(A) Lesson Objectives

a. Introduce the concept of inverse functions through an exploration
b. Introduce the inverse function notations
c. Apply the concept of inverse linear functions through a variety of representations

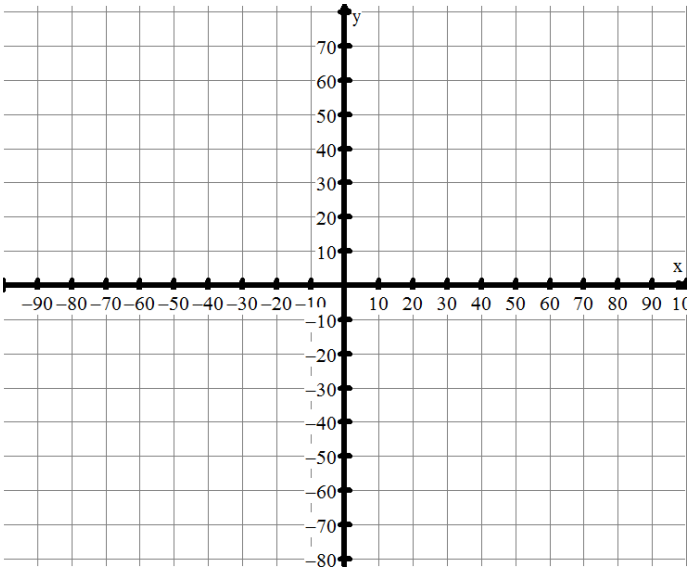
(B) Opening Exploration – PART 1

For American tourists visiting Canada, temperature data might seem a bit unusual. So a simplified "rule of thumb" for converting a temperature in degrees Celsius into degrees Fahrenheit is to double the Celcius temperature and then add 30.

(a) Copy and complete the table using the visitor's rule.

°C	-10	0	10	20	30	40
°F						

(b) Graph the relation.



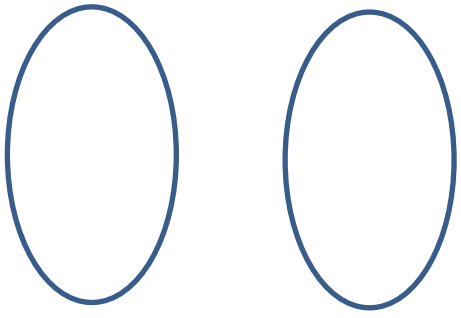
(c) What is the independent variable?

(d) What is the dependent variable?

(e) Does our "temperature conversion rule" define a function? Explain.

(f) Let f represent the rule. What ordered pair, (0,????), belongs to f ?

(g) Let x represent the temperature in degrees Celsius. Write the equation for this rule in function notation.



(h) In the table, f (10) = 50, which corresponds to a point on the graph of y = f (x). What is the x-coordinate of this point? What is its y -coordinate?

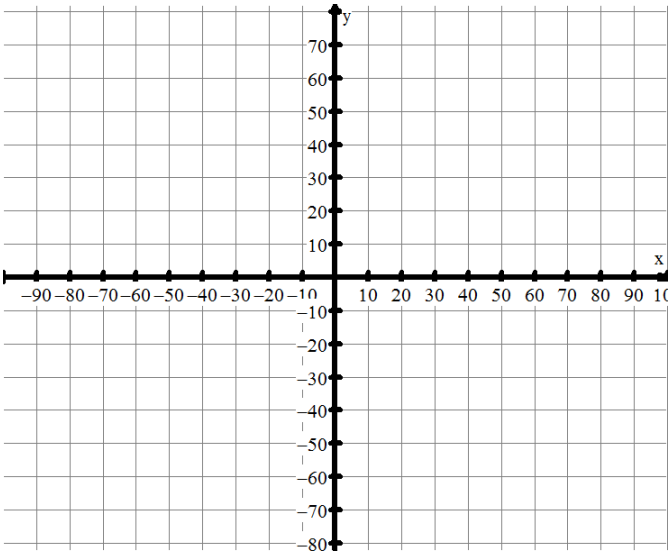
(C) Opening Exercise – PART 2

For CANADIAN tourists visiting THE US, temperature data might seem a bit unusual. So a simplified "rule of thumb" for converting a temperature in degrees Celsius into degrees Fahrenheit is …….

