

LEARNING GUIDE 2: Understanding Percent

Watch the following instructional video. In your handout:

i) Copy down the given notes and examples

ii) Complete the assigned questions

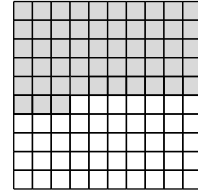
https://youtu.be/_62G0INoz38

Percents

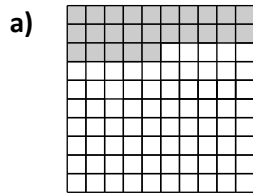
Percent

- means out of 100

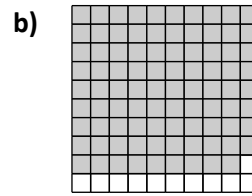
You can show a percent by shading squares on a hundred grid.
This grid shows 53% because 53 squares are shaded.



1. What percent does each hundred grid show?



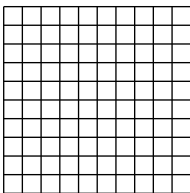
_____ %



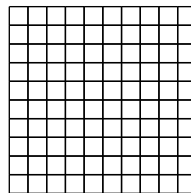
_____ %

2. Shade the hundred grids to show each percent.

a) 3% (shade 3 squares)

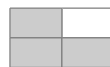


b) 87%



Fractions, Decimals, and Percents

This diagram shows the fraction $\frac{3}{4}$.




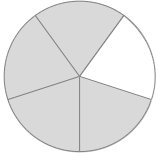
To change a fraction to a decimal, divide the numerator (top number) by the denominator (bottom number)

$$\frac{3}{4} = 3 \div 4 = 0.75$$

To change a decimal to a percent, multiply by 100 and write a percent symbol.

$$0.75 \times 100 = 75\%$$

3. Write each diagram as a fraction, a decimal, and a percent.

	Fraction	Decimal	Percent
a) 	$\frac{\quad}{\quad}$		
b) 	$\frac{\quad}{\quad}$		

Repeating Decimals

Repeating decimal

- has 1 or more digits that repeat over and over without ending

$$\frac{2}{3} = 2 \div 3 = 0.666666\dots \text{ or } 0.\overline{6}$$



Use a bar to show the repeating part.

To write a repeating decimal as a percent, multiply by 100 and write a percent symbol.

4. Write the repeating decimal using bar notation.

a) $0.333333\dots = \underline{\hspace{2cm}}$

b) $0.27272727\dots = \underline{\hspace{2cm}}$

4.1 Warm Up

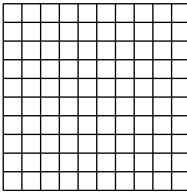
1. Write each fraction as a percent.

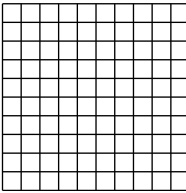
Percent means out of 100.

a) $\frac{2}{100} = \underline{\hspace{2cm}}\%$

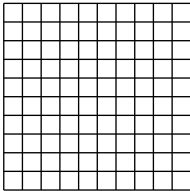
b) $\frac{50}{100} = \underline{\hspace{2cm}}\%$

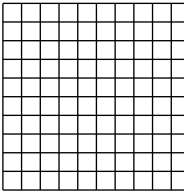
2. Show each fraction on a hundred grid.

a) $\frac{12}{100}$ 

b) $\frac{57}{100}$ 

3. Change each percent to a fraction out of 100. Then, show each percent on a hundred grid.

a) $25\% = \frac{\boxed{}}{100}$ 

b) $7\% = \frac{\boxed{}}{\boxed{}}$ 

4. Write each fraction as a decimal.

a) $\frac{1}{2} = \underline{\hspace{2cm}}$

b) $\frac{1}{4} = \underline{\hspace{2cm}}$

5. Shade the diagram to show each fraction.

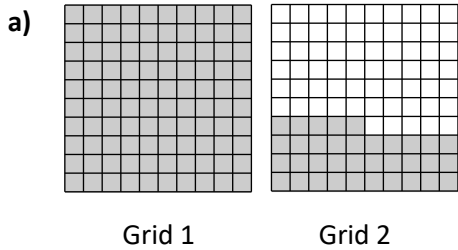
a) $\frac{1}{4}$ 

b) $\frac{3}{8}$ 

4.1 Representing Percents

Example 1: Determine the Percent Represented on a Grid

One completely shaded grid shows 100%. What percent does each diagram show?

