Name ______________________ Date ____________

10-1 Squares and Square Roots (pages 410–413)

When you find the product of a number times itself, you are finding the square of the number. For example, $5 \times 5 = 5^2$, or 25. Numbers such as 25, 36, and 49 are called **perfect squares** because they are the squares of whole numbers. The inverse operation to finding a square of a number is finding the **square root** of a number.

Square Root	If $a^2 = b$, then a is a square root of b, or $\sqrt{b} = a$.

There are actually two square roots to the above equation, a and $-a$. However, when the symbol $\sqrt{\ }$, called a **radical sign**, is used to represent a square root, it always represents the positive square root.

EXAMPLES

A Evaluate 9^2.

$9^2 = 9 \times 9$ The exponent tells you how many times the base is used as a factor.
$= 81$

The square of 9 is 81.

B Find $\sqrt{100}$.

Since $10^2 = 100$, $\sqrt{100} = 10$.
The square root of 100 is 10.

Try These Together

1. Evaluate 12^2.
HINT: What is the product of 12 times itself?

2. Find $\sqrt{49}$.
HINT: For which number is 49 the square?

PRACTICE

Find the square of each number.

3. 3 **4.** 5 **5.** 14 **6.** 28
7. 50 **8.** 45 **9.** 37 **10.** 100

Find each square root.

11. $\sqrt{361}$ **12.** $\sqrt{484}$ **13.** $\sqrt{400}$ **14.** $\sqrt{676}$
15. $\sqrt{1,369}$ **16.** $\sqrt{1,681}$ **17.** $\sqrt{3,481}$ **18.** $\sqrt{160,000}$

19. Interior Design Cole is installing 1-inch square tiles in his entryway. What are the dimensions of the square entryway if he is using 1,296 tiles?

20. Standardized Test Practice What is the square of 25?

A 5 **B** 50 **C** 625 **D** 15,625

Answers: 1. 144 **2.** 7 **3.** 9 **4.** 25 **5.** 196 **6.** 784 **7.** 2,500 **8.** 2,025 **9.** 1,369 **10.** 10,000 **11.** 19 **12.** 22 **13.** 20 **14.** 26 **15.** 37 **16.** 41 **17.** 59 **18.** 400 **19.** 36 inches × 36 inches **20.** C

Name ______________________ Date ____________

10-2 Estimating Square Roots (pages 415–417)

You can estimate to find the square root of a number that is not a perfect square.

EXAMPLE

Estimate $\sqrt{13}$ to the nearest whole number.

Since 13 is not a perfect square, estimate $\sqrt{13}$ by finding the two perfect squares closest to 13.

1, 4, 9, 16, 25, …	*List some perfect squares. 13 is between 9 and 16.*
$\sqrt{9} < \sqrt{13} < \sqrt{16}$	*Find the square root of each number.*
$3 < \sqrt{13} < 4$	

This means that $\sqrt{13}$ is between 3 and 4. Since 13 is closer to 16 than 9, then the best whole number estimate for $\sqrt{13}$ is 4.

Try These Together

Estimate each square root to the nearest whole number.

1. $\sqrt{7}$
HINT: Between which two perfect squares does 7 fall?

2. $\sqrt{48}$
HINT: Between which two perfect squares does 48 fall?

PRACTICE

Estimate each square root to the nearest whole number.

3. $\sqrt{75}$ **4.** $\sqrt{93}$ **5.** $\sqrt{119}$

6. $\sqrt{150}$ **7.** $\sqrt{288}$ **8.** $\sqrt{464}$

Use a calculator to find each square root to the nearest tenth.

9. $\sqrt{30}$ **10.** $\sqrt{45}$ **11.** $\sqrt{63}$ **12.** $\sqrt{90}$

13. $\sqrt{130}$ **14.** $\sqrt{333}$ **15.** $\sqrt{750}$ **16.** $\sqrt{1{,}122}$

17. Money Matters The Etherton family purchased a square lot for their new home that has an area of one acre. An acre is 4,840 square yards. How many yards is one side of their property? Round to the nearest tenth of a yard.

