Focus Relate percent to fractions and decimals.

We see uses of percent everywhere.

What do you know from looking at each picture?
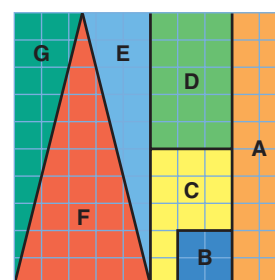Recall that percent means per hundred.

49% is $\frac{49}{100} = 0.49$

Explore

Your teacher will give you a large copy of this puzzle.
Describe each puzzle piece as a percent, then as a fraction
and a decimal of the whole puzzle.

Reflect & Share

Compare your answers with those of another pair of classmates.
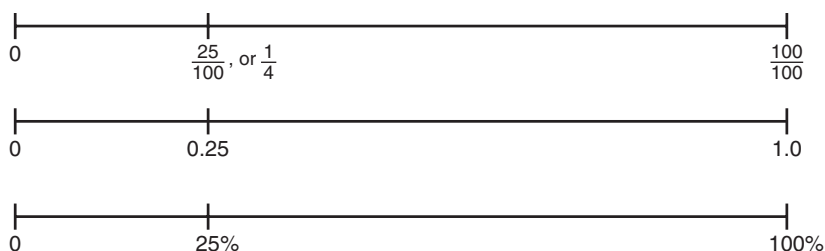If the answers are different, how do you know which are correct?
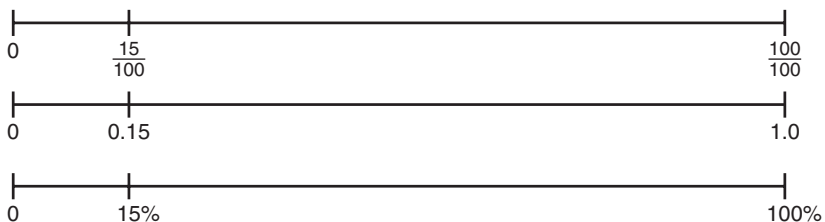
Connect

➤ We can use number lines
to show how percents
relate to fractions
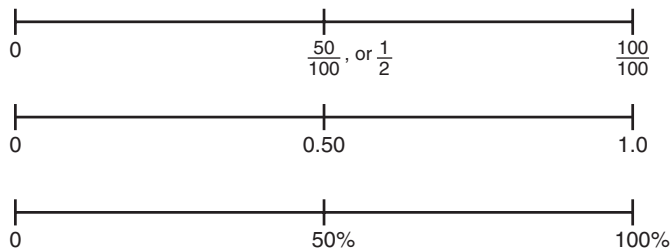and decimals.
For example:
$25\% = \frac{25}{100} = 0.25$

➤ Conversely, a decimal
can be written as a percent:
$0.15 = \frac{15}{100} = 15\%$

➤ To write a fraction as a percent, write the equivalent fraction with denominator 100.
For example:

$$\frac{1}{2} \xrightarrow{\times 50} \frac{50}{100} = 50\%$$

$$\frac{1}{2} = \frac{50}{100} = 50\%$$

(number line) 0 — $\frac{50}{100}$, or $\frac{1}{2}$ — $\frac{100}{100}$

(number line) 0 — 0.50 — 1.0

(number line) 0 — 50% — 100%

Example

a) Write each percent as a fraction and as a decimal.

   i) 75%   **ii)** 9%

b) Write each fraction as a percent and as a decimal.

   i) $\frac{2}{5}$ **ii)** $\frac{7}{20}$

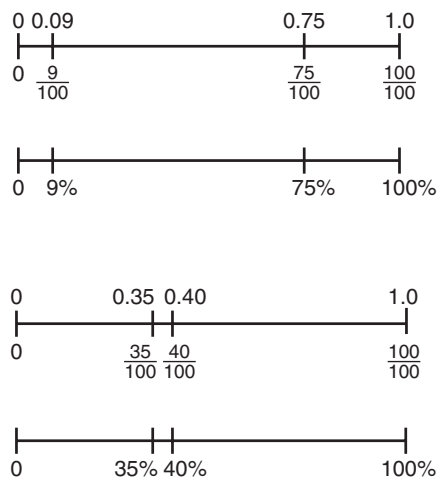Draw number lines to show how the numbers are related.

