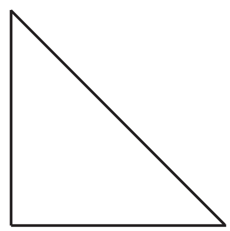
Identifying Triangles

5.5

Name______________________________ **Date** ____________________

Directions: Identify the name of each triangle below. If the triangle has more than one name, use all names.

1.



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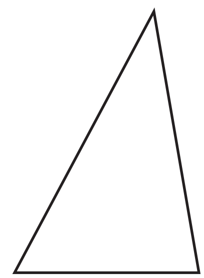
5.



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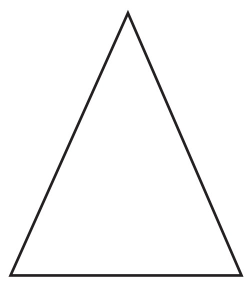
2.



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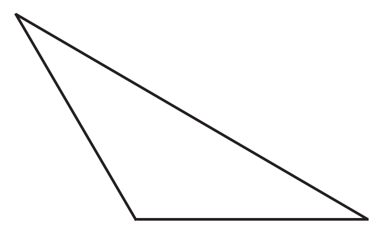
6.



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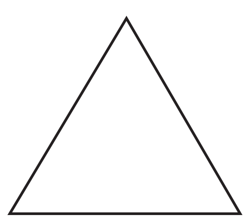
3.



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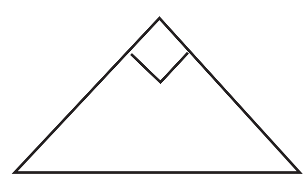
7.



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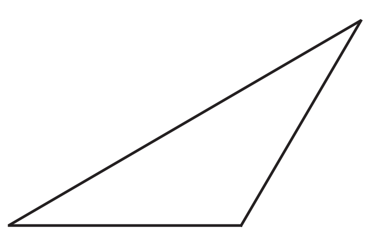
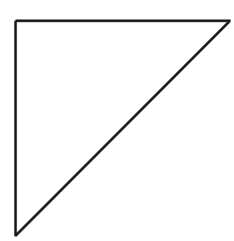
4.



_______________ _______________

8.



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Pages 19 and 20

Name	Number of Vertices	Feature
triangle	3	There are six different sorts
circle	0	It has one edge
rhombus	4	It has four sides of equal length
pentagon	5	A five sided shape
octagon	8	An eight sided, closed shape
rectangle	4	It has four right angles
parallelogram	4	Opposite sides are equal and parallel

Name	Number of Faces	Shape of Faces	Number of Vertices
tetrahedron	4	triangle	4
cube	6	square	8
triangular prism	5	triangle rectangle	6
cylinder	3	rectangle circle	0
dodecahedron	12	regular pentagon	20
cuboid	6	rectangle	8
icosahedron	20	triangle	12

Page 29

Definition for each quadrilateral could include something from the following:

A square has four sides. All corners are right angles and all sides are equal.

The diagonals cross at right angles at the center of the square.

A rectangle has four sides. All the four corners are right angles. Opposite sides are equal in length. It has two pairs of parallel sides.

Page 47

1. right triangle, isosceles
2. isosceles acute triangle
3. equilateral acute triangle
4. scalene obtuse triangle
5. isosceles acute triangle
6. scalene obtuse triangle
7. right isosceles triangle
8. right triangle, isosceles

Page 59

1. hexagon
2. isosceles triangle
3. pentagon
4. parallelogram
5. quadrilateral/trapezoid
6. rhombus

Page 60

1. (1, $^{-}8$)
2. ($^{-}7$, 2)
3. ($^{-}1$, $^{-}2$)
4. (0, $^{-}10$)
5. (9, $^{-}6$)
6. (9, $^{-}6$)

dodecagon

eratosthenes

Page 73

1. Shape a = parallelogram
2. Shape b = rectangle
3. Shape c = rectangle
4. Shape d = trapezoid/quadrilateral
5. Shape e = isosceles triangle

