

Performance Based Learning and Assessment Task

Summer Woes!

I. ASSESSMENT TASK OVERVIEW & PURPOSE:

This assessment task is to evaluate and build on student's understanding of one- and two-step equations. The students will set up and solve equations from a real-world application. The task allows the students to gain a better understanding and the benefits of having a summer job to make purchases.

II. UNIT AUTHORS:

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III. COURSE:

Algebra

IV. CONTENT STRAND:

Algebra

V. OBJECTIVES:

- Solve multi-step linear equations in one variable;
- Model a real-world linear equation and interpret its solutions.

VI. REFERENCE/RESOURCE MATERIALS:

Class Activity Worksheet, Performance Based Assessment, Student Assessment list, Calculator, Computers with Internet access, Paper and Pencil

VII. PRIMARY ASSESSMENT STRATEGIES:

The task includes an assessment component that performs two functions: (1) for the student it will be a checklist and provide a self-assessment and (2) for the teacher it will be used as a rubric. The Student Assessment list will help students do a self-evaluation, the Teacher Rubric will be used as a guide to assign grades; each are provided.

VIII. EVALUATION CRITERIA:

Student Assessment List for the Assessment and corresponding rubrics are included.

IX. INSTRUCTIONAL TIME:

Approximately 1.5 class periods or 135 minutes.

Summer Woes!

Strand

Algebra

Mathematical Objective(s)

The Students will

- Solve multi-step linear equations in one variable;
- Model a real-world linear equation and interpret its solutions.

Related SOL(s)

[A.4d and 4f]

- The student will solve
 - d)** multi-step (two-step) linear equations **algebraically** and graphically;
 - f)** **real-world problems involving equations** and systems of equations.

NCTM Standards

- Represent and analyze mathematical situations and structures using algebraic symbols;
- Understand the meaning of equivalent forms of expressions, equations, inequalities and relations;
- Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency – mentally or with paper and pencil in simple cases and using technology in all cases;
- Use symbolic algebra to represent and explain mathematical relationships;
- Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology;
- Use the language of mathematics to express mathematical ideas precisely;
- Adapt and apply a variety of appropriate strategies to solve problems.

Materials/Resources

- Class Activity Worksheet, Performance Based Assessment, Student Assessment list, Calculator, Computers with Internet access, Paper and Pencil.

Assumption of Prior Knowledge

- Students must know how to translate verbal and algebraic expressions.
- Students must know how to round decimals.
- Students must know how to simplify like terms.
- Students should apply their working knowledge and ability of solving one-step equations.
- Students should verify and interpret their solutions.
- Students should identify, perform, and apply a unit conversion.
- Students should have mastered solving one-step equations with one variable.
- Students must know how to verify their solutions to one-step equations.
- Students should be able to budget and plan accordingly for future expenses.
- Students may experience difficulty and need assistance in performing a unit conversion.

Introduction: Setting Up the Mathematical Task

- This task is being used to help students set up and solve equations (two-step) and notice how they are used in the real-world. This will give them an introduction to equations and the foundation to solve more complex multi-step equations.
- For the students to complete the worksheet and assessment it will take 1 and 1/2 class periods. The Activity Worksheet is to help students connect linear equations to the real-world by using an application problem. The Performance Based Assessment sheet is for the teacher to assess their understanding of linear equations.
- Students will practice solving and interpreting linear equations by applying them to a real-world application prior to the Performance Based Assessment.

- To introduce the task, the teacher will ask the following:
Are you tired of hearing, “If you want it, you have to earn it.” or “You need a job! I cannot afford this.” or “Money doesn’t grow on trees!”
Make this notion a reality or not with the “SUMMER Woes!” activity. In this task you will investigate the relevancy of how linear equations can assist you in achieving your desired outcome(s).
For example:
Have you ever gone to the store and tried to determine which deal was more cost effective for an item? How can we determine this? Such as how much tax is included, or how many units (ounces) are involved for each product, or how many items are in the product?
- Remind students that when dealing with monetary values, they should round appropriately.
- Teachers should discuss rounding in terms of money, hours, and days and how it relates to a job. This discussion should occur either before the activity or during the think/pair/share strategy time.
- The students will complete the Activity Worksheet using the think/pair/share strategy. The students will complete the Performance Based Assessment individually.

