

**Linear Applications Homework**

**Directions:** Be sure to show all work, communicate your thought process, and justify your reasoning. Remember to check that your answers are complete, correct, and reasonable.

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1. A solution for each equation is provided. Write the letter of each equation in the appropriate box for its solution. (Remember, not all of the solutions will be used ☺)

A:  $9x + 9 + m = 3(3x + 4)$

B:  $9(x - 1) - m + 2 = 3(3x - 3) + m + 20$

C:  $-9x + 12 - m = -3(3x - 4) + m$

m = -9

m = -3

m = 0

m = 1

m = 3

2. Rachel creates custom canvas paintings of pets. She donates all of her proceeds to an animal hospital. Rachel charges \$29.95 for each small painting and \$39.95 for each large painting. So far this month, Rachel has sold four small paintings and ten large paintings, but she does not have any large canvases left.

**Part A:** Let  $p$  represent the number of additional small canvas paintings Rachel expects to paint and sell for the month, and let  $t(p)$  represent the total amount of money Rachel expects to receive from the entire month's sales. Write an equation for the function  $t(p)$ .

**Part B** Determine the average rate of change, in dollars per painting, of  $t(p)$  as  $p$  varies from 4 to 10.

**Part C:** Rachel does not have enough supplies to create more than 30 total small canvas paintings this month. Which statement best provides the domain for the function  $t$ ?

i.  $0 \leq p < 30$ , where  $p$  is a whole number

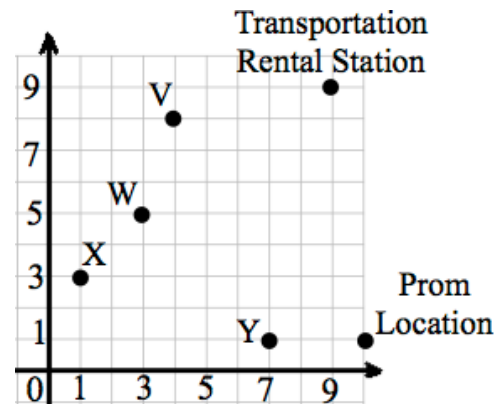
ii.  $0 \leq p \leq 30$ , where  $p$  is a whole number

iii.  $0 \leq p < 26$ , where  $p$  is a whole number

iv.  $0 \leq p \leq 26$ , where  $p$  is a whole number

**Part D:** Materials for each small painting cost \$5.95 per painting. Write a function  $d(p)$  for the profit Rachel earns and is able to donate when she sells  $x$  small paintings.

3. Some friends are deciding whether to take a limousine or a party bus to their prom. The houses where the friends will be picked up are located at points V, W, X, and Y on the grid. Each vehicle will begin from the transportation rental station, take the shortest route to the houses and the school. Each unit on the grid represents  $1\frac{1}{2}$  miles. The group will base their decision on the following information:



Party Bus	Limousine
<ul style="list-style-type: none"> <li>- fuel efficiency: 19 miles per gallon</li> <li>- has enough room to pick up all of the friends in one round trip</li> <li>- must return back to transportation rental station after the prom location</li> <li>- charges a base fee of \$100, a fuel fee, and an additional \$3.50 per each house of pick-up</li> </ul>	<ul style="list-style-type: none"> <li>- fuel efficiency: 21 miles per gallon</li> <li>- does not have enough room to carry all of the friends, so will have to stop at the prom location after picking up from locations V and W, and then go to locations X and Y</li> <li>- must return back to transportation rental station after the final visit to the prom location</li> <li>- charges the same base fee as the party bus, a fuel fee, and an additional fee of \$10.00 per four houses of pick-up</li> </ul>

**Part A:** Define the dependent variable, as well as the independent variable on which this relies.

**Part B:** Create a model (equation) that shows the total cost of the prom transportation for each type of vehicle, based solely on the provided information. Justify each of your models, including any assumptions you made.

**Part C:** Determine when it would be more cost efficient to use the limousine for transportation, rather than the party bus. Thoroughly support your reasoning.

**Part D:** Today, which would be more cost efficient to use? Explain.

Name: \_\_\_\_\_ Date: \_\_\_\_\_ **Unit 3 Homework**

**Solutions:**

$$\boxed{B} \quad m = -9 \quad \boxed{\phantom{B}} \quad m = -3 \quad \boxed{C} \quad m = 0 \quad \boxed{\phantom{C}} \quad m = 1 \quad \boxed{A} \quad m = 3$$

1. A:  $9x + 9 + m = 3(3x + 4)$

$$9x + 9 + m = 9x + 12$$

$$9 + m = 12 \rightarrow m = 3$$

B:  $9x - 9 - m + 2 = 9x - 9 + m + 20$

$$-m + 2 = m + 20$$

$$-2m = 18$$

$$m = -9$$

C:  $-9x + 12 - m = -9x + 12 + m$

$$-m = m$$

$$m = 0$$

2. A)  $t(p) = 29.95p + 29.95(4) + 39.95(10)$

$$t(p) = 29.95p + 519.3$$

B)  $\$29.95$  %c  $\frac{29.95(10) - 29.95(4)}{10 - 4} = \frac{179.7}{6} = 29.95$

C)  $30 - 4 = 26 \rightarrow$  max she can create

iv.  $0 \leq p \leq 26$ ;  $p$  is a whole #

D)  $d(p) = 29.95p + 519.3 - 5.95p - 5.95(4)$

$$d(p) = 24p + 495.5$$

3. each unit = 1.5 miles

A) cost of trip depends on price of gas per gallon

B) Bus

• 19mpg

• 34 units

$$= 34 \cdot 1.5 = \underline{51 \text{ miles}}$$

• \$100 fee

•  $\$3.50 \cdot 4 = \underline{\$14 \text{ fee}}$

Limo

• 21mpg

• 52 units

$$= 52 \cdot 1.5 = \underline{78 \text{ miles}}$$

• \$100 fee

• \$10 fee

$$b(x) = 5\frac{1}{9}x + 114$$

$$l(x) = 7\frac{8}{21}x + 110$$

c)

$$l(x) < b(x)$$

$$7\frac{8}{21}x + 110 < 5\frac{1}{9}x + 114$$

$$7\frac{8}{21}x - 5\frac{1}{9}x < 4$$

$$\frac{1482}{399}x - \frac{1071}{399}x < 4$$

$$\frac{411}{399}x < 4$$

$$x < 4 \div \frac{411}{399}$$

$$x < 4 \cdot \frac{399}{411}$$

$$x < 3.88$$

→ The limo is more cost efficient when gas is less than \$3.88 per gallon.

D) gas is currently under \$3.88/gal, so the limo is better today!;