



















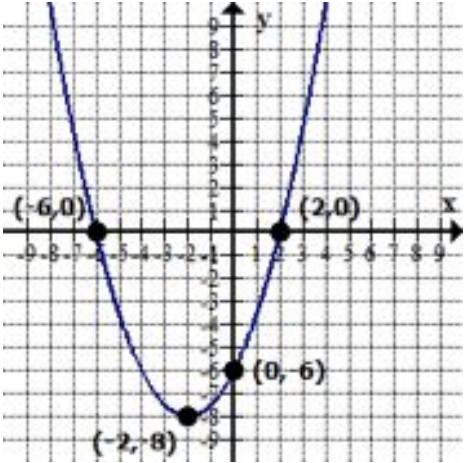






Self-Assessment for Grade 11 University Math (MCR3U)







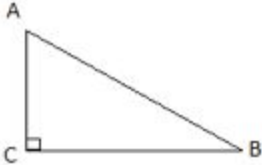



Students who are registered for Grade 11 University Math (MCR3U) may benefit from a self evaluation and review of the following sample of expectations from Grade10 Academic Math (MPM2D).








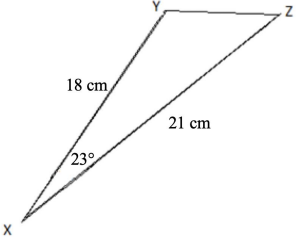






The questions in this self-assessment reflect some of the key ideas learned in prerequisite courses. They do not represent the problem solving approach or the rich experience that students would be exposed to in a classroom. The intention is for students to revisit some key concepts and, if needed, access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

Concept	Sample Question and Answer	How comfortable do you feel with this concept?	Link for further support
I can solve linear systems by graphing or by using the methods of substitution or elimination	1. Solve the system of equations. $4x - 5y = 12$ $6x - 10y = 24$ 2. Some high-school students held a bake sale recently to raise money for a field trip. They charged \$7 for fruit pies and \$10 for meat pies. They sold a total of 52 pies and earned \$424. How many of each type of pie did they sell?	 <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable	Solve Systems of Linear Equations
I can identify the key features of a graph of a parabola and use the appropriate terminology to describe them	3. For the quadratic relation $y = 2(x + 3)^2 + 4$, state the: a) direction of the opening; b) stretch or compression factor; c) coordinates of the vertex; d) equation of the axis of symmetry; e) y-intercept. f) Graph the Relation	 <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable	Key Features of a Parabola

<p>I can determine the meaning of a negative exponent and of zero as an exponent</p>	<p>4. Evaluate: a) 5^0 b) 4^{-2}</p> <p>5. Describe the significance of any power with an exponent of 0.</p> <p>6. Describe the role of the negative in the exponent when simplifying 4^{-1}.</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>Zero as an Exponent</p> <p>Negative Integer Exponents</p>
<p>I can explain the roles of a, h, and k in $y = a(x - h)^2 + k$, using the appropriate terminology and identify the vertex and the equation of the axis of symmetry;</p>	<p>7. Consider the function $y = -2(x + 3)^2 + 5$.</p> <p>a) State the vertex and axis of symmetry. b) Describe the transformations used to transform $y = x^2$ into $y = -2(x + 3)^2 + 5$</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>Transformations of Parabolas</p>
<p>I can sketch, by hand, the graph of $y = a(x - h)^2 + k$ using transformations</p>	<p>8. Sketch the graph of $y = -2(x + 3)^2 + 5$</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 Given Vertex Form</p>

<p>I can factor polynomial expressions involving common factors, trinomials, and differences of squares using a variety of tools and strategies</p>	<p>9. Factor the following:</p> <p>a) $x^2 - 14x + 49$ b) $25x^2 - 16$ c) $3x^2 - 14x - 5$ d) $10x^3 + 35x^2 + 15x$</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>Algebraic Skills</p>
<p>I can determine and describe the connection between the factors of a quadratic expression and the x-intercepts of the graph using $y = a(x - r)(x - s)$</p>	<p>10. Determine the equation of the graph below.</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>Finding an Equation from a Graph</p>
<p>I can solve quadratic equations that have real roots</p>	<p>11. Solve the following quadratic using any method: $5x^2 - 2x - 4 = 0$</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 Using the Quadratic Formula</p>

