7.2 Translating and Solving Percent Problems

In this section we will study how to solve percent problems. Percent problems usually have a phrase in the question in one of the following forms:

“Percent of Whole is Part”

“Part is Percent of Whole”

We will solve these types of problems by translating these questions into an algebraic equation as we did in Section 5.7. We will look for key words and use them to create an equation which we solve. The two most important key words for this section are “is” and “of: “is” means equal (=), and “of” means multiply (∗). Also, the word “what” is an indicator of an unknown quantity, which we will represent with a variable. Then, we will use solving methods that we first examined in Chapter 5.

<table>
<thead>
<tr>
<th>PARTS OF A PERCENT PROBLEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PERCENT</strong></td>
</tr>
<tr>
<td>Rate or portion of 100</td>
</tr>
<tr>
<td>The % symbol follows the number</td>
</tr>
<tr>
<td>$P$ will be used as the variable for <strong>Percent</strong></td>
</tr>
</tbody>
</table>

Note: When solving percent problems algebraically, you will need to change the percent to its decimal form. Recall from the last section that you change a percent to a decimal by dividing by 100. If the percent is the missing element from the problem, the algebraic answer to the equation that is solved will be in decimal form. Thus, you will need to change the decimal form into a percent in your final answer. Recall from the last section that you change a decimal to a percent by multiplying by 100%.

In the next few examples, the unknown value will be the percent. When we solve the equation, the value will be given as a decimal and we will need to change it to a percent for our final answer.
Example 1:  What percent of 20 is 5?

We need to determine the Percent. Use $P$ to represent the percent.

**Statement:** What percent of 20 is 5?

**Equation:**

$$P \times 20 = 5$$

Next, solve this equation for $P$.

$$P = \frac{5}{20}$$

$$P = \frac{1}{4} = 0.25$$

Change to a percent by multiplying by 100%.

$$P = 0.25 \times 100\% = 25\%$$

Practice 1:  What percent of 72 is 36?  
**Answer:** 50%

Watch It:  [http://youtu.be/S4yY1iklGQg](http://youtu.be/S4yY1iklGQg)

Example 2:  What percent of 320 is 64?

We need to determine the Percent. Use $P$ to represent the percent.

**Statement:** What percent of 320 is 64?

**Equation:**

$$P \times 320 = 64$$

Next, solve this equation for $P$.

$$P = \frac{64}{320}$$

$$P = 0.2$$

Change to a percent by multiplying by 100%.

$$P = 0.2 \times 100\% = 20\%$$

Practice 2:  What percent of 200 is 50?  
**Answer:** 25%

Watch It:  [http://youtu.be/GzR7n3Uflj4](http://youtu.be/GzR7n3Uflj4)
**Example 3:** 120 is what percent of 80?

We need to determine the Percent. Use \( P \) to represent the percent.

- **Statement:** 120 is what percent of 80
- **Equation:** \( 120 = P \times 80 \)

Next, solve this equation for \( P \).

\[
\begin{align*}
120 &= P \times 80 \\
\frac{120}{80} &= P \\
1.5 &= P \\
P &= 1.5 \times 100\% = 150\%
\end{align*}
\]

**Practice 3:** 42 is what percent of 168? **Answer:** 25%

**Watch It:** [http://youtu.be/xERrIrUVedA](http://youtu.be/xERrIrUVedA)

**Example 4:** What percent of 96 is 80?

We need to find the Percent. Use \( P \) to represent the percent.

- **Statement:** What percent of 96 is 80?
- **Equation:** \( P \times 96 = 80 \)

Next, solve this equation for \( P \).

\[
\begin{align*}
P \times 96 &= 80 \\
\frac{P \times 96}{96} &= \frac{80}{96} \\
P &= \frac{80}{96} \\
P &= \frac{2 \cdot 2 \cdot 2 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 3 \cdot 6} \\
P &= \frac{5}{6} \\
P &= \frac{5 \times 100\%}{6} \\
P &= \frac{5}{6} \times 100\% \\
P &= \frac{500}{6} \times \frac{1}{1} \\
P &= \frac{250}{3} \times \frac{1}{1} \\
P &= \frac{250 \times 3}{3} \\
P &= \frac{750}{3} \\
P &= \frac{83\frac{1}{3}}{3} \%
\end{align*}
\]

This is the percent as a mixed number.
Practice 4:  What percent of 120 is 90?  
Answer: 75%

Watch It:  http://youtu.be/ZOTKlgWG-A

In the next few problems the unknown value will be the part. We must remember to change the percent value that is given to a decimal before we solve the equation.

Example 5:  18% of 220 is what number?

We need to determine the ParT. Use $T$ to represent the part.

Statement:  18% of 220 is what?

Equation:  $0.18 \times 220 = T$

Next, solve this equation for $T$.

\[0.18 \times 220 = T\]
\[39.6 = T\]  Multiply to solve.

Practice 5:  15% of 60 is what number?  
Answer: 9

Watch It:  http://youtu.be/WD0smym_neI

Example 6:  What is 20% of 35?

