

**Adult Learning Academy**  
**Pre-Algebra Workbook**  
**UNIT 5: PERCENTS**



**LEARNING OBJECTIVES**

**1. Understanding Percentages:**

- Recognize that percents express parts per 100
- Represent percentages as parts of a whole using area models

**2. Converting Percents:**

- Represent numbers as decimals, percentages, and fractions
- Convert decimals to percents, and percents to decimals
- Convert fractions to percents, and percents to fractions; write fractions in lowest terms
- Order sets of numeric expressions that include decimals, percents, and fractions

**3. Solving Percent Problems:**

- Calculate percentages
- Identify the amount (part), base (whole), and percent in percentage problems; identify known and unknown information
- Use proportions to solve for unknowns in percent problems
- Perform calculations involving percentage increases and decreases

**4. Word Problems:**

- Solve word problems involving percents, including simple interest problems and other applications to the transportation industry

| Topic                      | Website   | Videos   | Exercises  |
|----------------------------|---|--|--|
| Understanding Percent      | <a href="http://www.khanacademy.org">www.khanacademy.org</a>  | Describing the Meaning of Percent<br>Describing the Meaning of Percent 2   | Worksheet: Coloring Decimals                                       |
| Converting Percents        | -   | Representing # as Dec, %, and Fraction<br>Converting Decimals to Percents Ex 1<br>Converting Decimals to Percents Ex 2<br>Representing a # as Dec, %, Fraction 2<br>Ordering Numeric Expressions | Converting Percents to Decimals<br>Converting Decimals to Percents |
| Solving Percent Problems   | <a href="http://www.khanacademy.org">www.khanacademy.org</a>  | Identifying Percent Amount and Base<br>Growing by a Percentage<br>Solving Percent Problems<br>Solving Percent Problems 2<br>Solving Percent Problems 3   | Discount Tax and Tip Word Probs<br>Markup, Commission Word Probs   |
| Use Proportions to solve % | <a href="http://www.youtube.com/watch?v=y10Rb6T09VM">http://www.youtube.com/watch?v=y10Rb6T09VM</a>                               |  |  |
| Use Equation to solve %    | <a href="http://www.youtube.com/watch?v=LkTYkHbUiU4">http://www.youtube.com/watch?v=LkTYkHbUiU4</a>                               |  |  |
| Unit 5 Review Powerpoint   | <a href="http://www.stlcc.edu">www.stlcc.edu</a>  | Unit 5 Flashcard Powerpoint on Blackboard  |  |
| Compass Practice           | <a href="http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac12.htm">http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac12.htm</a> |  | Percent  |



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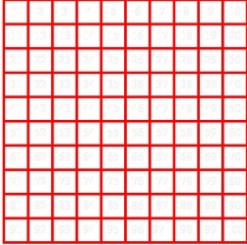
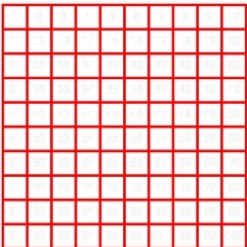
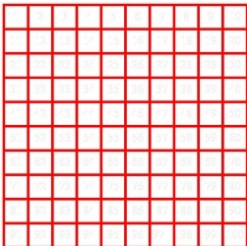
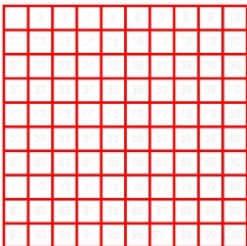
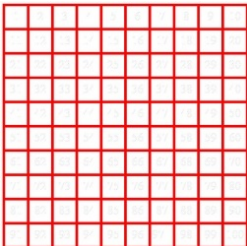
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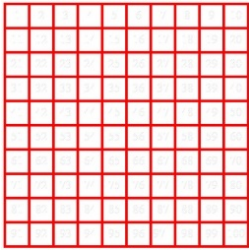
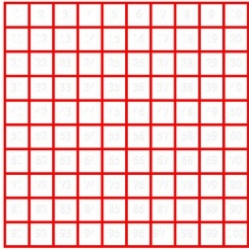
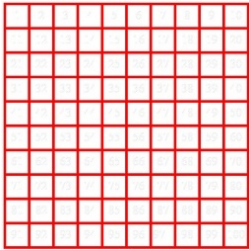
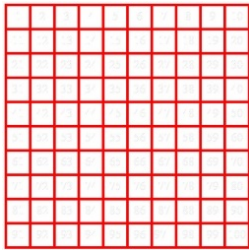


