Webster County Schools

95 CLARK AVENUE – EUPORA, MS 39744

Office of Curriculum

662-258-5551, Extension 15

packets@webstercountyschools.org

Geometry

Packet 2

Webster County Schools

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For Additional Online Resources, please see the Link to the following resources on the Curriculum page on www.webstercountyschools.org:

MDE Learning-at-Home Resources for Districts

The resources contained on this website contain materials and tools that may be used to provide additional resources to parents or students. This information is only intended to be a general summary of information provided to the public. The Mississippi Department of Education does not endorse or promote any commercial products or services. The views and opinion of authors expressed do not necessarily reflect those of the MDE, and they may not be used for advertising or product endorsement purposes. Please make sure that you choose the tool(s), resource(s) or material(s) that are developmentally appropriate and best fit the needs of your students, school, or district.

Resources have been divided into the following categories:

- Internet Services
- Multiple Content Area Resources
- Arts (Dance, Music, Theatre, Visual Arts) Resources
- Career Pathway Experiences (CPE) Alternative Resources
- English Language Arts Resources
- Mathematics Resources
- Science Resources
- Social Studies Resources
- World Language Resources
- Counselor Resources
- English Learner Resources
- Virtual Learning Resources

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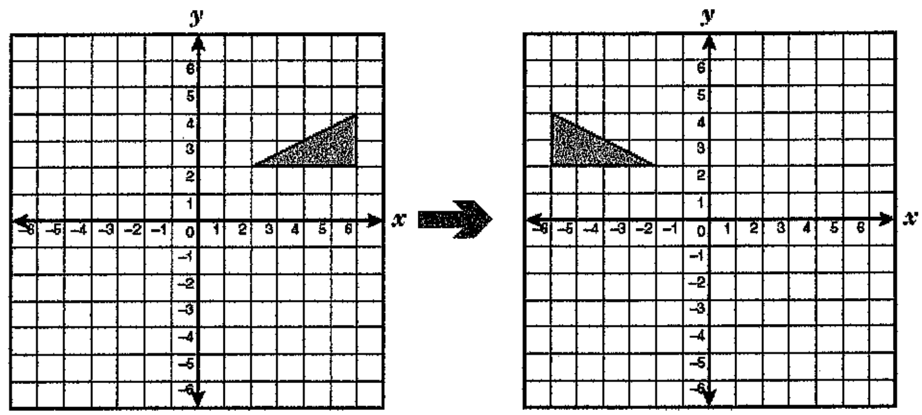
At-Home Learning Packet Schedule:

- Packet 2- April 20, 2020
- Packet 3- May 4, 2020
- Packet 4- May 18, 2020

Transformations in the Plane

Question 1 .



What is the rule for the transformation above?

A. $(x', y') = (-x, -y)$

B. $(x', y') = (y, x)$

C. $(x', y') = (-x, y)$

D. $(x', y') = (x, -y)$

Question 2 .

What is the rule for a dilation which makes the transformed polygon three times the size of the original polygon?

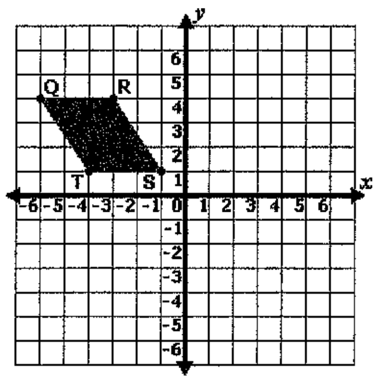
A. $(x', y') = (x, 3y)$

B. $(x', y') = \left(\frac{1}{3}x, y\right)$

C. $(x', y') = \left(\frac{1}{3}x, \frac{1}{3}y\right)$

D. $(x', y') = (3x, 3y)$

Question 3 .



If figure QRST is reflected across the *y*-axis and translated 5 units down, which of the following will be the coordinates for point T'?

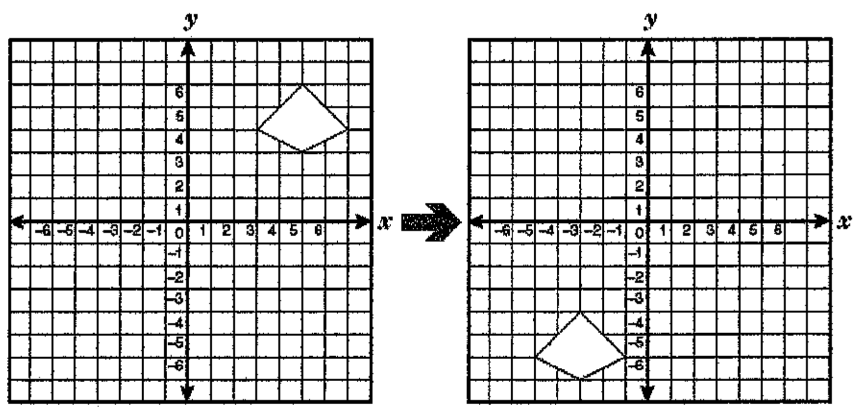
A. (4,-4)

B. (-4,-1)

C. (4,4)

D. (4,1)

Question 4 .



What is the rule for the transformation shown above?

A. $(x', y') = (x - 8, y - 10)$

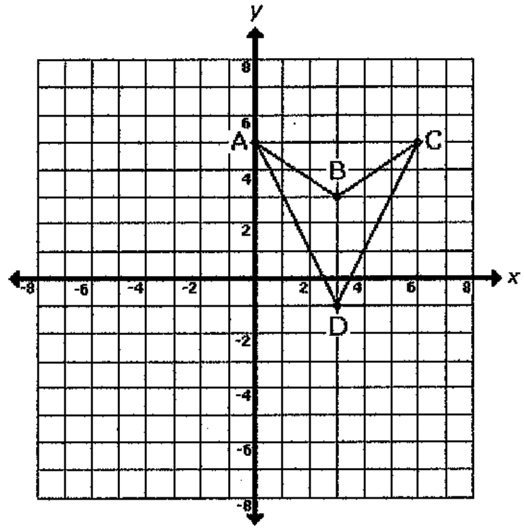
B. $(x', y') = (x + 8, y - 10)$

C. $(x', y') = (x + 8, y + 10)$

D. $(x', y') = (x - 8, y + 10)$

Question 5 .

