

STRAND 2: LINEAR FUNCTIONS

TOPIC 2.5: APPLICATIONS OF SLOPE AND INTERCEPT

Topic Notes

Mathematical focus

Participants apply the concepts of slope as rate of change and the y -intercept to a real-life situation. They translate among algebraic, tabular, graphical, and verbal descriptions of linear functions. Terms: rate of change, constant rate, y -intercept, slope.

Topic overview

This task begins with an application of the concepts of slope and y -intercept to a real-life situation. Participants look at variations of each concept separately. As participants consider these variations, they translate among verbal, tabular, graphical, and algebraic representations of the situation. Participants also find the input corresponding to a given output. They start with a function rule, substitute a given quantity (the output), and solve the equation (for the input). Finally, participants compare the linear functions using tabular, graphical, and algebraic representation of both functions.

One task is included in this topic.

Task 2.5.1: Jet Ski Rental

TEXES standards focus

TEXES Standard II.006 Patterns and algebra. The teacher understands linear and quadratic functions, analyzes their algebraic and graphical properties, and uses them to model and solve problems. The beginning teacher:

(A) Understands the concept of slope as a rate of change and interprets the meaning of slope and intercept in a variety of situations.

TEXES Standard II.005 Patterns and algebra. The teacher understands attributes of functions, relations, and their graphs. The beginning teacher:

(C) Understands that a function represents a dependence of one quantity on another and can be represented in a variety of ways (e.g., concrete models, tables, graphs, diagrams, verbal descriptions, symbols).

(E) Applies basic transformations [e.g., $k f(x)$, $f(x) + k$, $f(x - k)$, $f(kx)$, $|f(x)|$] to a parent function, f , and describes the effects on the graph of $y = f(x)$.

TEKS/TAKS focus

TEKS A.5 Linear functions. The student understands that linear functions can be represented in different ways and translates among their various representations. The student is expected to:

- (C) use, translate, and make connections among algebraic, tabular, graphical, or verbal descriptions of linear functions.

High School TAKS Objective 3: The student will demonstrate an understanding of linear functions.

TEKS A.6 Linear functions. The student understands the meaning of the slope and intercepts of the graphs of linear functions and zeros of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations. The student is expected to:

- (A) develop the concept of slope as rate of change and determine slopes from graphs, tables and algebraic representations;
 (B) interpret the meaning of slope and intercepts in situations using data, symbolic representations, or graphs;
 (C) investigate, describe, and predict the effects of changes in m and b on the graph of $y=mx+b$;
 (E) determine the intercepts of the graphs of linear functions and zeros of linear functions from graphs, tables, and algebraic representations;
 and
 (F) interpret and predict the effects of changing slope and y-intercept in applied situations.

High School TAKS Objective 4: The student will formulate and use linear equations and inequalities.

TEKS A.7 Linear functions. The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. The student is expected to:

- (A) analyze situations involving linear functions and formulate linear equations or inequalities to solve problems;
 (B) investigate methods for solving linear equations and inequalities using concrete models, graphs, and the properties of equality, select a method, and solve the equations and inequalities; and
 (C) interpret and determine the reasonableness of solutions to linear equations and inequalities.

Materials

Task 1	
Handout	X
Grid paper	X
Graphing Calculator	X
Ruler	X

Procedures

Arrange participants in groups of 3-4.

Ask participants to complete the activity. This task takes participants from a verbal description of a situation to a table, rule, and graph representing the situation. Then, participants investigate the effect of increasing the deposit (y -intercept) and the hourly rate (slope). Next, participants investigate what changes result in an increase in steepness of the line and a change in the starting point.

Finally, participants compare two jet ski rental situations, identify the conditions when each is the better deal, and justify their choice.

After participants complete the exercise, discuss their results.

Summary

In this task, participants see the effect of changing the y -intercept (deposit) and slope (hourly rate) in a real life situation.

Extensions

Have participants create problem situations from a given rule. Participants should then be asked to create changes in the problem situation that will increase and decrease the slope and then increase and decrease the y -intercept.

Assessment/Transition to the classroom

Participants should complete the Teacher's Journal, recording their responses and making any modifications necessary to make the tasks completely classroom ready.