Important Concepts . . .

Preview Review

Mathematics Grade 6 TEACHER KEY

W2 - Lesson 2: Metric Measurement

V5-07

Important Concepts of Grade 6 Mathematics

W1 - Lesson 1 ..... Basic Facts, Basic Operations, and Integers
W1 - Lesson 2 ..... Place Value, Whole Numbers, Decimals, and Common Fractions
W1 - Lesson 3 ..... Improper Fractions and Mixed Numbers
W1 - Lesson 4 ..... Ratios and Percents
W1 - Lesson 5 ..... Number Operations with Decimals
W1 - Quiz
W2 - Lesson 1 ..... Factors, Multiples, and Prime Factorizations
W2 - Lesson 2 ..... Metric Measurement
W2 - Lesson 3 ..... Perimeter and Area
W2 - Lesson 4 ..... Surface Area and Volume
W2 - Lesson 5 ..... Working with Angles and Drawing Objects and Shapes
W2 - Quiz
W3 - Lesson 1 ..... Transformations
W3 - Lesson 2 ..... Bar Graphs, Line Graphs, and Circle Graphs
W3 - Lesson 3 ..... Collecting and Analyzing Data
W3 - Lesson 4 ..... Number Patterns, Magic Squares, and Problem Solving
W3 - Lesson 5 ..... Probability and Outcomes
W3 - Quiz

Materials Required: A textbook is not needed. This is a stand-alone course.

Mathematics Grade 6
Version 5
Preview/Review W2 - Lesson 2 TEACHER KEY

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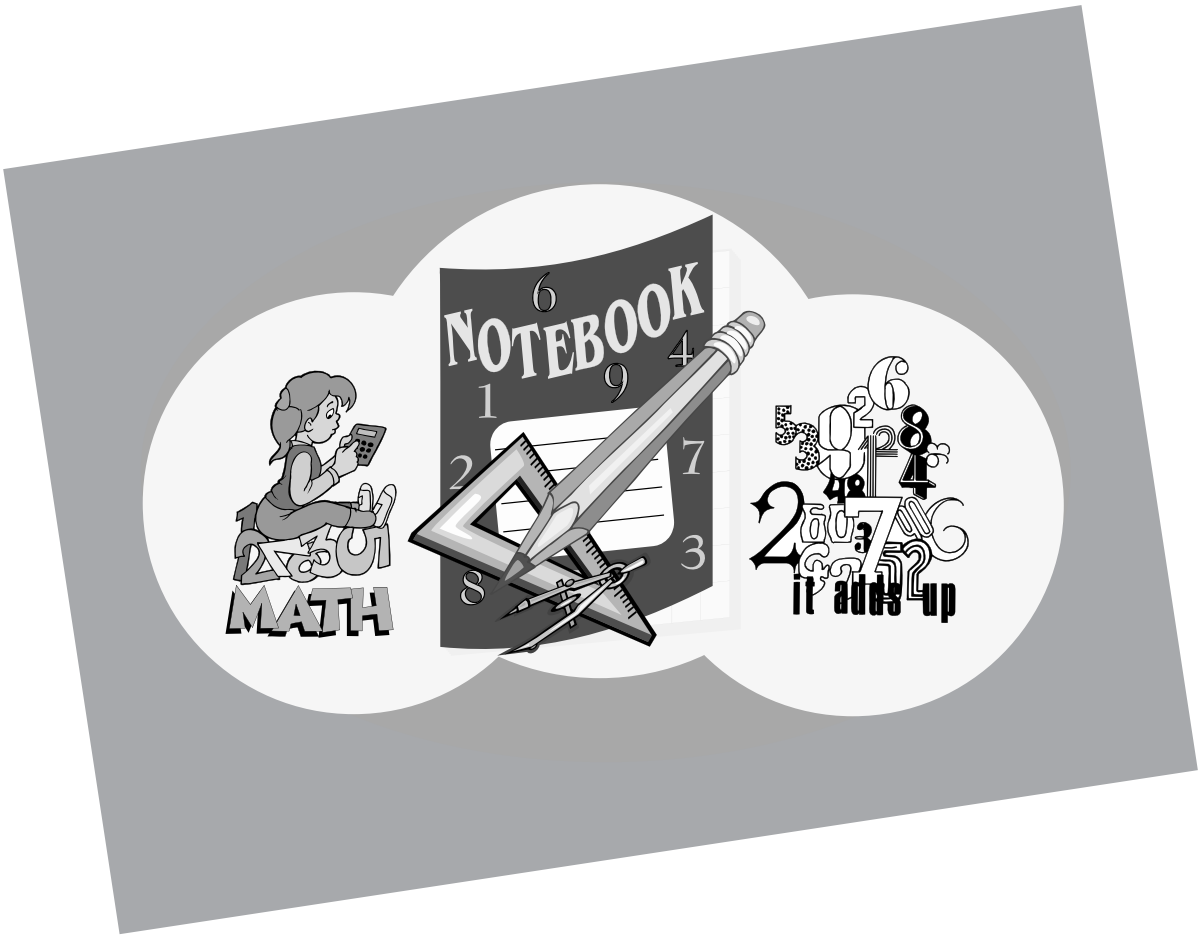
Preview/Review Concepts for Grade Six Mathematics

