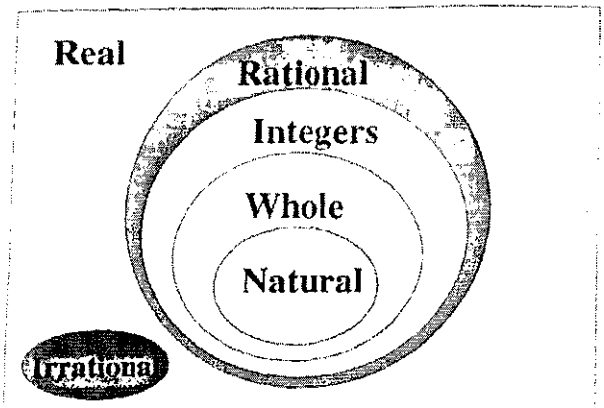
Rational vs. Irrational Numbers

Unit 2B packet



Natural Numbers: counting numbers starting from 1. No negative, no fractions, no decimals, no zero.

Whole Numbers: 0 and all natural numbers, no negatives, no fractions, no decimals

Integers: negative and positive numbers, no fractions, no decimals, includes all whole and natural numbers

Rational Numbers: a number that can be written as a fraction (repeating decimals, terminating decimals, includes all integers, whole numbers, and natural numbers

Irrational Numbers: non-repeating, non-terminating decimals (cannot be a fraction)

Real Numbers: either rational or irrational (all numbers we have learned so far)

Examples:

Natural Numbers:	
Whole Numbers:	
Integers:	
Rational Numbers:	
Irrational Numbers:	
Real Numbers:	

Directions: Classify each number according to its type. Some numbers may be more than one type.

1) - 250	2) $\frac{11}{39}$	3) $\sqrt{9}$
4) 0.09	5) 0	6) 27.5
7) $-3\frac{2}{5}$	8) $12.\overline{8}$	9) π
10) $-3.02\overline{59}$	11) 5.7189460.....	12) $\sqrt{60}$

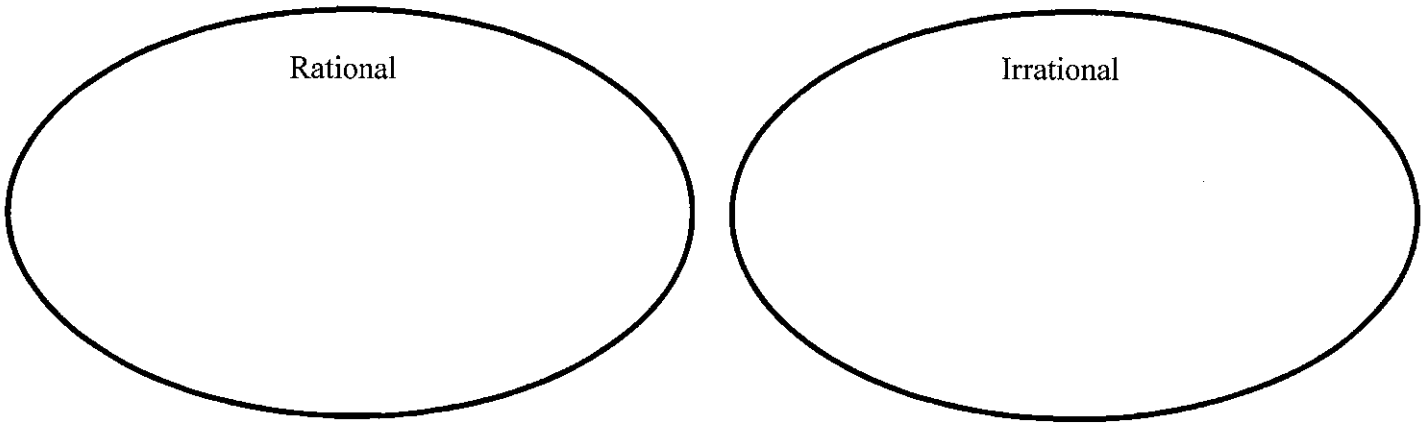
Rational and Irrational Numbers Name _____

