

1.4.1: Applications (Exercises)

SECTION 1.4 PROBLEM SET: APPLICATIONS

In the following application problems, assume a linear relationship holds.

1) The variable cost to manufacture a product is \$25 per item, and the fixed costs are \$1200. If x is the number of items manufactured and y is the cost, write the cost function.	2) It costs \$90 to rent a car driven 100 miles and \$140 for one driven 200 miles. If x is the number of miles driven and y the total cost of the rental, write the cost function.
3) The variable cost to manufacture an item is \$20 per item, and it costs a total of \$750 to produce 20 items. If x represents the number of items manufactured and y is the cost, write the cost function.	4) To manufacture 30 items, it costs \$2700, and to manufacture 50 items, it costs \$3200. If x represents the number of items manufactured and y the cost, write the cost function.
5) To manufacture 100 items, it costs \$32,000, and to manufacture 200 items, it costs \$40,000. If x is the number of items manufactured and y is the cost, write the cost function.	6) It costs \$1900 to manufacture 60 items, and the fixed costs are \$700. If x represents the number of items manufactured and y the cost, write the cost function.

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In the following application problems, assume a linear relationship holds.

7) A person who weighs 150 pounds has 60 pounds of muscles; a person that weighs 180 pounds has 72 pounds of muscles. If x represents body weight and y is muscle weight, write an equation describing their relationship. Use this relationship to determine the muscle weight of a person that weighs 170 pounds.	8) A spring on a door stretches 6 inches if a force of 30 pounds is applied. It stretches 10 inches if a 50 pound force is applied. If x represents the number of inches stretched, and y is the force, write a linear equation describing the relationship. Use it to determine the amount of force required to stretch the spring 12 inches.
9). A male college student who is 64 inches tall weighs 110 pounds. Another student who is 74 inches tall weighs 180 pounds. Assuming the relationship between male students' heights (x), and weights (y) is linear, write a function to express weights in terms of heights, and use this function to predict the weight of a student who is 68 inches tall.	10) EZ Clean company has determined that if it spends \$30,000 on advertising, it can hope to sell 12,000 of its Minivacs a year, but if it spends \$50,000, it can sell 16,000. Write an equation that gives a relationship between the number of dollars spent on advertising (x) and the number of minivacs sold(y).
11) The freezing temperatures for water for Celsius and Fahrenheit scales are 0°C and 32°F . The boiling temperatures for water are 100°C and 212°F . Let C denote the temperature in Celsius and F in Fahrenheit. Write the conversion function from Celsius to Fahrenheit. Use the function to convert 25°C into $^{\circ}\text{F}$.	12) By reversing the coordinates in the previous problem, find a conversion function that converts Fahrenheit into Celsius, and use this conversion function to convert 72°F into an equivalent Celsius measure.

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In the following application problems, assume a linear relationship holds.

13) California's population was 29.8 million in the year 1990, and 37.3 million in 2010. Assume that the population trend was and continues to be linear, write the population function. Use this function to predict the population in 2025. <i>Hint: Use 1990 as the base year (year 0); then 2010 and 2025 are years 20, and 35, respectively.)</i>	14) Use the population function for California in the previous problem to find the year in which the population will be 40 million people.
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<p>15) A college's enrollment was 13,200 students in the year 2000, and 15,000 students in 2015. Enrollment has followed a linear pattern.</p> <p>Write the function that models enrollment as a function of time. Use the function to find the college's enrollment in the year 2010.</p> <p><i>Hint: Use year 2000 as the base year.</i></p>	<p>16) If the college's enrollment continues to follow this pattern, in what year will the college have 16,000 students enrolled.</p>
<p>17) The cost of electricity in residential homes is a linear function of the amount of energy used. In Grove City, a home using 250 kilowatt hours (kwh) of electricity per month pays \$55. A home using 600 kwh per month pays \$118. Write the cost of electricity as a function of the amount used. Use the function to find the cost for a home using 400 kwh of electricity per month.</p>	<p>18) Find the level of electricity use that would correspond to a monthly cost of \$100.</p>

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In the following application problems, assume a linear relationship holds.

<p>19) At ABC Co., sales revenue is \$170,000 when it spends \$5000 on advertising.</p> <p>Sales revenue is \$254,000 when \$12,000 is spent on advertising.</p> <p>a) Find a linear function for</p> <p>y = amount of sales revenue as a function of</p> <p>x = amount spent on advertising.</p> <p>b) Find revenue if \$10,000 is spent on advertising.</p> <p>c) Find the amount that should be spent on advertising to achieve \$200,000 in revenue.</p>	<p>20) For problem 19, explain the following:</p> <p>a. Explain what the slope of the line tells us about the effect on sales revenue of money spent on advertising. Be specific, explaining both the number and the sign of the slope in the context of this problem.</p> <p>b. Explain what the y intercept of the line tells us about the sales revenue in the context of this problem</p>
<p>21) Mugs Café sells 1000 cups of coffee per week if it does not advertise. For every \$50 spent in advertising per week, it sells an additional 150 cups of coffee.</p> <p>a) Find a linear function that gives</p> <p>y = number of cups of coffee sold per week</p> <p>x = amount spent on advertising per week.</p> <p>b) How many cups of coffee does Mugs Café expect to sell if \$100 per week is spent on advertising?</p>	<p>22) Party Sweets makes baked goods that can be ordered for special occasions. The price is \$24 to order one dozen (12 cupcakes) and \$9 for each additional 6 cupcakes.</p> <p>a. Find a linear function that gives the total price of a cupcake order as a function of the number of cupcakes ordered</p> <p>b. Find the price for an order of 5 dozen (60) cupcakes</p>

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