Daytona Beach, Here We Come!

Keystone Exam: Algebra 1

Module: 1

Task Number: 2

Year Published: 2011

Code: ALG1-1-2-11

Name	_____
PA Secure ID	_____
School District	_____
District Contact	_____
Submission Date	_____

STUDENT BOOKLET

Keystone Exam Project Based Assessment

Title:	**Daytona Beach, Here We Come!**
Keystone Exam:	**Project Based Assessment**
Module:	**Module 1**

Eligible Content Assessed:

A1.1.1.1.1	Compare and/or order any real numbers.
A1.1.1.1.2	Simplify square roots.
A1.1.1.3.1	Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.
A1.1.1.4.1	Use estimation to solve problems.
A1.1.1.5.1	Add, subtract, and/or multiply polynomial expressions.
A1.1.2.1.1	Write, solve, and/or apply a linear equation.
A1.1.2.1.2	Use and/or identify an algebraic property to justify any step in an equation-solving process.
A1.1.2.1.3	Interpret solutions to problems in the context of the problem situation.
A1.1.2.2.1	Write and/or solve a system of linear equations using graphing, substitution and/or elimination.
A1.1.2.2.2	Interpret solutions to problems in the context of the problem situation.
A1.1.3.1.3	Interpret solutions to problems in the context of the problem situation.
A1.1.3.2.1	Write and/or solve a system of linear inequalities using graphing.
A1.1.3.2.2	Interpret solutions to problems in the context of problem situation.

Project Overview:

You and five of your friends (Sarah, Lee, Juan, Jamal, and Toni) are planning to take a road trip to Daytona Beach, Florida, at the end of the school year. As the designated trip planner, you have to rent (a) vehicle(s) that is/are affordable, fuel efficient, practical, and spacious enough for everyone and his/her luggage.

Project Directions:
1. Use the information in this packet to address the trip logistics.

You must employ mathematical reasoning and logic that supports your recommendations.

Project Activities:

TASK 1:

Calculate the measurements of the length and width of the storage space in a compact car, a luggage rack, and a Sport utility vehicle. Then determine which vehicle (compact car or Sport utility vehicle and luggage rack) has more storage space. Key words: <u>Measurement Calculations</u>

Estimate the cost of gas per mile for a compact car and a Sport utility vehicle. Calculate the actual cost of gas per mile for a compact car and a Sport utility vehicle.

TASK 2:

Determine how many compact cars are needed for the trip and how many Sport utility vehicles are needed for the trip. Write, solve and graph a system of equations to determine a break-even point for the vehicles.

Calculate the total cost to rent two compact cars and the cost to rent one Sport utility vehicle.

TASK 3:

Write and graph a system of linear inequalities for the amount of drinks and snacks to be purchased. State the range of possible solutions.

Write a polynomial expression for the sum of the weight of all the bags you and your friends would have to fly home with.

TASK 4:

Determine the cost per mile for each flight. Compare the cost per mile to fly directly versus via Detroit, MI. Compare the cost per mile to drive a Sport utility vehicle versus two compact cars. Determine the most economical flight to the most economical vehicle(s) rental.

Organize your findings into a report to present.

Required Materials:

Student packet.

Culminating Product:

Completed packet and organized report summarizing the student's findings.

Submission Procedure:

Completed student packet should be scanned and submitted along with organized

report summarizing the student's findings.

Pennsylvania Project Assessment
Algebra 1 Keystone
Module 1
Operations and Linear Equations & Inequalities

Daytona Beach, Here We Come!

Name: _____

Date(s): _____

TASK 1/ ACTIVITY 1: PACK THE TRUNK

While looking at the two styles of vehicles to rent, you realize that luggage space is a consideration. Below is a table that provides all necessary information to determine the best choice of vehicle for your trip. (EC: A1.1.1.1.2)

Vehicle Choices

Vehicle Type	Number of Passengers	Flat Storage Area
Compact Car	4 passengers	12 square ft. base area
Sport utility vehicle (Includes rooftop luggage carrier)	7 passengers	_Vehicle Space_: 8 square ft. base area _Rooftop Luggage Carrier_: 16 square ft. base

Using the table above, complete the following:
- o Calculate the measurement of a compact car for the side lengths of the flat storage space.
- o Using the square diagram below, label and calculate the available storage area. (Neglect height.)
- o Record your answer in reduced radical form.
- o Include correct units.