Independent Practice

1. Sort the numbers into 2 groups, rational or irrational. Write the numbers in the appropriate bubble.

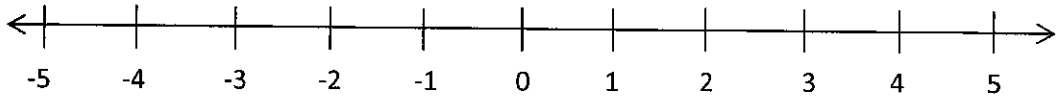
0.8 $\sqrt{64}$ 0 $\sqrt{32}$ -19 $-\sqrt{100}$ 2.343443444...

$\frac{3}{7}$ $\sqrt{75}$ $6\frac{2}{7}$ $12.6\overline{7}$ $\sqrt{121}$ $\frac{12}{5}$ π



2. Graph and label each number on the number line below. You may label the number with the letter.

A 0.75
B $\sqrt{3}$
C $\sqrt{9}$
D $-2\frac{1}{2}$
E $-\frac{15}{10}$
F $2.\overline{6}$
G $-\sqrt{2}$
H π



Based on what you know about rational and irrational numbers, determine if the following statements are ALWAYS true, SOMETIMES true, or NEVER true. Provide examples and explanations that support each conjecture.

1. The sum of a rational number and a rational number is irrational.

2. The sum of a rational number and an irrational number is irrational.

3. The sum of an irrational number and an irrational number is irrational.

4. The product of a rational number and a rational number is rational.

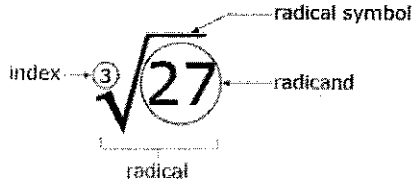
5. The product of a nonzero rational number and an irrational number is irrational.

6. The product of an irrational number and an irrational number is irrational.

Product Property of Square Roots

Words: For any numbers *a* and *b*, where a ≥ 0 and b ≥ 0, the square root of the product of *ab* is equal to the product of each square root.
Symbols: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$ **Example:** $\sqrt{4 \cdot 25} = \sqrt{4} \cdot \sqrt{25}$

Parts of a Radical



Method 1: Square Root Method – break the radicand into perfect square(s) and simplify

Ex 1: $\sqrt{72}$

$= \sqrt{36 \cdot 2}$

$= \sqrt{36} \cdot \sqrt{2}$

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

Ex 2: $\sqrt{48}$

$= \sqrt{16 \cdot 3}$

$= \sqrt{16} \cdot \sqrt{3}$

$\boxed{= 4\sqrt{3}}$

Let's try it!

Ex 3: $\sqrt{80}$ =

Ex 4: $\sqrt{50}$ =

Ex 5: $\sqrt{125}$=

Ex 6: $\sqrt{450}$=

Method 2: Factor tree (pairing method)

-Break radicand into **prime factors**, circle pairs, simplify.

Ex 1: Simplify $\sqrt{72}$

Ex 2: Simplify $\sqrt{48}$

Simplify.

1) $\sqrt{27}$

2) $\sqrt{80}$

3) $\sqrt{216}$

4) $\sqrt{196}$

5) $\sqrt{36}$

6) $\sqrt{20}$

How do we simplify if we include variables in our radicand?

Ex 1: $\sqrt{x^6} =$

Ex 2: $\sqrt{n^7}$

Ex 3: $\sqrt{12n^6}$

Ex 4: $3\sqrt{24x^{11}}$

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7) $\sqrt{36x^4}$

8) $\sqrt{12x^4}$

9) $-3\sqrt{72v^4}$

10) $-2\sqrt{12x^2}$

11) $-\sqrt{54xy^3}$

Homework Simplifying Radicals

Name _____
Class Time_____

Simplify each of the following expressions completely.