Student Exploration

Student/Teacher Actions:

- The Activity Worksheet is for the students to explore and solve two-step equations through a real-world application problem. The student will work on the assignment individually for 20 minutes. For the next 20 minutes, the students will then share their results with another person and finish what had not been completed. After completing the task, student pairs will be asked to share their results with the class. When students present their results the teacher will use guided questioning to correct any misunderstood assumptions. The teacher will then answer questions and transition the students to complete the Performance Based Assessment, which is to be completed individually.

Monitoring Student Responses During the Class Activity

- If students are having difficulties with the Activity Worksheet while working individually or in groups, the teacher will use appropriate questioning to guide the students.
- Students will communicate their new knowledge based on the Activity Worksheet to the class by presenting a question that is assigned. During student presentations, there may be some mathematical misunderstandings, at which point, the teacher will guide the students and clear up any confusion. The teacher could also ask the class if they are in agreement with student responses so as to get more student participation and engagement but to also ensure that all students walk away with a better understanding.

Monitoring Student Responses During the Performance Based Assessment

- The teacher needs to walk around and help students with questions they may have.
- The teacher is to direct the students and not give answers.

Summary

After completing the activity the teacher will lead the students through a series of questions to summarize. The students will then complete the Performance Based Assessment.

- How was the activity relevant to you?
- How do you verify and interpret your results?
- After new elements were added, how did you feel?
- What effects did the new elements have on your responses?
- Explain the process to solve multi-step equations.
- When and how would you be able to use the skills presented at a later time?

Assessment List and Benchmarks

Student Assessment list, Teacher Rubric, and benchmarks are attached

Questions

- What are some other expenses that may occur, which may affect your total amount spent? For example, purchasing items online, buying lunch while at work, or the total travel distance from home.
- What would happen if you were able to work overtime or had to take a family vacation?

Journal/writing prompts

- Describe a real-world situation that can be solved using linear equations. Solutions should be included.
- As an extension, the teacher may ask students about the true value of their pay. The students may then compare the gross pay versus the net pay.

Class Activity:

The Federal government wants to get a better understanding of high school students' potential interest in the workforce. To do so they want to know what kind of jobs students would be interested in and how much per hour they should be paid. They also want to make sure a high school student can complete some basic calculations to be prepared for the work force. Your task is to help them by completing the following survey. You will use your responses to complete a few calculations, which should reflect appropriate rounding. Use your graphing calculator to verify your results.

1. You are interested in getting a summer job for some extra cash. Where would you be interested in working and what job would you want to do?

2. How many hours a day would you want to work?

3. How much would you expect to get paid per hour for your job?

4. You want to purchase a pair of Jordans © that cost \$119.97. Using your expected pay per hour, and \$10 that's in your savings account, how many hours would you need to work to purchase the Jordans?
 - a. Set-up an algebraic equation to calculate how many hours you would need to work, where h represents the number of hours worked.

 - b. Solve the algebraic equation you created from part **a** to determine how many total hours you would need to work.

 - c. Explain your answer using complete sentences.

 - d. You forgot to include the 5% sales tax when calculating the number of hours needed to purchase the shoes. Set up and solve a new equation that includes the sales tax.

5. It is 5 miles to the store, and the total cost for those miles is \$1.50 for a one-way trip. How many hours will you need to work to pay for the Jordans including the sales tax and total cost in travel? Set up and solve equations to answer the question. Then write a sentence to support and explain your solutions.

Benchmark

Class Activity:

The Federal government wants to get a better understanding of high school students' potential interest in the workforce. To do so they want to know what kind of jobs students would be interested in and how much per hour should they be paid. They also want to make sure a high school student can complete some basic calculations to be prepared for the work force. Your task is to help them by completing the following survey. You will use your responses to complete a few calculations, which should reflect appropriate rounding. Use your graphing calculator to verify your results.

1. You are interested in getting a summer job for some extra cash. Where would you be interested in working at and what job would you want to do?

