8th Grade Assignment – Week #26

Group Assignments:

For Tuesday and Thursday:

- Look at *Proportions & Dimensional Analysis* **Practice Sheet #6** and **Practice Sheet #7**, and choose the more difficult ones to do in your group work. (The rest of the problems should be done individually.)
- *Puzzle!* **Tennis Club**

  If all eight members of a tennis club played today, how long would it be before they all played on the same day again, given that:
  - the first member plays every day?
  - the second member plays every two days?
  - the third member plays every three days?
  - the fourth member plays every four days?
  - the fifth member plays every five days?
  - the sixth member plays every six days?
  - the seventh member plays every seven days?
  - the eighth member plays every eight days?

Individual Work

- Test! You will take a test on this unit at the end of next week.
  Your best preparation for this test is to make sure you understand the problems that appear on *Proportions & Dimensional Analysis* **Practice Sheets #5** (from last week's assignment)**,** as well as **Sheets #6 and #7**. Working together in your group will help you prepare for the test (see above group assignment).
- Whatever problems you didn't complete in your group from *Proportions & Dimensional Analysis* **Practice Sheet #6 and #7**, you should do on your own. If this is too much for this week, then save some of these problems for next week as you make your final preparations for the test.
- Note that at the end of this document, there is also a **PDA Practice Test** which is intended for this Friday's tutorial session.

Proportions & Dimensional Analysis – Practice Sheet #6

1) **Unit Conversions**

a) 3.8 lb ≈ _____ g

b) 270 cm ≈ _____ yd

c) 3 yd^3 ≈ _____ gal

d) 0.091 oz ≈ _____ mg

e) 830 km^2 ≈ _____ mi^2

f) 830 mi^2 ≈ _____ km^2

g) 7.8 $\frac{mi}{min}$ ≈ _____ $\frac{m}{s}$

h) 58 $\frac{cm}{s}$ ≈ _____ mph

2) Use the *Chain Method.* (Don't use the conversion factors listed under "Density" of the *Conversion Table.*)

a) 1 $\frac{oz}{in^3}$ ≈ _____ $\frac{g}{cm^3}$

b) 1 $\frac{g}{cm^3}$ ≈ _____ $\frac{oz}{in^3}$

3) The speed of sound is approximately 1100 ft/sec.

a) If you see a strike of lightning and then 5 seconds later hear the thunder, about how far are you from the source of the lightning?

b) Explain how you can estimate how far away a storm is by counting the seconds between seeing the lightning and hearing the thunder.

c) What is the speed of sound in mph?

d) How far does sound travel in 3 minutes?

4) On March 24, 2004, gasoline prices hit an all-time high in the U.S. at $1.74/gal. Gas prices from other countries are shown below. Compare prices by converting to dollars per gallon. (Use the exchange rates from the earlier practice sheet.)

a) Mexico: 6.90 pesos/ℓ

b) Japan: ¥101/ℓ

c) England: £0.805/ℓ

5) Kathy has determined that her woodstove requires 35 logs to keep her cabin warm for 24 hours.

a) At this rate, how long will a pile of 400 logs last?

b) How many logs will she need to heat her cabin for one week?

6) How much does a cube of solid gold weigh if it has edges that are 8 inches long?

7) What is the volume (in in^3) of a block of aluminum that weighs 10 pounds?

8) What is the density (in lb/ft^3) of a ball that is 18" in diameter and weighs 18 pounds? What percent as dense as water is it?

9) A block has a volume of 31 in^3, and weighs 4.2 lb.

a) What is the density of the block (in lb/in^3)?

b) What is the density of the block (in lb/ft^3)?

c) What is the density of the block (in kg/m^3)?

d) What is the density of the block (in g/cm^3)?

e) What substance do you think the block is made of?

10) A small stone pyramid weighs 5.52 kg, has a height of 12 cm, and has a square base with 20cm-long sides.

a) What is its density (in g/cm^3)?

b) What does it weigh in water (in kg)?

