CHAPTER

15

Percent

Vocabulary:

percent %
percentage

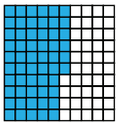
Chapter Outcomes:

- Demonstrate an understanding of percent concretely, pictorially and symbolically.
- Demonstrate an understanding of the relationships between fractions and percents.
- Apply understanding of fractions, decimals and percents to solve problems.

Percentages are a part of our daily lives. Whether you are eating, interested in sports, or using your cellphone, you have used percentages. The amount of life left in your cellphone's battery is shown as a percent. The food labels on packets, tins and bottles display percents for a certain serving size. If you can calculate percentages, you can determine how much of the food you need to eat or drink in order to get the full, or 100%, recommended daily intake.

Getting Ready for Chapter 15

1. What fraction of the square is shaded?

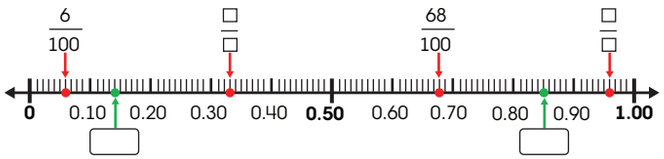


2. Write $\frac{12}{100}$ as a decimal.

3. Write $\frac{50}{100}$ in its simplest form.

4. Write the missing denominators and numerators for $\frac{2}{5} = \frac{10}{\square} = \frac{\square}{100}$.

5. Write the missing fractions and decimals.

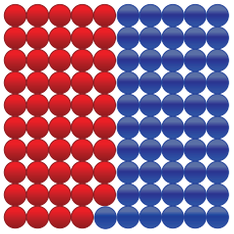


Percent, Fractions and Decimals

Teaching Point 1:

How are fractions and percents related?

Compare the number of red buttons with the total number of buttons.



There are 100 buttons.

49 of them are red.

So *49 out of 100* buttons are red.

$$\frac{\textit{Number of red buttons}}{\textit{Total number of buttons}} = \frac{49}{100}$$

There are three ways to represent this.

As a Fraction	As a Decimal	As a Percent
$\frac{49}{100}$	0.49	49%

Percent compares a number to 100. The word ***percent*** means ***out of one hundred***.

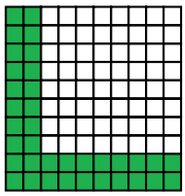
Percent is another way of writing the number of hundredths that represent the part of a whole. The percent symbol is **%**

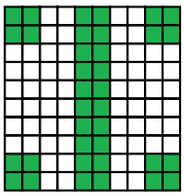
Read 49% as 49 percent.

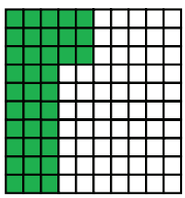
49% means 49 *out of 100*.

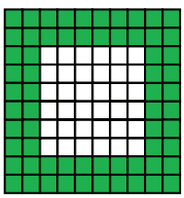
Activity 1:

Write the percent that is shaded for each model.

1. 

2. 

3. 

4. 

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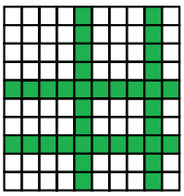

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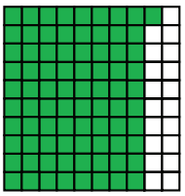

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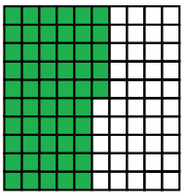

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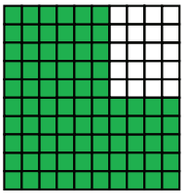
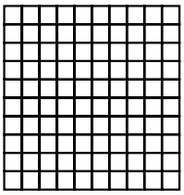


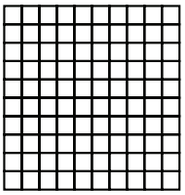
Shade each model to represent each percent.

9.



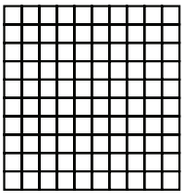
35%

10.



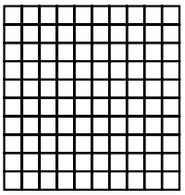
19%

11.



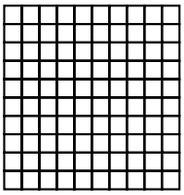
67%

12.



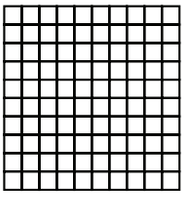
70%

13.



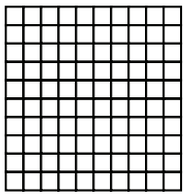
12%

14.



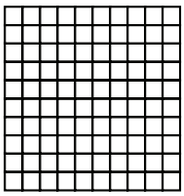
99%

15.



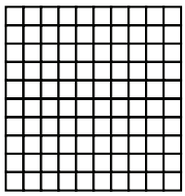
45%

16.



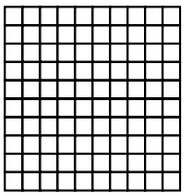
60%

17.



32%

18.

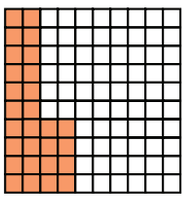


19%

Activity 2:

Complete.

1.



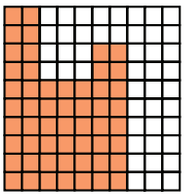
28 out of the 100 equal parts are shaded.

$\frac{28}{100}$ of the whole is shaded.

28% of the whole is shaded.

$\frac{72}{100}$ of the whole is not shaded.

72% of the whole is not shaded.

2. 