We need to determine the ParT. Use $T$ to represent the part.

Statement:  What is 20% of 35?

Equation:  $T = 0.20 \times 35$

Next, solve this equation for $T$.

$T = 0.20 \times 35$
$T = 7$  Multiply to solve.

Practice 6:  What is 30% of 90?  
Answer: 27

Watch It:  http://youtu.be/dWBiBzvsFZE
**Example 7:** What is 300% of 17?

We need to determine the ParT. Use $T$ to represent the part.

**Statement:** What is 300% of 17?

**Equation:**

$$T = \frac{300}{100} \times 17$$

Next, solve this equation for $T$.

$$T = 3 \times 17$$

$$T = 51$$

Multiply to solve.

**Practice 7:** What is 145% of 60?

**Answer:** 87

**Watch It:** [http://youtu.be/qnELMJigeDY](http://youtu.be/qnELMJigeDY)

**Example 8:** What is $\frac{5}{2}$% of 248?

When given the percent we must convert it to a decimal.

$$5 \frac{1}{2} \% = \frac{11}{2} \% = \frac{11}{2} \cdot \frac{1}{100} = \frac{11}{200} = 0.055$$

We need to determine the ParT. Use $T$ to represent the part.

**Statement:** What is $\frac{5}{2}$% of 248?

**Equation:**

$$T = 0.055 \times 248$$

Next, solve this equation for $T$.

$$T = 0.055 \times 248$$

$$T = 13.64$$

Multiply to solve.

**Practice 8:** What is $\frac{3}{5}$% of 325?

**Answer:** 10.4

**Watch It:** [http://youtu.be/va7leXu_AA0](http://youtu.be/va7leXu_AA0)

In the next few problems the unknown value will be the whole. We must remember to change the percent value that is given to a decimal before we solve the equation.
Example 9: 30 is 15% of what?

We need to determine the Whole. Use $W$ to represent the whole.

**Statement:** 30 is 15% of What?

**Equation:** $30 = 0.15 \times W$

Next, solve this equation for $W$.

\[
\frac{30}{0.15} = \frac{0.15 \times W}{0.15} \quad \text{Divide both sides by 0.15.}
\]

\[
200 = W
\]

Practice 9: 60 is 5% of what number? \hspace{1cm} Answer: 1200

Watch It: [http://youtu.be/MmJg05Gp8Z8](http://youtu.be/MmJg05Gp8Z8)

Example 10: 180% of what number is 81?

We need to determine the Whole. Use $W$ to represent the whole.

**Statement:** 180% of what is 81

**Equation:** $1.8 \times W = 81$

Next, solve this equation for $W$.

\[
1.8 \times W = 81
\]

\[
\frac{1.8 \times W}{1.8} = \frac{81}{1.8} \quad \text{Divide both sides by 1.8.}
\]

\[
W = 45
\]

Practice 10: 200% of what number is 90? \hspace{1cm} Answer: 45

Watch It: [http://youtu.be/MdO5HaSW6sg](http://youtu.be/MdO5HaSW6sg)
Example 11: 45 is 30% of what?

We need to determine the **Whole**. Use $W$ to represent the whole.

**Statement:** 45 is 30% of What?

**Equation:**

\[
45 = 0.3 \times W
\]

Next, solve this equation for $W$.

\[
\begin{align*}
45 &= 0.3 \times W \\
0.3 &= 0.3 \\
\frac{150}{0.3} &= W
\end{align*}
\]

Practice 11: 32 is 20% of what number?  
**Answer:** 160

**Watch It:** [http://youtu.be/2AjDsexCESM](http://youtu.be/2AjDsexCESM)

We can also solve percent problems as we did proportion ratio problems in Chapter 6. With this method you will not need to convert percents to decimals or decimals to percents. Every problem is set up the same no matter what the unknown value is.

### SOLVING PERCENT PROBLEMS USING PROPORTIONS

\[
\frac{\text{Percent}}{100} = \frac{\text{Part}}{\text{Whole}}
\]

Example 12: What percent of 20 is 5?

We need to determine the **Percent**.

**Whole** = 20  
**Part** = 5

Fill in the proportion with the known information and solve for the unknown.

\[
\begin{align*}
\frac{P}{100} &= \frac{5}{20} \\
20P &= 500 \\
\frac{20P}{20} &= \frac{500}{20} \\
P &= 25\
\end{align*}
\]

**Answer:** 50%
Example 13: What is 18% of 220?

We need to determine the \textit{Part}.

\textit{Whole} = 220
\textit{Percent} = 18

Fill in the proportion with the known information and solve for the unknown.

\[
\frac{18}{100} = \frac{T}{220}
\]

Cross multiply.

\[
3960 = 100T
\]

Divide.

\[
T = 39.6
\]

Practice 13: 15% of 60 is what number? \hspace{1cm} \textbf{Answer:} 9

Watch It: \hspace{1cm} http://youtu.be/1fTdTFl9R6w

Example 14: 30 is 15% of what?

We need to determine the \textit{Whole}.

