

unit 3

ratio, rate
&
percent

3.1 Ratios and Proportions

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1. In a class of thirty students, there are 18 boys and the rest are girls. Write the following ratios two different ways (if possible), then give the ratios in lowest terms.

- a) boys to girls b) girls to students c) students to girls to boys

2. In a standard deck of 52 cards, give the following ratios. Give the ratio, and then reduce to lowest terms.

- a) black cards to red cards b) spades to black cards c) queens to total cards

- d) hearts to non-hearts e) face cards to diamonds f) total cards to face cards

3. Find the ratio of each of the following. Remember units must be the same.

- a) 30 cm to 1m b) 2 kg to 70 g c) 60 m to 1 km

d) 600 mg to 3 kg

e) 45 min to 2 hours

f) 0.4 kg to 600 g

4. Fill in the blank to make the ratios equivalent:

a) $3:4 = 12:\underline{\hspace{2cm}}$

b) $9:\underline{\hspace{2cm}} = 54:12$

c) $6:\underline{\hspace{2cm}}:14 = 18:24:\underline{\hspace{2cm}}$

d) $9:6 = \underline{\hspace{2cm}}:20$

e) $\underline{\hspace{2cm}}:12 = 54:30$

f) $\underline{\hspace{2cm}}:28:12 = 39:84:\underline{\hspace{2cm}}$

5. Solve the following proportions (no calculator):

a) $\frac{n}{12} = \frac{3}{2}$

b) $\frac{6}{8} = \frac{w}{20}$

c) $\frac{40}{x} = \frac{600}{1350}$

d) $\frac{8}{11} = \frac{36}{k}$

$$e) \frac{x}{24} = \frac{6}{9}$$

$$f) \frac{15}{n} = \frac{18}{24}$$

$$g) \frac{5}{8} = \frac{n}{2}$$

$$h) \frac{45}{100} = \frac{18}{x}$$

$$i) \frac{n}{12} = \frac{24}{72}$$

$$j) \frac{24}{56} = \frac{2x}{7}$$

$$k) \frac{21}{76} = \frac{b}{19}$$

$$l) \frac{98}{21} = \frac{x}{6}$$

6. Solve the following proportions give answers correctly rounded to 2 decimal places, (use a calculator):

$$a) \frac{17}{n} = \frac{4}{7}$$

$$b) \frac{n}{12} = \frac{26}{19}$$

$$c) \frac{18}{29} = \frac{w}{250}$$

$$d) \frac{1618}{2718} = \frac{314}{d}$$

7. Babe Ruth had 12 hits in 30 at-bats. How many at-bats would he need to get 100 hits?

8. The base and height of a rectangle are 3cm and 4cm respectively. If the ratio of base to height for a second rectangle is the same, and the perimeter of the second rectangle is 84 cm, find the base and height of the second rectangle.

9. To determine the coyote population in a provincial park, a forest ranger catches 300 coyotes, tags them and releases them. Later that month, 150 coyotes are caught, and it is found that 75 of them are tagged. What is the best estimate for the total number of coyotes in the provincial park?

10. The ratio of boys to girls in Grade-8 at a certain Vancouver high school is 5:3.

a) The entire class of Grade-8's has 126 girls. How many boys are there?

b) In a group of 40 Grade-8 students, how many boys would you expect there to be?

c) The ratio of boys to girls in Grade 9 is also 5:3, while in Grade 10 the ratio of boys to girls is 5:7. If both Grade 9 and 10 have 288 students each, how many more girls are there in Grade 10 than in Grade 9?

11. In the blueprints for a house the scale is 1:200 (which means 1cm on the drawing equals 200cm in real life). If Sasha's bedroom in the drawing is 3cm by 4.5cm, find the dimensions of her real life bedroom (in metres).

12. The Shangri-La is the tallest building in Vancouver, standing at a height of 200 m. If it was drawn with a height of 80 cm on the blueprints, what is the scale used in the blueprints?