18. Standardized Test Practice Find $\sqrt{65}$ to the nearest tenth.

A 8.0 **B** 8.1 **C** 9.0 **D** 9.1

Answers: **1.** 3 **2.** 7 **3.** 9 **4.** 10 **5.** 11 **6.** 12 **7.** 17 **8.** 22 **9.** 5.5 **10.** 6.7 **11.** 7.9 **12.** 9.5 **13.** 11.4 **14.** 18.2 **15.** 27.4 **16.** 33.5 **17.** 69.6 yards **18.** B

Name ______________________ Date __________

10-3 The Pythagorean Theorem

MR2.6, MR3.3

(pages 419–422)

The longest side of a right triangle is called the **hypotenuse**. The hypotenuse is always opposite the right angle. The other two sides, called **legs**, form the sides of the right angle. Use the **Pythagorean Theorem** to find the lengths of the hypotenuse and the legs of a right triangle.

Pythagorean Theorem	**Words:**	In a right triangle, the sum of the squares of the lengths of the legs (*a* and *b*) is equal to the square of the length of the hypotenuse (*c*).
	Algebra:	$a^2 + b^2 = c^2$, where *a* and *b* are the legs and *c* is the hypotenuse

EXAMPLE

A right triangle has legs of 6 cm and 8 cm. What is the length of the hypotenuse?

$6^2 + 8^2 = c^2$ *Use the Pythagorean Theorem. Replace a and b with the values you know.*

$36 + 64 = c^2$

$100 = c^2$

$\sqrt{100} = c$ *Definition of square root*

$10 = c$

So, the length of the hypotenuse is 10 cm.

Try These Together

Find the missing measure for each right triangle. Round to the nearest tenth.

1. *a*: 17; *b*: 4

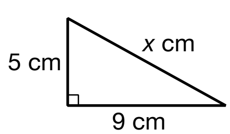
2. *a*: 20; *b*: 28

HINT: Be sure to identify whether a hypotenuse or leg measure is missing before you begin.

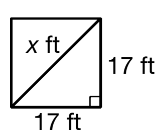
PRACTICE

Write an equation to solve for x. Then solve. Round to the nearest tenth.

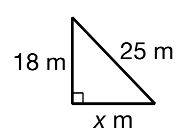
3.



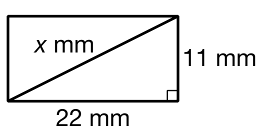
4.



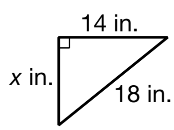
5.



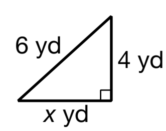
6.



7.



8.



9. Construction Alberto is making a ramp to the door of the chicken coop. The floor of the coop is 14 inches above the ground. The end of the ramp needs to be 3 feet from the coop. How long will the ramp be?

10. Standardized Test Practice A rectangle is 12 meters by 9 meters. Find the length of one of its diagonals to the nearest tenth of a meter.

A 7.9 m **B** 15.0 m **C** 21.0 m **D** 225 m

Answers: 1. 17.5 **2.** 34.4 **3.** $5^2 + 9^2 = x^2$; 10.3 cm **4.** $17^2 + 17^2 = x^2$; 24.0 ft **5.** $x^2 + 18^2 = 25^2$; 17.3 m **6.** $11^2 + 22^2 = x^2$; 24.6 mm **7.** $14^2 + x^2 = 18^2$; 11.3 in. **8.** $x^2 + 4^2 = 6^2$; 4.5 yd **9.** 38.6 in. **10.** B

Name ________________________ Date ____________

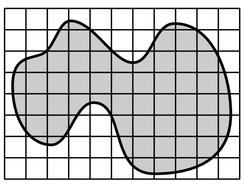
10-4 Area of Irregular Figures (pages 423–426)

An **irregular figure** does not necessarily have straight sides and square corners. You can estimate the area of an irregular figure with grid paper.

Method 1	• First, trace an outline of the figure onto grid paper. Find the number of whole squares that are *completely* within the outline. This number is the **inner measure**. • Find the number of whole squares that contain *part* of the figure and add this number to the inner measure to get the **outer measure**. • The mean (average) of the inner measure and outer measure is the estimated area of the irregular figure.
Method 2	You may be able to divide some irregular figures into shapes that look like squares and rectangles. You can then add the areas of those figures to estimate the area of the irregular figure.