TEACHER KEY



W2 - Lesson 2:
Metric Measurement

OBJECTIVES

By the end of this lesson, you should

- know metric prefixes for length, mass, and capacity
- use metric prefixes accurately
- change from one unit to another accurately

GLOSSARY

capacity - the amount a container holds

length - the distance from one end of an object to another; the distance between two points

mass - the amount of matter in an object; commonly thought of as the weight of an object

metric prefixes - the beginning part of words used in metric measurement; similar to place value in ordinary numbers

- milli - one thousandth
- centi - one hundredth
- deci - one tenth
- **base unit** (such as *metre*, *gram*, or *litre*)
- deca - ten
- hecto - hundred
- kilo - thousand

W2 - Lesson 2: Metric Measurement

Welcome to W2 - Lesson 2! This lesson is about measurement using the metric system. You will review measurement of length, mass (or weight), and capacity (or volume):

- metre (m) - the base unit of length and distance
- gram (g) - the base unit of mass (weight)
- litre (L) - the base unit of capacity

The lesson has three topics:

- Metric Prefixes and Units of Length and Distance
- Metric Prefixes and Units of Mass
- Metric Prefixes and Units of Capacity

You will change units from one size to another, and you will solve some problems

Metric Prefixes and Units of Length and Distance

Metric Prefixes

Prefixes	Symbol	Meaning (Number Value)
kilo	k	1 000
hecto	h	100
deca	da	10
Base Unit	m or g or L	mass, gram or litre
deci	d	0.1 or $\frac{1}{10}$
centi	c	0.01 or $\frac{1}{100}$
milli	m	0.001 or $\frac{1}{1\,000}$

Prefix symbols are printed in small letters. A metric unit abbreviation is **not** followed by a period. Unit abbreviations are never made plural. (Write **cm** and **not** cms.)

Common Units for Measuring Length

kilometre (km) - 1 km = 1 000 m

Highway distances and world travel distances are measured in kilometres.

metre (m) - the approximate length of one giant step

Size of rooms, size of sports fields, height of trees and other objects of similar size are measured in metres. A very tall person may be 2 metres tall.

centimetre (cm) - the approximate width of your little finger

This common unit is used to measure the length, width, and size of small objects such as pens, pencils, and erasers.

millimetre (mm) - approximately the thickness of a dime

Very small items such as tool sizes, bolts, nails, and the thickness of thin materials are measured in millimetres.

To change from one length unit to another length unit, you can use the following chart. Each stage is a multiple of 10.

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
1 km =	10 hm =	100 dam =	1 000 m =	10 000 dm =	100 000 cm =	1 000 000 mm

Remember: *When changing from a larger unit (such as km) to a smaller unit (such as mm),* ***multiply*** *by a multiple of 10. (10, 100, 1 000, 10 000, 100 000 or 1 000 000)*

Example: Change kilometres to metres: 5 km = 5 000 m

Move from Stage 1 km to Stage 4 m. Move three stages to the *right*, which means *multiply* by 1 000.

Remember: *When changing from a smaller unit (such as cm) to a larger unit (such as hm),* ***divide*** *by a multiple of 10. (10, 100, 1 000, 10 000, 100 000 or 1 000 000)*

Example: Change millimetres to decametres: 400 000 mm = 40 dam

Move from Stage 7 mm to Stage 3 dam. Move four stages to the *left*, which means *divide* by 10 000.

