KHDb d c m

Warm Up Metric Conversions Date:

1. Convert 5,000 centimeters to meters. 5000. 50meters	2. Jenny wants to pour 483 milliliters is poured into a one liter container. 483 a. Will the container overflow? (no) b. How many liters is this? .483L
3. Jamie rain 12,327 decimeters. How many kilometers did he run? 12327 1.237 K	4. Sandi needs 68.5 grams of sugar for a recipe. She has .2 hectograms. 68.5 .2 a. How many grams is this? 20g b. Is it enough for her recipe? no

Facts to know!

1,000 meters is the same as 1 Kilometers.
There are 100 centimeters in a meter.
It takes 1,000 milliliters to make 1 Liter.
There are 1,000 grams in a kilogram.

Name: _____ Date: _____

Unit Conversions (English System)

Distance:

1 mile = 5,280 feet

1 yard = 3 feet

1 foot = 12 inches

BIGGER

Weight:

1 ton = 2,000 pounds

1 pound = 16 ounces

BIGGER

Volume (liquids):

1 gallon = 4 quarts

1 quart = 2 pints

1 pint = 2 cups

1 cup = 8 ounces

To Convert Between English and Metric:

1 inch = 2.54 cm.	1 pound = 454 grams	1 quart = 946 mL

Steps: ① Determine initial unit and quantity.

② Determine final unit, and make a unit plan.

③ Determine conversion factor(s)

④ Multiply initial unit & quantity by the conversion factor(s).

* make sure diagonal units match *

Perform the following conversion:

1. Convert 6 miles to feet

miles → ft

$$\frac{6 \text{ miles} \cdot 5280 \text{ ft}}{1 \text{ mile}} = 31{,}680 \text{ ft.}$$

2. Convert 7 quarts gallons

qt → gal

$$\frac{7 \text{ qt} \cdot 1 \text{ gal}}{4 \text{ qt}} = \frac{7}{4} = 1.75 \text{ gal}$$

3. Convert 3,200 inches to miles

in → ft → miles

$$\frac{3200 \text{ in} \cdot 1 \text{ ft} \cdot 1 \text{ mile}}{12 \text{ in} \cdot 5280 \text{ ft}} = \frac{3200}{63{,}360} \text{ miles}$$

.05 miles

4. Convert 14 weeks to minutes

wk → day → hr → min

$$\frac{14 \text{ wk} \cdot 7 \text{ days} \cdot 24 \text{ hr} \cdot 60 \text{ m}}{1 \text{ wk} \cdot 1 \text{ day} \cdot 1 \text{ hr}} =$$

141,120 min

Name: _____ Date: _____

Interpret Language in Math Expressions - NOTES

Definitions:

Vocabulary	Definition	Examples
Algebraic Expression	• A mathematical phrase that contains operations, numbers, and/or variables. • Does NOT contain an equal sign.	① $5x + 7$ ② $3x^2 - 2x + 5$
Variable	• A symbol used to represent a quantity that can change. "unknown"	x, y, z, θ
Term	• A part of an expression. • Separated by "+" and/or "-"	$5x, 7, 3x^2, 2x$ 5
Like Terms	• Terms with the same variables raised to the same exponents.	$4x^2, 6x^2$
Coefficient	• A number multiplied by a variable. • Located in front of the variable.	$4x^2$
Exponent	• The number that indicates how many times the base is being multiplied by itself • Little # at the top right of a #	$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$ $x^5 = x \cdot x \cdot x \cdot x \cdot x$
Base	• The # in a power that is used as a factor • The big # under the exponent	3^4 base base $6^2 = 36$
Constant	• A term that does NOT contain a variable • A # that stands alone • Normally at the end	$3x^2 - 5x + 2$ constant
Factors	• #'s or variables that are multiplied • Separated by "."	$2x + 4$ $2(x + 2)$
Order of Operations	• PEMDAS Parenthesis Exponents Mult. Div. Add Subtract	$(16 \div 2 + 3)^2$ $(8+3)^2$ $(11)^2 = 121$

Name: _____ Date: _____

Classifying Polynomials → An expression w/ many terms

Polynomials are named according to their degree **and** number of terms

For a polynomial with one variable, the degree is the highest exponent of that variable.

Degree	Name	Example
* 0	constant	7
* 1	linear	$5x + 3$
* 2	Quadratic	$3x^2 + 2x + 7$
3	Cubic	$x^3 - 7x$
4	Quartic	$7x^4 + 2x^2 - 5$
5	Quintic	$x^5 - 2x - 3$

Terms are separated by plus or minus.

