MAT1L/MAT2L CURRICULUM DELIVERY

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This document is intended to outline some options for delivery of curriculum in MAT1L and MAT2L that focus on application, thinking and problem solving methods. It is hoped that this approach will help students better understand curriculum material and be better prepared to use mathematics in real world situations. The motivation for this project includes both pragmatic and philosophical elements that are outlined below.

The pragmatic motivation for this project revolves around the desire to address a number of challenges that are seen in classrooms delivering 1L and 2L material including:

- lack of connection to real world situations (Why are we doing this?)
- dependence on fill-in-the-blank worksheets
- lack of confidence dealing with unfamiliar circumstances or lack of information
- general anxiety related to mathematics
- lack of engagement by students

While each student may be affected differently by these challenges, the result is often poor academic achievement or behavioral difficulties.

The philosophical motivation is rooted in a desire to help students learn and explore in an environment that is interesting and supportive yet challenges students to deepen their understanding of course material and general concepts in mathematics. While there is a limit to how different a classroom setting can become (limited by room size, budget constraints, time limits etc.) there is much we can do simply in the method of delivery. By making the teacher a facilitator of exploration and cooperation (both student-teacher and student-student) learners become more comfortable exploring which leads to better understanding and confidence.

There is much support for change in mathematics education and no shortage of advocates. However there is a lack of practical resources available to teachers who wish to make use of problem based and inquiry based methods within the mathematics environment. This document is prepared as a starting point and is based on successful lessons used by the authors in their own classrooms. While the resources are by no means complete, there is a strong desire to continue developing such material to better engage and prepare students for their future endeavours.

SUMMARY OF THE PRODUCT

Although we have come to create this document, we recognize that it is a “living document” that can be enhanced, modified, improved.

The current state of the document begins with a possible sequence of topics that cover the overall expectations for both the MAT1L and MAT2L courses.

The sequence was done in the spirit of engaging students in real-life, hands-on problems. Although we believe in the benefit of problem-based learning, we also acknowledge that students still require skill development in some fundamental aspects of mathematics. For this reason we have categorized our activities into three main types: Introduction problems/activities, Learning activities and Skill development.

Our work also allowed us to brainstorm and develop activities that could be used as introductory problems and/or learning activities. We felt that there is a wealth of resources that pertain to skill development, and accordingly we simply outlined where and what that skill development might occur.

Activities that we were able to develop are linked from the sequence tables themselves. One may also use the table of contents to jump ahead to specific sections of the document.

We sincerely hope this document and the use of the activities in this document will inspire both students and teacher to appreciate the mathematics around us a little bit more.

MAT1L SEQUENCE

MONEY SENSE

Type	Name	Relevant topic(s)	Expectation(s)	Notes/Details	Period(s)
Intro activity	What is wrong with this	Place value		Find the errors exercise (basic addition/subtraction)	
Skill development		Place Value and Rounding			
Activity		Writing money value and rounding money			
Skill development		Writing money values and rounding money			
Activity	Purchasing activity / classroom "bazaar"	Making change		Adding/Subtracting monetary values, making change	
Intro Problem	72 is _____% of _____	Percent			
Skill development				Percents (as a ratio out of 100, as fractions, as decimals)	
Activity	Which is larger?			Comparing percents, fractions and decimals	
Activity				Sales Tax	
Activity				Understanding and calculating discounts, sale price	
Intro Problem	What is the better deal?			Unit price	
Summative Task					

MEASUREMENT

Type	**Name**	**Relevant topic(s)**	**Expectation(s)**	**Notes/Details**	**Period(s)**
Intro activity	Intro to measuring	Reading a metric and imperial ruler		"Diagnostic" activity	
Skill development		Reading a Metric ruler			
Skill development		Reading an Imperial ruler			
Skill development		Fraction (equivalencies)			
Activity	Does the greenhouse fit in our classroom?	Personal references		Estimating the length of large objects	
Intro problem	You have this much material to frame an object. What size object can you frame?	Perimeter		Investigating perimeter	
Activity	Frame picture / borders / fence	Perimeter of any object			
Problem	What is the perimeter of a rectangle 2m x 3 cm				
Skill development		Converting within metric units and within Imperial units			
Intro problem	How many "cube-a-link"-tiles do you need to tile the room? AND/OR How many shapes can you make on the geo-board with an area of _____?	Area			

Skill development		Area of rectangles and triangles and composite shapes			
Activity	Investigating surface area using nets	Optimizing surface area			
Activity	Optimizing area	Optimization			
Intro problem	How many pop bottles are needed to fill this desk?	Volume			
Skill development		Volume of prisms			
Intro problem	Which would you rather: 2L of chips or 250 g of chips?	Capacity vs. Mass		Investigating household products – when are units of capacity used and when are units of mass used?	
Activity	Estimating masses using familiar household items	Estimating mass			
Summative task	Design a bookshelf (or otherwise) Create a scale model using foam board Create a box to pack your item				

PROPORTIONAL REASONING

Type	**Name**	**Relevant topic(s)**	**Expectation(s)**	**Notes/Details**	**Period(s)**
Intro activity	Show an enlargement or reduction of a picture that is not done to scale – what is wrong?			Scale diagrams	
Activity	Create a scale diagram of the classroom			Review of measurement Scale diagrams	
Intro Problem	Given a recipe that requires, say, 1.5 cups of flour. How much can we make if we only have 1 cup of flour?			Ratios Multiplying fractions	
Skill development				Multiplying fractions??	
Activity	Problem set			Ratios	
Intro problem	Rates - ???			Equivalent rates (speed, pay …)	
Activity				Rates of pay	

MAT1L ACTIVITIES

Introduction Problems - Percent

Problem: Given any shape, no markings, shade in 75% of the shape

- Materials: paper
- Notes:
  - The idea is to see how students "see" 75%
  - Discussion can be catered to 1 – what the student has shaded and 2 – how did the student come to their answer

Problem: Fill in the blanks:

72 is _____% of _____.

- Materials: paper and pencil
- Notes:
  - Provides an opportunity for all students to enter, and allowing for variety in knowledge of percentages
  - e.g. 50% of 144 or 100% of 72; moving to more difficult just as 4% of 1800.
  - Could vary the question by changing the given (i.e. provide the percent or provide the total/whole value).
  - This question also provides an idea of what the student knows about percentages and working with them.

Source: Small, Marian. Good Questions – Great Ways to Differentiate Mathematics Instruction

Alternatively or additionally

Problem: Choose a fraction and choose a percentage. Which is larger and how do you know?

- Materials: paper and pencil
- Notes:
  - Helps to consolidate converting between decimals and percentages
  - Could also be used as a introduction to see what students know about decimals and percentages and the relationship between the two

Activity – Percents, Fractions, Decimals

Percents to Fractions to Decimals

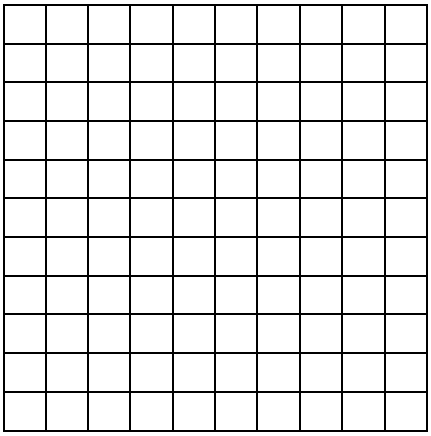
Percents are just fractions out of 100.

Per cent

Per, or “for every”

French word for “100”

for every 100 ….



This is a grid divided into 100 equal parts

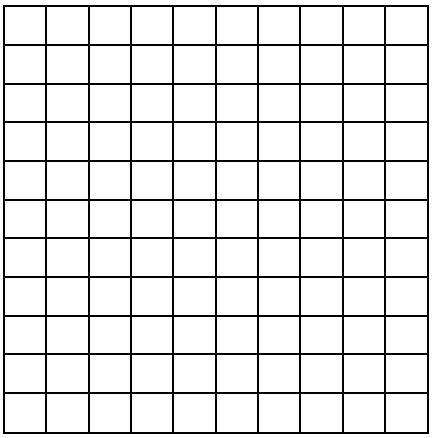
Shade in 8 parts.

Percent	Fraction	Decimal

Remember place value?

_____ . _____ _____

Shade in 24 parts.

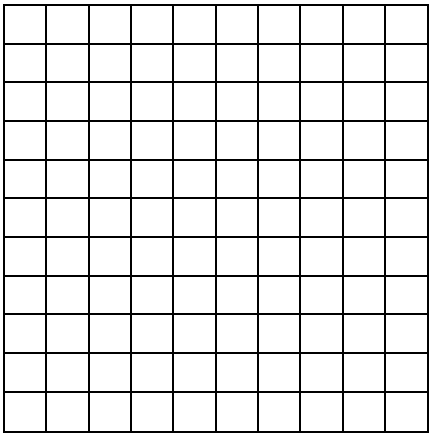


Percent

Fraction

Decimal

Shade in 79 parts.

