Representing Percents

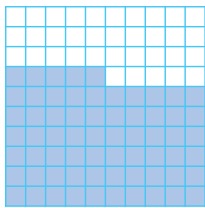People often read nutrition labels on food products to determine the **percent** of the recommended daily value (RDV) of nutrients the food contains. By reading these labels you can make wiser food choices to help maintain a healthy lifestyle.

The nutrition label on a certain brand of grape juice says that one 250-mL glass of juice contains 130% of the RDV of Vitamin C, 2% of the RDV of iron, and 1% of the RDV of sodium. Half a glass would contain 65% of the RDV of Vitamin C, 1% of the RDV of iron, and $\frac{1}{2}$% of the RDV of sodium. You have seen how to represent a percent like 65% on a grid. How might you use grids to represent 130% or $\frac{1}{2}$%?
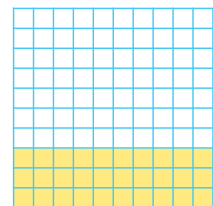
percent

- means *out of 100*
- another name for hundredths
- 65% means 65 out of 100 or $\frac{65}{100}$ or 0.65.

Materials
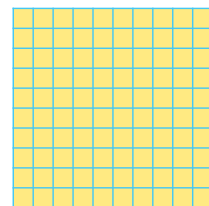
- hundred grids
- coloured pencils

Explore the Math

How can you represent percents on a grid?

1. a) The hundred grid shows 100%. How many squares are shaded?
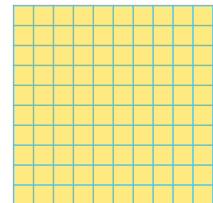
b) Explain how the following diagram shows 130%.

c) Shade hundred grids to show 350%. How many squares did you shade?

2. a) Shade a hundred grid to show half of 100%. How many squares did you shade? What percent of the whole grid do the shaded squares represent?

b) Shade a hundred grid to show half of your answer to part a). How many squares did you shade? What percent of the whole grid do the shaded squares represent?

c) Shade a hundred grid to show half of your answer to part b). How many squares did you shade? What percent of the whole grid do the shaded squares represent?

d) How does the type of number represented by the percent value in part c) differ from the types of numbers in parts a) and b)? Explain why.

3. The circled square represents 1% on the hundred grid shown.
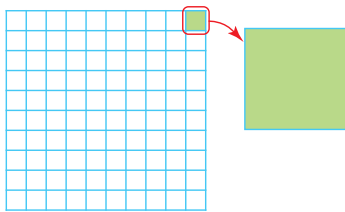
a) What fraction of the enlarged square would you need to shade to show half of 1%? What percent of the whole grid would your shaded portion represent?

b) What fraction of a 1% square would you need to shade to represent $\frac{3}{4}$%?

c) What fraction of a 1% square would you need to shade to represent 0.37%?

Reflect on Your Findings

4. Describe how to use grids to represent the following types of percent values.

a) percents greater than 100%

b) percents between 0% and 1%

c) percents containing a mixed number greater than 1%

History ❸ Link

In Roman times, the term *cent*urion was used to describe an officer in the Roman Legion who was in charge of 100 soldiers. There was one centurion *per cent*, meaning there was one centurion per 100 soldiers. What other English words do you know that include *cent*?

Example 1: Determine the Percent Represented on a Grid

One completely shaded grid represents 100%. What percent does each diagram represent?

a)

b)

