Integrated Math 2 Functions Assessment

Name _____ Block ____

You have 65 minutes. Calculators are permitted. Notes and books are permitted. Computers are not permitted. If you use your calculator to do something, make sure to show enough work so that I know what you were thinking. No work = no evidence for me of your understanding.



2) State the domain & range of the following relations, using proper notation.

<mark>6 marks – K</mark> 3 marks – C



a) Find f(4). | b) Find f(x+2).

5 marks – K

4) Let f(x) = 3x - 7 and g(x) = 2x + 5. What value of x would make $f^{-1}(x) = g^{-1}(x)$? 2 marks - K

2 marks – T

1 mark – C

5) Functions f and g are defined as follows: $f = \{(3,2), (5,1), (7,4), (9,3), (11,5) \text{ and } g = \{(1,3), (2,5), (3,5), (4,9), (5,7)\}$ a) Find f(3). 1 mark – T b) Find $g^{-1}(3)$. 1 mark – T c) Is $g^{-1}(x)$ a function.

1 mark – T

Practise, Apply, Solve 3.2



- **3.** Consider the $\sqrt{-}$ key on your calculator. Recall that $\sqrt{-}$ means the positive square root.
 - (a) What is the output if the input is 25?
 - (b) Does the output have more than one value for any input value?
 - (c) Why must this operation be a function? Explain.
 - (d) Are there any numbers that cannot be used as input?
 - (e) State the domain of this function.
- **4.** Consider the rule "Take the square root of the input number to get the output number."
 - (a) What is the output if the input is 25?
 - (b) Does the output have more than one value for any input value?
 - (c) Is this relation a function? Explain.
 - (d) Are there any numbers that cannot be used as input?



iii. In part ii, what are the answers to (e), (f), and (g), as a group, commonly called? Why is the answer to (j) the same as those for (e), (f), (g), (h), and (i)?



called? What are the answers to (j), (k), and (l), as a group, commonly called?

13. The graph shows $f(x) = 2(x - 3)^2 - 1$. 20 $y = 2(x - 3)^2$ (a) Evaluate f(-2). (b) What does f(-2) represent on the graph of f? (c) State the domain and range of the relation. 10 (d) How do you know that f is a function from its graph? (e) How do you know that f is a function from its equation? 0 **11** Consider the relation $y = y^2 = 3y$ (a) Are there any values of the independent variable for which the dependent variable is not unique? (b) Is this relation a function? Explain. **15.** A relation is defined by $x^2 + y^2 = 25$. (a) Sketch a graph of the relation. (b) Is this relation a function? Explain. **16.** For each of the following, i. graph the relation ii. state the domain and range iii. is the relation a function? Why or why not? (a) y = 3x - 1 (b) $y = 10 - 4.9x^2$ (c) $y = 3(x-2)^2 - 5$ (d) $y = \frac{1}{x^2}$ (e) $x^2 - y = 3x$ (f) y = x(x - 4)(g) 5x + 5y - 15

- **17.** State the domain and range of the function $y = \sqrt{x 1} + 2$.
- **18.** The cost of renting a banquet hall depends on the size of the room and the number of meals served. A graph of the number of meals versus cost is shown.





- (a) What problems would the banquet hall have if this relation were not a function?
- (b) What is the domain and range of this function?
- (c) Why does the domain have an upper limit?
- (d) Why is the graph a reasonable representation of the cost to rent a banquet hall?

PRACTICE Questions

Lesson 5.1

- 1. Identify the slope and *y*-intercept for each line. a) y = 3x + 4 c) y = -1.11 + 9.7xb) $y = -\frac{2}{5}x - 6.8$ d) y = 3
- **2.** Order each set of lines from closest to horizontal to closest to vertical.
 - a) y = 2x 4 y = x + 8 $y = \frac{1}{3}x - 2$ b) $y = -\frac{1}{3}x + 5$ y = -8x - 2 $y = -\frac{5}{2}x + 3$
- **3.** Copy and complete the table to identify whether the lines will rise or fall to the right.

	Equation	Rises to the Right	Falls to the Right
	y = 4x + 5		
)	$y = -\frac{2}{3}x - 8$		
	y = -2.8x + 4		
6	$y = \frac{21}{8}x$		
	y = 1.5x + 4.5		55

Lesson 5.2

4 Determine the slope and *y*-intercept for each of these lines.

- a) 3x 4y + 9 = 0 c) 2x + 6y = 32b) 5x - y = 12 d) 8x + 2y - 4 = 0
- **5.** Evan and his sister Sarah shovel driveway, during the winter. They charge \$10 for a double driveway and \$5 for a single driveway. This past winter, Evan earned \$255 and Sarah earned \$230.
 - a) Write equations for both Evan and Sarah to represent the relationship between the amounts earned shovelling single and double driveways.