<p>I can determine the zeros and the max/min value of a quadratic relation from its graph or from its defining equation</p>	<p>12. Determine the maximum value of $y = 2x^2 - 36x + 130$</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>Exploring Vertex Form</p> <p>Complete the Square for Vertex Form</p>
<p>I can solve problems arising from a realistic situation represented by a graph or an equation of a quadratic relation, with and without the use of technology</p>	<p>13. The flight path of a firework is modeled by the relation, $h = -5(t - 5)^2 + 127$, where h is the height, in metres, of the fireworks above the ground and t is the time, in seconds, since the fireworks was fired.</p> <p>a) What was the maximum height reached by the fireworks?</p> <p>b) When did the fireworks reach its maximum height?</p> <p>c) What was the height from which the fireworks were launched?</p> <p>d) What was the height of the fireworks at 2 seconds?</p> <p>e) At what time did the empty fireworks casing reach the ground?</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>Applications Involving Quadratic Relations</p>
<p>I can define the sine, cosine, and tangent ratios (e.g., $\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$)</p>	<p>14) Write each of the primary trig ratios in terms of the side lengths of the below triangle:</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>Trigonometric Ratios</p> <p>What Is the Tangent Ratio?</p>

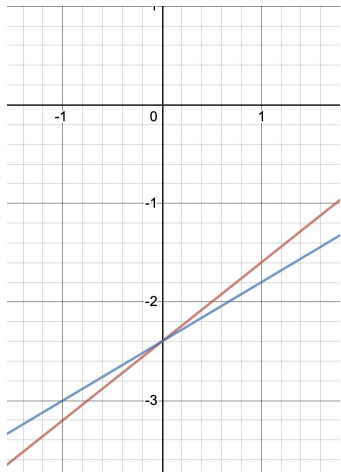
<p>I can determine the measures of the sides and angles in right triangles using the primary trigonometric ratios</p>	<p>15) Determine the measures of side AB and angle A if the length of AC is 5 and CB is 12, using primary trig ratios.</p> 	<p>  <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable </p>	<p>Applications of the Tangent Ratio</p> <p>The Pythagorean Theorem</p>
<p>I can solve problems involving the measures of sides and angles in right triangles in real-life applications.</p>	<p>16) A surveyor is 40m from the edge of a building. The angle of elevation from the surveyor to the top of the building is 55°. What is the height of the building?</p>	<p>  <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable </p>	<p>Applications of the Tangent Ratio</p> <p>Applications of Sine and Cosine</p>
<p>I can determine the measures of sides and angles in acute triangles, using the cosine law or sine law.</p>	<p>17) Determine the measure of the unknown side YZ.</p> 	<p>  <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable </p>	<p>The Cosine Law</p> <p>The Sine Law</p>
<p>I can solve problems involving the measures of sides and angles in acute triangles</p>	<p>18) The length of the base of an isosceles triangle is 30 metres. The angle opposite the base measures 32°. Find the perimeter of the triangle, the nearest metre.</p>	<p>  <input type="checkbox"/> Very comfortable  <input type="checkbox"/> Somewhat comfortable  <input type="checkbox"/> Not at all comfortable </p>	<p>Applications with Acute Triangles</p>

Solutions to Sample Questions:

1. Solve the system of equations.

$$4x - 5y = 12$$

$$6x - 10y = 24$$



P.O.I at (0, -2.4)

2. Some high school students held a bake sale recently to raise money for a field trip. They charged \$7 for fruit pies and \$10 for meat pies. They sold a total of 52 pies and earned \$424. How many of each type of pie did they sell?

Let F represent the number of Fruit Pies sold.