Terms	Name	Example
1	monomial	$5x$
2	binomial	$2x+5$
3	trinomial	x^2+3x+1
4+	polynomial	x^4+7x^2-3x+2

Examples:
1. $x^3 + 6x^2 + 12x + 8$ cubic polynomial
2. 3 constant monomial
3. $2x + 4$ Linear Binomial

Standard Form

- The terms of a polynomial are in standard form if they are ordered from left to right in descending order; which means from the highest exponent to the least.
- The coefficient of the first term is called the Leading Coefficient
- **Example:** Write $9 + x - 4x^3$ in Standard Form: $-4x^3 + x + 9$ "cubic trinomial"
- **Example:** Write $3x^2 - 2 + 4x - 5x^3$ in Standard Form: $-5x^3 + 3x^2 + 4x - 2$ "cubic polynomial"

You try:

Polynomial	Standard Form	Degree	# of Terms	NAME
$8x$	$8x$	1	1	Linear Monomial
$3 + 4x^2 + 2x$	$4x^2+2x+3$	2	3	Quadratic Trinomial
$5x^3 + x^2$	x^2+5x^3	2	2	Quadratic Binomial
$6 + 3x^2 - 4x - 2x^4$	$2x^4+3x^2-4x+6$	4	4	Quartic Polynomial

Remember **Like Terms:** two or more terms of a polynomial with the same variable raised to the same exponent

Examples: Simplify by following order of operations and combining like terms. Write in standard form.

1. $(4x^2+6x+7)+(2x^2-9x+1)$

$6x^2-3x+8$

Quadratic trinomial

Lead coeff: 6 Constant: 8

2. $(7x^3-5x+3)-(7x-4x^2+9)$

Distribute

$7x^3-5x+3-7x+4x^2-9$

$7x^3+4x^2-12x-6$

Cubic Polynomial

3. $(2p^3+10p-6p^2)+(11p^2-3p+4p^3)$

$6p^3+5p^2+7p$

Cubic Trinomial

Coefficients: 6, 5, 7

4. $(v^3+6v^2-v)-(9v^3-7v^2+3)$

Distribute

$v^3+6v^2-v-9v^3+7v^2-3$

$-8v^3+13v^2-v-3$

5. $(2x^3-3x+5x^2-8)-(x^3-8x^2+11x)$

Distribute

$2x^3-3x+5x^2-8-x^3+8x^2-11x$

$x^3+13x^2-14x-8$

6. $3(-3x^3+2x-4)+(4x^3+3x^2+2)$

$-9x^3+6x-12+4x^3+3x^2+2$

$-5x^3+3x^2+6x-10$

Cubic polynomial

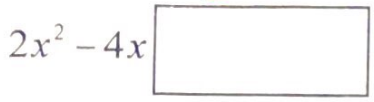
7. $(4xy-x^2)-(x^2y-7x^2+9xy)$

$4xy-x^2-x^2y+7x^2-9xy$

$-5xy+6x^2-x^2y$

Applications:

8. Find the perimeter if this is a rectangle:



$3x^2 + 5x$

$2x^2 - 4x$

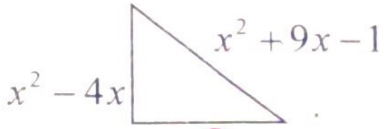
$3x^2 + 5x$

$P = 2(3x^2+5x) + 2(2x^2-4x)$

$P = 6x^2 + 10x + 4x^2 - 8x$

$P = 10x^2 + 2x$

9. Find the missing side if the perimeter is $2x^2 - 6x + 7$

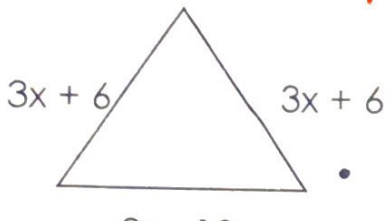


$P = x^2 - 4x + x^2 + 9x - 1 + ?$

$P = 2x^2 + 5x - 1 + ?$

$? = -11x + 8$

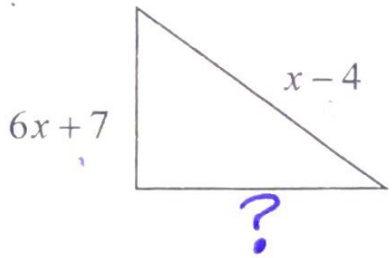
10. Find the perimeter: $P = S + S + S$



$P = 3x + 6 + 3x + 6 + 2x - 10$

$P = 8x + 2$

11. Find the missing side if the perimeter is $8x - 5$



$P = 6x + 7 + x - 4 + ?$

$= 7x + 3 + ?$

$? = x - 8$

Name: _____ Date: _____

Multiplying Polynomials

When multiplying polynomials, use the distributive property!!!

