



**Centre for Academic Learner  
Services**

**Academic Upgrading  
Math Placement Test  
Study Guide**

Effective: June 2011 © SAIT Polytechnic

## **Important Information about this Study Guide and the Placement Test**

This study guide is designed to prepare students for the Academic Upgrading Math Placement test. An answer key is included at the end of this guide. The test is available on a drop-in basis in the Testing Centre (MC 221; see [www.sait.ca/testing](http://www.sait.ca/testing) for hours and location). It is designed for upgrading placement purposes only. **No section of these exams may be used for admission to any other SAIT program other than Upgrading; that is, these are not SAIT admission exams. In addition, the results cannot be used at any other educational institution.**

There are two parts to the test.

Part 1 is the NO CALCULATOR Pre-100 and Grade 9 portion. It consists of questions #1 – 43 and covers material up to and at the Grade 9 level. A mark of 70% on the Pre-100 part of the exam can be accepted in lieu of the math admission requirement to Academic Upgrading and allows entrance into Math 100. A mark of 70% on the Grade 9 part of the exam allows entrance into Math 180.

Part 1 is the Grade 10 and Grade 11 portion. It consists of questions #1 – 20 and covers material up to and at the Grade 11 level. A mark of 70% on the Grade 10 part of the exam allows entrance into Math 181. A mark of 70% on the Grade 11 part of the exam allows entrance into Math 182.

Note: Math 180 is SAIT's version of Pure Math 10, but is not transferable outside of SAIT. Math 181 is equivalent to Pure Math 20, and Math 182 is equivalent to Pure Math 30. Both Math 181 and Math 182 are accepted as admission requirements at other post-secondary institutions in Alberta, but you should always check with the post-secondary institution you are interested in attending (if it is not SAIT) to confirm it will accept the courses.

## Introduction: Math Study Guide

- Review the mathematics topics required by examining the list of learning objectives for each section.
- Complete the practice exercises. You may use the formulas provided in the formula sheet at the end of the guide (this formula sheet is included for you when you write the test). The Pre-100 and grade 9 exercises should be completed without the use of a calculator. The grade 10 and 11 exercises require the use of a scientific calculator (graphing calculators are not permitted).
- Check your answers with the answer key provided at the end of this guide.

**NOTE:** If you are interested in taking an exam that can be used in lieu of the Pure Math 30 admission requirement for entrance into SAIT programs, this study guide is not sufficient for your preparation, though it is an excellent review. Graphing calculators are permitted for that exam. You may work on previously released Pure Math 30 diploma exams by going to the following website:

[www.sait.ca/testing](http://www.sait.ca/testing) – click on Pure Math 30 Admissions Exam and it will link you to the appropriate Alberta Education website.

There is also an exam that can be taken in lieu of the Applied Math 30 Admissions Exam, as well as a Pure Math 20 Admissions Exam. See the Testing website for more information.

## Pre-Math 100 Exercises (to be completed without using a calculator)

1) Which number is in the thousands place?

- a) 45 258.59      b) 32 587 174      c) 5 172.349 258

2) Which number is in the hundredths place?

- a) 34.257 239      b) 13 725 324.346      c) 23 432.837 238 234

3) Compute the following:

- a)  $2415 + 1234$       b)  $417 + 6972$       c)  $18\,964 + 1732$

4) Compute the following:

- a)  $32.75 + 12.864$       b)  $8.178 + 17.81$       c)  $4.487 + 6.137$

5) Compute the following:

- a)  $1476 - 472$       b)  $13\,387 - 9472$       c)  $642 - 259$

6) Compute the following:

- a)  $64.54 - 14.2$       b)  $789.123 - 412.6$       c)  $23.547 - 4.641$

7) Compute the following:

- a)  $523 + (-36)$       b)  $(-417) + (-78)$       c)  $(-324) + 857$

8) Compute the following:

- a)  $7 \times 9$       b)  $12 \times 11$       c)  $7 \times 18$

9) Compute the following:

a)  $4^2$

b)  $7^2$

c)  $5^2$

10) Compute the following:

a)  $52 \div 4$

b)  $84 \div 7$

c)  $128 \div 8$

11) Compute the following stating the remainder:

a)  $22 \div 5$

b)  $57 \div 7$

c)  $181 \div 4$

12) Write the appropriate inequality symbol between the two numbers to create a true statement:

a)  $5 \quad 9$

b)  $-6 \quad -10$

c)  $0 \quad -4$

13) Compute and fully reduce the following:

a)  $\frac{4}{3} + \frac{5}{8}$

b)  $\frac{1}{5} + \frac{3}{5}$

c)  $\frac{1}{4} + \frac{3}{7}$

14) Compute and fully reduce the following:

a)  $\frac{4}{5} - \frac{1}{6}$

b)  $\frac{3}{5} - \frac{1}{5}$

c)  $\frac{1}{2} - \frac{3}{7}$

15) Compute and fully reduce the following:

