All in a Day's Work

Overview

Description

After researching the cost to attend a local community college, students will analyze two summer job scenarios to determine which scenario will net enough money to pay for a semester of college. One scenario will involve working at a fast food restaurant near home for a set number of hours per week at a constant wage per hour, while the second scenario will involve travel costs to a distant location for a weekly wage. Finding the solution will involve writing a linear function for each job scenario and then analyzing the system of functions to determine which job scenario is the best choice. Finally, students will weigh other real-world factors into their decision of which job offer to accept.

Final Product: Students will create a presentation that includes the mathematical justification as well as other considerations weighed in deciding which job offer to accept.

Subject

Algebra I

Task Level

Grade 9

Objectives

Students will:

- Research the cost for a semester at a local community college, hourly wages at a nearby fast food restaurant, and related travel costs for the scenarios described.

- Formulate linear equations and inequalities to represent the relationship between time worked and total money earned, incorporating various costs as appropriate.

- Analyze and solve linear equations and inequalities to determine wage-earning potential for two given scenarios under various prescribed conditions.

- Describe real-world considerations other than wage-earning potential that factor into the decision.

Preparation

- Read the Instructor Task Information, Student Notes, and Student Handout. Make a copy of the handout for each student.

- On the website for a local community college, research the cost of one semester of classes at a local community college so you are prepared to facilitate class discussion. Include an estimate for the cost of books. You may choose to have students use one specific college for the assignment so you can give more direction on what to look for on the college's website.

- Determine a location suitable for job scenario B. This should be a government building approximately 30 miles away from school. You will need to provide students with the address of the building so that students can calculate their travel costs. Note that should you choose a location whose distance is significantly different than the suggested 30 miles, you will want to adjust the hourly wage for scenario B accordingly. For example, if the travel distance is significantly less than 30 miles, thereby reducing travel costs, you should lower the hourly wage to keep the two job options somewhat competitive with one another.

- Have a mock paystub prepared to display when explaining gross pay and deductions.

- Determine a reasonable timeline for students to conduct their research, analyze their findings using the student worksheets, and prepare a presentation summarizing their conclusions.

Prior Knowledge

Students should be able to construct tables, graphs, and equations that depict a linear relationship, and translate information from one algebraic representation to another. Students should be able to identify a constant (or fixed) value and a constant rate of change from multiple algebraic representations, including a verbal description. Students must realize the connections between linear equations and the patterns found in the tables and graphs of those equations (e.g., constant rate of change, slope, and *y*-intercepts). They should be able to solve linear equations and inequalities and understand the connections between solutions to systems of linear equations and their various representations. They should also be able to interpret the solution to a system of equations within the context of a real-world situation.

Key Concepts and Terms

- Constant rate of change
- Credit
- Debit
- Depreciation
- Federal withholding
- FICA
- Gross wages

- Linear relationship and/or linear function
- Net wages/earnings
- Point of intersection
- Slope
- *y*-intercept

Time Frame

Plan one to two weeks for this assignment. This includes conducting research, presenting a rough draft for instructor and/or peer review, and completing the final draft.

C R A f T
College Readiness Assignments for Texas

Instructional Plan

Getting Started

Learning Objectives

Students will:

- Gather information from various sources on college costs and potential earnings from job opportunities.

Procedure

1. Launch the task by asking students what colleges they would like to attend and what they know about the costs associated with those colleges. Elicit students' ideas about possible sources of information about college costs.

2. Direct students to research tuition and fees from a local college and record the data on the handout.

3. Distribute the Student Notes and handout. Introduce the job scenarios and the question of how to determine which is the better job. Elicit the understanding that one is a low-paying job with no associated costs and the other is a job that pays significantly more but involves additional costs.

4. Display the mock paycheck stub you have prepared. Discuss the difference between gross earnings and net earnings. Make sure students are aware of all deductions that will be subtracted from their gross pay.

5. For job scenario A, direct students to choose a local fast food restaurant (one at which there is no tipping) close to home so travel costs will be negligible. Students should go to the restaurant, ask to talk to the manager about hourly wages and tax information, and record their findings on the handout. Note: If students are unable to obtain the percent of withholding from the restaurant manager, let them know that deducting 19.75% from the gross earnings is an acceptable way to estimate withholding.

6. For job scenario B, provide students with the address of the government building you have selected. Because this scenario involves a mock job, the salary ($9.50 after withholdings) and clothing costs ($300) are given. Students must evaluate travel costs. Discuss different modes of travel and their associated costs: gas for a private vehicle, toll fees, bus or metro-rail fare, taxi fares, etc. Acquaint students with a commonly used mileage rate of $0.35 per mile, which covers the expense of gas as well as the depreciation of the vehicle. If the student will drive to work, then travel costs should be calculated at $0.35 per mile. If public transportation will be used, students might research costs online or by calling the local public transportation agency.

