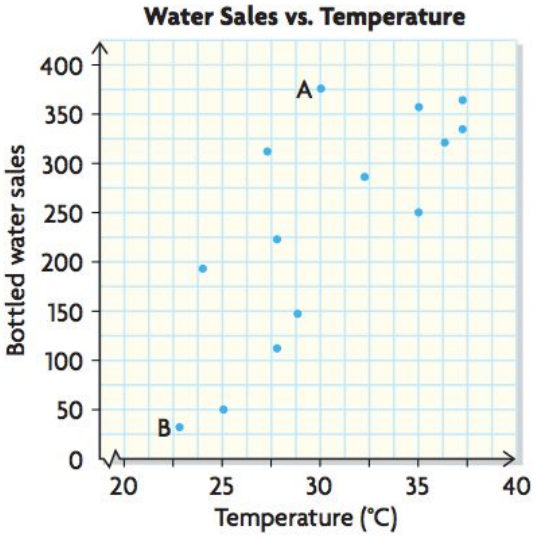
IM2 Problem Set 4.5 - Linear Relations and Functions

BIG PICTURE of this UNIT:	• What is meant by the term FUNCTIONS and how do we work with them? • mastery with working with basics & applications of linear functions • mastery with working with basics & applications of linear systems • understanding basics of function concepts and apply them to lines & linear systems

Part 1 - Skills/Concepts Review

1. **(CI)** Given the linear function $g(x) = -\frac{2}{3}x + 1$,
   a. Determine the slope, the y-intercept and the x-intercept of this function.
   b. Sketch a graph of this function.
   c. Rewrite the equation in standard form.
   d. Mr. S restricts the domain to be $\{x \in \boldsymbol{R} \mid -6 \leq x \leq 12\}$. Determine the range of this function.

2. **(CI)** The scatter plot shows the sales of bottled water at football game during the summer.
   a. What information does point A represent? Point B?
   b. What does the scatter plot show about the relationship between water sales and temperature?
   c. What would you predict the sales of water to be when the temperature is 31°C? How confident are you about your prediction? Explain your reasoning.
   d. Mr. S will use two points to determine an equation for a line of best fit for this data set.
      i. Select 2 points and explain WHY you decided to use these two points.
      ii. Use your points to determine a linear model for this data set.
      iii. Must the model be linear? What other possible models could be used?



3. **(CA)** Patrick has saved $600 and will use this money to buy British pounds as well as euros for a school trip. He knows that one British pound costs $2 and that one euro costs $1.50.
   a. Create a table of values OR an equation OR a graph to show how many pounds and euros Patrick can buy.
   b. Explain WHY this relation must be linear.
   c. Explain WHY this relation must be a function.

4. **(CI)** Solve the following equations:
   a. If $g(x) = 4 - 3x$, solve the equation $g(x) = 13$
   b. If $h(x) = \frac{2}{3}x + 6$, solve $h(x) = 10$

5. **(CI)** A relation is defined by the following description: ***To "create/generate" a new value, a "starting" number is reduced by 2 and then this result is halved.*** The CONDITION on the "starting" number is that it must be a real number between and excluding -4 and 8.
    a. Create a table of values and a mapping diagram for this relation.
    b. Create an equation for this relation.
    c. Graph this relation.

6. **(CA)** Students in Grade 9 and Grade 10 are trying out for the JV Boys baseball team. Coach Monty measures the speed of their pitches and these results are shown below.

Age (years)	14.1	14.6	14.9	15.3	15.5	15.6	15.7	15.8	15.9	16.3	16.4
Throwing Speed (km/h)	79.3	50.2	66.1	103.3	62.3	40.4	91.6	75.8	55.9	52.7	62.4

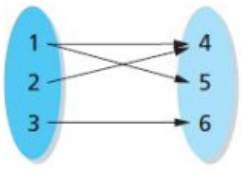
    a. Use your TI-84 to prepare a scatter plot and hence determine the nature of the relationship between the speed of the pitch and age.
    b. Can you predict the speed of a pitch from a student who is 14.2 years old?
    c. Can this relation be a function? Explain your thinking.