- **b)** Isolate the variable used for single driveways in both equations.
- c) If they both shovelled 10 double driveways, how many single driveways did each shovel?

6. Calculate the slopes of the line segments

Lesson 5.3



- 7. Calculate the slopes of the lines that pass through each of the following pairs of points.
 a) A(8, 2) and B(1, 0)
 - a) A(8, 2) and B(1, 9)
 - **b**) E(-1, 5) and F(3, 2)
 - c) C(-1, 2) and D(3, -8)
 d) G(-3, 2) and H(-9, -11)
- **8.** The points (-6, -3), (k, 1), and (8, 4) are collinear. Determine the value of k.
- 9. Three hours after beginning her long-distance bicycle trip, Cathy was 98 km from home. After seven hours, she was 182 km from home. Assuming she maintained the same speed throughout the trip, how fast was she cycling?

Lesson 5.4

10. Determine the equation of each line.



- **11.** Determine the equations of the lines described below.
 - a) passing through the point M(6, 9) with slope = $-\frac{3}{4}$
 - b) passing through the points P(3, -11) and Q(0, 5)
 - c) passing through the points D(2, 9) and E(1, 13)
 - **d**) passing through the points A(5, 2) and B(5,-3)
 - e) passing through the points X(8, 5) and Y(2, 3)
- **12.** Determine whether the points A(2, -6) and B(-3, 10) lie on the line y = -4x + 2.

Lesson 5.5

- **13.** For each pair of linear equations, determine if the lines are parallel, perpendicular, or neither. Justify your answers.
 - a) y = 3x 5 y = -3x - 5b) y = 0.25x - 2 $y = \frac{1}{4}x - 9$ c) $y = \frac{1}{2}x + 4$ y = -2x - 8d) 2x - 4y = 9 x + 2y + 7 = 0e) y = 0.625x - 2 y = -1.6x - 9f) 3x - 5y - 10 = 0
 - 5x + 3y + 2 = 0
- **14.** Determine the equation for each line.
 - a) passing through the point W(2, 9) and parallel to $y = \frac{7}{2}x + 3$
 - **b)** passing through the point V(1, 6) and perpendicular to $y = -\frac{1}{4}x + 11$
 - c) passing through the *y*-intercept of the line defined by 2x + 3y - 18 = 0 and perpendicular to 4x - 9y = 27
- **15. a**) Do you think that the diagonals of a square are perpendicular to each other?
 - **b**) Test your conjecture by plotting 4 points on grid paper that form a square. Draw the sides and diagonals of the square.
 - c) Calculate the slopes of the diagonals. Does this support your conjecture? Explain.
 - d) Repeat parts b) and c) using 4 different points. Is your result the same?

Chapter Self-Test

- 1. Which choice best describes the line defined by the equation y = -4x + 27?
 - A. rising to the right C. horizontal
 - **B.** falling to the right **D.** vertical
- 2. Which of the following statements is true about the line defined by the

equation
$$y = \frac{1}{3}x + 2$$
?

A. It is steeper than the line defined by $y = \frac{1}{6}x - 4$.

B. It has the same y-intercept as the line defined by the equation

$$y = \frac{1}{5}x + 2.$$

- **C.** It is less steep than the line defined by y = 5x 6.
- **D.** all of the above
- 3. Which of the following equations represents the same line as described by 12x 3y + 21 = 0?

A.
$$y = \frac{1}{4}x - 7$$

B. $y = -4x + 21$
C. $y = 4x + 7$
D. $y = \frac{1}{4}x + 63$

4. What can be said about the lines given by the equations 3x + 7y = 28

and
$$y = \frac{7}{3}x - 2$$
?

- A. they are perpendicular
- **B.** they are parallel
- **C.** they are the same

D. none of the above

5. A line passes through the point (1, -4) and has a slope of $\frac{5}{2}$. Which of the following points would also be on this line?

A.
$$(6, -2)$$
C. $(-1, 1)$ B. $(3, 1)$ D. $(3, -9)$

- 6. Sketch the graph of $y = \frac{-4}{5}x + 3$ using the slope and y-intercept.
- 7. Are the points A(-10, -4), B(-3, 7), and C(2, 14) collinear? Explain how you know.
- 8. Points M(14, 6) and N(-7, k) lie on a line that has a slope of $\frac{3}{7}$. Determine the value of k.