Questions

1. Write the name of the prefix beside the following symbols.

   a. k ***kilo***

   b. c ***centi***

   c. m ***milli***

   d. da ***deca***

   e. h ***hecto***

   f. d ***deci***

2. Write the number meaning of each prefix in relation to the base unit.

   a. k ***1 000***

   b. c ***0.01 or $\frac{1}{100}$***

   c. m ***0.001 or $\frac{1}{1000}$***

   d. da ***10***

   e. h ***100***

   f. d ***0.1 or $\frac{1}{10}$***

3. Which length unit would you use to measure the following items? Write one of the following in each answer space: millimetre, centimetre, metre, or kilometre.

   a. width of football field ***metre***

   b. length of an earthworm ***centimetre***

   c. the depth of a lake ***metre***

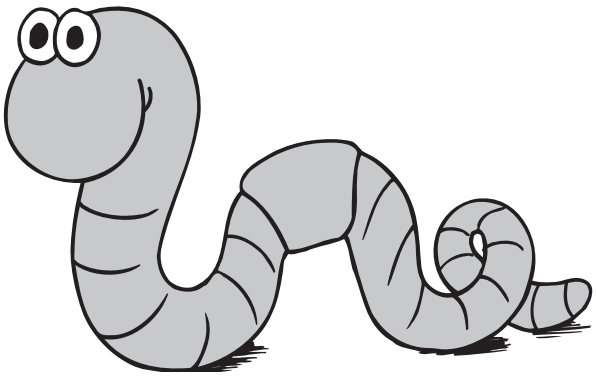
   d. the height of a Douglas Fir tree ***metre***

   e. the distance of an airplane trip to Cuba ***kilometre***

   f. the thickness of a cookie ***millimetre***

   g. the width of a Math textbook ***centimetre***

   h. the length of a candle ***centimetre***



4. In the space beside each question, use a ruler to draw lines of the following lengths.

   a. 8 cm _____

   b. 55 mm _____

   c. 110 mm _____

   d. 10.5 cm _____

length of lines must be checked

5. Write the size in metres of each of the following measurements.

Example: 3 km = 3 000 m
12 hm = 1 200 m

a. 6 dam ***60 m***

b. 11 cm ***0.11 m***

c. 20 km ***20 000 m***

d. 8 hm ***800 m***

e. 15 dm ***1.5 m***

f. 42 mm ***0.042 m***

6. Rewrite the following measurements in words.

Example: 6 cm = six centimetres

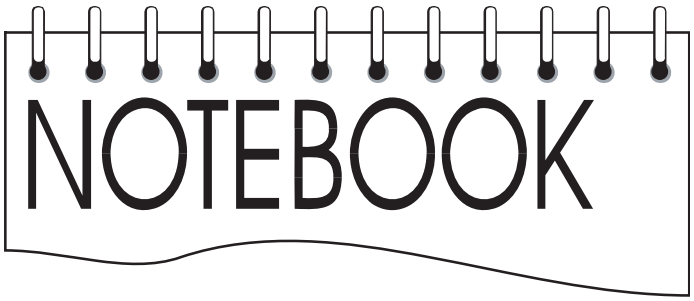
a. 9 km ***nine kilometres***

b. 14 hm ***fourteen hectometres***

c. 25 dam ***twenty-five decametres***

d. 57 m ***fifty-seven metres***

e. 750 mm ***seven hundred fifty millimetres***



7. Rewrite the following measurements as abbreviations.

   Example: twenty kilometres = 20 km

   a. thirty centimetres ***30 cm***

   b. sixteen decimetres ***16 dm***

   c. eight and seven tenths millimetres ***8.7 mm***

   d. seventy-nine hectometres ***79 hm***

   e. one hundred five kilometres ***105 km***

8. Change these larger length units to smaller length units. Multiply to find your answer. Use the stage chart on page 2 to count the stages.

   Example: Change kilometres to millimetres: 4 km = 4 000 000 mm
   Move from Stage 1 to Stage 7. Move 6 stages to the right, which means multiply by 1 000 000.

   a. 10 km = ***100*** hm (move 1 stage to the right)

   b. 11 km = ***1 100*** dam (move 2 stages to the right)

   c. 6 hm = ***6 000*** dm (move 3 stages to the right)

   d. 5 hm = ***50 000*** cm (move 4 stages to the right)

   e. 12 km = ***1 200 000*** cm (move 5 stages to the right)

   f. 7 hm = ***700 000*** mm

   g. 15 dam = ***150*** m

   h. 16 dam = ***16 000*** cm

   i. 20 m = ***200*** dm

   j. 21 m = ***21 000*** mm

9. Change these smaller length units to larger length units. Divide to find your answer. Use the stage chart to count the stages.

