ACC CCGPS Algebra/Geometry Name key

Units Conversion Notes
Taken from: http://www.alysion.org/dimensional/fun.htm, http://www.purplemath.com/modules/units2.htm

Standards:
MCC9-12.N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems;choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs

Examples:

1. *How many hours are in a day?*

24 hrs/day

2. *How many minutes are in a day?*

$24\ \text{hrs/day} \cdot 60\ \text{min/hr} = 1440\ \text{min/day}$

3. *How many seconds are in a day?*

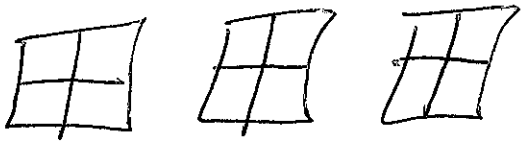
$24\ \text{hrs/day} \cdot 60\ \text{min/hr} \cdot 60\ \text{sec/min} = 86,400\ \text{sec/day}$

4. *How many hours are in a year?*

$24\ \text{hrs/day} \cdot 365\ \text{days/yr} = 8760\ \text{hrs/yr}$

5. *Convert 3 gallons to quarts.*

Quarts are smaller than gallons; every gallon has four quarts. Since I'm converting from a larger unit (gallons) to a smaller unit (quarts), my answer needs to be a bigger number. So I multiply:



3 · 4 = 12 quarts

6. *Convert 7920 yards to miles.*

Miles are bigger than yards; there are 1760 yards in every mile. Since I'm converting from a smaller unit (yards) to a bigger unit (miles), my answer needs to be a smaller number. So I divide:

$$\frac{7920 \text{ yds}}{1760 \text{ yr/mile}}$$

$$7920 \text{ yds} \cdot \frac{1}{1760} \text{ m/yds} = 4.5 \text{ miles}$$

Challenge **7.** *Which is faster, going 80 miles an hour or going 40 meters per second?*

$$\frac{80 \text{ m}}{1 \text{ hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{2.54 \text{ cm}}{1 \text{ in}} \cdot \frac{1 \text{ meter}}{100 \text{ cm}}$$

$$\simeq 35.7632 \text{ meters/hr}$$

8. *Suppose an object is moving at 66 ft/sec. How fast would you have to drive a car to keep pace with this object?*

$$\frac{66 \text{ ft}}{1 \text{ sec}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \simeq$$

45 miles/hr

*Added info. to #11 *

Name KEY

Date _____

Class Period _____

Dimensional Analysis Worksheet

Set up and solve the following using dimensional analysis.

Round to the hundredth

1 mile = 5,280 ft
1 inch = 2.54 cm
3 feet = 1 yard
454 g = 1lb
946 mL = 1 qt
4 qt = 1 gal

Don't forget: What you want / What you've got

1) 5,400 inches to miles

$$\frac{5400\ in}{1} \cdot \frac{1\ ft}{12\ in} \cdot \frac{1\ mile}{5280\ ft} = \frac{5400}{63{,}360} \approx 0.09\ miles$$

2) 16 weeks to seconds

$$\frac{16\ weeks}{1} \cdot \frac{7\ days}{1\ week} \cdot \frac{24\ hr}{1\ day} \cdot \frac{60\ min}{1\ hr} \cdot \frac{60\ sec}{1\ min} = 9{,}676{,}800\ sec.$$

3) 54 yards to mm

$$\frac{54\ yds}{1} \cdot \frac{3\ ft}{1\ yd} \cdot \frac{12\ in}{1\ ft} \cdot \frac{2.54\ cm}{1\ in} \cdot \frac{10\ mm}{1\ cm} = 49{,}377.6\ mm$$

4) 36 cm/sec to mph

$$\underbrace{\frac{36\ cm}{1\ sec} \cdot \frac{1\ in}{2.54\ cm} \cdot \frac{1\ ft}{12\ in} \cdot \frac{1\ mile}{5280\ ft}}_{cm \rightarrow m} \cdot \underbrace{\frac{60\ sec}{1\ min} \cdot \frac{60\ min}{1\ hr.}}_{sec \rightarrow hr} = \frac{129{,}60}{160{,}934.}$$

≈ 0.81 mph

5) 1.09 g/mL to lbs/gal

$$\frac{1.09\ g}{1\ mL} = \frac{1\ lb}{454\ g} \cdot \frac{946\ mL}{1\ qt} \cdot \frac{4\ qt}{1\ gal} = \frac{4124.56}{454}$$

