Section 3.3a – Linear Applications and Modeling

This booklet belongs to:_____**Block:** _____

- Graphs are used to represent information quickly and easily
- Data in a graph can often be interpreted more easily than in a table
- Graphs visually show trends or comparisons

Example 1:   Water freezes at $32°F$, or $0°C$. Water boils at $212°F$ or $100°C$. Graph a linear relation between $°C$ and $°F$, and find a formula that converts $Celsius$ to $Fahrenheit$.
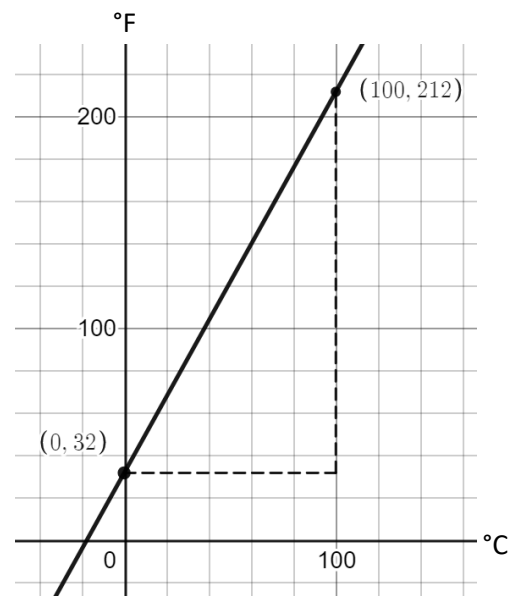
Solution 1:

The freezing point on the graph is: $(0, 32)$

The boiling point on the graph is: $(100, 212)$

$$m = \frac{212 - 32}{100 - 0} = \frac{180}{100} = \frac{9}{5}$$

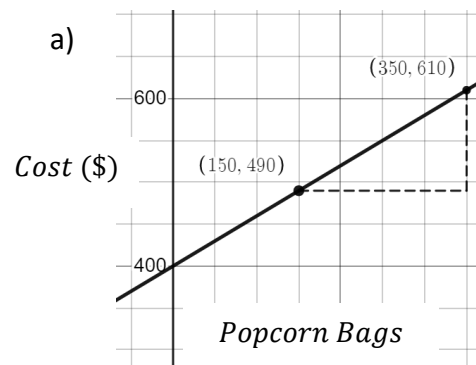By Slope-intercept, $\mathbf{F = \frac{9}{5}C + 32}$

Example 2:   It costs a popcorn vendor $490 to make 150 bags of popcorn and $610 to make 350 bags.

a) Graph the linear relation between cost and # of bags
b) Find the cost equation
c) Find the fixed cost.
d) Find the cost of 250 bags of popcorn.
e) How many bags of popcorn can be bought for $724

Solution 2:

b) $m = \dfrac{610 - 490}{350 - 150} = \dfrac{120}{200} = 0.60$

After you have the **Slope**, use $Point - Slope$ $\longrightarrow$

$$C - 490 = 0.60(B - 150)$$
$$C - 490 = 0.60B - 90$$

$$\mathbf{C = 0.60B + 400}$$

c)   The fixed cost is when we have sold 0 bags, it is the $y - intercept$.   So, the fixed cost is: **$400**

d) $C = 0.60(250) + 400 = \$\mathbf{550}$

e) $724 = 0.60B + 400$

          $724 - 400 = 0.60B$

          $0.60B = 324$

          $B = \dfrac{\mathbf{324}}{\mathbf{0.60}} = \mathbf{540}$

Example 3:   A family has a medical plan that pays 70% of all prescription costs, less a
                   $200 deductible each year.

a) Write a function that models the family's responsibility for prescription costs.
b) Determine the amount the medical plan will pay on $1250 in prescription costs.
c) Determine the amount spent on prescription purchases if the amount the plan paid was $1250
d) Graph this function and label the answers from $b)$ and $c)$

Solution 3:

    a) Let R be the refund and C be the prescription cost.