_____ 1. $\sqrt{64}$ _____ 2. $-\sqrt{18}$ _____ 3. $\sqrt{32}$

_____ 4. $\sqrt{50}$ _____ 5. $\sqrt{400}$ _____ 6. $\sqrt{x^6}$

_____ 7. $\sqrt{x^7}$ _____ 8. $\sqrt{16x^{16}}$ _____ 9. $\sqrt{9x^9}$

_____ 10. $\sqrt{40x^8}$ _____ 11. $\sqrt{25x^7}$ _____ 12. $\sqrt{12x^5}$

_____ 13. $\sqrt{a^2b^4}$ _____ 14. $\sqrt{49a^8x^{12}}$ _____ 15. $\sqrt{28x^9y^6}$

_____ 16. $\sqrt{32m^7n^{11}}$ _____ 17. $\sqrt{20x^{10}y^5}$ _____ 18. $\sqrt{100ab^4}$

_____ 19. $\sqrt{75x^8y^3}$ _____ 20. $\sqrt{98x^7y^5}$ _____ 21. $\frac{x^2+16x+63}{2x^2+19x+9}$

Homework: This worksheet
Answers to odd problems on worksheet:

1. 8 3. $4\sqrt{2}$ 5. 20 7. $x^3\sqrt{x}$ 9. $3x^4\sqrt{x}$ 11. $5x^3\sqrt{x}$

13. ab^2 15. $2x^4y^3\sqrt{7x}$ 17. $2x^5y^2\sqrt{5y}$ 19. $5x^4y\sqrt{3y}$ 21. $\frac{x+7}{2x+1}$

Adding and Subtracting Radicals

Example 1:

Evaluate:

a.) $\sqrt{3} + 2\sqrt{3}$

Since these terms are like terms, we simply add.

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

b.) $4\sqrt{2} + \sqrt{8}$

Since these terms are NOT like terms, we cannot combine them. We need to simplify each term completely to make sure they can't be written as like terms. If they can, then we will add!

$$4\sqrt{2} + \sqrt{8} = 4\sqrt{2} + \sqrt{4 \cdot 2}$$

$$= 4\sqrt{2} + \sqrt{4} \cdot \sqrt{2}$$

$$= 4\sqrt{2} + 2\sqrt{2}$$

Now they are like terms!

$$= 6\sqrt{2}$$

c.) $5\sqrt{7} - 2\sqrt{28} + 6\sqrt{63}$

d.) $2\sqrt{125x^2z} + 8x\sqrt{80z}$

Adding and Subtracting Radicals

Practice Problems

Evaluate

1. $4\sqrt{5} + \sqrt{5} - 2\sqrt{5}$

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

3. $\sqrt{2x^2} + 3x\sqrt{50}$

4. $\sqrt{20x^2} - 3x\sqrt{5}$

More Practice with Adding & Subtracting Radicals

Name_____ Date_____

Simplify completely.

1. $3\sqrt{6}-\sqrt{3}-\sqrt{6}-2\sqrt{6}$

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

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

4. $2\sqrt{3}-2\sqrt{5}+3\sqrt{3}+3\sqrt{5}$

5. $2\sqrt{6}-\sqrt{3}+2\sqrt{6}-2\sqrt{6}$

6. $-2\sqrt{12}+2\sqrt{3}+3\sqrt{45}$

7. $-\sqrt{45}+2\sqrt{27}+2\sqrt{5}$

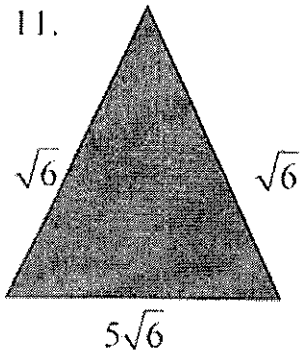
8. $-2\sqrt{6}-\sqrt{54}+2\sqrt{24}$

9. $-2\sqrt{5}+3\sqrt{8}-3\sqrt{18}$

10. $3\sqrt{45}-2\sqrt{54}+2\sqrt{6}$

Find the perimeter of the following figures.

11.



