

## Slope-Intercept Form

**Slope-Intercept Form:** An equation could be written in many different forms. One way to write an equation is called **slope-intercept form**. The main benefit of writing an equation in this form is that one can find the slope and the y-intercept of the equation by just looking at the equation.

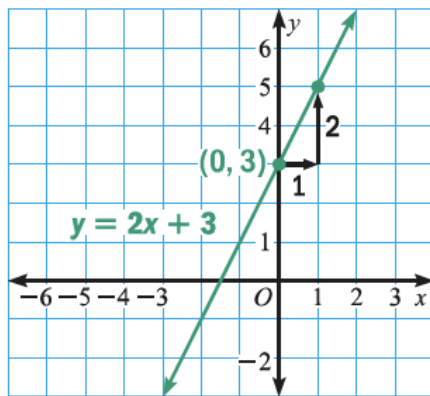
Slope-intercept form has the following form:

$$y = mx + b, \text{ where } m \text{ is the slope and } b \text{ is the y-intercept}$$

The slope is the constant rate of change of a line. It is also sometimes called the average rate of change. All linear relationships have a constant rate of change. The slope of a line is what determines how steep or flat the line is.

The y-intercept of a line is the point at which the line crosses the y-axis,  $(0, y)$ .

*Example:*



The graph of  $y = 2x + 3$  is shown.

The line's y-intercept is 3 and the line's slope  $m$  is 2:

$$m = \frac{\text{rise}}{\text{run}} = \frac{2}{1} = 2$$

Notice that the slope is equal to the coefficient of  $x$  in the equation  $y = 2x + 3$ .

Also notice that the y-intercept is equal to the constant term in the equation. These results are always true for an equation written in *slope-intercept form*.

Since we know how to graph and find the slope and y-intercept in slope-intercept form, it will be convenient to convert equations in different forms into slope-intercept form. An equation can be also easily graphed if you know the slope and its y-intercept.

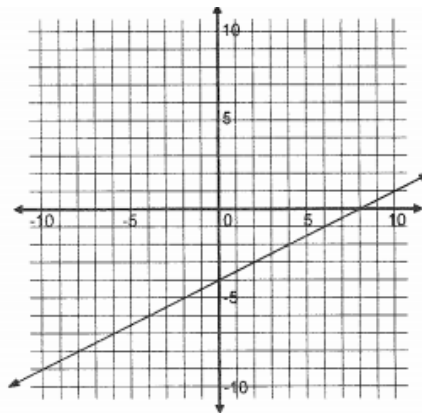
**Example:** Write  $2x - 4y = 16$  in slope-intercept form.

$$2x - 4y = 16$$

$$-4y = 16 - 2x$$

$$y = \frac{1}{2}x - 4$$

slope:  $\frac{1}{2}$   
y-intercept: -4



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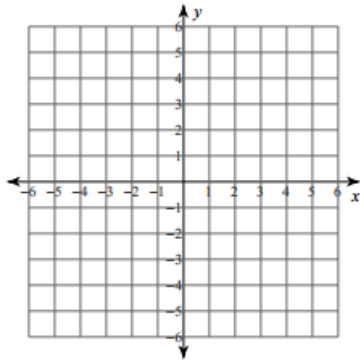
### Slope-Intercept Form & Percents

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1. Identify the slope and y-intercept. Then graph.