a)  $\frac{2}{9} \times \frac{3}{4}$

b)  $\frac{1}{4} \times \frac{4}{6}$

c)  $\frac{5}{8} \times \frac{3}{7}$

16) Compute and fully reduce the following:

a)  $\frac{4}{5} \div \frac{8}{3}$

b)  $\frac{1}{5} \div \frac{7}{5}$

c)  $\frac{4}{7} \div \frac{8}{14}$

## Grade 9 Mathematics Exercises (to be completed without using a calculator)

1) Find all the factors of the following:

a) 36

b) 30

c) 48

2) Solve the following and express your answer in both improper and mixed fraction formats:

a)  $4 + \frac{3}{5}$

b)  $1 + \frac{2}{5}$

c)  $2 + \frac{3}{4}$

3) Solve the following and express your answer in reduced form:

a)  $\frac{4}{5} - \frac{3}{8}$

b)  $\frac{3}{2} - \frac{2}{5}$

c)  $\frac{5}{3} - \frac{4}{5}$

4) Solve the following and put into reduced (simplest) form:

a)  $\frac{4}{7} \times \frac{3}{5}$

b)  $\frac{1}{3} \times \frac{3}{7}$

c)  $\frac{4}{5} \times \frac{5}{8}$

5) Solve the following and put into reduced (simplest) form:

a)  $\frac{3}{11} \div \frac{1}{3}$

b)  $\frac{2}{7} \div \frac{4}{3}$

c)  $\frac{3}{2} \div \frac{3}{4}$

6) Express as a decimal:

a)  $\frac{3}{8}$

b)  $\frac{3}{5}$

c)  $\frac{2}{9}$

7) What is

a) 30% of 55?

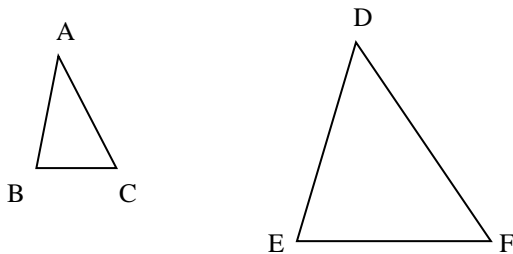
b) 25% of 64?

c) 15% of 22?

- 8) Alice buys a cake with a price tag of \$17. If the GST (federal sales tax) is 5%, what is the total price of the cake?
- 9) Jill buys a shirt with a price tag of \$32. If the GST (federal sales tax) is 8%, what is the total cost of Jillian's shirt?
- 10) Brad buys a pair of shoes with a price tag of \$85. If the GST (federal sales tax) is 3%, what is the total cost of his shoes?
- 11) Simplify the following expressions using exponential notation:
- a)  $A \times A \times A$       b)  $b \times b \times b \times b$       c)  $k \times k \times k \times k \times k \times k$
- 12) Place the following numbers in correct order from GREATEST to LEAST:
- a)  $-2/3, 3/4, 0.7, -0.545454, 2/5$       b)  $3/5, -0.11111, 7/3, -2/3, 0.99$
- 13) Place the following numbers in correct order from LEAST to GREATEST:
- a)  $5/4, -0.2222, 1/2, -5/10, 0.585858$       b)  $9/8, 0.141414, -2.0022, 1/6, -1/3$
- 14) Evaluate the following:
- a)  $30 - 3(12 + 6 \div 3) \times 5$       b)  $8 + 2(20 - 4 \times 3) \div 2$       c)  $7 + 2(15 - 3 \times 3) \div 4$
- 15) Solve the following equation for x:
- a)  $3x - 6 = 18$       b)  $5x + 2 = 27$       c)  $3x + 1 = 19$
- 16) A 5 metre-long ladder is leaned up against a wall. If the ladder reaches 3 m up the wall, how many metres is the base of the ladder from the wall?
- 17) A yard is 12 m long and 5 m wide. If you walked diagonally across the lawn (from one corner across the lawn to the other corner), how far did you walk?

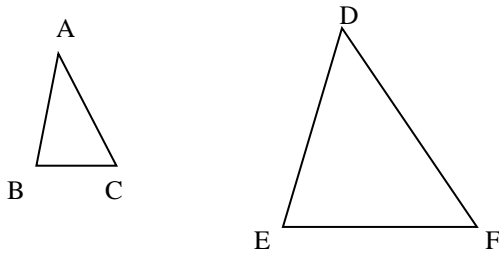
- 18) A room is 6 m long and 8 m wide. If you walked diagonally across the room (from one corner across the room to the other corner), how far did you walk?
- 19) A large desk is 130 cm long and 60 cm wide. A piece of square note paper is 10 cm long and 10 cm wide. How many pieces of note paper (side-by-side) can fit on the desk?
- 20) A floor is 5 m long and 6 m wide. The floor is to be filled in with square tiles that are each 0.5 m long and 0.5 m wide. How many tiles will it take to cover the entire floor?
- 21) A large floor is 15 m long and 25 m wide. The floor is to be filled in with square tiles that are each 1.0 m long and 1.0 m wide. How many tiles will it take to cover the entire floor?
- 22) A soup can has a diameter of 5 cm and a height of 11 cm. Write an expression in terms of  $\pi$  that could be used to find the volume of the can.
- 23) A large cylindrical can of juice has a radius of 10 cm and a height of 18 cm. What is the volume of the can?
- 24) An oil drum has a radius of 50 cm and a height of 120 cm. What is the volume of the drum?