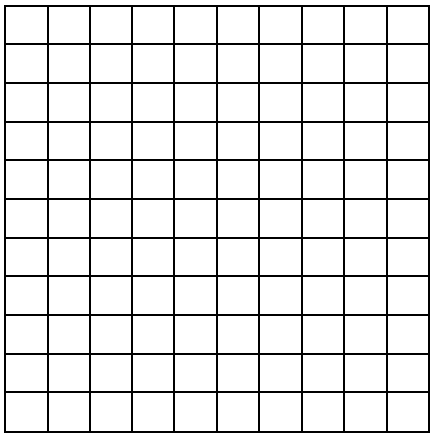


Percent

Fraction

Decimal

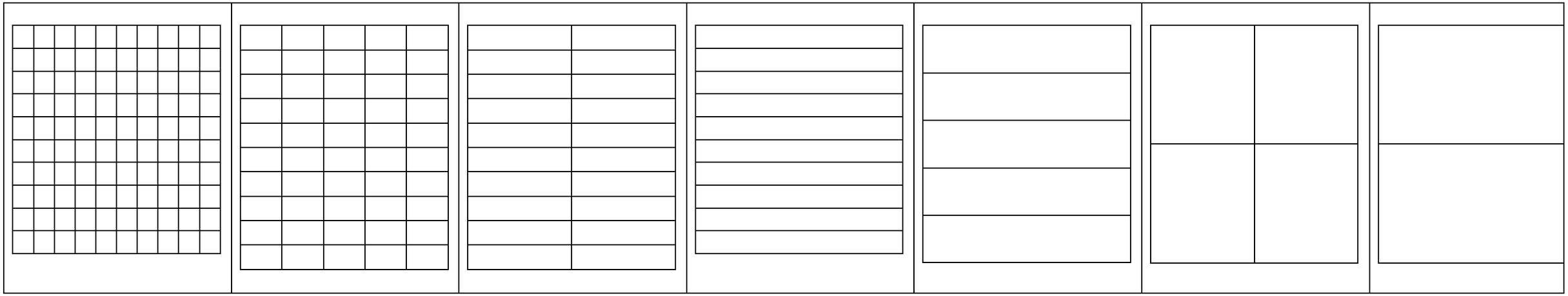
Shade in 50 parts.



Percent

Fraction

Decimal



The grid on the left has 100 squares. Shade in the appropriate number of squares to represent 80%.

Now use the other grids to write 80% as a fraction, in as many ways as possible. Explain how you know you are correct.

_____

_____

Introduction Activity - Measuring

1. Measure the following items found in the classroom using a ruler. Record both the metric and Imperial measurements.

Item	Metric Measurement	Imperial Measurement
Chalkboard eraser		
Workbook		
Your teacher's thumb		
Your foot		
The hall pass width		
The hall pass length		
Width of desk		
Length of desk		
Thumbtack		
Staple		
Width of door		
Length of door		

2. Now that you have measured the items above, group them into 3 categories:

Small – mm or part of inch	Medium – cm or inch	Large – m or feet

3. To estimate distance we can use a personal reference. Fill in the table below:

Small – mm or part of inch	Medium – cm or inch	Large – m or feet

4. Decide which the better measurement for the following items is. Circle the correct measurement:

   a. The length of this piece of paper is about 30 mm 30 cm
   b. The diameter of a CD is about 12 mm 12 cm
   c. The length of a car is about 4 m 40 m
   d. The width of a fingernail is about 1 mm 1 cm

5. Write the metric and Imperial unit you might use to measure each of the following items. The first one is done for you as an example.

Item	Metric Unit	Imperial Unit
a. A floor tile	cm	inches
b. Length of pencil		
c. A soccer field		
d. Distance to Calgary		
e. Length of an ant		
f. Width of a pen tip		

6. Using your personal references estimate the measurement of the following items in both metric and Imperial units.

Item	Metric Unit	Imperial Unit
a. Height of classroom		
b. Length of classroom		
c. Width of door		
d. Length of this paper		
e. Thickness of a loonie		
f. Diameter of a penny		

7. Measure each line segment shown below using both metric and Imperial units.

Line to Measure	cm	mm	inches
a.			
b.			
c.			
d.			
e.			
f.			
g.			
h.			
i.			

8. Use a straight object, but not a ruler, to draw a line that is about each length (use the back of this sheet if you need more room):

   a. 1 cm
   b. 2 cm
   c. 5 cm
   d. 10 cm
   e. 5 mm
   f. 10 mm
   g. 1 inch
   h. 2 inches
   i. 5 inches
   j. ¼ inch
   k. ½ inch
   l. 1 foot

9. Measure each line you drew in #8. How close were you?

Activity – Using Personal References

Problem: Can <any large object> fit into our classroom?

- Materials: paper
- Notes:
    - This provides students a situation in which they have to use estimation and their personal references
    - Students will need to decide which personal reference they require and/or which one is easiest to use (the size of their thumb? Their height?)
    - Focus on the plan, and not the result itself

Can the green house fit into our classroom?

Use your personal references to determine whether or not the green house can fit into our classroom.

Plan: What do we need to find out in order to answer this question?

Write out your plan here:

1) _____

_____

_____

2) _____

_____

_____

3) _____

_____

_____

4) _____

_____

_____

On the back of this page, record any measurements or calculations you performed.

Clearly state after your work whether or not you think the green house can fit into the classroom.

Introduction Activity – Measuring
Introduction Problems – Perimeter

Problem: You have 3 m of trim to make a border. What is the length of each side? Investigate fully!!!

- Materials: paper and pencil
- Notes:
  - Students may tend to produce answers that have all equal sides
    - As this develops, possible that a student may produce a circle as an answer?!
  - Although it is possible answers from students may not geometrically create a polygon (e.g. incomplete triangle), the focus here is for students to think about the distance around an object.
  - As students develop, it may be necessary to not use 3 m but to use 300 cm. Although this jumps into another issues altogether, it may come up depending on what students remember from their elementary school math days.
  - Draw new shapes/possibilities on the board as they come up. Students will soon see the options are endless
  - Upon the end of this discussion, it follows easily to discuss the terms dimensions, as well as perimeter.

Alternatively, or additionally, you could present the following problem:

Problem: How many rectangles can you create on the geoboard that are 12 units around? Form and leave all your answers on the geoboard.

- Materials: Geoboard, elastics
- Notes:
  - Focusing on rectangles forces students to choose sides that are not all the same.
  - As shapes are created, create a “class inventory” on a separate geoboard (visible to all), so that the student may use a “clean” geoboard to find more possibilities
  - Students may find rectangles that are formed along diagonal. It is not necessary to discuss how to find the length of the diagonal, but rather, simply discuss that it must be longer than the “perpendicular” sides
  - Upon the end of this discussion, it follows easily to discuss the terms dimensions, as well as perimeter.

Introduction Problem – Area

Problem: How many shapes can you create on the geoboard that covers a space of 12 squares?

- Materials: Geoboard, elastics
- Notes:
  - Focus of this is to understand area coverage of an object, versus the distance around an object
  - Students can focus on counting squares
    - When creating shapes on a diagonal, students will have to estimate parts of the square
  - Create a "class inventory" of shapes as students find different shapes. This will allow a clear space for students to work, as well as let them compare, to determine whether they created a new shape or not
  - Possibility – if students can create triangles that they will see the area of that triangle is half the area of some rectangle?

Optimizing Area (for a given perimeter)

Situation: You are a gardener who loves to grow lettuce in your back yard. Every year you have a problem with rabbits eating your lettuce before you can pick it. A friend of yours offers you some extra fencing so you can keep the rabbits out.

Question: If you have 12 1m long straight pieces of fencing, what is the largest area you can enclose? Your garden must be rectangular in shape.

Materials/Manipulatives: Students can be provided with a variety of objects such as a geoboard, tiles, straws, dominoes etc. They should also be provided with graph paper for their sketches and calculations. At the time of writing, an excellent source of custom printed graph paper is http://incompetech.com/graphpaper/

Note: For this question, the shape must be limited to rectangular shape since students only have experience with area of rectangles and triangles.

Discussion: Some possible reminders/explanations needed to define “enclose”, the concept of perimeter (fixed at 12m) and the calculation of area of a rectangle.

Students should be encouraged to find multiple sizes of shape (1x5, 2x4, 3x3) and determine the area of each one. Which shape gives the most area?

Discussion: Since the maximum area exists when the fence forms a square (3x3) this provides a good opportunity to discuss that a square is actually a rectangle (students will probably argue that a square and rectangle are different). Logic argument – squares are always rectangles but rectangles are not always squares.

Extension: Another friend gives you another 12 pieces. What is the largest area you can enclose now that you have 24 1m segments?

Students should be encouraged to record their findings and show all their work.

Further Extensions:

- The garden is going to be built against a fence that is already in your back yard. Explore how this changes the problem.
- A look at other shapes is possible using software such as Geometer Sketchpad or Geogebra.

Introduction Problem – Capacity and Mass

Problem: Which would you rather: 2L of chips or 250 g of chips?