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Adult Learning Academy  
Pre-Algebra Workbook  
5.1 EQUIVALENT FRACTIONS, DECIMALS, AND PERCENTS



| <u>SHADE</u>  | <u>PERCENT</u> | <u>FRACTION</u> | <u>DECIMAL</u> |
|---|----------------|-----------------|----------------|
|    | 1%             |                 |                |
|    |                | $\frac{1}{20}$  |                |
|   |                |                 | 0.2            |
|  |                | $\frac{1}{4}$   |                |
|  | 50%            |                 |                |

| <u>SHADE</u>  | <u>PERCENT</u> | <u>FRACTION</u> | <u>DECIMAL</u> |
|---|----------------|-----------------|----------------|
|    |                | $\frac{3}{4}$   |                |
|    |                |                 | 0.99           |
|   | 100%           |                 |                |
|  | 110%           |                 |                |
|  | 0.5%           |                 |                |

## ANSWER KEY

Try to find the matches by doing the calculations in your head!

10% of 250

15% of 200

5% of 300

1% of 2000

20% of 150

100% of 25

200% of 7.5

.5% of 4000

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**5.3 PERCENTS – SENSE OR NONSENSE?**



1. Vicky got a 10% raise at the end of her first year on the job. She got a 15% raise at the end of her second year. Her total raise was 25% of her original salary.
  
2. This month, Sasha paid 45% of her MasterCard bill of \$620 and 50% of her Visa bill of \$380. All-together, she paid 95% of her credit card bills this month.
  
3. George spent 25% of his salary on food and 40% on housing. Therefore, he spent 65% of his salary on food and housing.
  
4. Among Forest Park students, 65% work part-time, 25% work full time, and 15% are not currently employed.
  
5. In Clean City, the fine for various polluting activities is a certain percentage of one's monthly income. The fine for smoking is 40%, for driving a gas-guzzling car is 50%, and for littering is 30%. Mr. Schmutz committed all three polluting crimes in one day and was fined 120% of his salary.
  
6. A loaf of bread is 97% fat free. If I only eat 97% of the bread, I won't consume any fat.
  
7. 25%, or one out of every four eggs, contains salmonella. If I only use three eggs in my omelet, I'll be safe.
  
8. A low-fat brownie recipe is 50% fat free. If I double the recipe, the result will be 100% fat free.
  
9. A sweater is on sale at 75% off. I also have a 25% coupon. Thus, the sweater is free.

1. Convert the following decimals to percents.

a. .75 \_\_\_\_\_

b. .9 \_\_\_\_\_

c. .07 \_\_\_\_\_

d. 3.98 \_\_\_\_\_

e. .0085 \_\_\_\_\_

f. .902 \_\_\_\_\_

2. Convert the following percents to decimals. Remember  $100\% = 1$

a. 25% \_\_\_\_\_

b. 3% \_\_\_\_\_

c. 150% \_\_\_\_\_

d. 700% \_\_\_\_\_

e. .08% \_\_\_\_\_

f.  $9\frac{1}{2}\%$  \_\_\_\_\_

3. Find each amount:

a. 100% of 60 \_\_\_\_\_

b. 50% of 60 \_\_\_\_\_

c. 25% of 60 \_\_\_\_\_

d. 10% of 60 \_\_\_\_\_

e. 20% of 60 \_\_\_\_\_

f. 15% of 60 \_\_\_\_\_

g. 150% of 60 \_\_\_\_\_

h. 200% of 60 \_\_\_\_\_

i. 300% of 60 \_\_\_\_\_

j. 1000% of 60 \_\_\_\_\_

4. Solve the following percent problems. Show work.

a. What is 25% of 300?

b. What is 70% of 20?

c. What is 350% of 80?

d. 100 is what percent of 400?

e. 18 is what percent of 150?

f. .5 is what percent of 4?

g. 50% of 224 is what number?

h. 225% of 50 is what number?

5. The following pie chart shows how water is used in an average household.



a. The average household uses 400 gallons of water each day. How many gallons do we use for each activity?