Use the following diagram of **similar** triangles to answer #38 below. Note that the diagrams below are not drawn to scale.



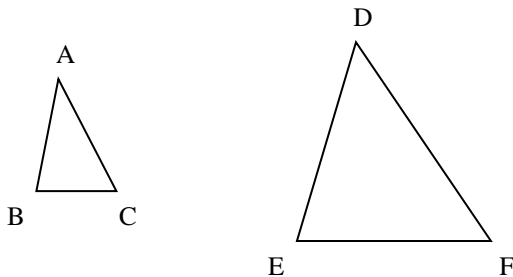
- 25)  $AC$  is 3 cm and  $DF$  is 10 cm. If  $DE$  is 8 cm, how long is  $AB$ ?

Use the following diagram of **similar** triangles to answer #39 below. Note that the diagrams below are not drawn to scale.



26)  $AB$  is 4 mm, and  $DE$  is 8 mm. If  $EF$  is 7 mm, how long is  $BC$ ?

Use the following diagram of **similar** triangles to answer #40 below. Note that the diagrams below are not drawn to scale.



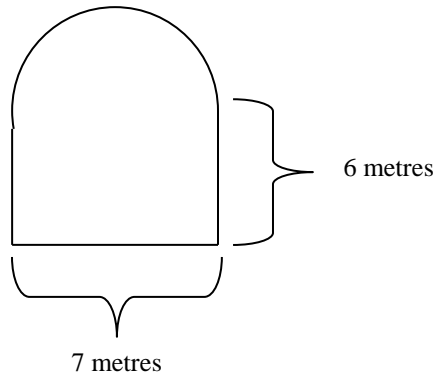
27)  $BC$  is 3 m, and  $EF$  is 6 m. If  $DF$  is 8 m, how long is  $AC$ ?

28) A 50 m tall building casts a shadow 20 m long. At the same time, a pole casts a shadow that is 4 m long. How tall is the pole?

29) A building casts a shadow of length 12 m. At the same time, a 2 m post casts a 6 m shadow. How tall is the building?

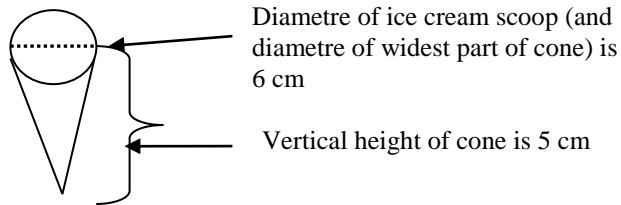
30) A building casts a shadow of length 20 m. At the same time, a 8 m tree casts a shadow 3 m long. How tall is the building?

- 31) A grain storage unit has the shape of a cylinder with a hemisphere on top as seen in the diagram below. The diameter of the base is 7 metres, and the height of the cylindrical part is 6 metres.



Write an expression in terms of  $\pi$  that could be used to find the volume of the grain storage unit.

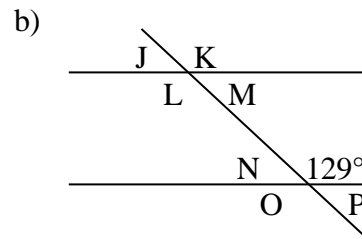
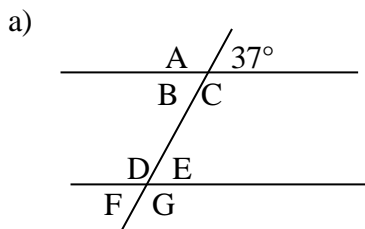
- 32) An ice cream cone is topped with one spherical scoop of chocolate ice cream as shown below. Note that the diagram is not drawn to scale.



