Name ______________________________

• Percent Change of Dimensions

Dilation: Add the percent of increase to 100%.

Reduction: Subtract the percent of decrease from 100%.

Scale factor: To find the scale factor, convert the dilation or reduction percent to a decimal.

Example: The dimensions of a square are increased 20%. By what percent is the area increased?

1. The dilation is 100% + 20% = 120%.
2. The scale factor is 120% = 1.2.
3. Square the scale factor to determine the relationship between the two areas. (Remember: Area is the product of two dimensions.) $(1.2)^2 = 1.44$
4. Change into percent: 1.44 = 144%.
   We can say that the area of the larger square is 144% of the area of the smaller square.
5. This means that the area is increased 44%. (144% − 100% = 44%)

Practice:

1. Patrick reduced the size of a photograph by 30%.

a. What percent of the original size is the reduction? __________

b. What is the scale factor from the original to the reduction? __________

c. By what percent was the area of the photograph reduced? __________

2. A square is dilated 160%.

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

b. By what percent would the area increase? __________

3. Maggie's blanket uniformly shrunk 10% when it was put into the dryer.

a. What is the scale factor of the reduction? __________

b. The area of the blanket is what percent of its original area? __________

c. By what percent was the area of the blanket reduced? __________

Name ______________________________

• Multiple Unit Multipliers

Use two unit multipliers to convert two different units.

Example:
Convert 440 yd per minute to miles per hour:

$$\frac{440\ \cancel{yd}}{1\ \cancel{min}} \cdot \frac{60\ \cancel{min}}{1\ hr} \cdot \frac{1\ mi}{1760\ \cancel{yd}} = \frac{26{,}400\ mi}{1760 hr} = 15\ mph$$

Use two unit multipliers to convert units of area.

Example:
Convert 288 square feet (ft^2) to square yards (yd^2):

$$288\ ft^2 \times \frac{1\ yd}{3\ \cancel{ft}} \times \frac{1\ yd}{3\ \cancel{ft}} = \frac{288\ yd^2}{9} = 36\ yd^2$$

Use three unit multipliers to convert units of volume.

Example:
Convert 1107 cubic feet (ft^3) to cubic yards (yd^3):

$$1107\ ft^3 \times \frac{1\ yd}{3\ \cancel{ft}} \times \frac{1\ yd}{3\ \cancel{ft}} \times \frac{1\ yd}{3\ \cancel{ft}} = \frac{1107\ yd^3}{27} = 41\ yd^3$$

Practice:

1. Examine problems b–f.

a. For which problems will you need to use two unit multipliers? Three unit multipliers?

____

b. 24 yards per minute to feet per second ______________

c. 32 dollars per hour to cents per minute ______________

d. 12 sq ft to sq in. ______________

e. 1,000,000,000 cm^3 to m^3 ______________

f. 3456 cubic inches to cubic ft ______________

• Formulas for Sequences

3, 6, 9, 12, . . . Formula: $a_n = 3n$

2, 4, 8, 16, 32, . . . Formula: $a_n = 2^n$

3, 5, 7, 9, . . . Formula: $a_n = 2n + 1$

To find a formula for a sequence, relate each term (*a*) with the number of the term (*n*.)

n	1	2	3	4
a	3	5	7	9

To find a term, double the number of the term and then add 1.

Practice:

1. 1, 4, 9, 16, 25, . . .

a. What is the formula for the above number sequence?

____

b. What is the next number? ____________________

2. 2, 4, 6, 8, . . .

a. What is the formula for the above number sequence?

____

b. Find the 10th term. ____________________

3. The terms of the following sequence are generated with the formula $a_n = n^n$. Find the next number in the sequence.

1, 4, 27, 256, . . .

____

4. The terms of the following sequence are generated with the formula $a_n = 2n - 1$.

1, 3, 5, 7, 9, . . .

What is the 12th number in the sequence? ____________________

Name ______________________________

• Simplifying Square Roots

The Product Property of Square Roots
$\sqrt{ab} = \sqrt{a}\sqrt{b}$

We can simplify square roots by removing perfect-square factors from the radical. We show two ways to simplify $\sqrt{12}$:

First Method:
Find the prime factors.

$$\begin{aligned}\sqrt{12} &= \sqrt{2 \cdot 2 \cdot 3} \\ &= \sqrt{2 \cdot 2}\sqrt{3} \\ &= 2\sqrt{3}\end{aligned}$$

Second Method:
Find the perfect sqare factor.

$$\begin{aligned}\sqrt{12} &= \sqrt{4 \cdot 3} \\ &= \sqrt{4}\sqrt{3} \\ &= 2\sqrt{3}\end{aligned}$$

When using prime factors to simplify, look for pairs of identical factors. Each pair is a perfect square.