The quadrilateral ABCD is shown below.



If this quadrilateral is reflected across the *y*-axis to become quadrilateral A'B'C'D', what will be the coordinates of A'?

A. (-5,0)

B. (0,-5)

C. (5,0)

D. (0,5)

Question 6 .

Which of the following transformations will always produce a congruent figure?

A. expansion

B. contraction

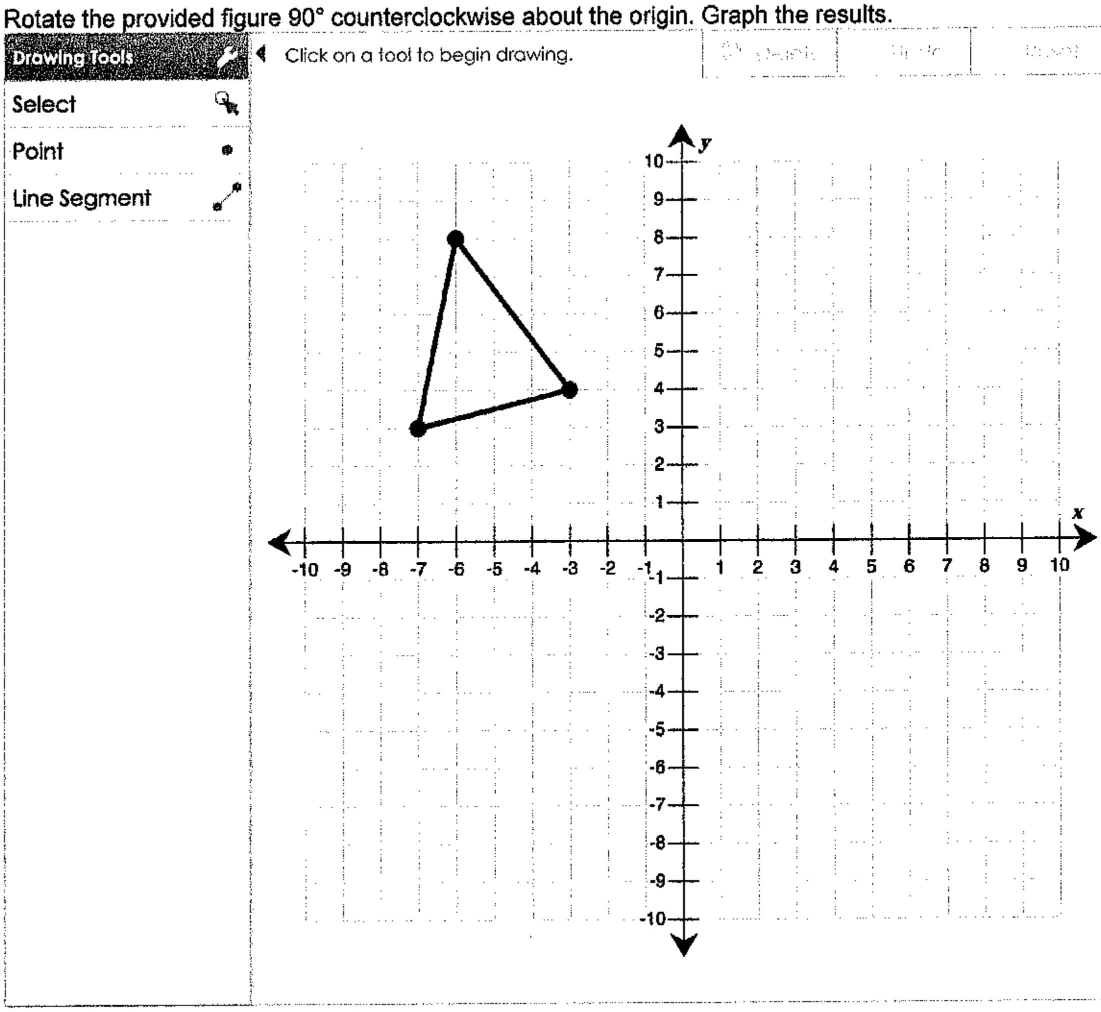
C. rotation

D. dilation

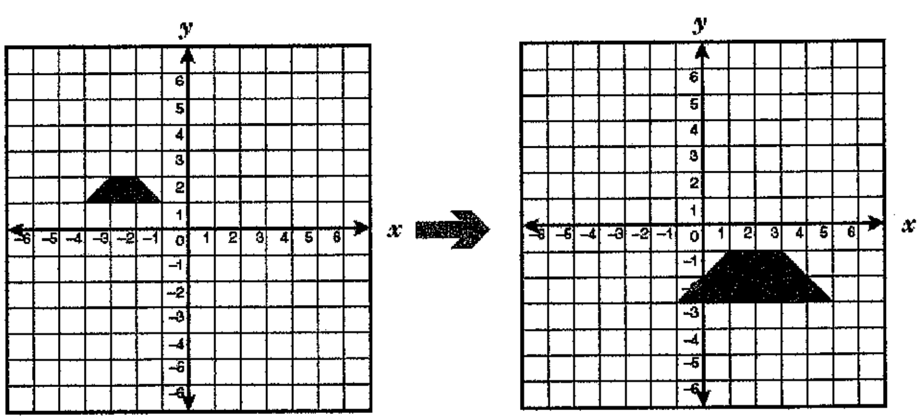
Question 7 .

Directions: Use the drawing tool(s) to form the correct answer on the provided graph.

Rotate the provided figure 90° counterclockwise about the origin. Graph the results.



Question 8 .



What is the rule for the transformation above?

