

Self-Assessment for Grade 10 Academic Math (MPM2D)

Students who are registered for Grade 10 Academic Math (MPM2D) may benefit from a self evaluation and review of the following expectations from Grade 9 Academic Math (MPM1D).

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 evaluate an algebraic expression involving exponents, by substituting a value into the variable	1. If $x = \frac{3}{5}$ and $y = 3$, find: a) x^3 b) $-y^4$	 <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable	An Introduction to Exponents

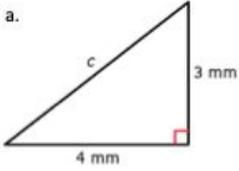
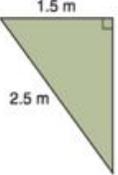
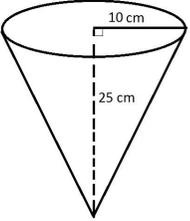
<p>I can apply the exponent rules for multiplying and dividing monomials to simplify expressions involving one and two variables with positive exponents</p>	<p>2. Write as a single power</p> $\frac{x^3 \times x^9}{(x^2)^3}$	<p>  <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable </p>	<p>Primary Exponent Rules (Product, Quotient, and Power of a Power)</p>
<p>I can add and subtract polynomials with up to two variables</p> <p>I can multiply a polynomial by a monomial involving the same variable</p> <p>I can expand and simplify polynomial expressions involving one variable</p>	<p>3. Simplify:</p> <p>a) $(3x^2 - 1) + (4x^2 - 2x + 6)$</p> <p>b) $(2x - 7y) - (3x - 2y + 5)$</p> <p>c) $3x(x - 1) + x(4x^2 - 2)$</p>	<p>  <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable </p>	<p>Adding and Subtracting Polynomials</p> <p>Simplifying an Expression Using the Distributive Property</p>

<p>I can solve first degree equations with integer coefficients</p> <p>I can solve first degree equations with fractional coefficients</p>	<p>4. Solve:</p> <p>a. $8x - 13 = -61$</p> <p>b. $3(2x - 3) = 12x - 57$</p> <p>c. $\frac{x}{3} - 5 = \frac{5}{2}x - 44$</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Solving Two-Step Equations</p> <p>Solving Multi-Step Equations</p> <p>Equations with Rational Coefficients</p>
<p>I can rearrange formulas</p>	<p>5. The formula $C = \frac{5}{9}(F - 32)$ allows you to convert between temperatures in degrees Celsius (C) and in degrees Fahrenheit (F).</p> <p>a) Rearrange this formula to isolate F b) Determine the temperature in degrees Fahrenheit if the temperature is 50 degrees Celsius.</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Rearranging Formulas</p>

<p>I can identify, through investigation, that a linear relation is represented graphically by a straight line</p> <p>I can interpret the intersection point of two linear relations in the context of an application</p>	<p>6. A summer job pays \$325 per week and 10% commission on total sales during that week.</p> <p>a) Write an equation to show the relationship between total sales (s) and the amount earned (E).</p> <p>b) Is the relationship linear? How do you know?</p> <p>c) Graph the relationship for sales between \$0 and \$2500.</p> <p>d) If a student earned \$645.00 in a week, what was the value of total sales for the student during that week?</p> <p>e) How would the graph of the relationship change if the job paid \$325 per week and 7% commission?</p> <p>f) If you worked for this company, would it be better for you to earn \$325 per week with 10% commission or would it be better to earn \$450 per week with no commission? Explain.</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Intro to Linear Relations Part 2</p> <p>Graphing Linear Relations</p> <p>Changing the Properties of a Linear Relation</p>
<p>I can determine values of a linear relation by using a table of values</p>	<p>7. Create a table of values for the relation $y = -\frac{2}{3}x - 5$</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Graphing Linear Relations Using a Table of Values</p>

<p>I can identify, the geometric significance of m and b in the equation $y=mx+b$</p> <p>I can graph lines by hand using a variety of techniques</p>	<p>8. Consider the line $y = \frac{3}{2}x + 6$</p> <p>a. Identify the slope. b. Identify the y-intercept. c. Graph the line.</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Graphing Linear Relations Using the Slope and y-Intercept</p>
<p>I can find the x- and y-intercepts of a line</p>	<p>9. Consider the line $x - 5y + 10 = 0$</p> <p>a. Determine the x-intercept of the line. b. Determine the y-intercept of the line.</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Graphing Linear Relations Using the x- and y-Intercepts</p>