Examples:

1. $5(x+6)$

$5x+30$

2. $x^2(x+6)$

x^3+6x^2

when you multiply variables, you add their exponents

3. $(-2x)(x^2-4x+2)$ *watch your signs*

$-2x^3+8x^2-4x$

4. $(x-2)(x+4)$ *Double Distribution*

$x^2+4x-2x-8$

x^2+2x-8

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

$x^2-3x+9x-27$

$x^2+6x-27$

6. $(x+3)(x-3)$

$x^2-3x+3x-9$

x^2-9

7. $(2x+5)(x+6)$

$2x^2+12x+5x+30$

$2x^2+17x+30$

8. $(3x-1)(2x-4)$

$6x^2-12x-2x+4$

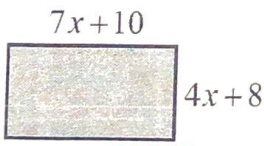
$6x^2-14x+4$

9. $(5b-6)(3b^2-2b+5)$

$15b^3-10b^2+25b-18b^2+12b-30$

$15b^3-28b^2+37b-30$

10.



$A=(7x+10)(4x+8)$

$28x^2+56x+40x+80$

$A=28x^2+96x+80$

11.

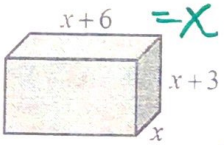
$A=(x+4)(5x+1)$

$A=5x^2+x+20x+4$

$A=5x^2+21x+4$

12. $V=x(x+6)(x+3)$

$=x(x^2+3x+6x+18)$



$V=x(x^2+9x+18)$

$V=x^3+9x^2+18x$

$\sqrt{Radicand}$

Name:_____

Radicals Notes

1. **Perfect Squares**

$1^2 = 1$ $2^2 = 4$ $3^2 = 9$ $4^2 = 16$ $5^2 = 25$ $6^2 = 36$ $7^2 = 49$ $8^2 = 64$ $9^2 = 81$ $10^2 = 100$ $11^2 = 121$ $12^2 = 144$ $13^2 = 169$ $14^2 = 196$ $15^2 = 225$ $16^2 = 256$ $17^2 = 289$ $18^2 = 324$ $19^2 = 361$ $20^2 = 400$

2. **Take the square Root.**

a. $\sqrt{16}$ = 4

b. $\sqrt{25}$ = 5

c. $\sqrt{100}$ = 10

Find the largest perfect square that goes evenly into the radicand.