- Materials:
  - worksheet (see below)
  - various household items, packaged by volume and by mass (8 to 10 is a good number)
  - Would be useful to have a couple of containers that have a capacity of 2L (ice cream is a good example)

- Notes:
  - Let students work in pairs
  - Students may not know the difference between capacity and mass, and a introduction to terms may be necessary
    - Prereq: mass
  - After going through the items and looking at their lists, have students see if they can see a "rule" for what is packaged by mass and what is packaged by volume. Why?
  - This leads to formalizing the units for capacity and mass; OR can return to initial problem – would you rather 2L of chips or 250g of chips?
    - Will students go to the 2L containers they saw?
    - Compare with a 250g bag of chips – which holds more?

Which would you rather have: 2L of chips or 250 g of chips?

As we begin our unit in measurement, it is important that we are familiar with the different units used and when they are used.

Today we are going to focus on measuring capacity and measuring mass. You are going to look at different products and try to make a conclusion about which *kind* of measurements are used and *when* they are used.

Work with a partner. For each product that passes your way, decide which column the product goes under: Mass or Capacity.
Also record the units used on the package.

Just to review, what is the difference between capacity and mass?

Capacity: Mass:

Products packaged by **mass**		Products packaged by **capacity**	
Product	*Units used*	*Product*	*Units used*

What do you think the "rule" is for packaging products by mass or by volume? Explain your answer fully. _____

_____

Here is a list of some of the units you saw in class today, plus a few extra. Fill in the blanks to complete the chart.

Units of _____

_____	
Unit	Abbreviation
	g
kilogram	

_____	
Unit	Abbreviation
	lb.
	oz.

Units of _____

_____	
Unit	Abbreviation
	mL
	L

_____	
Unit	Abbreviation
fluid ounce	

Now, answer the question, including justification:

Which would you rather have: 2L of chips or 250 g of chips?

_____

_____

_____

Introduction Problem – Mass

Problem: What does 1 mg feel like?

- Materials:
  - Various items with a mass labeled (e.g. food items)
    - Bag of popcorn
    - Tic Tacs
    - Chocolate eggs
    - Etc.
  - Other items with no labeled mass (e.g. balls, items in the classroom)

- Notes:
  - Students will go around room to touch each item.
  - For some, like the Tic Tacs or the eggs, they may have to find a unit mass, by examining the package and then counting the number of items in the package
    - Let students work out – how do you find the mass of one item?
  - With their references, have students go around room with other items to estimate the mass of each
    - Even answers such as, it is more like the chips than it is the bag of popcorn would work initially; from there, can they guess a better estimate?
  - Provide a scale to use at the end of class, to determine the actual mass of each item

Activity – Estimating Masses

Fill in this chart by examining the objects available in class.

Hold each object and get a “feel” for each mass.
These will be your personal references.

Item	Mass
Bag of popcorn kernels	
Bag of potato chips	
Chocolate egg	
Tic Tacs	
	1 mg

What do you think would have a mass of 1 mg?

Use the information you collected and **choose the unit** you would use to measure the following objects. Then, write down your estimate for the mass of each object.

Item	Appropriate unit to measure mass (mg, g, or kg)	Estimated mass	Measured mass
Paper Clip			
Math workbook			
A pen			
Football			
3-hole punch			
Stapler			
Badminton birdie			
Tennis ball			
Yourself			

As a class we will measure the actual measurements. How accurate were your estimates?

OKAY GOOD GREAT EXCELLENT

Introduction Lesson - Scale Diagrams

DPRV.01 • determine relationships among fractions, percentages, ratios, and rates by constructing diagrams, building models, and estimating measurements;
DPRV.03 • communicate information about proportional reasoning;
DPRV.04 • use literacy skills (reading, writing, listening, and speaking) to obtain and communicate information about proportional reasoning.
(DPR2.02 – solve simple problems using equivalent ratios (e.g., recipes, scale diagrams))

Problem: Need a diagram of the room so that we can reorganize to make everything in the classroom fit comfortably and so our student in a wheelchair can actually move around without having to move furniture.

Materials:

- scrap paper or plain paper (no lines)
- "real" examples of scale drawings – examples: building plan of school, blueprints addition to a house, …
- blank paper, grid paper, chart paper for scale diagrams
- markers
- rulers, tape measures,…
- ½ sheet of paper with question and box for check of understanding at end of activity

Activation / Minds On

- Students get a blank sheet of paper and are asked to quickly sketch 2 people by the door. Student have "3" minutes.
- Discuss in pairs/at tables/as a class: Does the drawing look realistic? Why?
- Might need to show examples of distorted pictures
- Show "real" examples of scale drawings – examples: building plan of school, blueprints addition to a house, …
- Ask why it's important to have these drawings be realistic (to scale). (know how far something is, which route is quickest, …, know how much can fit inside a room,…)

Action

- Introduce problem to class:
  Need a diagram of the room so that we can reorganize to make everything in the classroom fit comfortably and so our student in a wheelchair can actually move around without having to move furniture.
  - What do you think we should include in our diagram? (walls, desks?, tables?, computers?, cupboards?, shelving?, SmartBoard?, overhead?, teacher's desk?, filing cabinets?,…??????)
  - How should we do this? (draw a diagram to scale…) What do we need? (dimensions/measurements of whatever we need to include)
  - Drawing/sketch/diagram needs to be realistic. (Hopefully to scale)

- Students work in groups to draw a diagram (hopefully to scale) of the room. Provide blank paper, grid paper, chart paper, markers, rulers, tape measures,…

- Each group then presents their diagram.
- Discuss as a class – what makes the diagram work/seem realistic? (to scale)

Consolidation

- Students each get a ½ sheet with a box to draw part of a wall in the room. They need to sketch in the door (including the window in the door), the phone, and the light switches.
- Students also need to answer the question – why is it important to have drawings look realistic?

Follow Up

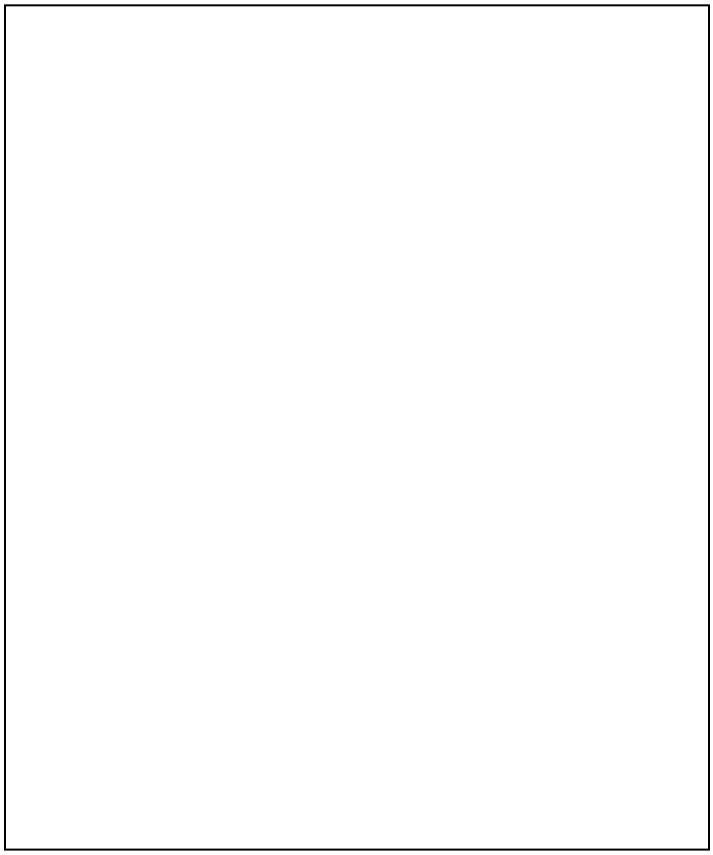
- Have students make a scale model of the classroom using tiles (something flat so not really a 3-D model) and then determine the scale so they can create desks and tables etc. to fit into the room.

- Have students draw a room to scale around a "desk"
    - The idea is to have a "desk" cut out (or use an object to represent the desk) and then the students would determine the scale of that desk so they can draw the room around the desk using the same scale.

Name:_____

In the space/box to the right draw the door (including the window in the door), the phone, and the light switches on the wall.