Page 79

1. (5, 6); parallel sides: (-2, 6) (-2, 9) and (5, 6) (5, 9); (-2, 9) (5, 9) and (5, 6) (5, 9).
2. (-4, -1); parallel sides: (-8, -1) (-4, -1) and (-10, -5) (-6, -5); (-10, -5) (-8, -1) and (-6, -5) (-4, -1).
3. (10, 5); parallel sides: (8, 1) (10, 5) and (6, 5) (8, 7); (8, 7) (10, 5) and (6, 5) (8, 1).
4. (-10, 6); parallel sides: (-5, 6) (-3, 8) and (-10, 6) (-8, 8); (-8, 8) (-3, 8) and (-10, 6) (-5, 6).
5. (-1, -5); parallel side: (-7. -3) (-2, -3) and (-8, -5) (-1, -5).

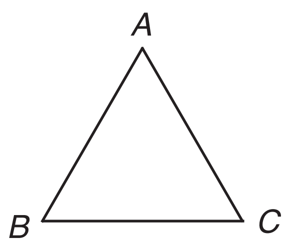
5 How to · · · · · · · · · · · · · · · · Understand Triangles

Facts to Know

A *triangle*, in plane geometry, is a closed figure that has three line segments for sides. The sides meet at three points called *vertices*, and each *vertex* forms an angle with two of the sides. The word *triangle* means "three angles." The sum of the three angles of a triangle is always 180°.

The symbol for triangle is △. You use it when you write the name of a triangle.

A triangle is named with the letters at each angle. The triangle below could have six names: △ *BAC*, △ *CAB,* △ *ABC,* △ *BCA,* △ *CBA, or* △ *ACB.*



The angles are named with the letters of the sides. Look at the right-hand angle in the triangle to the left. It could be named ∠ *BCA* or ∠ *ACB*. The letter of the vertex is always in the middle of the name.

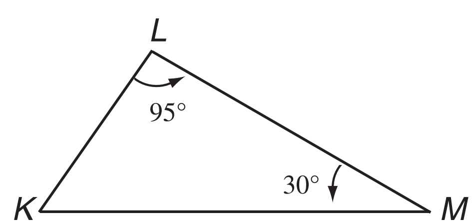
An angle in a triangle can also be named by the letter at its vertex: ∠ *C*.

You can figure out an unknown angle in a triangle if you know the measure of the other two angles. Since the sum of the angles in a triangle is always 180°, you can use addition and then subtraction to find the unknown angle. Here's an example:

∠ *KLM* = 95°

∠ *LMK* = 30°

Find ∠ *MKL*.



Step 1: Add the two known angles: 95° + 30° = 125°.

Step 2: The sum of the three angles is 180°. Subtract the sum of the two known angles to find the measure of ∠ *MKL*: 180° – 125° = 55°. ∠ *MKL* = 55°

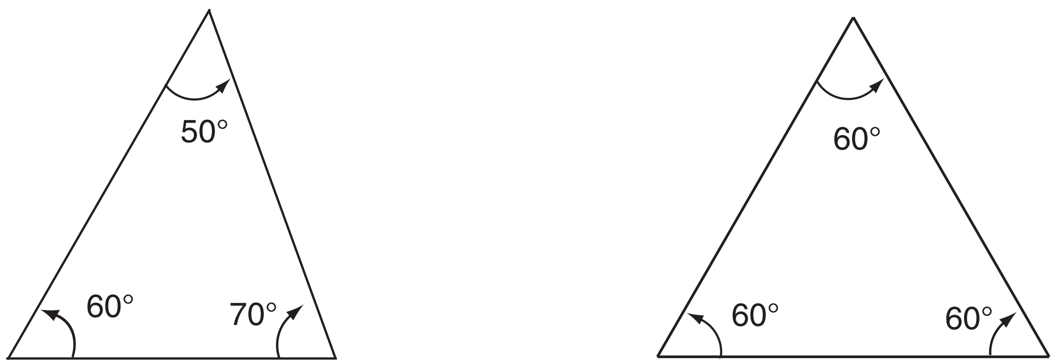
Facts to Know *(cont.)*

Triangles Named by the Sizes of Their Angles

Triangles are named according to either their largest angle or the lengths of their sides. You may want to review Unit 2, "How to Understand Angles," before beginning this unit.