c)
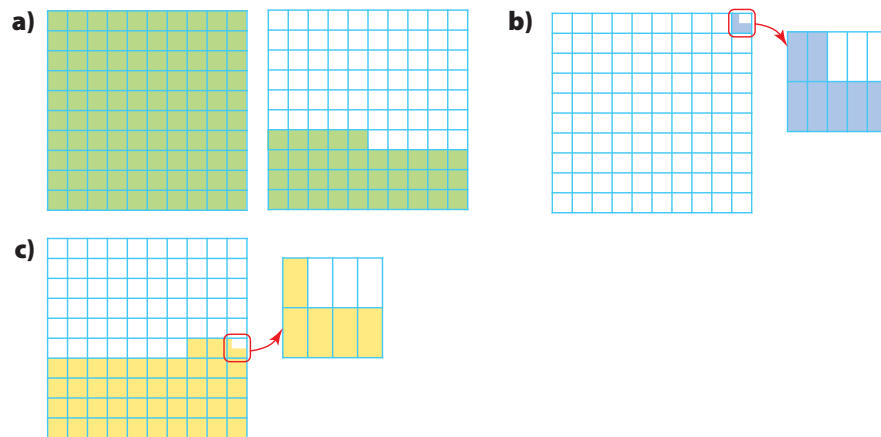
Solution

a) Each grid is divided into 100 squares. A completely shaded grid represents 100%.

The first grid is completely shaded. There are 100 squares shaded.

In the second grid, there are three full rows of ten shaded and five squares shaded in the fourth row. There are 35 squares shaded.

There are a total of 135 squares shaded.

100   35
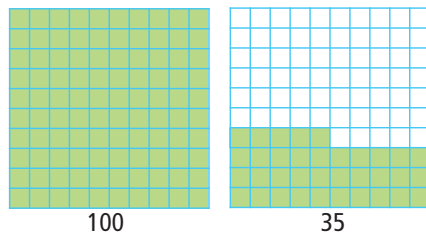
This diagram represents 135%.

b) Since a portion of only one square of a hundred grid is shaded, the percent represented is between 0% and 1%. You can *zoom in* on the partially shaded square and count the number of shaded parts. The enlarged diagram shows seven out of a total of ten parts shaded.

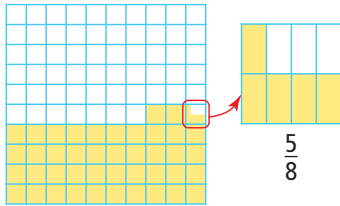The shading represents $\frac{7}{10}$ or 0.7 of 1% of the whole diagram.

$\frac{7}{10}$
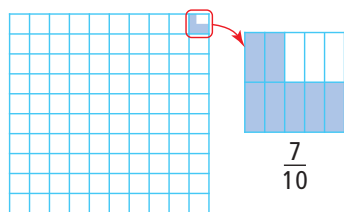
The diagram represents $\frac{7}{10}$% or 0.7%.

c) The diagram shows 42 squares shaded plus a portion of another square.

You can *zoom in* on the partially shaded square to determine the fraction that is shaded.

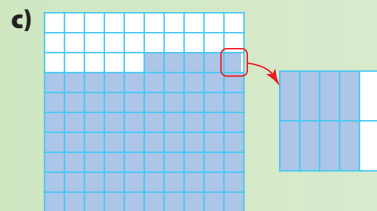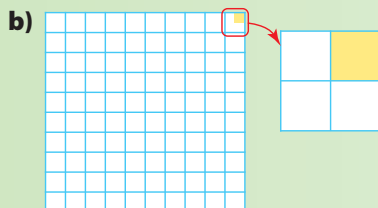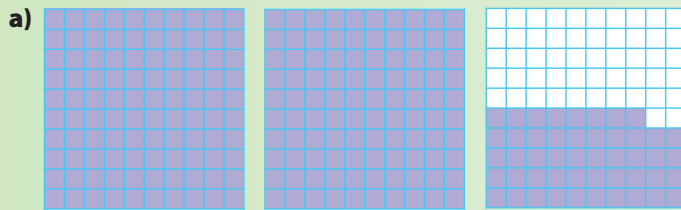The enlarged diagram shows $\frac{5}{8}$ shaded.

The shading represents $\frac{5}{8}$ of 1% of the whole diagram.

$$\frac{5}{8}$$

The diagram represents $42\frac{5}{8}\%$.

One completely shaded grid represents 100%. What percent does each diagram represent?

a)

b)


c)

Example 2: Represent Percents on a Grid

Represent the percent in each statement on a grid.

a) An orange juice container shows that one 250-mL serving contains 120% of the recommended daily value of Vitamin C.

b) A significant portion of the world's fresh water is found in Canada, but Canada has only 0.5% of the world's population.

c) A credit card company charges an interest rate of $18\frac{3}{4}\%$ on unpaid balances.

