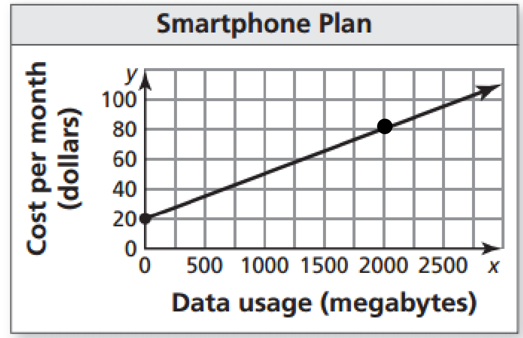
Unit 7 – Applications with Linear Functions



1) (a) What is the y-intercept of the line? Explain its meaning in the context of the problem.

The y-intercept is (0, 20). In the context of this situation, the y-intercept represents an initial fee (cost) before any data is used.

(b) Find the slope of the line. Explain its meaning in the context of the problem.

(0, 20) (2000, 80)

$$\frac{\Delta y}{\Delta x} = \frac{80-20}{2000-0} = \frac{60}{2000} = \frac{\mathbf{\$0.03}}{\mathbf{1\ megabyte}}$$

With this Smartphone plan, a person pays 3 cents for each megabyte of data used.

2) A band is performing at an auditorium for a fee of $1500. In addition to this fee, the band receives $6 of each ticket sold.

a) Write an equation that represents the band's revenue (**y**) when **x** tickets are sold.

y = 6x + 1500

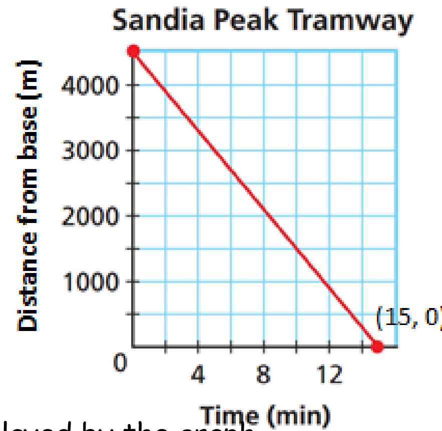
b) The band needs $5000 for new equipment. How many tickets must be sold for the band to earn enough money to buy the new equipment?

y = revenue = $5000
x = # of tickets = ?

y = 6x + 1500
5000 = 6x + 1500
3500 = 6x
$583.\overline{3}$ = x

584 tickets must be sold for the band to earn enough money.

3) The Sandia Peak Tramway in Albuquerque, New Mexico travels a distance of about 4500 meters to the top of Sandia peak. The graph shows the tram's distance from the summit to the base.



a) Identify the x and y-intercepts. Explain their meaning in the context of the situation.

x-intercept: 15
It takes 15 minutes to reach the base from the peak.

y-intercept: 4500
The peak is 4500m from the base.

b) Write an equation that models the relationship displayed by the graph.

slope	y-intercept	equation
(0, 4500) (15, 0) $\frac{\Delta y}{\Delta x} = \frac{4500-0}{0-15}$ $= \frac{4500}{-15}$ = -300	4500	y = -300x + 4500

c) Identify the rate of change in your equation. Explain its meaning.

$\frac{-300 \text{ meters}}{1 \text{ minute}}$ The tram descends from the peak to the base 300 meters per minute.

d) State the domain and range of the graph.

Domain: [0, 15] Range: [0, 4500]

4) A recreation department bought bottled water to sell at a fair. When the fair began at 10:00 am, they had 280 bottles. At 6:00 pm they had run out. Calculate the average rate of bottles sold per hour.

x = number of hours since fair began
y = number of bottles

(0, 280) (8, 0)

$$\frac{\Delta y}{\Delta x} = \frac{280-0}{0-8} = \frac{280}{-8} = \frac{-35 \textbf{ bottles}}{\textbf{1 hour}}$$

On average, 35 bottles are sold each hour.

5) The tables below represent the amount of hours worked and the amount of money earned by two different employees in the same company over one year.

Employee # 1

x **Hours Worked**	**y** **Money Earned**
0	0
1000	20,000
2000	40,000

Employee # 2

x **Hours Worked**	**y** **Money Earned**
0	50,000
1000	50,000
2000	50,000

a) Write an equation for each employee that shows the relationship between the annual salary (**y**) and the number of hours worked (**x**).

Employee #1

slope

$$\frac{\Delta y}{\Delta x} = \frac{20000 - 0}{1000 - 0} = \frac{20000}{1000} = 20$$

y-intercept

0

y = 20x

Employee #2

slope

$$\frac{\Delta y}{\Delta x} = \frac{50000 - 50000}{1000 - 0} = \frac{0}{1000} = 0$$

y-intercept

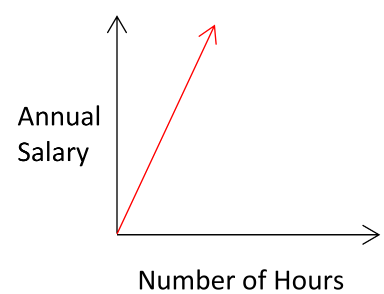
50,000

y = 50,000

b) Sketch the relationships and compare the graphs.

Employee #1

As the number of hours worked increases, the annual salary increases.



Employee #2

As the number of hours worked increases, the annual salary remains the same.