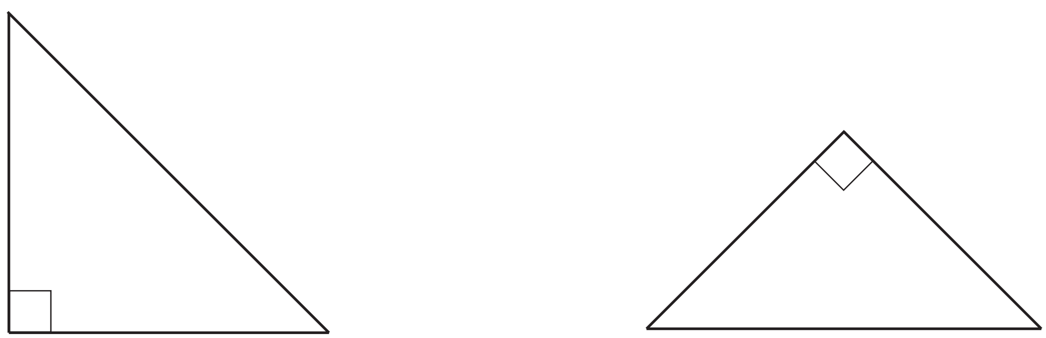
Acute Triangle

If each angle in a triangle is less than 90° (an acute angle), the triangle is an *acute triangle.*



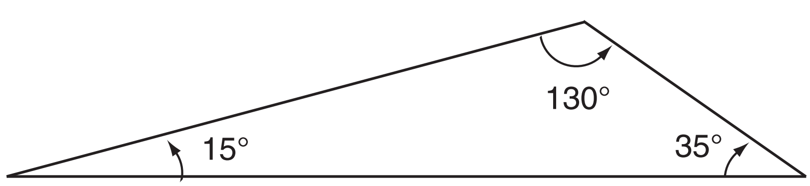
Right Triangle

A triangle with a right angle (an angle that measures 90°) is a *right triangle.* The □ symbol indicates a right triangle.



Obtuse Triangle

If one angle of the triangle is greater than 90° (an obtuse angle), it is an *obtuse triangle.*



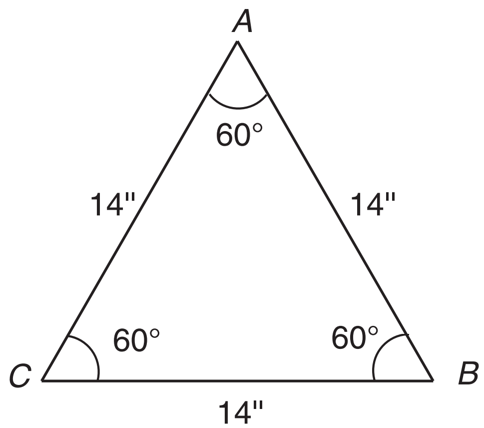
Note: No triangle can have more than one obtuse or one right angle.

Facts to Know *(cont.)*

Triangles Named by the Length of Their Sides

Equilateral Triangle

Equi means "equal" and *lateral* means "sides." An *equilateral triangle* has three sides of the same length. An equilateral triangle also has three equal angles.



