Self-Assessment for Grade 12 Foundations for College Math (MAP4C)

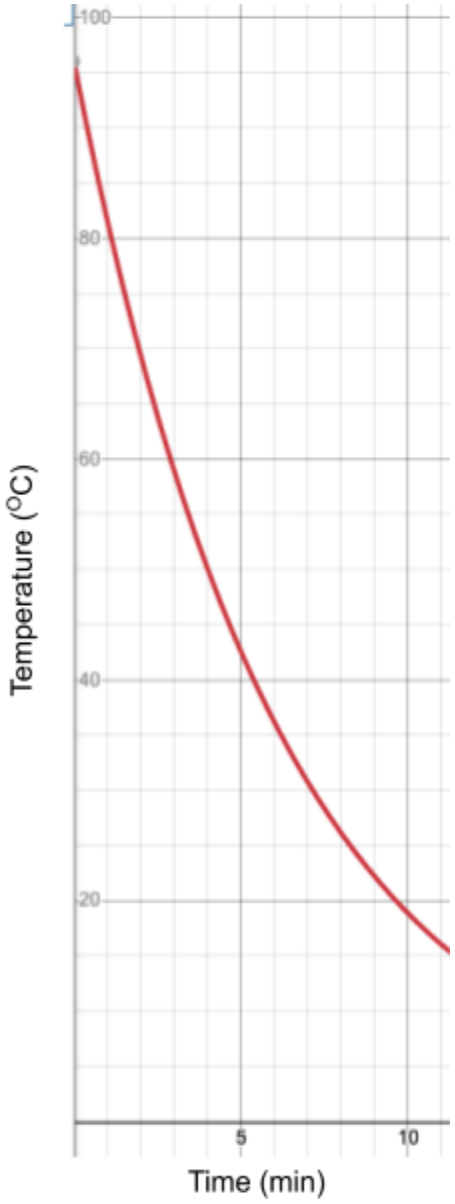
Students who are registered for Grade 12 College Math (MAP4C) may benefit from a self evaluation and review of the following expectations from Grade 11 College Math (MBF3C) and earlier courses.

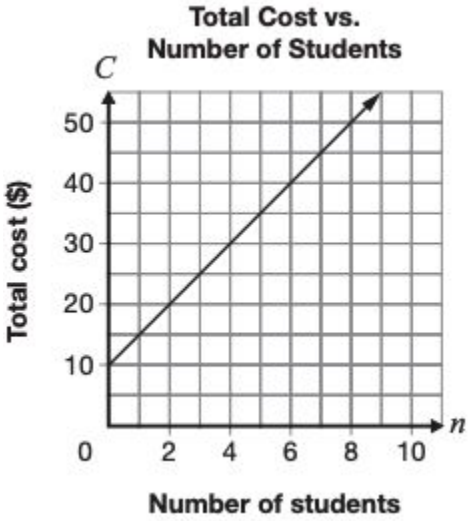
The questions in this self-assessment reflect some of the key ideas learned in prerequisite courses. They do not represent the problem solving approach or the rich experience that students would be exposed to in a classroom. The intention is for students to revisit some key concepts and, if needed, access review materials in an informal environment at a pace that is comfortable for the student.

Concept(s)	Sample Question	How comfortable do you feel with this concept?	Link(s) to explore concept further
I can solve first degree equations with integer coefficients	1. Solve: a) $8x - 13 = -61$ b) $3(2x - 3) = 12x - 57$	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Solving Two Step Equations Solving Multi Step Equations

I can evaluate, without technology, numerical expressions containing integer exponents and rational bases	2. If $x=\frac{3}{5}$ and $y=3$, find: a) x^3 b) $-y^4$	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Introduction to Exponents
I can simplify expressions involving exponents	3. Write as a single power $\frac{x^3 \times x^9}{(x^2)^3}$	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Primary Exponent Rules

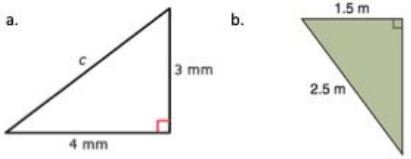
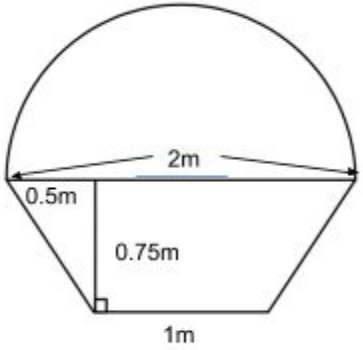
I can solve problems involving exponential relations	4. A cup of tea is left in a cool room. The graph below shows the temperature of the tea over time. a) How long did it take for the temperature to fall to $50°$ C? b) How long did it take for the temperature to fall to $40°$ C? c) Is the temperature decreasing at a constant rate? Explain. d) Would it make sense to extrapolate the graph to determine the temperature after 30 minutes?	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Exponential Decay