Length:_____

Width:_____

TASK 1/ ACTIVITY 2: PACK THE TRUNK

Vehicle Type	Number of Passengers	Flat Storage Area
Compact Car	4 passengers	12 square ft. base area
Sport Utility Vehicle (Includes rooftop luggage carrier)	7 passengers	*Vehicle Space*: 8 square ft. base area *Rooftop Luggage Carrier*: 16 square ft. base

Using the table above, complete the following:
- o Calculate the measurement for the sport utility vehicle for the side lengths of the flat storage area and the side lengths of the rooftop luggage carrier.
- o Use the square diagrams below to label and calculate the available combined storage area. (Neglect height.)
- o Record your answer in reduced radical form.
- o Include correct units.

Vehicle Trunk Space: Rooftop Luggage Carrier:

Length:_____   Length:_____

Width:_____   Width:_____

TASK 1/ ACTIVITY 3: GPS LEADS THE WAY

On your trip your Global Positioning System (GPS) will take you mainly on highways. Your one-way trip mileage is *1,030* miles.

The table below summarizes the two vehicle choices and the average miles per gallon for each.

Vehicle Type	Number of Passengers	Vehicle Rental Cost (round trip)	Average Highway Miles Per Gallon
Compact Car	4 passengers	$561.49	40
Sport Utility Vehicle	7 passengers	$1,018.08	13

Using the table above, complete the following:
- o **Estimate** the cost of gas per mile for each vehicle type. (One gallon cost = $4.14.)
- o Show and explain all work.
- o Include correct units.

Show your work for Estimated Cost per mile for one Compact Car:

Answer: _____

Show your work for Estimated Cost per mile for one Sport Utility Vehicle:

Answer: _____

TASK 1/ ACTIVITY 4: GPS LEADS THE WAY

On your trip your <u>G</u>lobal <u>P</u>ositioning <u>S</u>ystem (GPS) will take you mainly on highways. Your one-way trip mileage is *1,030* miles.

The table below summarizes the two vehicle choices and the average miles per gallon for each.

Vehicle Type	Number of Passengers	Vehicle Rental Cost (round trip)	Average Highway Miles Per Gallon
Compact Car	4 passengers	$561.49	40
Sport Utility Vehicle	7 passengers	$1,018.08	13

Calculate the actual cost of gas per mile for each type of vehicle.

Using the table above, complete the following:
- **Calculate** the cost of gas per mile for each vehicle type. (One gallon cost = $4.14.)
- Show and explain all work.
- Include correct units.

Show your work for the Actual Cost per mile for one Compact Car:

Answer: _____

Show your work for the Actual Cost per mile for one Sport Utility Vehicle:

Answer: _____

TASK 2/ ACTIVITY 1: FIND THE TURNING POINT

 VS.

The table below shows the cost to rent vehicles for your entire trip and the average highway miles per gallon.

Vehicle Type	Number of Passengers	Cost to rent for entire trip	Average Highway Miles Per Gallon
Compact Car	4 passengers	$561.49	40
Sport Utility Vehicle	7 passengers	$1,018.08	13

While comparing the vehicles you want to rent, you want to know if there is a distance where the cost to rent the vehicles is the same. You can do this two different ways (graphically or algebraically).

- o Determine how many compact cars are needed for the trip.
- o Determine how many Sport utility vehicles are needed for the trip.
- o Write a system of equations using the blank table below to organize your data.

	Cost for 'm' miles	Trip Rental Fee
Compact Car(s)		
Sport utility vehicle		

Amount of Compact Cars: _____

Amount of Sport Utility Vehicles: _____

Compact Car(s) Equation: _____

Sport utility vehicle Equation:_____

Use the space below to:
- o Solve the system of equations algebraically (using the substitution or elimination method).
- o Find the break-even point—the mileage where the cost to rent both types of vehicles is equal—round your answer to the nearest tenth of a mile.
- o Show all necessary work.
- o Include correct units.

Break-Even Point: _____

TASK 2/ Activity 2: FIND THE TURNING POINT

You are now going to check your work by graphing the system of equations from above.