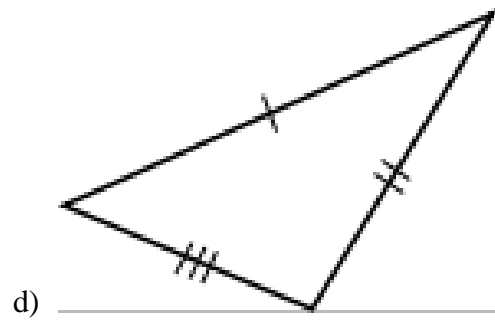
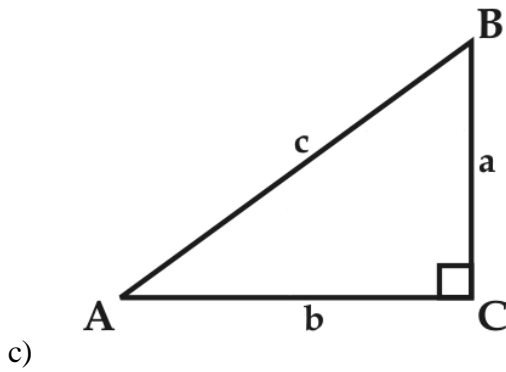
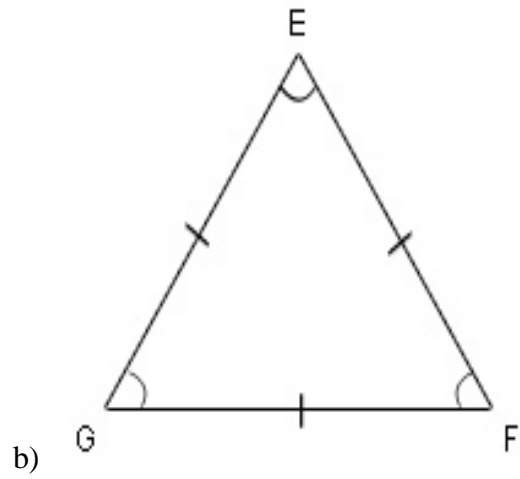
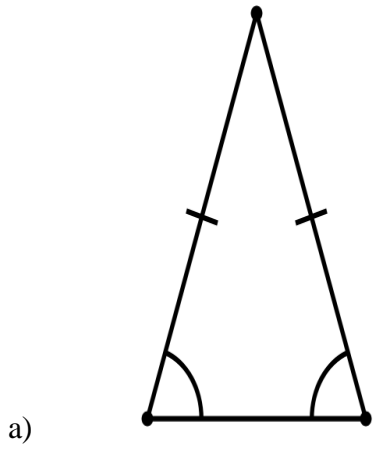
The diameter of the scoop of ice cream, which matches the diameter of the widest part of the cone, is 7 cm. The vertical height of the cone is 10 cm.

What expression can be used to calculate the volume of this entire object (cone + sphere of ice cream)?

- 33) State the value of each of the angles in the following diagrams:



34) Classify each type of the follow triangles:



35) Write each of the following in scientific notation:

a) 4 581

b) 31 523 872.2

c) 0.0000163

36) Write each of the following as a number:

a)  $7.123 \times 10^6$

b)  $5.223 \times 10^{-3}$

c)  $3.441 \times 10^{-5}$

## Grade 10 Mathematics Exercises (may use a scientific calculator)

1) Determine the slope and the y-intercept of the following lines:

a)  $-4x - 2y + 5 = 0$

b)  $4x - 6y - 3 = 0$

c)  $2x + 5y - 1 = 0$

2) Find the equation of the line passes through the point  $(-3, 4)$  and is perpendicular to the following line:  $3x - 2y + 2 = 0$

3) What is the equation of a line that passes through the point  $(-1, 4)$  and is perpendicular to the line  $x - 4y + 3 = 0$ ?

4) What is the equation of a line that passes through the point  $(-2, 2)$  and is perpendicular to the line  $2x - y - 7 = 0$ ?

5) Factor the following:

a)  $10x^2 - 11x - 6$

b)  $6x^2 - x - 2$

c)  $8x^2 - 2x - 3$

6) Perform the following operation and simplify:

a)  $\frac{b^2 - b - 6}{b^2 + 4b + 4} \times \frac{3b + 6}{b^2 - 9}$

b)  $\frac{a^2 + 4a + 4}{a - 2} \times \frac{a^2 - 4}{3a + 6}$

c)  $\frac{6b - 18}{b^2 - 6b + 9} \times \frac{2b + 6}{b^2 - 9}$

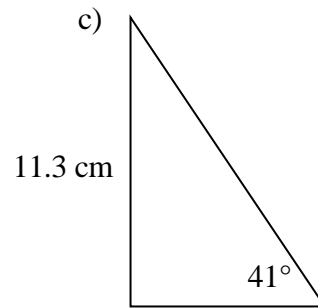
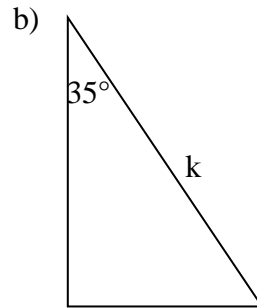
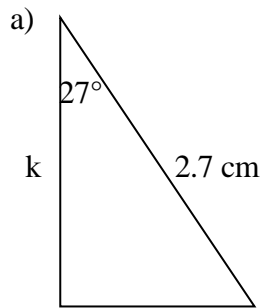
7) Solve the following equations for x:

a)  $\frac{4}{x-2} - \frac{2x-3}{x^2-4} = \frac{5}{x+2}$

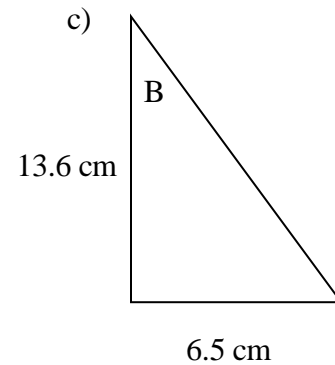
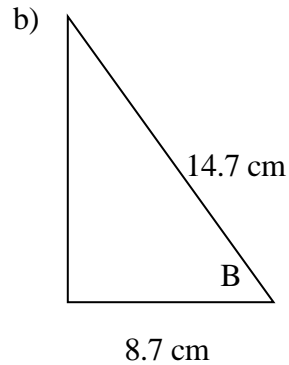
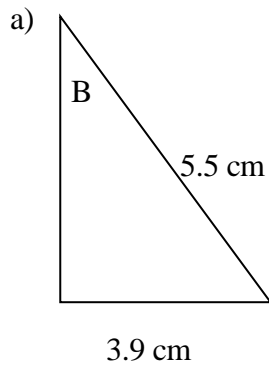
b)  $\frac{3}{x^2-9} - \frac{1}{x+3} = \frac{1}{x-3}$

c)  $\frac{1}{x-2} - \frac{1}{x+2} = \frac{8x}{x^2-4}$

8) In the triangles below, what is the length of side **k** to the nearest tenth of a centimetre?



9) In the triangles below, what is the measure of angle **B** to the nearest tenth of a degree?



10) Simplify the following expressions completely. Rationalize the denominator.

a)  $\frac{6}{\sqrt{7}}$

b)  $\frac{3}{\sqrt{12}}$

c)  $\frac{\sqrt{3}}{\sqrt{44}}$

11) If  $f(x) = x^3 - 2x + 4$ , what is  $f(-2)$ ?

12) If  $f(z) = z^2 - z + 3$ , what is  $f(-3)$ ?

13) If  $f(k) = k^2 - 2k + 1$ , what is  $f(5)$ ?

## Grade 11 Mathematics Exercises (may use a scientific calculator)

- 1) Determine the point of intersection of the following pair of lines. (Solve the system of equations.) Express the solutions as an ordered pair.

a)  $4x - 6y - 3 = 0$   
 $6x - 4y + 3 = 0$

b)  $6x - 2y - 4 = 0$   
 $7x + y - 13 = 0$

c)  $x - 3y + 2 = 0$   
 $4x - 7y + 6 = 0$

- 2) Graph the solution to the following system of inequalities on a coordinate plane:

a)  $2x - y + 3 \geq 0$   
 $\frac{1}{2}x - y + 4 \geq 0$

b)  $x - 2y + 6 \geq 0$   
 $2x + y - 2 \leq 0$

c)  $3x - y + 6 \geq 0$   
 $2x + y - 4 \leq 0$

- 3) Solve for the points of intersection of the circle and line given below:

Circle:  $x^2 + (y + 2)^2 = 4$

Line:  $x + y + 4 = 0$

- 4) A circle is given by the equation  $x^2 + (y - 3)^2 = 4$ . At what x-coordinates does this circle intersect with the line  $y = x + 1$ ?

- 5) A circle is given by the equation  $x^2 + (y - 2)^2 = 4$ . At what x-coordinates does this circle intersect with the line  $y = x + 4$ ?

- 6) Find the shortest distance between the point  $(0,0)$  and the line  $y = -2x - 3$ . Express your answer to the nearest tenth.

- 7) Find the shortest distance between the point  $(0,0)$  and the line  $x + y = 4$ . Express your answer to the nearest tenth.

- 8) Find the shortest distance between the point  $(0,0)$  and the line  $x + y = 3$ . Express your answer to the nearest tenth.

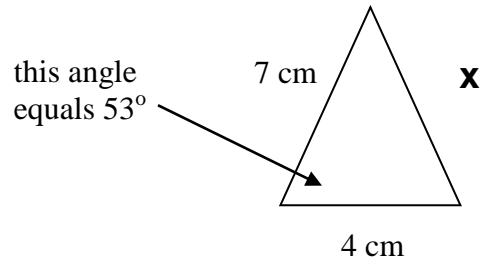
9) Determine the vertex and the x- and y-intercepts of the following parabolae:

a)  $y = -x^2 - 4x + 5$

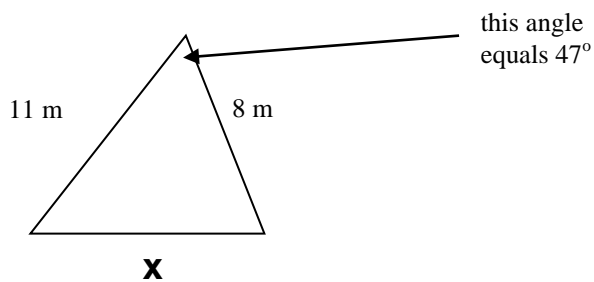
b)  $y = x^2 - 4x + 3$

c)  $y = x^2 - 6x + 5$

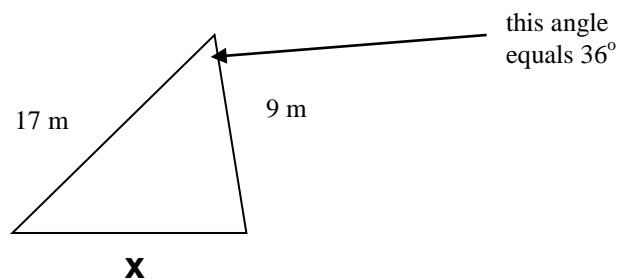
10) In the diagram below, what is the length of side "x" to the nearest tenth of a centimetre?  
(Note that the diagram is not drawn to scale.)



11) In the diagram below, what is the length of side "x" to the nearest tenth of a metre? (Note that the diagram is not drawn to scale.)



12) In the diagram below, what is the length of side "x" to the nearest tenth of a metre? (Note that the diagram is not drawn to scale.)



13) Solve the following quadratic equations for  $x$ . Express the answers in simplest radical form where necessary.

a)  $4x^2 + 8x + 3 = 0$

b)  $x^2 - 6x + 4 = 0$

c)  $2x^2 + 4x + 1 = 0$

d)  $x^2 + 4x + 1 = 0$

14) For each of the quadratic equations below, state whether the roots are rational, irrational, or imaginary. (Hint: you do not have to fully solve the equations – use the discriminant.)

a)  $x^2 + 2x - 3 = 0$

b)  $x^2 + 3x - 2 = 0$

c)  $x^2 + 2x + 3 = 0$

d)  $2x^2 + 5x + 3 = 0$

e)  $x^2 + 3x + 2 = 0$

f)  $-2x^2 - 3x + 1 = 0$

g)  $-5x^2 - 8x + 1 = 0$

h)  $x^2 + 2x + 3 = 0$

i)  $3x^2 + 5x + 2 = 0$

15) Given that  $f(x) = x^3$  and  $g(x) = x - 2$ , find  $g(f(-1))$ .

16) Given that  $f(x) = 2x - 3$  and  $g(x) = x^2$ , find  $f(g(-2))$ .

17) Given that  $f(x) = 3x + 2$  and  $g(x) = x^2$ , find  $f(g(-4))$ .

18) Solve the following equations:

a)  $-3|2 - x| + 5 = -16$

b)  $-2|3 - x| = -8$

c)  $-3|3 - x| = -9$

# Academic Upgrading Math Placement Answer Key

## Pre-Math 100 Exercises

- |                                            |                                   |                               |
|--------------------------------------------|-----------------------------------|-------------------------------|
| 1) a) 5                                    | b) 7                              | c) 5                          |
| 2) a) 5                                    | b) 4                              | c) 3                          |
| 3) a) 3649                                 | b) 7389                           | c) 20696                      |
| 4) a) 45.614                               | b) 25.988                         | c) 10.624                     |
| 5) a) 1004                                 | b) 3915                           | c) 383                        |
| 6) a) 50.34                                | b) 376.523                        | c) 18.906                     |
| 7) a) 487                                  | b) -495                           | c) 533                        |
| 8) a) 63                                   | b) 132                            | c) 126                        |
| 9) a) 16                                   | b) 49                             | c) 25                         |
| 10) a) 13                                  | b) 12                             | c) 16                         |
| 11) a) 4 R2                                | b) 8 R1                           | c) 45 R1                      |
| 12) a) $5 < 9$<br>or $5 \leq 9$            | b) $-6 > -10$<br>or $-6 \geq -10$ | c) $0 > -4$<br>or $0 \geq -4$ |
| 13) a) $\frac{47}{24}$ or $1\frac{23}{24}$ | b) $\frac{4}{5}$                  | c) $\frac{19}{28}$            |
| 14) a) $\frac{19}{30}$                     | b) $\frac{2}{5}$                  | c) $\frac{1}{14}$             |
| 15) a) $\frac{1}{6}$                       | b) $\frac{1}{6}$                  | c) $\frac{15}{56}$            |
| 16) a) $\frac{3}{10}$                      | b) $\frac{1}{7}$                  | c) 1                          |

## Grade 9 Mathematics Exercises

- |                                                         |                                                     |                                                      |
|---------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|
| 1) a) 1, 2, 3, 4, 6, 9, 12, 18, 36                      | b) 1, 2, 3, 5, 6, 10, 15, 30                        | c) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48                  |
| 2) a) improper: $\frac{23}{5}$<br>mixed: $4\frac{3}{5}$ | b) improper: $\frac{7}{5}$<br>mixed: $1\frac{2}{5}$ | c) improper: $\frac{11}{4}$<br>mixed: $2\frac{3}{4}$ |
| 3) a) $\frac{17}{40}$                                   | b) $\frac{11}{10}$ or $1\frac{1}{10}$               | c) $\frac{13}{15}$                                   |
| 4) a) $\frac{12}{35}$                                   | b) $\frac{1}{7}$                                    | c) $\frac{1}{2}$                                     |