Lifeguard at Onelife Fitness

2. How many hours a day would you want to work?

4 hours

3. How much would you expect to get paid per hour for your job?

\$16.00

4. You want to purchase a pair of Jordans © that cost \$119.97. Using your expected pay per hour, and \$10 that's in your savings account, how many hours would you need to work to purchase the Jordans?

a. Set-up an algebraic equation to calculate how many hours you would need to work, where h represents the number of hours worked.

$$119.97 = 16h + 10$$

b. Solve the algebraic equation you created from part **a** to determine how many total hours you would need to work.

$$\begin{array}{r} 119.97 = 16h + 10 \\ -10 \quad \quad -10 \\ \hline 109.97 = 16h \\ 16 \quad 16 \\ \hline 6.873125 = h \quad \Rightarrow \quad 7 = h \end{array}$$

c. Explain your answer using complete sentences.

The amount of the shoes is equal to the number of hours times the pay per hour plus the amount in my savings account. After solving, I find that the number of hours needed to work is between 6 and 7. Since I can't work less hours, I would have to round up and work at least 7 hours to be able to purchase the shoes.

d. You forgot to include the 5% sales tax when calculating the number of hours needed to purchase the shoes. Set up and solve a new equation that includes the sales tax.

$$\text{Sales tax: } 119.97 * .05 = 5.9985 = 6.00$$

$$119.97 + 6.00 = 16h + 10$$

$$125.97 = 16h + 10$$

$$\begin{array}{r} -10 \\ \hline \end{array} \quad \begin{array}{r} -10 \\ \hline \end{array}$$

$$\underline{115.97} = \underline{16h}$$

$$\begin{array}{r} 16 \\ 16 \end{array}$$

$$7.248125 = h \quad \Rightarrow \quad 8 = h$$

5. It is 5 miles to the store, and the total cost for those miles is \$1.50 for a one-way trip. How many hours will you need to work to pay for the Jordans including the sales tax and total cost in travel? Set up and solve equations to answer the question. Then write a sentence to support and explain your solutions.

One-way: \$1.50

Round-trip: \$3.00

Jordan's + tax + round-trip

$$\$119.97 + 6.00 + 3.00 = \$128.97$$

$$128.97 = 16h + 10$$

$$\begin{array}{r} -10 \\ \hline \end{array} \quad \begin{array}{r} -10 \\ \hline \end{array}$$

$$\underline{118.97} = \underline{16h}$$

$$\begin{array}{r} 16 \\ 16 \end{array}$$

$$7.435625 = h \quad \Rightarrow \quad 8 = h$$

The amount of the shoes (including tax and round-trip travel) is equal to the number of hours times the pay per hour plus the amount in my savings account. After solving, I find that the number of hours needed to work is between 7 and 8. Since I can't work less hours, I would have to round up and work at least 8 hours to be able to purchase the shoes.

Performance Based Assessment: Summer Woes! (Solving Equations)

Note: All values should be rounded to the hundredths place throughout the assessment.

1. You want a summer job to buy a new laptop from Best Buy. Go to the Best Buy website <http://www.bestbuy.com> and find the type and price of the laptop you would like to purchase. What would be the total cost of the laptop with a 5% sales tax? Show all calculations that lead to your results. To purchase the laptop by the end of the summer with only \$57 in your savings account you will need to find the job that works best for your circumstances.

- The chart below shows the top four jobs and salaries for summer jobs for high school students that the federal government found using a survey completed by high school students.

Job	Average Salary (\$/hr.)	Max hrs. (day/week)
AMC concession worker	\$8.25	6 day/35 week
Target store clerk	\$9.00	8 day/32 week
Chick-Fil-A cashier	\$7.75	6 day/39 week
Busch Gardens ride operator	\$11.00	5 day/35 week

2. After viewing the chart you decided that you were not currently interested in the jobs listed. Using the website <http://www.indeed.com/salary?q1=&l1=>, you will research a 5th job option that is different from the ones provided (it must be age and academic level appropriate). At the website include your desired place of employment and the position (i.e, Jason's Deli cashier) along with the zip code. Using the given salary, determine the average salary per hour. Note: the salary given on the website is based on a 40 hour work-week for 52 weeks in a year. Show all calculations that led to your results.