Example: Change decimetres to hectometres: 1 000 dm = 1 hm
Move from stage 5 to stage 2. Move 3 stages to the left, which means divide by 1 000.

a. 400 000 mm = ***40 000*** cm (left 1 stage)

b. 60 000 mm = ***600*** dm (left 2 stages)

c. 500 000 mm = ***500*** m (left 3 stages)

d. 70 000 cm = ***7*** hm (left 4 stages)

e. 800 000 cm = ***7*** km (left 5 stages)

f. 9 000 m = ***900*** dam (left 1 stage)

g. 2 000 000 mm = ***2*** km

h. 3 000 000 cm = ***300*** hm

i. 6 600 dm = ***660*** m

j. 770 000 dm = ***77*** km

10. Write the correct answer in the space provided. You must decide when to multiply and when to divide. Use the chart on page 2 to count the stages.

a. 333 m = ***33 300*** cm

b. 5 000 mm = ***5*** m

c. 2 200 dm = ***22*** dam

d. 666 hm = ***66 600*** m

e. 987 dam = ***987 000*** cm

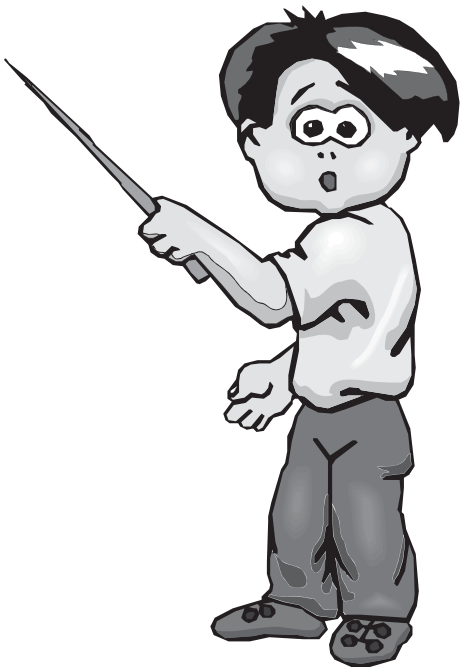
f. 22 000 mm = ***22*** m

g. 55 600 cm = ***556 000*** mm

h. 8 000 m = ***8*** km

i. 987 000 dm = ***987*** hm

j. 333 km = ***333 000 000*** mm



Metric Prefixes and Units of Mass

The amount of matter an object has is called its **mass**. Many people use **weight** to mean mass, but the meanings are slightly different. Mass stays the same no matter where an object is, whereas weight changes based on gravity. Use the word *mass* rather than the word *weight* in your work.

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
1 kg =	10 hg =	100 dag =	1 000 g =	10 000 dg =	100 000 cg =	1 000 000 mg

Most Common Units For Measuring Mass

tonne (t) - The tonne is a large unit of mass. 1 tonne = 1 000 kg It is used to measure the mass of very large objects such as vehicles, ships, loads of grain, steel, etc. **Note**: The tonne does not use gram in its name.

kilogram (kg) - A 1L plastic pop bottle when full has a mass of approximately 1 kg. Kilogram is used to measure the mass of large amounts of food and other goods, such as meat, sugar, nails, and body mass.

gram (g) - With a mass of approximately ten drops of water, gram is used to measure the mass of small amounts of food and other small items.

milligram (mg) - With an approximate mass of one drop of water, milligram is used to measure extremely small amounts, such as vitamins and minerals in a food serving or chemicals in a scientific laboratory.

