \cong \angle F$, $\overline{AB} \cong \overline{FE}$, $\angle C \cong \angle D$.

Unit 1, Topic 4

31. Every quadrilateral that is a parallelogram has certain properties. List all these properties.

32. What properties does a rectangle have in addition to those of a parallelogram?

33. What properties does a square have in addition to those of a rectangle?

34. Triangle *DEF* is isosceles with $\angle D \cong \angle E$. Which sides are congruent?

35. In the figure to the right,

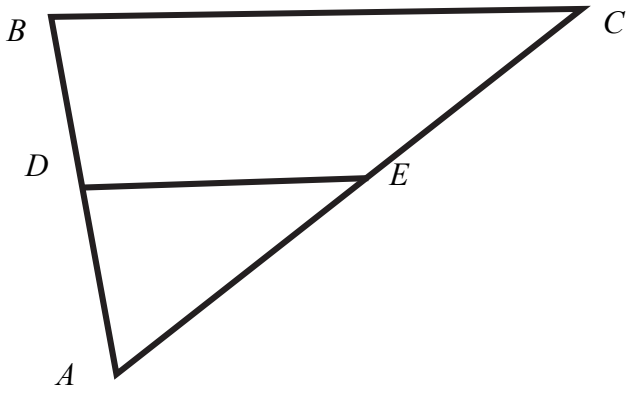
Figure NOT drawn to scale

D is the midpoint of $\overline{AB}$ and *E* is the midpoint of $\overline{AC}$.

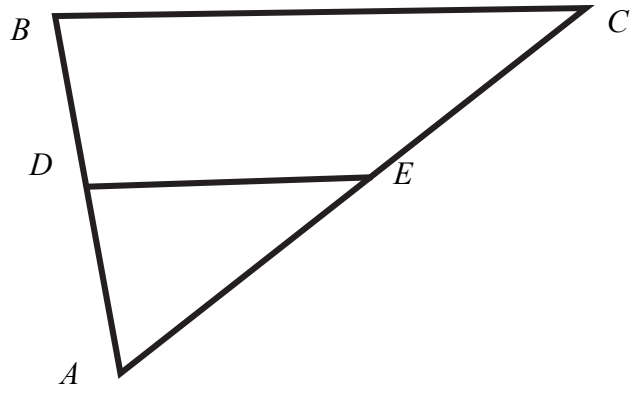
$AD = 8,\ BC = 22$

The ratio of AB to AC is 2 to 3.

Determine the lengths of $\overline{EC}$ and $\overline{DE}$.



36. In the figure below, D is the midpoint of $\overline{AB}$ and E is the midpoint of $\overline{AC}$.



Complete the statements using the items in the box on the right. Each item may be used more than once or not at all.

$\overline{AD}$	$\overline{AE}$
$\overline{DE}$	$\overline{BC}$
$\overline{EC}$	$\overline{BD}$
DE	AD
BC	EC
BD	AE
$2:1$	$1:2$

a. $\overline{AD} \cong$ _____

b. $\overline{AE} \cong$ _____

c. _____ is parallel to _____

d. $AD =$ _____

e. $AE =$ _____

f. _____ $= 2\times$ _____

g. The ratio $AB : AD$ is _____

h. The ratio $AE : AC$ is _____

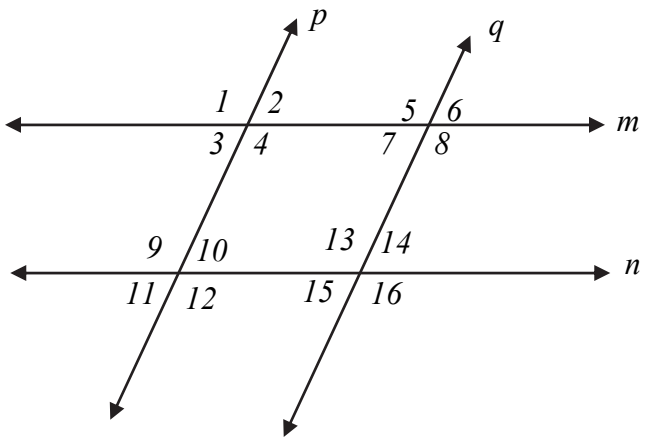
37. If two parallel lines are cut by a transversal:

    a. Which angle pairs are congruent?

    b. Which angle pairs are supplementary?