7. Direct students to record information on the handout. If students choose to research a local job opportunity that does not fit the description on the handout, they will need to record relevant information about their job on a separate sheet.

8. Set a deadline for students to complete their research and to verify that their findings are reasonable.

Investigating

Learning Objectives

Students will:

- Recognize that the relationship between time worked and amount earned is linear.

- Write a function for each job scenario and describe what information is represented by the variables and numbers.

- Represent the linear relationship as a function rule and a graph.

Procedure

1. Have students develop functions that represent their earnings and discuss their function rules with a peer. Once peers are convinced the functions are reasonable, students may share their work with the instructor. Listen for students to relate the patterns generated in the table to the constant rate of change in the equation. Also look for students to connect the fixed costs in the scenario to the constant in the function and the *y*-intercept on the graph. Allow students to revise their work as necessary before proceeding; the remainder of the task is contingent upon the two functions.

2. Students should complete the handout to represent their functions graphically as a system of equations. This part of the assignment may be completed in class so assistance can be provided as needed.

Drawing Conclusions

Learning Objectives

Students will:

- Analyze, compare, and make decisions about linear relationships using information given in tables, graphs, and equations.

- Connect the solution of a system of linear equations to a graph and interpret the meaning of the solution.

- Formulate equations and inequalities to interpret functions in the context of the problem.

- Use tables, graphs, and equations to solve problems and justify the solutions mathematically.

- Analyze other real life factors that may influence job choice.

- Create a presentation that clearly communicates all findings, conclusions, and justifications.

Procedure

1. This part of the assignment may also be completed in class so that assistance can be provided as needed.

2. Consider having a whole class discussion to prompt students' thinking about additional real-world considerations that might affect their job choice (e.g., traffic concerns, family obligations, vacations, job preference, future career path, day shifts vs. night shifts, etc.).

Scaffolding/Instructional Support

The goal of scaffolding is to provide support to encourage student success, independence, and self-management. Instructors can use these suggestions, in part or all together, to meet diverse student needs. The more skilled the student, however, the less scaffolding that he or she will need. Some examples of scaffolding that could apply to this assignment include:

- Having students describe in words the pattern of the amount of time worked and the amount of net earnings. Then ask, "How could you translate your words into symbols to describe this relationship?"

- Asking, "Does the relationship between time worked and net earnings appear to be linear or non-linear? How is this reflected in the table? In the graph? In the function rule?"

- Asking students to identify the *y*-intercept for each graph. Then asking, "What does the *y*-intercept mean in terms of the job scenarios? How will this point be represented in the table? In the function rule?"

Solutions

The solution provided in this section is for reference only and is intended to clarify the problem for instructors. This solution does not represent all possible strategies for approaching the problem or all the possible solutions.

Getting Started

College Costs

College: Lone Star College – Cypress		
Website: http://cyfair.lonestar.edu/		
Mailing Address: 14955 Northwest Freeway, Houston, TX		
Enrollment Fees	**Notes**	**Amount**
Entrance Exam (THEA, COMPASS, etc)		$29.00
Registration	Included in	
Cost per credit hour (resident)	$50 x 12hr	$600.00
Other fees (if applicable)	n/a	
Books (estimated)	$50 per credit	$600.00
Total Cost:		$1229.00

Housing Costs: The cheapest apartment I could find that would hold four of us was $625 per month. My part of that would by ($625)(10)/4 = $1562.50. For one semester, I calculated half that total, $781.25.

C R A f T
College Readiness Assignments for Texas

Job Scenario A

Restaurant: *fast food restaurant*				
Address: *close proximity to home/school*				
Travel distance round trip: *minimal distance*				
Hourly wage: *minimum wage of $7.25 per hour gross*				
Contact: *manager's name*				

	Amount (daily)		Amount (weekly)	
	Credits (+)	Debits (-)	Credits (+)	Debits (-)
Gross Earnings	7.25 x 8 = $58		7.25 x 40 = $290	
Deductions (e.g. FICA, Medicare, Federal Income Tax)		*20% of $58* $11.60		*$20% of $290* $58.00
Other related costs (if applicable)		n/a		n/a
Net Income	$58 -11.60 = $46.40		$232.00	