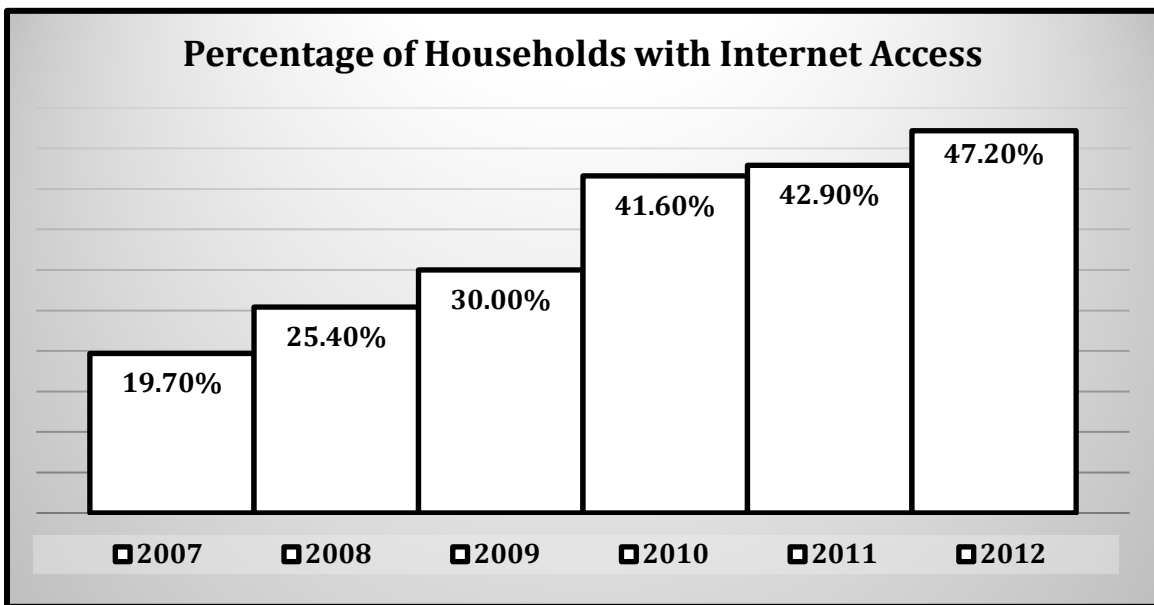
b. What percent of water is used for cooking, drinking, or showering?

c. What percent of water is NOT used for laundry or dishes?

d. Based on the percentage here, what suggestions would you make to cut down on water usage?



6. Earth's atmosphere is a mixture of gases: 78% nitrogen, 21% oxygen, .9% argon, and .03% carbon dioxide.
- Find the sum of these percents.
  - What percent of the atmosphere is made up of water vapor and trace gases, the only components not mentioned above?



7. The bar graph above shows the percentage of households with access to the internet from 2007 to 2012.
- In a state with 1.5 million households in 2012, how many would you expect to have access to the Internet?
  - In 2009, a state had 40,000 households with access to the Internet. Estimate the number of households in that state.

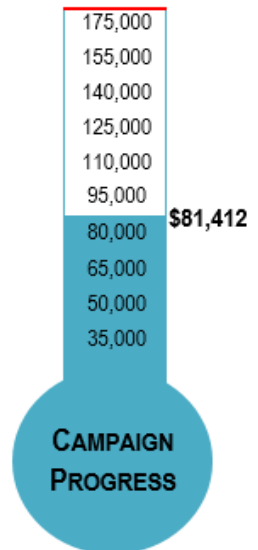
8. According to the Bureau of Labor Statistics, in 2012, the median wage for a female computer and information systems manager was \$79,404. This was 87.8% of what their male counterparts were being paid. How much were male computer and information systems managers being paid?
  
9. According to the Bureau of Labor Statistics, in 2012, 33% of all American computer systems analysts were women. 145,000 women were doing this job. How many men were doing the same job?
  
10. According to [www.internetworldstats.com](http://www.internetworldstats.com), as of June 30, 2014, North America had 310,322,257 of its 353,860,227 people using the Internet. What percent of people in North America were using the Internet?
  
11. In a laboratory experiment, 28 out of 75 patients improved when given the test drug. What percent of patients improved?
  
12. In a laboratory experiment, a plant grew from 11 inches to 15 inches tall. By what percent did the plant's height increase over the course of the experiment?
  