\textit{Part} = 30
\textit{Percent} = 15%

Fill in the proportion with the known information and solve for the unknown.

\[
\frac{15}{100} = \frac{30}{W}
\]

Cross multiply.

\[
15W = 3000
\]

Divide.

\[
W = 200
\]

Practice 14: 60 is 5% of what number? \hspace{1cm} \textbf{Answer:} 1200

Watch It: \hspace{1cm} http://youtu.be/MjbbuCcl688

Watch All: \hspace{1cm} http://youtu.be/q9-fzdIV078
7.2 Translating and Solving Percent Problems Exercises

1. What is 30% of 300?
2. What is 8.9% of 10?
3. 120% of 4000 is what?
4. 15% of 90 is what?
5. 30 is 25% of what?
6. 32 is 80% of what?
7. What percent of 125 is 25?
8. What percent of 100 is 150?
9. 40 is what percent of 400?
10. 24 is what percent of 60?
11. What is 25% of 225?
12. What is 68% of 180?
13. What is $33\frac{1}{3}$% of 125?
14. 125% of 1200 is what?
15. 4.5% of 86.5 is what?
16. 15 is 25% of what?
17. 25 is 80% of what?
18. 62 is 120% of what?
19. 1200 is 1% of what?
20. 36 is .5% of what?
21. 10 is what percent of 50?
22. 12 is what percent of 100?
23. 65 is what percent of 260?
24. 3 is what percent of 120?
25. 202 is what percent of 20,000?
7.2 Translating and Solving Percent Problems Exercise Answers

1. 90
2. 0.89
3. 4800
4. 13.5
5. 120
6. 40
7. 20%
8. 150%
9. 10%
10. 40%
11. $56.25 \text{ or } 56\frac{1}{4}$
12. $122.4 \text{ or } 122\frac{2}{5}$
13. $41\frac{2}{3}$
14. 1500
15. 3.8925
16. 60
17. $31.25 \text{ or } 31\frac{1}{4}$
18. $51\frac{2}{3}$
19. 120,000
20. 7,200
21. 20%
22. 12%
23. 25%
24. 2.5% or $2\frac{1}{2}$%
25. 1.01% or $1\frac{1}{100}$%
1. Convert to a fraction: $25\%$
2. Convert to a fraction: $93\%$
3. Convert to a fraction: $\frac{9\frac{1}{2}}{2}$
4. Convert to a percent: $\frac{2}{10}$
5. Convert to a percent: $\frac{2}{3}$
6. Convert to a percent: $0.452$
7. Convert to a percent: $3.63$
8. Convert to a decimal: $115.9\%$
9. Convert to a decimal: $8.5\%$
10. Convert to a decimal: $6\%$
11. What percent of 300 is 90?
12. What percent of 62 is 58.9?
13. What is 125% of 1200?
14. What is 18% of 420?
15. 28 is 20% of what?
16. 220 is 88% of what?
17. What percent of 45 is 9?
18. 99% of 90 is what?
19. 85 is what percent of 425?
20. 108 is what percent of 60?
21. 47% of 170 is what number?
22. What is 215% of 60?
23. 220% of what number is 550?
24. What is $83\frac{1}{3}\%$ of 96?
25. What percent of 320 is 64?
26. What percent of 200 is 230?
27. What percent of 20 is 12?
28. 150% of what number is 642?
29. 24% of what number is 96?
30. What is 82% of 100?
**Mid-Chapter 7 Review Answers**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>$\frac{1}{4}$</td>
<td>15.</td>
</tr>
<tr>
<td>2.</td>
<td>$\frac{93}{100}$</td>
<td>16.</td>
</tr>
<tr>
<td>3.</td>
<td>$\frac{19}{200}$</td>
<td>17.</td>
</tr>
<tr>
<td>4.</td>
<td>210%</td>
<td>18.</td>
</tr>
<tr>
<td>5.</td>
<td>$66\frac{2}{3}$%</td>
<td>19.</td>
</tr>
<tr>
<td>6.</td>
<td>45.2%</td>
<td>20.</td>
</tr>
<tr>
<td>7.</td>
<td>363%</td>
<td>21.</td>
</tr>
<tr>
<td>8.</td>
<td>1.159</td>
<td>22.</td>
</tr>
<tr>
<td>9.</td>
<td>0.085</td>
<td>23.</td>
</tr>
<tr>
<td>10.</td>
<td>0.06</td>
<td>24.</td>
</tr>
<tr>
<td>11.</td>
<td>30%</td>
<td>25.</td>
</tr>
<tr>
<td>12.</td>
<td>95%</td>
<td>26.</td>
</tr>
<tr>
<td>13.</td>
<td>1500</td>
<td>27.</td>
</tr>
<tr>
<td>14.</td>
<td>75.6</td>
<td>28.</td>
</tr>
<tr>
<td>15.</td>
<td>140</td>
<td>29.</td>
</tr>
<tr>
<td>16.</td>
<td>250</td>
<td>30.</td>
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</tbody>
</table>

*Sections 7.1 to 7.2*