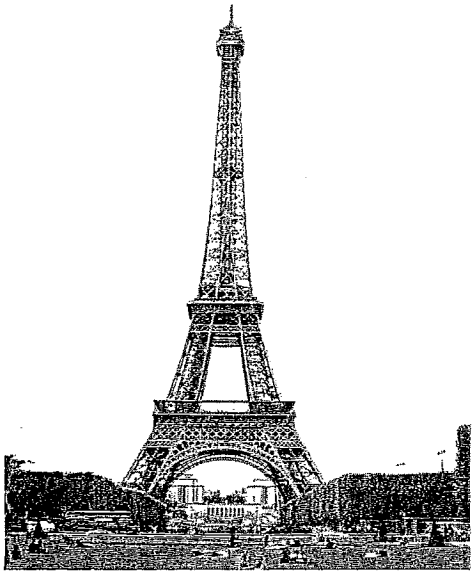
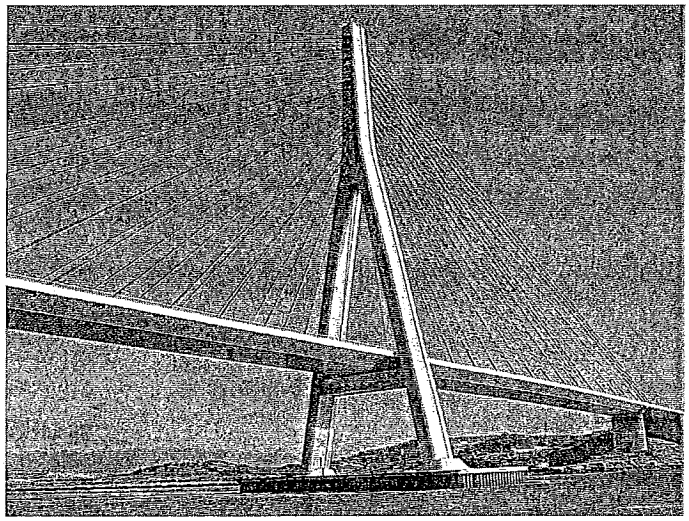
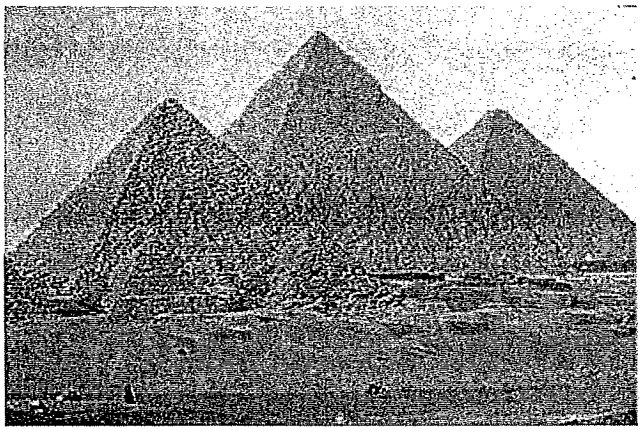
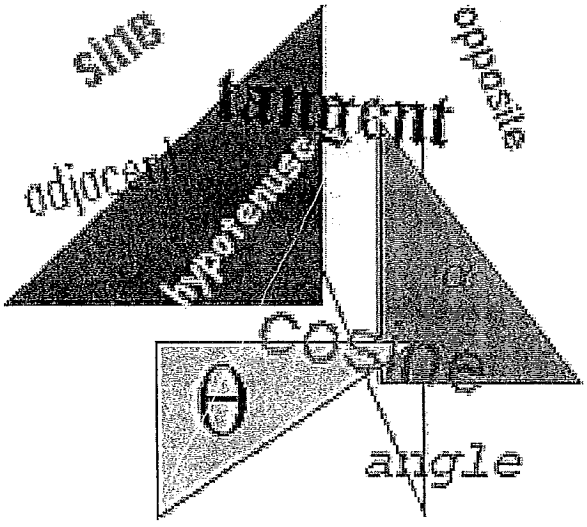




Triangles and Trigonometry

Secondary Math 2





Common Core Objectives:

Standards:

G.SRT.2: Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain, using similarity transformations, the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

G.SRT.3: Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

G.CO.10: Prove theorems about triangles. (Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.)

G.SRT.4: Prove theorems about triangles. (Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.)

G.SRT.5: Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

G.SRT.6: Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

G.SRT.7: Explain and use the relationship between the sine and cosine of complementary angles.