13. One year, a cherry tree produced 15 kilograms of fruit. The drought caused a 20% decrease in yield the next year. How many kilograms of fruit did the tree produce that year?

14. A pH meter costs \$165.

- a. The lab gets a 15% discount. How much will the meter cost?
  
  
  
  
  
  
  
  
  
  
- b. There is an 8.5% tax on the meter. Using your result from part a) above with the 15% discount, but adding in the tax, how much will the meter cost?
  
  
  
  
  
  
  
  
  
  
- c. It costs \$7.50 to ship your meter. Using the result from part b) above, the shipping cost is what percent of the meter's cost?

15. As shown on the right, a campaign has raised \$81,412 of its \$175,000 goal.

- a. What percent of the goal has been raised so far?



- b. What percent remains to be raised?

## ANSWER KEY

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- 1a. **75%**  
1b. **90%**  
1c. **7%**  
1d. **398%**  
1e. **.85%**  
1f. **90.2%**

- 2a. **.25**  
2b. **.03**  
2c. **1.5**  
2d. **7**  
2e. **.0008**  
2f. **.095**

- 3a. **60**  
3b. **30**  
3c. **1.5**  
3d. **6**  
3e. **12**  
3f. **9**  
3g. **90**  
3h. **120**  
3i. **180**  
3j. **600**

- 4a.  $x = .25(300)$  so  **$x = 75$**   
4b.  $x = .7(20)$  so  **$x = 14$**   
4c.  $x = 3.5(80)$  so  **$x = 280$**   
4d.  $100 = x(400)$  so  **$x = .25 = 25%$**   
4e.  $18 = x(150)$  so  $x = 18/150 = .12 = 12%$   
4f.  $.5 = x(4)$  so  $x = .5/4 = .125 = 12.5%$   
4g.  $.5(224) = 112$   
4h.  $2.25(50) = 112.5$

- 5a.  $.4(400) = 160$  gal for toilet  
 $.05(400) = 20$  gal for cooking & drinking  
 $.2(400) = 80$  gal for laundry & dishes  
 $.35(400) = 140$  gal for showers

- 5b.  $35\% + 5\% = 40\%$   
5c.  $100\% - 20\% = 80\%$   
5d. Shorter showers? Low-flush toilets? Answers will vary.

- 6a.  $78\% + 21\% + .9\% + .03\% = 99.3\%$   
6b.  $100\% - 99.3\% = .07\%$

- 7a.  $47.2\%$  of 1.5 million =  $.472(1,500,000)$   
= **708,000 households**

- 7b.  $40,000 = 30\%$  of what number?  
 $40,000 = .3x$   $x = 40,000/.3 = 133,333$  households

8.  $79,404 = 87.8\%$  of what number?  $79,404 = .878x$   
 $x = 79,404/.878 = 90,437$  (rounded to nearest \$)

9.  $145,000 = 33\%$  of all analysts  $145,000 = .33x$   
 $x = 145,000/.33 = 439,394$  total analysts (rounded)  
 $439,394 - 145,000 = 294,394$  male analysts

10.  $310,322,257 =$  what % of  $353,860,227$   
 $310,322,257 = x(353,860,227)$   
 $x = 310,322,257/353,860,227 = .8769$  so **about 88%**

11.  $28/75 = .3733$  so **about 37%**

12. Plant grew 4 inches; 4 = what % of original 11 in.  
 $4 = x(11)$   $x = 4/11$   $x = .3636$  so **about 36%**

13. Tree lost 20% of 15 kilograms or  $.2(15) = 3$  kg  
 $15 - 3 = 12$  kg fruit the next year

- 14a.  $\$165 - 15\%$  of  $\$165$  or  $165 - .15(165) =$   
 $165 - 24.75 = \$140.25$

- 14b.  $\$140.25 + 8.5\%$  of  $\$140.25$  or  $165 + .085(140.25)$   
 $140.25 + 11.92 = \$152.17$  (rounded)

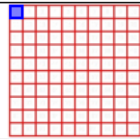
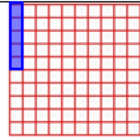
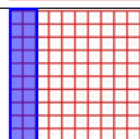
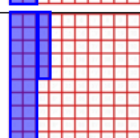
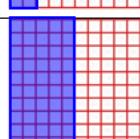
- 14c.  $\$7.50$  is what % of  $\$152.17$  or  $7.5 = x(152.17)$   
 $x = 7.5/152.17 = .049$  so **about 5%**