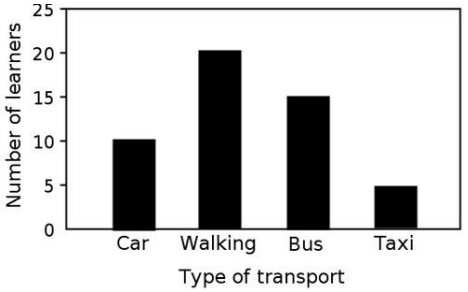

100
80
60
40
20
Temperature (°C)
5
10
Time (min)

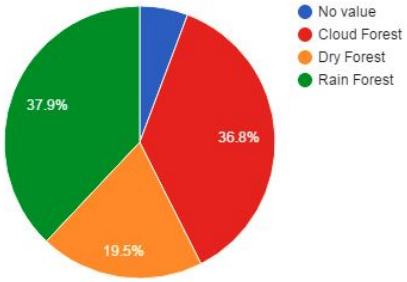
I can define the slope as the ratio $m = \frac{rise}{run}$	5. Determine the slope of the line. What does the slope represent?  (Image from EQAO released examples, 2018)	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Developing the Slope Formula
I can solve problems involving a quadratic relation by interpreting a given graph or a graph generated with technology from its equation	6. Consider the graph below, which shows the height of a diver after jumping off of a springboard. a. Determine the coordinates of the vertex. What do these coordinates represent? b. What is the height of the springboard?	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	What Is a Quadratic Relation?

I can solve compound interest problems	7. A graduating student invests $3000 for 3 years in a bond that earns 6% interest per year, compounded quarterly. How much will the bond be worth at the end?	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Introduction to Compound Interest

I can calculate the total interest earned on an investment, or paid on a loan, by determining the difference between the amount and the principal	8. An investor invests money at 3.2% per year compounded semi-annually. They received $23 440.51 at the end of a 5-year term. How much interest did they earn?	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Different Compounding Periods
I can perform everyday conversions between the imperial system and the metric system to solve problems involving measurement	9. Convert each measure to the unit indicated: a. 7.2 metres to millimetres b. 220 inches to centimetres	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Converting Units Numerically

I can solve problems using the Pythagorean theorem	10. Find the missing side length:  	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	The Pythagorean Theorem
I can solve problems involving the areas and perimeters of composite shapes	11. The figure below is made of a semicircle and a trapezoid. Determine the perimeter and area of the figure:  	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Perimeter of Composite Shapes Area of Composite Shapes

I can solve problems by interpreting and analyzing data	12. The bar graph below shows the results of a survey in a course. a. How many learners take the bus? b. If everyone participated in the survey, how many people are taking the course?  13. A scientist researched the ecosystems in which butterflies live, and then displayed the data in this circle graph. a. What does the red area represent? b. What does the blue area represent? c. What conclusions might the scientist make from this graph?	☐ **Very comfortable** ☐ **Somewhat comfortable** ☐ **Not at all comfortable**	Information in Graphs

Solutions to Sample Questions:

1. Solve:
   a) $8x - 13 = -61$
   b) $3(2x - 3) = 12x - 57$

   a)
   $x = -6$
   b)
   $x = 8$

2. If $x = \frac{3}{5}$ and $y = 3$, find:
   a) x^3
   b) $-y^4$

a) $\left(\frac{3}{5}\right)^3 = \frac{3}{5} \times \frac{3}{5} \times \frac{3}{5} = \frac{27}{125}$

b) $-3^4 = -3 \times 3 \times 3 \times 3 = -81$

Notice that the "-" sign is not included in the base.

3. Write as a single power

$$\frac{x^3 \times x^9}{(x^2)^3}$$

$$\frac{x^3 \times x^9}{(x^2)^3}$$

$$= \frac{x^{12}}{x^6}$$

$$= x^6$$

Use the exponent laws for multiplication, power of a power, and then division.