Questions #3, 4: Use the results from above and linear equations to solve the problems.

3. Determine how many total hours you would need to work to purchase the computer:
- using one of the jobs listed
 - and the job you found.

Show all calculations, which should include the use of an equation that led to your results. Explain your results comparing the two jobs using complete sentences.

4. If you could only work 4 days a week for 4 weeks with a maximum of 6 hours a day using the same two jobs, would you be able to purchase the laptop including the sales tax and travel expenses? Note: on average it costs \$.32 per mile for travel. Show all calculations, which should include the use of an equation that led to your results. Explain your results comparing the two jobs using complete sentences.

Benchmark

Performance Based Assessment: Summer Woes! (Solving Equations)

Note: All values should be rounded to the hundredths place throughout the assessment.

1. You want a summer job to buy a new laptop from Best Buy. Go to the Best Buy website <http://www.bestbuy.com> and find the type and price of the laptop you would like to purchase. What would be the total cost of the laptop with a 5% sales tax? Show all calculations that lead to your results. To purchase the laptop by the end of the summer with only \$57 in your savings account you will need to find the job that works best for your circumstances.

Apple-MacBook Air - \$849.99

$$\$849.99 * .05 = \underline{\$42.50}$$

$$\text{Price of laptop with tax} = \$849.99 + \$42.50 = \$892.49$$

- The chart below shows the top four jobs and salaries for summer jobs for high school students that the federal government found using a survey completed by high school students.

Job	Average Salary (\$/hr.)	Max hrs. (day/week)
AMC concession worker	\$8.25	6 day/35 week
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2. After viewing the chart you decided that you were not currently interested in the jobs listed. Using the website <http://www.indeed.com/salary?q1=&l1=>, you will research a 5th job option that is different from the ones provided (it must be age and academic level appropriate). At the website include your desired place of employment and the position (i.e, Jason's Deli cashier) along with the zip code. Using the given salary, determine the average salary per hour. Note: the salary given on the website is based on a 40 hour work-week for 52 weeks in a year. Show all calculations that led to your results.

Babysitting at 100 Ireland Street Hampton VA - \$19,000 / yr

$$\text{Salary per hour} = (19,000/40)/52 = \underline{\$9.13}$$

Questions #3, 4: Use the results from above and linear equations to solve the problems.

3. Determine how many total hours you would need to work to purchase the computer:

- using one of the jobs listed
- and the job you found.

Show all calculations, which should include the use of an equation that led to your results. Explain your results comparing the two jobs using complete sentences.

Babysitting	Target Store Clerk
$\begin{array}{r} 892.49 = 9.13h + 57 \\ -57 \qquad \qquad -57 \\ \hline 835.49 = 9.13h \\ 9.13 \quad 9.13 \\ \hline h = \underline{91.51} \end{array}$ <p>To purchase the laptop with the babysitting job, I would have to work 91.51 hours.</p>	$\begin{array}{r} 892.49 = 9h + 57 \\ -57 \qquad \qquad -57 \\ \hline 835.49 = 9h \\ 9 \qquad \qquad 9 \\ \hline h = \underline{92.83} \end{array}$ <p>To purchase the laptop working as a Target store clerk I would have to work 92.83 hours.</p>

4. If you could only work 4 days a week for 4 weeks with a maximum of 6 hours a day using the same two jobs, would you be able to purchase the laptop including the sales tax and travel expenses? Note: on average it costs \$.32 per mile for travel. Show all calculations, which should include the use of an equation that led to your results. Explain your results comparing the two jobs using complete sentences.

