

## Chapter 4 – Percents Study Card

### Percents, Fractions, Decimals

#### Percent → Fraction

Write the percent over 100 and reduce

$$56\% \rightarrow \frac{56}{100} \div 4 = \frac{14}{25}$$

$$130\% \rightarrow \frac{130}{100} \div 10 = \frac{13}{10} = 1\frac{3}{10}$$

#### Percent → Decimal

Move the decimal point 2 places to the left

$$42\% \rightarrow 42 \rightarrow .42$$

$$9\% \rightarrow 9 \rightarrow .09$$

$$210\% \rightarrow 210 \rightarrow 2.1$$

$$4.5\% \rightarrow 4.5 \rightarrow .045$$

#### Fraction → Percent

Set up a proportion with fraction =  $\frac{n}{100}$

Ex:  $\frac{13}{16}$

$$\frac{13}{16} = \frac{n}{100}$$

$$\frac{16n}{16} = \frac{1300}{16}$$

$$n = 81.25\%$$

#### Decimal → Percent

Move the decimal point 2 places to the right

$$.36 \rightarrow 36 \rightarrow 36\%$$

$$.07 \rightarrow 7 \rightarrow 7\%$$

$$.8 \rightarrow 80 \rightarrow 80\%$$

$$2.45 \rightarrow 245 \rightarrow 245\%$$

### Types of Percents

Type 1: Finding the % of a #

Ex: What is 45% of 210

$$\begin{array}{r} 210 \\ \times .45 \\ \hline 94.5 \end{array}$$

or

$$\frac{210}{100} = \frac{45n}{100}$$

$$\frac{100n}{100} = \frac{9450}{100}$$

$$n = 94.5$$

Type 2: Finding the % one # is of another #

$$\frac{\text{is}}{\text{of}} = \frac{n}{100} \text{ or } \frac{\text{part}}{\text{total}} = \frac{n}{100}$$

Ex: 26 is what percent of 40?

$$\frac{26}{40} = \frac{n}{100}$$

$$\frac{40n}{40} = \frac{2600}{40}$$

$$n = 65\%$$

Note: Calculating discount, tax, tip, markup, and commission are all an application of a type one percent.

## Word Problems

### Discount

Ex: A television that regularly costs \$675 is on sale for 30% off. What is the sale price?

① 
$$\begin{array}{r} 675 \\ \times .30 \\ \hline 202.5 \\ \downarrow \\ \$202.50 \end{array}$$
 or 
$$\frac{x}{675} = \frac{30}{100}$$

$$\frac{100x}{100} = \frac{20250}{100}$$
  

$$x = \$202.50$$

② 
$$\begin{array}{r} 675 \\ - 202.50 \\ \hline \$472.50 \end{array}$$

### Tip

Ex: The bill for the Schoff family's dinner at Tully's was \$42.90. They left an 18% tip for their waiter. What was the value of the tip?

$$\begin{array}{r} 42.50 \\ \times .18 \\ \hline \$7.65 \end{array}$$
 or 
$$\frac{x}{42.50} = \frac{18}{100}$$

$$\frac{100x}{100} = \frac{765}{100}$$
  

$$x = \$7.65$$

### Commission

Ex: A real estate agent sold a home for \$265,000. If they earn 6% commission on any sale, how much did he earn in commission?

$$\begin{array}{r} 265,000 \\ \times .06 \\ \hline \$15,900 \end{array}$$
 or 
$$\frac{x}{265,000} = \frac{6}{100}$$

$$\frac{100x}{100} = \frac{15,900,000}{100}$$
  

$$x = \$15,900$$

### Tax

Ex: A new Under Armour hoodie costs \$69.99 at Dick's Sporting Goods. If the sales tax is 8%, what is the cost including tax?

① 
$$\begin{array}{r} 69.99 \\ \times .08 \\ \hline 5.5992 \\ \approx \$5.60 \end{array}$$
 or 
$$\frac{x}{69.99} = \frac{8}{100}$$

$$\frac{100x}{100} = \frac{5599.2}{100}$$
  

$$x = 5.5992$$

② 
$$\begin{array}{r} 69.99 \\ + 5.60 \\ \hline \$75.59 \end{array}$$

### Markup

Ex: Game Stop buys its PS4 game systems from Sony for a price of \$210. The store marks up the price 45% for its selling price. What is the price at Game Stop for the PS4?

① 
$$\begin{array}{r} 210 \\ \times .45 \\ \hline 94.5 \\ \$94.50 \end{array}$$
 or 
$$\frac{x}{210} = \frac{45}{100}$$

$$\frac{100x}{100} = \frac{9450}{100}$$
  

$$x = 94.50$$

② 
$$\begin{array}{r} 210 \\ + 94.50 \\ \hline \$304.50 \end{array}$$

### Commission with Total Earnings

Mark works at Verizon Wireless. He earns a salary of \$275 a week plus 3% commission on his total sales. If his total sales last week were \$12,500, what were his total earnings last week?

$$\begin{array}{r} \text{Salary} \\ \$275 \\ + \text{Commission} \\ \$375 \\ \hline 650 \end{array}$$

$$\frac{x}{12,500} = \frac{3}{100}$$

$$\frac{100x}{100} = \frac{37,500}{100}$$
  

$$x = 375$$

Discount and Tax

Ex: A 50 inch television is on sale for 30% off. If the television costs \$965 and the sales tax is 7%, what is the sale price of the television including tax?