≈ 9.08 lbs/gal

6) 19 inches to feet

$$\frac{19\ in}{1} \cdot \frac{1\ ft}{12\ in} = \frac{19}{12} \approx 1.58\ ft$$

7) 840 inches to cm

$$\frac{840\ in}{1} \cdot \frac{2.54\ cm}{1\ in} = 2,133.6\ cm$$

8) 4.22 g/cm to lbs./ft

$$\frac{4.22\ g}{cm} \cdot \frac{1\ lb}{454\ g} \cdot \frac{2.54\ cm}{1\ in} \cdot \frac{12\ in}{1\ ft} = \frac{128.63}{454} \approx 0.28\ lbs/ft$$

9) 32 ft/sec to meters/min

$$\frac{32\ ft}{1\ sec} \cdot \frac{12\ in}{1\ ft} \cdot \frac{2.54\ cm}{1\ in} \cdot \frac{1\ m}{100\ cm} \cdot \frac{60\ sec}{1\ min} = \frac{58,521.6}{100} \approx 585.22\ m/min$$

10) Write, and then solve your own dimensional analysis problem. Be creative!

You weigh 125 lbs

11) You have the Heebie-Geebies. Your grandmother sends you a remedy for the Heebie-Geebies with the following instructions: "Take 1 drop per 10 lbs. of body weight per day divided into 4 doses until the Heebie-Geebies are gone." How many drops do you take per dose??

$\frac{1 \text{ drop}}{10 \text{ lbs}} = \frac{n \text{ drops}}{125 \text{ lbs}}$ $n = 12.5$ drops

$12.5 \div 4 =$ 3.125 drops per dose

12) You're throwing a pizza party for 15 people and figure that each person will eat 4 slices. You call up the pizza place and larn that each pizza will cost you $14.78 and it will be cut into 12 slices. How much is the pizza going to cost you? You only have $70. Will you have enough money?

$15 \times 4 = 60$ slices

$60 \div 12 = 5$ pizzas

$14.78 \times 5 = \$73.90$

No

13) Every three times I clean my bedroom, my mother makes me an apple pie. I cleaned my bedroom 9 times. How many apple pies does she owe me? (What?! Your mother doesn't reward you for cleaning your bedroom? Aren't there child labor laws? To make up for that injustice, you may have this very easy problem.)

3 apple pies

14) In my chemistry class, 28 students are each given 3 pens. If there are 8 pens in one package, priced at $1.88 per package, what is the total cost of giving away pens?

$28 \times 3 = 84$ pens

$84 \div 8 = 10.5$ 11 packages needed

$1.88 \times 11 =$ $20.68

15) Convert 5.70 Kilograms to milligrams. Show your work!

$$\frac{5.7\ \text{kg}}{1} \cdot \frac{1000\ \text{mg}}{1\ \text{kg}} = 5{,}700\ \text{mg}$$

16) You find 13,406,190 pennies. How many dollars did you actually find? If each penny weighs 4 grams, how much did all that loot weigh in lbs.?
(2.2 lbs = 1 Kilogram

13,406,190 pennies ≈ $134,061

13,406,190 p × 4g = 53,624,760 g

$$\frac{53{,}624{,}760\ \text{g}}{1} \cdot \frac{1\ \text{kg}}{1000\ \text{g}} \cdot \frac{2.2\ \text{lbs}}{1\ \text{kg}} = \frac{117{,}974{,}472}{1000}$$

≈ 117,974.47 lbs

17) Assume a movie ticket costs $9, how many movie tickets could you buy with the pennies you found in #8?