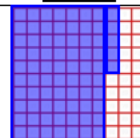
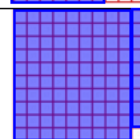
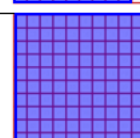
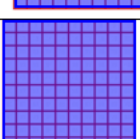
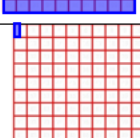
- 15a.  $\$81,412 =$  what % of  $\$175,000$  or  $81,412 = x(175,000)$   
 $x = 81,412/175,000 = .465$  so **about 47%**

*\* this makes sense since it is just under half of the goal*

- 15b.  $100\% - 47\% = 53\%$

**5.1 EQUIVALENT FRACTIONS, DECIMALS, AND PERCENTS**

| SHADE  | PERCENT | FRACTION        | DECIMAL |
|--|---------|-----------------|---------|
|   | 1%      | $\frac{1}{100}$ | .01     |
|   | 5%      | $\frac{1}{20}$  | .05     |
|   | 20%     | $\frac{1}{5}$   | 0.2     |
|   | 25%     | $\frac{1}{4}$   | .25     |
|  | 50%     | $\frac{1}{2}$   | .5      |

| SHADE   | PERCENT | FRACTION                                  | DECIMAL |
|---|---------|---|---------|
|  | 75%     | $\frac{3}{4}$                             | .75     |
|  | 99%     | $\frac{99}{100}$                          | 0.99    |
|  | 100%    | 1   | 1.00    |
|  | 110%    | $1 \frac{1}{10}$                          | 1.1     |
|  | 0.5%    | $\frac{5}{1000}$<br>or<br>$\frac{1}{200}$ | .005    |

**5.2 MATCHING PERCENTAGES**

|                  |
|------------------|
| 10% of 250 = 25  |
| 15% of 200 = 30  |
| 5% of 300 = 15   |
| 1% of 2000 = 20  |
| 20% of 150 = 30  |
| 100% of 25 = 25  |
| 200% of 7.5 = 15 |
| .5% of 4000 = 20 |

**5.3 PERCENTS - SENSE OR NONSENSE?**

1. Nonsense
2. Nonsense
3. Sense
4. Nonsense
5. Sense
6. Nonsense
7. Nonsense
8. Nonsense
9. Nonsense

**5.4 Career Applications: STEM**

- 1a. 75%
  - 1b. 90%
  - 1c. 7%
  - 1d. 398%
  - 1e. .85%
  - 1f. 90.2%
- 2a. .25
  - 2b. .03
  - 2c. 1.5
  - 2d. 7
  - 2e. .0008
  - 2f. .095
- 3a. 60
  - 3b. 30
  - 3c. 1.5
  - 3d. 6
  - 3e. 12

#### 5.4 Career Applications: STEM (cont.)

3f. **9**

3g. **90**

3h. **120**

3i. **180**

3j. **600**

4a.  $x = .25(300)$  so  $x = 75$

4b.  $x = .7(20)$  so  $x = 14$

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4d.  $100 = x(400)$  so  $x = .25 = 25\%$

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5b.  $35\% + 5\% = 40\%$

5c.  $100\% - 20\% = 80\%$

5d. Shorter showers? Low-flush toilets? Answers will vary.

6a.  $78\% + 21\% + .9\% + .03\% = 99.3\%$

6b.  $100\% - 99.3\% = .07\%$

7a.  $47.2\%$  of 1.5 million =  $.472(1,500,000)$   
= **708,000 households**

7b.  $40,000 = 30\%$  of what number?  
 $40,000 = .3x$   $x = 40,000/.3 = 133,333$  households

8.  $79,404 = 87.8\%$  of what number?  $79,404 = .878x$   
 $x = 79,404/.878 = 90,437$  (rounded to nearest \$)

9.  $145,000 = 33\%$  of all analysts  $145,000 = .33x$   
 $x = 145,000/.33 = 439,394$  total analysts (rounded)  
 $439,394 - 145,000 = 294,394$  male analysts

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14c.  $\$7.50$  is what % of  $\$152.17$  or  $7.5 = x(152.17)$   
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*\* this makes sense since it is just under half of the goal*

15b.  $100\% - 47\% = 53\%$



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