A Solution

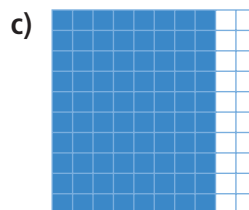**a)** **i)** $75\% = \frac{75}{100} = 0.75$

(number line) 0 0.09 ———— 0.75 1.0
0 $\frac{9}{100}$ ———— $\frac{75}{100}$ $\frac{100}{100}$

   ii) $9\% = \frac{9}{100} = 0.09$

(number line) 0 9% ———— 75% 100%

b) **i)** $\frac{2}{5} \xrightarrow{\times 20} \frac{40}{100} = 40\% = 0.40$

(number line) 0 ——— 0.35 0.40 ——— 1.0
0 ——— $\frac{35}{100}$ $\frac{40}{100}$ ——— $\frac{100}{100}$

   ii) $\frac{7}{20} \xrightarrow{\times 5} \frac{35}{100} = 35\% = 0.35$

(number line) 0 ——— 35% 40% ——— 100%

Practice

1. What percent of each hundred chart is shaded?
Write each percent as a fraction and as a decimal.

a)

b)

c)
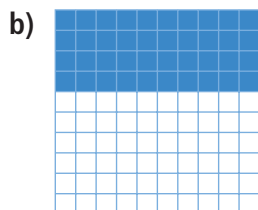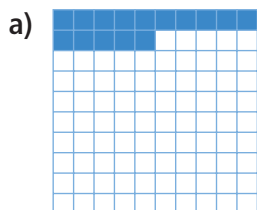
2. Write each percent as a fraction and a decimal.
Sketch number lines to show how the numbers are related.
  a) 2%   **b)** 9%   **c)** 28%   **d)** 95%

3. Write each fraction as a decimal and a percent.
  a) $\frac{2}{10}$ **b)** $\frac{3}{50}$ **c)** $\frac{4}{25}$ **d)** $\frac{13}{20}$ **e)** $\frac{4}{5}$

4. Fred had 8 out of 10 on a test. Janet had 82% on the test.
Who did better? How do you know?

5. ⬤ Assessment Focus ⬤ You will need a sheet of paper
and coloured pencils.
Divide the paper into these 4 sections.
  • 1 blue section that is $\frac{1}{2}$ of the page
  • 1 red section that is 10% of the page
  • 1 yellow section that is 25% of the page
  • 1 green section to fill the remaining space.
Explain how you did this.
What percent of the page is the green section?
How do you know?

6. **Take It Further** Suppose each pattern is continued on a hundred chart.
The numbers in each pattern are coloured red.
For each pattern, what percent of the numbers on the chart are red?
Explain your strategy for each pattern.
  a) 4, 8, 12, 16, 20, …   **b)** 1, 3, 5, 7, …   **c)** 2, 4, 8, 16, …   **d)** 1, 3, 7, 13, …

Reflect

Suppose you know your mark out of 20 on an English test.
Tell how you could write the mark as a decimal and a percent.

3.8 Solving Percent Problems

When shopping, it is often useful to be able to calculate a percent, to find the sale price, the final price, or to decide which of two offers is the better deal.

Explore

A jacket originally cost $48.00.
It is on sale for 25% off.
What is the sale price of the jacket?
How much is saved by buying
the jacket on sale?
Find several ways to solve this problem.

GRAND SALE EVERYTHING 25% OFF

Reflect & Share

Compare strategies with those of another pair of classmates.
Which strategy would you use if the sale was 45% off? Explain your choice.

Connect

A paperback novel originally cost $7.99.
It is on sale for 15% off.
To find how much you save, calculate 15% of $7.99.