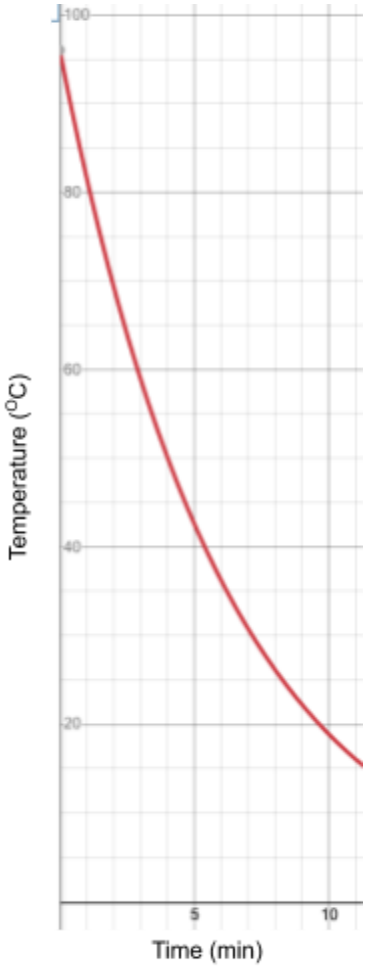
4. A hot cup of tea is left in a cool room. The graph below shows the temperature of the tea over time.

a) How long did it take for the temperature to fall to $50°$ C?

b) How long did it take for the temperature to fall to $40°$ C?

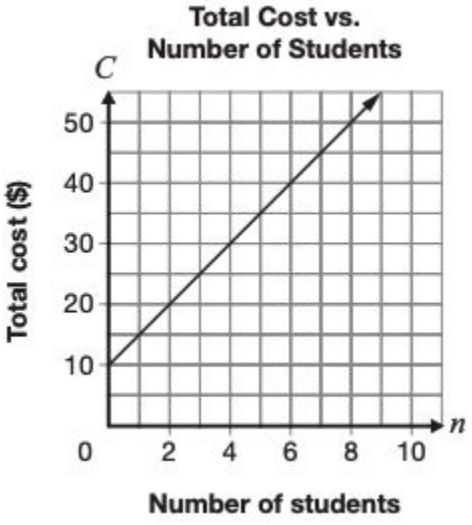
c) Is the temperature decreasing at a constant rate? Explain.

d) Would it make sense to extrapolate the graph to determine the temperature after 30 minutes?



a) It took approximately 4 minutes for the temperature to fall to $50°$ C.
b) It took approximately 5.5 minutes for the temperature to fall to $40°$ C.
c) The decrease in temperature is slowing down. If the decrease in temperature was constant, the graph would be linear.
d) No. After a certain time, the tea would reach the temperature of the room, and not decrease below that.

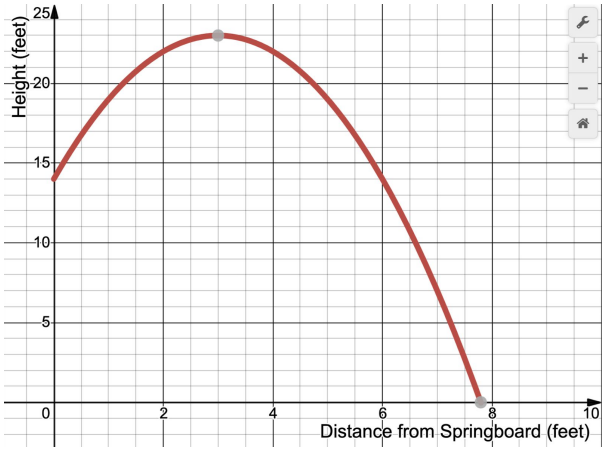
5. Determine the slope of the line. What does the slope represent?



(Image from EQAO released examples, 2018)

Slope is 5. (Pick two clear grid points, e.g. (0,10) and (2,20). Rise = 10, Run = 2. $Slope = \frac{Rise}{Run}$ **)**
The slope represents the rate of change of the cost compared to the number of students. Therefore, the cost is $5 per student. (Note that there is also a fixed cost of $10.)

6. Consider the graph below, which shows the height of a diver after jumping off of a springboard.
a) Determine the coordinates of the vertex. What do these coordinates represent?
b) What is the height of the springboard?



a) The vertex is (3, 23). The maximum height of the diver is 23 feet. When the diver is at this height, their horizontal distance from the springboard is 3 feet.
b) The dive begins at a height of 14 feet, so the springboard is 14 feet high.

7. A graduating student invests $3000 for 3 years in a bond that earns 6% interest per year, compounded quarterly. How much will the bond be worth at the end?

The bond will be worth $3586.85.