EXAMPLE

Estimate the area of the figure.



inner measure = 30 — *There are 30 whole squares within the outline.*

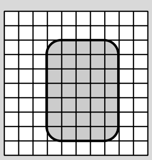
outer measure = 66 — *There are 36 whole squares that contain part of the figure. Add 36 to the inner measure to get the outer measure.*

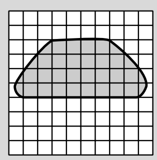
mean: $\frac{30 + 66}{2} = 48$

An estimate of the area of this irregular figure is 48 square units.

Try These Together

Estimate the area of each figure.

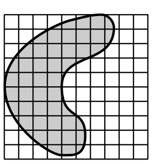
1. 

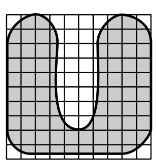
2. 

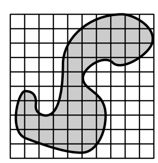
HINT: Take your time and count the number of squares carefully.

PRACTICE

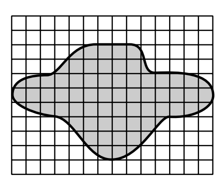
Estimate the area of each figure.

3. 

4. 

5. 

6. **Standardized Test Practice** What is the best estimate of the area of the figure?



A 13.5 units^2 **B** 24.5 units^2
C 39.5 units^2 **D** 59.5 units^2

Answers: 1. about 33 units^2 **2.** about 30 units^2 **3.** about 40 units^2 **4.** about 67.5 units^2 **5.** about 40.5 units^2 **6.** D

Name ______________________ Date ____________

10-5 Area of Triangles and Trapezoids (pages 428–431)

AF3.1, MR1.2

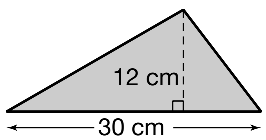
You can use the following formulas to find the area of triangles and trapezoids.

Area of a Triangle	The area (A) of a triangle is equal to half of the product of its base (b) and height (h), or $A = \frac{1}{2}bh$.
Area of a Trapezoid	The area (A) of a trapezoid is equal to half the product of the height (h) and the sum of the bases ($a + b$), or $A = \frac{1}{2}h(a + b)$.

EXAMPLES

Find the area of each figure.

A



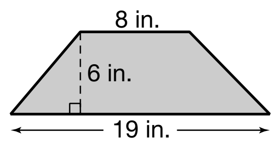
$A = \frac{1}{2}bh$

$A = \frac{1}{2} \times 30 \times 12$

$A = 15 \times 12$

$A = 180 \text{ cm}^2$

B



$A = \frac{1}{2}h(a + b)$

$A = \frac{1}{2}(6)(8 + 19)$

$A = (3)(27)$

$A = 81 \text{ in}^2$

Try These Together

Find the area of each triangle or trapezoid to the nearest tenth.

1. base: 4 in.
height: 9 in.
HINT: Substitute values carefully.

2. bases: 8cm, 2 cm
height: 14 cm
HINT: Do not forget to add the bases.

PRACTICE

Find the area of each triangle or trapezoid to the nearest tenth.

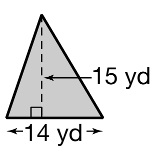
3. base: 1.2 cm
height: 1.8 cm

4. base: 23 yd
height: 8 yd

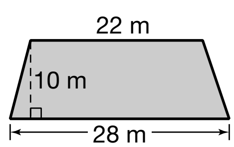
5. bases: 5 ft, 13 ft
height: 9 ft

Find the area of each figure to the nearest tenth.

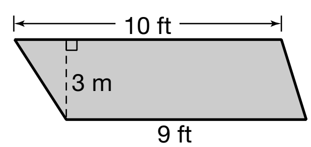
6.



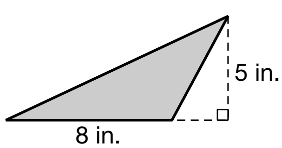
7.



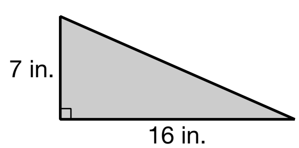
8.



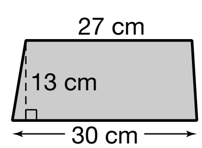
9.



10.



11.



12. **Standardized Test Practice** What is the area of a trapezoid with bases of 9 centimeters and 11 centimeters and a height of 4 centimeters?

