

CHAPTER

13

Rates

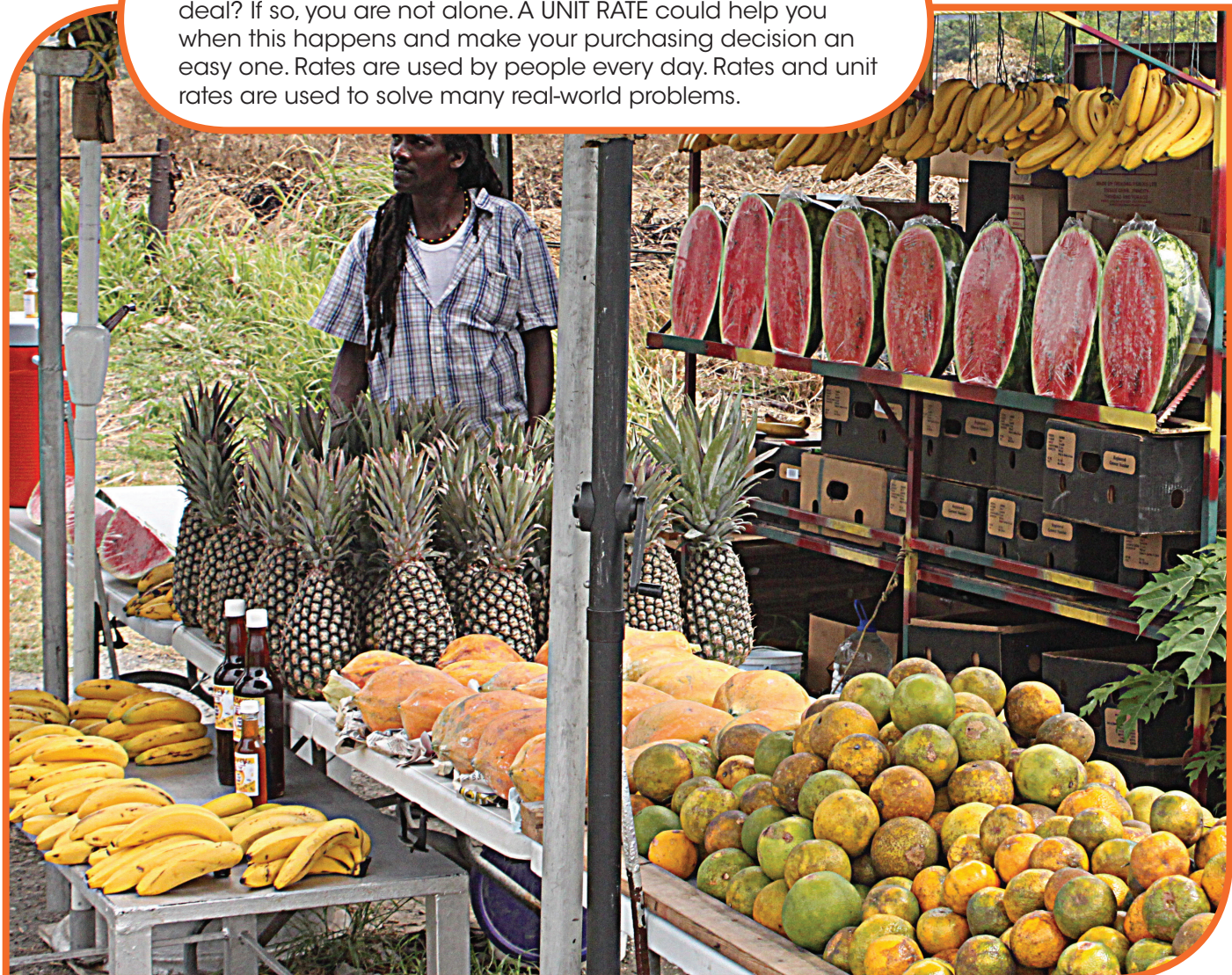
Vocabulary:

rate
unit rate

Chapter Outcomes:

- Create and solve one-step and multi-step problems involving whole numbers, fractions, mixed numbers, decimal, percents including money using algorithms, mental strategies and other problem solving strategies.

Have you ever been to the market and stood, staring, at two stalls with oranges and wondered which one is the better deal? If so, you are not alone. A UNIT RATE could help you when this happens and make your purchasing decision an easy one. Rates are used by people every day. Rates and unit rates are used to solve many real-world problems.



Getting Ready for Chapter 13

Write each fraction in its simplest form.