Sides: $AB = BC = CA$
Angles: $\angle A = \angle B = \angle C$

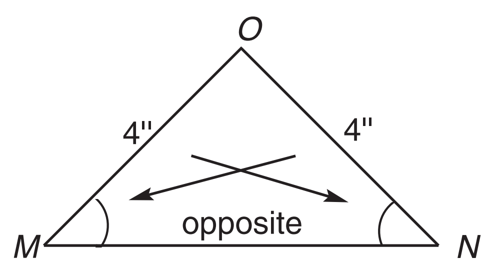
Isosceles Triangle

An *isosceles triangle* is a triangle with two equal sides. An isosceles triangle also has two equal angles because it has two equal sides. Angles that are opposite equal sides are also equal.

Side *MO* = Side *ON*

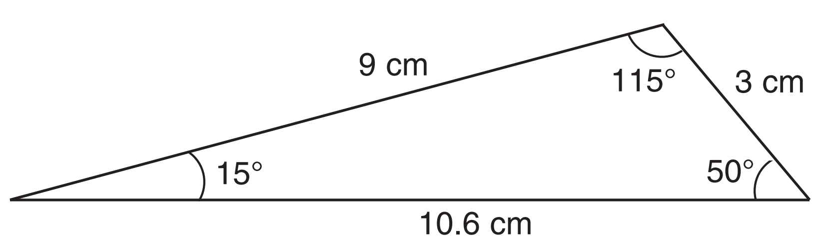
$\angle M$ is opposite side *ON*
and $\angle N$ is opposite *MO*

So, $\angle M = \angle N$.



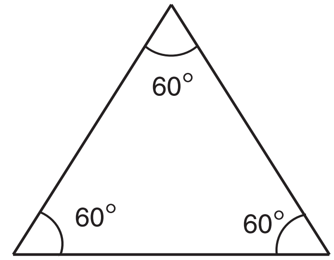
Scalene Triangle

A *scalene triangle* is a triangle with no equal sides. Because there are no equal sides, there are no equal angles. All the angles have different measures.

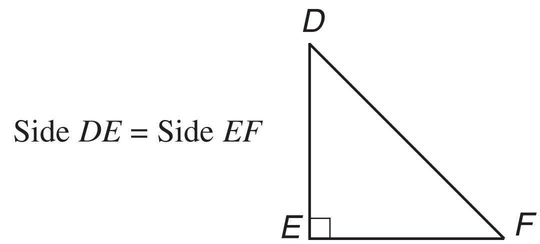


5 Practice • • • • • • • • • • • • • • • • • • Identifying Triangles

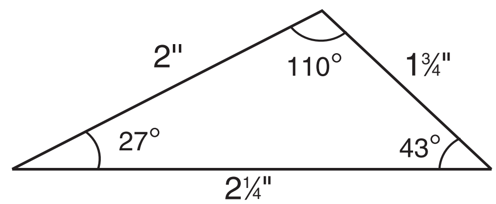
Directions: Write the correct answer to each question.



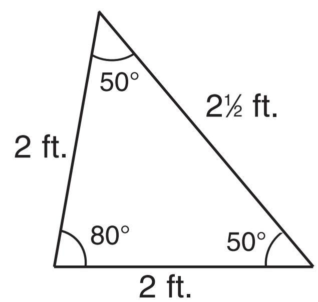
1. What is the name of this triangle by the size of its angles? ______________________________
2. What is the name of this triangle by the length of its sides? ______________________________



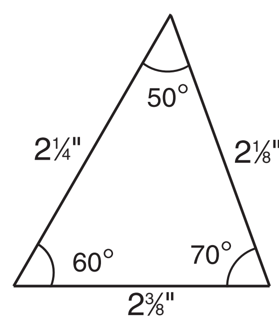
3. What is the name of this triangle by the size of its angles? ______________________________
4. What is the name of this triangle by the length of its sides? ______________________________



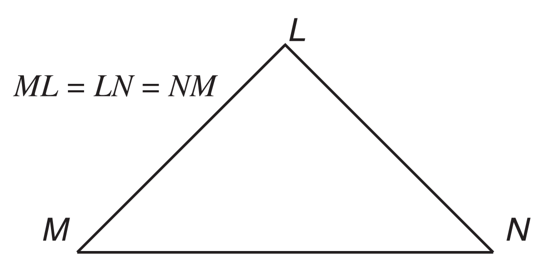
5. What is the name of this triangle by the size of its angles? ______________________________
6. What is the name of this triangle by the length of its sides? ______________________________