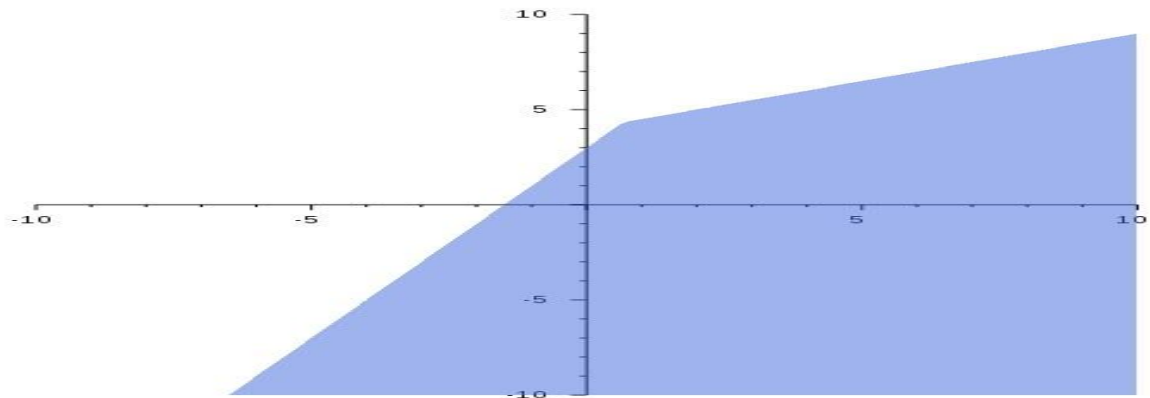
- 5) a)  $\frac{9}{11}$                       b)  $\frac{3}{14}$                       c) 2
- 6) a) 0.375                      b) 0.6                      c)  $0.\bar{2}$
- 7) a) 16.50                      b) 16.00                      c) 3.30
- 8) \$17.85
- 9) \$34.56
- 10) \$87.55
- 11) a)  $A^3$                       b)  $b^4$                       c)  $k^6$
- 12) a)  $\frac{3}{4}, 0.7, \frac{2}{5}, -0.545454, -\frac{2}{3}$                       b)  $\frac{7}{3}, 0.99, \frac{3}{5}, -0.111111, -\frac{2}{3}$
- 13) a)  $-\frac{5}{10}, -0.2222, \frac{1}{2}, 0.585858, \frac{5}{4}$                       b)  $-2.0022, -\frac{1}{3}, 0.141414, \frac{1}{6}, \frac{9}{8}$
- 14) a) -180                      b) 16                      c) 10
- 15) a) 8                      b) 5                      c) 6
- 16) 4 m
- 17) 13 m
- 18) 10 m
- 19) 78 pieces
- 20) 120 tiles
- 21) 375 tiles
- 22)  $68.75\pi \text{ cm}^3$
- 23)  $1800\pi \text{ cm}^3$
- 24)  $300000\pi \text{ cm}^3$
- 25) 2.4 cm
- 26) 3.5 mm
- 27) 4 m
- 28) 10 m
- 29) 4 m
- 30)  $53.\bar{3} \text{ m}$
- 31)  $(\frac{147}{2}\pi + \frac{343}{12}\pi) \text{ m}^3$
- 32)  $51\pi \text{ cm}^3$
- 33) a) A -  $143^\circ$                       b) J -  $51^\circ$   
       B -  $37^\circ$                       K -  $129^\circ$   
       C -  $143^\circ$                       L -  $129^\circ$   
       D -  $143^\circ$                       M -  $51^\circ$   
       E -  $37^\circ$                       N -  $51^\circ$   
       F -  $37^\circ$                       O -  $129^\circ$   
       G -  $143^\circ$                       P -  $51^\circ$
- 34) a) isocles                      b) equilateral, equiangular                      c) right-angle, scalene                      d) scalene
- 35) a)  $4.581 \times 10^3$                       b)  $3.15238722 \times 10^7$                       c)  $1.63 \times 10^{-5}$
- 36) a) 7123000                      b) 0.005223                      c) 0.00003441