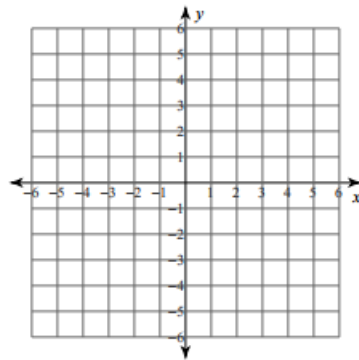
a)  $y = \frac{1}{4}x - 1$

slope:  
y-intercept:



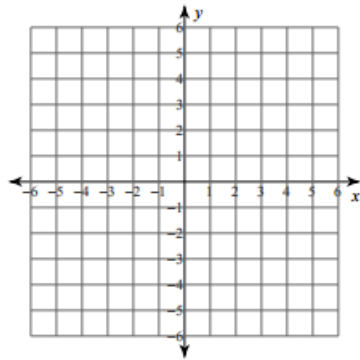
b)  $y = x + 1$

slope:  
y-intercept:



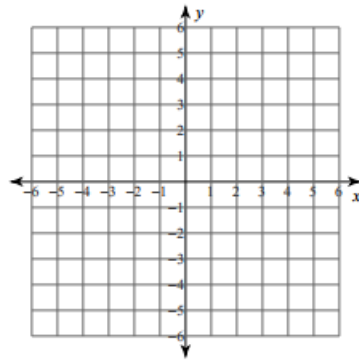
c)  $y = -3x - 3$

slope:  
y-intercept:



d)  $y = \frac{3}{5}x - 1$

slope:  
y-intercept:



2. Find the slope, the y-intercept, and the x-intercept of each equation using slope-intercept form.

a)  $3x + 4y = 16$

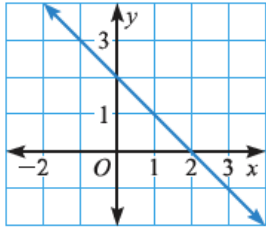
b)  $\frac{x+y}{2} = 1$

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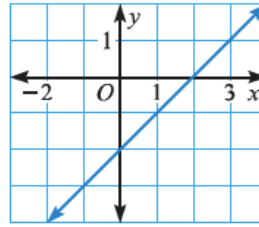
### Slope-Intercept Form & Percents

3. Find the slope and y-intercept for each of the following graphs. Then, write the equation in slope-intercept form.

a)



b)



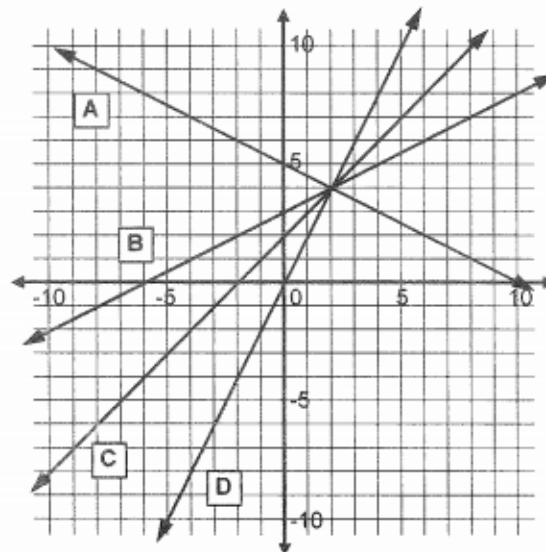
4. The snow on the ground is melting at a steady rate. The equation  $2y + x = 24$  models the depth of  $y$  of snow on the ground after  $x$  hours with the initial depth of  $b$  inches. Find the slope of the equation and find the initial depth of the snow when  $x=0$ .