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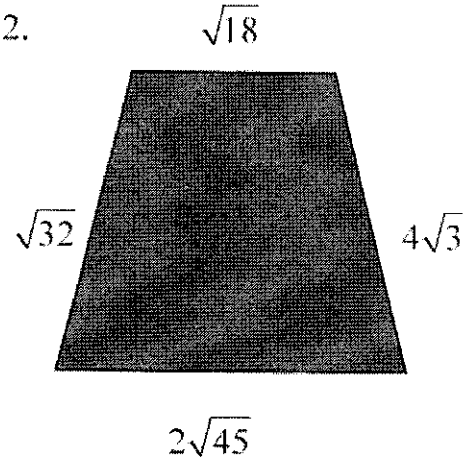

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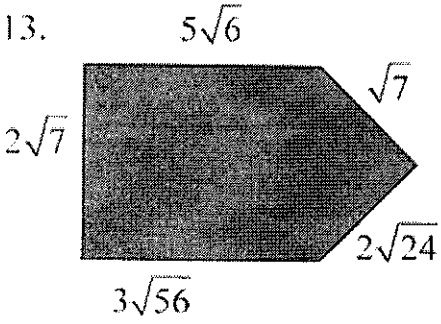
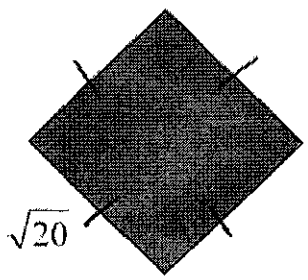


14.



Multiplying Radicals:

$a\sqrt{b} \cdot a\sqrt{b}$

1. Multiply the outsides
2. Multiply the insides
3. Simplify

Aug 16-7:57 AM

Multiplying radicals examples:

1. $\sqrt{10} \cdot \sqrt{30}$

2. $2\sqrt{5} \cdot \sqrt{5}$

3. $5\sqrt{27} \cdot 4\sqrt{3}$

Aug 11-10:27 AM

How about these?

$(3\sqrt{5})^2 =$

$(\sqrt{18})^2 =$

$(5\sqrt{32})^2 =$

Aug 11-10:44 AM

11

Simplify.

1) $4\sqrt{6} \cdot \sqrt{12}$

2) $-4\sqrt{6} \cdot \sqrt{6}$

3) $-5\sqrt{15} \cdot \sqrt{16}$

4) $\sqrt{2} \cdot \sqrt{3}$

5) $4\sqrt{3} \cdot \sqrt{2}$

6) $5\sqrt{5}(3 + \sqrt{10})$

Aug 16-8:09 AM

Multiplying Radicals Name_____

Directions: Perform the indicated operations. Simplify all answers completely.

1. $\sqrt{5} \cdot \sqrt{15}$

2. $\sqrt{14} \cdot \sqrt{35}$

3. $4\sqrt{2} \cdot 8\sqrt{2}$

4. $2\sqrt{6} \cdot 4\sqrt{8} \cdot \sqrt{3}$

5. $12\sqrt{2} \cdot \sqrt{18}$

6. $15\sqrt{3} \cdot \sqrt{15}$

7. $\sqrt{2}(\sqrt{6} + \sqrt{10})$

8. $\sqrt{7}(3 - \sqrt{7})$

9. $\sqrt{5}(3\sqrt{5} - 4\sqrt{3})$

10. $\sqrt{6}(\sqrt{3} - \sqrt{5})$

12

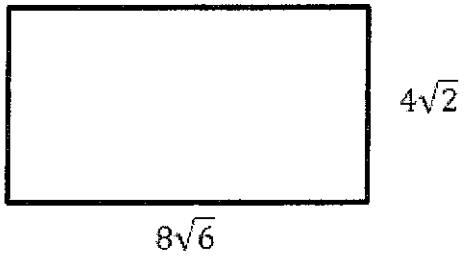
11. $(3\sqrt{7})^2$

12. $(-6\sqrt{5})^2$

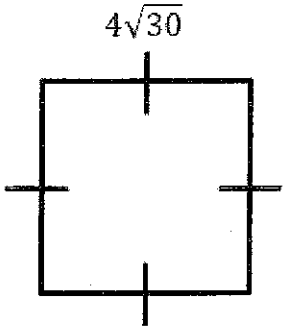
Directions: Solve each problem.