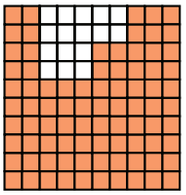
☐ out of the 100 equal parts are shaded.

$\frac{\square}{\square}$ of the whole is shaded.

☐ % of the whole is shaded.

$\frac{\square}{\square}$ of the whole is not shaded.

☐ % of the whole is not shaded.

3. 

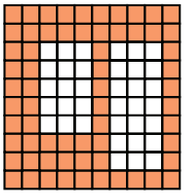
☐ out of the 100 equal parts are shaded.

$\frac{\square}{\square}$ of the whole is shaded.

☐ % of the whole is shaded.

$\frac{\square}{\square}$ of the whole is not shaded.

☐ % of the whole is not shaded.

4. 

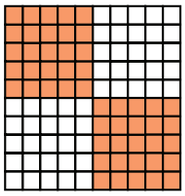
☐ out of the 100 equal parts are shaded.

$\frac{\square}{\square}$ of the whole is shaded.

☐ % of the whole is shaded.

$\frac{\square}{\square}$ of the whole is not shaded.

☐ % of the whole is not shaded.

5. 

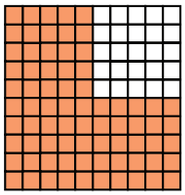
☐ out of the 100 equal parts are shaded.

$\frac{\square}{\square}$ of the whole is shaded.

☐ % of the whole is shaded.

$\frac{\square}{\square}$ of the whole is not shaded.

☐ % of the whole is not shaded.

6. 

☐ out of the 100 equal parts are shaded.

$\frac{\square}{\square}$ of the whole is shaded.

☐ % of the whole is shaded.

$\frac{\square}{\square}$ of the whole is not shaded.

$\square$ % of the whole is not shaded.

Activity 3:

Express each as a percent.

1. 73 out of 100	**2.** 57 out of 100
3. 81 out of 100	**4.** 95 out of 100
5. 64 out of 100	**6.** 5 out of 100
7. 1 out of 100	**8.** 13 out of 100
9. 34 out of 100	**10.** 54 out of 100
11. 80 oranges per 100	**12.** 2 marks per 100
13. \$15 per \$100	**14.** 91 workers per 100
15. 85 books per 100	**16.** 42 girls per 100
17. 90 pupils per 100	**18.** 7 men per 100
19. 11 hours per 100	**20.** 25 minutes per 100

Activity 4:

Express each fraction as a percent.

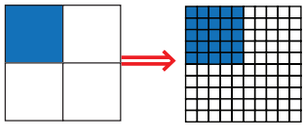
1. $\frac{25}{100} = \square$ %	**2.** $\frac{3}{100} = \square$ %
3. $\frac{80}{100} = \square$ %	**4.** $\frac{32}{100} = \square$ %
5. $\frac{11}{100} = \square$ %	**6.** $\frac{99}{100} = \square$ %
7. $\frac{6}{100} = \square$ %	**8.** $\frac{81}{100} = \square$ %
9. $\frac{7}{100} = \square$ %	**10.** $\frac{31}{100} = \square$ %
11. $\frac{1}{100} = \square$ %	**12.** $\frac{10}{100} = \square$ %
13. $\frac{50}{100} = \square$ %	**14.** $\frac{96}{100} = \square$ %
15. $\frac{13}{100} = \square$ %	**16.** $\frac{67}{100} = \square$ %
17. $\frac{20}{100} = \square$ %	**18.** $\frac{45}{100} = \square$ %
19. $\frac{84}{100} = \square$ %	**20.** $\frac{90}{100} = \square$ %

Teaching Point 2:

How are fractions and percents related?

Mia spent $\frac{1}{4}$ of her money on snacks.

What percent of her money was spent on snacks?

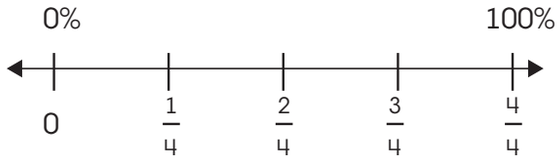


$$\frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = 25\%$$

The whole is $\frac{4}{4}$ or 100%

1 whole → 100%

1 part → 100% ÷ 4 = 25%



$\frac{1}{4} \times 100\% = 25\%$. So 25% of Mia's money was spent on snacks.

What do you do when the denominators of fractions are not factors or multiples of 100?

Express $\frac{2}{3}$ as a percent.

$\frac{2}{3} = \frac{2}{3} \times 100\%$ ← Multiply the fraction by 100.

$= \frac{200}{3}$

$= 66\frac{2}{3}$ ← Write the improper fraction as a mixed number.

$100\% = \frac{100}{100} = 1$

So, $\frac{2}{3} \times 100\%$ has the same value as $\frac{2}{3} \times 1$.

Activity 5:

Express each fraction as an equivalent fraction and a percent.

1. $\frac{2}{10} = \frac{\square}{100} = \square\,\%$	**2.** $\frac{4}{10} = \frac{\square}{100} = \square\,\%$
3. $\frac{2}{5} = \frac{\square}{100} = \square\,\%$	**4.** $\frac{1}{4} = \frac{\square}{100} = \square\,\%$
5. $\frac{3}{4} = \frac{\square}{100} = \square\,\%$	**6.** $\frac{4}{25} = \frac{\square}{100} = \square\,\%$
7. $\frac{7}{50} = \frac{\square}{100} = \square\,\%$	**8.** $\frac{1}{2} = \frac{\square}{100} = \square\,\%$
9. $\frac{7}{20} = \frac{\square}{100} = \square\,\%$	**10.** $\frac{12}{25} = \frac{\square}{100} = \square\,\%$

Write each fraction as a percent.