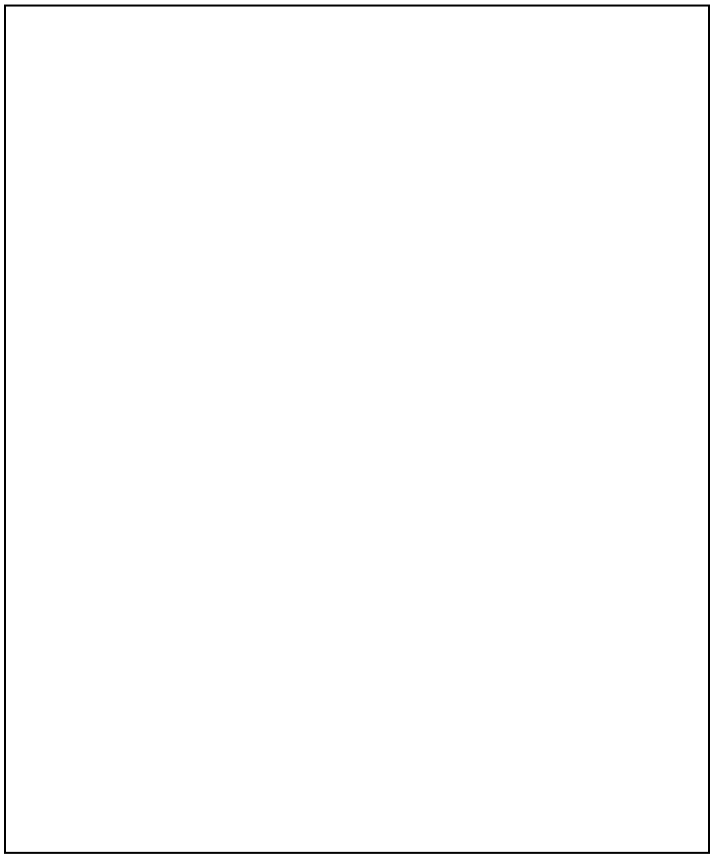
Why is it important to draw/sketch so that the picture looks realistic?

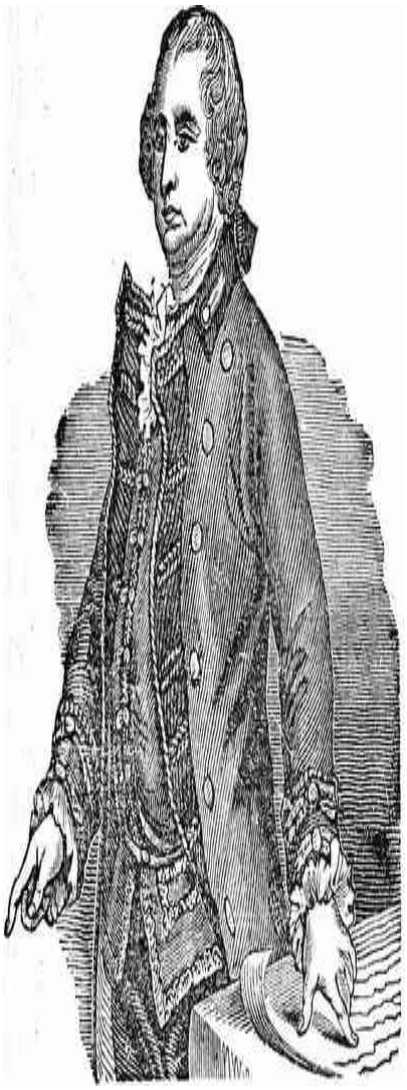


Name:_____

In the space to the right draw in the door (including the window in the door), the phone, and the light switches on the wall.

Why is it important to draw/sketch so that the picture looks realistic?





Activity – Recipes

Problem: You're having a party for 42 people and you're planning on serving 2 desserts. Unfortunately you can't get to a store and only have a 1.8kg bag of sugar. Using the recipes for caramel flan and peppermint ice cream decide what you should make (how many of each dessert) and explain your choice.

Caramel Flan (Serves 10)

¾ cup sugar
5 eggs
11 oz sweetened condensed milk
14 oz evaporated milk
1 tsp vanilla

Pour 1 cup sugar in warm pan over medium heat. Constantly stir sugar until is browns and becomes caramel. Quickly pour approximately 2-3 tablespoons of caramel in each of the 6 ramekins, tilting it to swirl the caramel around the sides. Reheat caramel if it starts to harden. In a mixer or with a whisk, blend the eggs together. Mix in the milks then slowly mix in the 1/2 cup of sugar, then the vanilla. Blend smooth after each ingredient is added. Pour custard into caramel lined ramekins. Place ramekins in a large glass or ceramic baking dish and fill with about 1-2 inches of hot water. In a 325°F, bake for 45 minutes in the water bath and check with a knife just to the side of the center. If knife comes out clean, it's ready. Remove and let cool. Let each ramekin cool in refrigerator for 1 hour. Invert each ramekin onto a small plate, the caramel sauce will flow over the custard.

Peppermint Ice Cream (Serves 5)

2 cups whipping cream
½ cup sugar
½ tsp vanilla extract
½ tsp peppermint extract
Crushed peppermint stick
3 lb coffee can with plastic cover
1 lb coffee can with plastic cover
Rock salt
Crushed ice or snow

Place 1 lb can in centre of 3 lb can. Fill 1 lb can with ice cream ingredients.

Layer crushed ice or snow and rock salt around the small can. Cover both cans with their plastic lids. Roll the can around on the floor for about 15 min.

Materials: recipes – either on cards or overhead or printed, calculators, …

Notes: 225g sugar is 1 cup of sugar

- 1.8 kg sugar = 1800g ÷ 225g/cup = 8 cups of sugar
- Different combinations of the desserts would be appropriate for the party

# of servings	Flan - sugar	Ice cream - sugar
5		½ cup
10	¾ cup	
40	3 cups	4 cups
45		4 ½ cups
50	3 ¾ cups	5 cups

- Possible combinations:
  - 50 servings of flan and 40 servings of ice cream – more flan than needed but some people won't have ice cream or don't need as much ice cream as the suggested serving
  - 40 servings of flan and 50 servings of ice cream – more ice cream some people won't want flan
  - don't have enough sugar for 50 servings of flan and 45 servings of ice cream
- could extend the problem by having students write out the quantities for each recipe once they have decided what they will make based on their sugar restriction
- could extend the problem by adding an extra constraint – cream

Activity – Proportional Reasoning and Money Sense

Some problems for students to show their money sense and proportional reasoning. Student could use manipulatives if needed.

Problem 1: You'd like the best deal. Which should you buy: 4 apples for $3 or 3 apples for $2.40? Prove with calculations.

Materials: money tray with at least 12 quarters and 9 quarters and 3 nickels

- 7 "apples" (or something to represent apples) – 3 fraction circles that divide into thirds and 4 fraction circles that divide into quarters would be great but 7 blocks would work too!

Notes:

- $3 ÷ 4 = $0.75 per apple $2.40 ÷ 3 = $0.80 per apple therefore 4 for $3 is cheapest
- 4 ÷ $3 = 1.33 apples per $1 and 3 ÷ $2.40 = 1.25 apples per $1 therefore 4 for $3 is cheapest because you get more apples per dollar (1.33 is bigger than 1.25)
- some students may decide to buy the more expensive apples because they look better, are organic, or only need 3 apples…

Problem 2: You need to spend as little money as possible. Which should you buy: 900 g of pasta for $2.99 or 400g of pasta for $1.45? Prove with calculations.

Notes:

- $2.99 ÷ 9 = $1.33 per 100 g $1.45 ÷ 4 = $1.36 per 100 g therefore 900g for $2.99 is best buy since pay less per 100g
- 900 g ÷ $2.99 = 301 g per $1 400g ÷ $1.45 = 275.86 g per $1 therefore 900 g for $2.99 is best buy since you get more grams per dollar (301 is more than 276)

Problem 3: You need to buy toy cars for the loot bags for your little brother's birthday party. They come in packages of 5. There will be 7 people getting loot bags.

a) If each loot bag needs 3 cars, how many packages of cars should you buy? Explain.
b) If each package of 5 cars costs $4.29 how much will it cost to buy as many as you need? Don't forget to include tax. Show your calculations.

Materials:

- money trays
- toy cars – at least 25 per group
- loot bags – at least 7 per group

Notes:

- could take out the numbers (quantities, prices) in the question and have the students figure out what information they would need - if working in groups this could create a competition as each group could send someone to get the info they need as they figure out what they need

Problem 4: You need to buy new socks because all of yours have holes or no longer have a match! The socks come in packages of 3. How much will they cost?

You decide it would be a good idea to have 10 pairs of socks so you don't have to do laundry all the time.

a) How many packages of socks do you need to buy?
b) How much will the socks cost if the packages are 20% off and originally cost $7.49 each? Don't forget to include tax and show your calculations.

Materials:

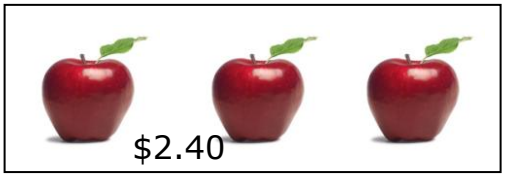
- money trays
- socks – at least 25 per group

Notes:

- could include the numbers (quantities, prices) in the question or have the students figure out what information they would need - if working in groups this could create a competition as each group could send someone to get the info they need as they figure out what they need

You'd like the best deal possible. Which should you buy:

4 apples for $3 or 3 apples for $2.40? Prove with calculations.



You need to spend as little money as possible. Which should you buy:

900 g of pasta for $2.99 or 400g of pasta for $1.45? Prove with calculations.

900 g for $2.99

400g for $1.45

You need to buy toy cars for the loot bags for your little brother's birthday party. They come in packages of 5.