Proportions & Dimensional Analysis – Practice Sheet #7

1) **Unit Conversions**

a) 7 lb ≈ _____ kg

b) 380 g ≈ _____ oz

c) 72 cm ≈ _____ in

d) 9 cups ≈ _____ mℓ

e) 3.1 km ≈ _____ yd

f) 54 ft^3 = _____ in^3

g) 54 ft^3 = _____ yd^3

h) 54 ft^3 ≈ _____ m^3

i) 54 ft^3 ≈ _____ ℓ

j) 700 $\frac{kg}{m^3}$ = _____ $\frac{g}{cm^3}$

k) 2.8 $\frac{g}{cm^3}$ ≈ _____ $\frac{lb}{ft^3}$

l) 2.63 $\frac{m}{s}$ = _____ $\frac{km}{h}$

m) 130 $\frac{km}{h}$ ≈ _____ mph

2) The exchange rate for the Indian rupee is 44.4 rupees per dollar.

a) 44.4 $\frac{rupees}{dollar}$ ≈ _____ $\frac{dollars}{rupee}$

b) $200 = _____ rupees

c) 3.39 $\frac{dollars}{gal}$ ≈ _____ $\frac{rupees}{ℓ}$

3) Charlie's lawnmower uses 1¼ gallons of gas to mow ¾ of his lawn. How much gas does it take to mow his whole lawn?

4) A road crew can pave 28 miles of road in five 8-hour days.

a) How much road can they pave in 15 days?

b) How much road can they pave in 4 days?

c) How long does it take to pave 63 miles of road?

5) Paul bikes up an 8-mile hill averaging 8 mph, and then bikes down the same hill at 32mph. What was his average speed for the whole trip?

6) A map has a fractional scale of 1:1000 000.

a) Two towns on the map measure 6.3cm apart. What is the real distance between the towns?

b) What is the verbal scale in metric?

c) What is the verbal scale in the U.S. system?

7) A map of the Cotswolds in England has a distance of 21 inches between Stroud and Gloucester. The actual distance between these two places is 8.4 miles. What are the two scales of the map?

8) If it takes 24 gallons of gas to drive 680 miles, how far can you drive on 17 gallons?

9) A recipe calls for 50mℓ of oil to make 4 enchiladas. How much oil is needed in order to make 30 enchiladas?

10) Alex can make 25 burritos in 40 minutes. How long does it take him to make 35 burritos?

11) A gas tank in the shape of a rectangular prism (i.e., a box) measures 18cm by 45cm by 60cm. Gasoline has a density of about 660 kg/m^3.

a) What is the capacity of the tank, in liters?

b) What is the capacity of the tank, in gallons?

c) What is the density of gasoline, in lb/ft^3?

d) How much does 5.3m^3 of gasoline weigh?

e) How much does a liter of gasoline weigh?

f) How much does a gallon of gasoline weigh?

g) What is the weight of the gasoline when the tank is full? (Give your answer both in kg and in lb.)

12) What is the weight of a cubic mile of air? (Assume a uniform density of 1.29 oz/ft^3.)

Proportions & Dimensional Analysis – Practice Test

This test should not be viewed before Friday's tutorial session. Whatever problems are not done during the tutorial session, can then be done by the student individually, or in the group, if so desired.

Note: You must show what goes into your calculator.

1) **Unit Conversions**

a) $5\frac{1}{2}$ lb ≈ _____ kg

b) 3.9 km ≈ _____ yd

c) $0.39\,\ell$ ≈ _____ fl.oz.

d) 7 ft^3 ≈ _____ ℓ

e) $5.8m^2$ ≈ _____ in^2

f) $8\,\frac{cm}{s}$ ≈ _____ mph

2) If it takes 6.8 gallons of gas to drive 238 miles, how far can you drive on 16 gallons?