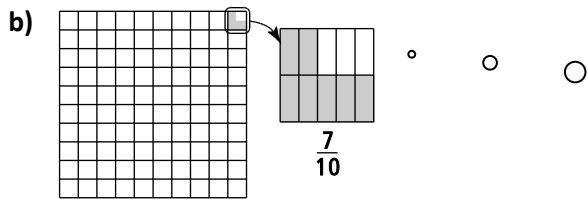


One grid has 100 squares.

Solution

Grid 1 has _____ squares shaded. Grid 2 has _____ squares shaded.

In total, _____ squares are shaded, so the diagram shows 135%.



This is a bigger version of 1 square. It is divided into 10 smaller parts.

Solution

Only part of 1 square of the grid is shaded. This percent is between 0% and 1%. This is a **fractional percent** (a percent that shows part of 1 percent)

the shading shows $\frac{\quad}{10}$ or 0.7 of 1% of the whole diagram.

So, $0.7 \times 1\% = 0.7\%$

The diagram shows $\frac{\quad}{10}\%$ or 0.7%.

$\frac{7}{10} = 0.7$

Example 2: Represent Percents on a Grid

Show each percent on the grid.

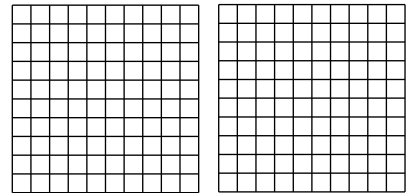
- a) A glass of orange juice has 120% of the recommended daily amount of Vitamin C.

Solution

To show 120%, you need 2 grids.

The first grid shows 100%. Shade _____ squares.

The second grid shows 20%. Shade _____ squares.

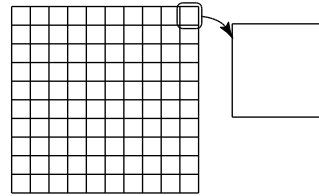


- b) A credit card company charges an interest rate of $18\frac{1}{4}\%$ on unpaid balances.

Solution

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

Use _____ grid with an enlarged square.



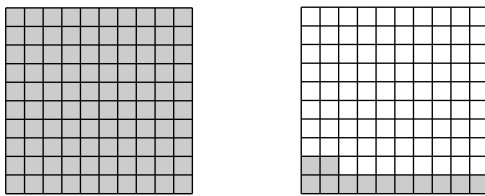
Shade _____ whole squares and $\frac{1}{4}$ of the enlarged square.

Practise

1. What percent does each diagram show?

1 shaded grid = 100%

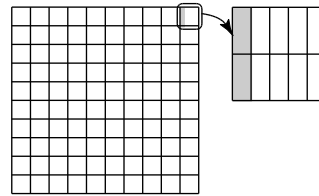
a)



_____ shaded squares _____ shaded squares

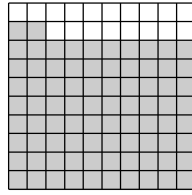
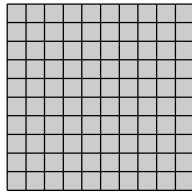
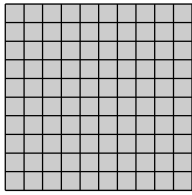
Total shaded squares = _____ %

b)



Shaded part = $\frac{\quad}{\quad}$ %

c)