<p>① <math display="block">\begin{array}{r} 965 \\ \times .30 \\ \hline 289.5 \end{array} \rightarrow \\$289.50</math></p> <p style="text-align: center;">or</p> <p style="text-align: center;"><del><math display="block">\begin{array}{r} 965 \\ \times 30 \\ \hline 28950 \end{array}</math></del></p> <p style="text-align: center;"><math display="block">\frac{100x = 28950}{100 \quad 100}</math></p> <p style="text-align: center;"><math>x = 289.50</math></p> <p style="text-align: right; margin-right: 20px;">discount</p>	<p>② <math display="block">\begin{array}{r} 965 \\ - 289.50 \\ \hline 675.50 \end{array}</math></p> <p style="text-align: center;">sale price</p>	<p>③ <math display="block">\begin{array}{r} 675.50 \\ \times .07 \\ \hline 47.285 \end{array} \approx \\$47.29</math></p> <p style="text-align: center;">or</p> <p style="text-align: center;"><del><math display="block">\begin{array}{r} 675.50 \\ \times 7 \\ \hline 47285 \end{array}</math></del></p> <p style="text-align: center;"><math display="block">\frac{100x = 47285}{100 \quad 100}</math></p> <p style="text-align: center;"><math>x = 47.285 \approx \\$47.29</math></p> <p style="text-align: right; margin-right: 20px;">tax</p>	<p>④ <math display="block">\begin{array}{r} 675.50 \\ + 47.29 \\ \hline 722.79 \end{array}</math></p>
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**Remember the tax is calculated on the sale price!!!!**

Tax and Tip

Ex: The Brown family went to dinner last night at the Bonefish Grill. Their bill was \$58.90 before tax. If the sales tax is 8% and they left 20% for a tip, how much money did they leave total?

**Note: Remember that tax and tip are calculated on the original price (bill).**

<p style="text-align: center;"><u>Tax</u></p> <p><math display="block">\begin{array}{r} 58.90 \\ \times .08 \\ \hline 4.712 \end{array} \approx \\$4.71</math></p> <p style="text-align: center;">or</p> <p style="text-align: center;"><del><math display="block">\begin{array}{r} 58.90 \\ \times 8 \\ \hline 4712 \end{array}</math></del></p> <p style="text-align: center;"><math display="block">\frac{100n = 471.2}{100 \quad 100}</math></p> <p style="text-align: center;"><math>n = 4.712 \approx \\$4.71</math></p>	<p style="text-align: center;"><u>Tip</u></p> <p><math display="block">\begin{array}{r} 58.90 \\ \times .20 \\ \hline 11.78 \end{array}</math></p> <p style="text-align: center;">or</p> <p style="text-align: center;"><del><math display="block">\begin{array}{r} 58.90 \\ \times 20 \\ \hline 1178 \end{array}</math></del></p> <p style="text-align: center;"><math display="block">\frac{100n = 1178}{100 \quad 100}</math></p> <p style="text-align: center;"><math>n = 11.78</math></p>	<p style="text-align: center;"><u>Total</u></p> <p><math display="block">\begin{array}{r} 58.90 \\ 4.71 \\ + 11.78 \\ \hline 75.39 \end{array}</math></p>
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## Interest

$I = Prt$   $P = \text{Principal (Loan or Investment)}$   $r = \text{rate (decimal)}$   $t = \text{time (in years)}$

Ex: Scott made an investment of \$4,500 in a mutual fund. The fund is earning money at interest rate of 11% per year. At this rate, how much interest will he earn in 8 years?

$$I = 4,500(.11)(8)$$

$$I = \$3,960$$

Payoff amount = Loan + Interest

Ex: Mrs. Roberts bought a new car at a price of \$25,900. To pay for the car she took out a loan for the value of the car at interest rate of 4.99% for 5 years. How much will it cost her to pay off the car loan at the end of the 5 years?

$$I = 25,900(.0499)(5)$$

$$I = 6,462.05$$

$$\begin{array}{r} 25,900 \\ + 6,462.05 \\ \hline \$32,362.05 \end{array}$$

← payoff amount

## Percent of Change(Increase/Decrease)

$$\frac{\text{amount of change}}{\text{original amount}} = \frac{n}{100}$$

Ex: The price of a gallon of milk has risen from \$.45 in 1970 to \$1.99 in 2017. What is the percent of increase in the cost of a gallon of milk to the nearest percent?

$$\begin{array}{r} 1.99 \\ - .45 \\ \hline 1.54 \end{array}$$

$$\frac{1.54}{.45} = \frac{n}{100}$$

$$\frac{.45n}{.45} = \frac{154}{.45}$$

$$n = 342.2222 \approx 342\%$$

## Percent of Error

$$\frac{|\text{measured value} - \text{actual value}|}{\text{actual value}} = \frac{n}{100}$$

Ex: During a science lab, Jenna calculated the density of an object to be 5.4 g/cm<sup>3</sup>. The actual density of the object is 4.8 g/cm<sup>3</sup>. What is her percent of error?

$$\begin{array}{r} 5.4 \\ - 4.8 \\ \hline .6 \end{array}$$

$$\frac{.6}{4.8} = \frac{n}{100}$$

$$\frac{4.8n}{4.8} = \frac{60}{4.8}$$

$$n = 12.5\%$$