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Job Scenario B

Teen Leaders Internship

Address: *TBD by instructor*

Travel distance round trip: *60 miles round trip*

Hourly wage: *$9.50 after deductions/taxes*

	Amount (daily)		Amount (weekly)	
	Credits (+)	Debits (-)	Credits (+)	Debits (-)
Gross Earnings	$9.50 x 8hr = $76		$9.50 x 40hr = $380	
Deductions (e.g. FICA, Medicare, Federal Income Tax)		n/a		n/a
Other related costs (if applicable) clothing		$300		$300
Travel ($0.35 per mile)		$0.35 x 60 miles = $21		$0.35 x 300 miles = $105
Net Earnings	$76 – 21 = $55 per day less clothing		$380 – 105 = $275 per week less clothing	

Investigating

1. The relationships are both linear. The slope for job A is smaller than the slope for job B (representing a lower hourly wage), but job A has a larger *y*-intercept (representing the fact that there are no costs associated with performing job A).

Amount of time worked *1 week = 40 hours* *WEEKS*	Job Scenario A Net Earnings	Job Scenario B Net Earnings
0	$0	- $300.00
1	$232.00	- $25.00
2	$464.00	$250.00
3	$696.00	$525.00
4	$928.00	$800.00
5	$1160.00	$1075.00
6	$1392.00	$1350.00
7	$1624.00	$1625.00
8	$1856.00	$1900.00
9	$2088.00	$2175.00
Etc.		

2. Earnings function A: $E = 232w$

   (a) **E** represents net earnings and **w** represents number of weeks worked, and 232 represents the amount of net earnings per week.

   Earnings function B: $E = 275w - 300$

   (b) **E** represents net earnings and **w** represents number of weeks worked, 275 represents amount of income less mileage expenses ($380 less $105) per week, and 300 represents the one time clothing cost.

3. Possible graph:
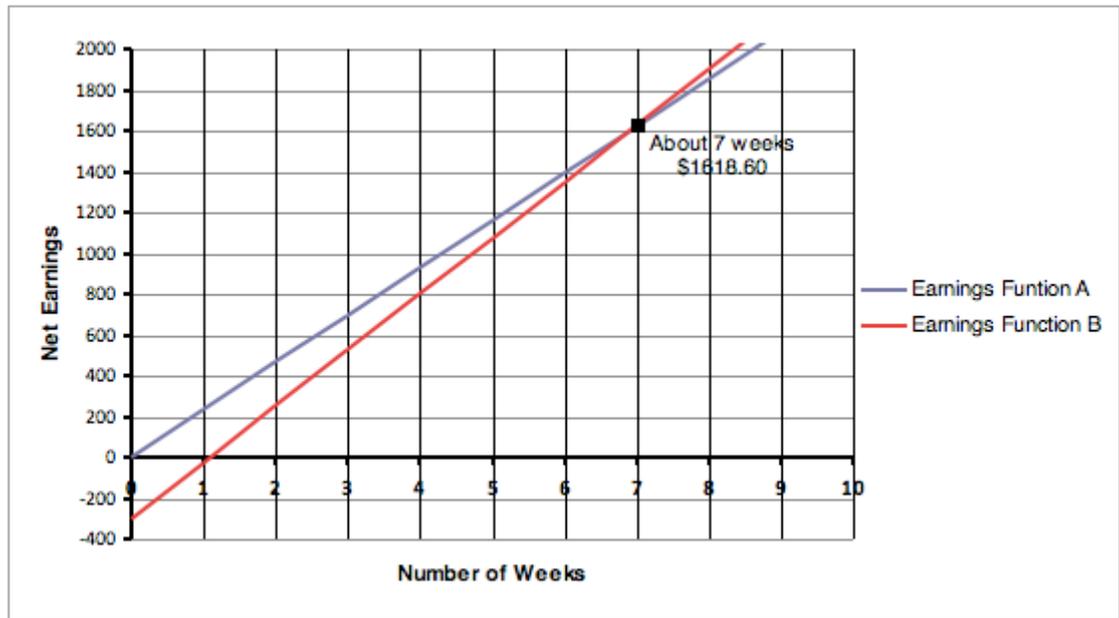
4. Possible answer: The point of intersection (about 7 weeks, $1618.60) shows the time when the net earnings for the two jobs are the same. Up to this point of intersection, job A produced more net earnings than job B. After this point, job B had a greater earning potential. Therefore, if I intend to work more than 7 weeks, job B will produce more earnings to pay for college costs. However, if I want to work fewer than 7 weeks, job A would be the better option.

Drawing Conclusions

1. Answers will vary depending on the hourly wage offered in job A and the travel costs associated with job B. Be sure students are able to use the graph and function rule to justify their job choice and that they take into account the cost of housing.