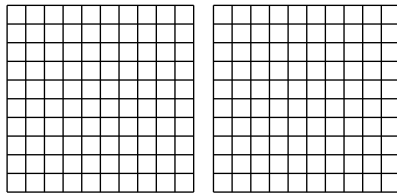


_____ shaded squares _____ shaded squares _____ shaded squares

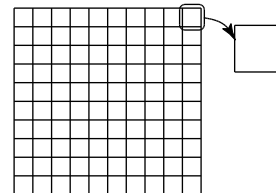
Total shaded squares = _____%

2. Show each percent on a grid.

a) 125%

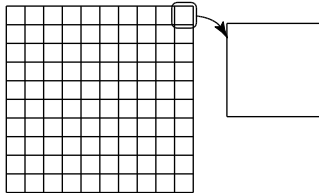


b) $\frac{7}{8}$ %



3. Show each percent on a grid.

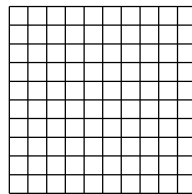
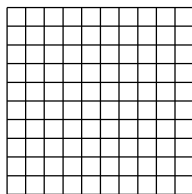
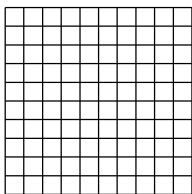
a) The mass of a Singapura cat is about 0.1% of the mass of a Siberian tiger.



0.1 is the same as $\frac{\quad}{\quad}$

Shaded part = _____%

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



_____ shaded squares _____ shaded squares _____ shaded squares

Total shaded squares = _____%

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ii) Complete the assigned questions

<https://youtu.be/5JGJB9ti0qU>

4.2 Warm Up

1. Change each fraction to a decimal.

a) $\frac{2}{10} = \underline{\hspace{2cm}}$

b) $\frac{15}{20} = \underline{\hspace{2cm}}$

numerator \div denominator

2. Change each decimal to a percent.

a) $0.12 = \underline{\hspace{2cm}}\%$

b) $0.45 = \underline{\hspace{2cm}}\%$

Multiply by 100.

3. Write each percent as a fraction of 100.

a) $30\% = \frac{\boxed{\hspace{1cm}}}{100}$

b) $9\% = \frac{\boxed{\hspace{1cm}}}{100}$

4. Use equivalent fractions to find the missing number.

a) $\frac{2}{25} = \frac{\boxed{\hspace{1cm}}}{100}$

$\times \underline{\hspace{1cm}}$

$\times \underline{\hspace{1cm}}$

b) $\frac{14}{20} = \frac{\boxed{\hspace{1cm}}}{100}$

$\times \underline{\hspace{1cm}}$

$\times \underline{\hspace{1cm}}$

4.2 Fractions, Decimals, and Percents

Example 1: Convert Fractions to Decimals and Percents

Change each fraction to a decimal and a percent.

a) $\frac{1}{20}$

Solution

Method 1: Divide

To find a decimal, divide the numerator by the denominator.

$$1 \div 20 = \underline{\hspace{2cm}}$$

To change the decimal to a percent, multiply by 100.

$$\underline{\hspace{2cm}} \times 100 = \underline{\hspace{2cm}}\%$$

Method 2: Make an Equivalent Fraction

Make an equivalent fraction out of 100.

$$\frac{1}{20} = \frac{\boxed{\hspace{1cm}}}{100} = \underline{\hspace{2cm}}\%$$

(Note: Curved arrows indicate multiplying both numerator and denominator by 5.)

So, $\frac{1}{20} = \underline{\hspace{2cm}}\%$ or $0.\underline{\hspace{2cm}}$. ○ ○

$1 \div 20 = 0.\underline{\hspace{1cm}}$

b) $\frac{5}{4}$

Solution

Method 1: Divide

To find a decimal, divide the numerator by the denominator.

$5 \div 4 = \underline{\hspace{2cm}}$

To change the decimal to a percent, multiply by 100.

$\underline{\hspace{2cm}} \times 100 = \underline{\hspace{2cm}}\%$

Method 2: Write an equivalent fraction out of 100

Example 2: Convert Decimals to Percents and Fractions

Change each decimal to a percent and a fraction.