Example: Simplify $\sqrt{600}$.

FIRST METHOD:

Step 1: Factor 600.
$\sqrt{600} = \sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5}$

Step 2: Group pairs of identical factors.
$\sqrt{2 \cdot 2} \cdot \sqrt{5 \cdot 5} \cdot \sqrt{2 \cdot 3}$

Step 3: Simplify perfect squares.
$2 \cdot 5 \cdot \sqrt{2 \cdot 3}$

Step 4: Multiply.
$10\sqrt{6}$

SECOND METHOD:

$$\begin{aligned}\sqrt{600} &= \sqrt{100 \cdot 6} \\ &= \sqrt{100}\sqrt{6} \\ &= 10\sqrt{6}\end{aligned}$$

Practice:

Simplify if possible.

1. $\sqrt{140}$ ________________

2. $\sqrt{80}$ ________________

3. $\sqrt{500}$ ________________

4. $\sqrt{1372}$ ________________

5. $\sqrt{480}$ ________________

6. $\sqrt{30}$ ________________

Name ______________________________

• Area of a Trapezoid

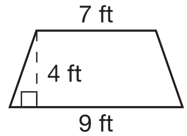
Formula to Find the Area of a Trapezoid

$$A = \frac{1}{2}(b_1 + b_2) \cdot h$$

We read this formula: Area equals $\frac{1}{2}$ times the sum of the bases times the height.

The formula means: Multiply the average of the bases times the height.

Example: Find the area of the trapezoid.



Step 1: Add base 1 and base 2.
$7 + 9 = 16$

Step 2: Multiply the sum by $\frac{1}{2}$ or divide by 2.

The average of the bases is 8 ft. $\frac{1}{2}(16) = 8$

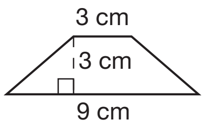
Step 3: Multiply the average of the bases by the height.
$8(4) = 32$

The area of the trapezoid is 32 square feet.

Practice:

Find the average of the bases and the area of each trapezoid.

1.



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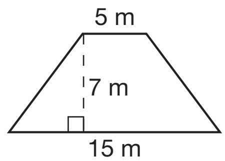

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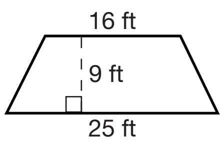

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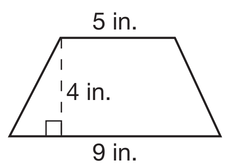

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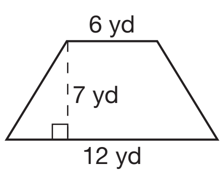

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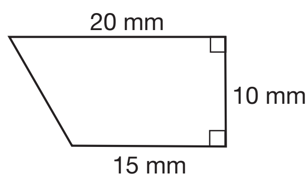

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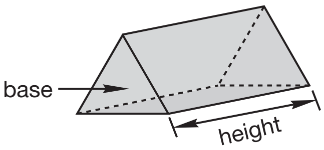
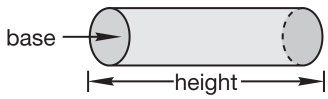
• Volumes of Prisms and Cylinders

- To find the volume of a prism or a cylinder perform these two steps:
  1. Find the area of the base.
  2. Multiply the area of the base times the height.





Practice:

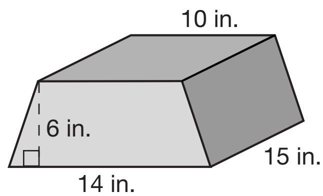
1. Find the volume of a cylinder with a radius 5 ft and a height 10 ft.

(Use 3.14 for π.) ______________________________

2. Find the volume of a rectangular prism with length 6 in., height 4 in.,

and width 4 in. ______________________________

3. Find the volume of this trapezoidal prism.



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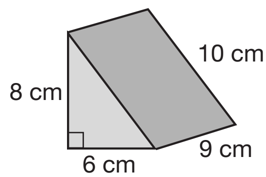
4. Find the volume of this triangular prism.



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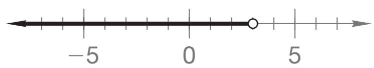
Name ________________________________

• Inequalities with Negative Coefficients

- Recall that we solve an inequality the way we solve an equation. However, if we multiply or divide by a negative number, we reverse the direction of the inequality.
- We can graph on a number line all the numbers that make the inequality true.