11. $\frac{1}{8}$	**12.** $\frac{1}{6}$	**13.** $\frac{1}{3}$
14. $\frac{1}{9}$	**15.** $\frac{1}{7}$	**16.** $\frac{1}{6}$
17. $\frac{5}{11}$	**18.** $\frac{3}{16}$	**19.** $\frac{3}{8}$
20. $\frac{5}{12}$	**21.** $\frac{2}{9}$	**22.** $\frac{2}{7}$

Teaching Point 3:

How are fractions and percents related?

Out of 500 children, 350 of them are boys.

(a) What percentage of them are boys?

Fraction that are boys:

$\frac{350}{500} = \frac{350 \div 5}{500 \div 5} = \frac{70}{100}$

Percentage that are boys:

$\frac{70}{100} \times 100\% = 70\%$

So 70% of them are boys.

(b) What percentage of them are girls?

Percentage that are girls:

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

So, 30% of them are girls.

Activity 6:

Express each fraction as an equivalent fraction and a percent.

1. $\frac{128}{400} = \frac{\square}{100} = \square\,\%$	**2.** $\frac{256}{400} = \frac{\square}{100} = \square\,\%$
3. $\frac{124}{200} = \frac{\square}{100} = \square\,\%$	**4.** $\frac{99}{300} = \frac{\square}{100} = \square\,\%$
5. $\frac{300}{400} = \frac{\square}{100} = \square\,\%$	**6.** $\frac{450}{900} = \frac{\square}{100} = \square\,\%$
7. $\frac{280}{400} = \frac{\square}{100} = \square\,\%$	**8.** $\frac{120}{200} = \frac{\square}{100} = \square\,\%$
9. $\frac{350}{700} = \frac{\square}{100} = \square\,\%$	**10.** $\frac{72}{200} = \frac{\square}{100} = \square\,\%$
11. $\frac{150}{300} = \frac{\square}{100} = \square\,\%$	**12.** $\frac{237}{300} = \frac{\square}{100} = \square\,\%$
13. $\frac{260}{400} = \frac{\square}{100} = \square\,\%$	**14.** $\frac{240}{800} = \frac{\square}{100} = \square\,\%$
15. $\frac{88}{800} = \frac{\square}{100} = \square\,\%$	**16.** $\frac{210}{300} = \frac{\square}{100} = \square\,\%$

Solve. Show your working.

17. A baker had 25 kg of flour. He used 10 kg to make bread. What percentage of the flour was used to make bread?

18. In a class of 20 children, 4 of them have difficulty reading. What percentage of the children read well?

19. About $\frac{23}{25}$ of a watermelon is water. What percentage of the watermelon is water?

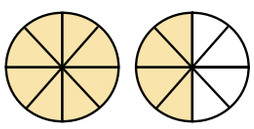
20. Maria's baby sister sleeps for $\frac{8}{10}$ of a day. About what percentage of the baby's day is spent sleeping?

21. A football team played 20 games. The team lost 4 games, drew 2 and won the others. What percentage of games did they win?

Teaching Point 4:

How are fractions, mixed numbers and percents related?

Jenny and her friends ate $1\frac{4}{8}$ of pizzas for lunch. What percentage of pizza was eaten by Jenny and her friends?



$\Rightarrow 1\frac{4}{8}$ or $1\frac{1}{2}$

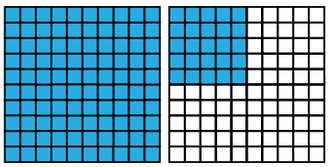
$1\frac{1}{2} = \frac{3}{2}$ ← Write $1\frac{1}{2}$ as an improper fraction.

$\frac{3}{2} = \frac{3 \times 50}{2 \times 50} = \frac{150}{100} = 150\%$

So, $\frac{150}{100}$ or 150% of pizza was eaten.

Convert 125% to a common fraction.

125% means 125 for every hundred.



$\Rightarrow$ **125% = $1\frac{1}{4}$**

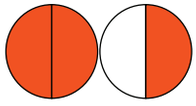
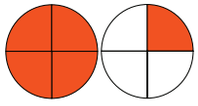
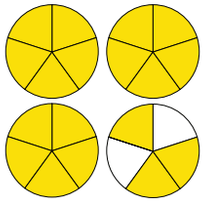
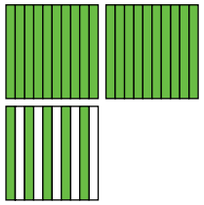
$125\% = \frac{125}{100}$ ← Define the percent.

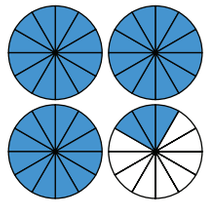
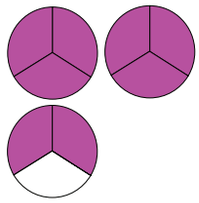
$= 1\frac{25}{100}$ ← Write as a mixed number.

$= 1\frac{25 \div 25}{100 \div 25} = 1\frac{1}{4}$ ← Simplify.

Activity 7:

Write each of the following as a percent.