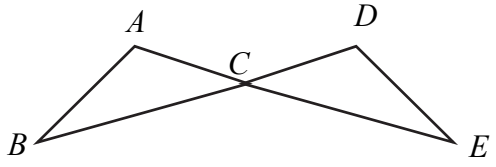
38. Given: $m \parallel n,\ \angle 1 \cong \angle 16$

    Prove: $p \parallel q$



39. Given: $\angle A \cong \angle D$
    $\overline{AB} \cong \overline{DE}$

    Prove: $\overline{CE} \cong \overline{CB}$

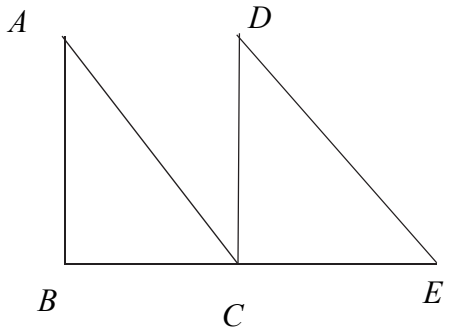


C is the midpoint of $\overline{BE}$.

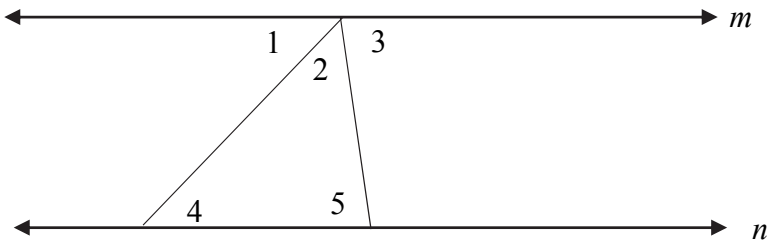
40. Given: $\overline{AB} \cong \overline{DC}$

$\overline{AB} \perp \overline{BE}$, $\overline{DC} \perp \overline{BE}$

Prove: $\angle A \cong \angle D$



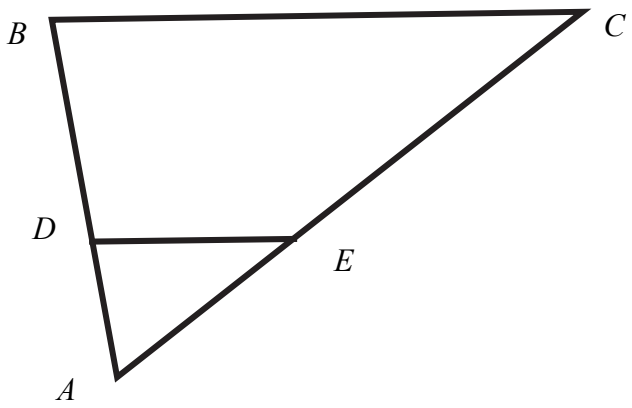
41. Below is a figure that will help you prove that the sum of the angles of a triangle is 180 degrees. The two lines are parallel.



Write a proof for this theorem.

Unit 2, Topic 1

Figure NOT drawn to scale



42. In the figure to the right, $\overline{DE} \parallel \overline{BC}$.

$CE = 2AD,\ AE = 8,\ BD = 9,\ BC = 18$

a. Prove that $\Delta ADE \sim \Delta ABC$.

b. Determine the length of $\overline{AD}$.

c. Determine the length of $\overline{DE}$.

43. Jory wants to measure the length, ***L***, of a pond. The figure below shows the measurements she will use to determine the length of the pond.

In the figure below, $\overline{AE}$ and $\overline{BD}$ intersect at point C.