Babysitting	Target Store Clerk
Mileage: 8.7 miles one way 17.4 miles both ways Amount per day = $17.4 * .32 = \underline{\$5.57}$ $5.57 * 4 * 4 = \$89.12$	Mileage: 2.2 miles one way 4.4 miles both ways Amount per day = $4.4 * .32 = \underline{\$1.41}$ $1.41 * 4 * 4 = \$22.56$
Total amount to include travel = $892.49 + 89.12 = \$981.61$	Total amount to include travel = $892.49 + 22.56 = \$915.05$
$981.61 = 9.13h + 57$ $\begin{array}{r} -57 \\ \hline 924.61 = 9.13h \\ 9.13 9.13 \\ \hline h = \underline{101.27} \end{array}$	$915.05 = 9h + 57$ $\begin{array}{r} -57 \\ \hline 858.05 = 9h \\ 9 9 \\ \hline h = \underline{95.34} \end{array}$
Number of days = $101.27/6 = \underline{16.88 \text{ days}}$	Number of days = $95.34/6 = \underline{15.89 \text{ days}}$
If I include travel costs, I will not be able to purchase the laptop because it would take me 16.88 days which is greater than the 16 days allowed.	If I include travel costs, I would be able to purchase the laptop because it would take me 15.89 days which is less than the 16 days allowed.

Student Assessment List

	Assessment points		
Element	Points Possible	Earned Assessment	
		Self	Teacher
1. Laptop name and total price.	3		
2. Included place and position of new job and average salary per hour.	3		
3a. Set up appropriate equation(s).	3		
3b. Computations to calculate hours needed to work.	3		
3c. Explanation with complete sentences.	3		
4a. Set up appropriate equation(s) that include distance traveled.	3		
4b. Computations to calculate hours needed to work.	3		
4c. Explanation with complete sentences.	3		
** Demonstrated appropriate rounding.	3		

Teacher Rubric for Performance Based Assessment

#	3 points	2 points	1 points	0 points
1.	Stated the laptop name and correctly demonstrated and computed the total cost including the tax.	Stated the laptop name and correctly computed the total cost including the tax.	Stated the laptop name and calculated the cost of the laptop including the tax incorrectly.	Stated the name and price of the laptop.
2.	Stated place and position of new job and correctly demonstrated and computed the average salary per hour.	Stated place and position of new job and correctly computed the average salary per hour. OR Correctly computed the average salary per hour without stating a place and position of employment.	Stated place and position of new job and incorrectly computed the average salary per hour.	Stated place, position, and annual salary of new job.
3a.	Correctly set up 2 equations which should include 1 job from the table and the job they found demonstrating the relationship between the amount per hour and the initial savings for each job.	Correctly set up 2 equations which should include 1 job from the table and the job they found demonstrating the relationship between the amount per hour for each job, but did not include the initial savings.	Correctly set up 1 equation demonstrating the relationship between the amount per hour for each job and/or included the initial savings .	Did not set up either equation correctly.
3b.	If the students correctly demonstrated and calculated the hours needed to work for both jobs using equations or algebraic computations..	Correctly calculated the hours needed for both jobs using equations or algebraic computations.	Correctly demonstrated and calculated the hours needed for 1 job using equations or algebraic computations.	Did not demonstrate or calculate the hours needed for either job.
3c.	Uses mathematical language to thoroughly explain both solutions.	Uses mathematical language to partially explain both solutions.	Uses mathematical language to explain one solution.	Uses no explanation.
4a.	Correctly set up 2 equations demonstrating the relationship between the amount per hour and the initial savings for each job to include the total distance traveled (both directions).	Correctly set up 2 equations demonstrating the relationship between the amount per hour for each job, but: - did not include the initial savings but did include the total distance traveled. OR - did not include the initial savings but did include the distance traveled for only one direction.	Correctly set up 1 equation: - included travel both ways with savings OR - included travel one way with savings OR - included travel both ways without savings OR - included travel one way without savings.	Did not set up either equation correctly.
4b.	Correctly demonstrated and calculated the hours needed to work for both jobs..	Correctly calculated the hours needed for both jobs.	Correctly demonstrated and calculated the hours needed for 1 job.	Did not demonstrate or calculate the hours needed for either job.
4c.	Uses mathematical language to thoroughly explain their solution in relation to the problem and identifies the appropriate units.	Uses mathematical language to partially explain both solutions.	Uses mathematical language to explain one solution.	Uses no explanation.
**	Correctly rounded 10 solutions that are underscored and bold responses on the benchmark.	Correctly rounded 7 out of 10 solutions that are underscored and bold responses on the benchmark.	Correctly rounded 4 out of 10 solutions that are underscored and bold responses on the benchmark.	Correctly rounded less than 4 solutions that are underscored and bold responses on the benchmark.