13. If the area of a square is 128 units^2, what is the length of the side of the square?

14. What is the area of the figure below?



15. What is the area of the figure below?



16. What is the perimeter of the figure shown in question #15?

Name _____ Period _____ Date _____

ACCURACY AND PRECISION

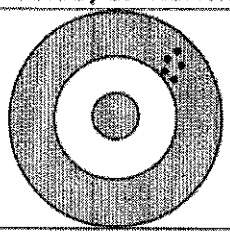
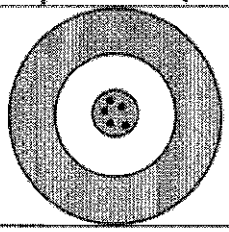
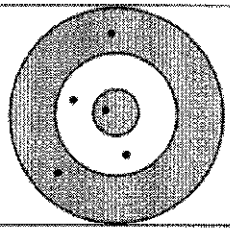
Definitions:

Accuracy - how close a measurement is to _____

Precision - how close a measurement is to _____

Precision versus Accuracy:

Look at each target and decide whether the "hits" are accurate, precise, both accurate and precise, or neither accurate nor precise: (Note: An accurate "hit" is a bulls eye!)

		
Accurate?: Yes / No Precise?: Yes / No	Accurate?: Yes / No Precise?: Yes / No	Accurate?: Yes / No Precise?: Yes / No

Comparing Values: Which is more Precise?

a. 56.2 inches (to the tenths)

b. 47.23 inches (to the hundredths)

c. 24 inches (whole numbers only)

The more decimal places, the more precise.

Answer choice B is **most precise** because it has the _____ decimal places.

1. Which measurement is most precise?

   a. 44.4 grams b. 25.2 grams c. 98.23 grams

   Which measurement is least precise?

   a. 52 months b. 50.2 months c. 50.5 months

2. A basketball player throws free-throws; 95 of these balls go through the goal; 5 miss the goal entirely. Describe the precision and accuracy of the FT's.

3. The same player is having an off day; 5 balls go through the goal; 5 miss the goal entirely. Describe the accuracy and precision now.

Measurement Conversion

Length

Metric	Customary	Customary to Metric
1 kilometer (km) = 1000 meters (m)	1 mile (mi) = 1760 yards (yd)	1 in ≈ 2.54 cm
1 meter = 100 centimeters (cm)	1 mile = 5280 feet (ft)	1 ft ≈ 0.305 m
1 centimeter = 10 millimeters (mm)	1 yard = 3 feet	1 yd ≈ 0.914 m
	1 foot = 12 inches (in)	1 mi ≈ 1.61 km
	1 yard = 36 inches	

Volume and Capacity

Metric	Customary	Customary to Metric
1 liter (L) = 1000 milliliters (mL)	1 gallon (gal) = 4 quarts (qt)	1 fl oz ≈ 29.6 mL
1 kiloliter (kL) = 1000 liters	1 gallon = 128 fluid ounces (fl oz)	1 pt ≈ 0.473 L
	1 quart = 2 pints (pt)	1 qt ≈ 0.946 L
	1 pint = 2 cups (c)	1 gal ≈ 3.78 L
	1 cup = 8 fluid ounces	

Weight and Mass

Metric	Customary	Customary to Metric
1 kilogram (kg) = 1000 grams (g)	1 ton (T) = 2000 pounds (lb)	1 oz ≈ 28.4 g
1 gram = 1000 milligrams (mg)	1 pound = 16 ounces (oz)	1 lb ≈ 454 g
1 metric ton (t) = 1000 kilograms		1 kg ≈ 2.2 lbs

Time

1 year (yr) = 12 months (mo)	1 leap year = 366 days	1 hour = 60 minutes (min)
1 year = 52 weeks (wk)	1 week = 7 days	1 minute = 60 seconds (s)
1 year = 365 days (d)	1 day = 24 hours (h)	