$15\% = \frac{15}{100} = 0.15$

So, 15% of $7.99 $= \frac{15}{100}$ of 7.99

$= 0.15 \times 7.99$

Use a calculator.

$0.15 \times 7.99 = 1.1985$

So, $0.15 \times \$7.99 = \$1.1985$

$1.1985 to the nearest cent is $1.20.

You save $1.20 by buying the book on sale.

We can show this on a number line.

```
      $1.20                              $7.99
├──────┼───────────────────────────────────┤
0      15%                               100%
```

Estimate to check if the answer is reasonable.

15% is about 20%, which is $\frac{1}{5}$.

$7.99 is about $10.00.

So, 0.15×7.99 is about $\frac{1}{5}$ of 10, which is 2.

This is close to the calculated amount, so the answer is reasonable.

Example

Sandi works at Fancies Flowers on Saturdays.
The owner pays Sandi 3% of all money she takes in on a day.
Last Saturday, Sandi took in $1200.00.
How much money did Sandi earn last Saturday?
Illustrate the answer on a number line.

A Solution

Sandi took in $1200.00.

We want to find 3% of $1200.00.

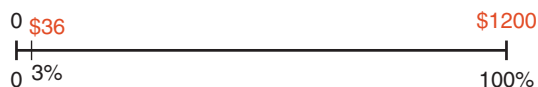3% is $\frac{3}{100} = 0.03$

So, 3% of $1200 = 0.03 \times 1200$

Ignore the decimal point and multiply as whole numbers.

Another Strategy
We could find 1% of $1200.00, then multiply by 3.

```
 1200
×   3
─────
 3600
```

Estimate to place the decimal point.
$1200 is about $1000.
1% of $1000 is $10.
So, 3% of $1000 is: $10 × 3 = $30

So, $0.03 \times \$1200 = \$36.00$

Sandi earned $36.00 last Saturday.

Show this on a number line.

```
0  $36                              $1200
├──┼──────────────────────────────────┤
0  3%                               100%
```

Practice

1. Calculate.

   a) 10% of 30   **b)** 20% of 50   **c)** 18% of 36   **d)** 67% of 112

2. The regular price of a radio is $60.00.

   Find the sale price before taxes when the radio is on sale for:

   a) 25% off   **b)** 30% off   **c)** 40% off

3. Find the sale price before taxes of each item.
   a) coat: 55% off $90   b) shoes: 45% off $40   c) sweater: 30% off $50

4. Find the tip left by each customer at a restaurant.
   a) Denis: 15% of $24.20   b) Molly: 20% of $56.50   c) Tudor: 10% of $32.70

5. The Goods and Services tax (GST) is currently 6%.
   For each item below:
   i) Find the GST.
   ii) Find the cost of the item including GST.
      a) bicycle: $129.00   b) DVD: $24.99   c) skateboard: $42.97

6. There are 641 First Nations bands in Canada.
   About 30% of these bands are in British Columbia.
   About how many bands are in British Columbia?
   Sketch a number line to show your answer.

7. **Assessment Focus** A clothing store
   runs this advertisement in a local paper.
   "Our entire stock up to 60% off"
   a) What does "up to 60% off" mean?
   b) Which items in the advertisement
      have been reduced by 60%?
   c) Suppose all items are reduced by 60%.
      Explain the changes you would make
      to the sale prices.

Item	Regular Price	Sale Price
Sweaters	$49.99	$34.99
Ski Jackets	$149.99	$112.49
Scarves	$29.99	$12.00
Leather Gloves	$69.99	$38.49
Hats	$24.99	$10.00

8. **Take It Further** Marissa and Jarod plan to purchase
   DVD players with a regular price of $199.99.
   The DVD players are on sale for 25% off.
   Marissa starts by calculating 25% of $199.99.
   Jarod calculates 75% of $199.99.
   a) Show how Marissa uses her calculation to find the sale price.
   b) How does Jarod find the sale price? Show his work.
   c) Do both methods result in the same sale price? Explain.

Reflect

How does a good understanding of percents help you outside
the classroom? Give an example.