d. $\sqrt{32}$ = $4\sqrt{2}$ $\sqrt{16 \cdot 2}$

e. $\sqrt{48}$ = $4\sqrt{3}$ $\sqrt{16 \cdot 3}$

f. $\sqrt{80}$ = $4\sqrt{5}$ $\sqrt{16 \cdot 5}$

3. $\sqrt{75}$

$\sqrt{25 \cdot 3}$

$5\sqrt{3}$

4. $\sqrt{20}$

$\sqrt{4 \cdot 5}$

$2\sqrt{5}$

5. $\sqrt{128}$

$\sqrt{64 \cdot 2}$

$8\sqrt{2}$

6. When there's a coefficient....

multiply

$6\sqrt{16}$

$6 \cdot 4 = 24$

7. $-5\sqrt{12}$

$-5\sqrt{4 \cdot 3}$

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

$-10\sqrt{3}$

8. $-8\sqrt{32}$

$-8 \cdot \sqrt{16 \cdot 2}$

$-8 \cdot 4\sqrt{2}$

$-32\sqrt{2}$

$x^3 \cdot x^3 = x^6$ $\quad x^2 \cdot x = x^3$

$x^5 \cdot x^5 = x^{10}$

$\sqrt{Radicand}$ Name:_____

9. When there's a variable....

$\sqrt{150b^4}$

$\sqrt{25 \cdot 6 \cdot b^4}$

$5b^2\sqrt{6}$

* when the exponent is even, diride it by two to get the square root *

10. $\sqrt{216x^3}$

$\sqrt{36 \cdot 6 \cdot x^3}$

$6\sqrt{6 \cdot x^2 \cdot x}$

$6x\sqrt{6x}$

* when exponent is odd, you will have one variable left underneath the radical *

11. $\sqrt{18k^2}$

$\sqrt{9 \cdot 2 \cdot k^2}$

$3k\sqrt{2}$

12. $\sqrt{8n^2}$

$\sqrt{4 \cdot 2 \cdot n^2}$

$2n\sqrt{2}$

13. $\sqrt{63x}$

$\sqrt{9 \cdot 7 \cdot x}$

$3\sqrt{7x}$

* any variable to the 1st power Stays under the radical *

* Challenge *

14. Putting it all together.

$3\sqrt{192x^4y^2}$

$3\sqrt{64 \cdot 3x^4y^2}$

$3 \cdot 8x^2y\sqrt{3}$

$24x^2y\sqrt{3}$

15. $2\sqrt{98y^5}$

$2\sqrt{49 \cdot 2 \cdot y^4 \cdot y}$

$14y^2\sqrt{2y}$

16. $4\sqrt{45y^6}$

$4\sqrt{9 \cdot 5 \cdot y^6}$

$12y^3\sqrt{5}$

RADICALS QUIZ REVIEW WARM UP

1. $\sqrt{18x^2}$

$\sqrt{9 \cdot 2 \cdot x^2}$

$\boxed{3x\sqrt{2}}$

2. $\sqrt{32n^3}$

$\sqrt{16 \cdot 2 \cdot n^2 \cdot n}$

$\boxed{4n\sqrt{2n}}$

3. $5\sqrt{512}$

$5\sqrt{256 \cdot 2}$

$5 \cdot 16\sqrt{2}$

$\boxed{80\sqrt{2}}$

4. $-3\sqrt{45} + 2\sqrt{20}$

$-3\sqrt{9 \cdot 5} + 2\sqrt{4 \cdot 5}$

$-9\sqrt{5} + 4\sqrt{5}$

$\boxed{-5\sqrt{5}}$

5. $2\sqrt{6} + 2\sqrt{27} - 2\sqrt{27}$

$2\sqrt{6} + 2\sqrt{9 \cdot 3} - 2\sqrt{9 \cdot 3}$

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

$\boxed{2\sqrt{6}}$

6. $-3\sqrt{10} \cdot \sqrt{2}$

$-3\sqrt{20}$

$-3\sqrt{4 \cdot 5}$

$-3 \cdot 2\sqrt{5}$ $\boxed{-6\sqrt{5}}$

7. $\sqrt{2} \cdot -4\sqrt{6}$

$\boxed{-4\sqrt{12}}$

$-4\sqrt{4 \cdot 3}$

$\boxed{-8\sqrt{3}}$

8. $-2\sqrt{3}(2\sqrt{6} + 3)$

$-4\sqrt{18} + -6\sqrt{3}$

$\boxed{-12\sqrt{2} - 6\sqrt{3}}$

Name: _____ Date: _____

Classifying Rational & Irrational Numbers

Today's Question: What is the result of the product of a rational number with an irrational number? MCC9-12.N.RN.3

Rational Numbers

Terminating decimal *Fractions that are integer over integer*

Examples:

$\frac{7}{8} = .875$

$\frac{123}{1000} = .123$

Repeating decimal or Pattern

Examples:

$\frac{2}{3} = .\overline{6}$

$\frac{123}{999} = .\overline{123}$

Radicals with Perfect Squares

Examples:

$(8+\sqrt{2})(8-\sqrt{2}) = \boxed{62}$

$64 - 8\sqrt{2} + 8\sqrt{2} - 2$

$\frac{\sqrt{8}}{\sqrt{2}} = \sqrt{4} = \boxed{2}$

$\sqrt{3} \cdot \sqrt{12} = \sqrt{36} = \boxed{6}$

$4\sqrt{2} - 2\sqrt{8} = \boxed{0}$

$4\sqrt{2} - 2\sqrt{4 \cdot 2}$

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

Irrational Numbers

Non-terminating,

Non-repeating decimal, or

Non-perfect square radicals

Examples:

$\pi = 3.1415\ldots$

$\sqrt{8} = 2\sqrt{2}$ NOT A Perfect Square!

$\frac{\sqrt{3}}{4}$ IRR. NOT A Perfect Square!

$\sqrt{8} + \sqrt{2}$ NOT a Perfect Square.

$2\sqrt{2} + \sqrt{2} = \boxed{3\sqrt{2}}$

Facts to know . . .