G.SRT.8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

F.TF.8: Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, and the quadrant of the angle.

SWBAT:

- Decide whether two figures are similar using properties of transformations.
- Understand that in similar triangles corresponding sides are proportional and corresponding angles are congruent.
- The sum of the measures of the angles in a triangle is 180 degrees.
- If two angles of a triangle are congruent to two corresponding angles of a second triangle, then the third pair of corresponding angles must be congruent.
- Prove that the sum of the interior angles of a triangles = 180.
- Prove that the base angles of an isosceles triangle are congruent.
- Prove that if two angles of a triangle are congruent, the triangle is isosceles.
- Prove the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length.
- Prove the medians of a triangle meet at a point.
- Find lengths of measures of sides and angles of congruent and similar triangles.
- Solve problems in context involving sides or angles of congruent or similar triangles.
- Prove conjectures about congruence or similarity in geometric figures using congruence and similarity criteria.
- Prove that a line constructed parallel to one side of a triangle intersecting the other two sides of the triangle divides the intersected sides proportionally.
- Prove that a line that divides two sides of a triangle proportionally is parallel to the third side.
- Prove that if three sides of one triangle are proportional to the corresponding sides of another triangle, the triangles are similar.
- Prove the Pythagorean Theorem using similarity.
- Understand that the ratio of two sides in one triangle is equal to the ratio of the corresponding two sides of all other similar triangles.
- Define sine, cosine, and tangent as the ratio of sides in a right triangle.
- Demonstrate the relationship between sine and cosine in the acute angles of a right triangle.
- Explain the relationship between the sine and cosine in complementary angles.
- Use the Pythagorean Theorem and trigonometric ratios to find missing measures in triangles in contextual situations.
- Prove $\sin^2(\theta) + \cos^2(\theta) = 1$ for right triangles in the first quadrant.
- Given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ for $0 < \theta$.

Classifying Triangles

Triangle –

Vertex –

Acute Triangle –

Obtuse Triangle –

Right Triangle –

Scalene Triangle –

Isosceles Triangle –

Base Angles –

Equilateral Triangle –

Equiangular Triangle –

Interior Angles –

Exterior Angles –

Midpoint –

Midsegment –

Median –

Centroid –

Altitude –

Angle Bisector –

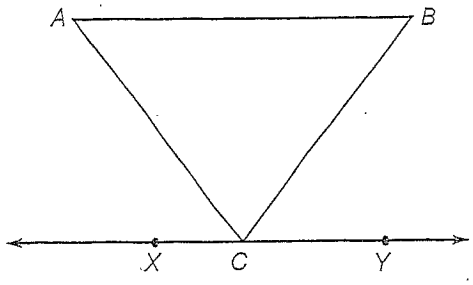
Reading the Lesson

1. Determine whether each statement is *true* or *false*. If the statement is false, replace the underlined word or number with a word or number that will make the statement true.
   a. The acute angles of a right triangle are supplementary.
   b. An equilateral triangle has three congruent sides.
   c. The sum of the measures of the angles of any triangle is 100.
   d. The measures of each angle of an equiangular triangle is 60.
   e. A triangle can have at most one right angle or acute angle.

2. You have measured two angles of a triangle. The measures are 65° and 35°. Explain how to find the measure of the third angle without measuring the angle.

Classifying Triangles

For Exercises 1–7, refer to the figure at the right. Triangle ABC is isosceles with AB > AC and AB > BC. Also, $\overleftrightarrow{XY} \parallel \overline{AB}$. Name each of the following.



1. sides of the triangle

2. angles of the triangle

3. vertex angle

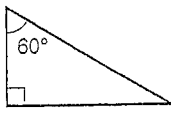
4. base angles

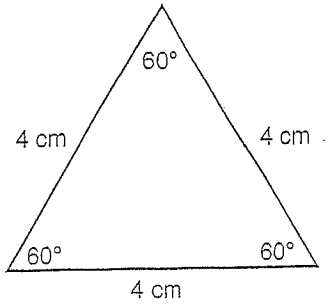
5. side opposite $\angle BCA$

6. congruent sides

7. angle opposite $\overline{AC}$

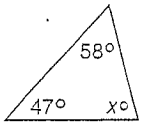
Classify each triangle by its angles and by its sides.

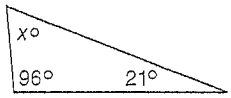
8. 