A. $(x', y') = (2x + 7, 2y - 5)$

B. $(x', y') = (x + 1, -y - 4)$

C. $(x', y') = (-2x + 1, 2y + 4)$

D. $(x', y') = (-x - 1, y - 4)$

Question 9 .

What is the rule for a counterclockwise rotation about the origin of 90°?

A. $(x',y') = (-x,-y)$

B. $(x',y') = (-y,-x)$

C. $(x',y') = (-y,x)$

D. $(x',y') = (y,x)$

Question 10 .

$F(1,2)$ $F'(3,6)$
$G(2,3)$ $G'(6,9)$

Given the points above, which of the following transformations maps $\overline{FG}$ to $\overline{F'G'}$?

A. a dilation with scale factor $\frac{1}{2}$

B. a dilation with scale factor $\frac{1}{3}$

C. a dilation with scale factor 2

D. a dilation with scale factor 3

Explanations

1. The transformation shows a reflection across the *y*-axis.

   For each point of the polygon, the *x*-value changes sign while the *y*-value stays the same.

   Thus $x' = -x$ and $y' = y$.

2. The scale factor of a dilation is the magnitude by which the original image is expanded or reduced.

   A scale factor greater than 1 results in an expansion; a scale factor less than 1 results in a reduction.

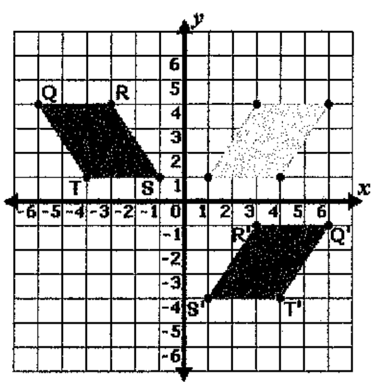
   In this case, the resulting polygon is three times the size of the original polygon. Thus, the scale factor is 3.

   Since each dimension is changed by a factor of 3, the transformation is given by the equation below.

$$(x', y') = (3x, 3y)$$

3. When point $P(x,y)$ is reflected across the *y*-axis and translated 5 units down, the translation point, P', is located at $(-x, y - 5)$, where the *x*-coordinate changes signs and 5 units are subtracted from the *y*-coordinate to move down.

   Thus, the coordinates of point T reflected across the *y*-axis and translated 5 units down are ***T*'(4,-4)**.



4. Choose a corner of the object, such as (5 , 3). Then, see what point that corner is on after the object has been translated.

   The corner on point (5 , 3) is on point (-3 , -7) after the translation.

   The object moved -8 units horizontally on the *x*-axis (the 8 is negative since it moved to the left on the *x*-axis). Therefore, $x' = x - 8$.

   It also moved -10 units vertically on the *y*-axis (the 10 is negative since it moved down the *y*-axis). Therefore, $y' = y - 10$.

   So, the rule for the transformation is **$(x', y') = (x - 8, y - 10)$**.

5. If the quadrilateral is reflected across the *y*-axis to become quadrilateral A'B'C'D', then the corresponding coordinates will have the same *y*-coordinate and a change in sign of the *x*-coordinate.

   Therefore, the coordinates of A' will be **(0,5)**.

6. A rotation is the only answer listed that preserves both the angles of the figure and the lengths of the sides. Therefore, a **rotation** will always produce a congruent figure.

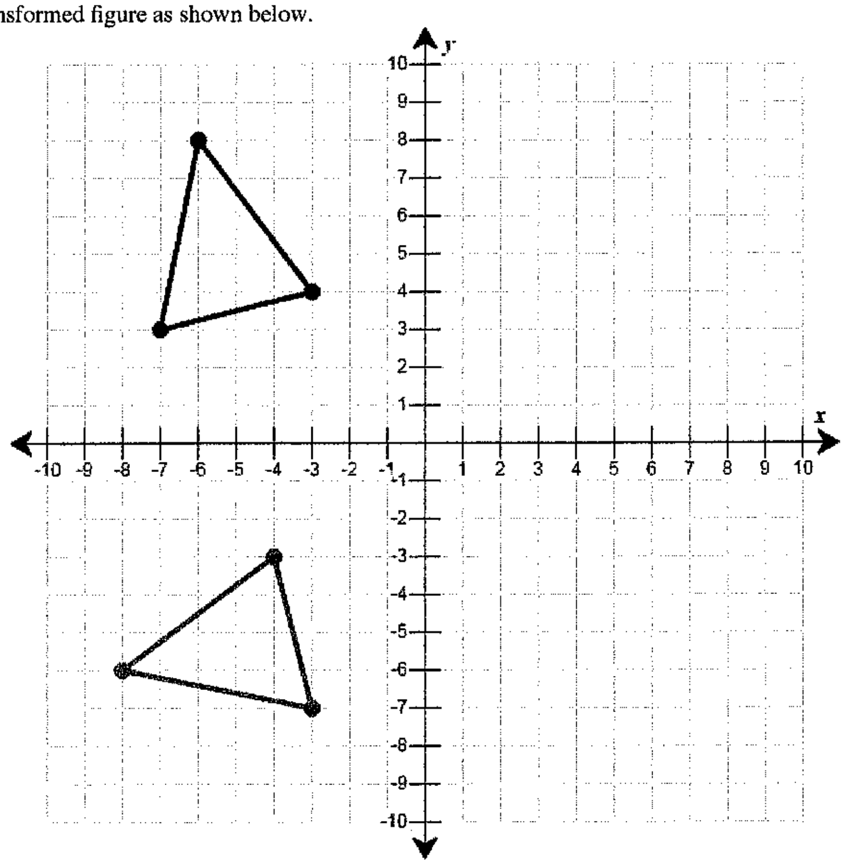
7. To rotate a figure counterclockwise about the origin, use the following rule.

$$(x,\ y) \rightarrow (-y,\ x)$$

Use the provided graph to determine the ordered pairs of the vertices of the original figure. In this case, the points are (-7,3), (-3,4), and (-6,8).
Apply the rule to each of the coordinate pairs. The transformed points are listed in the provided table.