A 40 cm^2 **B** 80 cm^2 **C** 160 cm^2 **D** 396 cm^2

Answers: **1.** 18 in² **2.** 70 cm² **3.** 1.1 cm² **4.** 92 yd² **5.** 81 ft² **6.** 105 yd² **7.** 250 m² **8.** 28.5 ft² **9.** 20 in² **10.** 56 in² **11.** 370.5 cm² **12.** A

Name ______________________________ Date ____________

10-6 Area of Circles (pages 432–435)

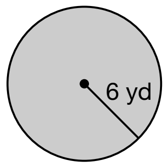
AF3.1, MG1.1, MG1.2, MR2.6

You can use the formula below to find the area of a circle. You can use your calculator for calculations involving .

Area of a Circle	The area (A) of a circle is equal to pi ( ) times the square of the radius (r), or $A = \ \ r^2$.

EXAMPLES

A Find the area of the circle to the nearest tenth.



$A = \ \ r^2$
$A = \ \ \times 6^2$
$A = \ \ \times 36$
$A \approx 113.1$ yd²

B Find the length of the radius of a circle with an area of 96 m².

$A = \ \ r^2$ *Use the formula for the area of a circle.*
$96 = \ \ r^2$ *Substitute the area.*
$\frac{96}{\ } = \frac{\ r^2}{\ }$ *Divide each side by .*
$30.6 \approx r^2$ *Use a calculator.*
$\sqrt{30.6} \approx r$, so $5.5 \approx r$
The radius is about 5.5 m.

Try These Together

Find the area of each circle to the nearest tenth.

1. diameter: 5 in. **2.** diameter: 8 m

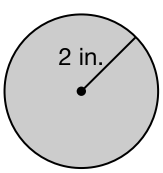
HINT: Use the diameter length to find the radius before you use the area formula.

PRACTICE

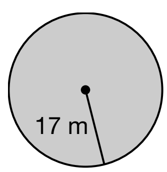
Find the area of each circle to the nearest tenth.

3. radius: 19 cm **4.** radius: 11.3 m **5.** radius: 16 yd

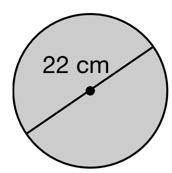
6.



7.



8.



Find the length of the radius of each circle given the following areas. Round to the nearest tenth.

9. 18 yd² **10.** 60 m² **11.** 75 m² **12.** 23 cm² **13.** 48 in² **14.** 32 cm²

15. Music The diameter of a compact disc (CD) is 12 centimeters. The diameter of its hole is 1.5 centimeters. What is the area of one side of a CD?

16. Standardized Test Practice What is the area of a circle with a diameter of 18 meters?

A 2.4 m² **B** 5.7 m² **C** 254.5 m² **D** 1,017.8 m²

Answers: 1. 19.6 in² **2.** 50.3 m² **3.** 1,134.1 cm² **4.** 401.1 m² **5.** 804.2 yd² **6.** 12.6 in² **7.** 907.9 m² **8.** 380.1 cm² **9.** 2.4 yd **10.** 4.4 m **11.** 4.9 m **12.** 2.7 cm **13.** 3.9 in. **14.** 3.2 cm **15.** about 111.3 cm² **16.** C

Name ______________________ Date __________

Area Models (pages 438–441)

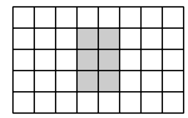
SDP3.3

You can use area models to find the probability of some events.

Probability	Probability (P) is equal to the ratio of the number of ways a certain event can occur to the number of possible outcomes, or $P = \frac{\text{number of ways a certain event can occur}}{\text{number of possible outcomes}}$.

EXAMPLE

Find the probability that a randomly-dropped counter will fall in the shaded region.



$P = \frac{\textit{number of ways to land in the targeted region}}{\textit{number of ways to land in the entire figure}}$

You are comparing two different areas, so you can substitute these areas into the equation.