There will be 7 people getting loot bags.

a) If each loot bag needs 3 cars, how many packages of cars should you buy? Explain.

b) If each package of 5 cars costs $4.29 how much will it cost to buy as many as you need? Don't forget to include tax. Show your calculations.

You need to buy new socks because all of yours have holes or no longer have a match! The socks come in packages of 3.

You decide it would be a good idea to have 10 pairs of socks so you don't have to do laundry all the time.

a) How many packages of socks do you need to buy?

b) How much will it cost if the packages are 20% off and originally cost $7.49 each? Don't forget to include tax. Show your calculations.

MAT2L SEQUENCE

MEASUREMENT

Type	Name	Relevant topic(s)	Expectation(s)	Notes/Details	Period(s)
Introduction activity		(Review of) metric and Imperial units for capacity and mass		- Activity to investigate different units used in everyday products (chips, sugar, cereal, granola bars, drinks, ice cream …)	
Skill development		(Review of) metric and Imperial units for linear measurement		- Units of measure Metric Imperial	
Skill development				- Taking measurements Metric + Imperial	
Skill development				- Estimating measurements Metric + Imperial	
Skill development				- Converting measurements Metric + Imperial	
Skill Development		Relating Metric and Imperial units?		- Cross-border shopping activity (lengths, speeds, gas prices, temperature) temperature litres vs. gallons pounds vs. kilograms money length comparisons!!	
Introduction lesson		Introduction to circles – terms and parts			
Activity		Discovering pi			
Skill development		Circumference of a circle			
				TASK – designing the layout of the yard (the "yard-plan")	

Type	Name	Relevant topic(s)	Expectation(s)	Notes/Details	Period(s)
Skill development		Area of a circle		**- include area of sectors**	
Introduction activity	Classifying shapes				
Skill development		Volume of a cylinder			
				TASK – a circular pond	

PROPORTIONAL REASONING

Introduction problem	Why is less sometimes more				
Activity	Thinkers			Using proportional reasoning in everyday problems/scenarios	
Activity	Fraction Models			Constructing models of fractions, decimals and percents	
Skill Development		Ratios		- creating mixtures (e.g. fertilizer, punch, cement) party mixes proportions - three-term ratios cement mixing RATES	
		Problem solving with ratios/rates			
		Scale diagrams			
				Task - Creating a scale diagram of your yard + fertilizer calculation	

MONEY SENSE

Type	Name	Relevant topic(s)	Expectation(s)	Notes/Details	Period(s)
		Reading, writing and understanding monetary values – introduction		- Different ways to write monetary values p. 2 warm-up - Counting money - Rounding money p. 10	
		Tax and discounts		- Revisit percents and fractions - understanding tax and discounts - Calculations on calculator	
		Estimating costs		- Finding 10% and 5% without a calculator - Estimating tax and discounts	
		Investigating part-time jobs		- Examining want-ads in newspaper - Hourly pay into monthly, yearly pay - Take home pay - raises?	
		Budgeting for a purchase, understanding negative monetary values		- introduce circle graphs and angles in circles - negative value - spreadsheet work	
		Money in the media – understanding the value of money		- a look at salaries of professional athletes - understanding large numbers	
		Moving towards summative … planning a trip		- trip dates (days away, nights away) - time zones - 12h vs. 24 h clock - reading schedules - budgeting for the trip (hotel rates, travel costs, spending …)	
				TASK #4– purchasing materials for yard work	

MAT2L ACTIVITIES

Introduction Activity – Volume

Problem: Classify these shapes

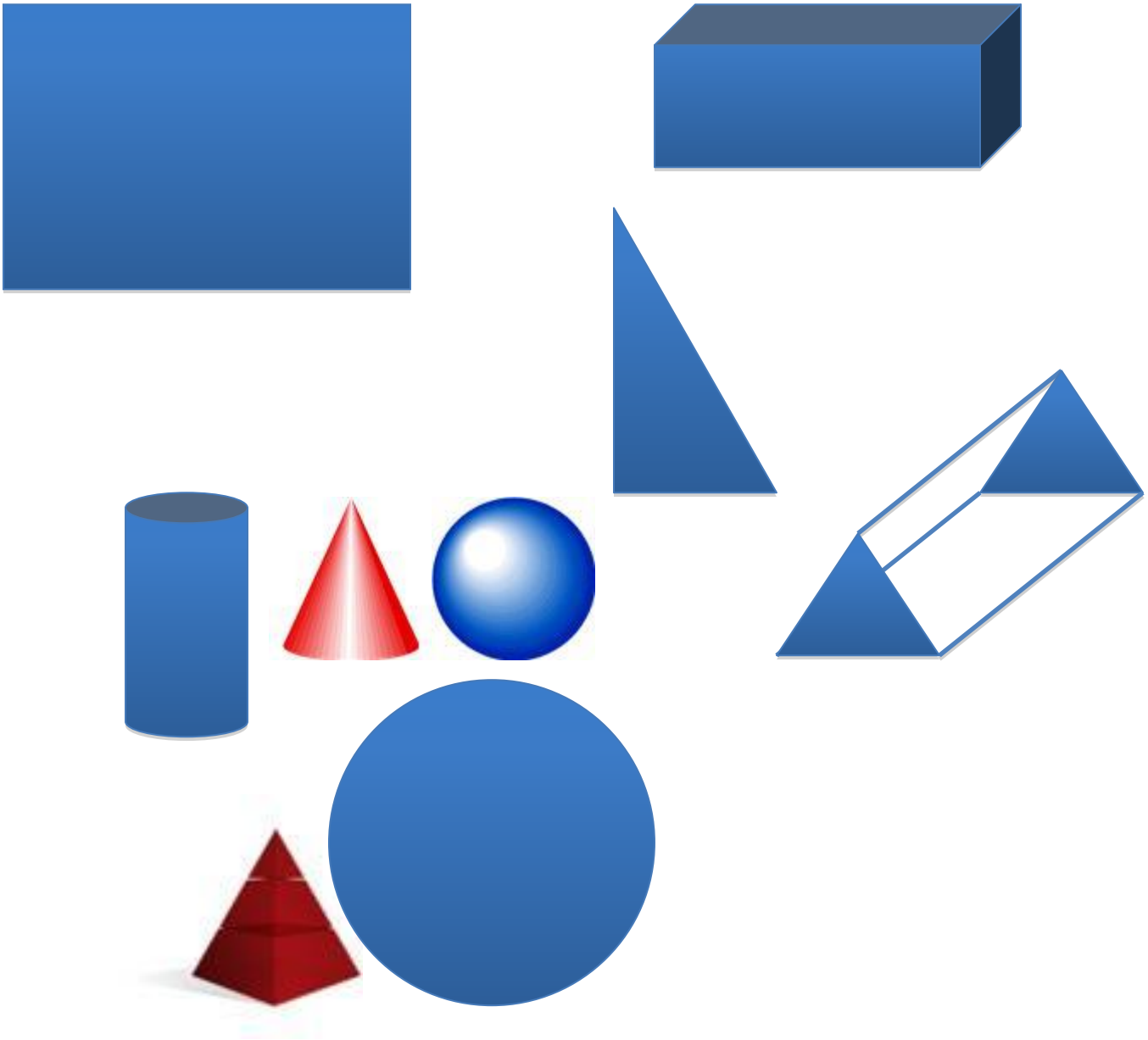
- Materials:
  - See attached sheet

- Notes:
  - Students work in groups to determine groups for these shapes
  - The idea is for students to see the different properties between these objects
    - 2D or 3D
    - for 3D objects:
      - shape of sides (prism or pyramid)
      - shape of base in relation to shape of top (prism or pyramid or cone)
  - Goal is for students to see the difference between objects that hold a size and shape throughout (prism) to those that change (pyramid, cone or sphere)
  - Leads to the **next lesson** on finding the volume of prisms and cones, and how finding the volume of each (as area of base x height), which could extend to finding the volume of a pyramid or cone and why that is different.

Activity - Classifying Shapes

Here are a bunch of different objects. Put them into groups, based on similarities they have.

Explain how you made the groups (i.e. what makes the shapes form one group?)



