Name & Surname: _____ Class: _____ Date: _____

Proportional Relationships

Recognize and show the same rate.

About 45 minutes Level ★★★☆☆



Proportional in 3 Checks

Two quantities are in a **proportional relationship** when they grow together at the same rate.

- Check the **ratio**: y ÷ x is the same for every pair.
- Check the **graph**: it is a straight line through (0, 0).
- Check the **equation**: it looks like y = kx, where k is the constant of proportionality or unit rate.

Task A

/2

Follow the worked example to find the constant in a proportional relationship.

WORKED EXAMPLE

Table shows 3 lb for $12, 5 lb for $20, 8 lb for $32. Find the constant k.

1. Find each ratio y ÷ x: 12 ÷ 3 = 4, 20 ÷ 5 = 4, 32 ÷ 8 = 4
2. All ratios are equal, so it is proportional
3. k = 4 dollars per pound, so y = 4x

Answer: 4 dollars per pound

YOUR TURN

Table shows 2 cups for $6, 4 cups for $12, 7 cups for $21. Find the constant k.

Answer: _____

WORKED EXAMPLE

A recipe uses 2 cups of flour for 12 cookies. How many cookies from 5 cups if proportional?

1. Find unit rate: 12 ÷ 2 = 6 cookies per cup
2. Multiply by new amount: 5 × 6 = 30
3. Answer is 30 cookies

Answer: 30 cookies

YOUR TURN

A printer prints 8 pages in 2 minutes at a steady rate. How many pages in 7 minutes?

Answer: _____

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Proportional Relationships

Task B /12

Find the unit rate and constant to test for proportional thinking.

WARM UP

1. Find the **constant** k if y = 18 when x = 3.

Answer: _____

2. Find the **constant** k if y = 20 when x = 4.

Answer: _____

3. $15 for 3 lb of apples. What is the **unit price** in dollars per pound?

Answer: _____

4. A car uses 4 gallons to go 24 miles. What is the **unit rate** in miles per gallon?

Answer: _____

PRACTISE

5. Table shows x = 2, y = 10 and x = 6, y = 30. Find y when x = 9 if **proportional**.

Answer: _____

6. Table shows x = 4, y = 12 and x = 7, y = 21. Find y when x = 10 if **proportional**.

Answer: _____

7. Table shows x = 2, y = 5 and x = 4, y = 9. Is it **proportional**? Explain how you know.

Answer: _____

8. Is y = 2x + 1 **proportional**? Explain how you know.

Answer: _____

PROBLEM SOLVING

9. 6 pencils cost $3.00. What is the **cost** of 10 pencils at the same **rate**?

Answer: _____

10. A car travels 150 miles on 5 gallons. How far on 8 gallons at the same **rate**?

Answer: _____

11. 3 pizzas serve 12 students. How many students do 7 pizzas serve if **proportional**?

Answer: _____

12. A 12-pack of water costs $6.00 and a 20-pack costs $10.00. Is price **proportional** to packs? Explain how you know.

Answer: _____

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Proportional Relationships

Task C /12

Use tables and graphs to write equations for proportional pairs.

WARM UP

1. Which **equation** is proportional: y = 3x or y = 3x + 2?

   Answer: _____

2. Write the **equation** for a proportional relationship with k = 2.5.

   Answer: _____

3. A **graph** is a straight line through (0,0) and (2,10). Could it be **proportional**?

   Answer: _____

4. If y = 4x, find y when x = 5 using **multiplication**.

   Answer: _____

PRACTISE

5. Table shows x = 0, y = 0; x = 1, y = 6; x = 2, y = 12. Write the **equation**.

   Answer: _____

6. A **graph** is a straight line through (0,0) and (4,20). Find k.

   Answer: _____

7. If y = 7x, find x when y = 35 using **division**.

   Answer: _____

8. Table shows (3,9) and (5,16). Is it **proportional**? Explain how you know.

   Answer: _____

PROBLEM SOLVING

9. A shop sells lemonade at $2 per cup. Write the **equation** for cost y for x cups.

   Answer: _____

10. A car drives 180 miles in 3 hours at a **steady speed**. Write the **equation** for miles y and hours x.

    Answer: _____

11. A **proportional line** goes through (0,0) and (6,42). What is y when x = 10?

    Answer: _____

12. Explain how you know the **graph** of y = 4x + 1 is not **proportional**.

    Answer: _____

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Proportional Relationships

Task D /3

Decide what you think of each idea about proportional relationships.