Questions

1. What mass unit is commonly used to measure the mass of the following items? Write one of the following units in the answer space provided: tonne, kilogram, gram, or milligram.

   a. apple ***gram***

   b. oil supertanker ***tonne***

   c. armoured tank ***tonne***

   d. Saint Bernard Dog ***kilogram***

   e. handful of sand ***gram***

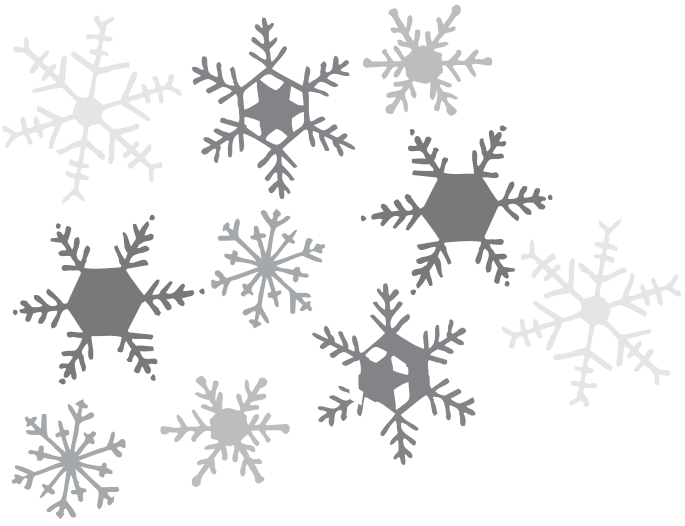
   f. sprinkle of salt ***milligram***

   g. minivan ***tonne or kilogram***

   h. amount of Vitamin C in a glass of orange juice ***milligram***

   i. snowflake ***milligram***

   j. chocolate bar ***gram***



2. Rewrite the following measurements in either words or abbreviations as required:

Example: 4 hm = four hectometres
ten decagrams = 10 dag

a. 5 kg = ***five kilograms***

b. 14.5 g = ***fourteen and five-tenths grams***

c. ten hectograms = ***10 hg***

d. four hundred twenty milligrams = ***420 mg***

e. 26 t = ***twenty-six tonnes***

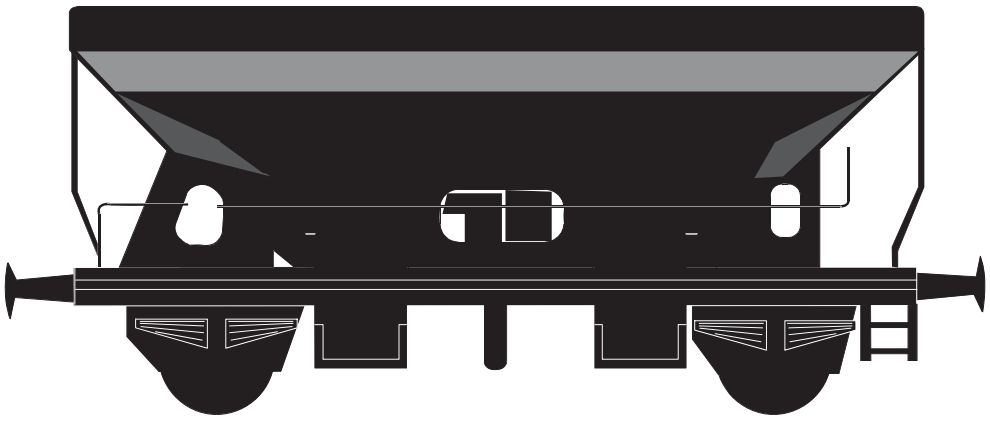
f. seventy-eight hundredths decagram = ***0.78 dag***

g. ninety thousand tonnes = ***90 000 t***

h. forty-six kilograms = ***46 kg***

i. 40.3 dag = ***forty and three-tenths decagrams***

j. 3 300 mg = ***three thousand three hundred milligrams***



3. Change these larger mass units to smaller mass units. Multiply to find your answer. Use the stage chart to count the stages.

Example: 3 kg = 3 000 g
30 g = 30 000 mg

a. 66 kg = ***66 000*** g
b. 77 kg = ***77 000 000*** mg
c. 55 g = ***5 500*** cg
d. 66 g = ***66 000*** mg
e. 44 t = ***44 000*** kg
f. 34 kg = ***340 000*** dg
g. 567 hg = ***56 700*** g
h. 99 dag = ***990 000*** mg
i. 25 dg = ***2 500*** mg
j. 567 t = ***567 000*** kg

4. Change these smaller mass units to larger mass units. Divide to find your answer. Use the stage chart to count the stages.