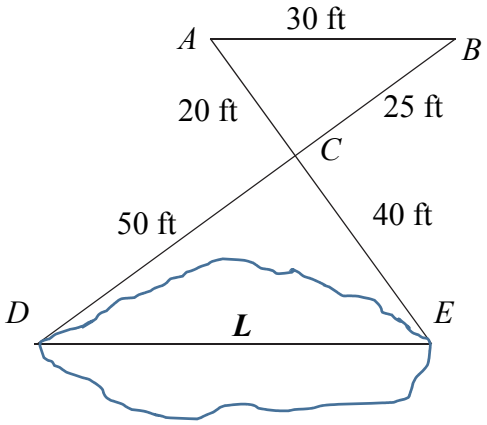


Figure NOT drawn to scale

a. Which similarity postulate/theorem may be used to prove $\triangle ABC \sim \triangle EDC$?

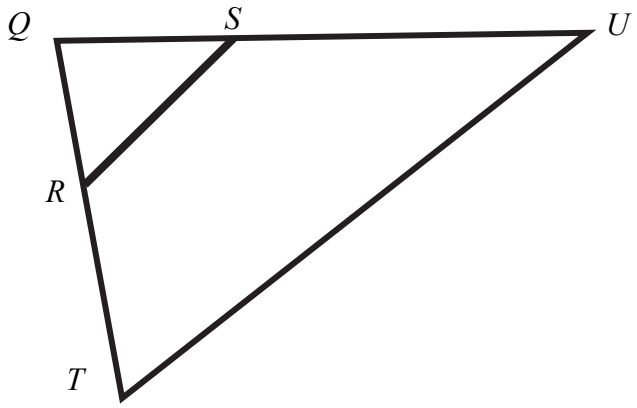
b. What is the length, ***L***, of the pond? Show how you determined your answer.

44. If two figures are similar, then

    a. Corresponding sides are _____(proportional/congruent).

    b. Corresponding angles are _____(proportional/congruent).

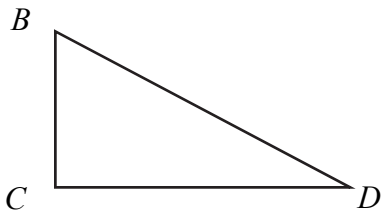
45. In the figure below, $\Delta QRS \sim \Delta QTU$.



    a. Prove that $\overline{RS} \parallel \overline{TU}$.

    b. Write all congruences and proportions using the sides and angles in the figure.

46. The figure below shows ΔBCD . $\Delta B'C'D'$ will be the image of ΔBCD after a dilation with center B and scale factor 5.



Item Bank

B

C

D

5

$\frac{1}{5}$

parallel to

on the same line as

perpendicular

Complete the statements using the item bank on the right.

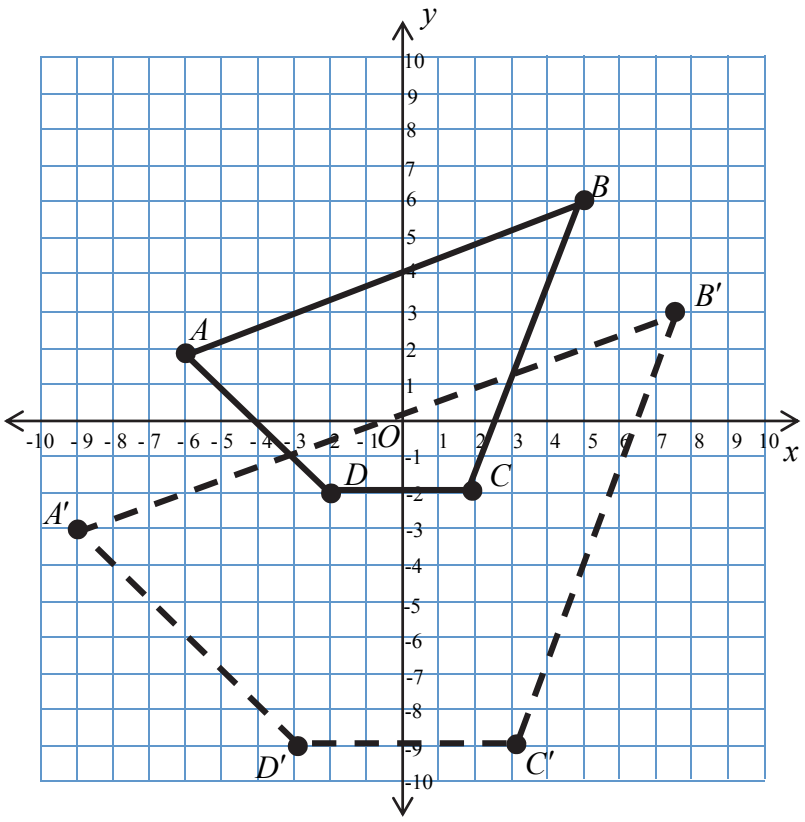
a. The point B' will be the same point as point _____.