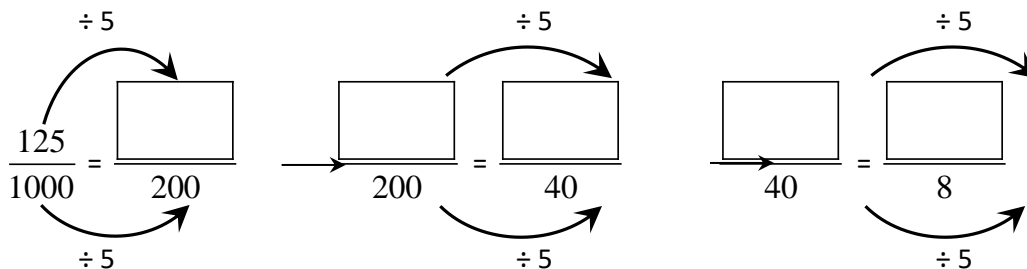
a) 0.125

Solution

Multiply by 100 to write 0.125 as a percent: $0.125 \times 100 = \underline{\hspace{2cm}}\%$.

The 5 is in the thousandth place, so the fraction is $\frac{125}{1000}$.

Write in lowest terms:



So, 0.125 is 12.5% or $\frac{\boxed{\hspace{1cm}}}{8}$.

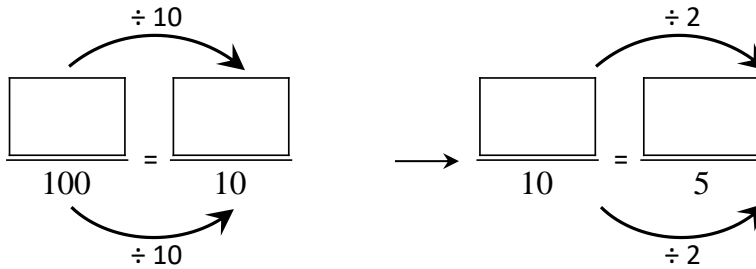
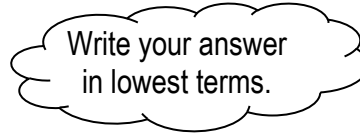
Example 3: Convert Percents to Fractions and Decimals

Change each percent to a fraction in lowest terms and a decimal.

a) 160%

Solution

Write the percent as a fraction out of 100.



To find the decimal, divide the numerator by the denominator.

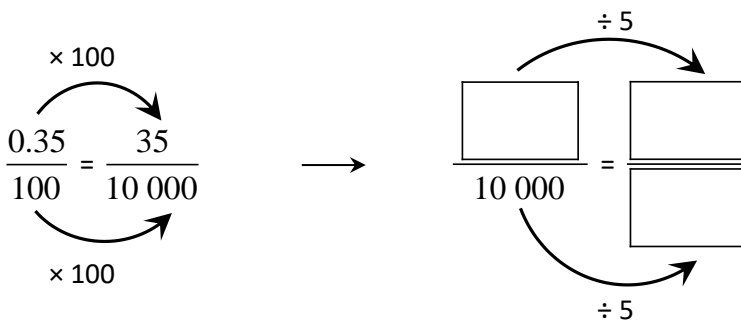
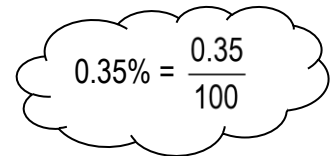
$$\frac{160}{100} = \frac{\quad}{\quad} \div \frac{\quad}{\quad} = \underline{\hspace{2cm}}$$

So, 160% = $\frac{\boxed{\quad}}{\boxed{\quad}}$ or 1. $\underline{\hspace{1cm}}$.

b) 0.35%

Solution

Divide by 100 to find the decimal: $0.35 \div 100 = \underline{\hspace{2cm}}$



So, $0.35\% = \frac{\boxed{}}{\boxed{}} \text{ or } 0.\text{_____}$.

c) $8\frac{1}{2}\%$

Solution

Write $8\frac{1}{2}\%$ as $8\% + \frac{1}{2}\%$.