1. 	**2.** 
3. 	**4.** 
5. 	**6.** 

7. 	**8.** 
9. $\frac{3}{5}$	**10.** $\frac{10}{20}$
11. $3\frac{3}{4}$	
12. $\frac{5}{2}$	**13.** $\frac{12}{10}$
14. $\frac{10}{4}$	
15. $\frac{15}{10}$	**16.** $3\frac{1}{2}$
17. $1\frac{3}{5}$	
18. $\frac{12}{8}$	**19.** $\frac{15}{6}$
20. $2\frac{15}{50}$	
21. $2\frac{5}{10}$	**22.** $1\frac{7}{10}$
23. $2\frac{4}{25}$	

Activity 8:

Write each percent as a fraction or mixed number.

1. 120%	**2.** 80%	**3.** 1%
4. 12%	**5.** 210%	**6.** 75%
7. 50%	**8.** 33%	**9.** 169%
10. 56%	**11.** 3%	**12.** 16%
13. 145%	**14.** 203%	**15.** 189%

Teaching Point 5:

How are fractions, mixed numbers and percents related?

Express $33\frac{1}{3}\%$ as a fraction in its simplest form.

$33\frac{1}{3}\% = \frac{100}{3}$ ← Write the mixed number as an improper fraction.

$= \frac{100}{3} \div 100$ ← Divide by 100 to express the percent as a fraction.

$= \frac{100}{3} \times \frac{1}{100}$ ← Rewrite using the reciprocal of the divisor.

$= \frac{100}{300}$ ← Multiply

$= \frac{1}{3}$ ← Simplify

So, $33\frac{1}{3}\% = \frac{1}{3}$

Activity 9:

Express each percent as a fraction in simplest form.

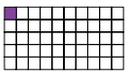
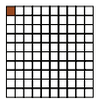
1. $33\frac{1}{3}\%$	**2.** $37\frac{1}{2}\%$	**3.** $66\frac{2}{3}\%$
4. $83\frac{1}{3}\%$	**5.** $12\frac{1}{2}\%$	**6.** $87\frac{1}{2}\%$
7. $16\frac{2}{3}\%$	**8.** $16\frac{2}{3}\%$	**9.** $8\frac{1}{3}\%$
10. $6\frac{1}{4}\%$	**11.** $7\frac{1}{2}\%$	**12.** $2\frac{1}{2}\%$

Fractions, Decimals and Percentages

Common Fraction	Decimal Fraction	Percentage
$\frac{1}{2}$ 	0.5	50%

Common Fraction	Decimal Fraction	Percentage
$\frac{1}{3}$ 	0.33	$33\frac{1}{3}\%$
$\frac{2}{3}$ 	0.66	$66\frac{2}{3}\%$
$\frac{1}{4}$ 	0.25	25%
$\frac{3}{4}$ 	0.75	75%
$\frac{1}{5}$ 	0.2	20%
$\frac{2}{5}$ 	0.4	40%
$\frac{3}{5}$ 	0.6	60%
$\frac{4}{5}$ 	0.8	80%
$\frac{1}{10}$ 	0.1	10%
$\frac{2}{10}$ 	0.2	20%
$\frac{9}{10}$ 	0.9	90%
$\frac{1}{20}$ 	0.05	5%
$\frac{9}{20}$ 	0.45	45%
$\frac{1}{25}$ 	0.04	4%
$\frac{3}{25}$ 	0.12	12%

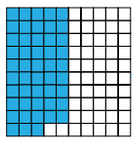
Fractions, Decimals and Percentages

Common Fraction	Decimal Fraction	Percentage
$\frac{1}{50}$ 	0.02	2%
$\frac{1}{100}$ 	0.01	1%

Teaching Point 6:

How can you relate percents to decimals?

Express 48% as a decimal.



$\Rightarrow \frac{48}{100}$

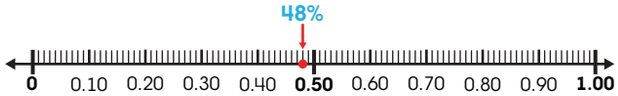
Method 1:

$48\% = \frac{48}{100} = 0.48$

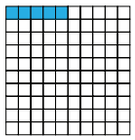
Method 2:

$48\% = 48 \div 100$ ← Divide the percentage by 100.

$= 0.48$ ← Move the decimal point 2 places to the left.



Express 0.05 as a percentage.

0.05 ⇒ 

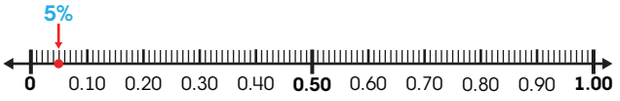
Method 1:

$0.05 = \frac{5}{100} = 5\%$

Method 2:

$0.05 = 0.05 \times 100$ ← Multiply the decimal by 100.

$= 5\%$ ← Move the decimal point 2 places to the right.



Activity 10:

Change these percentages to decimals

1. 28%	**2.** 4%	**3.** 12%
4. 60%	**5.** 11%	**6.** 5%
7. 7%	**8.** 49%	**9.** 125%
10. 241%	**11.** 600%	**12.** 120%
13. 225%	**14.** 7%	**15.** 9%
16. 10%	**17.** 3%	**18.** 2%

Change these decimals to percentages.

19. 0.12	**20.** 0.89	**21.** 0.65
22. 0.01	**23.** 0.09	**24.** 0.02
25. 0.1	**26.** 0.7	**27.** 0.2
28. 1.09	**29.** 4.75	**30.** 3.04
31. 0.4	**32.** 0.8	**33.** 0.1
34. 15.3	**35.** 16.8	**36.** 11.2

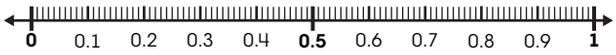
Activity 11:

Mark × on the number lines to show where each percent is located.

1. 28%

2. 49%

3. 63%



4. 90%

5. 50%

6. 25%

7. 67%

Solve the problems.