Part 2 - Skills/Concepts Application Problems

7. **(CI)** For each of the following relations, state:
    i. the domain and range
    ii. whether the relation defines a function or not and justify your answer.
    iii. For Qabc, evaluate $f(1)$ for each function.
    iv. For Qabc, solve the equation $f(x) = 1$

(a) $\{(1, 2), (3, 1), (4, 2), (7, 2)\}$
(b) $\{(1, 2), (1, 3), (4, 5), (6, 1)\}$
(c) $\{(1, 0), (0, 1), (2, 3), (3, 2)\}$

(d)



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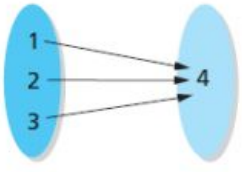

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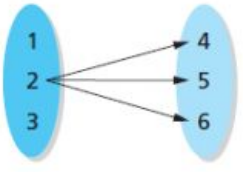


8. **(CA)** At 9:20 am, Adrian left Windsor with 64 litres of gas in his car. He drove at a constant speed of 110 km/hr until his low fuel warning light came on (which happens in his car when there are 10 litres of gas in the tank). Adrian's car uses gas at a rate of 8.8 L/100 km. At what time did his warning light come on?

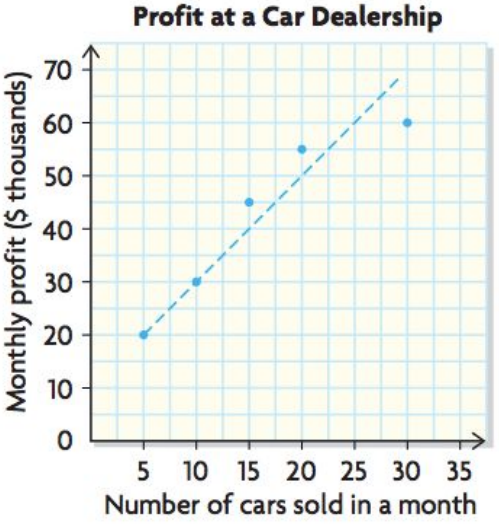
9. **(CA)** Maureen pays a $350 registration fee as well as a $85 monthly fee to belong to a fitness club. Lia belongs to another club that has a higher registration fee but a lower monthly fee. After 5 months, both Lia and Maureen have paid the same amount of $775. Determine the possible fees at Lia's club.

10. **(CA)** Mr S is running a game of darts wherein you pay 25 cents every time you miss scoring a bullseye, but Mr S pays you 75 cents every time you score a bullseye.

    a. You throw a dart 5 times. List 3 possible "outcomes" of this game and the amount of money resulting from each of your 3 outcomes.
    b. After playing the game n times, Luke pays $2.00. How many games could he have played? MANY answers are possible - give 3 possible answers.
    c. Luke plays 25 games and he paid $5.25. In how many games did he score a bullseye?

11. **(CI)** This scatter plot shows the monthly profit for a car dealership when a certain number of cars are sold.

    a. Use the graph to estimate the monthly profit when 23 are sold. How confident are you about your prediction? Explain your reasoning.
    b. Use the graph to estimate the number of cars sold when the monthly profit is $67,000. How confident are you about your prediction? Explain your reasoning.
    c. Use the graph to estimate the monthly profit when 50 are sold. How confident are you about your prediction? Explain your reasoning.



Part 3 - Extension Problems

12. Let $f(x) = 3x + 1$ and let $g(x) = 2 - x$. Determine the values for a such that:
    a. $f(a) = g(a)$
    b. $f(a^2) = g(2a)$

13. A function has the following properties: (i) the domain of f is the set of natural numbers, (ii) $f(1) = 1$, and (iii) $f(x + 1) = f(x) + 3x(x + 1) + 1$.
    a. Determine $f(2), f(3), f(4), f(5)$ and $f(6)$
    b. Describe this function.

HOMEWORK PROBLEMS:

(1) Function Notation: Nelson 11, Chap 1.2, p22, Q9,11,12
(2) Linear Relations: Nelson 10, Chap 1.1, p19, Q11,12,16