2a. Answers will vary.

2b. Answers will vary. The final job choice should not be based solely on the mathematics of the college costs but should include an analysis of other real-world factors involved.

TCCRS Cross-Disciplinary Standards Addressed

Performance Expectation	Getting Started	Investigating	Drawing Conclusions
I. Key Cognitive Skills			
A.1. Engage in scholarly inquiry and dialogue.	✓		
B.3. Gather evidence to support arguments, findings, or lines of reasoning.	✓		
C.1. Analyze a situation to identify a problem to be solved.		✓	
C.3. Collect evidence and data systematically and directly relate to solving a problem.	✓	✓	✓
D.1. Self-monitor learning needs and seek assistance when needed.	✓	✓	✓
D.2. Use study habits necessary to manage academic pursuits and requirements.	✓	✓	✓
D.3. Strive for accuracy and precision.	✓	✓	✓
D.4. Persevere to complete and master tasks.	✓	✓	✓
E.1. Work independently.	✓	✓	✓
F.1. Attribute ideas and information to source materials and people.	✓		✓
II. Foundational Skills			
B.1. Write clearly and coherently using standard writing conventions.			✓
C.5. Synthesize and organize information effectively.		✓	✓
C.6. Design and present an effective product.			✓
C.8. Present final product.			✓
E.1. Use technology to gather information.	✓		
E.2. Use technology to organize, manage, and analyze information.			✓

TCCRS Mathematics Standards Addressed

Performance Expectation	Getting Started	Investigating	Drawing Conclusions
VII. Functions			
C.2. Develop a function to model a situation.		✓	
VIII. Problem Solving and Reasoning			
A.3. Determine a solution.			✓
A.4. Justify the solution.			✓
IX. Communication and Representation			
A.1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem.		✓	
A.2. Use mathematical language to represent and communicate the mathematical concepts in a problem.			✓
B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context.	✓		
C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, graphs, and words.			✓
C.2. Create and use representations to organize, record, and communicate mathematical ideas.		✓	
C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications.			✓

TEKS Standards Addressed

All in a Day's Work - *Texas Essential Knowledge and Skills (TEKS): Math*
111.32.b.1. Foundations for functions. The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways. The student is expected to: 111.32.b.1.D. represent relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities.

All in a Day's Work - *Texas Essential Knowledge and Skills (TEKS): Math*

111.32.b.3. Foundations for functions. The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations. The student is expected to:

    111.32.b.3.A. use symbols to represent unknowns and variables.

    111.32.b.3.B. look for patterns and represent generalizations algebraically.

111.32.b.4. Foundations for functions. The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. The student is expected to:

    111.32.b.4.A. find specific function values, simplify polynomial expressions, transform and solve equations, and factor as necessary in problem situations.

111.32.b.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:

    111.32.b.7.A. analyze situations involving linear functions and formulate linear equations or inequalities to solve problems.

    111.32.b.7.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.

    111.32.b.7.C. interpret and determine the reasonableness of solutions to linear equations and inequalities.

111.33.b.3. Foundations for functions. The student formulates systems of equations and inequalities from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situations. The student is expected to:

    111.33.b.3.A. analyze situations and formulate systems of equations in two or more unknowns or inequalities in two unknowns to solve problems.

    111.33.b.3.B. use algebraic methods, graphs, tables, or matrices, to solve systems of equations or inequalities.

    111.33.b.3.C. interpret and determine the reasonableness of solutions to systems of equations or inequalities for given contexts.

111.36.c.1. The student uses a variety of strategies and approaches to solve both routine and non-routine problems. The student is expected to:

    111.36.c.1.B. use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines.

    111.36.c.1.C. select a method to solve a problem, defend the method, and justify the reasonableness of the results.

111.36.c.3. The student develops and implements a plan for collecting and analyzing data (qualitative and quantitative) in order to make decisions. The student is expected to:

    111.36.c.3.B. communicate methods used, analyses conducted, and conclusions drawn for a data- analysis project by written report, visual display, oral report, or multi-media presentation.

111.36.c.5. The student uses functional relationships to solve problems related to personal income. The student is expected to:

    111.36.c.5.A. use rates, linear functions, and direct variation to solve problems involving personal finance and budgeting, including compensations and deductions

    111.36.c.5.B. solve problems involving personal taxes.

All in a Day's Work

Introduction

Suppose you intend to start college in the fall at your local community college. You have the summer to work and save money. You have two job offers. You need to weigh the pros and cons of each job and determine which will generate the most money. There may also be other factors you want to consider in deciding which job to take.