Example: 3 000g = 1kg
5 000mg = 5g

a. 25 000 kg = ***25*** t
b. 45 000 g = ***45*** kg
c. 7 500 g = ***75*** hg
d. 1 800mg = ***1.8*** g
e. 290 mg = ***29*** cg
f. 180 000 cg = ***1 800*** g
g. 7 700 dg = ***77*** dag
h. 5 600 dag = ***56*** kg
i. 8 000 kg = ***8*** t
j. 88 800 g = ***88*** hg

5. Write the correct answer in the blank. You must decide whether to multiply or divide to find the correct answer. Use the stage chart to count the stages.

a. 25 kg = ***25 000*** g

b. 58 kg = ***58 000 000*** mg

c. 3 hg = ***300*** g

d. 34 hg = ***34 000*** dg

e. 70 000 mg = ***70*** g

f. 660 000 mg = ***66*** dag

g. 560 g = ***5 600*** dg

h. 430 g = ***43*** dag

i. 450 hg = ***45*** kg

j. 4 500 g = ***4.5*** kg

Metric Prefixes and Units of Capacity

How much a container holds or how much space is taken up by an object is **its capacity**. Liquids are usually measured in units of capacity (L or mL). Capacity is sometimes called **volume**.

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
1 kL =	10 hL =	100 daL =	1 000 L =	10 000 dL =	100 000 cL =	1 000 000 mL

Most Common Units For Measuring Capacity

kilolitre (kL) - 1 kL = 1 000 L Large liquid capacities (oil tankers, gasoline trucks, etc.) are measured in kilolitres.

Litre (L) - Large amounts of liquid foods and goods (milk, juices, pop, paint, gasoline, etc.) are usually measured in litres.

millilitre (mL) - 1 L = 1000 mL Small amounts of liquids are measured in millilitres. A pop can contains 384 mL, for example.

Questions

1. What capacity unit is commonly used to measure the following items? Write one of the following units in the answer space: kilolitre, litre, or millilitre.

   a. oil-hauling railroad car: ***kilolitre***

   b. bath tub: ***litre***

   c. eye-dropper: ***millilitre***

   d. small juice box: ***millilitre***

   e. jug for a water cooler: ***litre***

   f. dosage of medicine: ***millilitre***

   g. truck hauling fuel oil: ***kilolitre***

   h. water in a reservoir: ***kilolitre***

   i. large container of paint thinner: ***litre***

2. Write the correct answer in the blank. You will have to decide whether to multiply or divide. Use the stage chart to count the stages.

a. 6 000 L = ***6*** kL

b. 7 777 mL = ***7.777*** L

c. 540 L = ***540 000*** mL

d. 1 600 mL = ***1.6*** L

e. 949 000 mL = ***949*** L

f. 13 L = ***13 000*** mL

g. 15 500 mL = ***15.5*** L

h. 22 kL = ***22 000*** L

j. 345 kL = ***345 000*** L

3. Answer the following questions using these two recipes.

Recipe for Sweet and Sour Rice

625 mL	Short-grain Rice
500 mL	Water
125 mL	White Vinegar
55 mL	Salt
15 mL	Pepper

Recipe for Refried Beans and Rice

375 mL	Long-grain Rice
525 mL	Water
375 mL	Refried Beans
5 mL	Salt
5 mL	Pepper

a. Calculate the total volume (in mL) of materials used in the recipe for Sweet and Sour Rice.

1 320 mL

b. Calculate the total volume (in mL) of materials used in the recipe for Refried Beans and Rice.

1 285 mL

c. How much larger is the volume of the Sweet and Sour Rice than the volume of the Refried Beans and Rice?

$$\begin{array}{r} 1\,320 \text{ ml} \\ -\ 1\,285 \text{ ml} \\ \hline 35 \text{ ml} \end{array}$$

d. Double the two recipes, and then mix them together. What size of bowl (in mL) is needed to hold the combined serving?

$$\begin{array}{r} 1\,320 \text{ ml} \\ +\ 1\,320 \text{ ml} \\ \hline 2\,640 \text{ ml} \end{array} \quad + \quad \begin{array}{r} 1\,285 \text{ ml} \\ +\ 1\,285 \text{ ml} \\ \hline 2\,570 \text{ ml} \end{array} \quad = 5\,210 \text{ mL container}$$

4. Use the following information about necklaces made by a goldsmith to answer these questions.

Type of Necklace	Length of Link	Mass of Link	Cost per Link
10 karat gold (40% gold)	6.5 mm	6.5 mg	$5.25
14 karat gold (60% gold)	4.4 mm	6.6 mg	$5.50
24 karat gold (pure gold)	3.5 mm	7.0 mg	$6.50

a. A goldsmith makes a 14-karat gold necklace 30.8 cm long. If each link of the necklace is 4.4 mm in length, how many links are needed?