13. A recipe for lasagna calls for 400 g of mozzarella cheese and 250 g of ricotta. If you have 1 kg of mozzarella cheese to use, how much ricotta will you need?

14. At the 2010 Winter Olympic games, the ratio of medals won by Canada, USA, and Russia was 6:3:4. If there were a total of 104 medals won by those three countries, how many did each country win?

3.2 Rates

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1. Find the unit rates for each item. Be sure to include the units. Give answer using most appropriate units.

a) Milk costs \$3.60 for 4 L.

b) Corn on the cob is \$3.00 per dozen

c) A flat (24) of pop cans costs \$18

d) To fill up my car (50L) with gas cost \$70

e) I drove 300 km in 3 hours 45 min.

f) I ran 21 km in 3.5 hours.

g) 40mL of perfume costs \$60

h) ice cream costs \$3.50 for 200mL

i) saffron costs \$3 for 6 grams

j) I drove 450 km in 5 hours

2. A 400g package of prosciutto is on sale for \$9.60 at the local deli.

a) What is the price per 100 g?

b) How much would 250 g cost?

c) What is the price per kilogram?

d) How much prosciutto could you buy with \$36?

3. Three Junior Bacon Cheeseburgers cost \$4.20.

a) How much would 8 cost?

b) What is the maximum number you could buy with \$25?

4. It took Speedy Gonzalez 90 minutes to drive 180 km.

a) What is his speed in km/hr?

b) How far could he drive in 6 hours?

c) If he drove non-stop at that rate, how long would it take him to drive from Vancouver to Winnipeg (approximately 2280 km)?

5. Cid cycles 90km in 6 hours, while Sandy cycles 98km in 7 hours.

a) Who is faster?

b) At those rates, if they both cycle 420 km, how much longer will it take the slower person?

6. A car travels 150 km on 12 L of gasoline, what is the rate of gas consumption in litres per 100 km? Why do you think in Canada we measure gas consumption in L/100km instead of km/L (the USA uses miles/gallon)? If you can't figure it out try to find the answer, be resourceful.

7. A plane travels 450 km/hr, what is its speed in metres per second?

8. Gwen skateboards at 12km/hr. How long will it take to skateboard 400m? Answer in minutes.

9. Katiana typed 500 words in 20 minutes. If she types continuously, how long will it take her to type out her 3200 word essay?

10. Which is a better buy? Justify your answer using unit rates and/or other methods.
a) 3 donuts for \$2.10 or a dozen for \$7.99?

b) \$1.75 for 350mL of pop or \$5.20 for 1 L?

c) \$2.20 /100g or \$16 for 750g?

d) a 20 pack of 500ml bottles of water for \$6 or \$4.50 for a 7.5L jug of water?

e) A 5-month gym membership for \$160 or a one-year membership for \$370?

f) 2kg of frozen berries for \$13 or \$5 for 800g?

11. While driving on a road trip, Shervin noticed that her gas tank was at a quarter full, so she stopped for gas. She filled up the tank which cost her \$40. At the same price of gas, how much would it cost to completely fill an empty tank?

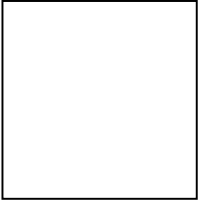
3-3 Percents

Handwriting practice lines consisting of multiple sets of three horizontal lines (top, middle, and bottom) for letter formation. Each set is separated by a larger gap, and each set contains a solid top line, a dashed middle line, and a solid bottom line.

