Rate Ready

Use unit rates, proportions, percents, and conversions to solve real situations.

7.4 · Proportionality. The student applies mathematical process standards to represent and solve problems involving proportional relationships. The student is expected to: represent constant rates of change in mathematical and real-world problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations, including d = rt; calculate unit rates from rates in mathematical and real-world problems; determine the constant of proportionality (k = y/x) within mathematical and real-world problems; solve problems involving ratios, rates, and percents, including multi-step problems involving percent increase and percent decrease, and financial literacy problems; and convert between measurement systems, including the use of proportions and the use of unit rates.

Name _____ Date _____

Constant Rates

When two quantities are proportional, the ratio y/x stays the same for each pair with nonzero x. Divide to find a unit rate or constant of proportionality, then multiply to find a new value. For a constant-speed trip, use d = rt.

Worked example

A bike messenger travels 64 miles in 8 hours at a constant speed. How far will the messenger travel in 9 hours?

1. Find the rate: r = 64/8 = 8 miles per hour.
2. Use t = 9 hours.
3. Find distance: d = rt = 8 x 9 = 72.

72 miles

1. Practice

Four handmade bracelets cost $10 at a school market. Find the cost per bracelet. Show a multiplication check.

2. Practice

A runner completes 18 laps in 12 minutes at a steady pace. How many laps will the runner complete in 20 minutes? Show a rate check.

3. Practice

A poster designer charges according to y = 6x, where x is the number of posters and y is the number of dollars charged. Find k. Give one input-output pair that checks it.

4. Practice

A food delivery cyclist rides at 15 miles per hour for 4 hours. Use d = rt to find the distance traveled. Check your answer by dividing distance by time.

5. Practice

A hoodie has an original price of $40 and is marked 25% off. Find the sale price. Show the discount amount and check what percent of the original price remains.

6. Practice

A video studio needs 3.5 yards of cable. Use 1 yard = 3 feet to convert the length to feet. Show a unit-rate check.

7. Apply

An audiobook app downloads files at a constant rate. Use two rows of the table to verify the unit rate, then predict how many megabytes will download in 14 minutes.

Audiobook Download

Minutes	Megabytes Downloaded
4	60
6	90
10	150

8. Apply

A game controller is listed at $60. Its price increases by 20%, then a storewide sale takes 25% off the increased price. What is the final price? Show both percent amounts.

9. Challenge

Two music streaming plans are available for 6 months. Plan A costs $18 for the first 3 months, then its monthly price increases by 25% for the next 3 months. Plan B costs $7 per month, but gives 10% off when 6 months are prepaid. Which plan costs less for 6 months, and by how much? Show calculations and explain your comparison.

What to accept

Accept equivalent unit-rate forms, such as 3/2 laps per minute or 1.5 laps per minute. For checks that ask for an input-output pair, accept any correct pair that follows the stated proportional rule.

1. Practice

$2.50 per bracelet; check: 4 x $2.50 = $10

2. Practice

30 laps; 18/12 = 3/2 laps per minute and 30/20 = 3/2 laps per minute

3. Practice

k = 6 dollars per poster; sample check: x = 2 and y = 12

4. Practice

60 miles; check: 60/4 = 15 miles per hour

5. Practice

Discount = $10, sale price = $30; $30 is 75% of $40

6. Practice

10.5 feet; check: 10.5/3.5 = 3 feet per yard

7. Apply

15 megabytes per minute; 210 megabytes in 14 minutes

Verify the rate with two rows: 60/4 = 15 MB per minute and 90/6 = 15 MB per minute. Then multiply 15 x 14 = 210 MB.

8. Apply

The increase is $12, so the increased price is $72. The discount is $18, so the final price is $54.

Find 20% of $60 to get $12. Add $12 to $60 to get the increased price, $72. Find 25% of $72 to get $18, then subtract $18 from $72 to get $54.

9. Challenge

Plan A: $18/3 = $6 per month, and a 25% increase makes it $7.50 per month. Total = $18 + 3 x $7.50 = $40.50. Plan B: 6 x $7 = $42, and 10% off is $4.20, so the total is $37.80. Plan B costs less by $40.50 - $37.80 = $2.70.