30.8 cm = 308 mm

$$\begin{array}{r} 70 \\ 44\text{ mm}\overline{)3080}\text{ mm} \\ \underline{308} \\ 00 \end{array}$$

70 links are needed.

b. What is the cost to make a 10-karat necklace with 64 links?

64 × $5.25 = $336.00

It will cost $336.00.

c. How long is a 14-karat necklace with 55 links?

55 × 4.4 mm = 242 mm or 24.2 cm

A 55 link necklace will be 24.2 cm long.

d. How heavy is a 24-karat necklace if it has 62 links? Give the answer in milligrams.

62 × 7.0 mg = 434 mg

A 24-karat necklace will weigh 434 mg.

e. Which will cost more: a 24-karat necklace 28 cm long or a 14-karat necklace 33 cm long? How much more?

24 karat necklace
28 cm = 280 mm

$35\overline{)2800} = 80$ ***links***

80 links x $6.50 = $520.00

14 karat necklace
33 cm = 330 mm

$44\overline{)3300} = 75$ ***links***

75 links × $5.50 = $412.50

$520.00
− 412.50
$107.50

The 24 karat necklace costs $107.50 more.

5. Use the correct sign (= or < or >) to make true statements.

Example: 7 kg = 7 000 g
7 kg < 7 tonne
5 000 g > 2 kg

a. 3 kg **>** 999 g
b. 15 kg **>** 2 000 g
c. 750 kg **<** 3 t
d. 2 250 kg **=** 2.25 t
e. 18 kL **>** 10 000 L
f. 17 cL **=** 170 mL
g. 260 mL **<** 50 L
h. 8 875 mL **>** 8 L
i. 10 000 mL **=** 10 L
j. 9.6 L **>** 111.6 mL

Homework Assignment

1. What unit of measurement is commonly used to measure the following items?

   a. distance from Edmonton to Jasper ***kilometre***

   b. mass of a business letter ***gram***

   c. capacity of a can of soda pop ***millilitre***

   d. capacity of the fuel tank in a new SUV ***litre***

   e. mass of High Level Bridge in Edmonton ***tonne***

   f. length of a grasshopper ***millilitre or centimetre***

   g. height of the CN Tower in Toronto ***metre***

2. Complete the chart.

   a. 17 km = ***17 000*** m

   b. 38 hm = ***380 000*** cm

   c. 350 kL = ***350 000*** L

   d. 425 kg = ***425 000*** g

   e. 50 m = ***50 000*** mm

   f. 988 000 g = ***988*** kg

   g. 765 g = ***765 000*** mg

   h. 18 t = ***18 000*** kg

   i. 37 kL = ***37 000*** L

   j. 433 kL = ***433 000 000*** mL

3. Sale of Chocolate Treats at Easter

Items	Height	Weight
Easter Bunny (hollow)	42.5 cm	556 g
Easter Bunny (solid)	35.5 cm	1.4 kg
Easter Egg (hollow)	30.8 cm	343 g
Easter Egg (solid)	25.6 cm	1.25 kg

a. Calculate the total weight of the four chocolate items. Give your answer in grams.

556 g + 1.4 kg + 343 g + 125 kg
556 g + 1 400 g + 343 g + 1 250 g = 3 549 g

b. Calculate the total height of the four items. Give your answer in centimetres.

$$\begin{array}{r} 42.5\ cm \\ 35.5\ cm \\ 30.8\ cm \\ +\ 25.6\ cm \\ \hline 134.4\ cm \end{array}$$

c. How much heavier is the solid Easter Bunny than the hollow Easter Bunny? Give your answer in grams.

$$\begin{array}{rr} solid= & 1400\ g \\ hollow= & -\ 556\ g \\ \hline & 844\ g \end{array}$$

d. How much taller is the hollow Easter Bunny than the solid Easter Egg? Give the answer in centimetres.

$$\begin{array}{r} 42.5\ cm \\ -\ 25.6\ cm \\ \hline 16.9\ cm \end{array}$$

Self-Evaluation

Ask yourself some important questions. Write your answers in sentences for your teacher.

1. In this lesson, what part of your work was **excellent**?

2. In this lesson, what part of your work **needs improvement**?

3. If you want help for some of the work in this lesson, ask your teacher in this space.