b. $\overline{C'D'}$ will be _____ $\overline{CD}$.

c. $\overline{B'C'}$ will be _____ $\overline{BC}$.

d. The perimeter of $\Delta B'C'D'$ will be _____ times the perimeter of ΔBCD .

47. On the graph below, quadrilateral $ABCD$ has been dilated, with the center of dilation the origin, then translated down six units, to create quadrilateral $A'B'C'D'$.

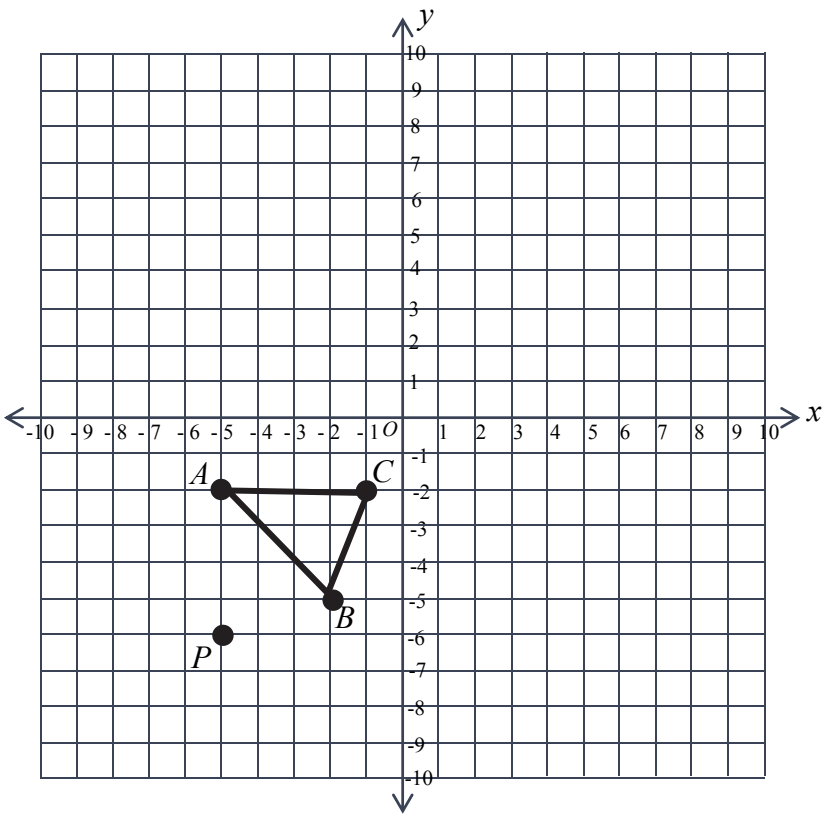


a. What is the scale factor of the dilation?

b. What is the ratio of the length of $\overline{AB}$ to the length of $\overline{A'B'}$?

c. How are the measures of $\angle A$ and $\angle A'$ related?