(a) Copy and complete the table using the visitor's rule.

°F	50	60	70	80	90	100
°C						

(b) Graph the relation.



(c) What is the independent variable?

(d) What is the dependent variable?

(e) Does our "temperature conversion rule" define a function? Explain.

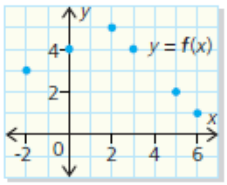
(f) Let f represent the rule. What ordered pair, (0,????), belongs to f ?

(g) Let x represent the temperature in degrees Celsius. Write the equation for this rule in function notation.

(h) In the table, f (50) = 10, which corresponds to a point on the graph of y = f (x). What is the x-coordinate of this point? What is its y -coordinate?

(D) Examples – Working with Mappings & Relations

The graph of $y = f(x)$ is shown.



i. State the domain and range of f.

ii. Draw an arrow diagram for f^{-1}.

iii. Evaluate.
(a) $f(2)$ (b) $f(4)$ (c) $f^{-1}(1)$ (d) $f^{-1}(4)$

iv. Graph $y = f^{-1}(x)$.

v. Is f^{-1} a function? Explain.

vi. State the domain and range of f^{-1}.

1. For each set of ordered pairs,

i. graph the relationship and its inverse
ii. is the relationship a function? Is the inverse a function? Explain.

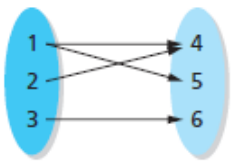
(a) {(0, 1), (1, 3), (2, 5), (3, 7)} (b) {(0, 3), (1, 3), (2, 3), (3, 3)}

(c) {(1, 1), (1, 2), (1, 3), (1, 4)}

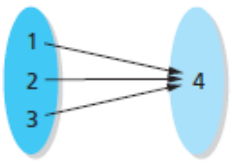
2. For each of the following,

i. draw an arrow diagram for the inverse relationship
ii. state whether or not each inverse defines a function, and justify your answer

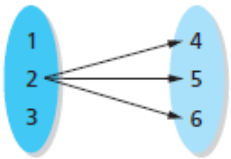
(a)



(b)



(c)



(E) Key Concepts & Notations

a. The **inverse** of a relation and a function maps each output of the original relation back onto the corresponding input value. The inverse is the "reverse" of the original relation, or function

b. f^{-1} is the name given for the inverse relation.

c. $f^{-1}(x)$ represents the expression for calculating the value of f^{-1}.

d. If $(a,b) \in f$, then $(b,a) \in f^{-1}$.

e. Given a table of values for a function, interchange the independent and dependent variables to get a table for the inverse relation.

f. The domain of *f* is the range of f^{-1} and then range of *f* is the domain of f^{-1}.

g. To determine the equation of the inverse in function notation, interchange *x* and *y* and solve for *y*.

(F) Examples – Working with Linear Relations

Example 3

The table shows all of the ordered pairs belonging to function g.

x	y
1	5
2	7
3	9
4	11
5	13

(a) Determine $g(x)$.

(b) Write the table for the inverse relation.

(c) Evaluate $g(5)$.

(d) Evaluate $g^{-1}(5)$.

(e) What are the coordinates of the point that corresponds to $g^{-1}(5)$ on the graph of g^{-1}?

(f) What are the coordinates of the point on the graph of g that corresponds to $g^{-1}(5)$?

(g) Determine $g^{-1}(x)$.

Example 5

A relation is $h(x) = -4x + 6$, where $\{x \mid -2 \leq x \leq 3, x \in \mathrm{R}\}$.

(a) Sketch the graph of $y = h(x)$.

(b) Sketch the graph of $y = h^{-1}(x)$.

(c) State the domain and range of h.

(d) State the domain and range of h^{-1}.

(e) Are h and h^{-1} functions? Explain.

13. Communication: An electronics store pays its employees by commission. The relation $p(s) = 100 + 0.05s$ is used to find an employee's weekly pay, p, in dollars, where s represents the employee's weekly sales in dollars.

(a) Describe the function as a rule.

(b) Determine $p^{-1}(s)$.

(c) Describe the inverse function as a rule.

(d) Describe a situation where the employee might use the inverse function.

(e) State a reasonable domain and range for p^{-1}.