1. $\frac{4}{10}$	2. $\frac{32}{48}$	3. $\frac{14}{21}$
4. $\frac{15}{25}$	5. $\frac{7}{28}$	6. $\frac{30}{35}$
7. $\frac{12}{36}$	8. $\frac{8}{48}$	9. $\frac{16}{54}$

Solve the problems below. Write the answer in its simplest form.

10. $\frac{1}{5} \times \frac{3}{4}$	11. $7 \div \frac{4}{14}$	12. $\frac{5}{8} \times \frac{2}{10}$
13. $\frac{3}{12} \times \frac{6}{9}$	14. $\frac{4}{9} \div 12$	15. $5 \div \frac{15}{16}$
16. $\frac{2}{6} \div \frac{3}{8}$	17. $\frac{4}{7} \times \frac{1}{2}$	18. $\frac{1}{8} \div 4$

Find the next three values in each pattern.

19. 4, 7, 10, 13, ____, ____, ____

20. 62, 66, 70, 74, ____, ____, ____

21. 1.8, 2.4, 3.0, 3.6, ____, ____, ____

Rates

Teaching Point 1:

How can you use rates to solve problems?

A **rate** compares two quantities with different kinds of units.

Dollars and **pencils** are different kinds of units.

\$12 for 6 pencils

When the comparison is to 1 unit, the rate is called the **unit rate**.

Find how much for 1 pencil.

Step 1 → **Write** the cost of the 6 pencils as a rate.

\$12 for 6 pencils

$$\frac{\$12}{6 \text{ pencils}}$$

Step 2 → **Divide** to find the **unit rate**.

1 pencil → $\$12 \div 6 = \2

So, 1 pencil will cost \$2.

Unit rates answer the question, "How many for **one**?"

Activity 1:

Write each statement as a rate.

1. It took Liann 32 minutes to run 4 laps.
2. \$24.60 for 1 dozen eggs
3. A car uses 8 litres of gasoline to travel 100 km
4. Vanessa burned 120 calories in 20 minutes while hiking.
5. Josiah bought 10 pencils for \$12.50.
6. Rachael solved 6 mathematics problems in 18 minutes.
7. John buys 3 shirts for \$60.
8. The seamstress sews 12 buttons in 6 minutes.
9. A tap left running for 5 minutes wasted 30 litres of water.
10. 8 hours for \$160.00

Activity 2:

Find the unit rate for each.

1. $\frac{150 \text{ snacks}}{50 \text{ students}}$	2. $\frac{\$120}{5 \text{ hours}}$
3. $\frac{110 \text{ km}}{11 \text{ litres}}$	4. $\frac{6 \text{ pages}}{3 \text{ minutes}}$

5. $\frac{24 \text{ eggs}}{6 \text{ cakes}}$	6. $\frac{12 \text{ loaves}}{4 \text{ kg flour}}$
7. $\frac{\$48}{24 \text{ bottles of water}}$	8. $\frac{410 \text{ heart beats}}{5 \text{ minutes}}$
9. $\frac{180 \text{ words}}{3 \text{ minutes}}$	10. $\frac{200 \text{ children}}{8 \text{ classes}}$
11. $\frac{880 \text{ calories}}{8 \text{ servings}}$	12. $\frac{1\,000 \text{ ml}}{4 \text{ glasses}}$

13. Anton's heart beats 320 times in 4 minutes. How many times does his heart beat in 1 minute.

14. A printer took 5 minutes to print 25 pages. What is the rate of pages per minute?

15. Tamara earned 15 points for every 5 books she read. If she read only 1 book, how many points would she have earned?



16. A pencil company uses 30 grams of rubber to make 3 pencils. What is the rate of grams per pencil?



17. A carpenter used 2 boxes of nails to build 6 doors. How many boxes of nails did he use to build each door?

18. Mother bought 6 notebooks for \$96.48. How much did she pay for 1 notebook?

Teaching Point 2:

How can you use unit rates to solve problems?

A farmer picks 12 fruits in 3 minutes. How many fruits will he pick in 1 hour if he picks the fruits at the same rate?

Step 1: Find the unit rate.

$$\frac{12 \text{ fruits}}{3 \text{ minutes}} \text{ or } \frac{12}{3}$$

$$\frac{12 \div 3}{3 \div 3} = \frac{4}{1}$$

The unit rate is 4 fruits in 1 minute.

Step 2: Solve the problem with the unit rate.

1 minute $\rightarrow$ 4 fruits

60 minutes $\rightarrow 60 \times 4 = 240$ fruits

The farmer could pick 240 fruits in 1 hour

Activity 3:

Solve the problems below.



1. A florist made 16 bouquets in 4 hours. How many hours will the florist take to make 20 bouquets if they are made at the same rate?