48. Triangle ABC is shown on the coordinate grid below.



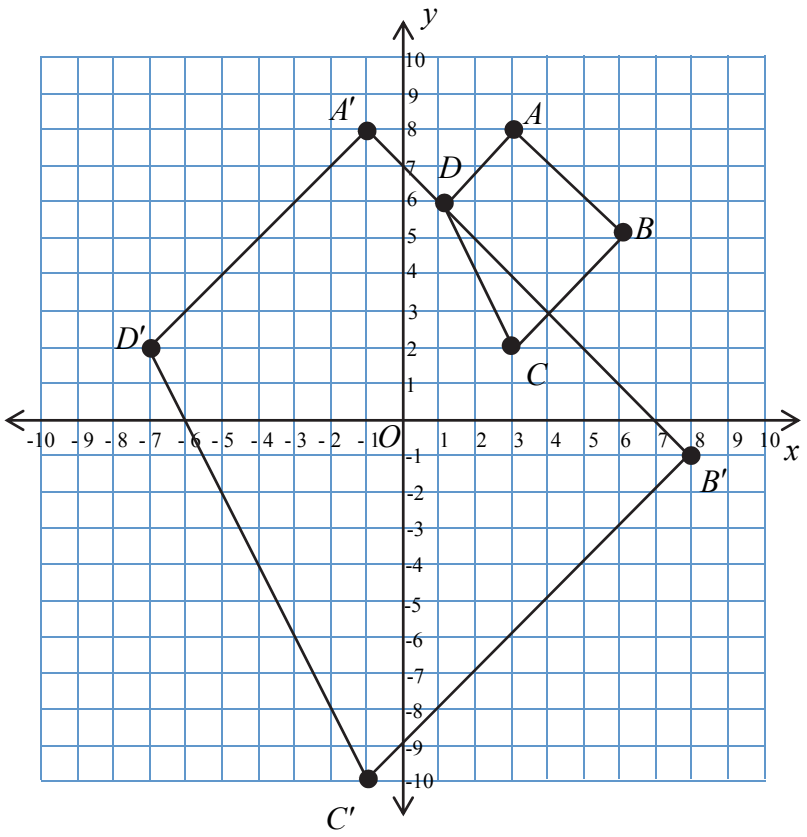
Triangle ABC is to be dilated by a scale factor of three with the center of dilation the point $P(-5,-6)$ to produce triangle $A'B'C'$.

a. On the coordinate plane above, sketch $\Delta A'B'C'$.

b. What is the ratio of the perimeter of ΔABC to the perimeter of $\Delta A'B'C'$?

c. Is there a sequence of rigid transformations that will produce the same result? Justify your answer.