Student A

How can we tell if y is **proportional** to x?

Check that y ÷ x is always the **same**, and the **graph** goes through (0,0).



Student B

If both x and y go up, it must be **proportional**.



Student C

y = 3x + 1 is **proportional** because it has 3x in it.



Student D

What do you think of each idea? Why?

Student B: .....

Student C: .....

Student D: .....

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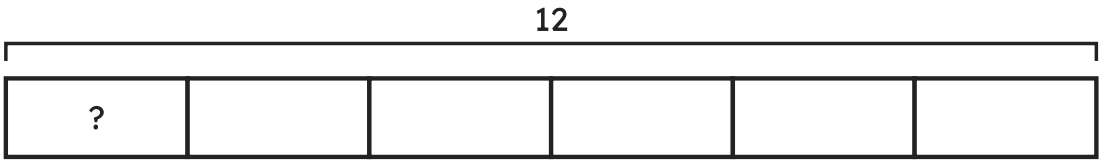
Proportional Relationships

Task E

/4

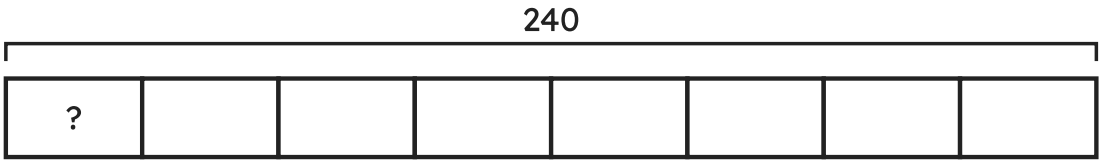
Use the bar model to find the unit rate.

1. 6 notebooks cost $12 at the same **unit price**. How much does 1 notebook cost?



Answer: _____ **dollars**

2. A car uses 8 gallons to drive 240 miles at a **steady rate**. How many miles per gallon?



Answer: _____ **miles**

Task F

Example done for you

/4

Match each term to its meaning.

1	proportional relationship	◯	the point (0,0) that a proportional graph goes through
2	constant of proportionality	◯	the value k in y = kx, found by y ÷ x
3	unit rate	◯	how much of y for 1 unit of x
4	ratio	◯	a comparison of y to x by division
5	origin	(1)	two quantities that grow together at the same rate

How did I do?

Circle a face for each line.

I can tell if a relationship is proportional.	☹ 😐 ☺
I can find the unit rate and write y = kx.	☹ 😐 ☺
I can use tables and graphs to solve problems.	☹ 😐 ☺

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Answer sheet: Proportional Relationships

Task A

1. 3 dollars per cup
2. 28 pages

Task B

1. k = 6
2. k = 5
3. 5 dollars per pound
4. 6 miles per gallon
5. 45
6. 30
7. No, because 5 ÷ 2 = 2.5 but 9 ÷ 4 = 2.25, the ratios are not equal.
8. No, it is not in the form y = kx, when x = 0, y = 1, so the graph does not go through (0,0).
9. $5.00
10. 240 miles
11. 28 students
12. Yes, both cost $0.50 per pack because 6 ÷ 12 = 0.50 and 10 ÷ 20 = 0.50, the ratios are equal.

Task C

1. y = 3x
2. y = 2.5x
3. Yes, it goes through (0,0) and y ÷ x = 5 for (2,10).
4. 20
5. y = 6x
6. k = 5
7. x = 5
8. No, because 9 ÷ 3 = 3 but 16 ÷ 5 = 3.2, the ratios are not equal.
9. y = 2x
10. y = 60x
11. 70
12. It does not go through (0,0), when x = 0, y = 1, so it is not in the form y = kx.

Task D

Student B: right

Student C: not right

Student D: not right

Student B is correct because a proportional relationship has equal ratios, a straight line through the origin, and the form y = kx. Student C is wrong because going up can be additive, not multiplicative. Student D is wrong because +1 means when x = 0, y = 1, so it does not go through (0,0).

Task E

1. 2 dollars
2. 30 miles

Task F

1. proportional relationship → two quantities that grow together at the same rate
2. constant of proportionality → the value k in y = kx, found by y ÷ x
3. unit rate → how much of y for 1 unit of x
4. ratio → a comparison of y to x by division
5. origin → the point (0,0) that a proportional graph goes through

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