In this task, you will research the costs for one semester of college and determine which job will best cover your college costs. You will present your findings and decision to the class and support your decision.

The Problem

Here are the two job scenarios:

Job Scenario A	Job Scenario B
• Fast food restaurant • Travel distance minimal • 5 days a week • 8 hour shift per day • Entry level hourly wage less withholdings • Restaurant uniform provided	• Teen Leaders Internship • Travel distance approximately 30 miles one way • 5 days a week • 8 hour shift per day • $9.50 per hour after withholdings • Professional attire required – estimated cost $300

To make your decision, you will need to investigate the following.

1. The cost of attending your local community college with a schedule of 12 semester hours, including registration, entrance exam, any other required fees, and an estimated cost for books.

2. The cost of renting an apartment.

3. The net earning potential under job scenario A, an entry level position at a fast food restaurant; and

4. The net earning potential under job scenario B, an internship program working as a clerk for local government.

5. Other factors you want to consider.

Directions

Getting Started

1. Keep a list of resources you use in your research (e.g., websites, periodicals, persons with whom you speak). You will include this documentation in your presentation. Use the handout to record information and calculate the costs involved.

2. Research tuition fees and all other costs associated with enrolling in the first semester of the community college. Include the registration fee, entrance exam fee, cost of 12 credit hours, and any additional fees you learn about. Also include the estimated cost of books.

3. Determine the cost of renting an apartment September through June. Research local apartment rental rates. Assume that you will have three roommates to share the costs.

4. Research both job scenarios.

    *   For job scenario A, choose a nearby fast food restaurant so that travel costs are not a factor. Speak with a manager to find out the gross hourly wage for an entry-level employee. Also ask about the percentage of pay that is withheld for FICA, Medicare, and federal income tax.

    *   For job scenario B, you will be working as a clerk for local government as part of a "Teen Leaders Internship" program. The internship pays $9.50 per hour after taxes. It's a great opportunity. The drawback is that there are these costs involved:

        A. You will have to travel to the government office located at:

        (to be given by your instructor)

        To get there, you will need to use public transportation or drive. If you will use public transportation, research the cost of traveling to work. If you are driving, calculate the mileage expense using the standard mileage rate of $0.35 per mile.

        B. You will be required to wear professional dress. Allow a personal expense of $300 for the cost of new clothes.

Investigating

1. Describe in words the relationship between the amount of time worked and the net earnings for each job scenario. Create a table with net earnings for the first several weeks of the jobs. How does this information help you choose between job A and job B?

2. For each job scenario, represent as a function rule the relationship between amounts of time worked and net earnings. Describe what each number and variable represent.

3. Graph the two functions on the grid provided in the handout. How does the information found in the graph help you choose between job A and job B?

4. On the graph, mark any point(s) that assisted you in your analysis of the two job scenarios. Record these coordinates, and explain their significance in context to the job scenarios.

Drawing Conclusions

1. Based only on your mathematical findings, which job is best for you? Discuss your ideas with your peers. Then write a short summary of your conclusions. Include the mathematical support for your conclusions.

2. What other factors are you considering in deciding which job to take? Weigh them along with the potential earnings, and decide which job offer you will accept. When you are ready, write a summary of all the considerations that have gone into your decision.

3. Prepare to present your decision to the class. Your presentation should include the mathematical support for your findings about potential earnings, and the other considerations you took in to account in making your decision. Choose one of these presentation formats:

    - An electronic file (Word document or PowerPoint presentation).

    - A short video (4-5 minutes in length).

4. Refer to your list of resources used in your research. Include this documentation in your presentation.

Name: _____ **Date:** _____ **Class:** _____

College Costs

Community College:

Address:

Website:

Costs:

Housing Costs

Record your calculations and total contribution to the rental cost.

Job Scenario A

Restaurant:

Address:

Travel distance round trip:

Hourly wage:

Contact:

	Amount (daily)		Amount (weekly)	
	Credits (+)	Debits (-)	Credits (+)	Debits (-)
Gross Income				
Deductions (e.g. FICA, Medicare, Federal Income Tax)				
Other related costs (if applicable)				
Net Income				

Job Scenario B

Teen Leaders Internship

Address:

Travel distance round trip:

Hourly wage:

	Amount (daily)		Amount (weekly)	
	Credits (+)	Debits (-)	Credits (+)	Debits (-)
Gross Income				
Deductions (e.g. FICA, Medicare, Federal Income Tax)				
Other related costs (if applicable)				
Net Income				

Grid

Use the grid below to graph the two functions.