49. Quadrilateral $ABCD$ has been dilated. The dilation results in the quadrilateral $A'B'C'D'$.

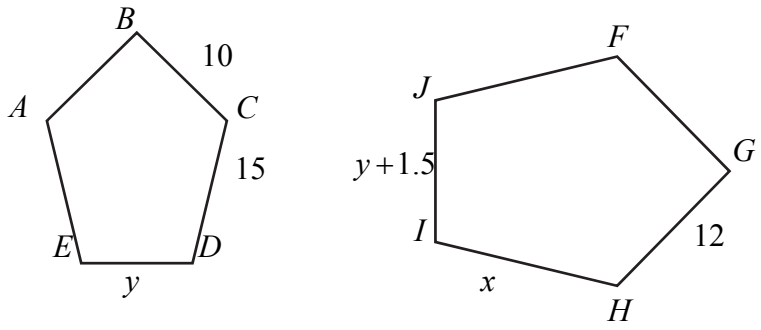


a. What is the scale factor of the dilation? _____

b. What point is the center of dilation? _____

50. Pentagons *ABCDE* and *FGHIJ* are similar.

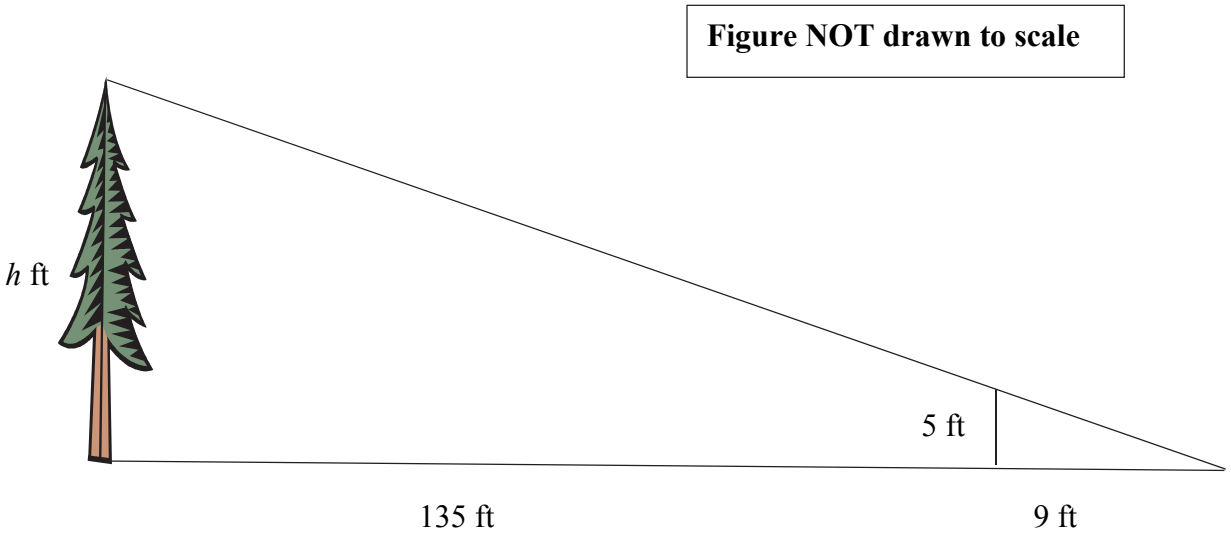
Figure NOT drawn to scale



a. What is the value of x?

b. What is the value of y?

51. Jack wishes to find the height of a tree. He puts a stick into the ground and uses the sun's shadow to take some measurements. The figure below shows his measurements.



a. Determine the height of the tree.

b. Determine the distance from the tip of the sun's shadow to the top of the tree.

52. Draw examples of two triangles that are similar by each similarity postulate/theorem.

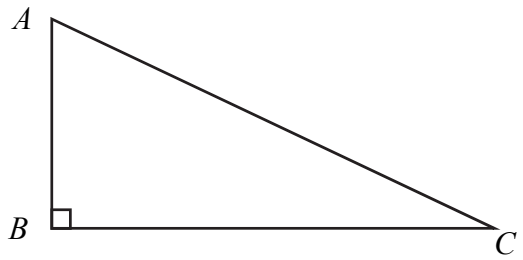
a. Draw examples of two triangles that are similar by SSS Similarity.

b. Draw examples of two triangles that are similar by AA Similarity.

C. Draw examples of two triangles that are similar by SAS Similarity.

Unit 2, Topic 2

53. Given right ΔABC , use the item bank to identify the following. Items may be used more than once.



Item Bank

$\angle A$ $\angle B$ $\angle C$ $\overline{AB}$ $\overline{AC}$ $\overline{BC}$

$\frac{BC}{AC}$ $\frac{BC}{AB}$ $\frac{AB}{BC}$ $\frac{AB}{AC}$ $\frac{AC}{BC}$ $\frac{AC}{AB}$

a. Leg opposite $\angle A$

b. Leg opposite $\angle C$

c. Sine ratio of $\angle A$

d. Cosine ratio of $\angle A$

e. Tangent ratio of $\angle A$

f. Sine ratio of $\angle C$

g. Cosine ratio of $\angle C$

h. Tangent ratio of $\angle C$

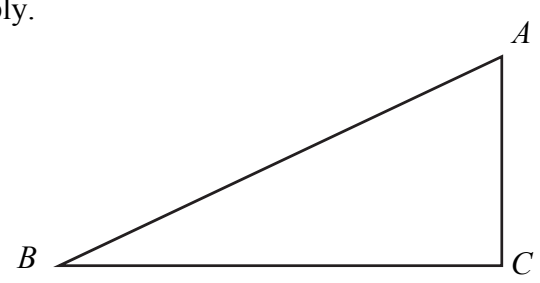
i. The angle whose Sine ratio is $\frac{BC}{AC}$

j. The angle whose Tangent Ratio is $\frac{AB}{BC}$

k. Hypotenuse

54. Let ABC be a right triangle, with right angle at C.

Which statements are true? Check all that apply.



