Name _____ Date _____

3-1 Study Guide

Ratios and Rates

A **ratio** is a comparison of two numbers by division.

Examples **Express each ratio in simplest form.**

1 **35 wins to 42 losses** *The greatest common factor of 35 and 42 is 7.*

$\frac{35}{42} = \frac{5}{6}$ *Divide the numerator and denominator by 7.*

The ratio in simplest form is $\frac{5}{6}$ or 5 : 6.

2 **1 foot to 3 inches**

$\frac{1 \text{ foot}}{3 \text{ inches}} = \frac{12 \text{ inches}}{3 \text{ inches}}$ *The greatest common factor of 12 and 3 is 3.*

$\frac{4 \text{ inches}}{1 \text{ inch}}$ *Divide the numerator and denominator by 3.*

The ratio in simplest form is $\frac{4}{1}$ or 4 to 1.

A **rate** is a ratio that compares two different units.

Example 3 **Express *Andres drove 300 miles in 6 hours* as a unit rate.**

$\frac{300 \text{ miles}}{6 \text{ hours}} = \frac{50 \text{ miles}}{1 \text{ hour}}$ *Divide the numerator and denominator by 6.*

Andres drove at a rate of 50 miles per hour.

Express each ratio or rate in simplest form.

1. 12 wins:15 games **2.** 8 out of 20 cars **3.** 65 to 10

4. 8 out of 10 people **5.** 90 men:144 women **6.** 81 to 36

7. 180 tickets:60 tickets **8.** 4 feet:1 yard **9.** 3 out of 24

Express each rate as a unit rate.

10. $45 for 9 hours **11.** 280 kilometers in 5 hours

12. $330 for 3 days **13.** 432 beats in 6 minutes

14. 77 pounds in 11 weeks **15.** 480 miles in 12 hours

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3-2 Study Guide

Ratios and Percents

A **percent** is a ratio that compares a number to 100.

Examples **Express each ratio as a percent.**

1 **He made 65 out of 100 foul shots.**

65 out of 100 = 65%

2 **In 1992, $\frac{1}{4}$ of all high school students took physics.**

$$\frac{1}{4} \overset{\times 25}{=} \frac{25}{100}$$

So, $\frac{1}{4} = 25\%$.

You can express a percent as a fraction by writing it as a fraction with a denominator of 100.

Example 3 **Express 95% as a fraction.**

$$95\% = \frac{95}{100}$$

$$= \frac{17}{20}$$ *Divide the numerator and the denominator by 5.*

So, $95\% = \frac{17}{20}$.

Express each ratio or fraction as a percent.

1. $\frac{13}{65}$ **2.** 49 out of 98 **3.** 91 hundredths

4. 16 out of 25 **5.** $72\frac{1}{2}$ out of 100 **6.** \$25 per \$40

Express each percent as a fraction in simplest form.

7. 20% **8.** 24% **9.** 35%

10. 47% **11.** 48% **12.** 70%

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3-3 Study Guide

Solving Proportions

A **proportion** is an equation that shows that two ratios are equivalent. To determine if a pair of ratios form a proportion, find the *cross products*.

Examples **Determine whether each pair of ratios forms a proportion.**

1 $\frac{30}{48}$ **and** $\frac{15}{24}$

Find the cross products.

$30 \times 24 = 720$ $\quad$ $48 \times 15 = 720$

Since the cross products are equal, the ratios form a proportion.

2 $\frac{20}{24}$ **and** $\frac{12}{18}$

Find the cross products.

$20 \times 18 = 360$ $\quad$ $24 \times 12 = 288$

Since the cross products are not equal, the ratios do not form a proportion.

You can also use cross products to solve proportions.

Example 3 **Solve** $\frac{12}{30}$ **and** $\frac{k}{70}$.

$30 \times k = 12 \times 70$

$30k = 840$

$k = 28$ The solution is 28.

Determine whether each pair of ratios forms a proportion.

1. $\frac{4}{6}, \frac{16}{24}$
2. $\frac{15}{25}, \frac{10}{20}$
3. $\frac{9}{12}, \frac{10}{15}$
4. $\frac{27}{72}, \frac{12}{32}$
5. $\frac{7}{15}, \frac{13}{32}$
6. $\frac{10}{24}, \frac{6}{14}$
7. $\frac{32}{12}, \frac{56}{21}$
8. $\frac{15}{6}, \frac{10}{3}$

Solve each proportion.

9. $\frac{3}{4} = \frac{m}{16}$
10. $\frac{y}{3} = \frac{9}{27}$
11. $\frac{12}{y} = \frac{3}{5}$
12. $\frac{2}{7} = \frac{14}{x}$
13. $\frac{7}{15} = \frac{21}{c}$
14. $\frac{9}{r} = \frac{18}{24}$
15. $\frac{p}{5} = \frac{5}{25}$
16. $\frac{11}{2} = \frac{m}{8}$

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3-4 Study Guide

Fractions, Decimals, and Percents

To express a percent as a decimal, divide by 100 and write as a decimal.