To find the decimal, change the $\frac{1}{2}$ to a decimal.

So $8\frac{1}{2}\% = 8.5\%$

8.5% as a decimal is $8.5 \div 100 = \text{_____}$

To change this to a fraction: $8.5\% = \frac{8.5}{\boxed{100}} =$

Write the fraction in lowest terms.

$$\frac{85}{1000} = \frac{\boxed{}}{\boxed{}}$$

$\div 5$

 $\div 5$

So, $8\frac{1}{2}\% = \frac{\boxed{}}{\boxed{}} \text{ or } 0.\text{_____}$.

Practise

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

	Decimal	Percent
a) $\frac{22}{200}$	_____ ÷ _____ = _____	$\frac{22}{200} = \frac{\boxed{}}{100} = \text{_____}\%$ <div style="text-align: center;"> $\div 2$ </div>
b) $\frac{51}{30}$	_____ ÷ _____ = _____	_____ × 100 = _____%

2. Write each decimal as a percent and a fraction. Write the fraction in lowest terms.

	Percent	Fraction
a) 0.56	_____ × 100 = _____%	$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$
b) 1.5	_____ × 100 = _____%	$\frac{\boxed{}}{100} =$

3. Write each percent as a decimal and a fraction. Write the fraction in lowest terms.

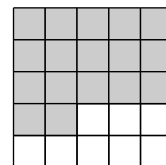
	Decimal	Fraction
a) 0.6%	$\frac{0.6}{100} = \frac{\quad}{\quad} \div \frac{\quad}{\quad}$ $= \frac{\quad}{\quad}$	
b) 248%	$\frac{\quad}{\quad} \div \frac{\quad}{\quad}$ $= \frac{\quad}{\quad}$	

4. Write the percent as a decimal and a fraction. Write the fraction in lowest terms.

	Percent	Decimal	Fraction
	$5\frac{8}{10}\%$		$5\frac{8}{10}\% = \frac{\quad}{\quad} + \frac{\quad}{\quad}$ $= \frac{\quad}{\quad}$ <p>Use the decimal to make the fraction.</p> $\frac{\quad}{1000} = \frac{\quad}{\quad}$

5. Write the shaded part of the diagram as a fraction, a decimal, and a percent.

Fraction: $\frac{\text{number of shaded squares}}{\text{total number of squares}} = \frac{\boxed{\quad}}{\boxed{\quad}}$



Decimal: $\frac{\quad}{\quad} \div \frac{\quad}{\quad} = \frac{\quad}{\quad}$

Percent: $\frac{\quad}{\quad} \times 100 = \frac{\quad}{\quad}\%$

6. A miner found 12 g of gold in a 2500-g sample of ore.
What percent of the sample is gold?

$$\frac{\text{grams of gold}}{\text{grams of ore}} = \frac{\boxed{}}{\boxed{}}$$

= _____ ← decimal

= _____% Multiply by 100 to find the percent.

7. A snack has 0.9 g of fat.
If you ate a total of 40 g of fat during the day, what percent of fat is the snack?

$$\frac{\boxed{}}{\boxed{}}$$

= _____ ← decimal

= _____ ← percent

Watch the following instructional video. In your handout:

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ii) Complete the assigned questions

<https://youtu.be/NLq2y83JRx0>

4.3 Warm Up

1. Change each percent to a decimal.

Divide by 100.

a) 55% = _____

b) 200% = _____

c) 140% = _____

d) 6% = _____

2. Write each percent as a decimal.

a) $\frac{1}{4}\%$
= 0. _____ %
= 0. _____ $\div 100$
= 0. _____

b) $\frac{1}{2}\%$
= 0. _____ %
= 0. _____ $\div 100$
= 0. _____

Example 1: Calculate the Percent of a Number

- a) A survey showed $\frac{1}{4}\%$ of 800 students use inline skates to get to school.
How many students skate to school?