## Grade 10 Mathematics Exercises

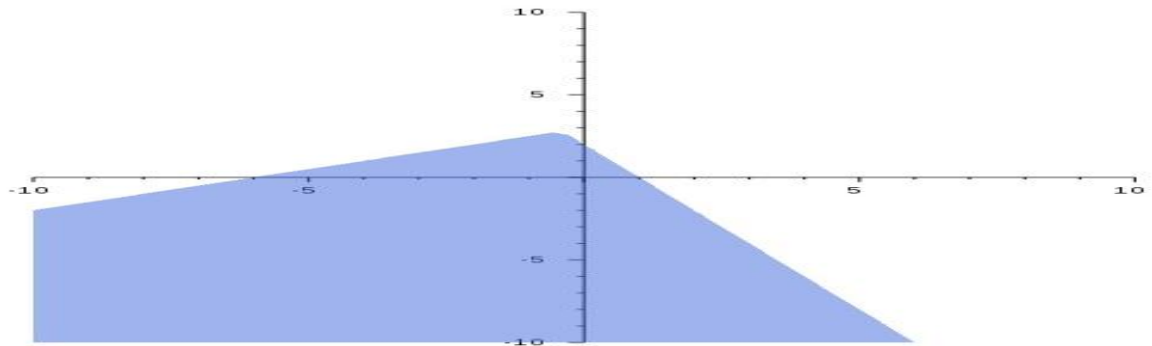
- 1) a) slope: -2                      b) slope:  $\frac{2}{3}$                       c) slope:  $-\frac{2}{5}$   
       y-intercept:  $(0, \frac{5}{2})$     y-intercept:  $(0, -\frac{1}{2})$     y-intercept:  $(0, \frac{1}{5})$
- 2)  $2x + 3y - 6 = 0$   
 3)  $4x + y = 0$   
 4)  $x + 2y - 2 = 0$
- 5) a)  $(5x + 2)(2x - 3)$     b)  $(3x - 2)(2x + 1)$     c)  $(4x - 3)(2x + 1)$
- 6) a)  $\frac{3}{b+3}$                       b)  $\frac{(a+2)^2}{3}$                       c)  $\frac{12}{(b-3)^2}$
- 7) a) 7                              b)  $\frac{3}{2}$                               c)  $\frac{1}{2}$
- 8) a) 2.4 cm                      b) 72.9 cm                      c) 13.0 cm
- 9) a)  $45.2^\circ$                       b)  $53.7^\circ$                       c)  $25.5^\circ$
- 10) a)  $\frac{6\sqrt{7}}{7}$                       b)  $\frac{\sqrt{3}}{2}$                               c)  $\frac{\sqrt{33}}{22}$
- 11) 0  
 12) 15  
 13) 16

## Grade 11 Mathematics Exercises

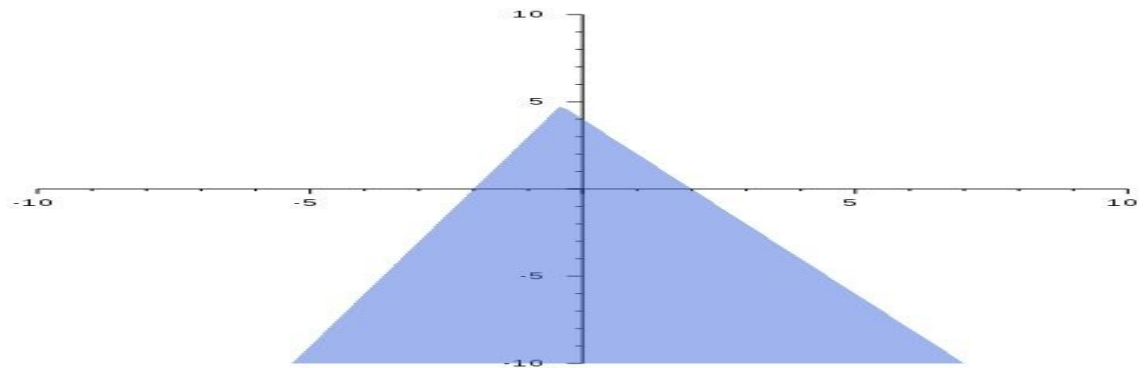
- 1) a)  $(-\frac{3}{2}, -\frac{3}{2})$                       b)  $(\frac{3}{2}, \frac{5}{2})$                       c)  $(-\frac{4}{5}, \frac{2}{5})$
- 2) a)



b)



c)



3) (0,-4) and (-2,-2)

4) (0,1) and (2,3)

5) (0,4) and (-2,2)

6) 1.3

7) 2.8

8) 2.1

9) a) y-intercept: (0,5)

x-intercepts: (-5,0) and (1,0)

b) y-intercept: (0,3)

x-intercepts: (1,0) and (3,0)

c) y-intercept: (0,5)

x-intercepts: (1,0) and (5,0)

10) 5.6 cm

11) 8.1 m

12) 11.1 m

13) a)  $-\frac{1}{2}, -\frac{3}{2}$

b)  $3+\sqrt{5}, 3-\sqrt{5}$

c)  $\frac{-2+\sqrt{2}}{2}, \frac{-2-\sqrt{2}}{2}$

d)  $-2+\sqrt{3}, -2-\sqrt{3}$

14) a) rational

b) irrational

c) imaginary

d) rational

e) rational

f) irrational

g) irrational

h) imaginary

i) rational

15) -3

16) 5

17) 50

18) a) -5 or 9

b) -1 or 7

c) 0 or 6