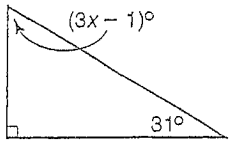
9. 

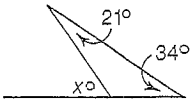
Angles of a Triangle

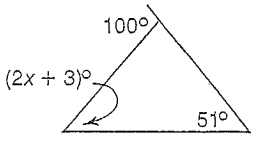
Find the value of x.

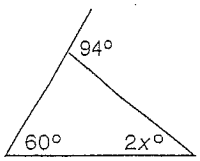
1. 

2. 

3. 

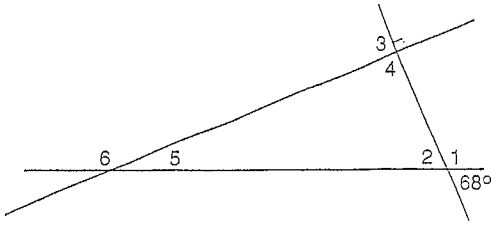
4. 

5. 

6. 

Find the measure of each angle.

7. $\angle 1$ 8. $\angle 2$ 9. $\angle 3$

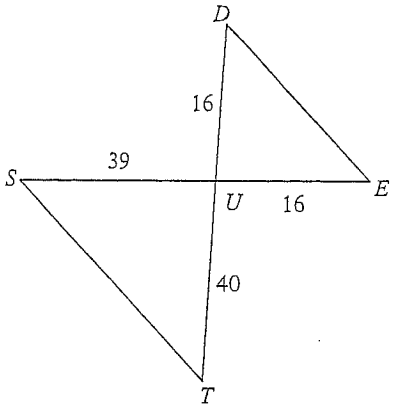


Similar Triangles and Proportional Parts

Ratio –

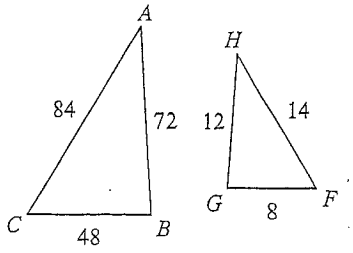
Proportion –

1)



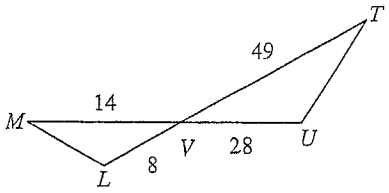
$\Delta UTS \sim$ _____

2)



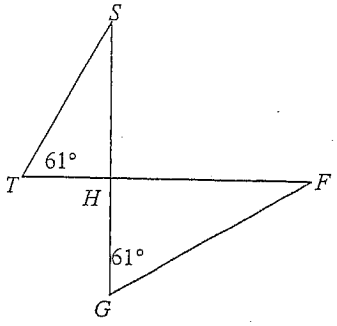
$\Delta CBA \sim$ _____

3)



$\Delta VUT \sim$ _____

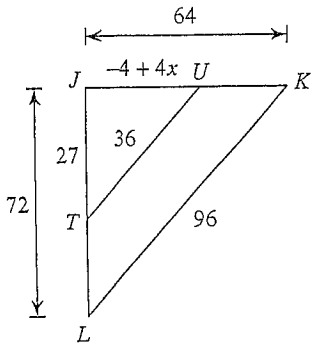
4)



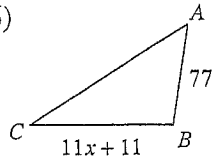
$\Delta HGF \sim$ _____

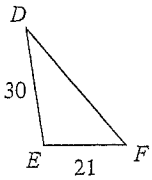
Solve for x. The triangles in each pair are similar.

5)

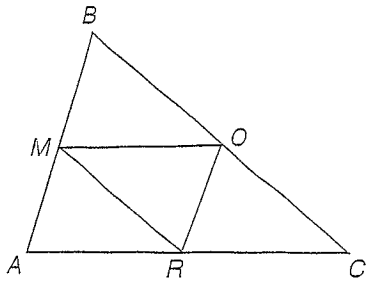


6)





M, O, and R are the midpoints of the sides of $\triangle ABC$.
Complete each statement.



