

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Unit 1 Study Guide

Use the following to review for you test. Work the Practice Problems on a separate sheet of paper.

What you need to know & be able to do	Things to remember		
<p>1. Unit Conversions</p> <ul style="list-style-type: none"> <li>There are 5280 feet in one mile</li> <li>There are 0.034 ounces in one milliliter</li> <li>There are 0.454 kg in one pound</li> <li>There are 1.6 kilometers in one mile</li> <li>There are 73 gallons in 2 barrels</li> <li>There are 1.05 quarts in one liter</li> <li>There are 4 quarts in one gallon</li> <li>There are 16 ounces in a pound.</li> </ul>		<p>1. Convert 1500dg to hg.</p> <p>1500 dg 15 Hg or</p> $\frac{1500 \text{ dg}}{10 \text{ dg}} \cdot \frac{1 \text{ Hg}}{100 \text{ g}} = \frac{1500}{1000} = 1.5$ <p>3. Convert 12 kilometers to inches.</p> $\frac{12 \text{ K}}{1 \text{ K}} \cdot \frac{1000 \text{ m}}{1 \text{ meter}} \cdot \frac{3.28 \text{ ft}}{1 \text{ ft}} = 39,372 \text{ in.}$	<p>unit plan OZ → ML → L</p> <p>2. A bowl of cereal weighs 60 oz. How heavy is it in L?</p> $\frac{60 \text{ oz}}{0.034 \text{ oz}} \cdot \frac{1 \text{ ML}}{1000 \text{ mL}} = 1.76 \text{ L}$ <p>4. You are in a car traveling that is traveling at 65 mph. How long will it take to travel to Chattanooga (150 miles away)?</p> $\frac{150 \text{ miles}}{65 \text{ miles/hr}} = 2.3 \text{ hr}$
<p>2. Identify Vocabulary</p>	<ul style="list-style-type: none"> <li># of terms</li> <li>Coefficients</li> <li>Factors</li> <li>Constants</li> </ul>	<p>5. How many terms are in the expression <math>12x^3 + 7x^2 - 4x - 19</math>?</p> <p>4 terms</p>	<p>6. What are the factors, coefficients, and constants in the expression <math>20x^4 - 11x + 3</math>?</p> <p>Factors <math>20x^4 = 5 \cdot 2 \cdot x \cdot x \cdot x \cdot x</math>  coeff: <math>11x = 11 \cdot x</math>    constant <math>3</math></p>
<p>3. Number Systems</p>	<ul style="list-style-type: none"> <li>Real numbers</li> <li>Rational Numbers</li> <li>Irrational Numbers</li> <li>Integers</li> <li>Whole numbers</li> <li>Natural Numbers</li> </ul>	<p>7. Show that the product of two irrational numbers can be a rational number.</p> $\sqrt{7} \cdot \sqrt{7} = \sqrt{49}$ <p>7 rational</p>	<p>8. Identify each by number type</p> <p>a) <math>\sqrt{14}</math> NOT perfect    IRR  b) 3.5    Rational because: terminating decimal  c) <math>\frac{\sqrt{9}}{\sqrt{36}} = \frac{3}{6} = \frac{1}{2}</math>    rational  d) <math>-\pi</math>    IRR</p>
<p>4. Dimensional Analysis</p>	<p>Make a unit Plan Diagonal units Cancel!</p>	<p>9) Convert 76 kilometers per minute to miles per hour.</p>	<p>10) Asheville is 219 miles away. It takes you 4 hours to get there. What was your average miles per hour for the trip?</p>

$$\frac{76 \text{ K}}{1 \text{ min}} \cdot \frac{1000 \text{ m}}{1 \text{ K}} \cdot \frac{3.28 \text{ ft}}{1 \text{ m}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = \frac{14956800}{5280} = 2832.7 \text{ m/h}$$