NAME:

- 1. You will work with the points A(-2,3) and B(1,-2) as illustrated on the graph included. In all solutions to this question, show necessary work to clearly communicate your solution.
 - a. Determine the equation of the line that passes through these points. The final equation may be presented in ANY form. (K3, C1)



- b. Write the equation in standard form. (K2)
- c. Write the equation using function notation (HINT: f(x) =). (K2)

d. Evaluate f(4). (A2)

e. Solve f(x) = -12. (A2) f. Solve f(x) > 6. (A2)

- NAME:
 - Joseph worked two part-time jobs in the summer; one as a math tutor for elementary students and a second job as a piano teacher. He makes \$15 per hour as a math tutor and \$25 per hour as a piano teacher. In order to save money for a trip to Boracay in October, Joseph would like to earn a total of \$750 in one month of the summer.
 - a) Let x represent the hours he tutors math and let y represent the hours he teaches piano. On the table provided, determine 4 combinations of hours worked at his 2 jobs that will earn him \$750. (K3)

Hours of math	0		
tutoring (x)			
Hours of piano		0	
teaching (y)			

 b) Graph this linear function on the grid provided. Make sure your graph is PROPERLY presented! (C2)



- c) Write the equation of this linear function in slopeintercept form. (K2)
- d) What is meaning of the slope in this context?
 (T1,C1)
- e) What do the x- and yintercepts mean in this context? (A2)

f) Evaluate f(19). (A2)

g) Joseph wants to work AT MOST 25 total hours per month. Can he earn enough money to take his trip? If not, why not? If yes, how? (T2)

NAME:

- 3. Mr. S. wants to explore a relationship between Grade 10 students' math quiz scores and the amount of time they spent studying for the quiz. So let the variable *t* represent the hours spent studying and let *M* represent the mark received on the quiz. Mr. S. knows that Joshua studied for 3 hours and scored 75% and that Alice studied for 7 hours and scored 90%. The points are graphed on the attached grid.
 - a. Determine the slope of the linear relation and state what the slope means. (K1,A1)



- b. Determine the y-intercept of the linear relation and state what the y-intercept means. (K2,A1)
- c. Solve M(t) > 84% and interpret your answer.
 (K2,A1)

- d. State the domain and range of the relation and explain your reasoning for the domain and range. (T2,C1)
- e. Does this linear relation have an x-intercept? If yes, what is the value of the x-intercept? If no, why not? (T2)

NAME:

- (CONTINUED FROM PREVIOUS PAGE) Mr. S. wants to explore a relationship between Grade 10 students' math quiz scores and the amount of time they spent studying for the quiz. So let the variable *t* represent the hours spent studying and let *M* represent the mark received on the quiz. Mr. S. knows that Joshua studied for 3 hours and scored 75% and that Alice studied for 7 hours and scored 90%.
- f. Susan decides that this situation does NOT lend itself to a <u>FUNCTION</u>. Explain why Susan could be correct in this decision. (T1,C1)
- g. Betty decides that this situation does NOT lend itself to a <u>LINEAR</u> relation. Explain why Betty could be correct in this decision. <u>(T1,C1)</u>

QUIZ SCORES:

Application (A)	Communication (C)	Knowledge (K)	Thinking/PS (T)	Overall Score
<u>/13</u>	<u>/7</u>	_/17	<u>/9</u>	

Practise, Apply, Solve 1.8 -

A

1.	Solve for y in terms of x .		
	(a) $3x + y = 12$	(b) $y - 4x = 15$	(c) $12x - y = 3$
	(d) $8x = y + 6$	(e) $2y - 2x = 18$	(f) $13x - 12y = 14$
2.	Solve for x in terms of y.		
	(a) $x + 3y = 5$	(b) $x - 2y = 18$	(c) $8y - x = 5$
	(d) $3y = 8 - x$	(e) $5x - y + 1 = 0$	(f) $7y - x + 6 = 0$
3.	Solve for the variable indic	ated.	
	(a) $8a = 4 - b, b$	(b) $8m - 2n = 6$, <i>n</i>	(c) $6r + 3s = 9, r$
	(d) $4d - 5e - 12 = 0$, e	(e) $6p = 12 - 3q, p$	(f) $3u + 7v = 21, v$
4.	For each system, use the gi	ven value to find the value o	of the other variable.
	(a) $x = 2$	(b) $y = 2$	(c) $3 = y - x$
	2x + y = 3	4x - 2y = 8	x = -3
	(d) $r = 3$	(e) $2m - 3n = 5$	(f) $3a - b + 1 = 4$
	2s - 3r = 6	n = -6	a = 2

5. A system of equations is defined by

$$x + 4y = -10 \quad \textcircled{1}$$
$$2x + y = 1 \qquad \textcircled{2}$$

- (a) Obtain from equation ① an expression for x and solve the system.
- (b) Obtain from equation @ an expression for y and solve the system.
- (c) What can you conclude from your results in (a) and (b)?

