IM2 Problem Set 5.8 - Linear 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. Sketch $\frac{2}{3}x - y - 4 = 0$ on the range of $\{x \in R \mid -4 \leq y \leq 2\}$, clearly labelling the "end points" of this line segment.

2. For the following sequences of numbers, describe the pattern and then predict the next 4 terms in each sequence as well as predicting the 3 numbers that preceded the first listed number. Finally, as a challenge, find the 100th term in each sequence.

   a. …., 20, 36, 52, 68, ……
   b. …., 20, 36, 64.8, 116.64,…….
   c. …., 20, 36, 56, 80, 128, ……

3. Determine the equation (in all 3 forms) of the line through the points A(5,2) and B(-1,-6).

4. Graph the function $g(x) = \frac{1}{2}x + 5$ on your calculator. Determine:

   a. the range if the domain were $\{x \in \boldsymbol{R} \mid -8 < x \leq 16\}$
   b. the domain if the range were $\{y \in \boldsymbol{R} \mid -2.5 \leq y < 1\}$
   c. Determine the x- and y-intercepts
   d. Evaluate $g(-24)$
   e. What value of x makes $g(x) = -8$?

Part 2 - Skills/Concepts Application Problems

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

6. Ishaan has $15 to buy muffins and doughnuts for the school bake sale for the Math Club. Muffins cost $0.75 each and doughnuts are $0.25 each. How many muffins and doughnuts can he buy?

    a. Create a table to show some possible combinations of muffins and doughnuts.
    b. What is the maximum number of muffins he can buy? The maximum number of doughnuts he can buy?
    c. Write an equation that describes Ishaan's options.
    d. Graph the possible combinations.
    e. Mr. S states that the domain can be a **real** number , whereas Mr. R states that the domain must be an **integer** number. Who is correct and why?

7. Torie pays 10 cents per minute for cell phone calls and 6 cents for text messages. She has a budget of $25/month for both calls and text messages.

    a. Create a table to show 4 ways that Torie can spend up to $25 each month on calls and text messages. (HINT: What will your variables represent?)
    b. Write an equation that models this context. (HINT: what will be your variables?)
    c. State the domain and range of the model that you created to describe this relation.
    d. Torie's brother, Will, thinks he has found a better deal. He would pay 4 cents per text message and 12 cents per minute for calls for a month fee of $20 for both calls and texts. Explain whether or not her brother's deal is "better"

8. Determine the equations of the following lines:

    a. the line that passes through the point E(5,-2) and is parallel to $3x - 4y = -9$.
    b. the line that is parallel to $y - 5 = \frac{2}{3}(x - 2)$ and passes through the point (-3,6)
    c. the line passing through (4, -3) and is perpendicular to $2x - 3y = -8$.

9. The Grade 9 student council is going to sell muffins as a fund raising activity. They spend $16 on advertising and the cost of ingredients to bake each muffin is $0.50. They decide to sell each muffin for $0.75.

    a. If they make and sell 200 muffins, how much money do they earn?
    b. How many muffins must they sell in order to break-even (zero profit)
    c. Write two equations that could be used to model this situation (one equation will represents what it costs the council and one equation will represent what the council will earn)

10. Jack sells furniture and earns $280/week plus a 4% commission on his weekly sales.

    a. What weekly sales target does Jack need to have so that he can earn $900 weekly?
    b. Jack is offered an alternate pay option: he can earn $200 weekly plus a 6% commission. He asks you for advice - should he take this new pay option and why/why not?

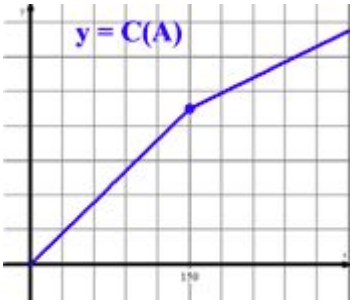
11. You are selling tickets for the CAC Theatre's new play. Student tickets cost $5 and adult tickets cost $8. You know that the total sales have been 500 tickets and that the theatre collected $3475 in revenues from the sale of these 500 tickets.

    a. Write 2 equations to model this problem.
    b. Using your equations, how many tickets were sold to students and to adults?

12. STUCO is selling hot chocolate as a fund raising activity this winter. The equation $A(p) = \frac{26 - 2p}{4}$ relates the price of a cup of hot chocolate, p (in LE), to the amount of cups, A, that people will buy (in hundreds) at that given price.

    a. Evaluate and interpret $A(9)$.
    b. Explain why the function has a negative slope.
    c. What is the y-intercept of this function and what does it represent?

    The **COST** for the supplies is modeled by the piecewise function $C(A) = \begin{cases} 6A & \text{if } A \le 150 \\ 3A + 450 & \text{if } A > 150 \end{cases}$, where C is the cost in LEs and A is the amount of cups of hot chocolate sold. Here is a sketch of this cost function:

    d. Evaluate and interpret $C(100)$.
    e. Evaluate $C(200)$.
    f. Determine the PROFIT that STUCO makes if the price per cup of hot chocolate is 9 LE.

Part 3 - Extension Problems

13. A museum charges $40 for a group of 10 or fewer people. A group of more than 10 people will pay $2.00 per person for the number of people above 10 (in addition to the $40,00). For example, a group of 15 will pay $50. The maximum group size is 50 people.

    a. Draw a sketch that represents this situation. Show key points.
    b. Write an equation in the form of y = …… ?
    c. What are the domain and range of this cost relation

14. The charge for a taxi ride in New York City is $10.00 for the first half of a mile and then $1.50 for each additional quarter of a mile (rounded to the nearest quarter mile.)

    a. Make a data table showing the how the cost in dollars (C) of a trip is determined by the distance travelled, in miles (m). So the function will be called C(m)
    b. What is the cost for a 1.75 mile trip?
    c. How far can you go for $25.00?
    d. Sketch the graph, showing key points.