Using the applet at *Equations of a Straight Line* (http://www.cut-the-knot.org/Curriculum/Calculus/StraightLine.shtml), plot a line through the points P1(-2,0) and P2(0,1). Select the "show grid" option below the window. Copy the plot, and crop it to show only the area defined on the left and right by X = ±5, and on the top and bottom by Y = ±5. (

1. Insert your plot about here...



...and then answer the following questions.

2. What is the X-intercept?

 (-2, 0)

3. What is the Y-intercept?

 (0, 1)

4. What is the slope?

 m=(0-1)/(-2-0)=1/2

5. The application gives us one form of the equation of the line, below the plot. Write the equation of the line in slope-intercept form.

 y=(1/2)x+1

6. Use the plot to find the value of y when x=4. Verify that value using the equation of the line.

From the plot, we estimate the value of y when x=4 is 3.

Indeed, when x=4,

 y=(1/2)\*4+1=2+1=3

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The "Cut the knot" application we used above allows us to plot a line using two points, and gives us a version of the equation. The application we'll use below, Relplot, begins with the equation. We type the equation into the app, and it generates the plot.

Click HERE to launch Relplot. Type in the following equation; y = -2x+2. (Note that you'll have to indicate the multiplication using an asterisk; i.e., y = -2\*x+2. ) As before, copy the plot. Crop it to show only the area defined on the left and right by X = ±2, and on the top and bottom by Y = ±2.

7. Insert your plot about here ...



...and answer the following questions.

Remember that the equation was entered in slope-intercept form.

8. Looking at the equation, what is the slope?

 The slope is m= -2.

9. What is the Y-intercept?

 (0, 2)

10. Looking at the plot: What is the X-intercept?

 (1, 0)

11. How does the plot verify the value of the Y-intercept, as shown in the equation?

 The intersection point of the line and y-axis is (0, 2), which verifies the Y-intercept in the equation.

12. Use the X- and Y-intercepts to verify the value of the slope, as shown in the equation.

 The slope is m=[2-0]/[0-1]=-2

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*For the problems below, begin with a freehand sketch (no need to present it). After determining the value of two points in the X-Y plane, write the equation, and use the equation to answer any additional questions.*

Here on Earth, the zero point of the Celsius temperature scale (0 C) is the melting point of ice. 100 C is the boiling point of water. The planet Hades is a a bit warmer. The native species, known as Devils, reckon temperature in degrees H. The zero point (0 H) is the melting point of sulfur (113 C). 100 H is the boiling point of sulfur (445 C).

13. Write the equation for calculating the temperature in H, given the temperature in C.

 Using two points (113, 0) and (445, 100), we get

 

 i.e.,

 

14. Calculate human body temperature (37 C) in H.

 When C=37, we get

 

The value of the new corporate jet in 2005 was $2,000,000. By 2015, the value will have depreciated to $800,000.

14. Write a linear equation modeling this straight-line depreciation, where x is the number of years after 2005.

 y=-120,000x+2000,000

15. Use this equation to predict the jet’s value in 2020.

 Letting x=15, we get

 y=-120,000\*15+2000,000=200,000

So, the jet’s value in 2020 would be $200,000.

Total employee costs at ABC, Inc., are $500,000. Each new employee is estimated to cost an average of $40,000 including salary and benefits.

16. Write a linear equation modeling the total employee costs after adding x new employees.

 y=40000x+500000

17. Use the equation to find out how many employees can be added the total employee costs are capped at $820,000.

 Let y=820000. Then

 40000x+500000 =820000

So, x=8

So, 8 new employees can be added the total employee costs are capped at $820,000.