134,061 ÷ 9

14,895 movie tickets

Unit Conversions Practice - Answers

Do the following one-step unit conversions:

1) Convert 23 miles to feet.
121,440 feet

2) Convert 120 lbs to kilograms.
54.5 kg

3) Convert 451 mL to ounces.
15.3 oz

4) Convert 6 feet to miles.
0.00114 miles

5) Convert 4 quarts to liters.
3.81 L

6) Convert 0.045 barrels to gallons.
1.64 gallons

Do the following multi-step unit conversions:

7) Convert 75 minutes to days.
0.052 days

8) Convert 46 inches to miles (there are 12 inches in one foot).
0.000726 miles

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

10) Convert one million seconds to years.
0.032 years

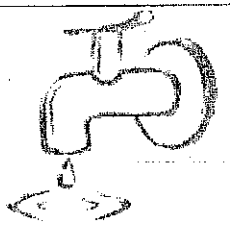
11) Convert 12 liters to barrels.
0.0863 barrels

12) Find your age in seconds.
The age will be equal to 3.15×10^7 seconds for every year. Thus, students should have the following ages for each age:
11 y.o. – 3.47×10^8 sec
12 y.o. – 4.13×10^8 sec
13 y.o. – 4.47×10^8 sec
14 y.o. – 4.81×10^8 sec
15 y.o. – 5.16×10^8 sec

10 & 11

Name _____ **CCGPS Coordinate Algebra Unit 1**

MCC9-12.A.CED.1, MCC9-12.A.CED.3, MCC9-12.N.Q.1,MCC9-12.N.Q.2, MCC9-12.N.Q.3



Acting Out Part 2:

Kim and Erik are good friends since they live close to each other. Kim has a leaky faucet in her kitchen and asks Erik to come over and take a look at it.

1. Kim estimates that the faucet in her kitchen drips at a rate of 1 drop every 2 seconds. Erik wants to know how many times the faucet drips in a **week**. Help Erik by **showing your calculations below.**

60 sec = 1 min
60 min = 1 hour
24 hours = 1 day
7 days = 1 week
365 days = 1 year

$$\frac{1 \text{ drop}}{1 \cancel{2 \text{ sec}}} = \frac{30}{\cancel{60 \text{ sec}}} = \frac{60 \text{ min}}{1 \text{ hr}} = \frac{24 \text{ hrs}}{1 \text{ day}} = \frac{7 \text{ days}}{1 \text{ week}}$$

$$= 302{,}400 \text{ drops}$$

2. Kim estimates that approximately 575 drops fill a 100 milliliter bottle. Estimate how much water her leaky faucet wastes in a **year**. (This problem may be solved two different ways. Solve first by using problem #1 solution, then solve by starting with the original information of " her kitchen drips at a rate of 1 drop every 2 seconds."

$$\frac{43{,}200}{\cancel{302{,}400} \text{ drips}}{1 \text{ week}} = \frac{1 \text{ week}}{\cancel{7} \text{ days}} = \frac{365 \text{ days}}{1 \text{ year}}$$

$$= 15{,}768{,}000 \text{ drops per year}$$

$$\approx 27{,}423 \text{ water bottles}$$

CAG | WS 05

Literal Equations & Unit Cancellation (Dimensional Analysis)

Unit conversions

1 hr = 60 min	1 min = 60 sec	1 ton = 2000 lbs	7 days = 1 week
24 hrs = 1 day	1 kg = 2.2 lbs	1 gal = 3.79 L	264.2 gal = 1 cubic meter
1 mi = 5,280 ft	1 kg = 1000 g	1 lb = 16 oz	20 drops = 1 mL
365 days = 1 yr	52 weeks = 1 yr	2.54 cm = 1 in	1 L = 1000 mL
0.621 mi = 1.00 km	1 yd = 36 inches	1 cc is 1 cm^3	1 mL = 1 cm^3

Solve each problem using dimensional analysis. Every number must have a unit. Work must be shown. Conversion factors are given above.

1. How many miles will a person run during a 10 kilometer race?

$10\text{ km} \cdot \frac{.621}{1\text{ km}} = 6.21\text{ miles}$

2. The moon is 250,000 miles away. How many feet is it from earth?

$250{,}000\text{ miles} \cdot \frac{5280\text{ ft}}{1\text{ mile}} = 1320000000$

3. A family pool holds 10,000 gallons of water. How many cubic meters is this?

$10{,}000\text{ gal} \cdot \frac{1\text{ cubic meter}}{264.2\text{ gal}} \approx 37.85\text{ cubic meters}$

4. Sixty miles per hour is how many feet per second?

$\frac{60\text{ mi}}{1\text{ hr}} \cdot \frac{5280\text{ ft}}{1\text{ mi}} \cdot \frac{1\text{ hr}}{60\text{ min}} \cdot \frac{1\text{ min}}{60\text{ sec}} = \frac{316800}{3600} = 88\frac{\text{ft}}{\text{sec}}$