Original Figure	Transformed Figure
(-7,3)	(-3,-7)
(-3,4)	(-4,-3)
(-6,8)	(-8,-6)

Graph the points of the transformed figure as shown below.



8. The transformation shows a dilation and a translation. The transformation can be written in two different ways, one in which the dilation is done first and one in which the translation is done first. In this explanation of the transformation, the dilation is done first.

Start by determining the scale factor of the dilation. The length of the bottom of the original polygon is 3 units. The length of the bottom of the translated polygon is 6 units. So, the scale factor is two and $(x', y') = (2x, 2y)$.

Now, choose a point on the original polygon, such as (-1 , 1). Then, find the corresponding point after a dilation with a scale factor of two.

So, the point (-1 , 1) should be at point (-2 , 2) after the dilation. Now, determine the translation needed to get from the dilated point (-2 , 2) to its final resting place at the point (5 , -3). The translation can be found by subtracting the dilated coordinates from the final coordinates.

For x: $5 - (-2) = 7$.
For y: $-3 - 2 = -5$.

So, the rule for the translation after the dilation is $(x', y') = (x + 7, y - 5)$.

The combined transformation for both operations (dilation and translation) is $\mathbf{(x', y') = (2x + 7, 2y - 5)}$.

9. In a 90° counterclockwise rotation about the origin, for each point on the figure, the x-value remains the same, the y-value changes sign, and the coordinates are swapped.

Thus, $x' = -y$ and $y' = x$.

10. The point F (1,2) maps to F' (3,6).

So, the values of the x and y coordinates were both tripled during the transformation. Therefore, $x' = 3x$ and $y' = 3y$.

Thus, the rule for the transformation is **a dilation with scale factor 3**.

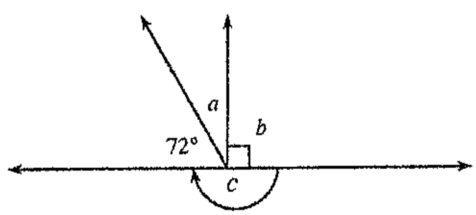
Applications of geometry in "everyday" settings often involve the measures of angles. In this chapter we begin our study of angle measurement. After describing angles and recognizing their characteristics, students complete an Angle Relationships Toolkit (Lesson 2.1.3 Resource Page). The toolkit lists some special angles and then students record important information about them. The list includes vertical angles (which are always equal in measure), straight angles (which measure 180°), corresponding angles, alternate interior angles, and same-side interior angles.

See the Math Notes boxes in Lessons 2.1.1 and 2.1.4 for more information about angle relationships.

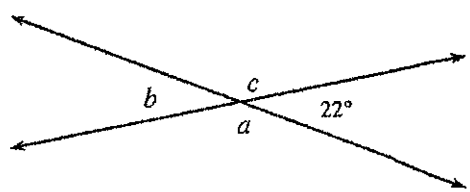
Example 1

In each figure below, find the measures of angles a, b, and/or c. Justify your answers.

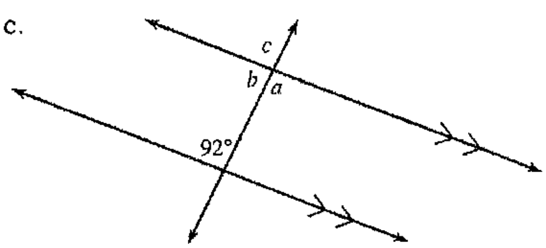
a.



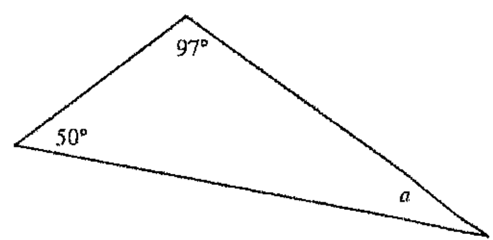
b.



c.



d.



Each figure gives us information that enables us to find the measures of the other angles. In part (a), the little box at angle b tells us that angle b is a right angle, so $m\angle b = 90°$. The angle labeled c is a straight angle (it is opened wide enough to form a straight line) so $m\angle c = 180°$. To calculate $m\angle a$ we need to realize that $\angle a$ and the 72° angle are complementary which means together they sum to 90°. Therefore, $m\angle a + 72° = 90°$ which tells us that $m\angle a = 18°$.

In part (b) we will use two pieces of information, one about supplementary angles and one about vertical angles. First, $m\angle a$ and the 22° angle are supplementary because they form a straight angle (line), so the sum of their measures is 180°. Subtracting from 180° we find that $m\angle a = 158°$. Vertical angles are formed when two lines intersect. They are the two pairs of angles that are opposite (across from) each other where the lines cross. Their angle measures are always equal. Since the 22° angle and $\angle b$ are a pair of vertical angles, $m\angle b = 22°$. Similarly, $\angle a$ and $\angle c$ are vertical angles, and therefore equal, so $m\angle a = m\angle c = 158°$.

The figure in part (c) shows two parallel lines that are intersected by a transversal. When this happens we have several pairs of angles with equal measures. $\angle a$ and the 92° angle are called alternate interior angles, and since the lines are parallel (as indicated by the double arrows on the lines), these angles have equal measures. Therefore, $m\angle a = 92°$. There are several ways to calculate the remaining angles. One way is to realize that $\angle a$ and $\angle b$ are supplementary. Another uses the fact that $\angle b$ and the 92° angle are same-side interior angles, which makes them supplementary because the lines are parallel. Either way gives the same result: $m\angle b = 180° - 92° = 88°$. There is also more than one way to calculate $m\angle c$. We know that $\angle c$ and $\angle b$ are supplementary. Alternately, $\angle c$ and the 92° angle are corresponding angles, which are equal because the lines are parallel. A third way is to see that $\angle a$ and $\angle c$ are vertical angles. With any of these approaches, $m\angle c = 92°$.