7. What is the name of this triangle by the size of its angles? ______________________________
8. What is the name of this triangle by the length of its sides? ______________________________



9. What is the name of this triangle by the size of its angles? ______________________________
10. What is the name of this triangle by the length of its sides? ______________________________



11. What is the name of this triangle by the size of its angles? ______________________________
12. What is the name of this triangle by the length of its sides? ______________________________

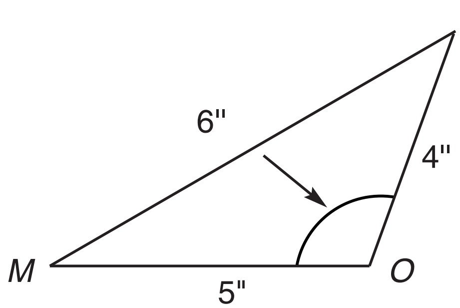
6 How to • • • • • • • • • • • Learn More About Triangles

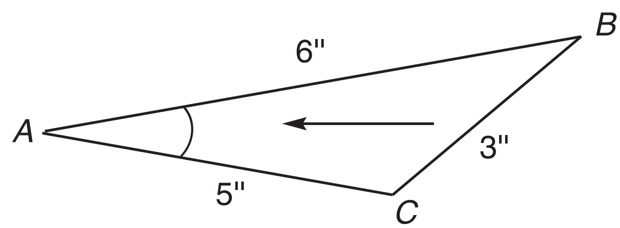
Facts to Know

Knowing the lengths of a triangle's sides can tell you something about its angles. The longest side of a triangle is the side opposite the largest angle. The shortest side is the side opposite the smallest angle.

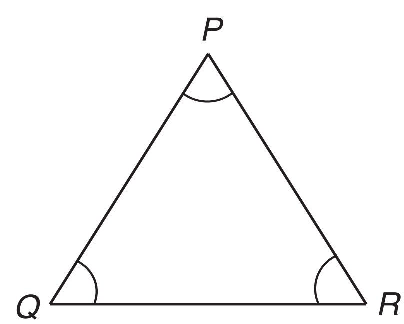
Examining Triangles

Here are some examples showing the link between the length of a triangle's sides and its angles.





- *MN* is the longest side, so ∠*O*, which is opposite *MN*, is the largest angle.
- *BC* is the shortest side, so ∠ *A*, which is opposite *BC*, is the smallest angle.

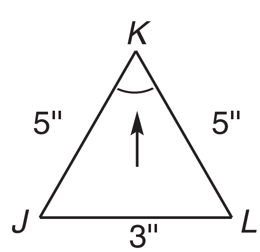


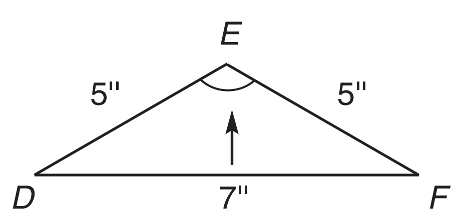
- Equilateral triangles have no longest and shortest sides. Therefore, opposite the three equal sides are three equal angles.

  $PQ = QR = RP$

  So, $\angle P = \angle Q = \angle R$

- An isosceles triangle with only two equal sides can have a longest or a shortest side. Look at these two examples:





JL is the shortest side so ∠ *K* is the smallest angle of the triangle.

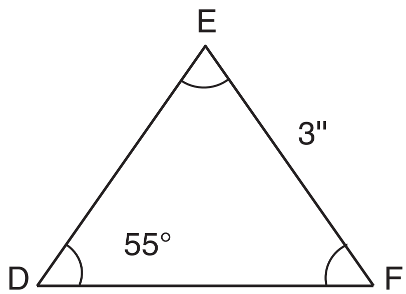
DF is the longest side, so ∠*E* is the largest angle.