8. About 70% of the human body is water. What decimal is equivalent to 70%?

9. Melissa spent 25% of her savings on a car. What fraction of her savings was spent on the car?

10. In Mr. James' class 40% of the students are girls. What decimal fraction represents the portion of the class that are boys?

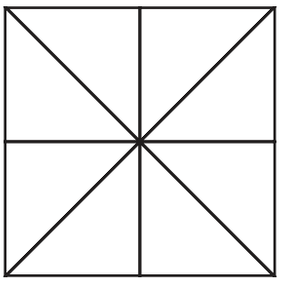
11. Allyann's favourite clothing store is having a 30% sale. What fraction represents the 30%?

12. Of the 250 cartons of juice sold at a grocery, 225 of them were orange juice. The rest of them were apple juice.

    (a) What percentage of them were apple juice?

    (b) If $\frac{24}{50}$ of the orange juice were sold to students, what percentage of the orange juice was not sold to students?

13. Shade 75% of the shape below.



14. Complete the table below.

Fraction	Decimal	Percentage
$\frac{1}{2}$	_____	_____
_____	0.2	_____
_____	_____	25%
$\frac{1}{10}$	_____	_____

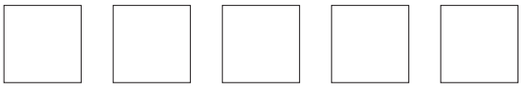
15. In Jamal's class, 7 out of 25 students travel to school by bus. What percentage of the class travel to school by bus?

16. A bag contains red and blue marbles. Given that $\frac{18}{20}$ of the marbles are blue. What percentage of the marbles are red?

17. Michael answered 0.7 questions correctly on his test. What percentage of the questions did Michael answer correctly?

18. In the 2015 general elections, 67% of eligible adults voted. What is 67% written as a decimal?

19. A bakery sold 60% of their cakes on Monday. Represent this percent by shading in the squares.



20. China accounts for 0.21 of the world's population. What percentage of the world's population lives in China?

21. Some children spend about 25% of the day watching television. What fraction of the day is this?

22. Mummy made sandwiches with $\frac{2}{5}$ of a loaf of bread. What percentage of the loaf of bread remained?

23. In the morning a tank contained 10 L of water. At lunch time it contained 7 L of water. What percentage of water was used from the tank?

24. Jonathan scored 14 goals in 20 attempts in soccer this season. About what percentage of his attempts were goals?

Compare and Order Fractions, Decimals and Percents

Teaching Point 1:

How can you compare and order numbers that are written as fractions, decimals and percents?

Which number is the greatest?

$\frac{2}{5}$, 0.5, 30%

Method 1:

Change all the numbers to fractions with common denominators. Then compare.

$0.5 = \frac{5}{10}$

$30\% = \frac{30}{100}$ or $\frac{3}{10}$

$\frac{2}{5} = \frac{4}{10}$

So, 0.5 is the greatest number.

Method 2:

Change all numbers to decimals. Then compare.

$\frac{2}{5} = \frac{4}{10}$ or 0.4

30% = $\frac{30}{100}$ or $\frac{3}{10}$ or 0.3

So, 0.5 is the greatest number.

Method 3:

Change all numbers to percents. Then compare.

$\frac{2}{5} = \frac{4}{100}$ = or 40%

0.5 = $\frac{50}{100}$ or 50%

So, 0.5 is the greatest number.

Activity 1:

Compare the numbers below. Write <, > or = in the circle.

1. 0.12 ◯ 24%	**2.** 0.25 ◯ 25%
3. $\frac{2}{10}$ ◯ 0.16	**4.** 2% ◯ 0.2
5. 0.1 ◯ $\frac{1}{100}$	**6.** $\frac{3}{5}$ ◯ 0.45
7. $\frac{7}{10}$ ◯ 1.01	**8.** 1.5 ◯ 150%
9. 10% ◯ 0.09	**10.** 0.25 ◯ $\frac{1}{4}$

Arrange the following in order of size (smallest first).

11. $\frac{1}{2}$, 46%, 0.64

12. 0.19, 4%, $\frac{1}{5}$

13. 10%, $\frac{1}{2}$, 0.8

14. $\frac{3}{4}$, 0.79, 9%

15. 0.25, 40%, $\frac{3}{5}$

Write the numbers in descending order.

16. $\frac{1}{2}$, 0.75, 65%

17. 0.23, 15%, $\frac{1}{5}$

18. 40%, $\frac{1}{4}$, 0.35

19. $\frac{4}{10}$, 0.44, 39%

20. 0.5, 61%, $\frac{7}{10}$

Solve the problems below.

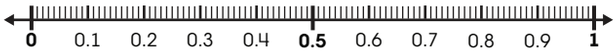
21. A packet of mixed nuts is 15% peanuts, $\frac{1}{4}$ almonds and 0.6 cashew nuts. Which type of nuts is most?

22. Jenna sleeps for $\frac{1}{3}$ of a day and watches television for 50% of the same day. Which activity does she spend more time doing?

23. You spent 75% of your allowance. Your sister spent $\frac{13}{20}$ of her allowance and your friend spent 0.7 of his allowance. Who spent the most out of their allowance?

24. Use the number line below to order the numbers from least to greatest.

$$38\%, \frac{8}{25}, 0.41$$



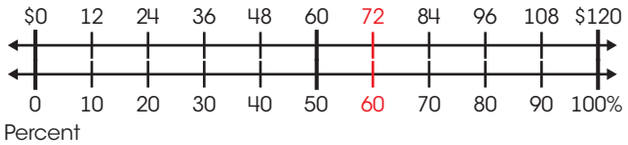
Percent of a Quantity

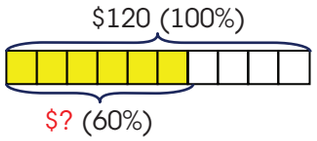
Teaching Point 1:

How can you find the percent of a given number?