Part (d) is a triangle. In class, students investigated the measures of the angles in a triangle. They found that the sum of the measures of the three angles always equals 180°. Knowing this, we can calculate $m\angle a$: $m\angle a + 50° + 97° = 180°$. Therefore, $m\angle a = 33°$.

Problems

Use the geometric properties and theorems you have learned to solve for x in each diagram and write the property or theorem you use in each case.

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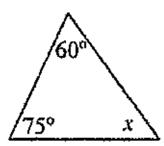

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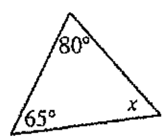

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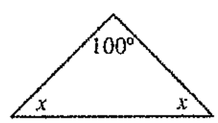

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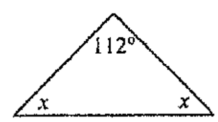

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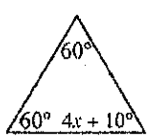

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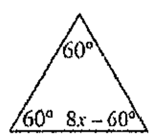

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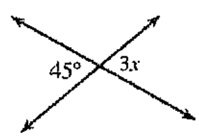

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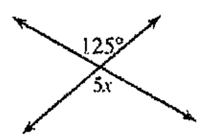

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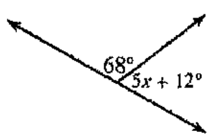

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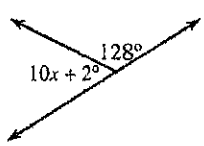

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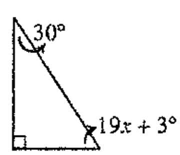

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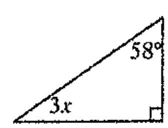

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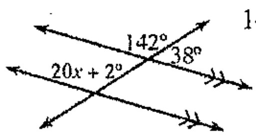

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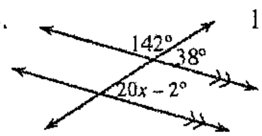

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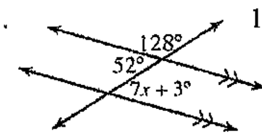

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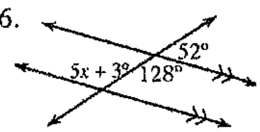
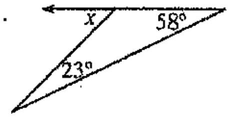
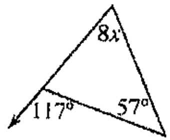
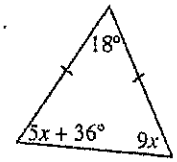
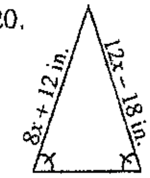
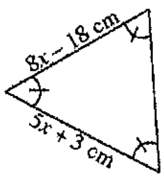


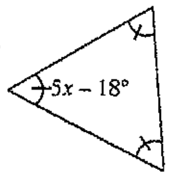
17. 

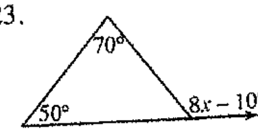
18. 

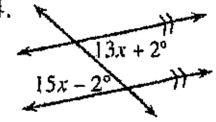
19. 

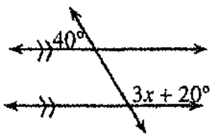
20. 

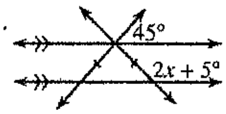
21. 

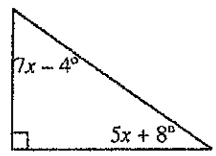
22. 

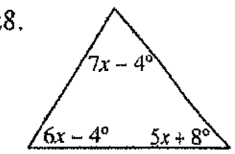
23. 

24. 

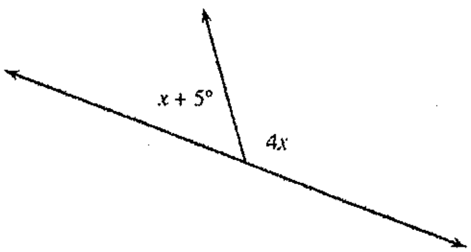
25. 

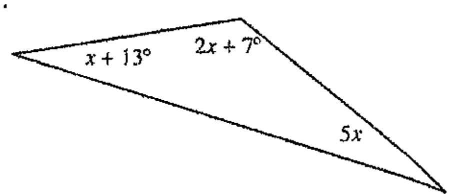
26. 

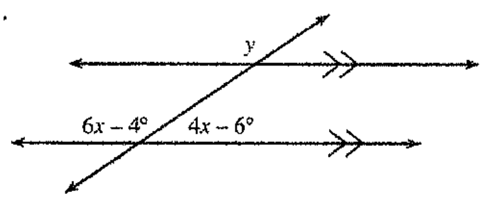
27. 

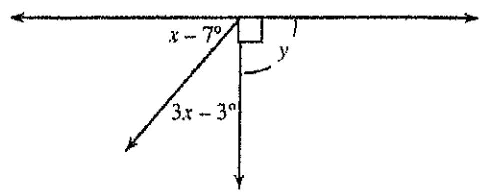
28. 

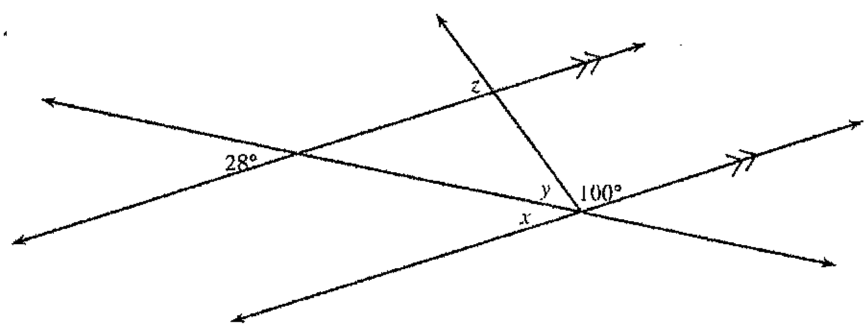
Use what you know about angle measures to find x, y, or z.