_____ $\angle A$ and $\angle B$ are complementary

_____ $m\angle A = 90^o - m\angle B$

_____ $\tan A = \dfrac{\sin A}{\cos A}$

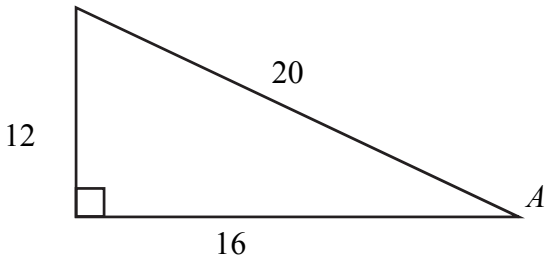
_____ $(AB)^2 = (AC)^2 + (BC)^2$

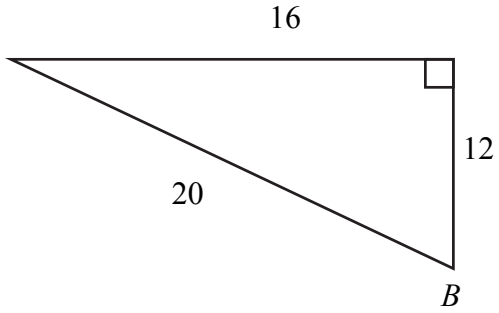
_____ $\sin A = \cos B$

_____ $\cos A = \sin\left(90^o - A\right)$

_____ If $\angle A \cong \angle B$, then $m\angle A = 45^o$.

55. Look at the two triangles below.

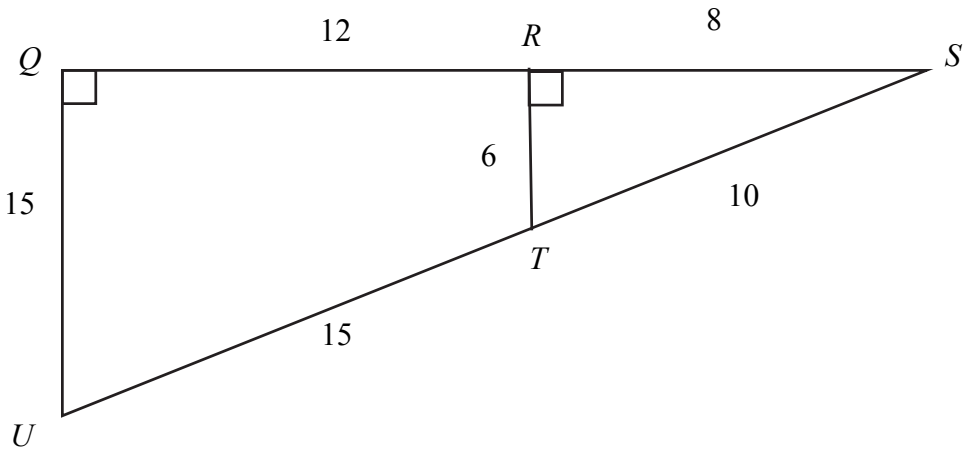




Saundra says that since the two triangles are congruent that $\sin A = \sin B$. Is Saundra correct? Justify your answer.

56. Look at the figure below.

Figure NOT drawn to scale



a. Show that the value of $\cos S$ is the same if ΔSQU or ΔSRT is used.

b. What is the value of $\sin U$?

c. Is $\cos U = \cos T$? Why or why not?

57. A skateboarder has a piece of plywood that she wants to use as a ramp. The plywood is 16 feet long. She wants to put a vertical support under the ramp so that the ramp is at a 20^o angle to the ground. This is shown in the figure below. The view is from the side of the ramp.

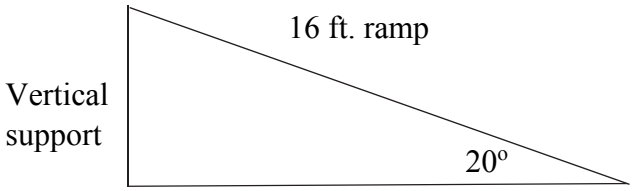


Figure NOT drawn to scale

How high is the vertical support? Round your answer to the nearest hundredth of a foot.

58. Josh has a 17 ft. ladder. He would like to place the ladder against the side of a vertical wall so that the top of the ladder is 15 feet up the wall. Safety guidelines state that the angle that the ladder makes with the horizontal can be no more than 70 degrees.

a. Can Josh safely place the ladder against the wall?

b. Suppose that Josh wanted the top of the ladder to be 24 feet up the wall. In order to meet the safety guidelines, what is the minimum length of ladder that Josh needs? Round your answer to the nearest hundredth of a foot.