5. Rewrite each equation in slope-intercept form and match the equation with its graph.

a)  $y - 2x = 0$

b)  $2y + x = 10$

c)  $y - x = 2$



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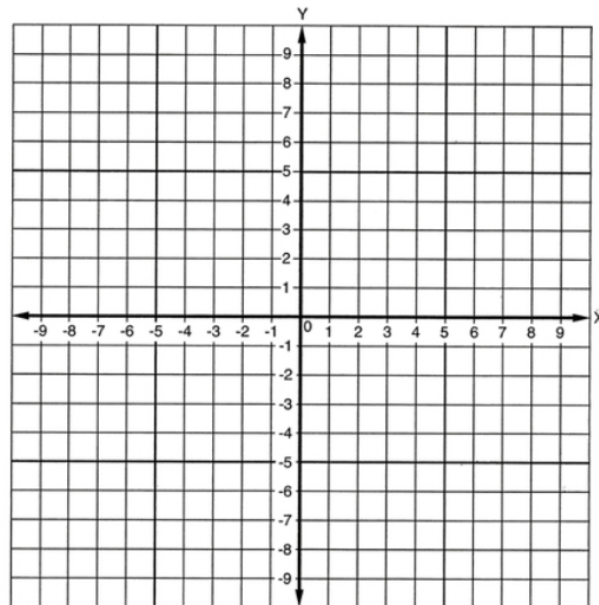
6. Write the equation in slope-intercept form. Then graph the equations on the same graph below.

a)  $2y + x = -12$

b)  $-\frac{12}{5}x - 10 + 2y = 0$

c)  $3y - 9 = 12x$

d)  $y - 3 = 0$



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### Slope-Intercept Form & Percents

### Percents

**Percent (Review):** A ratio that compares a number to 100. The symbol for percent is %.

Fraction	Decimal	Percent
$\frac{3}{10} = \frac{30}{100}$	0.30	30%
$\frac{1}{2} = \frac{50}{100}$	0.50	50%
$\frac{3}{4} = \frac{75}{100}$	0.75	75%

To write a decimal as a percent, move the decimal point two places to the right and write a percent sign.

To write a percent as a decimal, move the decimal point two places to the left and remove the percent sign.

*Example:* Express  $\frac{3}{8}$  as a percent.

$$\frac{3}{8} = \frac{x}{100}$$

$$8x = 300$$

$$x = 37.5$$

*Example:* Express 2.5% as a fraction and decimal

Fraction:  $2.5\% = \frac{2.5}{100} = \frac{25}{1000} = \frac{1}{400}$

Decimal:  $2.5\% = \frac{2.5}{100} = \frac{25}{1000} = 0.025$

**Percent Proportion:** You can use the percent proportion to express fraction as percents and to solve percent problems. The formula for the percent proportion is as follows:

$$\frac{\text{part}}{\text{whole}} = \frac{\text{number}}{100}$$

You can also use this relationship to set up equations and solve for the variable:

$$\frac{\text{is}}{\text{of}} = \frac{\%}{100}$$

Percent problem	Example	Proportion
Find a percent.	What percent of 48 is 12?	$\frac{12}{48} = \frac{p}{100}$
Find a part of a base.	What number is 15% of 80?	$\frac{a}{80} = \frac{15}{100}$
Find a base.	20 is 30% of what number?	$\frac{20}{b} = \frac{30}{100}$

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1. 204 is 68% of what number?
2. What percent is 208 of 320?

### Percents (Cont.)

If we go back to the original proportion  $\frac{\text{part}}{\text{whole}} = \frac{\text{number}}{100}$  and consider that  $\frac{\text{number}}{100}$  can be written as a decimal, we now have the equation:

$$\text{percent (as a decimal)} = \frac{\text{part}}{\text{whole}}$$

We can use the percent equation to solve for *part*:

$$\text{part} = \text{whole} \cdot \text{percent (as a decimal)}$$

We can use the percent equation to solve for *whole*:

$$\text{whole} = \text{part} \div \text{percent (as a decimal)}$$

### Sales Tax

**Sales Tax:** A percent of the purchase price and is an amount paid in addition to the purchase price.

*Example:* There is a 8.25% sales tax in California. You bought a surfboard that is \$200. How much do you have to pay in total including tax?

#### Method 1

Step 1: Find the tax.

$$\$200 \times 8.25\% = \$16.50$$

Step 2: Add the tax to the original price.

$$\$200 + \$16.50 = \$216.50 \checkmark$$

#### Method 2

Step 1: Add 100% and the tax rate.

$$100\% + 8.25\% = 108.25\%$$

Step 2. Multiply the sum and the original price.

$$\$200 \times 108.25\% = \$216.50 \checkmark$$

In Massachusetts, the sales tax is 6.25%. If someone buys a sweater for \$24.95, what is the total cost, including sales tax?