Liana bought a dress that was on sale. She paid 60% of the original price of $120. How much did Liana pay for the dress?

Method 1: Use a model.





100% → $120.00

1% → 120.00 ÷ 100 = $1.20

60% → $1.20 × 60 = $72.00

So, Liana paid $72.00 for the dress.

Method 2: Write the percent as a fraction.

$60\% = \frac{60}{100}$ ← Write percentage as a fraction.

$\frac{60}{100}$ of $120 = \frac{60}{100} \times 120$ ← Change 'of' to '×' and multiply.

$= 72$

So, Liana paid $72.00 for the dress.

Method 3: Write the percent as a decimal.

$60\% = \frac{60}{100}$ or 0.6

0.6 of 120 = 0.6 x 120

$= 72$

So, Liana paid $72.00 for the dress.

Teaching Point 2:

How can you find the percent of a given number?

Find $12\frac{1}{2}$ % of 48

Method 1: Use mental strategies.

100% → 48

1% → 48 ÷ 100 = 0.48

10% → 0.48 x 10 = 4.8

2% → 0.48 x 2 = 0.96

$\frac{1}{2}$% → 0.48 ÷ 2 = 0.24

$12\frac{1}{2}$% → 4.8 + 0.96 + 0.24 = 6

So, $12\frac{1}{2}$ % of 48 is 6.

Method 2: Write the percent as a fraction.

1. Change the percent to a fraction.

$12\frac{1}{2}\% = \frac{25}{2}\%$ ← Write the mixed number as an improper fraction.

$= \frac{25}{2} \div 100$ ← Divide by 100 to express the percent as a fraction.

$= \frac{25}{2} \times \frac{1}{100}$ ← Rewrite using the reciprocal of the divisor.

$= \frac{25}{200}$

2. Find the fraction of the quantity.

$12\frac{1}{2}\%$ of $48 = \frac{25}{200} \times 48$ ← Multiply.

$= \frac{25 \div 25}{200 \div 25} \times \frac{48}{1}$ ← Simplify.

$= \frac{1}{8 \div 8} \times \frac{48 \div 8}{1}$

$= 6$

So, $12\frac{1}{2}\%$ of 48 is 6.

Activity 1:

Work out the following.

Number

1.	25% of 100	**2.**	12% of \$4800.00
3.	70% of 420	**4.**	$12\frac{1}{2}\%$ of 192
5.	125% of 200	**6.**	$33\frac{1}{3}\%$ of 12
7.	5% of \$4.00	**8.**	30% of 90
9.	75% of \$600.00	**10.**	50% of 45
11.	1% of 5 000	**12.**	10% of 360
13.	25% of \$4 400	**14.**	2% of \$900
15.	21% of 400	**16.**	87% of \$35

Time

1.	5% of 3 hr	**2.**	25% of 4 hr
3.	10% of 5 hr 20 min	**4.**	75% of 60 months
5.	120% of 120 sec	**6.**	20% of 4 wks 2 days
7.	20% of 40 min	**8.**	50% of 5 hr

Length

1.	15% of 40 m	**2.**	20% of 4 km 800 m
3.	50% of 6 m 50 cm	**4.**	25% of 1 m
5.	10% of 2 km	**6.**	80% of 14 km 400 m
7.	$33\frac{1}{3}\%$ of 6 km	**8.**	60% of 4 cm 5 mm
9.	10% of 240 mm	**10.**	80% of 500 cm

Mass

1.	10% of 12 kg	**2.**	5% of 30 g
3.	75% of 1 kg	**4.**	$33\frac{1}{3}$% of 300 g
5.	40% of 8 kg 800 g	**6.**	35% of 7 kg 500 g

Capacity

1.	150% of 3 L	**2.**	25% of 200 ml
3.	$33\frac{1}{3}$% of 6 L	**4.**	20% of 80 ml
5.	90% of 5 L	**6.**	15% of 400 ml

Activity 2:

Solve.

1. Dianne had $600.00. She spent 20% of her money. How much money did she spend?

2. In a school of 450 students, 60% of them are boys. How many are girls?

3. At Easter 800 persons visited the zoo, and 75% of the visitors were children. How many children visited the zoo at Easter?

4. Tamara has a box that held 64 markers. She is missing 25% of the markers. How many markers are missing?

5. In a survey 240 persons were asked their favourite colour, and 15% of the persons chose red. How many persons chose red?

6. In a Mathematics test of 50 questions, Jamie got 80% correct. How many questions did he get wrong?

7. A bookstore received a delivery of 5 000 notebooks. If 4% of the books were defective, how many good books were in the delivery?

8. Rhys monthly salary is $6 000. He spends 25% of his salary on rent and 20% on food.

(a) What percentage of his salary is left?

(b) How much of his salary is left?

9. In a 250 g fruit salad, 22% of the fruits in the salad are watermelon, 28% are pineapples and 44% are apples. The rest are pawpaw.

(a) What percentage of the fruit salad are pawpaw?

(b) What is the mass of the pawpaw?

10. Mr. James has 1 200 animals on his farm. 60% are chickens, 30% are ducks and the rest are cows. How many cows are on the farm?

11. The mass of Jeremy's book bag is 20% of his body weight. Jeremy weighs 40 kg.

(a) Calculate the mass of Jeremy's book bag?