$$\frac{219 \text{ miles}}{4 \text{ hrs}} = 54.75 \text{ m/h}$$

<p>5. Operations with Polynomials</p>	<p>Remember Order of operations! PEMDAS</p> <p>Multiply - use distributive property</p> <p>Add or Subtract - Combine like terms</p>	<p>11) Simplify</p> $(x^2 - 3x + 5) + (+3x^2 - 4x + 6)$ $x^2 - 3x + 5 + 3x^2 - 4x + 6$ $4x^2 - 7x + 11$	<p>12) Multiply FOIL</p> $(x - 3)(2x + 7)$ $2x^2 + 7x - 6x - 21$ $2x^2 + x - 21$
<p>7. Simplifying Radicals</p>	<p>Complete the prime factorization.</p> <p>Look for pairs of prime factors. or Perfect Squares!</p>	<p>11. <math>\sqrt{50} = \sqrt{5 \cdot 5 \cdot 2}</math></p> $25 \uparrow 2$ $5 \uparrow 5$ $\boxed{5\sqrt{2}}$	<p>12. <math>-\sqrt{300x^2y^5} = \sqrt{3 \cdot 10 \cdot 10 \cdot x \cdot x \cdot y \cdot y \cdot y}</math></p> $3 \uparrow 100$ $10 \uparrow 10$ $\boxed{10xy^2\sqrt{3y}}$
<p>8. Operations with Radicals</p>	<p>Addition and Subtraction - Simplify first. Must have matching Radicands to be like terms. Just add the coefficients. Leave the Radicand alone!</p>	<p>13.</p> $3\sqrt{20} + 8\sqrt{45}$ $3\sqrt{2 \cdot 2 \cdot 5} + 8\sqrt{3 \cdot 3 \cdot 5}$ $6\sqrt{5} + 24\sqrt{5}$ $\boxed{30\sqrt{5}}$	<p>14.</p> $3\sqrt{98} - 6\sqrt{18}$ $3\sqrt{7 \cdot 7 \cdot 2} - 6\sqrt{3 \cdot 3 \cdot 2}$ $21\sqrt{2} - 18\sqrt{2}$ $\boxed{3\sqrt{2}}$
<p>Multiplication</p> <ul style="list-style-type: none"> <li>• Multiply the coefficients</li> <li>• Multiply the radicands</li> <li>• Simplify</li> </ul>	<p>15) <math>\sqrt{6y^5} \cdot \sqrt{4y^6}</math></p> $\sqrt{24y^{11}}$ <p>5 pairs</p> $\sqrt{2 \cdot 2 \cdot 2 \cdot 3 y^{11}}$ $2\sqrt{6y}$	<p>16) <math>\sqrt{3}(\sqrt{27} + 4)</math></p> $\sqrt{81} + 3\sqrt{4}$ $9 + 3 \cdot 2$ $9 + 6 = \boxed{15}$	<p>17) <math>\sqrt{3x} \cdot \sqrt{12x}</math></p> $\sqrt{36x^2} = \boxed{6x}$
<p>Rationalize the Denominator</p>	<p>18) <math>\frac{\sqrt{3}}{\sqrt{2}}</math></p>	<p>19) <math>\frac{\sqrt{12}}{\sqrt{3}}</math></p>	

### Station 5: Irrational vs. Rational

*always*

- Which of the following is true?
  - A. A rational number plus a rational number equals a rational number
  - B. An irrational number plus an irrational number equals a rational number
  - C. An irrational number plus a rational number equals a rational number
  - D. A rational number plus a rational number always equals an integer.

- Simplify the following expressions, if possible. Then, identify the solution as rational or irrational, and state why this is the case.

a)  $3\sqrt{36} - 2.5\sqrt{25}$   
 $3 \cdot 6 - 2.5 \cdot 5$   
 $18 - 12.5 = 5.5$  5.5 Rational  
*Terminates*

b)  $\sqrt{8}(\sqrt{2} + \sqrt{7})$   
 $\sqrt{16} + \sqrt{56}$   
 $4 + \sqrt{2 \cdot 2 \cdot 2 \cdot 7}$  IRR  
 $4 + 2\sqrt{14}$  not perfect

c)  $4 + \pi$   $7.14\dots$  IRR  $\rightarrow$  ~~is~~ doesn't terminate

d)  $\sqrt{7} * \sqrt{7} = \sqrt{49} = 7$  7 Rational

### Station 3: Operations with Polynomials

Simplify the following polynomials. Write your answer in standard form.

1)  $(3x^3 - 5x^2 - x + 1) + (2x^3 + x^2 + 3x + 5)$

$5x^3 - 4x^2 - 4x + 6$

2)  $(4x + 5)^2$

$(4x+5)(4x+5)$

$16x^2 + 40x + 25$

3)  $(4x - 3)(5x + 9)$

$20x^2 + 36x - 15x - 27 = 20x^2 + 21x - 27$

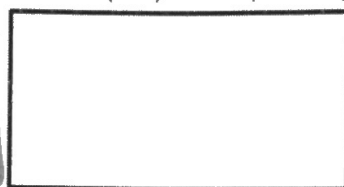
4)  $(3x - 2)(4x^2 - 9x + 2)$

$12x^3 + -27x^2 + 6x - 18x^2 + 18x - 4$

$12x^3 - 35x^2 + 24x - 4$

5)

Find perimeter and area of the rectangle. Simplify completely.