3) A machine can pump 300ℓ of water in 35 minutes. How much can it pump in 3 hours?

4) How long (to the nearest minute) does it take to go 187 miles if you are traveling at a rate of 55 mph?

5) What is the density of a cube that weighs 700g and has edges that are 9cm long?

6) What is the volume of 8kg of air?

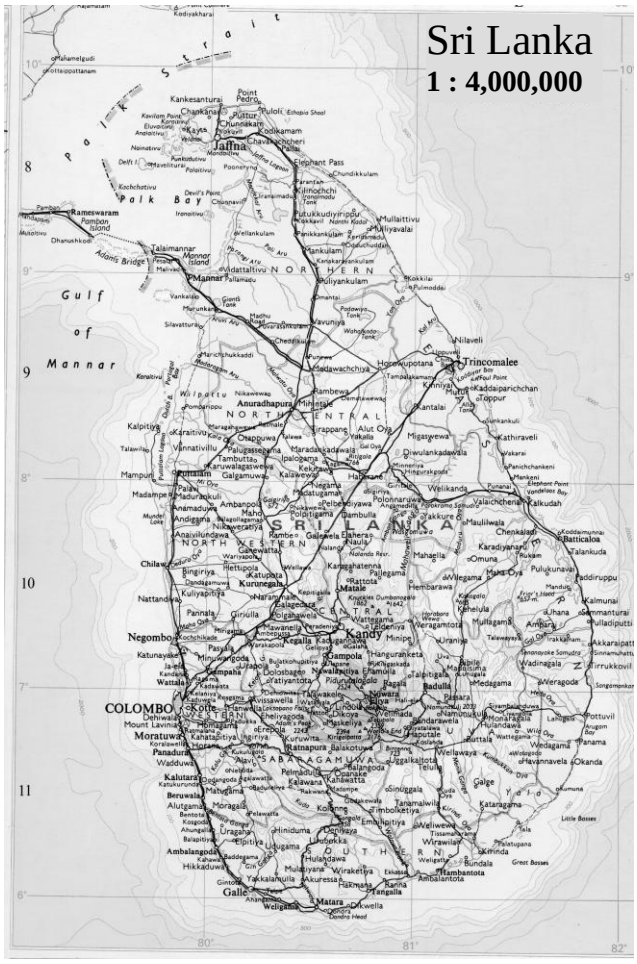
7) Jeff biked at a rate of 15mph to John's house (a distance of 15 miles), and then immediately returned home along the same route by jogging at a rate of 5mph. What was his average speed for the whole trip?

8) Building a house in Munich, Germany costs about 2500 euros/m^2. What is this cost in dollars/ft^2?

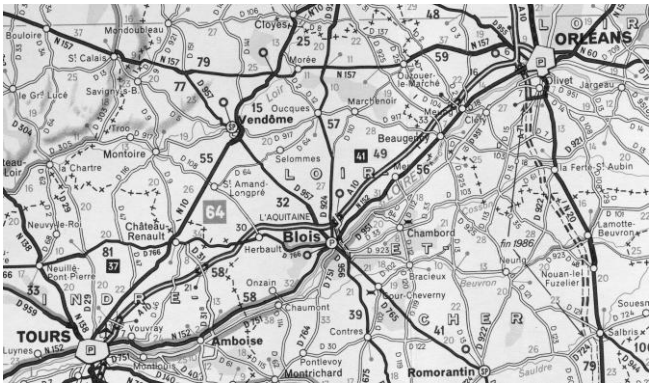
(The exchange rate is $1.56\frac{dollars}{euro}$.)

9) A container has a volume of $200in^3$ and weighs 8 ounces when empty. What is the weight of the container if it is filled with mercury?

10) Find the approximate length and area of Sri Lanka?



11) The straight-line distance between Tours and Orleans, in France, is 105 km. Give both the verbal and the fractional scale of the map shown below.



Answers

Note: Keep in mind that there are always many ways to solve any problem.