Solution

Find $\frac{1}{4}\%$ of 800.

Change the fractional percent to a decimal.

$$\frac{1}{4}\% = 1 \div 4$$
$$= 0. \text{_____} \%$$

To write the percent as a decimal, divide by 100.

$$0.25\% = 0.25 \div 100$$
$$= \text{_____}$$

$$0.0025 \times 800 = \text{_____} \quad \boxed{C} \cdot 0.0025 \times 800 = \boxed{2}$$

So, _____ students use inline skates to get to school.

- b) $30\frac{3}{4}\%$ of 400 students surveyed said they own a cell phone.
How many students own a cell phone?

Solution

Find $30\frac{3}{4}\%$ of 400.

$$\frac{3}{4}\% = 3 \div 4$$
$$= 0. \text{_____} \%$$

So, $30\frac{3}{4}\% = 30.75\%$.

To write the percent as a decimal, divide by 100.

$$30.75 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

To find the number of students, multiply by 400.

$$\underline{\hspace{2cm}} \times 400 = \underline{\hspace{2cm}} \quad \boxed{C} \quad \boxed{.3075} \quad \boxed{\times} \quad \boxed{400} \quad \boxed{=} \quad \boxed{123}$$

So, $\underline{\hspace{2cm}}$ of the 400 students own a cell phone.

Practise

1. The school sold 200 tickets for a draw.

a) What is your chance of winning if you have 1 ticket? Write your answer as a percent.

Sentence: $\underline{\hspace{10cm}}$

b) How many tickets would you need to buy to have a 2.5% chance of winning?

$$\begin{array}{l} 2.5\% = 2.5 \div 100 \qquad \qquad \qquad 2.5\% \text{ of } 200 \\ = \underline{\hspace{2cm}} \qquad \qquad \qquad \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \end{array}$$

Sentence: $\underline{\hspace{10cm}}$

2. Mount Logan in Yukon Territory is 159% as high as Mount Columbia in Alberta. If Mount Columbia is 3747 m, how high is Mount Logan?

Find 159% of 3747 m.

Sentence: $\underline{\hspace{10cm}}$

3. When water freezes, its volume increases by about 10%. If you have 750 mL of water, how much will you have after it freezes?

Find 10% of 750 mL.

Add: 10% increase + 750 mL

Sentence: $\underline{\hspace{10cm}}$

4. The original price of a jacket was \$84.00.
The store manager reduced the price by 25%.
By how much was the price reduced?

Watch the following instructional video. In your handout:

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ii) Complete the assigned questions

<https://youtu.be/92VGvG8qVq0>

4.4 Warm Up

1. To find the total cost of an item, add the price of the item plus the taxes.

$$\text{Price} + \text{Tax} = \text{Total Cost}$$

a) $\$10.99 + \$1.32 = \underline{\hspace{2cm}}$

b) $\$5.98 + \$0.78 = \underline{\hspace{2cm}}$

2. Find the percent of each number.

a) 12% of 84

b) 7% of 50

$$0.12 \times 84 = \underline{\hspace{2cm}}$$

3. Write each percent as a decimal.

a) $12\% = \underline{\hspace{2cm}}\%$

b) $5\% = \underline{\hspace{2cm}}$

c) $112\% = \underline{\hspace{2cm}}$

d) $325\% = \underline{\hspace{2cm}}$

5. Write each fraction as a percent.

a) $\frac{19}{20}$

b) $\frac{55}{220}$

$$= \underline{\hspace{2cm}} \quad \leftarrow \text{decimal} \rightarrow$$

$$= \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$$

$$= \underline{\hspace{2cm}}\%$$

4.4 Combining Percents

Example 1: Combined Percents

Suppose GST is 5% and PST is 7%.

Calculate the total tax and total cost of a \$250 sound system.

Solution

Method 1: Combine the Tax Percents First

GST is 5% and PST is 7%.