To graph each equation you need to:
- o Create five data points for each equation.
- o Use your data tables to plot the lines.
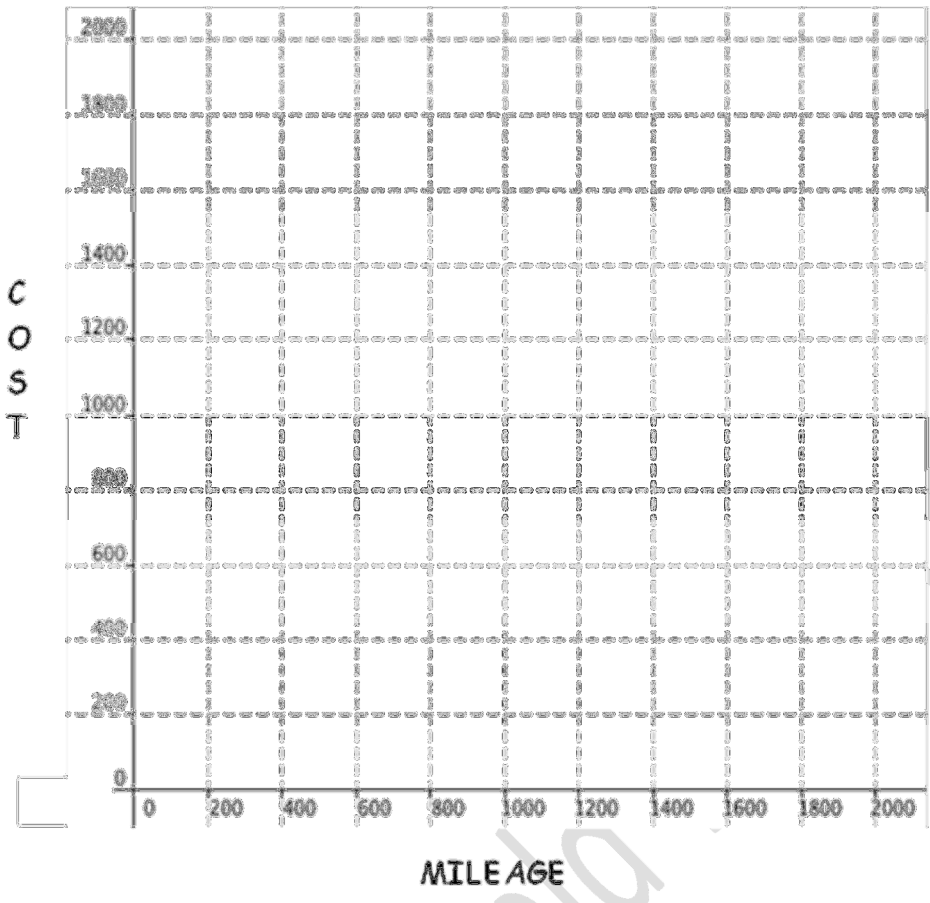- o Label each line you plot on the coordinate plane

Equation for the sport utility vehicle: _____

Mileage	Cost

Equation for the Compact Car(s) : _____

Mileage	Cost

COST vs MILEAGE

TASK 2/ ACTIVITY 3: TOTAL COST OF TRANSPORTATION

- Calculate the total cost of renting each type of vehicle you would choose to drive to the beach.
- Remember the trip is *1030 miles (round trip)*.
- Remember gas cost $4.14 per gallon.
- Show all necessary work.
- Include correct units.

Vehicle Type	Number of Passengers	Cost to rent for entire trip	Average Highway Miles Per Gallon
Compact Car	4 passengers	$561.49	40
Sport Utility Vehicle	7 passengers	$1,018.08	13

Total Cost to rent two Compact Cars:
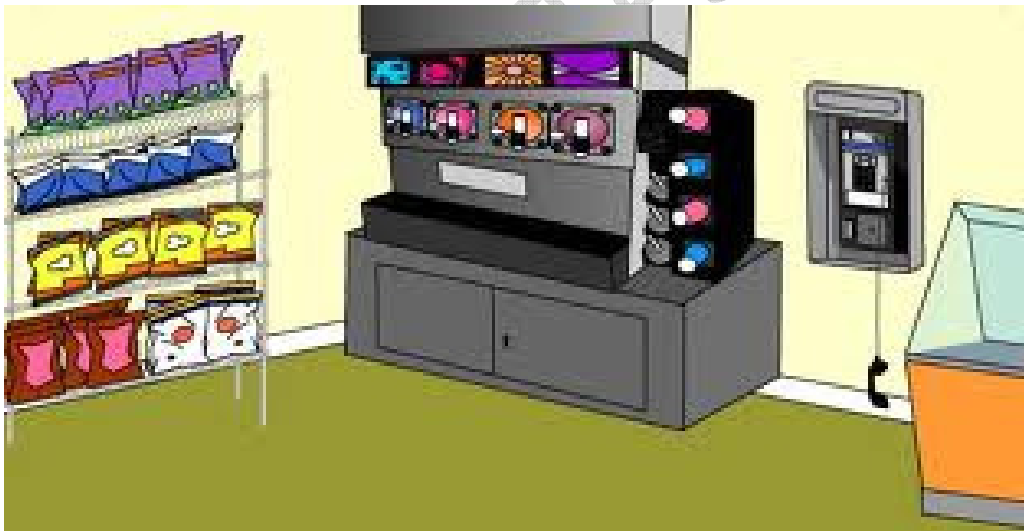
Answer:_____