59. A plane takes off from a runway and climbs at an angle of elevation of 15^{o}.

a. After the plane has travelled one mile (5280 feet) how far has the plane travelled horizontally? Round your answer to the nearest foot.

b. After the plane has travelled one mile (5280 feet) how far has the plane travelled vertically? Round your answer to the nearest foot.

60. A farmer wishes to make separate sections of a piece of land as shown in the figure below. All triangles are right triangles.

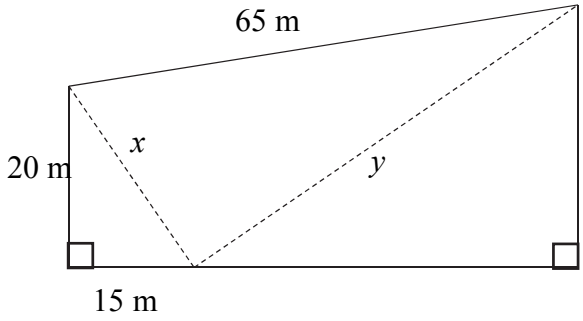


Figure NOT drawn to scale

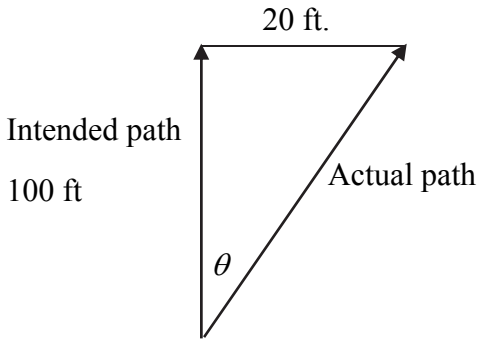
a. What is the value of x? _____

b. What is the value of y? _____

c. What is the area of the trapezoid?

61. A swimmer tries to swim straight across a stream. The stream is 100 feet wide. A current in the stream, perpendicular to his intended path, caused him to land 20 feet downstream from his intended landing point.

Figure NOT drawn to scale

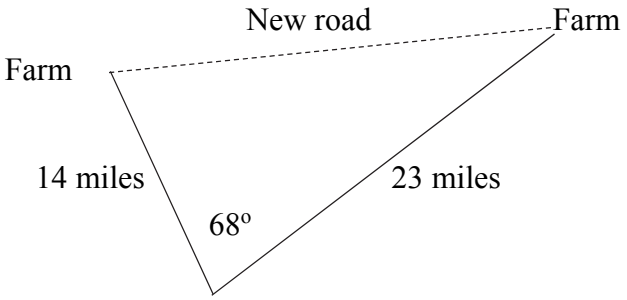


a. How far did the he swim? Give your answer to the nearest tenth of a foot.

b. At what angle, θ, was his actual path to the intended path? Give your answer to the nearest tenth of a degree.

62. Kevin purchased two farms. Currently, the two farms are connected by two roads. Kevin wants to construct a new road connecting the two farms directly. The figure below represents this situation.

Figure NOT drawn to scale



a. What will be the length of the new road? Your answer should be correct to the nearest hundredth of a mile.

b. The Federal Government is planning on making the area between the two existing roads and the new road into a national park. What is the area of the park? Your answer should be correct to the nearest hundredth of a square mile.

63. A roof is being constructed on a building and slopes differently on the two sides, as shown in the figure below.

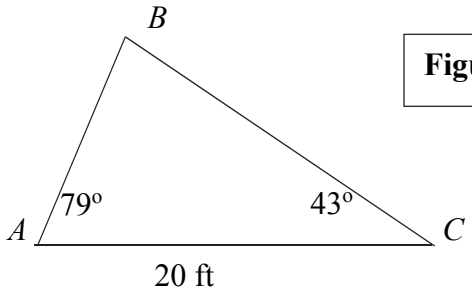


Figure NOT drawn to scale

What is the length of the roof represented by $\overline{BC}$? You answer should be correct to the nearest hundredth of a foot.