29. 

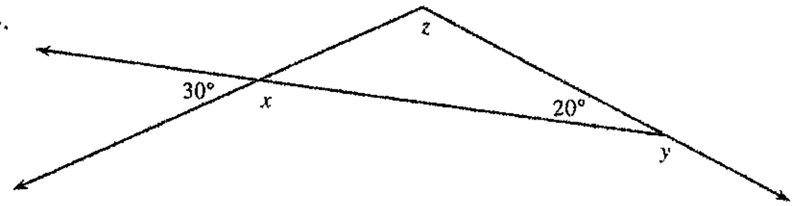
30. 

31. 

32. 

33. 

34.



In Lesson 2.1.5 we used what we have learned about angle measures to create proofs by contradiction. (See the Math Notes box in Lesson 2.1.5.) Use this method of proof to justify each of your conclusions to problems 35 and 36 below.

35. Nik scored 40 points lower than Tess on their last math test. The scores could range from 0 to 100 points. Could Tess have scored a 30 on this test? Justify using a proof by contradiction.

36. Can a triangle have two right angles? Justify your answer with a proof by contradiction.

Kuta Software - Infinite Geometry

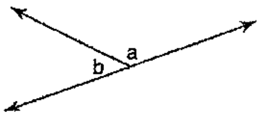
Name________________________________

Angle Pair Relationships

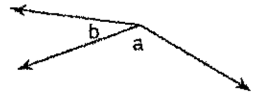
Date________________ Period____

Name the relationship: complementary, linear pair, vertical, or adjacent.

1)



2)



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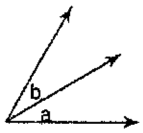

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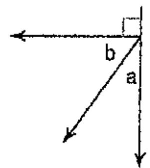

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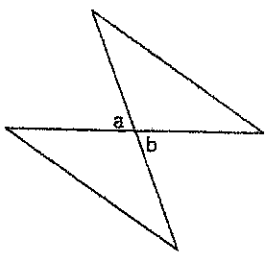

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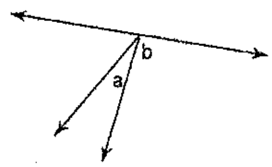

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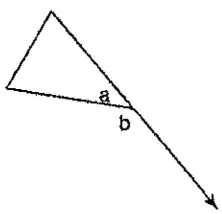

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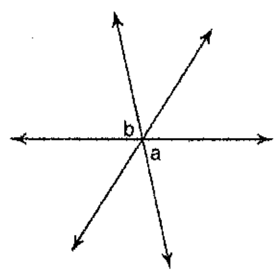
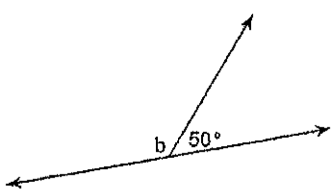


Find the measure of angle b.

9)



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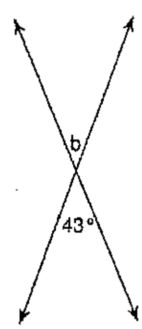

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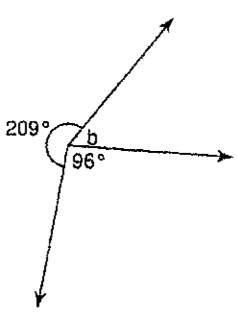

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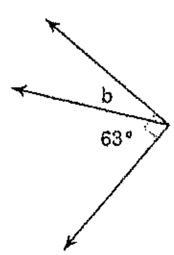

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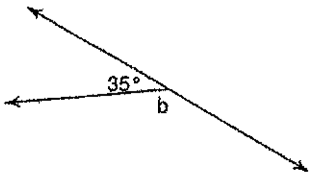

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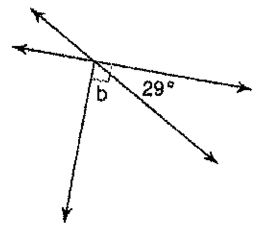

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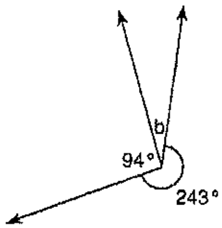

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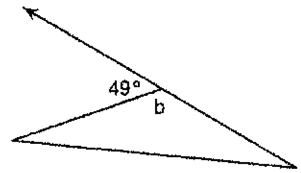

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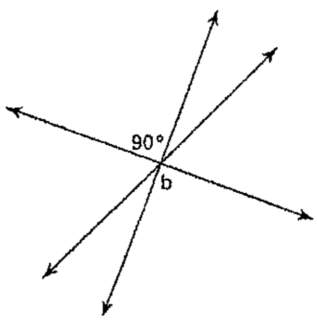

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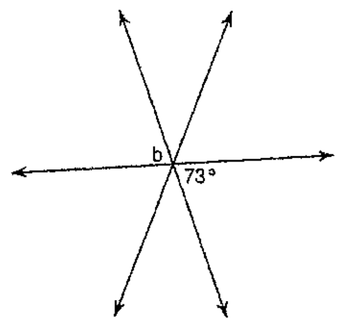
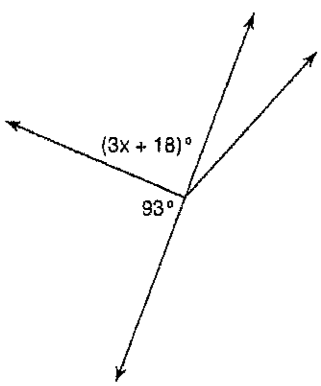


Find the value of x.