Total Cost to rent a Sport Utility Vehicle two Compact Cars:

Answer:_____

TASK 3/ ACTIVITY 1: SNACK TIME!

On the trip you and your friends stop for gas and decide to get drinks ($1.05-tax included) and snacks ($2.20-tax included) if they spend a maximum of $25.00 and wish to purchase at least 12 items.

Write a system of inequalities that shows the range of drinks and snacks you can buy with $25.00.

Inequality 1: _____

Inequality 2: _____

TASK 3/ Activity 2: SNACK TIME!

You are now going to graph the system of inequalities to show the possible amount of drinks and snacks you can buy with $25.00.
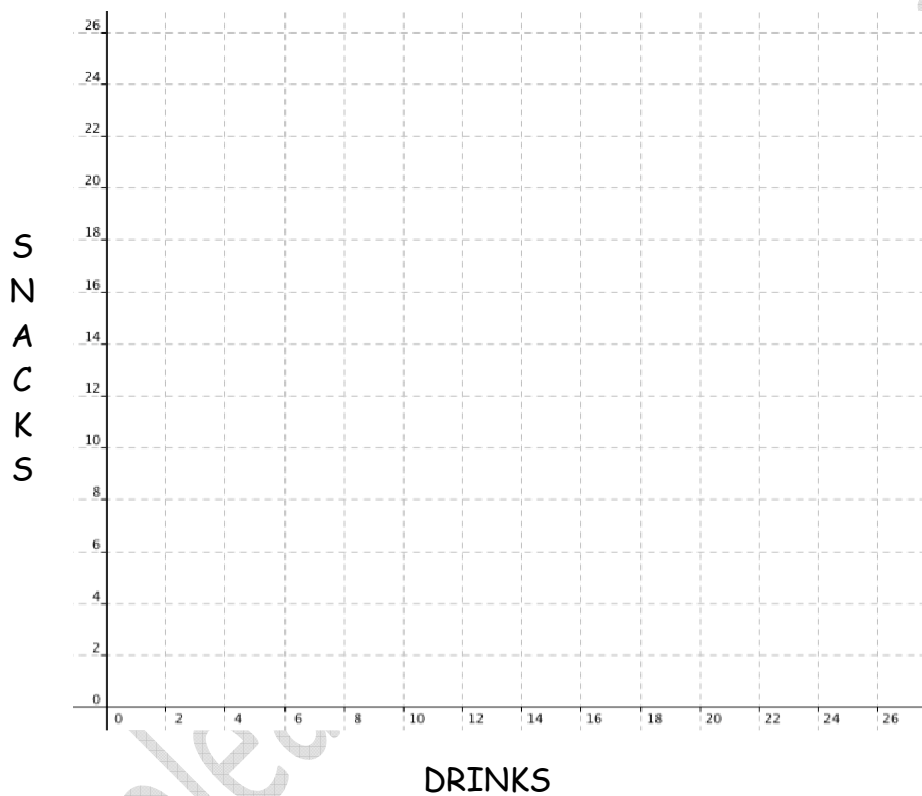
To graph each inequality you need to:
- o Create five data points for each equation.
- o Use your data tables to plot the lines.
- o Label each line you plot on the coordinate plane.
- o Make sure your lines are clearly solid or dashed and shaded appropriately.

Inequality 1: _____

Snacks	Drinks

Inequality 2:_____

Snacks	Drinks

DRINKS

Considering your graph above, give a possible combination of the amount of drinks and snacks that can be purchased.

Possible Drinks:_____

Possible Snacks:_____

TASK 3/ ACTIVITY 3: FLORIDA BOUND

When doing research on travel you are trying to determine if it would make more sense to fly instead of drive from New York City to Daytona Beach. If you fly you need to consider the weight of the luggage that you plan to check.