NOTES PACKET

Date_____

Guided Notes: Dimensional Analysis

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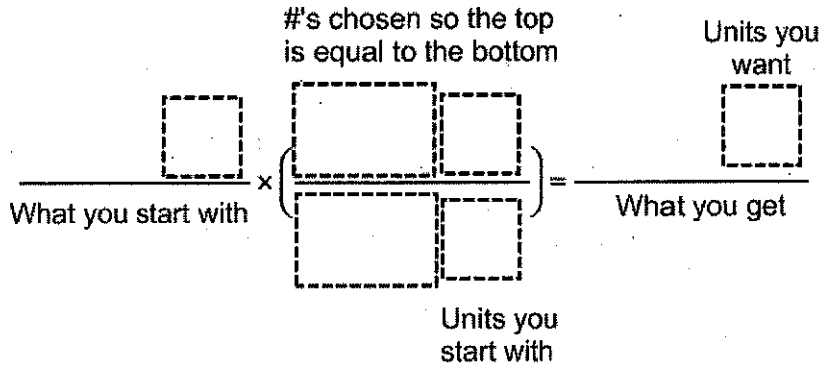
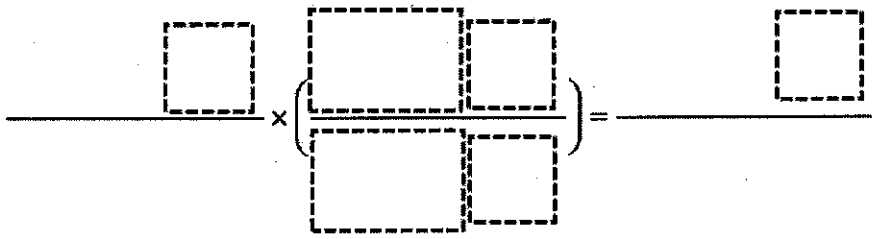
Dimensional Analysis

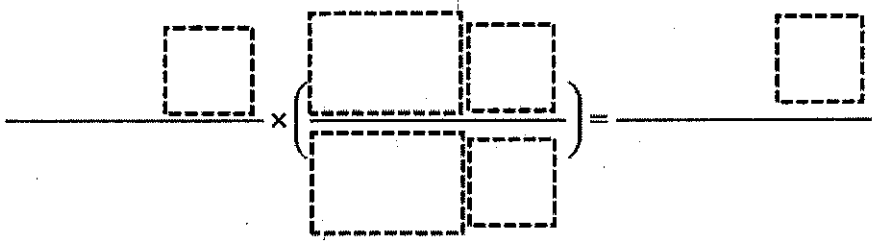
A method used to make unit conversions



Mount Everest, the tallest mountain on the Earth, is 29, 028 ft high. What is its height in miles? Round to the nearest thousandths.

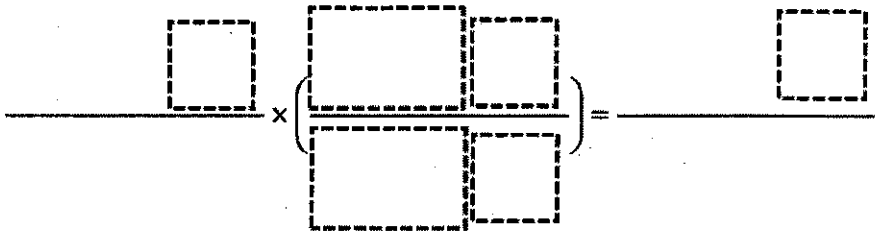


What is its height in meters?



7.3 m = _____cm

(1 m = 100 cm)