1) a) $5.5 \text{ lb} \div 2.205 \approx \underline{2.49 \text{ kg}}$

b) $3.9\text{km} \rightarrow 3900\text{m} \cdot 1.09 \approx \underline{4263\text{yd}}$

c) $0.39\ell \cdot 33.8 \approx \underline{13.2 \text{ fl.oz}}$.

d) $7 \text{ ft}^3 \cdot 7.481 \rightarrow 52.37\text{gal} \cdot 3.785 \approx \underline{198\ell}$

e) $\frac{5.8 \text{ m}^2}{1} \cdot \frac{(3.28)^2 \text{ ft}^2}{1 \text{ m}^2} \cdot \frac{12^2 \text{ in}^2}{1 \text{ ft}^2} \approx \underline{8985 \text{ in}^2}$

f) $\frac{8 \text{ cm}}{\text{s}} \cdot \frac{3600 \text{ s}}{1 \text{ hr}} \cdot \frac{1 \text{ km}}{100000\text{cm}} \cdot \frac{1 \text{ mi}}{1.61 \text{ km}} \approx \underline{0.179 \text{ mph}}$

2) $\text{mi:gal} = \text{mi:gal} \rightarrow \frac{238}{6.8} = \frac{x}{16} \rightarrow \underline{x = 560 \text{ mi}}$

3) $\ell : \text{min} = \ell : \text{min} \rightarrow \frac{300}{35} = \frac{x}{180} \rightarrow \underline{x = 1543\ell}$

4) $187 \div 55 \approx 3.4 \text{ hrs} \rightarrow \underline{3 \text{ hrs, } 24 \text{ min}}$

5) $V = 9^3 = 729\text{cm}^3$

$D = {}^{W}/_{V} \rightarrow D = \frac{700}{729} \rightarrow \underline{0.960 \frac{\text{g}}{\text{cm}^3}}$

6) $V = {}^{W}/_{D}$; $D = 1.29 \frac{\text{kg}}{\text{m}^3}$

$V = \frac{8}{1.29} \approx \underline{6.20\text{m}^3 \text{ or } 6{,}200\ell}$

7) bike time = 1 hr ; run time = 3 hr

total time = 4 hr; avg sp = $\frac{\text{total dist}}{\text{total time}}$

avg sp = $\frac{30}{4} \rightarrow \underline{7.5\text{mph}}$

8) $\frac{2500 \text{ euro}}{\text{m}^2} \cdot \frac{1 \text{ m}^2}{3.28^2 \text{ ft}^2} \cdot \frac{1.56 \$}{1 \text{ euro}} \approx \underline{\$363/\text{ft}^2}$

9) $W = D \cdot V$; $D = 843 \frac{\text{lb}}{\text{ft}^3}$

$V = 200\text{in}^3 \div 12^3$ (or 1728) $\rightarrow 0.1157\text{ft}^3$

$W = D \cdot V \rightarrow 843 \cdot 0.1157 \approx 97.5$ lb

Total weight ≈ 97.5 lb + 8 oz $\rightarrow \underline{98.0 \text{ lb}}$

10) Map length ≈ 10.7cm

reality is $10.7 \cdot 4{,}000{,}000 \approx 42800000$cm

Therefore length $\approx \underline{428\text{km}}$ (or $\underline{266\text{mi}}$)

Area is close to a 340km by 200km rectangle, which is 68,000km^2.

Actual area $\approx \underline{65{,}600\text{km}^2}$ (or $\underline{25{,}300 \text{ mi}^2}$)

11) Map distance ≈ 7.0cm

Since 7cm = 105km

the $\underline{\text{verbal scale is } 1\text{cm} = 15\text{km}}$

Real distance $\approx 105\text{km} = 10{,}500{,}000\text{cm}$

Reality:Map = 10,500,000:7

Therefore, $\underline{\text{fractional scale is } 1{,}500{,}000:1}$