7. $\overline{OR} \parallel$ ___?___

8. $\overline{BC} \parallel$ ___?___

9. If $MO = 15$, then $AC =$ ___?___

10. If $BC = 62$, then $MR =$ ___?___

11. If $m\angle BMO = 75$, then $m\angle BAC =$ ___?___

12. If $m\angle BCA = 52$, then $m\angle BOM =$ ___?___

13. $\overline{AC} \parallel$ ___?___

14. If $BM = 28$, then $AM =$ ___?___

15. If $AB = 50$, then $OR =$ ___?___

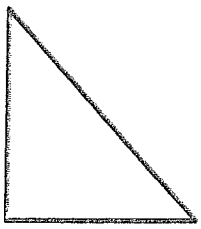
16. If $BC = 74$, then $BO =$ ___?___

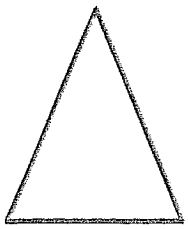
17. If $m\angle COR = 60$, then $m\angle CBA =$ ___?___

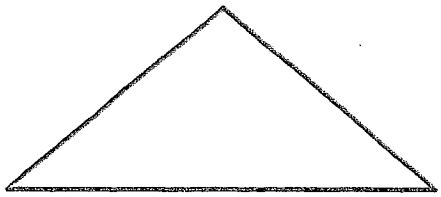
18. If $BO = 19$, then $MR =$ ___?___

Triangle Congruency

Triangles and their Markings:







SSS –

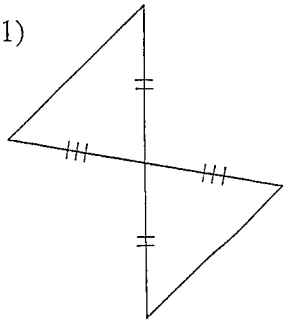
SAS –

ASA –

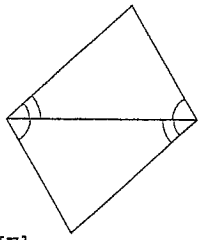
SAA –

State if the two triangles are congruent. If they are, state how you know.

1)



2)



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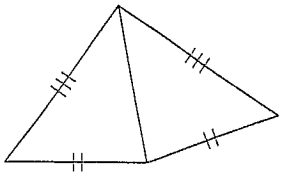


[7]

LL –

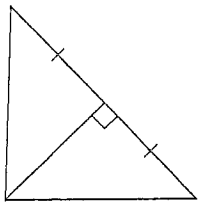
HA –

LA –

HL –

State if the two triangles are congruent. If they are, state how you know.

1)



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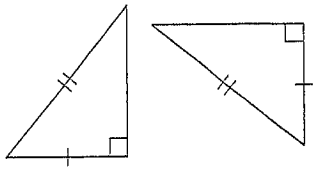
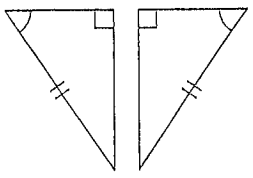
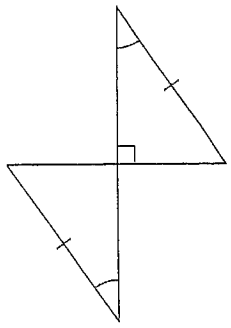


3)



4)



[8]

Pythagorean Theorem

Perfect Square Roots –

Radical Expression –

Square Root –

Radicand –

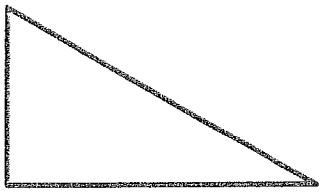
Hypotenuse –

Leg –

Right Angle –

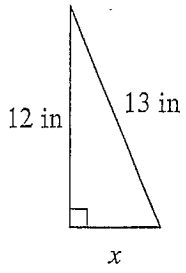
Pythagoras –

Pythagorean Theorem –

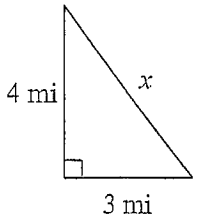


Find the missing side of each triangle. Round your answers to the nearest tenth if necessary.

1)



2)



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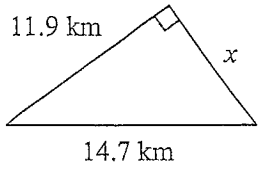
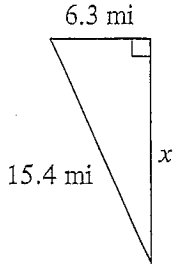


4)



Trigonometry Ratios

Sine –

Cosine –

Tangent –

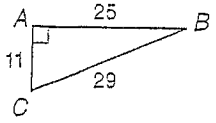
SOHCAHTOA –

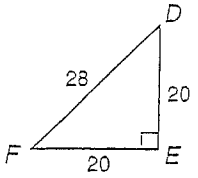
Simplify each expression.