Examples **Express each percent as a fraction and as a decimal.**

1 **56%**

$56\% = \frac{56}{100}$ or $\frac{14}{25}$

$56\% = 0.56$

2 **3.4%**

$3.4\% = \frac{3.4}{100}$ or $\frac{17}{500}$

$3.4\% = 0.034$

To express a decimal as a percent, first write the decimal as a fraction with a denominator of 100. Then write the fraction as a percent.

Examples **Express each decimal as a percent.**

3 **0.3**

$0.3 = \frac{3}{10}$

$= 30\%$

4 **0.17**

$0.17 = \frac{17}{100}$

$= 17\%$

To express a fraction as a percent, you can use a proportion.

Examples **Express each fraction as a percent.**

5 $\frac{7}{20}$

$\frac{7}{20} = \frac{n}{100}$

$20 \times n = 7 \times 100$

$20n = 700$

$n = 35$

6 $\frac{5}{12}$

$\frac{5}{12} = \frac{n}{100}$

$12 \times n = 5 \times 100$

$12n = 500$

$n \approx 41.7$

Express each percent as a decimal.

1. 45% **2.** 91% **3.** 24.5% **4.** 8.37%

Express each decimal as a percent.

5. 0.13 **6.** 0.06 **7.** 0.765 **8.** 0.0122

Express each fraction as a percent.

9. $\frac{11}{50}$ **10.** $\frac{13}{20}$ **11.** $\frac{1}{8}$ **12.** $\frac{433}{1{,}000}$

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3-5 Study Guide

Finding Percents

To find 1% of a number mentally, move the decimal point two places to the left. To find 10% of a number mentally, move the decimal point one place to the left.

Examples **1** **Find 1% of 19.5.**

1% of $19.5 = 0.19.5$

$= 0.195$

2 **Find 10% of 0.39.**

10% of $0.39 = 0.0.39$

$= 0.039$

To find the percent of a number, use common percents like 20%, 25%, or $33\frac{1}{3}\%$ whenever possible.

Examples **3** **Find 25% of 68.**

25% of $68 = \frac{1}{4} \times 68$

$= 17$

4 **Find 60% of 125.**

60% of $125 = \frac{3}{5} \times 125$

$= 75$

5 **Find 37.5% of 98.**

37.5% of $98 = \frac{3}{8} \times 98$

$= 36.75$

6 **Find $33\frac{1}{3}\%$ of 57.**

$33\frac{1}{3}\%$ of $57 = \frac{1}{3} \times 57$

$= 19$

Compute mentally.

1. 10% of 90
2. 1% of 62.5
3. 10% of 0.14
4. 20% of 75
5. 25% of 52
6. 50% of 18
7. 40% of 55
8. 60% of 10
9. 30% of 20
10. 12.5% of 56
11. $66\frac{2}{3}\%$ of 27
12. 37.5% of 72

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3-6 Study Guide

Percent and Estimation

You can use compatible numbers to estimate with percents.

Examples **1** **Estimate 35% of 360.**

35% is about $\frac{1}{3}$. *$\frac{1}{3}$ and 360 are compatible numbers.*
$\frac{1}{3}$ of 360 is 120.

So, 35% of 360 is about 120.

2 **Estimate 24% of 158.**

24% is about $\frac{1}{4}$, and 158 is about 160. *$\frac{1}{4}$ and 160 are compatible numbers.*
$\frac{1}{4}$ of 160 is 40.

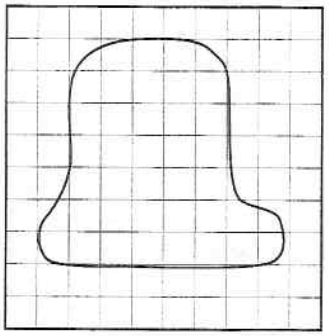
So, 24% of 158 is about 40.

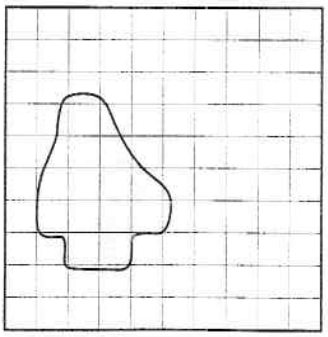
3 **Estimate 19 out of 48.**

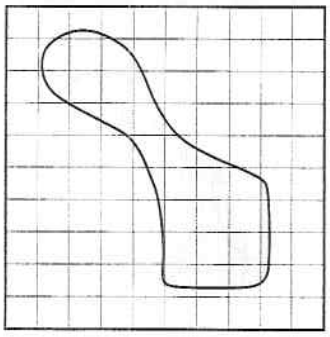
19 is about 20. 48 is about 50.
20 out of 50 is $\frac{2}{5}$ or 40%.

So, 19 out of 48 is about 40%.

Estimate the percent of the area shaded.

1. 

2. 

3. 

Estimate.

4. 52% of 240
5. 12% of 72
6. 65% of 270
7. 23% of 195
8. 42% of 309
9. 31% of 155

Estimate the percent.

10. 7 out of 15
11. 53 out of 77
12. 14 out of 112
13. 12 out of 98
14. 68 out of 208
15. 34 out of 140