(b) Jeremy added some more books to his bag and the bag is now 25% of his body weight. What is the mass of the books that he added?

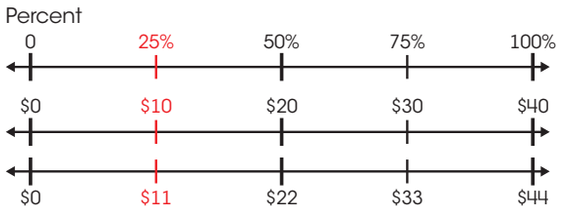
Compare Percentages of Quantities

Teaching Point 1:

How can you explain differences in percentages of different amounts?

Mark had $40 and Mia had $44. They both spent 25% of their money on food. Who spent more money?

Method 1: Use a model.



Mark's 25% → $10

Mia's 25% → $11

So, Mia spent more money.

Method 2:

$$25\% \text{ of } \$40 = \frac{25}{100} \times \$40$$

$$= \$10$$

$$25\% \text{ of } \$44 = \frac{25}{100} \times \$44$$

$$= \$11$$

So, Mia spent more money.

Activity 1:

Compare both percents. Explain which is less.

1. 20% of $40 20% of $60	**2.** 25% of 800 m 25% of 1 km
3. 10% of 60 15% of 60	**4.** 50% of 8 L 25% of 16 L
5. 75% of 4 hr 50% of 4 hr	**6.** 40% of $120 30% of $90

Compare both percents. Explain which is more.

7. 15% of 60 m 15% of 6 km	**8.** 80% of $100 80% of $60
9. 60% of 100 min 80% of 60 min	**10.** 12% of 200 L 20% of 100 L
11. 3% of $900 10% of $150	**12.** 6% of 100 g 2% of 400 g

Use < or > to compare each of the following.

13. $\frac{1}{4}$ of 32 ◯ 0.5 of 30

14. 35% of 20 ◯ 0.2 of 25

15. $4 \times \frac{1}{6}$ ◯ 3×0.25

16. 20% of 1 hr ◯ 15 min

17. 20% of 30 ◯ 100% of 15

18. 0.1 of 2 m ◯ 60 cm

19. 200 ◯ 50% of 300

20. 25% of $24 ◯ $\frac{2}{10}$ of 20

21. $\frac{1}{3}$ of 48 ◯ 20% of 60

22. 75% of 36 ◯ $\frac{1}{3}$ of 45

23. Mark says that 15% of 60 is the same as 60% of 15. Is Mark correct? Show your working.

24. Myron and Victor saves 2% of their allowance each week. Myron's weekly allowance is $24.00 and Victor's allowance is $20.00. What is the difference between their savings at the end of 4 weeks?

$6.00

25. After Easter a shop sells three chocolate eggs for the price of two or one chocolate egg for 40% less of the original price of $5. Which offer is cheaper?

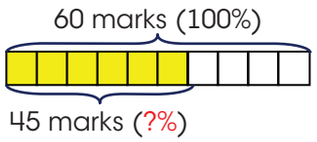
Quantity as Percentage of Another

Teaching Point 1:

How can you express a quantity as a percentage of another quantity?

In a test Aria scores 45 marks out of a possible total of 60 marks. What percent of the total marks did Aria score?

Method 1: Use a model.



60 marks → 100%

1 mark → $\frac{100}{60}\%$

45 marks → $45 \times \frac{100}{60}\% = 75\%$

So, Aria scored 75% of the total marks.

Method 2:

Aria's fraction of the total marks:

$\frac{\text{Aria's Marks}}{\text{Total Marks}} = \frac{45}{60}$ or $\frac{3}{4}$ ← Simplify.

$\frac{3}{4}$ of $100\% = \frac{3}{4} \times 100$

$= 75\%$

So, Aria scored 75% of the total marks.

Activity 1:

Express the following as both a fraction and percentage of the total.

1. $40 out of a total of $200
2. 24 girls out of a total 30 children
3. 30 out of a total of 100
4. $10 out of a total of $50
5. 3 L out of a total of 12 L
6. 3 out of a total of 5
7. 14 g out of a total of 28 g
8. 30 ml out of a total of 200 ml
9. $60 out of a total of $80
10. 20 cents out of $5
11. 14 days out of 5 weeks
12. 15 cm removed from a total length of 3 metres

13. 3 seconds taken from a world record of 5 minutes

14. 180 g of a total of 9 kg

15. 500 cm from a total of 0.6 km

Write each shaded part as both a fraction and percentage of the total area.

16. 

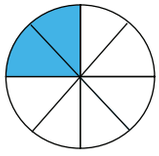
17. 

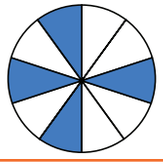
18. 

19. 

20. 

21. 

22. 

23. 

Activity 2:

Solve.

1. After a game the players drank 12 L of water from the 36 L water cooler. What percentage of the water from the water cooler did they drink?

2. 5 of the 25 students in a class are left handed. What percentage of the students in the class are left handed?

3. In a survey of 500 voters, 300 of them said they would vote for the same candidate again. What percentage of the voters would vote the same way again?

4. A pants that normally costs $160 is on sale for $120. What percentage of the regular price is the sale price?

5. On Thursday morning a restaurant served tea to 35 of its 140 customers. What percentage of the customers ordered tea?

6. Of 20 students, 10 play cricket and 2 play football. The rest play musical instruments. What percentage of students play musical instruments?

