Writing Point-Slope Equations

John is a serious golfer. He believes that his game is affected when he carries his golf clubs. He has decided to hire a caddy to see if his hypothesis is justified. The caddy charges $15 per hour. John estimates that if it takes him 6 hours to complete the course his total bill will be $135. Find the cost of the entrance fee for John's club.

Variables: hours and cost $\overset{x}{(hours,} \overset{y}{cost)}$

In slope–intercept form the equation would be: Total Cost = ___Cost per hour___ + ___entrance fee___

Information given: caddy charges $15 per hour   slope $m =$ ___15___

6 hours of golf will cost $135   point $\underset{x \quad y}{(6, 135)}$

Need to find: ___entrance fee___

If we are given a point and a slope, one method that can be used is the conversion of point–slope to slope–intercept form. $(y = mx + b)$

Point–slope form: $y - y_1 = m(x - x_1)$

$$y - 135 = 15(x - 6)$$

Then convert to $y = mx + b$

$$y - 135 = 15x - 90$$
$$+135 \qquad\qquad +135$$
$$\boxed{y = 15x + 45}$$

John is going to pay a $___45___ fee. (y–intercept)

2. A repairman charges $25 per hour plus an initial service charge. The bill for 3 hours is $105.

a. Identify the point in this situation.

$$(3, 105)$$

b. Identify the slope. What does it represent in this situation?

$$m = 25, \quad \text{cost per hour}$$

c. Write the equation of the line in point–slope form and convert to slope–intercept form.

$$y - y_1 = m(x - x_1)$$
$$y - 105 = 25(x - 3)$$

Convert to $y = mx + b$

$$y - 105 = 25x - 75$$
$$+105 \qquad\qquad +105$$
$$\boxed{y = 25x + 30}$$

d. Identify the y–intercept. What does it represent in this situation?

$$b = 30, \quad \text{initial service charge}$$

e. How much would the bill be if the repair took 7 hours?

$$x = 7$$

$$y = 25(7) + 30$$
$$\boxed{y = \$205}$$

f. Suppose you had $140 to spend on the service call. How long could the repairman stay?

$$y = 140$$

$$140 = 25x + 30$$
$$-30 \qquad\qquad -30$$
$$\frac{110}{25} = \frac{25x}{25}$$

$$\boxed{x = 4.4 \text{ hours}}$$

Write the point–slope form of an equation of the line that passes through the given point and has the given slope, then convert to slope–intercept form. $y - y_1 = m(x - x_1)$ HOY VUX

3. (1, 6); slope = 3

$$x_1 \, y_1 \qquad m$$

$$y - 6 = 3(x - 1)$$
$$y - 6 = 3x - 3$$
$$+6 \qquad\qquad +6$$
$$\boxed{y = 3x + 3}$$

4. (−5, 9); slope = undefined

vertical
$$x = \#$$

$$\boxed{x = -5}$$

5. (−6, −2); slope = $-\dfrac{1}{2}$

$$x_1 \, y_1 \qquad m$$

$$y + 2 = -\frac{1}{2}(x + 6)$$

$$y + 2 = -\frac{1}{2}x - 3$$
$$-2 \qquad\qquad -2$$
$$\boxed{y = -\frac{1}{2}x - 5}$$

6. (3, −5); slope = 0   HOY VUX

horizontal
$$y = \#$$

$$\boxed{y = -5}$$