Solution

a) Since 120% is greater than 100%, more than one hundred grid is needed.

You can represent 100% by completely shading one grid. You can represent 20% by shading 20 squares of a second hundred grid.
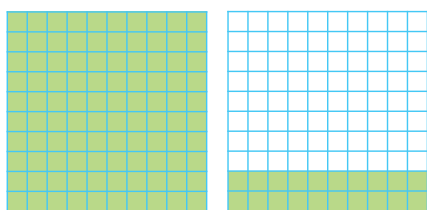
fractional percent

- a percent that includes a portion of a percent, such as $\frac{1}{2}\%$, 0.42%, $7\frac{3}{8}\%$, $125\frac{3}{4}\%$, 4.5%

b) 0.5% is a **fractional percent** between 0% and 1%. *Zoom in* on one square of a hundred grid. Since 0.5 represents $\frac{1}{2}$, divide the enlarged square into two equal sections. Shade one of the two sections.
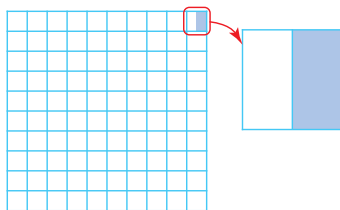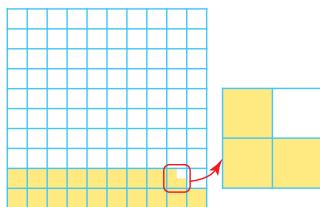

c) $18\frac{3}{4}\%$ is a fractional percent between 1% and 100%.

Use one hundred grid.

Shade 18 squares to represent 18%.

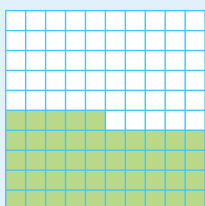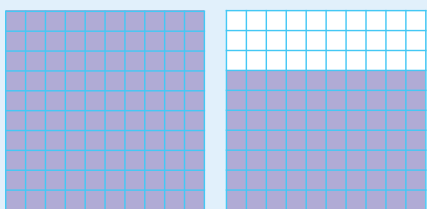Shade $\frac{3}{4}$ of another square to represent $\frac{3}{4}\%$.

Key Ideas

- To represent a percent, you can shade squares on a grid of 100 squares called a hundred grid. One completely shaded grid represents 100%.
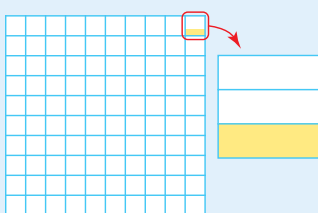
45%

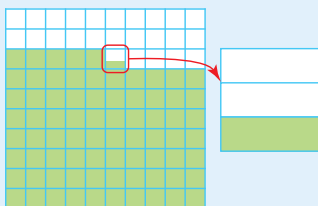- To represent a percent greater than 100%, shade more than one grid.

170%

- To represent a fractional percent between 0% and 1%, shade part of one square.

$\frac{1}{3}\%$

- To represent a fractional percent greater than 1%, shade squares from a hundred grid to show the whole number and part of one square from the grid to show the fraction.

$75\frac{1}{3}\%$

Communicate the Ideas

1. Use hundred grids and words to describe the similarities and differences between a percent less than 1%, a percent between 1% and 100%, and a percent greater than 100%.

2. a) You are asked to show a classmate how to use hundred grids to show 243%. How do you explain which squares need shading?

b) Explain how you would represent $25\frac{1}{4}\%$ on a grid.

3. Shindi commented to a friend that "some percents would be easier to show if we shaded the parts that were not included in the percent." Explain what she means. Which percents are easier to show using Shindi's method? Why?

Check Your Understanding

Practise

For help with #4 and #5, refer to Example 1 on pages 124–125.