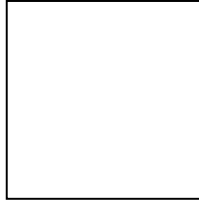
3-3 Percents

1. Shade in the following percents:

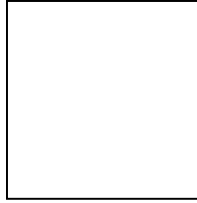
a) 25%



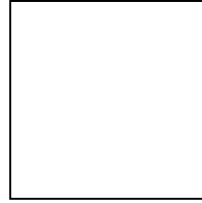
b) 40%



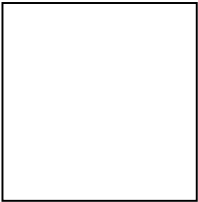
c) 75%



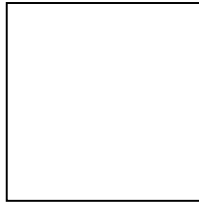
d) 10%



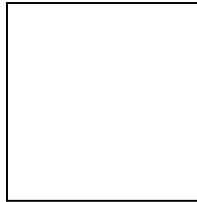
e) 33.3%



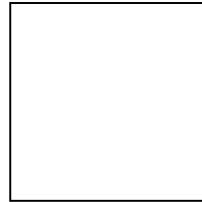
f) 80%



g) 5%



h) 110%



2. Express the following as percents:

a) $0.4 = \underline{\hspace{2cm}}$

b) $0.23 = \underline{\hspace{2cm}}$

c) $0.06 = \underline{\hspace{2cm}}$

d) $0.005 = \underline{\hspace{2cm}}$

e) $1.2 = \underline{\hspace{2cm}}$

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

g) $0.425 = \underline{\hspace{2cm}}$

h) $1.07 = \underline{\hspace{2cm}}$

3. Express the following as decimals:

a) $25\% = \underline{\hspace{2cm}}$

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

c) $70\% = \underline{\hspace{2cm}}$

d) $110\% = \underline{\hspace{2cm}}$

e) $0.3\% = \underline{\hspace{2cm}}$

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

g) $350\% = \underline{\hspace{2cm}}$

h) $8\frac{3}{4}\% = \underline{\hspace{2cm}}$

4. Express the following as percents:

a) $\frac{3}{5} =$

b) $\frac{7}{10} =$

c) $\frac{23}{50} =$

d) $\frac{125}{1000} =$

e) $\frac{4}{125} =$

f) $\frac{30}{30} =$

g) $\frac{15}{24} =$

h) $\frac{45}{60} =$

i) 38 out of 45 =

j) 6.4 out of 8 =

k) What percent of 18 is 6?

5. Express each of the following as fractions reduced to lowest terms:

a) 6% =

b) 15%

c) 0.4%

d) 35%

e) 80%

f) 110%

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

h) $7\frac{1}{5}\%$

6. Some useful percents to know:

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

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

$$\frac{3}{4} = 75\%$$

$$\frac{1}{3} \sim 33\%$$

$$\frac{2}{3} \sim 67\%$$

$$\frac{1}{5} = 20\%$$

Use these facts to estimate the following percents.

a) $\frac{31}{40} =$

b) $\frac{62}{80} =$

c) $\frac{19}{30} =$

d) $\frac{15}{48} =$

e) $\frac{37}{45} =$

f) $\frac{42}{80} =$

g) $\frac{47}{49} =$

h) $\frac{16}{60} =$

7. If the price of shoes is regularly \$80 and the sale price is \$60, by what percent did the price decrease by?

8. If the hospital workers got a bonus of \$4000 and their annual salary was \$32000, by what percent did their salary increase?

9. In the 2006 Torino Olympics there were 84 gold medals awarded, Canadian athletes won 7. What percent of the gold medal winners were Canadian?

10. In a class of 30 grade-8's, 18 students have seen "Harry Potter and the Half-Blood Prince". What percent haven't seen the movie?

11. Siobhan got 56 out of 80 questions correct on her math test, what percent did she get? What's the minimum number of questions she would've needed to get correct to get a "A" on the test.

12. In March, Pasquale spent \$750 on transportation costs, while in April he spent \$810 and in May, he spent \$648.

a) By what percentage did his transportation costs increase from March to April?

b) By what percentage did his transportation costs decrease from April to May?

c) By what percentage did his transportation costs change from March to May?