Introduction Activity – Proportional Reasoning

Activity: See attached sheet

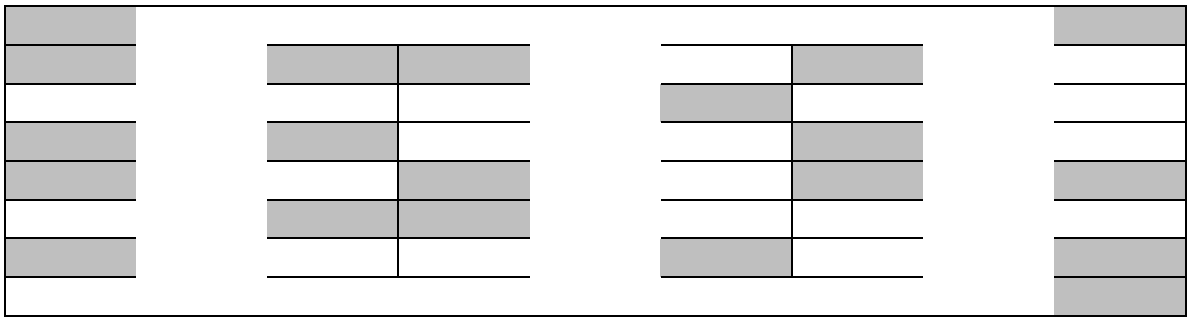
- Materials:
  - worksheet

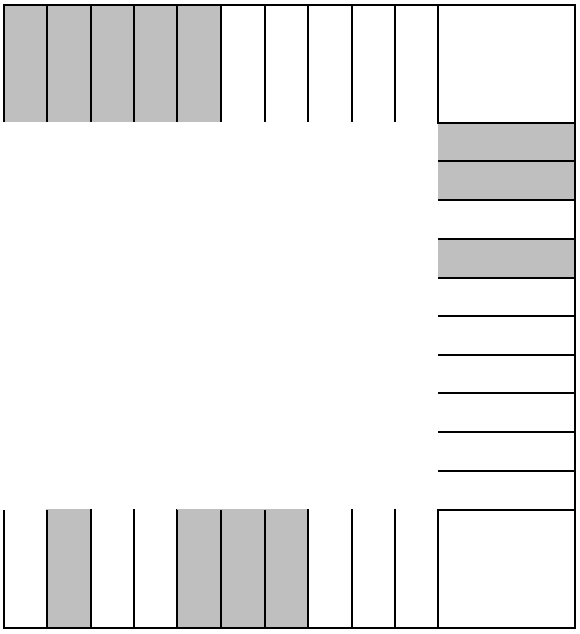
- Notes:
  - Students move between stations, in groups, to discuss each problem.
  - Encourage students to find different ways to think about each problem
    - Is there only one answer?
    - How else can we look at each problem?
      - e.g. the parking lot – does the number of free spaces the same as having a better chance at finding a spot? Or does the total number of spots in the lot matter?

Why less is sometimes more

Station 1

Which parking lot would you rather look for a spot? Why?



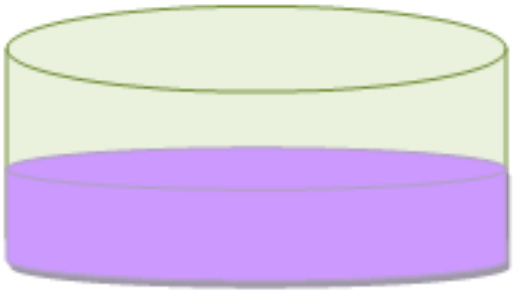


Why less is sometimes more

Station 2

Which container has more liquid?

(ContainerA)



(Container B)

Work with a partner to answer this question.

Why less is sometimes more

Station 3

Which would you purchase - One shirt for $30 or two shirts for $50?

Why less is sometimes more

Station 4

What's wrong with this picture?

I took this picture, but wanted to make it larger, so I can put it on my wall.

Did I do a good job? Explain in words what you think happened when I tried to make the picture larger.

_____

_____

How big should the picture be if I want it the same length as shown?

Activity – Proportional Reasoning

Problem: Various (see problem set)

- Materials:
  - Pattern blocks to represent buses and car (or if available, actual toy buses and cars)
  - Bucket of BINGO chips with a known (to teacher only) number of blue and red chips

- Notes:
  - Students can work in groups and move between stations to look at materials available
  - To answer the question about number of boys (or girls) in school, we hope students will ask the question “How many students go to this school?” Again, the goal is for students to utilize problem solving skills to attainable problems
  - For the cellphone question, change the population to reflect your school’s size
    - Students may ask how they will know – help them by suggesting how they could take a quick sample (e.g. as everyone in the room if they have a cell phone at school today)
  - Bucket question – make sure students following the directions. It was found that 30 to 70 (total 100 chips) was a good division that could not be easily counted by a quick glance, but was not too close to looking like there were equal numbers of each colour chip
  - Wage question was again to get students thinking about proportions.
    - Questions that may be asked: how many hours are worked in a day?
    - Common error: students will go from weekly pay to monthly pay (by x 4 – four weeks/month). Explain that a month does not always have 4 weeks … but that a year always has 52 weeks.

Activity – Thinkers!

Going down Baseline, it is estimated that there are 3 OC Transpo Bus that goes by for every 50 cars. How many OC Transpo buses will go by during rush hour after school today, if there are about 1000 cars that go down Baseline during rush hour?

Look around the room. How many boys are in the school today?

There are about 500 students at this school. How many students have their cell phones on them today?

Reach into the bucket with your eyes closed. Pull out one chip. Write down its colour and then put it back in the bucket. Repeat this 10 times.

Without counting, how many red chips do you think are in the bucket?

Minimum wage is $10.25/hour. How much money will you make in one week? In one year? In one month?

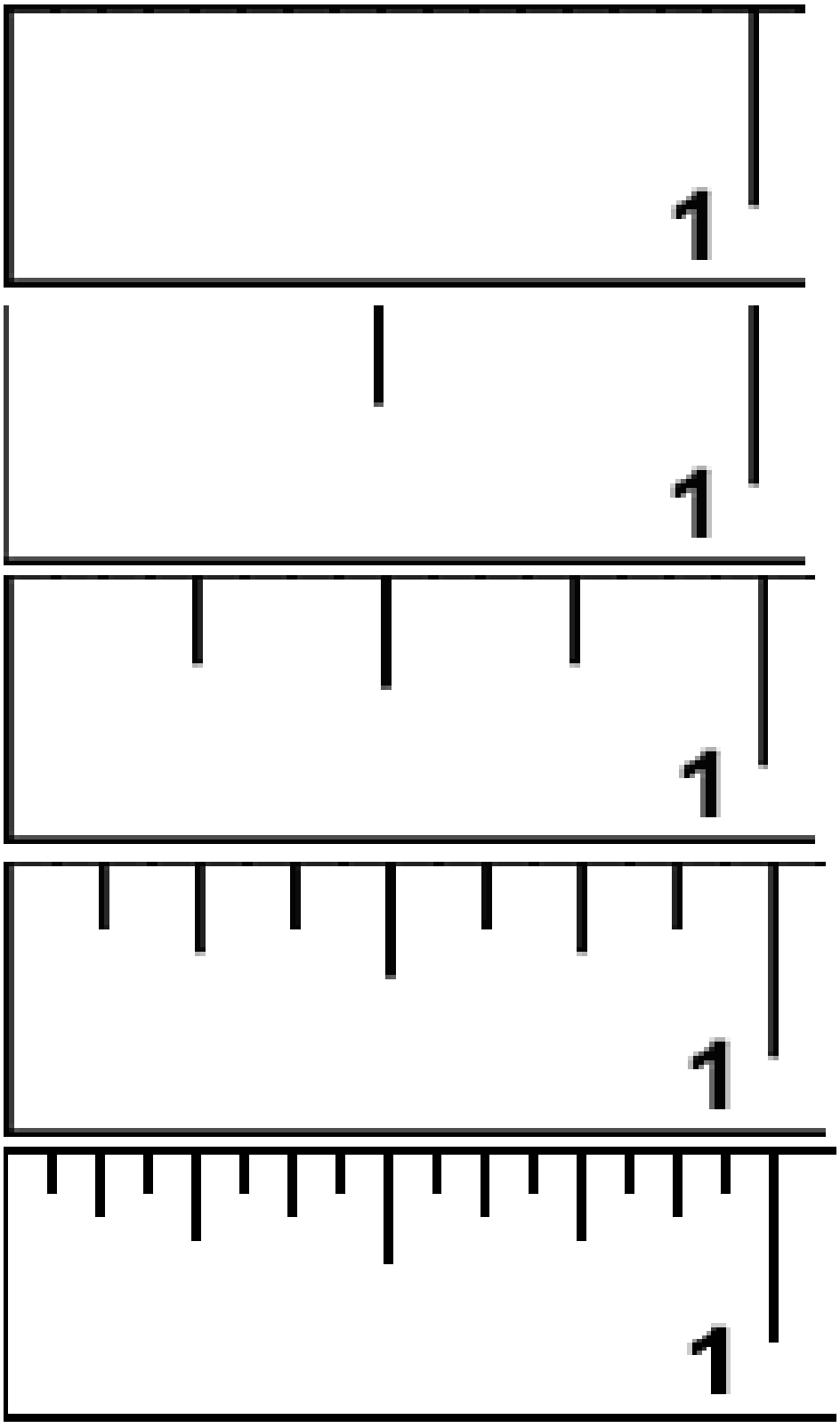
Activity – Fraction Models

Problem: Various (see problem set)

- Materials:
  - Strips of paper of equal length
  - Pattern blocks

- Notes:
  - Students can work in groups and move between stations to look at materials available
  - This is to help students construct an understanding of fractions (since fractions can also be ratios)

Activity – Fraction Models Station 1



Here is one inch in an Imperial ruler, divided in different ways.

Fill in the blanks at each division.