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6. Communication: Write a paragraph comparing the substitution method to the graphing method for solving a linear system. What are the advantages and disadvantages of each method?

7. Solve using substitution.

(a)
$$y = x - 1$$

 $y = 2x - 3$
(b) $x = -2y + 3$
 $x = 3y - 7$
(c) $y = x - 1$
 $y = 3 - 3x$
(d) $a = 1 - b$
 $a = 1 - 2b$
(e) $m = -3 - 2n$
 $a = 1 - 2b$
(f) $p = 2q - 2$
 $p = -3 + 3q$
8. Solve using substitution.
(a) $y = 3x - 8$
 $5x + y = 6$
(b) $a = 2b + 2$
 $5a - 9b = 12$
(c) $x = 4 - y$
 $2y + 2x = 8$
(d) $3m - 2n = -5$
 $m = n - 2$
(e) $2x - 3b = -4$
 $m = n - 2$
(f) $2x - 3y = 1$
 $x = y + 1$
(g) $2r - s = -11$
 $s = r - 1$
(h) $3p + 2q - 1 = 0$
 $p = q + 2$
(i) $2x + y = 5$
 $x - 3y = 13$

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- **4.** The equations 3x + y = 9 and x 2y = -7 form a linear system.
 - (a) Explain how you would eliminate x from the equations.
 - (b) Explain how you would eliminate y from the equations.
 - (c) Solve the system.

B

5. A small plane flying into the wind takes 3 h 20 min to complete a flight of 960 km. Flying with the wind, the same plane takes 2 h 30 min to make the trip. What is the speed of the plane? What is the speed of the wind?





- **7.** Communication: Explain the advantages and disadvantages of both the substitution method and the elimination method for solving a system of equations. Use the systems below in your explanation.
 - (a) 3x + 2y = 6 x + 3y = 16(b) 2x + 3y = 185x - 4y = -1
- 8. A system of equations consists of 3(x-1) 2(y+2) = 7 and x 5y = -4.
 - (a) What is the first step in solving this system?
 - (b) Solve the system.
- **9.** Knowledge and Understanding: Explain what to do to this linear system to eliminate *x* from both equations.

$$3x + 2y = 22$$
$$5x - 4y = 22$$

- **10.** Find the coordinates of the point of intersection of the graphs defined by each linear system.
 - (a) 3(x-1) 2(y-2) = 0 x + 3y = -4(b) $2x - \frac{1}{3}y = \frac{1}{3}$ 3(x+1) - 2(y-3) = 11(c) a = 6 + 3b 3(a-2) = 4 + 2(b-3)(d) $\frac{1}{2}x - y = -3$ $x - \frac{2}{3}y = -2$

(e)
$$a - \frac{3}{4}b = -4$$

 $a + \frac{1}{4}b = 0$
(f) $x - \frac{1}{3}y = -1$
 $\frac{2}{3}x - \frac{1}{4}y = -1$

- 11. (a) Create a linear system of two equations that has no solution.
 - (b) What happens when you use elimination to solve this system? Show an example and explain.

12. Application:

- (a) Create a linear system of two equations that has many solutions.
- (b) What happens when you use elimination to solve this system? Show an example and explain.

13. Thinking, Inquiry, Problem Solving:

- (a) Make up a word problem that you can solve using a linear system with a solution of (5, 35).
- (b) Ask a classmate to solve the problem, then check his or her work. If the solution is incorrect, write suggestions explaining how to correct it.
- **14.** As the owner of a banquet hall, you are in charge of catering a reception. There are two dinners: a chicken dish that costs \$16 and a beef dish that costs \$18. The 300 wedding guests have ordered their meals in advance, and the total cost to prepare the dinner is \$5256. How many of each type of type of dinner are you preparing?
- **15.** The student council made \$750 from a dance. They put part of the \$750 in a savings account that earns 4% interest and the rest in a chequing account that pays 2%. If the total interest for a year was \$27, how much was put in each account?
- **16.** At a silversmith's shop, they have alloys that contain 40% silver and others that are 50% silver. A custom order for a bracelet requires 150 g of 44% silver. How much of each alloy should be melted together to make the bracelet?
- **17.** During a training exercise, a submarine travels 16 km/h on the surface, but it goes only 10 km/h underwater. If the submarine travelled a distance of 160 km in 12.5 h, how long was it underwater?
- **18.** Each spring, the conservation authority stocks the local lake with 10 000 bass and perch. If there were three times as



many bass and twice as many perch, the total number of fish would be 22 000. How many of each type of fish make up the 10 000?

19. Use elimination to solve the linear systems you developed for questions 17 to 22 in the Practise, Apply, Solve 1.1 on page 52.