13. Complete the following chart:

Percent	Decimal	Fraction	Ratio
50%			
	0.25		
		$\frac{3}{5}$	
			12:16
82%			
	1.2		
		$\frac{3}{40}$	
			2:3
		$\frac{5}{8}$	
0.4%			

3-4 Percent of a Number

Handwriting practice lines consisting of multiple sets of three horizontal lines (top, middle, and bottom) for letter formation. Each set is separated by a larger gap, and the lines are evenly spaced across the page.

3-4 Percent of a Number

For all questions, do them as stated without a calculator, then check your answer with a calculator.

1. Estimate the following:

a) 10% discount on a \$58 shirt

b) 20% of 26

c) 15% tip on a bill of \$58.25

d) 15% tax on \$139.88

2. Fifteen percent is the most common percent you'll ever use (it's the common tip at restaurants and also very close to the amount of sales tax you pay). Explain how to easily estimate 15% of some amount.

Estimate 15% of the following:

a) \$36.50

b) \$18.99

c) \$91.23

d) \$157.49

3. Use multiples of 10% to estimate what the answer is between, and then calculate the following percents:

ex 12% of 30: 10% is 3, 20% is 6, so 12% is between 3 and 6, but closer to 3
actual answer $0.12 \times 30 = 3.6$

a) 12% of 20

b) 16% of 30

c) 8% of 140

d) 32% of 120

e) 66.66% of 60

f) 87.5% of 210

4. Calculate the following percents: (be sure to check if your answer is reasonable)

a) 20% of 61

b) 1000% of 25

c) 0.8% of 200

d) $8\frac{1}{2}\%$ of 30

e) 70% of 40

f) 75% of 60

5. It is suggested that you spend no more than 30% of your gross (before taxes) monthly income on rent. If a family makes \$96000 per year, what is the most they should pay per month for rent?

6. It is estimated that 5% of the population is left-handed. In a class of 50 students, how many would you expect to **not** be left-handed?

7. The cost of milk is increased by 20%. What percent of the old price is the new price?

8. Shoes are normally priced at \$160. If they are on sale for 20% off, how much money would you save? What is the sale price? How can you calculate the sale price in one step?

9. Inflation causes prices to increase each year. If the inflation rate is 4% per year, how much will a \$15000 car cost one year later? Two years later?

10. On his Science test, Xavi got 42 out of 60. This was 10% lower than he got on his Math test. If his Math test was out of 80 marks total, what mark did he get?

11. The price of a dvd is reduced by 20% to give the sale price. Is the original price greater than, equal to, or less than 120% of the sale price? Justify your answer.

12. Peter, Paul and Mary each had 20 tries at throwing balls into a basket. Complete the table below:

Name	Number of Successful Shots	Percentage of Successful Shots
Peter	10 out of 20	50%
Paul	15 out of 20	
Mary	___ out of 20	80%

*13. A 40-litre barrel is full of wine, which contains 8% alcohol. 10 litres of the wine is removed and replaced by 10 litres of water. What percentage of alcohol is the wine now? (Calculator allowed)

3-5 Applications of Percents

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1. I want to buy a 80-Gig Playstation3 for \$300.

a) Tax needs to be paid. In BC we pay 12% HST tax. Calculate the amount of tax you will have to pay, and then calculate your total price. How can you find the total price with tax included in one step?

b) Suppose you travel to Alberta to make this purchase. In Alberta they only pay 5% GST. Now calculate your amount of tax and your total price. How can you find the total price with tax included in one step?

c) You're back in BC now (for good). Suppose the store is having a 20% off sale. Calculate the amount of discount, then the sale price. How can you find the sale price in one step? Finally, calculate the total price after tax.

d) Suppose the store is giving a choice of three different money saving options:

Option 1 - Take 12% off the price, but still pay tax on the sale price.