        •   The plan pays 70% so the slope $m = \mathbf{0.70}$

        •   When the cost is $0 there is a $200 dollar deductible so the $y - intercept$ is: -200

            so, $b = \mathbf{-200}$

        •   Therefore, $R = \mathbf{0.70C - 200}$

    b) $R = 0.70C - 200$
             $= 0.70(1250) - 200$
             $= \mathbf{675}$

         The plan will pay $**675** on $1250 in prescription costs
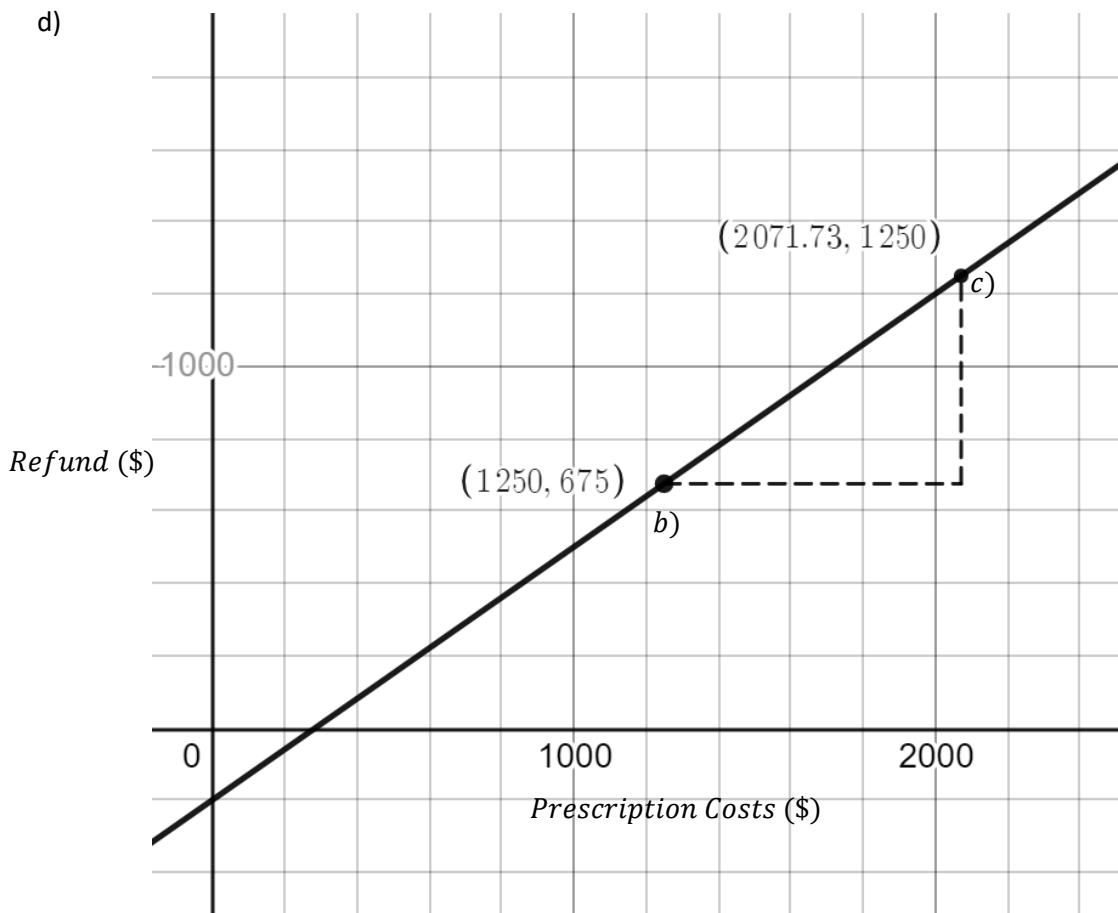
c) $R = 0.70C - 200$

$1250 = 0.70C - 200$

$1250 + 200 = 0.70C$

$1450 = 0.70C$

$\dfrac{1450}{0.70} = C = \mathbf{\$2071.43}$

$\mathbf{\$2071.43}$ is spent on prescription purchases, to get a \$1250 refund.

d)

Section 3.3a – Practice Problems

PROFIENT LEVEL QUESTIONS

1. An insurance company purchased computers for its office. The value of the computers after two years was $80 000, and $56 000 after four years. Determine the purchase price of the computers.

2. In her first year of practice, a psychologist has 160 patients. By the third year, the number of patients grew to 246. IF this trend continues, how many patients will she have in the fourth year?

3. The percent of $18 - 25$ year olds who smoke worldwide has changed from 46.8% in 1987, to 37.2% in 2000. Predict the percentage of $18 - 25$ year olds that will smoke in 2012.

4. A taxi cab is purchased for $36 000. At the end of the 10 years, it is sold for scrap for $1800. Find the depreciation equation for the car.

5. A home was purchased for $410 000. The owner expects the home to double in value in the next 10 years. Find the appreciation equation of the home.

6. A printer costs $960 new and is expected to be worth $140 after six years. What will it be worth after four years?

Section 3.3a – Answer Key

1. $104\,000

2. $y = 289$

3. $y = 28.3\%$

4. $V = -3420(yr) + 36000$

5. $y = 41000(yr) + 410000$

6. $y = \$413.33$

Extra Work Space