Rational vs Irrational

Based on the above information, conjecture which of the statements is ALWAYS true, which is SOMETIMES true, and which is NEVER true?

1. The sum of a rational number and a rational number is rational. Always
2. The sum of a rational number and an irrational number is irrational. Always
3. The sum of an irrational number and an irrational number is irrational. Sometimes
   $\pi - \pi = 0$
4. The product of a rational number and a rational number is rational. Always
5. The product of a nonzero rational number and an irrational number is irrational. Always
6. The product of an irrational number and an irrational number is irrational. Sometimes
   $\sqrt{2} \cdot \sqrt{2} = \sqrt{4} = 2$

Topic 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
2.2 pound = 1 kg

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

$\frac{80g}{} \left| \frac{1kg}{1000g} \right. = .08kg$

2) A tire is rotating at 120 revolutions per minute. Convert this to revolutions per hour.

$\frac{120 rev}{1 min} \left| \frac{60 min}{1 hr} \right. = 7200 rv/hr$

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

$\frac{102.667 ft}{1 sec.} \left| \frac{1 mile}{5280 ft} \right| \frac{60 sec}{1 min} \left| \frac{60 min}{1 hr} \right. = 70 mi/hr$

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.

$\frac{30 friends}{1 friend} \left| \frac{2 slices}{8 slices} \right| \frac{1 pizza}{} = 7.5 pizzas$ so 8

$8 \times 9.50 = \$76$

Topic 2 – Identifying Parts of an Expression

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

4 terms

2) Identify and label each of the following for the above expressions

Name By Degree	Name by # of Terms	List the Coefficients	List the Constants
cubic	polynomial	1, -18, 8	-9

3) Simplify these polynomials and arrange in standard form, then name by degree and number of terms, and state the Leading Coefficient.

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

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

Name by Degree: cubic

Name by Number of Terms: polynomial

Leading Coefficent: -1

Standard Form: $-x^3 - 5x^2 + 3x - 12$

Topic 3: Operations with Polynomials

Simplify the following polynomials. ***Write your answer in standard form, and put a box around your final answer.***

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

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

$\boxed{5x^3 - 4x^2 - 4x + 6}$

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

$16x^2 + 20x + 20x + 25$

$\boxed{16x^2 + 40x + 25}$

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

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

$\boxed{20x^2 + 21x - 27}$

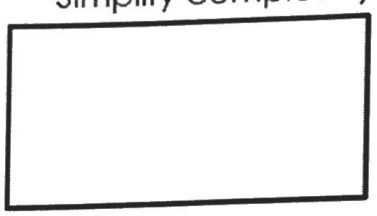
4. $(3x - 2)(4x^2 - 9x + 2)$

$12x^3 - 27x^2 + 6x - 8x^2 + 18x - 4$

$\boxed{12x^3 - 35x^2 + 24x - 4}$

5.

Find perimeter and area of the rectangle. Simplify completely.



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

$P = 4x + 2 + 2x + 10$

$\boxed{P = 6x + 12}$

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

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

$\boxed{A = 2x^2 + 11x + 5}$

Station 4: Radicals

1. $\sqrt{18x^2}$ $3x\sqrt{2}$	2. $\sqrt{196x^7y^2}$ $14x^3y\sqrt{x}$	3) $\sqrt{24}+3\sqrt{54}$ $2\sqrt{6}+9\sqrt{6}$ $11\sqrt{6}$	4. $-2\sqrt{5x^4}-x^2\sqrt{5}$ $-2x^2\sqrt{5}-x^2\sqrt{5}$ $-3x^2\sqrt{5}$
5. $-2\sqrt{5}\cdot\sqrt{12}$ $-2\sqrt{60}$ $-2\sqrt{4\cdot15}$ $-4\sqrt{15}$	6. $\sqrt{48y^3}$ $4y\sqrt{3y}$	7. $\sqrt{2}(3\sqrt{2}-6)$ $3\cdot2-6\sqrt{2}$ $6-6\sqrt{2}$	8. $2\sqrt{63x^5y^8}$ $2\cdot3x^2y^4\sqrt{7x}$ $6x^2y^4\sqrt{7x}$

Station 5: Irrational vs. Rational

1. Which of the following is true?
   - (A) A rational number plus a rational number equals a rational number True
   - 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.

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

a) $3\sqrt{36}-\sqrt{25}$

$3\cdot6-5$

$18-5$

13 R

b) $\sqrt{8}*\sqrt{2}+\sqrt{7}$

$4+\sqrt{7}$ R

c) $4+\pi$

irr

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

R