The other two angles in an isosceles triangle are opposite equal sides, so they are equal. Above, $\angle J = \angle L$ and $\angle D = \angle F$.

Facts to Know *(cont.)*

Examining Triangles *(cont.)*

Using the information on the previous page, you can solve problems about triangles—their type and the size of their angles. In addition, you may be able to figure out the size of two angles if one angle and the sides are given. Look at this example that uses △ DEF.



Given: *DE* = *FE*
∠ *d* = 55°

Problem: Find the number of degrees in ∠ *F* and ∠ *E.*

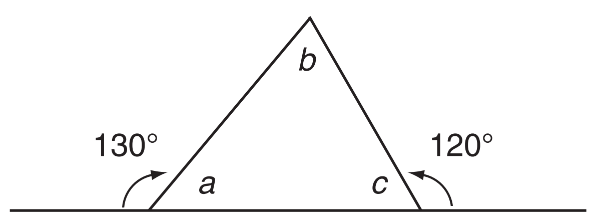
Step 1: Determine if there are any equal sides. Side *DE* = side *FE*, so the angles opposite these two sides are equal: ∠ *D* = ∠ *F*. Since ∠ *D* = 55°, then ∠ *F* = 55°, too.

Step 2: Find the number of degrees in ∠ *E*. Remember, the sum of all the angles in a triangle is 180°. You know two of them now, ∠ *D* and ∠ *F*, which are both 55°. Add the two angles and then subtract the sum from 180° to find ∠ *E.*

55 + 55 = 110
180 – 110 = 70
So, ∠ *E* = 70°.

Here's another example. This time, you don't know the lengths of the sides, but you can find the measures all three angles.

Find ∠ *b*.



Step 1: Find the number of degrees in ∠ *a*. You know that ∠ a and the 130° angle are supplementary, therefore, ∠ *a* + 130° = 180°. Subtract to find ∠ *a*.

∠ *a* = 180° – 130°
So, ∠ *a* = 50°.

Step 2: Find ∠ *c*. You know that ∠ *c* and the 120° angle are supplementary angles, therefore ∠ *c* + 120° = 180°; subtract to find ∠ *c*.

∠ *c* = 180° – 120°
So, ∠ *c* = 60°.

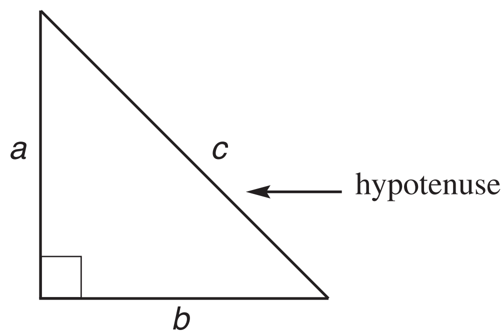
Step 3: Find ∠ *b*. The sum of the angles in a triangle is 180°. You know the number of degrees in two of the angles.
∠ *a* + ∠ *c* = 50° + 60° = 110°

∠ *b* = 180° – 110°
So, ∠ *b* = 70°.

Facts to Know *(cont.)*

Right Triangles and the Hypotenuse

The sides of a right triangle have a special relationship. When you add the squares of the two shortest sides, the sum equals the square of the longest side. In a right triangle, the longest side is called the *hypotenuse*. The other two sides are called *legs*.

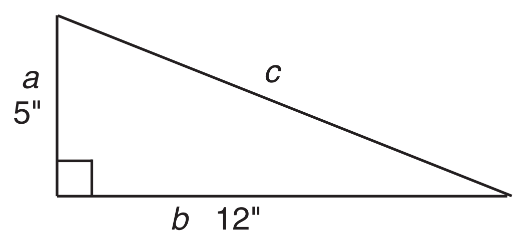


The formula for finding the hypotenuse is side a^2 + side b^2 = side c^2 (hypotenuse) or $a^2 + b^2 = c^2$.