<p>I can determine the equation of a line from information about the line</p>	<p>10. A line passes through the points $A(3, -3)$ and $B(-9, -11)$. Find the equation of the line.</p> <p>11. Given this group of lines,</p> $y = -2x + 3 \quad y = 5x + 1 \quad y = \frac{1}{2}x + 3$ $y = 5x - 10 \quad y = 2x + 1 \quad y = 5$ <p>select two lines that are</p> <ol style="list-style-type: none"> Parallel Perpendicular <p>12. A line has the same x-intercept as the line $3x + 2y + 72 = 0$ and is perpendicular to $3x + y - 2 = 0$. Find the equation of the line.</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Point-Slope Form of a Line</p> <p>Parallel and Perpendicular Lines</p>
<p>I can determine the maximum area given a perimeter by constructing a variety of rectangles</p>	<p>13. What is the minimum amount of fence needed to completely enclose a rectangular area of 400 square metres?</p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>Maximizing Area of Rectangles with Fixed Perimeter</p>

<p>I can solve problems using the Pythagorean theorem as needed in problems</p>	<p>14. Find the missing side length:</p> <p>a. </p> <p>b. </p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>The Pythagorean Theorem</p>
<p>I can solve problems involving the surface areas and volumes of prisms, pyramids, cylinders, cones, and spheres</p>	<p>15. The diagram shows a closed cone.</p> <p>a. Calculate the slant height.</p> <p>b. Find the surface area.</p> <p></p>	<p> <input type="checkbox"/> Very comfortable</p> <p> <input type="checkbox"/> Somewhat comfortable</p> <p> <input type="checkbox"/> Not at all comfortable</p>	<p>The Pythagorean Theorem</p> <p>Surface Area of Pyramids and Cones</p>

Solutions to Sample Questions:

1. If $x = \frac{3}{5}$ and $y = 3$, find:

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

$$\text{b. } -y^4 = -3^4 = -3 \times 3 \times 3 \times 3 = -81$$

Notice that the “-” sign is not included in the base.

2. Write as a single power

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

$$= x^6$$

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

3. Simplify:

$$\text{a. } (3x^2 - 1) + (4x^2 - 2x + 6) = 7x^2 - 2x + 5$$

$$\text{b. } (2x - 7y) - (3x - 2y + 5) = -x - 5y - 5$$

$$\text{c. } 3x(x - 1) + x(4x^2 - 2) = 4x^3 + 3x^2 - 5x$$

4. Solve:

$$\text{a. } 8x - 13 = -61 \quad x = -6$$

$$\text{b. } 3(2x - 3) = 12x - 57 \quad x = 8$$

$$\text{c. } \frac{x}{3} - 5 = \frac{5}{2}x - 44 \quad x = 18$$

Multiply every term on both sides by the lowest common denominator (6) in order to clear the fractions.

5. The formula $C = \frac{5}{9}(F - 32)$ allows you to convert between temperatures in degrees Celsius

(C) and in degrees Fahrenheit (F).

$$F = \frac{9C + 160}{5} \text{ or } F = \frac{9}{5}C + 32$$

a. Rearrange this formula to isolate F .

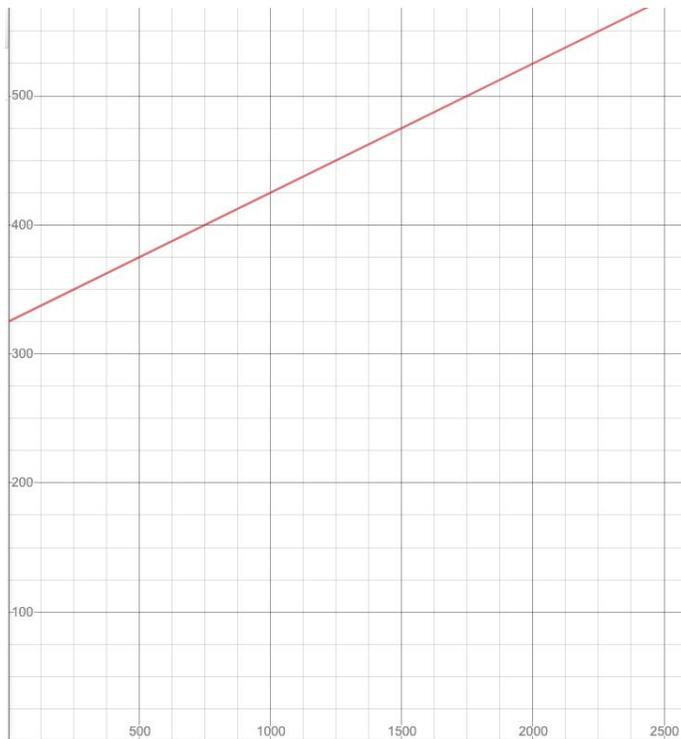
b. Determine the temperature in degrees Fahrenheit if the temperature is 50 degrees Celsius. **The temperature is 122 degrees Fahrenheit.**

6. A summer job pays \$325 per week and 10% commission on total sales during that week.

a. Write an equation to show the relationship between total sales (s) and the amount earned (E). $E = 325 + 0.10s$ or $E = 0.10s + 325$

b. Is the relationship linear? How do you know? **The relationship is linear, as the equation is in the form $y=mx+b$. Also, if we create a table of values, we would find that the first differences are constant (0.10)**

c. Graph the relationship for sales between \$0 and \$2500.