7. Mrs. Ramroop made 80 L of fruit punch for the graduation. She used 52 L of fruit juice and the rest is water.

   (a) What percentage of the punch is fruit juice?

   (b) What percentage of the punch is water?

8. Ayesha had $60. She spent $36 on a shirt and the rest on socks.

   (a) What percentage of the money did she spend on the shirt?

   (b) What percentage of the money did she spend on the socks?

9. For a class test, Ria scored 45 out of 60 and Melissa scored 72 out of 100. Use percentages to show who obtained the higher mark.

10. Mark spent $36 and had $12 left. What percent of his money did he spend?

11. Joanne pays $120 tax out of her income of $3 000. What percentage of her income does she keep?

Use Mental Strategies

Teaching Point 1:

How can you use mental strategies to solve percent problems?

What is 40% of 50?

Mental strategy 1:

10% of 50 is 5 ← Dividing by 10.

So, 40% of 50 is 20 ← Multiplying 10% by 4.

What is 4% of $400?

1% of $400 is 4 ← Dividing by 100.

So, 4% of $400 is 16 ← Multiplying 1% by 4.

What is 35% of $300?

Mental strategy 2:

10% of $300 is $30 ← Dividing by 10.

30% is $90 ← Multiplying 10% by 3.

5% is $15 ← Halving 10%.

So, 35% of $300 is $105.

What is 50% of 26 L?

Mental strategy 3:

50% of 26 is 13. ← Finding half of 26.

So, 50% of 26 L is 13.

Activity 1:

Use mental strategies to find each percentage.

1. 25% of 48	2. 50% of $800
3. 10% of $500	4. 1% of $7 500
5. 20% of 15 L	6. 50% of 48
7. 25% of $200	8. 15% of 60 m
9. 90% of 1 km	10. 40% of 400 g
11. 7% of 500	12. 2% of 300 ml

Use mental strategies to solve the problems below.

13. A gardener picked 360 cucumbers for sale at the market. 20% of the cucumbers were not fit for sale. How many of the cucumbers were not fit for sale?

14. One hundred children went to a football game. 80% of them were boys. How many of them were girls?

15. 50% of a box of 200 apples are bad. How many apples are good?

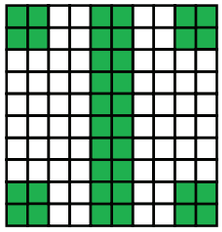
16. Maria spent 90% of her allowance on snacks and saved the rest. If her allowance was $60, how much money did she save?

17. There are 40 students in a class. At the end of the year, 10% of them left the class and 3 new students joined the class. What is the new enrolment of the class?

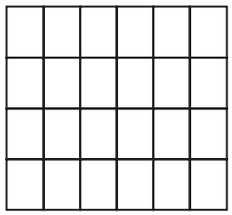
Chapter Review

Solve the problems below.

1. Express the shaded part as a percentage of the whole shape?



2. Shade 25% of the shape below.



3. When peeling a banana, the skin which is 8% of its mass, is discarded. What percentage is left?

4. Complete the table below.

Common Fraction	Percentage	Decimal
	75%	
$\frac{2}{5}$		

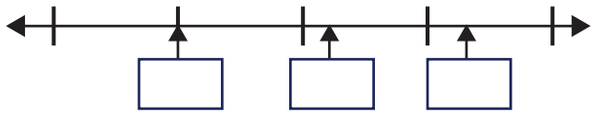
5. What percentage is 56 hundredths?

6. John lives 2 km away from the school. He walks 500 m and takes the bus the rest of the way. Calculate the percentage of the bus ride to his school.

7. A man mixed 8 L of fruit juice with 4 L of water to make a fruit punch. What is the percentage of water in the fruit punch?

8. Order the three numbers below by writing them in the correct box on the number line.

$0.8, \frac{1}{4}, 60\%$



9. Mark and 4 friends shared a pizza equally. What percentage of the pizza did each person get?

10. What percent of $1 is 15 cents?

11. In a box of pencils 0.6 of the pencils were yellow and the rest were red. What percentage of the pencils was red?

12. Maria spent 75% of her allowance. Write × on the number line to show how much of her allowance she spent.

13. A pair of sneakers are on sale as shown. The original price was $240. What percent of the original price is the sale price?

14. From a bag containing 44 kg of beans, a shopkeeper sold all but 25% of the beans. How many kilograms of beans did he sell?

15. In a mental competition, Ameena was given 20 items to solve. She got 15 of the items correct.

    (a) What percentage of the total items did she solve correctly?

    (b) Ameena must get at least 80% of the items correct to move on to the final round of the competition. How many items should she solve correctly to qualify?

16. In a school of 480 students, 288 of them are boys. What percentage of them are girls?

17. A box has 60 marbles that are either red, blue or green in colour. There are 30 red marbles, and equal numbers of blue and green marbles. Calculate the percentage of marbles that are green.

18. Avia's brother is 16 years old. In four years time Avia will be 50% of her brother's age. How old is Avia now?

19. The table shows the membership of a sports club.

Type of membership	Adult	Child
Number of members	120	80

    (a) What percentage of the membership are adults?

    (b) What percentage of the membership are children?

20. Alisha went to the Easter Fair with \$60.00. She spent $\frac{1}{4}$ of her money on lunch, $\frac{1}{5}$ on snacks and the rest on games. What percentage of her money did she spend on games?

21. Ashton had some marbles. 20% of them were red and the rest were blue. He gave all the red marbles and 25% of the blue marbles to his friends. If he had 40 marbles how many marbles did he give away?

22. There are 320 students in a school. 180 students are girls. 45% of the boys play sports. How many boys do not play sports?