This rule was discovered by a Greek mathematician named Pythagoras, and so the formula is called the *Pythagorean theorem* which states: "The square of the hypotenuse is equal to the sum of the squares of the other two sides."

Here's how to find the hypotenuse of a triangle.

Sample



Step 1: The lengths of sides a and b are given. Put those numbers into the formula: side a^2 + side b^2 = side c^2

$5^2 + 12^2 = c^2$

Step 2: Find the squares of the numbers you put in the formula.

$25 + 144 = c^2$ or $169 = c^2$

Step 3: Finish solving the equation.

$c^2 = 169$
$c = \sqrt{169}$
$c = 13$

So, the hypotenuse of the triangle is 13 inches.

6 Practice · · · · · · · · · Finding the Degrees of Angles in Triangles

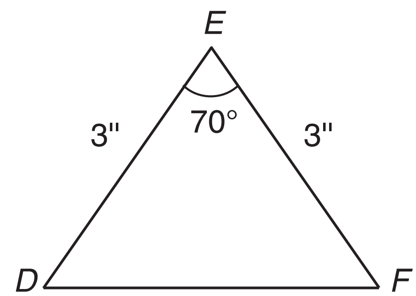
Directions: Write the correct answer.

Given △ *ABC,* where ∠ *A* = ∠ *55°* and B = ∠ *65°* . . .

1. What is the measurement of ∠ *C*? _______
2. What kind of triangle is △ *ABC*?________

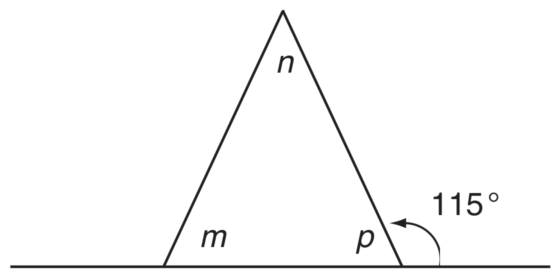
Given △ *DEF*, where ∠ *D* = 60° and ∠ *E* = 60° . . .

3. What is the measure of ∠ F? __
4. What kind of triangle is △ *DEF*?__________



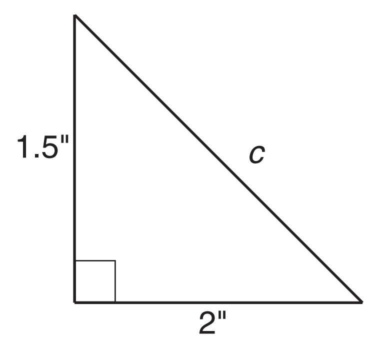
Given side *DE* (3 inches), side *EF* (3 inches), and ∠ *E* (70°) . . .

5. Find ∠ *D* and ∠ *F.* ________________________



Given an isosceles triangle, where ∠ *m* = ∠ *p* . . .

6. Find ∠ *n*. ______________________________



7. Find the hypotenuse of this right triangle.

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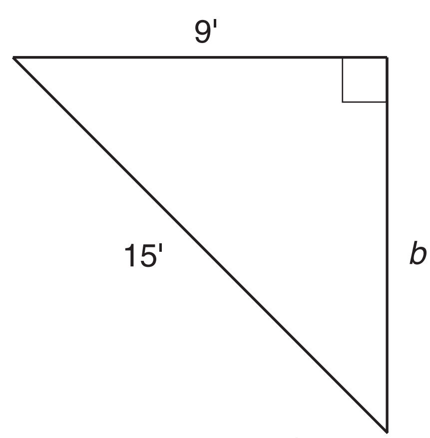

