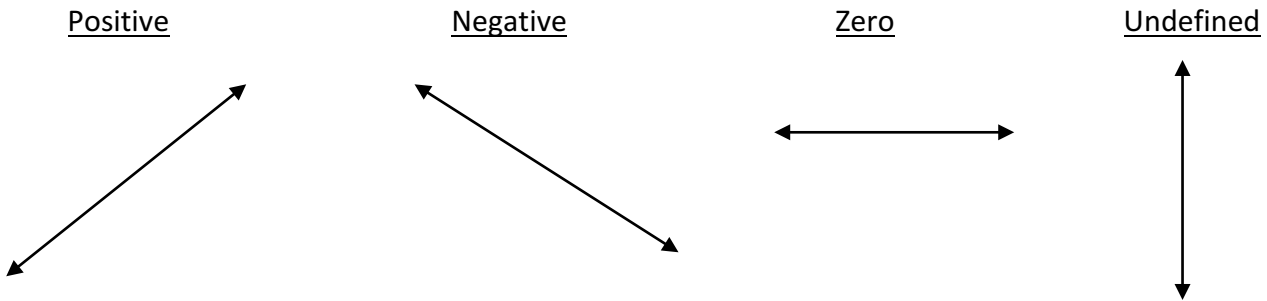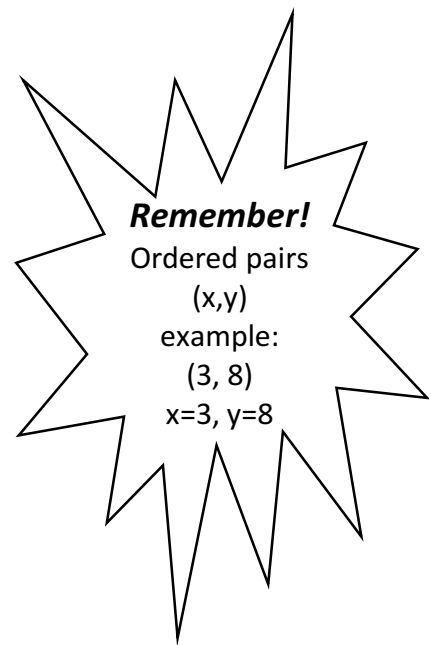### *LINEAR FUNCTIONS (Lines)*

The **slope** of a line describes how **steep** the line is. Slope is also called **rate of change**.
A slope can be positive, negative, zero, or undefined.

<u>Positive</u>   <u>Negative</u>   <u>Zero</u>   <u>Undefined</u>

To find the slope of a line, compare rise (height) to run (length). A line's
slope is the same everywhere, so you can use any two points to find the
slope.

Change in y

$$Slope = \frac{Rise}{Run} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Change in x

Remember!
Ordered pairs
(x,y)
example:
(3, 8)
x=3, y=8

Example Find the slope of a line passing through points (1, 2) and (4,6).

$$Slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 2}{4 - 1} = \frac{\mathbf{4}}{\mathbf{3}}$$

To draw a line given a point and the slope

1) plot the point

2) $slope = \frac{rise}{run}$ so from the point, go up the
number in the numerator, and over the number
in the denominator (right if the slope is positive,
left if the slope is negative). *Note: if the slope is not
a fraction, you can make it into one with a denominator of 1.*
3) Use ruler to draw a line going through both
points and draw arrows on each end.

Remember!
5 ← Numerator
─
8 ← Denominator

Example draw the line
with slope $\frac{3}{2}$,
going through the point (1,4)
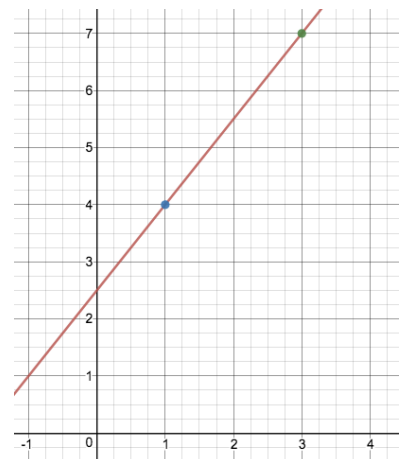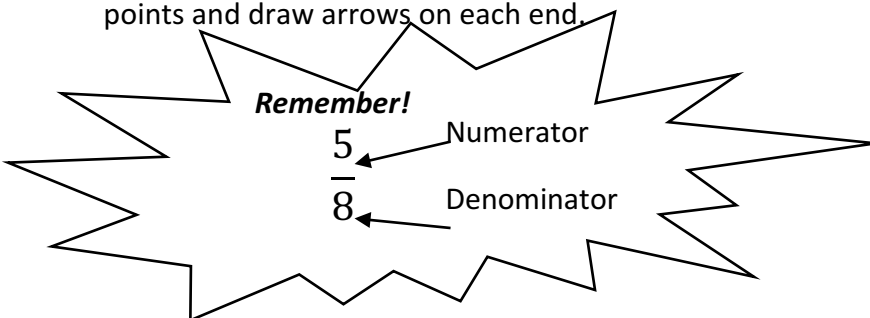
The **equation of a line**: $y = mx + b$

y is a y-coordinate

x is an x-coordinate

m is the slope

b is the y-intercept (where the line crosses the y-axis)

Find the rule (equation) given slope and a point

Step 1: Plug in slope for m

Step 2: Find y-intercept (b) by plugging in
point (x,y) into $y = mx + b$ and use
algebra to solve for b

Step 3: State final equation

Example Given slope = 1/3 and point (6,4), find the equation (rule) of the line

1) $y = mx + b$

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

$$4 = \frac{1}{3}(6) + b$$

$$4 = \frac{6}{3} + b$$

$$4 = 2 + b$$
$$\underline{-2 \quad -2}$$
$$2 = b$$

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

Find the rule (equation) given two points

Step 1: Find slope (m) using $m = \frac{y_2 - y_1}{x_2 - x_1}$

Step 2: Find y-intercept (b) by plugging in
point (x,y) into $y = mx + b$ and use
algebra to solve for b

Step 3: State final equation

Example Find rule given points (4,2) and (8, -3).

1) $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-2}{8-4} = \frac{-5}{4}$

2) $y = mx + b$

$y = \frac{-5}{4}x + b$

$2 = \frac{-5}{4}(4) + b$

$2 = -5 + b$
$\underline{+5 \quad +5}$
$7 = b$

3) $\boldsymbol{y = \frac{-5}{4}x + 7}$