

Exercise 1.3.129 The relationship between Celsius ( $^{\circ}\text{C}$ ) and Fahrenheit ( $^{\circ}\text{F}$ ) degrees of measuring temperature is linear. Find a linear equation relating  $^{\circ}\text{C}$  and  $^{\circ}\text{F}$  if  $0^{\circ}\text{C}$  corresponds to  $32^{\circ}\text{F}$  and  $100^{\circ}\text{C}$  corresponds to  $212^{\circ}\text{F}$ . Use the equation to find the Celsius measure of  $70^{\circ}\text{F}$ .

Solution

Let  $x$  represent  $^{\circ}\text{F}$  and let  $y$  represent  $^{\circ}\text{C}$ . Since  $0^{\circ}\text{C}$  corresponds to  $32^{\circ}\text{F}$  then we have the point  $(x_1, y_1) = (32, 0)$ .

Since  $100^{\circ}\text{C}$  corresponds to  $212^{\circ}\text{F}$  then we have the point  $(x_2, y_2) = (212, 100)$ .

So the slope of the linear equation is

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(100) - (0)}{(212) - (32)} = \frac{100}{180} = \frac{5}{9}$$

Using the point slope  $y - y_1 = m(x - x_1)$  we have  $y - (0) = \frac{5}{9}(x - 32)$  or

$$\boxed{y = \frac{5}{9}x - \frac{160}{9}} \quad \text{When } x = 70 (^{\circ}\text{F}),$$

$$\text{we have } y = \frac{5}{9}(70) - \frac{160}{9} = \frac{350 - 160}{9}$$

$$= \frac{190}{9} = 21\frac{1}{9}^{\circ}\text{C}.$$

$\therefore 70^{\circ}\text{F}$  corresponds to  $21\frac{1}{9}^{\circ}\text{C}$ .  $\square$