5. A small herd of cattle consumes fourteen bales of hay in two weeks. How many bales will this herd consume in a year?

$\frac{14\text{ bales}}{2\text{ weeks}} = 7\frac{\text{bales}}{\text{week}} \cdot 52\text{ weeks} = 364\frac{\text{bales}}{\text{yr}}$

6. Saffron costs $368.00 per ounce. Determine how many grams you can purchase for $15.00.

$\frac{\$368}{10\text{ oz}} \cdot \frac{16\text{ oz}}{1\text{ lb}} \cdot \frac{2.2\text{ lb}}{1\text{ kg}} \cdot \frac{1\text{ kg}}{1000\text{ g}} = \frac{12953.6}{1000} = 12.95/\text{g}$

oz → lbs → kg → g

1.15 g

7. Trent purchases 44 euros worth of souvenirs while on vacation in France. If $1 U.S. = 0.678 euros, find the cost of the souvenirs in U.S. dollars. Round to the nearest cent.

$44\text{ euros} \cdot \frac{\$1}{.0678\text{ euros}} = \$64.89$

Solve each equation or formula for the variable indicated.

8. $A = \frac{h(a+b)}{2}$; solve for h

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

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

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

9. $xy + w = 9$, solve for y

$-w \quad -w$

$\frac{xy}{x} = \frac{9-w}{x}$

$y = \frac{9-w}{x}$

10. $\frac{p+9}{5} = r$, solve for p

$p+9 = 5r$
$-9 \quad -9$
$p = 5r-9$

11. $kn + 4f = 9v$, solve for n

$-4f \quad -4f$
$\frac{kn}{k} = \frac{9v-4f}{k}$
$n = \frac{9v-4f}{k}$

12. If a 2 day rafting trip covers a distance of 60 miles and you are expected to raft 8 hours each day, how many miles must you raft each hour?

1 day = 30 miles
$\frac{30 \text{ miles}}{8 \text{ hrs}} = 3.75$ mph

13. The formula $C = \pi d$ represents the circumference of a circle, or the distance around the circle, where d is the diameter. If an airplane could fly around Earth at the equator without stopping, it would have traveled about 24, 900 miles. Find the diameter of Earth to the nearest whole number.

$\frac{24,900}{\pi} = \frac{\pi d}{\pi}$ $d \approx 7,929$ miles

14. The surface area of a rectangular solid is given by the formula $x = 2lw + 2lh + 2wh$, where l = length, w = width, and h = height.

a. Solve the formula for h.

$x = 2lw + 2lh + 2wh$
$x = 2lw + 2h(l+w)$
$\frac{x-2lw}{2(l+w)} = \frac{2h(l+w)}{2(l+w)}$
$h = \frac{x-2lw}{2(l+w)}$

b. The surface area of a rectangular solid with length 6 centimeters and width 3 centimeters is 72 square centimeters. Find the height.

$\frac{72}{18} = \frac{h \cdot 6 \cdot 3}{18}$ $h = 4$

15. The price of a ream of paper is $4.00. There are 500 sheets of paper in a ream. If a sheet of paper weighs 0.50 oz., what is the price of one pound of paper? (16 oz = 1 pound)

$.5 \times 500 = 250$ oz/ream
$250 \text{ oz} \cdot \frac{1 \text{ lb}}{16 \text{ oz}} = 15.625$ lb
$\frac{\$4}{15.625 \text{ lb}} = \$.26/\text{lb}$

16. What is the cost to drive from Atlanta to Orlando, a distance of 475 miles, if the cost of gasoline is $3.59 a gallon and the minivan gets 25 miles per gallon?

$\frac{475 \text{ miles}}{25 \text{ miles/gal}} = 19$ gal
$19 \times 3.59 = \$68.21$

17. You have been working at a fast food restaurant for the past 35 years wrapping hamburgers. Each hour you wrap 184 hamburgers. You work 8 hours per day, 5 days a week and get paid every 2 weeks with a salary of $840.34. How many hamburgers will you have to wrap to make your first one million dollars?

$184 \cdot 8 \cdot 5 = 7,360$ wraps/week

week pay = 420.17

$\frac{\$1,000,000}{\$420.17/\text{week}} = 2,380$ weeks

$2,380 \times 7,360 =$
$\$/\text{weeks} \quad \text{wraps/week}$
17,516,800