2. Mark can mow 4 lawns in 8 hours. How many lawns can he mow in 12 hours?
3. A builder installs 10 windows in 5 hours. How long will he take to install 18 windows if he works at the same rate?



4. Water leaks from a tap at a rate of 200 ml every 4 minutes.
 - (a) At this rate, how much water will leak from the tap in 10 minutes.
 - (b) At this rate, how long will it take to collect 2 litres of water?
5. Lauren took 3 hours to read a 60-page book. At this rate, how long will it take her to read a 120-page book?
6. An empty bucket is filled with water at a rate of 2 litres per minute. How long will it take to fill the bucket with 20 litres of water?



7. A farmer is able to fill 120 crates of eggs in 1 hour. At this rate, how many crates can he fill in 10 minutes?

8. A Standard 4 class sold 24 barbecue tickets in 12 days. At this rate, how long will it take for them to sell 36 tickets?

Teaching Point 3:

How can you compare rates?

Jerry reads 48 pages in 3 hours. Mark reads 24 pages from the same book in 2 hours. Who is the faster reader?

Step 1: Find each unit rate.

Jerry's rate $\rightarrow \frac{48 \text{ pages}}{3 \text{ hours}}$ or $\frac{48}{3}$

$$\frac{48 \div 3}{3 \div 3} = \frac{16}{1}$$

Jerry's unit rate is 16 pages per hour.

Mark's rate $\rightarrow \frac{24 \text{ pages}}{2 \text{ hours}}$ or $\frac{24}{2}$

$$\frac{24 \div 2}{2 \div 2} = \frac{12}{1}$$

Mark's unit rate is 12 pages per hour.

Step 2: Compare unit rates.

16 pages > 12 pages

So Jerry reads faster than Mark.

Activity 4:

Compare the rates. Write which is greater.

1. 35 points in 5 seconds or 64 points in 8 seconds.

2. 12 laps in 6 minutes or 16 laps in 10 minutes.
3. 32 runs in 4 overs or 12 runs in 2 overs.
4. 220 km on 10 litres or 160 km on 8 litres.
5. 360 visitors in 24 hours or 300 visitors in 20 hours.
6. 12 text messages in 4 minutes or 8 text messages in 2 minutes.
7. 4 hours to fill a 320 litre tank or 3 hours to fill a 270 litre tank.
8. 288 points in 12 games or 182 points in 7 games.

Solve the problems below.

9. Dwayne scored 96 runs in 3 cricket matches and Adesh scored 48 runs in 2 matches. Which of the two batsmen scored less runs per match?
10. Tap A can fill a 24 litre water cooler in 8 minutes. Tap B can fill a 40 litre water cooler in 10 minutes. Which tap will take the shorter time to fill a 20 litre container?

Chapter Review

Solve the problems below.

1. A tailor can sew 16 pants in 8 days. How many pants can he sew in one day?
2. Four litres of gasoline cost \$16.80. What is the price per litre?

3. In 12 games, Jeffrey scored 252 points. What is his scoring rate in points per game?
4. Kianna reads 40 pages in 2 hours. At this rate, in how many hours will she have read 100 pages?
5. Mother baked a dozen cupcakes with 2 cups of flour. How many cups of flour will she need to make 36 cupcakes?



6. Leanna can text at a rate of 24 words in 3 minutes.
 - (a) At this rate, how many words can she text in 5 minutes?
 - (b) At this rate, how many minutes would she take to text 360 words?
7. Maria jogged for 30 minutes and burned 150 calories. Jason walked for 1 hour and burned 180 calories. Who burned the most calories per hour?



Tap A



Tap B

8. Tap A leaks 450 ml in 10 minutes. Tap B leaks 360 ml in 9 minutes. Which tap leaks at a faster rate?
9. A bakery can bake 160 loaves of bread in 5 hours.
 - (a) How many loaves can they bake in 1 hour?
 - (b) How long will they take to bake 200 loaves?
10. Mr. Smith lays 20 cm square tiles. He lays 20 of these tiles in 2 hours.
 - (a) At this rate, how many tiles can he lay in 5 hours?
 - (b) If he works 8 hours every day, how long would he take to tile a room that is 4 metres long and 3 metres wide?
11. A baker can make 48 muffins per hour.
 - (a) At this rate, how many muffins can he make in 6 hours.
 - (b) At this rate, how long will he take to make 120 muffins?
12. In one week Jenny was paid \$55 for 11 hours of baby sitting, Chrissy was paid \$48 for 4 hours of baby sitting and Lexi got \$54 for baby sitting 6 hours on Friday. Whose rate of pay was the highest?