4. One full grid represents 100%. What percent does each diagram represent?

a)

b)

c)
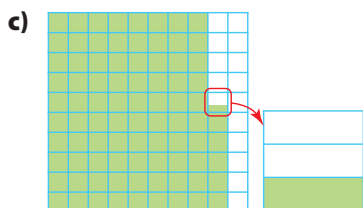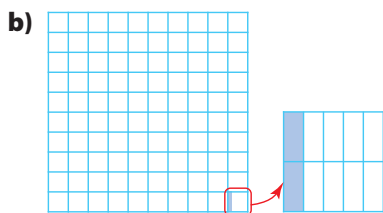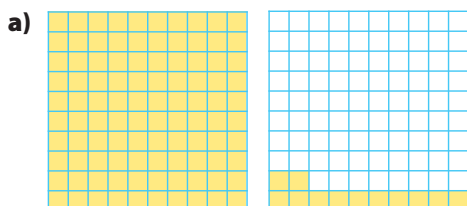
5. What percent is represented by each diagram if a completely shaded grid represents 100%?

a)

b)

c)
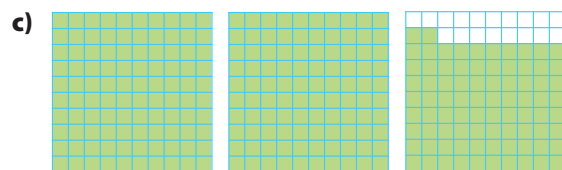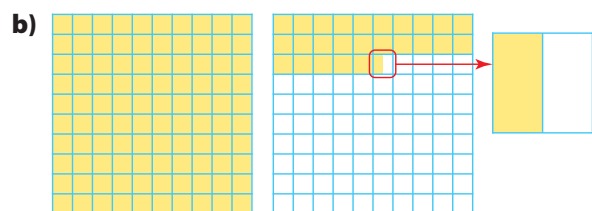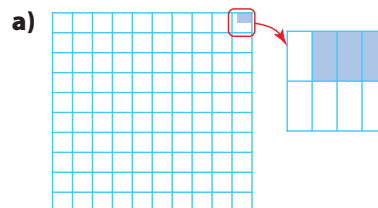
For help with #6 and #7, refer to Example 2 on page 126.

6. Represent each percent on a grid.

a) 125%   **b)** $10\frac{1}{2}\%$ **c)** 0.4%

d) 262%   **e)** $\frac{7}{8}\%$ **f)** 45.6%

7. Represent the percent in each statement on a grid.

a) Attendance at the fall fair increased by 3.2% this year.

b) The average mass of a Singapura cat is about 0.13% of the mass of a Siberian tiger.

c) The length of the Yukon River is about 230% of the length of the Fraser River.

8. How many hundred grids are needed to show each of the following percents?

a) 300% **b)** 466% **c)** 1200%

9. Give two examples where a percent greater than 100% might be found in everyday life.

10. Why might a scientist studying water pollution work with percents less than one?

11. The land area of Alberta is about 113% of the land area of Saskatchewan. Use hundred grids to show how the land area of Alberta compares with the land area of Saskatchewan.

12. A 250-mL glass of milk contains 30% of the recommended daily value of calcium. Use a hundred grid to show how many glasses of milk you would need to drink to get 100% of the daily value of calcium.

13. a) Use a calculator to convert $\frac{1}{3}$ to a decimal. How could $\frac{1}{3}$% be shown using a hundred grid?

b) Why are percents involving repeating decimals sometimes difficult to show on a hundred grid?

14. a) If 200 squares were used instead of 100 squares to represent 100%, how would you show 0.25%?

b) If 400 squares were used instead of 100 squares to represent 100%, how would you show 0.75%?

15. Show how hundred grid(s) could be used to represent a very small percent, such as 0.000 0125%.

16. Suppose one large square represents 100%. The square is divided into smaller equal-sized pieces.

a) If there are 1000 pieces, what percent do 17 pieces represent?

b) If there are two large squares each divided into ten smaller pieces, what percent do 13 pieces represent?

c) If the large square is divided into eight smaller pieces, show how to represent $87\frac{1}{2}$% and $56\frac{1}{4}$%.

MATH LINK

Use hundred grids to represent the following data.

97.5% of Earth's Water is Salt Water

2.5% of Earth's Water is Fresh Water

0.04% of Fresh Water Found in Earth's Atmosphere

$\frac{3}{10}$% of Fresh Water Found in Lakes and Rivers

0.007% of Fresh Water Accessible for Drinking Water