8. Find the missing side (*b*) of this right triangle.

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Pages 7 and 8

1. d
2. g
3. b
4. h
5. b
6. e
7. b
8. e
9. a
10. f
11. c
12. g
13. d
14. f

Pages 12 and 13

1. b
2. f
3. a
4. f
5. b
6. g
7. d
8. e
9. b
10. e
11. c
12. h

Page 17

1. 80°
2. 80°
3. 100°
4. 15°
5. ∠ g
6. ∠ f
7. 110°
8. 70°
9. 70°
10. 180°
11. 360°
12. 30°
13. 30°
14. 150°
15. 30°

Pages 20 and 21

1. radius
2. diameter
3. chord
4. circumference
5. 4 ft.
6. 6 in.
7. 9 ft.
8. 8½ in.
9. 1¾ in.
10. 110 ft.
11. 20.41 miles
12. 5½ yds.
13. 452.16 ft.^{2}
14. 615.44 in.^{2}
15. 314 ft.^{2}

Page 25

1. acute
2. equilateral
3. right
4. isosceles
5. obtuse
6. scalene
7. acute
8. isosceles
9. acute
10. scalene
11. acute
12. equilateral

Page 29

1. 60°
2. acute and scalene
3. 60°
4. acute and equilateral
5. ∠ D = 55°
   ∠ F = 55°
6. 50°
7. c = 2.5"
8. b = 12'

Pages 32 and 33

1. parallelogram
2. trapezoid
3. rhombus
4. rectangle
5. trapezoid
6. parallelogram
7. 120 ft.
8. 36 ft.
9. 2.75 ft.
10. 7 ft.
11. 45 ft.
12. 14 ft.

Pages 36 and 37

1. 120 ft.^{2}
2. 48 ft.^{2}
3. 400 yds.^{2}
4. 110.25 in.^{2}, 176 in.^{2}
5. 40 ft.^{2}
6. 14.625 ft.^{2}
7. 12 ft.^{2}
8. 6 in.^{2}
9. 6 ft.^{2}
10. 21.85 ft.^{2}
11. 37.1 ft.^{2}
12. 117 in.^{2}

Pages 40 and 41

1. 385 in.^{3}
2. 125 in.^{3}
3. 2,154 in.^{3}
4. 565.2 in.^{3}
5. 400 ft.^{3}
6. 79.507 ft.^{3}
7. 1,846.32 ft.^{3}
8. 42⅞ ft.^{3} or 42.875 ft.^{3}

Pages 42 and 43

1. 21 m; 9.5 m^2
2. 12 m; 9 m^2
3. 36 m; 81 m^2
4. 162 m
5. 13.72 m; 4.64 m^2
6. 155 cm
7. 25.6 m; 40.87 m^2
8. 195 m
9. 84 ft.^{2}
10. 336 ft.^{2}
11. 4 quarts
12. 13.58 m^2
13. 43,560 ft.^{2}
14. 4,840 yards^2
15. 1.10 acres
16. 3,780,000 pounds
17. *A* = 5,024 cm^2
    C = 251 cm
18. 16.75 minutes
19. r = 50 cm
    A = 7,850 cm^2
    C = 314 cm
    time = 20.93 min
20. r = 30 cm
    A = 2,826 cm^2
    C = 188.4 cm
    time = 12.56 min

Pages 44 and 45

1. 32 cm^2 = 1,024 cm^2
2. P = 2(4s) = 16 cm
3. P = 4(4s) = 32 cm
4. A = 4(1 x w) = 16 cm^2
5. A = 16(1 x w) = 64 cm^2
6. 50°
7. Let side of square A = 1 cm

   Let the side of square B = 4 cm

   Area square A = 1 cm

   Area square B = 16 cm

   The area of square B is 16 times greater than the area of square A.
8. Area of rectangle = 70 cm x 30 cm = 2,100 cm^2

   2,100 cm^2 + 600 cm^2 = 2,700 cm^2

   30 x 2,700 cm^2 = 81,000 cm^2 of wood
9. Yes, they have the same area. Since you multiply the base and height, and these two parallelograms use the same numbers, so it doesn't matter which is the base and which is the height.