$2x + 1$

$x + 5$

$P = 2(2x + 1) + 2(x + 5)$

$4x + 2 + 2x + 10$

$P = 6x + 12$

$A = (2x + 1)(x + 5)$

$2x^2 + 10x + x + 5$

$2x^2 + 11x + 5$

### Station 4: Radicals

1)  $\sqrt{2}(3\sqrt{2} - 6)$

$3\sqrt{4} - 6\sqrt{2}$

$6 - 6\sqrt{2}$

2)  $-2\sqrt{5x^4} - x^2\sqrt{5}$

$-2x^2\sqrt{5} - x^2\sqrt{5}$

$-3x^2\sqrt{5}$

3)  $\sqrt{24} + 3\sqrt{54}$

$\sqrt{2 \cdot 2 \cdot 2 \cdot 3} + 3\sqrt{2 \cdot 3 \cdot 3 \cdot 3}$

$2\sqrt{6} + 9\sqrt{6} = 11\sqrt{6}$

4)  $-2\sqrt{5} \cdot \sqrt{12}$

$-2\sqrt{60}$

$-2\sqrt{5 \cdot 12}$

$-2\sqrt{2 \cdot 2 \cdot 3 \cdot 5}$

$-4\sqrt{15}$

5)  $\sqrt{2}(3\sqrt{2x} - \sqrt{6x})$

$3\sqrt{4x} - \sqrt{12x}$

$3\sqrt{2 \cdot 2x} - \sqrt{2 \cdot 2 \cdot 3 \cdot x}$

$6\sqrt{x} - 2\sqrt{3x}$

6)  $\sqrt{196x^7y^2}$

$\sqrt{(14 \cdot 14)x^6y^2}$

$14x^3y\sqrt{x}$

Station 1 - Unit Conversions

- 5280 feet = 1 mile
- 0.034 ounces = 1 milliliter
- 0.454 kg = 1 pound
- 1.6 kilometers = 1 mile
- 73 gallons = 2 barrels
- 1.05 quarts = 1 liter
- 4 quarts = 1 gallon
- 16 ounces = 1 pound

oz → lb → Kg

1) A big bowl of Mac and Cheese weighs 80 oz. How heavy is it in kg?

$$\frac{80 \text{ oz}}{16 \text{ oz}} \times \frac{1 \text{ lb}}{1 \text{ lb}} \times \frac{.454 \text{ kg}}{1 \text{ lb}} = 2.27 \text{ kg}$$

2) A tire is rotating at 120 revolutions per minute. How many revolutions is the tire making in an hour?

$$\frac{120 \text{ rev}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} = 7,200 \frac{\text{rev}}{\text{hr}}$$

3) A car is traveling 102.667 feet per second, how fast is that in miles per hour?

$$\frac{102.667 \text{ ft}}{\text{second}} \times \frac{1 \text{ mile}}{5280 \text{ ft}} \times \frac{60 \text{ sec.}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} = \frac{369601.2}{5280} = 70 \frac{\text{miles}}{\text{hr}}$$

4) Sabrina wants to have a pizza party and invite 30 of her closest friends. She called Papa Johns and found that a large pizza cost \$9.50 and is cut into 8 slices. If she wants each guest to get 2 pieces each, how much is she going to have to spend on pizza? Show all unit conversion work to get full credit.

$$\frac{30 \text{ friends}}{1 \text{ friend}} \times \frac{2 \text{ slices}}{8 \text{ slices}} \times \frac{1 \text{ pizza}}{1 \text{ pizza}} = 7.5 \text{ pizzas, so order 8 pizzas} \times \$9.50 = \$76$$

Station 2 - Identifying Parts of an Expression

1) How many terms are in the expression  $x^3 - 18x^2 + 8x - 9$ ?

4 terms

2) Identify each in the above expression: Factors, Coefficients, and

Constants  $x^3 = x \cdot x \cdot x$      $-18x^2 = -1 \cdot 2 \cdot 3 \cdot 3 \cdot x \cdot x$      $8x = 2 \cdot 2 \cdot 2 \cdot x$   
 Coeff: 1, 18, 8, Constant: -9     $-9 = -1 \cdot 3 \cdot 3$

3) Simplify these polynomials and arrange in standard form:

$(3x^3 - 5x^2 + x - 4) + (-4x^3 + 2x - 8)$

$-x^3 - 5x^2 + 3x - 12$

• How many terms are in the simplified expression, and what is the leading coefficient?

4 terms, -1