Let M represent the number of Meat Pies sold.

$$7F + 10M = 424 \quad (1)$$

$$F + M = 52 \quad (2)$$

Solve (2) for F: $F = 52 - M$

Sub this into (1)

$$7(52 - M) + 10M = 424$$

$$364 - 7M + 10M = 424$$

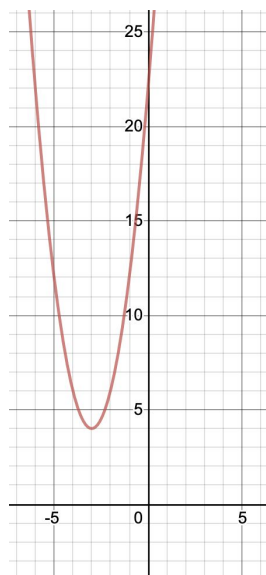
$$3M = 60$$

$$M = 20$$

Sub $M = 20$ into (2): $F + 20 = 52 \rightarrow F = 32$

Therefore they sold 32 Fruit pies and 20 Meat pies

3. For the quadratic relation $y = 2(x + 3)^2 + 4$, state the:
- direction of the opening; **Up**
 - stretch or compression factor; **Vertical stretch factor of 2**
 - coordinates of the vertex; **(-3,4)**
 - equation of the axis of symmetry; $x = -3$
 - y-intercept. **22**
 - Graph the Relation



4. Evaluate:

a. $5^0 = 1$

b. $4^{-2} = \frac{1}{16}$

5. Describe the significance of any power with an exponent of 0. **The value will always be 1.**

6. Describe the role of the negative in the exponent when simplifying 4^{-1} . **The base in this question is 4**

The operation using the negative in the exponent results in the reciprocal of the base: $\frac{1}{4}$

7. Consider the function $y = -2(x + 3)^2 + 5$.

- a. State the vertex and axis of symmetry. **Vertex (-3,5). Axis of symmetry: $x = -3$**
- b. Describe the transformations used to transform $y = x^2$ into $y = -2(x + 3)^2 + 5$

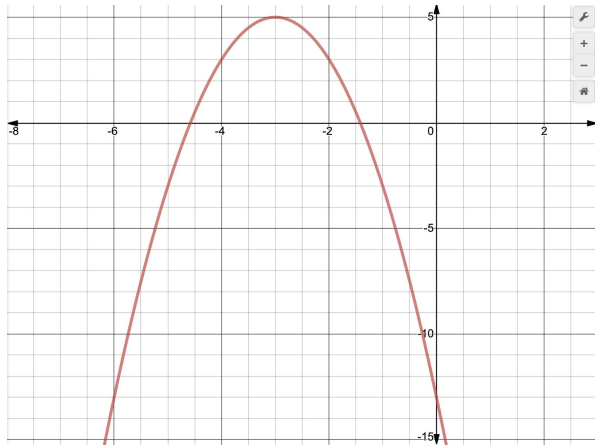
Reflection over x-axis

Vertical stretch by factor of 2

Horizontal translation by 3 to the left

Vertical translation by 5 up

8. Sketch the graph of $y = -2(x + 3)^2 + 5$.



9. Factor the following:

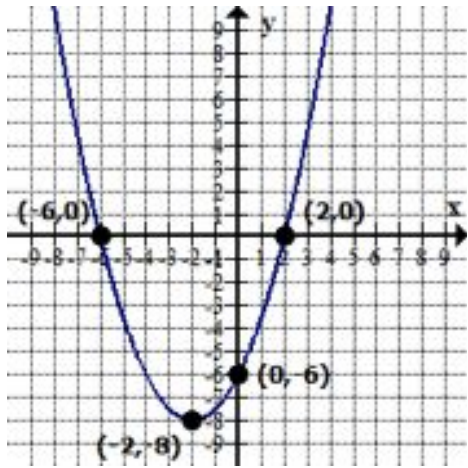
a) $x^2 - 14x + 49 = (x - 7)(x - 7) = (x - 7)^2$

b) $25x^2 - 16 = (5x - 4)(5x + 4)$

c) $3x^2 - 14x - 5 = (3x + 1)(x - 5)$

d) $10x^3 + 35x^2 + 15x = 5x(2x^2 + 7x + 3) = 5x(2x + 1)(x + 3)$

10. Determine the equation of the graph below.



$$y = 0.5(x + 2)^2 - 8$$

$$y = 0.5(x + 6)(x - 2)$$

11. Solve using any method

$$5x^2 - 2x - 4 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 \pm \sqrt{(-2)^2 - 4(5)(-4)}}{2(5)}$$

$$x = \frac{-5 \pm \sqrt{84}}{10}$$

$$x = -0.72, 1.11$$

12. Determine the maximum value of $y = 2x^2 - 36x + 130$

$$y = 2x^2 - 36x + 130 = 2(x - 13)(x - 5)$$

Axis of symmetry: $x = 9$

Find the value of the function at $x = 9$ to yield max value (as vertex must be on the axis of symmetry)

$$y = 2(9 - 13)(9 - 5)$$

$$= 2(-4)(4)$$

$$= -32$$

13. The flight path of a firework is modeled by the relation, $h = -5(t - 5)^2 + 127$, where h is the height, in metres, of the fireworks above the ground and t is the time, in seconds, since the fireworks was fired.