Use your ruler model to provide as many answers as possible for the following:

a) $\frac{1}{2}$ =

b) $\frac{3}{4}$ =

c) $\frac{14}{16}$ =

d) $\frac{10}{16}$ =

e) $\frac{4}{16}$ =

f) 1

g) $1\frac{8}{16}$ =

Activity – Fraction Models Station 2

1. Take the pieces of paper provided. Work together to do the following:

- Divide one piece into 2 equal parts.
  - Shade in $\frac{1}{2}$ of the paper.
- Divide another piece into 3 equal parts.
  - Shade in $\frac{1}{3}$ of the paper.
- Divide another piece into 4 equal parts
  - Shade in $\frac{1}{4}$ of the paper.
- Divide another piece into 6 equal parts
  - Shade in $\frac{1}{6}$ of the paper.
- Divide another piece into 8 equal parts
  - Shade in $\frac{1}{8}$ of the paper.
- Divide another piece into 12 equal parts.
  - Shade in $\frac{1}{12}$ of the paper.

2. Use your folded papers to answer the following questions:

a) $\frac{1}{3} = \frac{\_}{6} = \frac{\_\_}{12}$

b) $\frac{1}{2} = \frac{4}{\_} = \frac{6}{\_}$

c) $\frac{2}{3} = \frac{4}{\_} = \_$

d) $\frac{3}{4} = \frac{6}{\_} = \frac{\_\_}{12}$

Activity – Fraction Models Station 3

1. Use the pattern blocks to answer the following questions.

a) What part of a trapezoid is a triangle?

b) What part of a blue rhombus is a triangle?

c) What part of a hexagon is a triangle?

d) What part of a hexagon is a blue rhombus?

e) What part of a trapezoid is a blue rhombus?

f) What part of a hexagon is a trapezoid?

2. Draw your answers to the following problems.

a) If the square is one-fourth, make the whole (There should be 5 solutions)

b) If the triangle is one-fourth, make a whole. How many solutions can you find?

c) If the blue rhombus is one-fourth, make a whole. How many solutions can you find?

Solve each puzzle using the pattern blocks. Record and colour each solution.

1. Build a triangle that is one-third green and two-thirds red.

2. Build a triangle that is two-thirds read, one-ninth green and two-ninths blue.

3. Build a parallelogram that is three-fourths blue and one-fourth green.

Course Problem

In order to tie together the idea from this course, a course problem has been created, that will be presented in parts as the overall expectations of the course are met.

The task is divided into four parts. At this point in time, 3 of the 4 parts are developed, although the plan for all tasks has been created. The entry point of each task is outlined in the sequence of the course content.

Task #1

- Expectations covered:
  - **EUMV.01** • make estimates and measurements to extend understanding of the metric system;
  - **EUMV.02** • make estimates and measurements to extend understanding of the Imperial system;
  - **EUMV.03** • solve problems involving measurements of circles, rectangles, cylinders, and rectangular prisms, using metric units in applications drawn from everyday life and the workplace;
  - **EUMV.04** • communicate information about measurement concepts;
  - **EUMV.05** • use literacy skills (reading, writing, listening, and speaking) to extend understanding of measurement.
- This task has students creating their ideal backyard.
- Creativity is encouraged but namely to let students showcase that they have an understanding of size in relation to the Imperial system and the placement of large(r) objects.
- The component to use Google Sketch Up is optional, but it does provide students who are advanced to showcase their spatial sense.
  - An accommodation may be to allow students to hand in their work either by hand (and they can create a scale diagram of their work with task #3, when proportional reasoning is covered) or to hand in their plan done first by hand and then transferred to Google Sketch Up

Task #2

- Expectations covered:
  - **EUMV.03** • solve problems involving measurements of circles, rectangles, cylinders, and rectangular prisms, using metric units in applications drawn from everyday life and the workplace;
  - **EUMV.04** • communicate information about measurement concepts;
  - **EUMV.05** • use literacy skills (reading, writing, listening, and speaking) to extend understanding of measurement.
- This task has students using their backyard design and to perform calculations that provide more detailed information about their yard (the amount of fencing required, the amount of sod required, and the amount of soil required for their garden beds and the amount of water required for the pond.

Task #3

- Expectations covered:
  - **EPRV.01** • solve problems drawn from everyday situations, demonstrating skill and understanding in the use of fractions, percentages, ratios, and rates;
  - **EPRV.02** • communicate information drawn from a variety of sources;
  - **EPRV.03** • use literacy skills (reading, writing, listening, and speaking) to extend understanding of proportional reasoning.
- This task focuses on the garden beds and making fertilizer for the soil, as well as some rate questions related to filling up their pond and digging up their garden beds.

Task #4

- Expectations covered:
  - **EMSV.01** • solve problems drawn from everyday situations involving money, demonstrating skill, and understanding in the use of decimal numbers;
  - **EMSV.02** • communicate information about money sense;
  - **EMSV.03** • use literacy skills (reading, writing, listening, and speaking) to extend their money sense.
- In this task, students will use their calculated values in the preceding three parts of the task to purchase the necessary materials for their backyard.

Task #1 – Designing your Garden

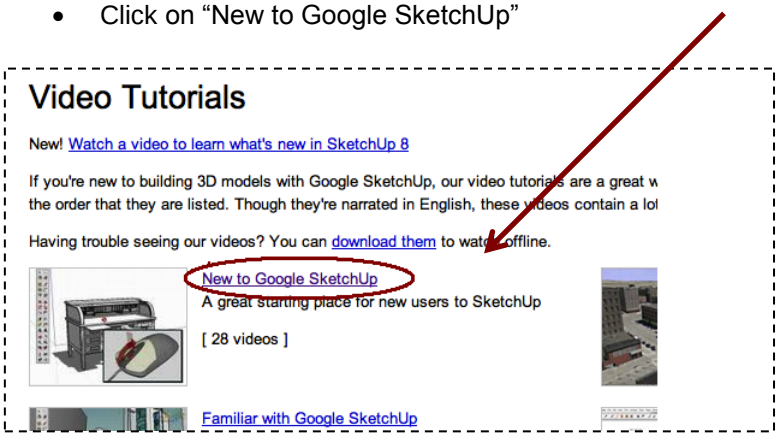
This task is the first of a series of tasks you will complete throughout the year. Together this will form into the summative in May that is 10% of your grade.

This first task is focused mostly on familiarizing yourself with a planning tool, Google SketchUp. The end result is that you will have designed, using SketchUp, a yard (filled with a patio, garden beds, ponds, and whatever else you would like).

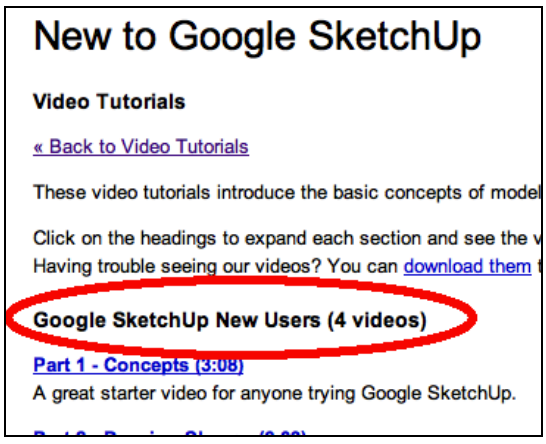
A - Familiarizing yourself with SketchUp

Go to the following link: http://sketchup.google.com/training/videos.html

- Click on “New to Google SketchUp”



- You will see 4 videos under “Google SketchUp new users”.



- View each video at least once

B – Demonstrating your knowledge of SketchUp

The first video introduced you to three important tools. List the names of the tools:

-
-
-

The second video talks about how to draw basic shapes.

- Draw any shape using the edge tool
- Pull the same so that it is 3-D
- Draw in this shape a circle
- Pull the circle down so that it is “sunken” in to the ground
- Use the appropriate tool so that you can look at your finished diagram from above.
- Save this file with the name: <your last name> Video 2 and submit it to your teacher

The third video talks about some properties of the push/pull tool

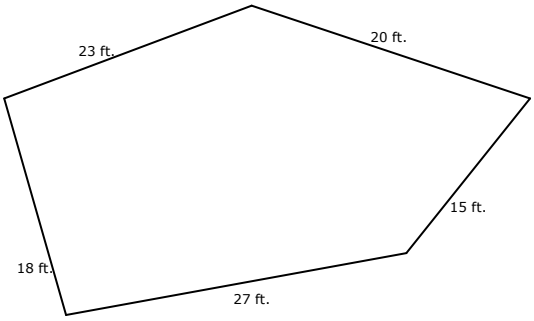
- Draw (any) two rectangles.
- Pull the two rectangles to the exact same height (as shown in the video)
- Draw a circle in one rectangle.
- Pull this circle right through to make a hole in the rectangle.
- Save this file with the name: <your last name> Video 3 and submit it to your teacher

The fourth video you watched took you through how to draw a chair in SketchUp.