19)



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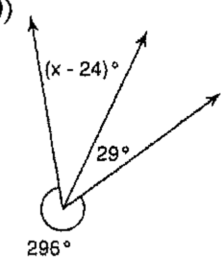

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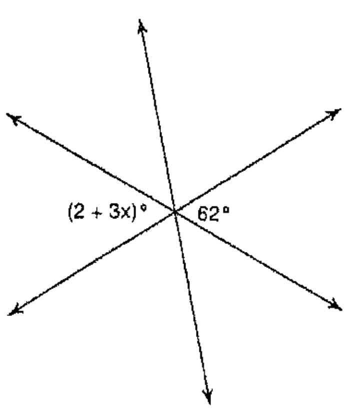

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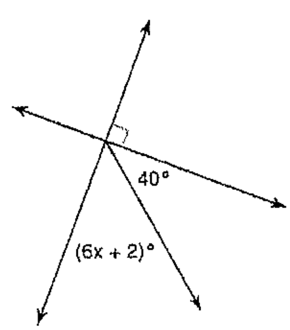


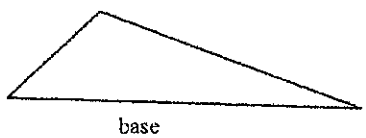
AREA 2.2.1 – 2.2.4

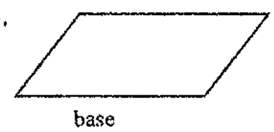
After measuring various angles, students look at measurement in more familiar situations, those of length and area on a flat surface. Students develop methods and formulas for calculating the areas of triangles, parallelograms, and trapezoids. They also find the areas of more complicated shapes by partitioning them into shapes for which they can use the basic area formulas. Students also learn how to determine the height of a figure with respect to a particular base.

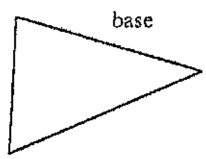
See the Math Notes box in Lesson 2.2.4 for more information about area.

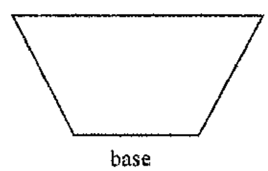
Example 1

In each figure, one side is labeled as the "base." For this "base," draw in a corresponding height.

a. 

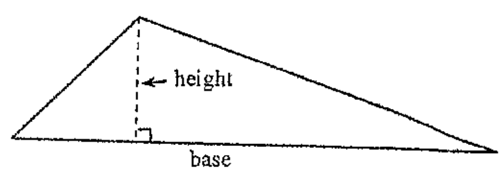
b. 

c. 

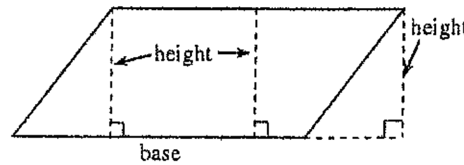
d. 

To find how tall a person is, we have them stand straight up and measure the distance from the highest point on their head straight down to the floor. We measure the height of figures in a similar way. One way to calculate the height is to visualize that the shape, with its base horizontal, needs to slide into a tunnel. How tall must the tunnel be so that the shape will slide into it? How tall the tunnel is equals the height of the shape. The height is perpendicular to the base (or a line that contains the base) from any of the shape's "highest" point(s). In class, students also used a 3 × 5 card to help them draw in the height.

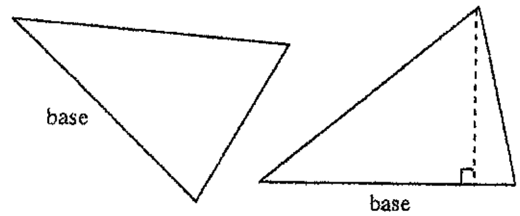
a. It is often easier to draw in the height of a figure when the base is horizontal, or the "bottom" of the figure. The height of the triangle at right is drawn from the highest point down to the base and forms a right angle with the base.



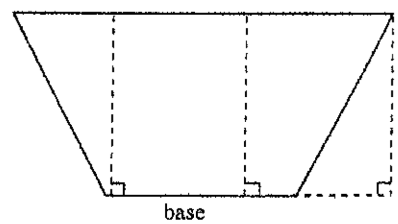
b. Even though the shape at right is not a triangle, it still has a height. In fact, the height can be drawn in any number of places from the side opposite the base. Three heights, all of equal length, are shown.



c. The base of the first triangle at right is different from the one in part (a) in that no side is horizontal or at the bottom. Rotate the shape, then draw the height as we did in part (a).



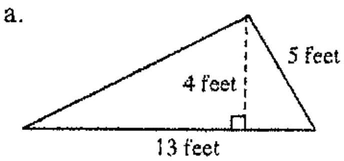
d. Shapes like the trapezoid at right or the parallelogram in part (b) have at least one pair of parallel sides. Because the base is always one of the parallel sides, we can draw several heights. The height at far right shows a situation where the height is drawn to a segment that contains the base segment.



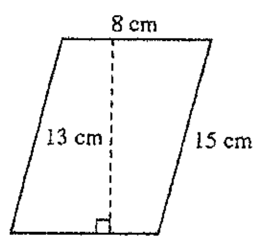
Example 2

Find the area of each shape or its shaded region below. Be sure to include the appropriate units of measurement.

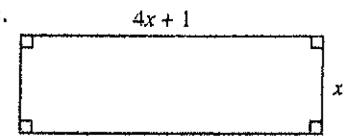
a.



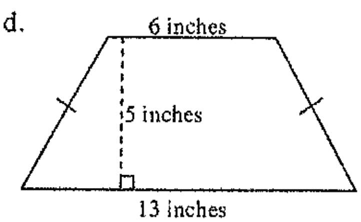
b.



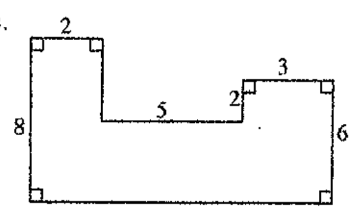
c.