a. What was the maximum height reached by the fireworks? **Max height of 127 metres**

b. When did the fireworks reach its maximum height? **at a time of 5 seconds.**

c. What was the height from which the fireworks were launched? **Solve when t = 0.**

$$h = -5(0 - 5)^2 + 127$$

$$= -125 + 127$$

$$= 2 \text{ m}$$

d. What was the height of the fireworks at 2 seconds? **Solve when t = 2.**

$$h = -5(2 - 5)^2 + 127$$

$$= -20 + 127$$

$$= 107$$

Therefore the height of the fireworks was 107 m

e. At what time did the empty fireworks casing reach the ground?

Solve the equation

$$0 = -5(t - 5)^2 + 127$$

$$-127 = -5(t - 5)^2$$

$$\frac{127}{5} = (t - 5)^2$$

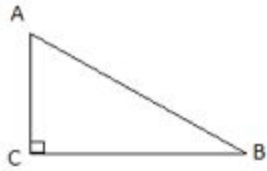
$$t - 5 = \pm \sqrt{\frac{127}{5}}$$

$$t = 5 + \sqrt{\frac{127}{5}}, 5 - \sqrt{\frac{127}{5}}$$

$$t = 10, 0$$

Therefore the casing hit the ground at 10 seconds.

14. Write each of the primary trig ratios, relative to A, in terms of the side lengths of the below triangle:

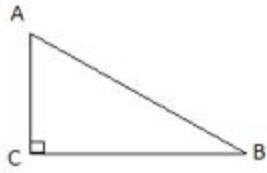


$$\sin A = \frac{BC}{AB} = \frac{a}{c}$$

$$\cos A = \frac{AC}{AB} = \frac{b}{c}$$

$$\tan A = \frac{BC}{AC} = \frac{a}{b}$$

15. Determine the measures of side AB and angle A if the length of AC is 5 and CB is 12, using primary trig ratios.



$$\tan A = \frac{12}{5}$$

$$A = \tan^{-1} \frac{12}{5} = 67.4^\circ$$

$$AB^2 = 5^2 + 12^2 = 25 + 144 = 169$$

$$AB = 13$$

Or

$$\sin 67.4 = \frac{12}{AB}$$

$$AB = \frac{12}{\sin 67.4}$$

$$AB = 13$$

16. A surveyor is 40m from the edge of a building. The angle of elevation from the surveyor to the top of the building is 55° . What is the height of the

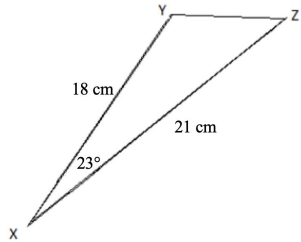
building?

$$\tan 55 = \frac{\text{height}}{40}$$

$$\text{Height} = 40 \tan 55$$

$$= 57.13$$

17. Determine the measures of the unknown side YZ.

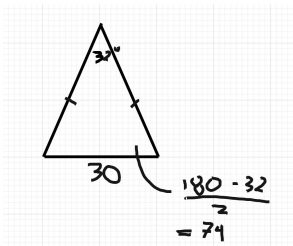


$$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos A$$

$$a^2 = 18^2 + 21^2 - 2(18)(21) \cos 23$$

$$a = 8.31$$

18. The length of the base of an isosceles triangle is 30 metres. The angle opposite the base measures 32° . Find the perimeter of the triangle, the nearest metre.



Solve for the length of the two equal sides:

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{30}{\sin 32} = \frac{x}{\sin 74}$$

$$x = \frac{30 \sin 74}{\sin 32}$$

$$x = 54.4$$

$$\text{Perimeter} = 30 + 2(54.4) = 138.8$$

Therefore the perimeter to the nearest metre is 139m.