Option 2 - Add the tax first, then take off 12% of the after tax price

Option 3 - The store pays the tax. (ie. you just pay the \$300)

Which of these is the best option for you the buyer?

2. The original price of a video game was \$60, the sale price was \$33. What percent are you saving?

3. 30% of grade 8 students are blonde, five-eighths are brunettes, and the rest are redheaded. If there are 200 grade 8 students, how many are redheaded?

4. A pair of jeans is regularly priced at \$80.

a) They went on sale for 25% off. Shen went to buy the jeans and had a scratch 'N' save card that got him a further 10% off the sale price. What was the total amount he paid for the jeans (before tax)?

b) This is not the same price he would pay if the store would've taken 35% (25%+10%) of the original price. Explain why.

c) What single percent discount could be given to calculate the final amount that Shen paid for the jeans? (calculator allowed)

5. Calculate the amount of simple interest earned in each case, and then the total amount of money.

a) \$1000 invested at 8%/yr for 5 years

b) \$500 invested at $4\frac{1}{2}\%$ /yr for 8 years

6. How many years would it take for \$1000 to earn \$400 interest if invested at 8%/yr simple interest?

7. How many years would it take \$500 to turn into a total of \$800 if invested at 5%/yr simple interest?

8. Delores invested some amount of money in the bank at 4% simple interest per year for 20 years. If she earned \$2000 interest in total, how much money did she originally invest?

9. Jatinder gets paid \$8/hr plus 5% commission on his sales. In one week he worked 40 hours and sold \$1000 of merchandise. How much did he get paid that week?

10. Jill gets paid 4% commission on all sales over \$3000 each week. If she sells \$8000 one week, how much money does she earn?

11. Pao Ting has applied at Future Shop and Best Buy. Future Shop offers him \$8/hr plus 2% commission. Best Buy offers him \$10.50/hr.

a) In a 40 hour work week, how much would Pao Ting have to sell working at Future Shop to make it more profitable than working at Best Buy?

b) Imagine you are faced with the same job offers as Pao Ting, why might you choose one job offer over the other?

3-6 100% of a number

3-6 100% of a number

1. Find the number:

a) 12 is 10% of _____ b) 18 is 75% of _____ c) 90% of _____ is 63

d) 55% of _____ is 33 e) 25% of _____ is 72 f) 4% of _____ is 32

g) 120% of _____ is 36 h) 120 is 15% of _____ i) 0.8% of _____ is 2

2. A store was having a 15% off sale. If I saved \$12 on a pair of shoes, how much did they cost before the sale?

3. A store advertised a sale of 20% off. If the sale price of a shirt is \$24, what was the original price?

4. The price of a book was decreased by 5% to \$19, what was the original price?

5. Rental costs have increased by 20% over the last 6 months. If the current average rental cost is \$1500 per month, what was the average rental cost 6 months ago?

6. If the total amount of tax (12% HST) paid on a pair of shoes was \$10.20, what was the original price of the shoes?

7. Diana has a receipt that got wet, and all she can read is the total after tax, which is \$896. What was the price of the goods sold, and the amount of HST paid?

8. An I-Pod was on sale for 10% off, when the store went bankrupt and discounted everything in the store by a further 25% off the sale prices. If the sale price before tax was \$216, what was the original price?

9. A random survey found that 60% of Vancouverites were in favour of the 2010 Olympics. Theoretically, how many people would I have to ask before I found 210 people in favour of the 2010 Olympics?

10. When a DVD player was on sale for 20% off, it was selling for \$144. What would the sale price be if it were on sale for 25% off instead of 20% off?

11. A serving of Kellogg's Special K with Red Berries cereal is $\frac{2}{3}$ cup, and in it there is 2g of fibre, which is 8% of your daily recommended dosage of fibre. How much cereal would you have to eat to get 100% of your daily recommended fibre?