Problem Solving: Unit Rates

Felicia's Ride

READ

Felicia takes 4 hours to ride her bike 56 miles. She rides at a constant speed during the 4-hour ride. What is her **unit rate** in miles per hour?

PLAN

Write an equation to represent the problem.
The number of miles per hour Felicia rides is her unit rate.
Let m = the number of miles Felicia rides per hour.
The number of hours Felicia rides multiplied by her unit rate is equal to the distance she rides.

$4 \times m = 56$

SOLVE

Step 1: Choose an operation to solve the equation. Use the opposite operation to isolate the variable. The opposite of multiplication is _____.

Step 2: Solve the equation. Divide both sides by 4.
$$4 \times m = 56$$
$$\frac{4 \times m}{4} = \frac{56}{4}$$

Step 3: Simplify.
On the left side of the equation, $4 \div 4 = 1$, so the 4s cancel, leaving $1m$ or m. On the right side of the equation, compute $56 \div 4$.
$$\frac{\cancel{4} \times m}{\cancel{4}} = \frac{56}{4}$$
$$m = \underline{\hspace{1cm}}$$

CHECK

Substitute the value found for m in the original equation.
$$4 \times m = 56$$
$$4 \times \underline{\hspace{1cm}} \overset{?}{=} 56$$

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

▶ Felicia's unit rate is _____ miles per hour.

Tennis Camp

READ

There are 3 instructors per 18 students at a tennis camp. At that rate, how many instructors are needed for 30 students?

PLAN

First find the unit rate of students to instructors. Then use the unit rate to find the number of instructors needed for 30 students.

SOLVE

Step 1: Find the unit rate.

Write the ratio of students to instructors: $\dfrac{\text{students}}{\text{instructors}} = \dfrac{\square}{\square}$

Divide to find the unit rate: $18 \div 3 =$ _____

The unit rate is _____ students per instructor.

Step 2: Write an equation using the unit rate.

Let $n =$ the number of instructors needed for 30 students.
The number of students divided by the number of students per instructor is equal to the number of instructors needed.

$30 \div \square = n$

Step 3: Simplify the equation.

$n =$ _____

CHECK

Use a tape diagram to check the relationship between the number of instructors and the number of students.

instructors	1	2	3	4	5
students	6	12	18	24	30

The tape diagram supports the relationship. It shows that the number of students is always 6 times the number of instructors.

There is 1 instructor for 6 students, 2 instructors for 12 students, 3 instructors for 18 students, _____ instructors for 24 students, and _____ instructors for 30 students.

▶ So _____ instructors are needed for 30 students.

The Farmer's Market

READ

At the farmer's market, 8 apples cost $5.20. If each apple costs the same amount, what is the price per apple?

PLAN

Write an equation to represent the problem.

The price per apple is the unit cost.

The number of apples times the cost per apple is equal to the total cost.

Let p = the price per apple.

$8 \times p = \$5.20$

Find the unit cost.

SOLVE

Find the unit cost.

Write a ratio of cost to number of apples: $\dfrac{5.20}{8}$

Simplify to find the unit cost: $\dfrac{5.20}{8} = \dfrac{5.20 \div \boxed{}}{8 \div \boxed{}} = \dfrac{\boxed{}}{1}$

So the unit cost is _____.

CHECK

Substitute the unit rate for p in the original equation.

$8 \times p = 5.20$

$8 \times$ _____ $\overset{?}{=} 5.20$

_____ = _____

▶ The price per apple is _____.

Art Supply Order

READ

An order of 5 paintbrushes costs $3.50. If each paintbrush costs the same amount, what is the unit cost? What is the cost for an order of 3 paintbrushes?

PLAN

First, find the unit cost of 1 paintbrush.

Let c = the cost of one paintbrush.

$$\frac{\$3.50}{5} = \frac{c}{1}$$

Then use the unit cost to find the total cost of 3 paintbrushes.

SOLVE

Find the unit cost, c.

$$\frac{3.50}{5} = \frac{3.50 \div \boxed{}}{5 \div \boxed{}} = \frac{\boxed{}}{1}$$

$c =$ _____

Find the total cost of 3 paintbrushes.

$3 \times$ _____ $=$ _____

CHECK

Use a double number line to check the relationship between the number of paintbrushes and the total cost.

Paintbrushes ordered

0   1   2   3   4   5

Total cost, $

0   0.70   1.40   2.10   2.80   3.50
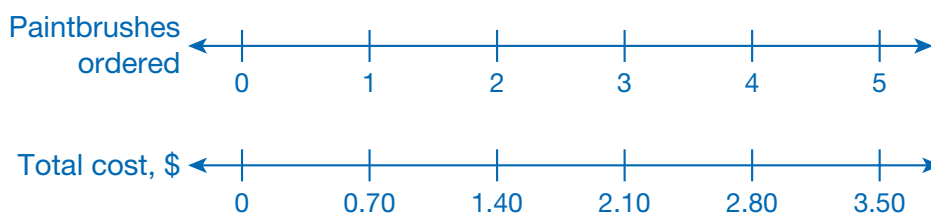
The double number line supports the relationship. It shows that the total cost is always $0.70 times the number of paintbrushes ordered.

▶ The unit cost of a paintbrush is _____. An order of 3 paintbrushes costs _____.

Practice

Use the 4-step problem-solving process to solve each problem.

1. **READ** It takes Karl 6 hours to drive 372 miles. If he drives at a constant speed during the 6 hours, what is his unit rate? At this rate, how far will Karl drive in 8 hours?

   PLAN _____

   _____

   SOLVE

   CHECK

2. Harper bought 4 chairs for $232. What is the unit price? How much will 6 chairs cost?

3. A painter uses 2 tubes of black paint for every 6 tubes of white paint to paint a mural. At that rate, how many tubes of black paint are used if 15 tubes of white paint are used?

4. At Bob's Binders, a set of 3 notebooks costs $4.20. At Pam's Paper Place, a set of 4 notebooks costs $5.20. What is the unit price of the notebooks at each store? Which is the better buy?

5. Ms. Compra bought 5 markers for $4.75. At this price, how much will 4 markers cost? How much will 10 markers cost?