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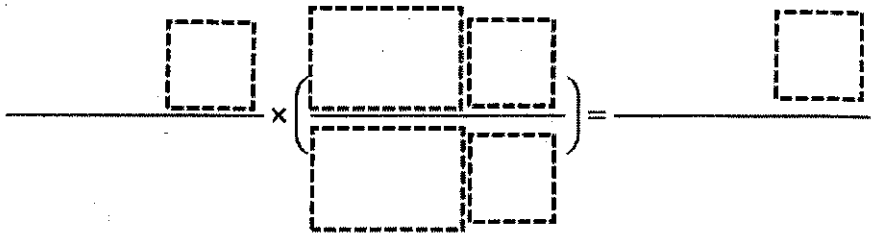
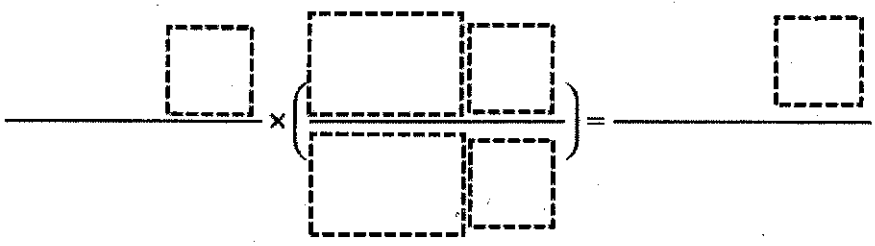
Convert 200 lbs to kg
(Round to the nearest tenth.)
(1 kg = 2.2 lbs)



Convert $50 into ¥ (yen)

($1 = 90¥)



One-Step Conversions

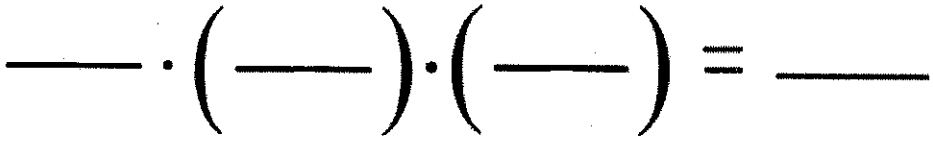
1. Houston Rockets basketball player, Yao Ming, is about 7.5 feet tall. How tall is he in inches?

2.. Using the height in inches from problem 1, convert Yao's height to centimeters.

Multi-Step Conversions

*Each of the calculations in Problems 1 and 2 were single-step conversions. We can combine these two problems to make one multi-step problem.

3. Use the following multi-step setup to convert Yao Ming's height from feet to centimeters. (What units should be at the beginning? What units should be at the end?)



Unit Conversions Homework

- 5280 feet = one mile
- 0.034 ounces = one milliliter
- 0.454 kg = one pound
- 1.6 kilometers = one mile
- 63 gallons = 2 barrels
- 1.06 quarts = one liter
- 4 quarts = one gallon

Do the following one-step unit conversions:

1) Convert 23 miles to feet.

2) Convert 120 lbs to kilograms.

3) Convert 451 mL to ounces.

4) Convert 6 feet to miles.

5) Convert 4 quarts to liters.

6) Convert .045 barrels to gallons.

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Do the following multi-step unit conversions:

7) Convert 75 minutes to days.

8) Convert 46 inches to miles

9) Convert 65 ounces to liters. (There are 1000 mL in one liter).

10) Convert 1 million seconds to years.

11) Convert 12 liters to barrels.

12) Find your age in seconds.

19

Name: _____ CCGPS ALGEBRA January 9, 2013

Unit Conversion Worksheet

Conversions

1 hour = 3600 seconds
1 meter = 3.28 feet
1 kg = 2.2 lbs
1 km = 1000m
100cm = 1 m

1 mile = 5280 feet
1 km = 0.62 miles
1 lb = 0.45 kg
1 foot = 12 inches

1 yard = 3 feet
1 light second = 300,000,000 meters
1 quart = 0.946 liters
1 inch = 2.54 cm = 25.4 mm

Convert the following quantities.

1) 565,900 seconds into days

2) 17 years into minutes

3) 43 miles into feet

4) 165 pounds into kilograms

5) 100 yards into meters

6) 22,647 inches into miles

7) 2678 cm into feet

8) 60 miles per hour into meters per second

9) 130 meters per second into miles per hour

10) 1100 feet per second into miles per hour

11) 53 yards per hour into inches per week

12) 721 lbs per week into kg per second

13) 88 inches per second into miles per day

14) 12080 gallons per month into liters per hour

15) 27 miles per gallon into kilometers per liter

16) 186,282 miles per second into meters per second