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### Discount

**Discount:** A decrease from the original price of an item to the sale price is a discount. The discount is calculated using a percent of the original price.

*Example:* An employee of the Discount Superstore gets a 30% discount on any item he buys for himself. He bought a pair of sunglasses with discounted price. If the regular price of the sunglasses is \$85, how much did he pay for them?

Method 1

Step 1: Find the amount of discount.

$$\$85 \times 30\% = \$25.50$$

Step 2: Subtract the discount from the regular price.

$$\$85 - \$25.50 = \$59.50 \checkmark$$

Method 2

Step 1: Subtract the percent discount from 100%.

$$100\% - 30\% = 70\%$$

Step 2: Multiply the result and the regular price.

$$\$85 \times 70\% = \$59.5 \checkmark$$

You buy an electronic organizer that is on sale for 15% off the original price of \$25. What is the sale price?

### Simple Interest

**Simple Interest:** It is an interest calculated using only the original principal and the amount of time the principal earns interest. The formula for the simple interest is as follows:

$$I = p \cdot r \cdot t$$

Simple interest,  $I$  is calculated by finding the product of the principal  $p$ , the rate  $r$ , and the time  $t$ , where  $r$  is in percent and  $t$  is in years.

**Principal ( $p$ ):** the amount of money deposited or borrowed is the principal.

**Annual interest rate:** the percent of the principal earned or paid per year is the annual interest rate.

*Example:* Mr. Kim deposited \$2,000 in his savings account which earns 5% of interest annually. Assuming that he does not deposit or withdraw any money, how much will he have in his account after 3 years?

$$I = p \cdot r \cdot t$$

$$= 2,000 \cdot 0.05 \cdot 3$$

$$= 300$$

The interest earned after 3 years is \$300. Then, add the interest to the savings  $\$2,000 + \$300 = \$2,300$ .

So, after 3 years, he will have \$2,300 in his account.

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Dr. Blevins will take out a loan of \$94,000 over 7 years at 6.25% interest to remodel the office. How much will she pay in interest on this loan?

**Percent of Change:** A **percent of change** indicates how much a quantity increases or decreases with respect to the original amount. In other words, it is the ratio of the amount of increase or decrease to the original amount.

If the new amount is greater than the original amount, the percent of change is called a percent of increase.

If the new amount is less than the original amount, the percent of change is called a percent of decrease.

$$\text{Percent of change, } p\% = \frac{\text{amount of change}}{\text{original amount}}$$

*Example:* What is the percent of change from 30 to 24?

$$\begin{aligned}\text{amount of change} &= \text{new} - \text{old} \\ &= 24 - 30 \text{ or } -6\end{aligned}$$

$$\text{percent of change} = \frac{\text{amount of change}}{\text{original measurement}}$$

$$\begin{aligned}&= \frac{-6}{30} \\ &= -0.2 \text{ or } -20\%\end{aligned}$$

The percent of change is  $-20\%$ .

The percent of decrease is  $20\%$ .

1. Find the percent of decrease from 102 to 51.

2. Find the percent of increase from 150 to 189.



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3. A salesperson at a car dealership has a salary of \$1,200 per week plus a 2% commission on sales. If a salesperson had sales of \$135,000 in one week, what was he paid that week?
4. Solve.
  - a) 120 is 40% of what number?
  - b) 250 is what percent of 100?
5. A pet album that usually sells for \$12.50 was put out on sale for \$8.50. What is percent decrease?
6. A cat's catnip toy is on sale for 10% off the regular price of \$3.30. Find the sale price.
7. An X-ray machine for animals costs \$125,000. If the loan is for 10 years, and the interest paid is \$65,625, what is the interest rate on the loan?