In the formula $A = P(1+i)^n$**, P=3000, i=** $\frac{0.06}{4}$ **, n=3x4, solve for A.**

8. An investor invested money at 3.2% per year compounded semi-annually. They received $23 440.51 at the end of a 5-year term. How much interest did they earn?

The investor earned $3440.51 in interest.

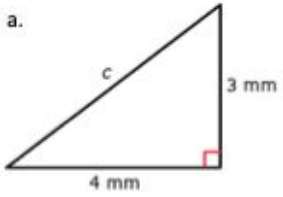
In the formula $A = P(1 + i)^n$, A=23440.51, i= $\frac{0.032}{2}$, n=6x2, solve for P. This gives the principal of $20 000. If the principal was $20 000 and the ending amount was $23440.51, then the difference of $3340.51 is the amount of interest that was earned.

9. Convert each measure to the unit indicated:
a) 7.2 metres to millimetres
b) 220 inches to centimetres

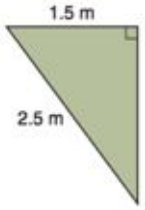
a) 7 200 mm (1 m = 1 000 mm)
b) 558.8 cm (1 in = 2.54 cm)

10. Find the missing side length:

a.



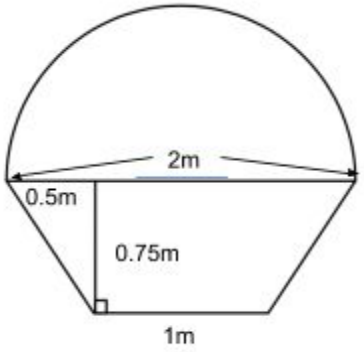
b.



Use the Pythagorean Theorem.

a) 5 mm (find the hypotenuse - longest side)
b) 2 mm (find a leg - one of the shorter sides)

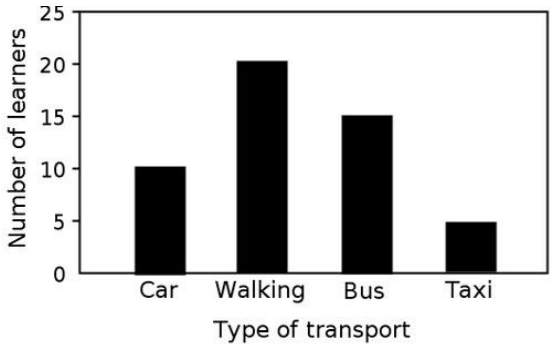
11. The figure below is made of a semicircle and a trapezoid. Determine the perimeter and area of the figure:



PERIMETER
The circumference of the semicircle part is 3.14m. (Circumference of circle is $C = \pi d$, and then divide by 2 as it is a semicircle)
Using the Pythagorean Theorem, the diagonal side is 0.9m.
The other diagonal side will also be 0.9m, as the "triangle" on the right will have the same dimensions as the triangle on the left.
The horizontal side is 1m long.
Therefore, perimeter = 3.14 + 0.9 + 1 + 0.9 = 5.94m.

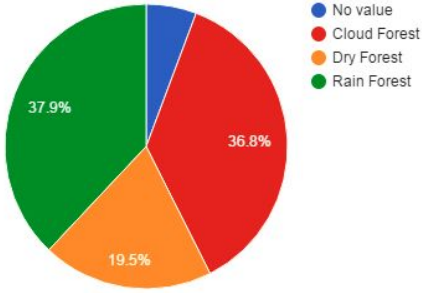
AREA
The radius of the semicircle is 1m.
The area of the semicircle is 1.57m^2. ($A = \pi r^2$, then divide by 2)
The trapezoid can be divided into two triangles and a rectangle between them.
The area of one triangle is 0.1875m^2.
The area of the rectangle is 0.75m^2.
Therefore, area = 1.57 + 0.1875 + 0.1875 + 0.75 = 2.695m^2.

12. The bar graph below shows the results of a survey in a course.
a) How many learners take the bus?
b) If everyone participated in the survey, how many people are taking the course?



a) Fifteen learners take the bus.
b) Add the numbers of the learners who use each method of transportation: 10 + 20 + 15 + 5. There are 50 students taking the course.

13. A scientist researched the ecosystems in which butterflies live, and then displayed the data in this circle graph.
a) What does the red area represent?
b) What does the blue area represent?
c) What conclusions might the scientist make from this graph?



a) The red area says that 36.8% of butterflies live in cloud forests.

b) The blue area says that a small percentage (5.8%) of the butterflies live in areas other than cloud forest, dry forest or rain forest.
c) The scientist could conclude that butterflies live mostly in rain forests, followed closely by cloud forests.