- d. If a student earned \$645.00 in a week, what was the value of total sales for the student during that week? **The total sales were \$3200.00 (Solve the equation $637.50 = 325 + 0.1 \cdot s$)**
- e. How would the graph of the relationship change if the job paid \$325 per week and 8% commission? **Since the rate of change of earnings is lower, we would still begin at (0, 325) and increase, but the line would be less steep.**
- f. If you worked for this company, would it be better for you to earn \$325 per week with 10% commission or would it be better to earn \$450 per week with no commission? Explain. **It takes \$1250 in sales for the week to earn \$450. Therefore, if I thought I might make less than \$1250 in sales, the \$450 with no commission would be better. If I thought I might make more than \$1250 in sales, the \$325 plus commission would be better. At exactly \$1250 in sales, the two options give the same earnings.**

7. Create a table of values for the relation

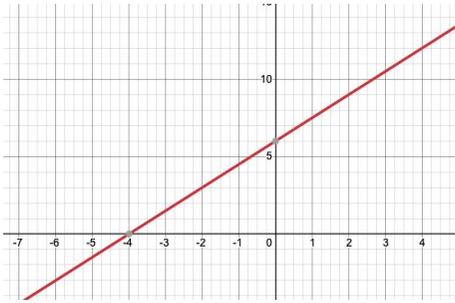
$$y = -\frac{2}{3}x - 5$$

x	y
-6	-1
-3	-3
0	-5
3	-7
6	-9

It is convenient to select x values that would result in y -values that have no fractions, for easy graphing. For this relation, we decide to choose x values that are multiples of 3.

8. Consider the line $y = \frac{3}{2}x + 6$

- Identify the slope. $\frac{3}{2}$
- Identify the y -intercept. **6**
- Graph the line. **Start at (0,6). Rise 3, run 2.**



9. Consider the line $x - 5y + 10 = 0$

- Determine the x-intercept of the line. **x-int is -10 (substitute 0 for y and solve for x)**
- Determine the y-intercept of the line. **y-int is 2 (substitute 0 for x and solve for y)**

10. A line passes through the points $A(3, -3)$ and $B(-9, -11)$. Find the equation of the line. $y = \frac{2}{3}x - 5$

11. Given this group of lines,

$$y = -2x + 3 \quad y = 5x + 1 \quad y = \frac{1}{2}x + 3$$

$$y = 5x - 10 \quad y = 2x + 1 \quad y = 5$$

Select two lines that are

a. Parallel $y = 5x + 1$ and $y = 5x - 10$ **(their slopes are the same)**

b. Perpendicular $y = -2x + 3$ and $y = \frac{1}{2}x + 3$ **(their slopes are negative reciprocals of each other)**

12. A line has the same x-intercept as the line $3x + 2y + 72 = 0$ and is perpendicular to $3x + y - 2 = 0$. Find the equation of the line.

The x-intercept is -36 (substitute $y=0$ and solve for x)

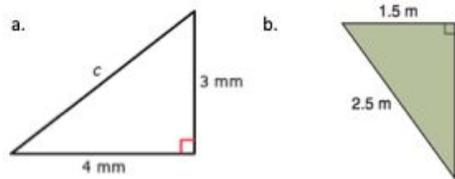
The slope is $\frac{1}{3}$ (rearrange the equation to $y=mx+b$, get $y = -3x + 2$, then take the negative reciprocal of m)

Substitute the point (-36, 0) into the equation $y = \frac{1}{3}x + b$ and solve for b.

The equation of the line is $y = \frac{1}{3}x + 12$.

13. What is the minimum amount of fence needed to completely enclose a rectangular area of 400 square metres? **80 metres.**
(To minimize the perimeter of a rectangle, make the rectangle into a square. The side lengths would all be 20m, so the perimeter would be 80m.)

14. Find the missing side length:



Use the Pythagorean Theorem.

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

15. The diagram shows a closed cone.
- a. Calculate the slant height to one decimal place. **26.9 cm (use the Pythagorean Theorem)**
 - b. Find the surface area to one decimal place. **1159.2 cm² (surface area of cone formula: $\pi r^2 + \pi r s$, where r is the radius and s is the slant height)**