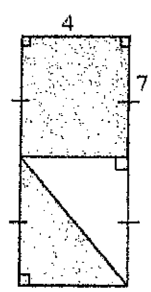
d.



e.



f.

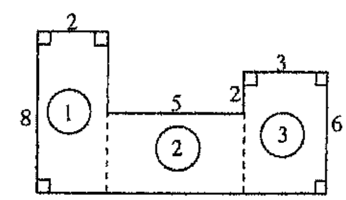


Students have the formulas for the areas of different shapes in their Area Toolkit (Lesson 2.2.4B Resource Page). For part (a), the area of a triangle is $A = \frac{1}{2}bh$, where b and h are perpendicular to each other. In this case, the base is 13 feet and the height is 4 feet. The side which is 5 feet is not a height because it does not meet the base at a right angle. Therefore, $A = \frac{1}{2}(13\text{ feet})(4\text{ feet}) = 26\text{ feet}^2$. Area is measured in square units, while length (such as a perimeter) is measured in linear units, such as feet.

The figure in part (b) is a parallelogram and the area of a parallelogram is $A = bh$ where b and h are perpendicular. Therefore $A = (13 \text{ cm})(8 \text{ cm}) = 104$ square cm.

The figure in part (c) is a rectangle so the area is also $A = bh$, but in this case, we have variable expressions representing the lengths of the base and height. We still calculate the area in the same way. $A = (4x + 1)(x) = 4x^2 + x$ square units. Since we do not know in what units the lengths are measured, we say the area is just "square units."

Part (d) shows a trapezoid; the students found several different ways to calculate its area. The most common way is: $A = \frac{1}{2}(b_1 + b_2)h$ where b_1 is the upper base and b_2 is the lower base. As always, b and h must be perpendicular. The area is $A = \frac{1}{2}(6 \text{ in.} + 13 \text{ in.})(5 \text{ in.}) = 47.5$ square inches.

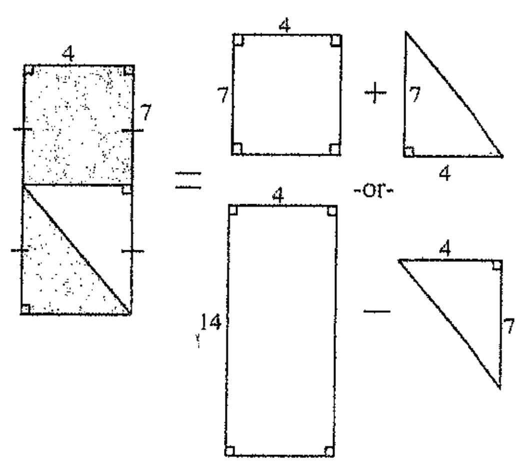


The figures shown in parts (e) and (f) are more complicated and one formula alone will not give us the area. In part (e), there are several ways to divide the figure into rectangles. One way is shown at right. The areas of the rectangles on either end are easy to find since the dimensions are labeled on the figure. The area of rectangle (1) is $A = (2)(8) = 16$ square units. The area of rectangle (3) is $A = (3)(6) = 18$ square units. To find the area of rectangle (2), we know the length is 5 but we have to determine its height. The height is 2 shorter than 6, so the height is 4. Therefore, the area of rectangle (2) is $A = (5)(4) = 20$ square units. Now that we know the area of each rectangle, we can add them together to find the area of the entire figure: $A(\text{entire figure}) = 16 + 18 + 20 = 54$ square units.

In part (f), we are finding the area of the shaded region, and again, there are several ways to do this. One way is to see it as the sum of a rectangle and a triangle. Another way is to see the shaded figure as a tall rectangle with a triangle cut out of it. Either way will give the same answer.

Using the top method,
$A = 4(7) + \frac{1}{2}(4)(7) = 42$ square units.

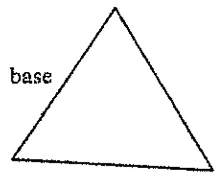
The bottom method gives the same answer:
$A = 4(14) - \frac{1}{2}(4)(7) = 42$ square units.



Problems

For each figure below, draw in a corresponding height for the labeled base.

1.



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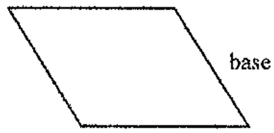

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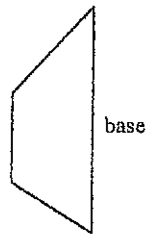

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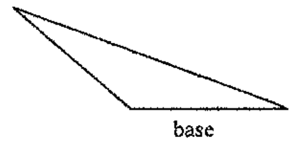
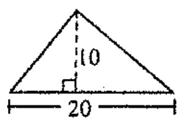


Find the area of the following triangles, parallelograms and trapezoids. Pictures are not drawn to scale. Round answers to the nearest tenth.

5.



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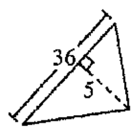

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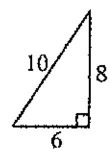

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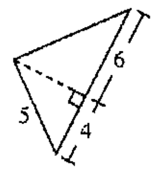

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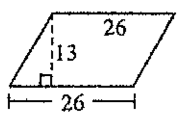
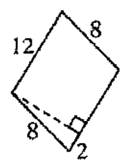


10.

11.



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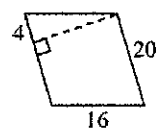

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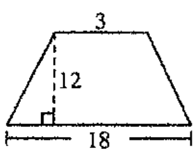

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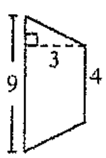

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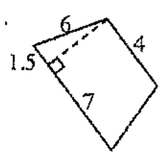

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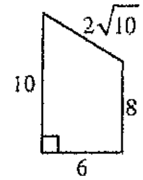

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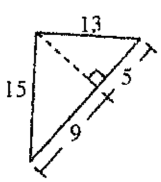

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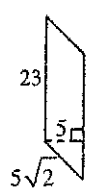

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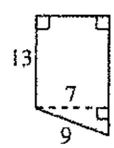

20.