The combined tax is $5\% + 7\% = 12\%$.

Change the percent to a decimal.

$$12\% = \underline{\hspace{2cm}}$$

$$12 \div 100$$

To find the total tax, multiply by the price.

$$0.12 \times \$250 = \underline{\hspace{2cm}}$$

Total cost = cost of item + total tax

$$= \$250 + \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

The total cost of the sound system is

$$\underline{\hspace{2cm}}.$$

Method 2: Combine the Cost and Tax Percents

The cost of the item is 100%.

The PST is 7%.

The GST is 5%.

Total of the percents = $100\% + 7\% + 5\%$

$$= \underline{\hspace{2cm}}$$

Change the percent to a decimal.

$$112\% = \underline{\hspace{2cm}}$$

$$112 \div 100$$

To find the total cost, multiply by the price.

$$1.12 \times \$250 = \underline{\hspace{2cm}}$$

The total cost of the sound system is

$$\underline{\hspace{2cm}}.$$

Example 2: Percent of a Percent

Keifer wants to buy a goalie mask that costs \$200. At Sports R Us, there is a 10% discount, and an additional 10% off the sale price. Sports Galore offers a 20% discount on all items. Which store has the best price? Show your work.

Sports Galore
20% off one day only!

Sports R Us
10% off already reduced prices!

Solution

Sports R Us:

The first discount is 10% of \$200.

Discount = $0.1 \times \$200$
= _____

Sale price = price – discount
= $200 - \text{_____}$
= _____

The second discount is 10% of the sale price.

Second discount = decimal \times sale price
= $0.1 \times \$180$
= _____

Final sale price = sale price – second discount
= $\$180 - \text{_____}$
= _____

The final sale price at Sports R Us
is _____.

Sports Galore:

The discount is 20% of \$200.

20% = _____

Decimal \times price = discount
_____ \times \$200 = _____

Price – discount = sale price
_____ – _____ = _____

The final sale price at Sports Galore
is _____.

$10 \div 100 = 0.1$

$20 \div 100$

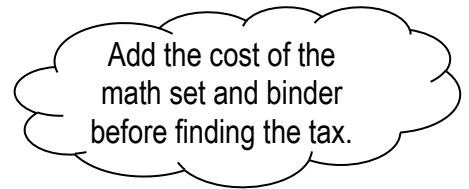
The sports store that has the best buy is _____ because the sale price is _____.

Practise

- Ravi bought a DVD for \$19.99.
Find the total cost, including 5% GST and 6% PST.

The total cost of the DVD is _____.

- Chris bought a binder for \$4.99 and a math set for \$3.99.
Find the total cost, including 5% GST and 7% PST.



The total cost of the binder and math set is _____.

- Complete the table. Use 5% GST and 6% PST.

Item	Price	GST 5%	PST _____	Total Tax	Total Cost
a) Boots	\$119.99	$\$119.99 \times 0.05$ = _____	$\$119.99 \times$ _____ = _____	GST + PST = _____ + _____ = _____	Price + Total Tax $\$119.99 +$ _____ = _____
b) Gloves	\$39.99				
c) Pants	\$89.99				
d) Helmet	\$189.99				

4. Jasmine wants to buy a CD player that costs \$85.00.
The store has a sale: 50% off the original price the first week.
If it is not sold out: 10% off the sale price the second week.
How much is the CD player after the second week?

50% of \$85

Discount = 50% of 85

$$= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

Sale price = price – discount

$$= \underline{\hspace{2cm}} - \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

Second discount = 10% of sale price

$$= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

Final sale price = sale price – second discount

$$= \underline{\hspace{2cm}} - \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

Sentence: _____

5. Last year, the car Arjay wanted to buy cost \$23 000.
One year later, the cost increased by 3.2%.
What is the price of the car now?

Sentence: _____

6. What is the total cost of 4 tires that sell for \$85 each, plus 5% GST and 1.5% environment tax?

Cost of 4 tires

$$= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

Total cost:

Sentence: _____