- Draw your own chair
  OR
  Speak to your teacher about another object you want to draw
- Save this file with the name: <your last name> Video 4 and submit your drawing to your teacher

C – Designing your yard

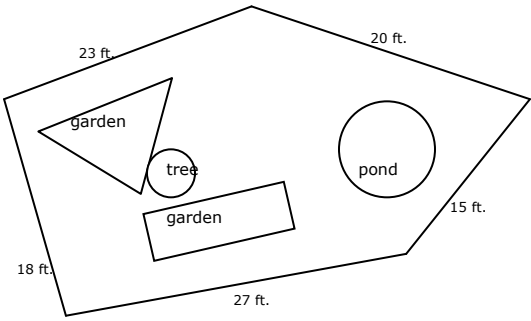
a) Your yard may take on any shape and size (the bigger the better and then you will have more room to put in what you want).



- Draw the shape of your yard, as would be seen from above.
- Next, write in the dimensions of your yard (with Imperial measures). The yard may be any size, however it is important that what you write is **reasonable** and makes sense logically.

b) What do you want in your yard? The bare minimum for your yard:

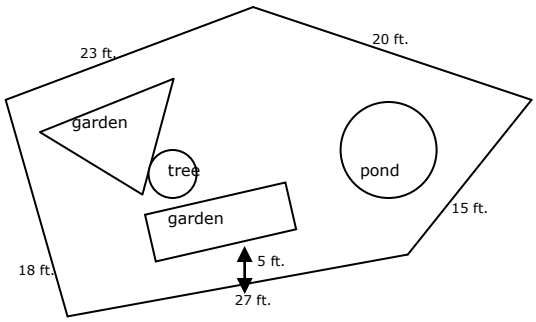
- A fence to enclose the yard
- A gate so that you may walk into the yard
- A round pond
- Two garden beds (of any shape) for flowers or other plants
- A tree



Other options include:

- A patio (for a table and/or barbecue)
- Bushes/shrubs
- A swimming pool
- Anything else you like

- Be creative and place the required elements and anything other items you want in your yard.
- Next, state the dimensions of each element you placed in your yard. These items may be any size, however it is important that what you write agrees with the size of your yard and is **logical**.
- You must label all other distances as well (e.g. how far away at the gardens from the edge of the yard?)



	Level 4	Level 3	Level 2	Level 1	Below Level 1
Thinking/Inquiry					
Yard outline	Student constructs an appropriately shaped yard, with all distances clearly labeled. Distances are all logically thought out.	Student constructs an appropriately shaped yard, with all distances labeled. Distances are mostly logical.	Student constructs a yard that is not complete **or** not appropriate. Some distances are labeled **or** *some* distances are not logically thought out.	Student constructs a yard that is not complete or not appropriate. Most distances are not labeled or most distances are not logically thought out.	Student is unable to construct an enclosed yard. Distances are not labeled or distances given are not reasonable.
Yard elements	Student places all required elements into the yard, as well as optional elements. The dimensions of each element are clearly labeled and are logically thought out.	Student places all required elements into the yard. The dimensions of each element are clearly labeled and most are logically thought out.	Student places most of the required elements into the yard. Some dimensions are labeled or some dimensions are not logically thought out.	Student places some of the required elements into the yard. Most dimensions are not labeled or most dimensions are not logically thought out.	Student does not place any of the required elements in the yard. Dimensions are not labeled or dimensions given are not reasonable.
Placement of elements	Student specifies all distances required to show the placement of each element in the yard. The distances are consistent with the yard dimensions.	Student specifies all distances required to show the placement of each element in the yard. Most of the distances are consistent with the yard elements.	Student specifies most of the distances required to show the placement of each element in the yard or some of the distances given are not consistent.	Student specifies some of the distances required to show the placement of each element in the yard or most distances are not consistent.	Student does not provide details about the placement of each element in the yard or distances provided are not consistent.

Task #2 – Landscaping your Yard

Using your yard design from task #1 you are now going to landscape your yard. You will need to install a fence around your yard, lay sod on your yard, fill your flower gardens with soil and dig a hole for your pool.

For all your calculations in this task, round all answers to the nearest inch.

Label and show all your calculations.

A - Fencing your Yard

You need to install a fence around your yard for privacy.

1. Calculate the amount of fence required to go around your yard. Don't forget you have a gate.

Show all your work and calculations.

4 marks (A)

B - Sodding your yard

You want to lay grass (sod) on your new yard.

1. Look at your yard and identify where you need grass. Find the total area that requires grass. Show all your work and calculations.

13 marks (A)

C - Filling your Garden

1. It's time to fill each garden with soil. Determine the amount of soil required for each garden if the soil depth is 12 inches.

8 marks (A)

Amount of soil for garden # 1:

Amount of soil for garden # 2 =

What is the total amount of soil required?

D - Filling your Pond

1. When you dig the hole for your pond a volume of earth is removed. Draw a rough sketch (diagram) of your pond below, label the dimensions and calculate how much earth will be removed for your pond.

3 marks (A)

2. Do you have enough soil from the hole dug for your pond to use in your garden beds?

If you have enough soil, calculate how much soil you have left over after using what you can in your gardens. Show all your work.

OR

If you do not have enough soil from your pond, calculate how much more soil you need to purchase. Show all your work.

3 marks (A)

3. You need to fill your pond with water. The pond will be filled to a depth of 0.5 ft **from the top**, calculate how many cubic feet of water are needed to fill your pond?
(**Hint**: draw the water level on your diagram above)

3 marks (A)

	Level 4	Level 3	Level 2	Level 1	Below Level 1
Thinking/Inquiry	Student *independently* recognizes the mathematical concept associated with finding the amount of: fence; sod for the yard; soil for the garden beds; **and** water for the pond.	Student independently recognizes the mathematical concept associated with finding 3 of the following - the amount: of fence; sod for the yard; soil for the garden beds; **or** water for the pond.	Student independently recognizes the mathematical concept associated with finding 2 of the following - the amount: of fence; sod for the yard; soil for the garden beds; **or** water for the pond.	Student independently recognizes the mathematical concept associated with finding 1 of the following - the amount: of fence; sod for the yard; soil for the garden beds; **or** water for the pond.	Student requires assistance to begin each step of the problem.
Application	Student is able to correctly determine the amount: of fence required; sod for the yard; soil for the garden beds; **and** water or the pond	Student is able to correctly determine the amount: of fence required; sod for the yard; soil for the garden beds; and water or the pond with minor errors.	Student is able to begin calculations required, with errors that prevent complete execution of the calculations for no more than 2 of the 4 parts.	Student is able to begin calculations required, with errors that prevent complete execution of the calculations for more than 2 of the 4 parts.	Student is unable to begin calculations required.
Communication	Student presents an organized solution that labels or explains their calculations. Appropriate units are used throughout.	Student presents an organized solution. Appropriate units are used throughout.	Student presents a final answer along with some calculations. Student does not consistently use appropriate units.	Student solutions include little details / provides only the final answer. Units are not utilized.	Student does not provide a solution.

/24	(level)	(level)
A	T	C

Task #3 – Planting your gardens and Filling your Pond

Remember your yard? This task will take a look at how to fill up your garden with soil and how to fill your pond with water.

A – How much soil do you have?

We are going to get most of our soil from the hole we will dig to put in our pond. The pond provides 86 cubic feet of soil.

You decide to purchase a pre-fabricated garden bed frame from Home Depot. It is rectangular shaped, 6 ft. by 8 ft. You need to dig an appropriate sized hole to place the garden, and it needs to be 12 inches deep.

Draw the Home Depot garden bed below. Show the depth of 12 inches in your diagram, and label all other dimensions.

/ 3 A

How much soil do you have in total (from the garden bed and from the pond)? Round your answer to the nearest **cubic foot**.

/ 4 A

B - Fertilizer

In order to use the soil you have dug out, you are going to need to add fertilizer.

In case you are interested …
Fertilizer contains 3 main elements that promote plant growth: Nitrogen (N), Phosphorous (P) and Potassium (K). It is not usual to find these elements in “regular” soil, so we add fertilizer to give plants what they need.

You have _____ of soil.

It is recommended that you use 2 lbs of fertilizer for every 10 cubic-feet of soil.

How much fertilizer do you require? Round to the nearest pound.

/ 3 A

You need a fertilizer that contains N, P and K in the ratio 12 : 5 : 8, which is not available pre-mixed. So, you have to make your own fertilizer. How many pounds of each component (N, P and K) do you need to make your fertilizer?

/ 5 A

Bags of each component are priced as follows:

- Nitrogen (N) – 8 lb bag for $6.95
- Phosphorous (P) – 10 lb bag for $11.95
- Potassium (K) – 8 lb bag for $13.45

How much of each bag do you need to purchase?

/ 3 A

C – Filling Up the Pond

Now that your gardens are done and there is a hole dug for the pond, we need to fill it with water. Water comes out of your garden hose at a rate of 2 cubic feet / minute. How long will it take to fill up the pond with water, if you want the water level to be 6-inches from the top of the pond?

/ 3 A

In order to save time, you decide to turn on the hose to fill the pond while you go to dig your garden bed. You are able to dig at a rate of 1.5 cubic feet per minute. What will be finished first – Filling the pond with water or digging the hole for the garden bed? Show all your work.

/ 3 A