6.5 Slope-Point Form of the equation for a Linear Function

Lesson 7

Apr 28-9:46 AM

Connect EXAMPLE 1:

Slope-Point Form of the Equation of a Linear Function

The equation of a line that passes through $P(x_1, y_1)$ and has slope m is:
$y - y_1 = m(x - x_1)$

Graphing a Linear Function Given Its Equation in Slope-Point Form

a) Describe the graph of the linear function with this equation:

$$y - \overset{y_1}{2} = \frac{1}{3}(x + 4) \qquad +4 = -(-4)$$

$$m = \frac{1}{3}, \quad (-4, 2)$$

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Connect

We can use the coordinates of two points that satisfy a linear function P (x_1, y_1) and Q(x_2, y_2), to write an equation for the function.

We write the slope of the graph of the function in two ways:

$$m = \frac{y - y_1}{x - x_1} \quad \text{and} \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

So, an equation is: $\boxed{\dfrac{y - y_1}{x - x_1} = \dfrac{y_2 - y_1}{x_2 - x_1}}$

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Connect EXAMPLE 3:

Writing an Equation of a Linear Function Given Two Points

The sum of the angles, s degrees, in a polygon is a linear function of the number of sides, n, of the polygon. The sum of the angles in a triangle is 180 degrees. The sum of the angles in a quadrilateral is 360 degrees.

a) Write a linear equation to represent this function.

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Connect EXAMPLE 3:

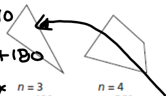
Writing an Equation of a Linear Function Given Two Points

SOLUTION: a) $s = f(n)$, so two points on the graph have coordinates T(3, 180) and Q(4, 360)

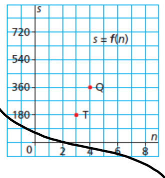
$y - 180 = 180x - 540$

$y = 180n - 540 + 180$

$\boxed{y = 180n - 360}$



x $n = 3$ / y $s = 180$ $n = 4$ $s = 360$



Therefor: $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{y - 180}{x - 3} = \frac{360 - 180}{4 - 3}$ → $\frac{y - 180}{x - 3} = 180$

$\cancel{x-3}\left[\frac{y - 180}{\cancel{x-3}}\right] = 180(x - 3)$

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Connect EXAMPLE 3:

Writing an Equation of a Linear Function Given Two Points

$\overset{x}{(3},\overset{y}{180)}, \overset{x}{(4},\overset{y}{360)}$

$\boxed{m = \frac{y_2 - y_1}{x_2 - x_1}}$

Slope

$m: \frac{360 - 180}{4 - 3}$

$m: \frac{180}{1}$

$m = 180$

Find y-int

$y = mx + b$

$180 = 180(3) + b$

$180 = 540 + b$

$180 - 540 = b$

$-360 = b$

Write Equation

$y = mx + b$

$\boxed{y = 180x - 360}$

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Connect EXAMPLE 3:

Writing an Equation of a Linear Function Given Two Points

b) Use the equation to determine the sum of the angles in a dodecagon

dodecagon = 12 sides

$S = 180n - 360$

$S = 180(12) - 360$

$S = 2160 - 360$

$S = 1800$

The sum of the angles is 1800°

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Practice YOU TRY!

Writing an Equation of a Linear Function Given Two Points

A temperature in degrees Celsius, c, is a linear function of the temperature in degrees Fahrenheit, f. The boiling point of water is 100 degrees Celsius and 212 degrees Fahrenheit. The freezing point of water is 0 degrees C, and 32 degrees F.

(c, f) (212, 100) (32, 0)

a) Write a linear equation to represent this function.

Slope

$\frac{100 - 0}{212 - 32}$

$\frac{100}{180} = \frac{10}{18} = \boxed{\frac{5}{9}}$

y-int

$y = mx + b$

$0 = \frac{5}{9}(32) + b$

$0 = 160 + 9b$

$-\frac{160}{9} = \frac{9b}{9}$

$-\frac{160}{9} = b$

Equation

$y = mx + b$

$\boxed{y = \frac{5}{9}x - \frac{160}{9}}$

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$(212,100), (32,0)$

Slope

$\frac{100-0}{212-32}$

$\frac{5}{9}$

Point-slope

$y-100=\frac{5}{9}(x-212)$

$9(y-100)=9\left[\frac{5}{9}(x-212)\right]$

$9y-900=5x-1060$

$9y=5x-1060+900$

$\frac{9y}{9}=\frac{5x}{9}-\frac{160}{9}$

$\boxed{y=\frac{5}{9}x-\frac{160}{9}}$

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Practice YOU TRY!

Writing an Equation of a Linear Function Given Two Points

b) Use the equation to determine the temperature in degrees Celsius at which iron melts, 2795 degrees F.

$C-100=\frac{5}{9}(f-212)$

$C-100=\frac{5}{9}(2795-212)$

$=\frac{5}{9}(2583)$

$C-100\approx1435$

$C=1435+100$

$C=1535$

$C=\frac{5}{9}f-\frac{160}{9}$

$C=\frac{5}{9}(2795)-\frac{160}{9}$

$C=1552.77-17.77$

$\boxed{C=1535}$

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Connect EXAMPLE 4:

Writing an Equation of a line that is parallel or perpendicular to a given point

Write an equation for the line that passes through R(1, -1) and is:

a) parallel to the line $y=\frac{2}{3}x-5$ $m=\frac{2}{3}$ $R(1,-1)$

$y-y_1=m(x-x_1)$

$\boxed{y+1=\frac{2}{3}(x-1)}$

a) perpendicular to the line $y=\frac{2}{3}x-5$ $m=\frac{-3}{2}$ $R(1,-1)$

$\boxed{y+1=\frac{-3}{2}(x-1)}$

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Practice YOU TRY!

Writing an Equation of a line that is parallel or perpendicular to a given point

Write an equation for the line that passes through S (2, -3) and is:

a) parallel to the line $y=3x+5$ $m=3$ $(2,-3)$

$y+3=3(x-2)$

a) perpendicular to the line $y=3x+5$ $m=\frac{-1}{3}$ $(2,-3)$

$y+3=-\frac{1}{3}(x-2)$

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Practice Practice Questions

Handout questions:

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