Example: Solve and graph: $-6(x - 3) > 6(x - 3)$

Step	**Justification**
$-6(x - 3) > 6(x - 3)$	Given equality
$-6x + 18 > 6x - 18$	Distributive Property
$-12x + 18 > -18$	Subtracted 6*x* from both sides
$-12x > -36$	Subtracted 18 from both sides
$\boldsymbol{x < 3}$	Divided both sides by −12 and reversed the comparison symbol.



Practice:

Solve. Then graph the set of solutions.

1. $2x - 5x + 4 \leq 10$ ____________________

2. $4(x - 1) > 8$ ____________________

3. $11 - 2x \geq 3x + 16$ ____________________

4. $2(x - 2) \geq 5(x + 1)$ ____________________

5. $4(x + 2) < 5x - 1$ ____________________

• Products of Square Roots

Property of Square Roots

$$\sqrt{ab} = \sqrt{a}\sqrt{b}$$

This property means that square roots can be factored.

This property also means square roots can be multiplied.

This property can help you solve problems with square roots.

Simplify: $\sqrt{5} \cdot \sqrt{5}$

$\sqrt{5} \cdot \sqrt{5} = \sqrt{25}$

$\sqrt{25} = 5$

Simplify: $\sqrt{8} \cdot \sqrt{18}$

$\sqrt{8} \cdot \sqrt{18} = \sqrt{144}$

$\sqrt{144} = 12$

Simplify: $\sqrt{10} \cdot \sqrt{14}$

$\sqrt{10} \cdot \sqrt{14} = \sqrt{140}$

$\sqrt{140} = \sqrt{2 \cdot 2 \cdot 5 \cdot 7}$

$\sqrt{140} = \sqrt{2^2} \cdot \sqrt{5 \cdot 7}$

$\sqrt{140} = 2\sqrt{35}$

Practice:

1. $\sqrt{8}\sqrt{2}$ ____________

2. $\sqrt{12}\sqrt{3}$ ____________

3. $\sqrt{27} \cdot \sqrt{49}$ ____________

4. $\sqrt{3} \cdot \sqrt{6}$ ____________

5. $\sqrt{3} \cdot \sqrt{3}$ ____________

6. $\sqrt{5} \cdot \sqrt{50}$ ____________

• Transforming Formulas

Standard formulas are expressed with one variable isolated. You can transform, or rearrange, formulas before you solve a problem when you want to isolate a different variable.

Example: The formula for distance can be transformed to solve the equation to find the time:

Step	**Justification**
$d = rt$	Distance formula
$\frac{d}{r} = \frac{rt}{r}$	Divided both sides by r
$\frac{d}{r} = t$	Simplified
$t = \frac{d}{r}$	Symmetric property

Example: Solve for x: $w = x + b$

$w = x + b$	Equation
$w - b = x$	Subtracted b from both sides
$x = w - b$	Symmetric property of equality

Practice:

1. Solve $A = lw$ for width. ____________________

2. Solve $c = \pi d$ for the diameter. ____________________

3. Solve $c^2 = a^2 + b^2$ for a. ____________________

4. Transform this formula to solve for c. $a = bc$ ____________________

5. Solve $d = rt$ for time. Then use your transformed formula to solve the following problem. Jan traveled a distance of 90 miles at the rate of 40 mph. How long did it take her to travel the 90 miles?

____

Name ________________________________

• Adding and Subtracting Mixed Measures Polynomials

To add mixed measures, combine the units separately and then make adjustments.

Example:

	13 minutes 41 seconds
+	9 minutes 31 seconds
	22 minutes 72 seconds = 23 min 12 sec

When subtracting, you may need to regroup.

Example:

		→		
	14 pounds 3 ounces	→	13 pounds	19 ounces
−	10 pounds 9 ounces		10 pounds	9 ounces
			3 pounds	10 ounces

Polynomials are algebraic expressions with one or more terms. Monomials (one term), binomials (two terms), and trinomials (three terms) are types of polynomials.

Practice:

1. Add:

a.
2 hr 25 min 18 sec
\+ 4 hr 51 min 22 sec

____

b.
3 ft 8 in.
\+ 4 ft 10 in.

____

2. Subtract:

a.
9 hr 12 min 18 sec
− 2 hr 21 min 45 sec

____

b.
10 lbs 3 oz
− 4 lbs 12 oz

____

3. Identify each polynomial below as a monomial, binomial, or trinomial.

a. $3x + 7y - 2$

____

b. $x + 4y + 4$

____

c. $4xy^3$

____

d. $x^2 - 2y$

____