Each piece of luggage is the same size (length: 22 inches, width: 18 inches).

Sarah's luggage is 3 pounds more than twice the weight of your luggage.

Jamal's luggage is half the weight of Sarah's.

Lee plans to bring two pieces of luggage that each weighs 7 pounds less than Jamal's.

Juan's luggage is 8 pounds lighter than yours, while Toni's is 8 pounds heavier than yours.

Write a polynomial expression for the sum of the weight of the entire luggage you and your friends would plan to take on the plane.

Polynomial Expression: _____

TASK 3/ Activity 4: FLORIDA BOUND

If the airline charges a baggage fee of $25 for every piece of luggage over 20 lbs., what is the total baggage fee that you and your friends will have to pay when flying (one way). *(HINT: You know your luggage weighs 20 lbs. by itself.)*
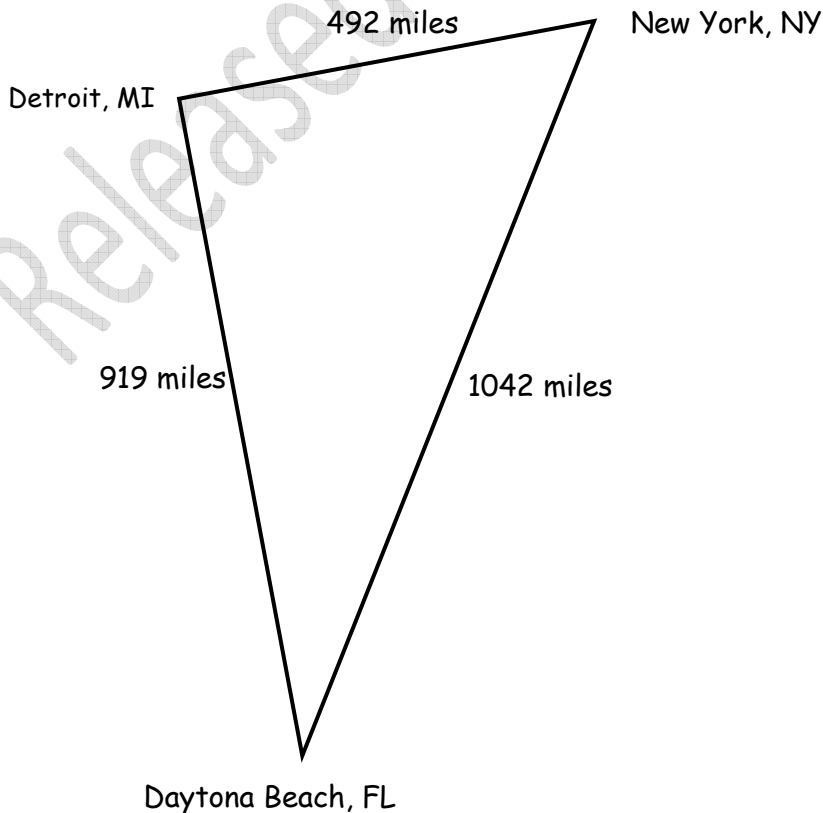
Baggage Fee:_____

TASK 4/ ACTIVITY 1: WHICH IS BETTER?

VS.

Detroit, MI   492 miles   New York, NY

919 miles   1042 miles

Daytona Beach, FL

The diagram above shows the flight plan and air miles for the trip. A one-way flight from New York City, NY (John F. Kennedy International Airport) to Daytona Beach, FL

(Daytona Beach International Airport) cost $395(tax included).

There are two different flight options for the same price: a direct flight, or a flight with one stop that travels from New York, NY to Detroit, MI to Daytona Beach, FL.

- Determine the cost per mile for the trip for each flight.

Cost per mile of a Direct Flight: _____

Cost per mile of a Flight via Detroit, MI:_____

TASK 4/ Activity 2: WHICH IS THE MOST ECONOMICAL CHOICE?

Complete the following:

- The cost per mile to fly directly to Daytona Beach compared to the cost per mile to fly via Detroit, MI.

- The cost per mile to drive a sport utility vehicle compared to the cost per mile to drive two compact cars.

- The most economical flight to the most economical vehicle(s) rental.

Which is the better mode of travel when based upon the all cost per mode of travel? Explain your answer.