Name Key Class Date

UNIT 3

Problem Solving Connections

COMMON CORE

CC.8.EE.7a, CC.8.EE.7b, CC.8.EE.8a, CC.8.EE.8b, CC.8.EE.8c

Is the Price Right? Travelers who arrive at an airport usually have transportation options for getting to their next destination. Most travelers can choose between taxi or shuttle services to get to their hotels.

1 Writing Equations

Jackie just arrived at the Orlando International Airport. There are two routes from the airport to Jackie's hotel:

- If the driver uses city streets, the distance to the hotel is 29 miles.
- If the driver takes the expressway, the distance is only 23 miles, but Jackie will pay an additional $2.75 in toll charges.

A The first taxi company Jackie talks to charges an initial fee of $2.00 plus $2.40 for each mile. Write an equation to show the total charge y for traveling x miles.

$y = 2.4x + 2$

B Calculate the total cost to travel to Jackie's hotel taking each route.

Streets:

$y = 2.4x + 2$
$y = 2.4(29) + 2$
$y = 69.6 + 2$
$y = \$71.6$

Expressway:

$y = 2.4x + 2 + 2.75$
$y = 2.4(29) + 4.75$
$y = 55.2 + 4.75$
$y = \$59.95$

Which route should Jackie instruct the driver to take? Why?

Expressway; it's cheaper

C Jackie learns that the taxi can transport up to 4 people to the same destination at the rates given above. There is a $3 charge for each additional person. A shuttle bus company offers transportation to the hotel for $15 per person. Jackie is traveling with 3 friends. Calculate the total cost for Jackie and her friends to take the taxi along the expressway and the shuttle.

Taxi:

$59.95 + 3(3)$
$59.95 + 9$
$\$68.95$

Shuttle:

$4 \cdot 15$
$\$60$

Should Jackie and her friends choose the taxi or the shuttle? Explain.

Shuttle it's cheaper.

2 Graphing a System

Chuck and his family are also vacationing in Florida. He researches taxi rates before they leave home. There are 5 people in Chuck's family (including Chuck).

Company 1: $2 initial fee, plus $2.40 per mile for 1 to 2 passengers and $3 per person for each additional person.

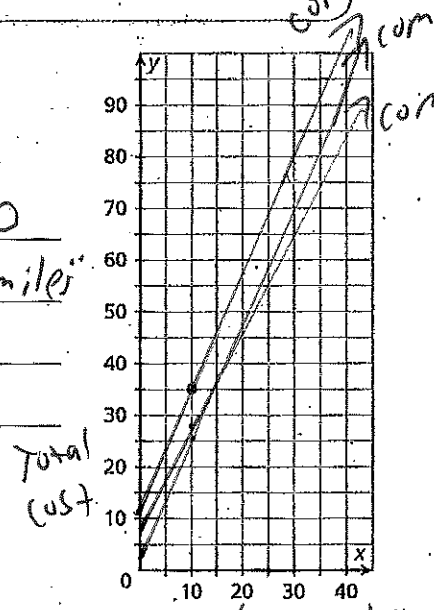
Company 2: $3.75 initial fee, plus $2.00 per mile for 1 to 2 passengers and $1.50 per person for each additional person.

Company 3: $3.85 initial fee, plus $2.20 per mile for up to 5 passengers.

A Write equations in slope-intercept form to model each company's fare y for traveling x miles with 5 passengers.

Company 1:	Company 2:	Company 3:
$y = 2.4x + 2 + 3(3)$	$y = 2x + 3.75 + 3(1.5)$	$y = 2.2x + 3.85$
$y = 2.4x + 11$	$y = 2x + 8.25$	

B Sketch a graph of the system.



C Explain any restrictions that should be placed on the values of x and y.

x & y should both be ≥ 0
We don't drive "negative miles"

D The distance from the airport to the hotel where Chuck and his family are staying is 35 miles. Use your graph to determine which company is most expensive for Chuck's family of five to get to their hotel. Which company is least expensive?

Comp 1 is most expensive
Comp 2 is the cheapest

E How could you check your answers to **D**?

Put 35 in for x in all 3 equations

3 Solving a System of Equations Algebraically

Chuck's family decides to change their hotel reservation. They also learn that taxi company 1 will not be in operation on they day they need transportation.

A Chuck has not yet determined the distance between the airport and his family's new hotel. Explain how to use the graph from 2 to help Chuck's family choose the best value.

Based on the graph use Comp 3 for $x < 20$ cheaper
use Comp 2 for $x > 20$ cheaper

B Can you use the graph to determine which company is less expensive for a distance of 23 miles? If not, what method can you use?

It's not that clear. Solving algebraically is the better method.

C Use algebraic methods to solve the system of equations representing fares for company 2 and company 3.

$y = 2x + 8.25$
$y = 2.2x + 3.85$

$2x + 8.25 = 2.2x + 3.85$
$4.4 = .2x$
$x = 22$ miles

D Explain what your solution means in the context of the problem.

Exactly $x < 22$ use Comp 3
$x > 22$ use Comp 2

E Which company should Chuck's family choose to travel 23 miles to their new hotel?

Comp 2.

4 Looking Back at the Context

A. What factors do you need to consider when analyzing transportation costs?

- Distance
- fees for more passengers
- initial fee

B. Suppose two companies have the same rate per mile but different initial fees. Describe what the graph representing their fares would look like. What is the solution of the system of equations representing the fares? Which company has the lower fare?

Same rate means same slope which means the lines are // because they also have different y-inter. The company with the lower initial fee will always be cheaper.

C. Suppose two companies have the same initial fees but different rates per mile. Describe what the graph representing their fares would look like. What is the solution of the system of equations representing the fares? Which company has the lower fare?

- Same initial fee means same y-inter.
- Different rates → different slopes
- The solution is at (0, initial fee) because they started with the same fee.
- The lower the rate, the cheaper it will always be.

D. Why is it important to put restrictions on the values of x and y in a real-world problem?

We don't drive "neg miles"