$P = \frac{\textit{area of targeted region}}{\textit{area of the entire figure}}$

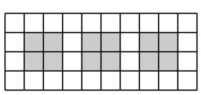
$P = \frac{6 \textit{ square units}}{40 \textit{ square units}}$, *or* $\frac{6}{40}$

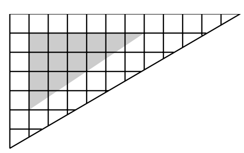
$P = \frac{6 \div 2}{40 \div 2}$ *Divide the numerator and denominator by the GCF.*

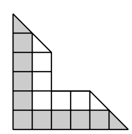
$P = \frac{3}{20}$

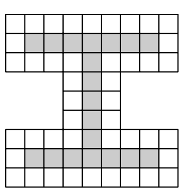
PRACTICE

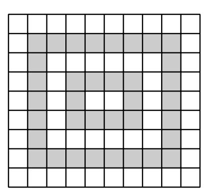
Find the probability that a randomly-dropped counter will fall in the shaded region.

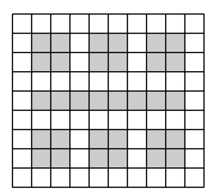
1. 

2. 

3. 

4. 

5. 

6. 

7. **Standardized Test Practice** A toddler spilled a cup of milk on the floor of a room that has 350 square feet of carpet, and 200 square feet of tile. What is the probability that the toddler spilled the milk on the tile?

A $\frac{7}{11}$ **B** $\frac{3}{8}$ **C** $\frac{2}{5}$ **D** $\frac{4}{11}$

Answers: 1. $\frac{3}{10}$ **2.** $\frac{2}{7}$ **3.** $\frac{5}{8}$ **4.** $\frac{19}{63}$ **5.** $\frac{2}{5}$ **6.** $\frac{16}{45}$ **7.** D

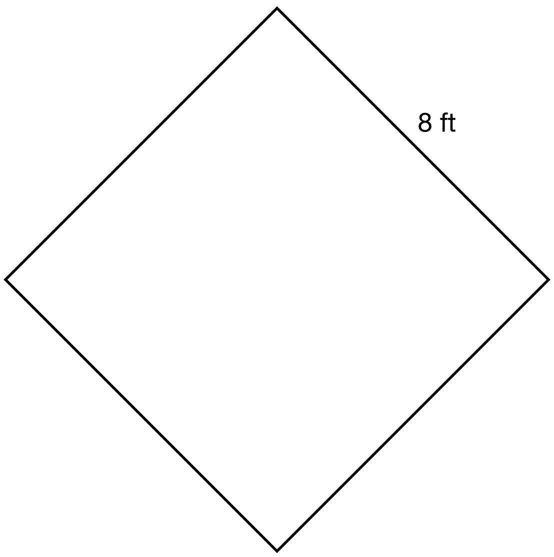
Name ______________________ Date ____________

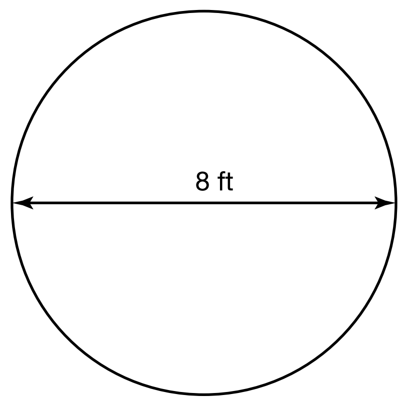
Chapter 10 Review

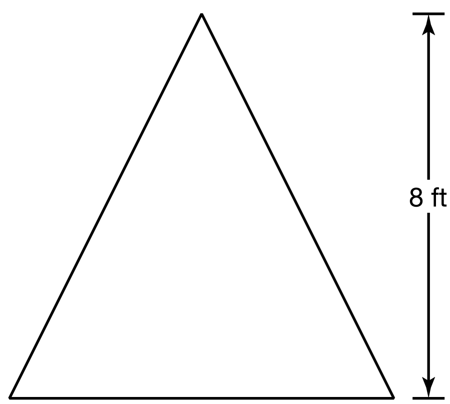
AF3.1, AF3.2, MG1.1, MG1.2, MR2.4

Work Smarter, Not Harder!

Lawanda and the other students in the 4-H club have volunteered with other student organizations to paint the inside of the local youth recreation center. Each club is going to paint a different geometric figure on the wall of the recreation center. Because her group has the fewest members, Lawanda wants to help her club members pick the smallest figure to paint.







Which of the above figures should Lawanda's club pick? Explain your answer.

Answers are located on page 115.