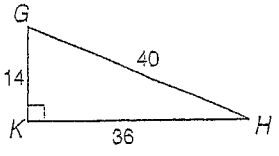
1. $\sqrt{25}$
2. $\sqrt{64}$
3. $\frac{\sqrt{16}}{\sqrt{36}}$
4. $\sqrt{3} \cdot \sqrt{32}$
5. $\sqrt{324}$
6. $\sqrt{5} \cdot \sqrt{8}$
7. $\sqrt{\frac{2}{10}}$
8. $\frac{\sqrt{3}}{\sqrt{5}}$
9. $\sqrt{99}$

Sine and Cosine Ratios

Find each sine or cosine.



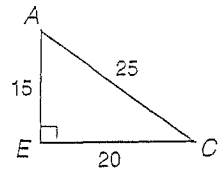




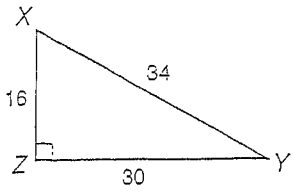
1. sin B
2. cos C
3. cos B
4. sin D
5. sin F
6. cos G

Tangent Ratio

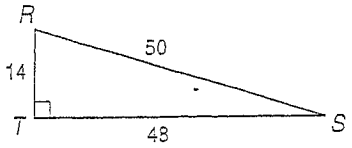
Find each tangent.



1. tan A



2. tan Y



3. tan S

4. tan C

5. tan X

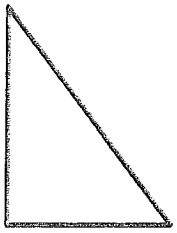
6. tan R

Special Triangles

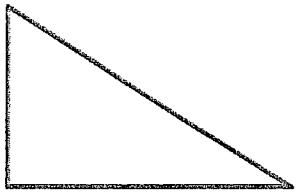
Pythagorean Theorem –

SOHCAHTOA –

45-45-90 Triangle –

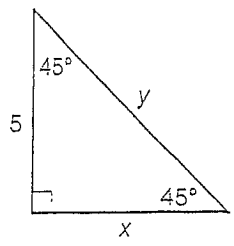


30-60-90 Triangle –



Find the missing measure. Write all radicals in simplest form.

1.



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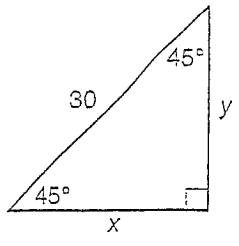

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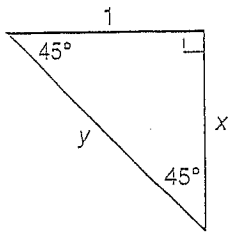

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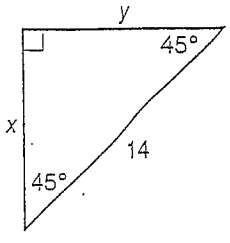
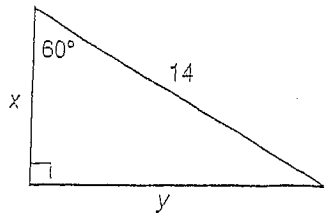


5. Find the length of a diagonal of a square with sides 10 inches long.

30°-60°-90° Triangles

Find the missing measures. Write all radicals in simplest form.

1.



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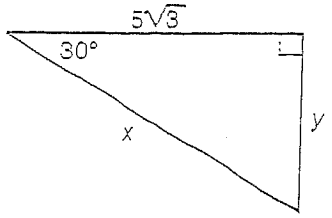
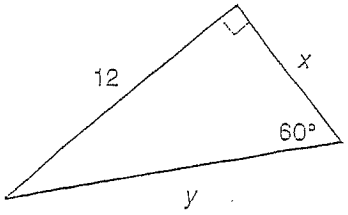
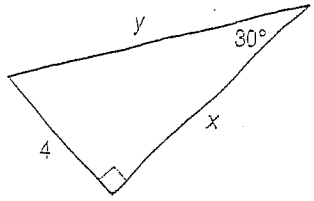


3.



4.



5. One side of an equilateral triangle measures 6 cm. Find the measure of an altitude of the triangle.

6. Find the missing measures in the triangle. Write all radicals in simplest form.