LESSON MAKER PRO

Same Rate, Different Start

Compare how linear relationships grow and where they begin.

GRADE 8 · 8.AF.B

8.AF.B "Analyze the relationship between proportional and non-proportional situations."

NAME _____ DATE _____

RATE AND STARTING VALUE

A proportional relationship has the same y/x for every x that is not 0. Its rule is y = kx, so it starts at (0, 0). A non-proportional linear relationship can grow at a constant rate, but it starts at a value other than 0.

WORKED EXAMPLE

Is the relationship in the table proportional? Write its rule.

EXAMPLE RELATIONSHIP

x	y
13	39
26	78

1. Find the ratios: 39/13 = 3 and 78/26 = 3.
2. The ratios match, so the constant of proportionality is 3.
3. Write the rule: y = 3x.

Answer: Yes, it is proportional. The rule is y = 3x.

PRACTICE 6 problems

1 Find the constant of proportionality and write a rule for this table.

RELATIONSHIP A

x	y
2	10
5	25
10	50

ANSWER _____

2 Find the starting value and write a rule for this table.

RELATIONSHIP B

x	y
0	5
2	9
6	17

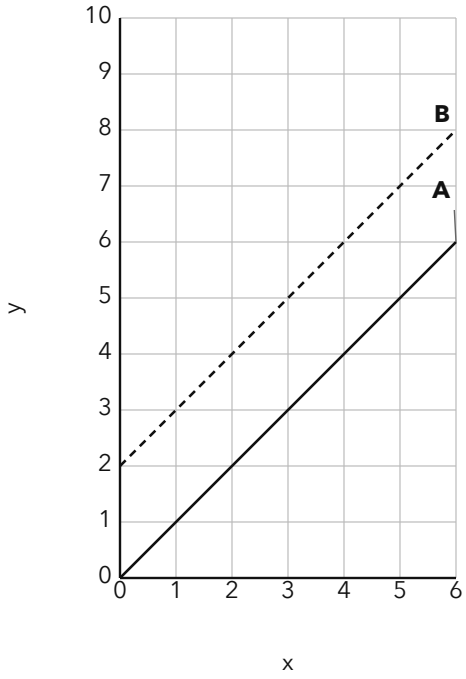
ANSWER _____

3 Compare y = 6x and y = 6x + 2. Which rule is proportional? When x = 5, how much greater is the output of the other rule?

ANSWER _____

_____

4 Which line shows a proportional relationship? Explain how the graph shows this.



ANSWER _____

_____

5 A pattern follows y = 2x + 6. Subtract 6 from every output to make a new pattern. Is the new pattern proportional? Write its rule.

ANSWER _____

_____

6 Find a rule for this table. Is the relationship proportional?

RELATIONSHIP C

x	y
1	6
2	10
5	22

ANSWER _____

_____

APPLY IT Show your work

1 One music app charges a $6 sign-up fee plus $2 per month. Another charges $5 per month with no sign-up fee. After how many months will the total costs be equal? Which app has a proportional cost?

WORK SPACE

ANSWER _____

2 For a club hoodie order, an online shop charges $12 shipping plus $6 per hoodie. A pop-up shop charges $8 per hoodie with no shipping fee. For 5 hoodies, which shop costs less, and by how much? Which shop has a proportional total cost?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Relationship A passes through (2, 10) and (6, 18). Relationship B passes through (0, 0) and (5, 10). A student says, "Both relationships have the same rate of change, so both are proportional." Explain why the claim is false. Write an equation for each relationship.

WORK SPACE AND ANSWER

ANSWER KEY

Same Rate, Different Start

GRADE 8 · 8.AF.B

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the constant of proportionality and write a rule for this table.	**The constant of proportionality is 5. The rule is y = 5x.**
2	Find the starting value and write a rule for this table.	**The starting value is 5. The rule is y = 2x + 5.**
3	Compare y = 6x and y = 6x + 2. Which rule is proportional? When x = 5, how much greater is the output of the other rule?	**y = 6x is proportional. The other rule's output is 2 greater.**
4	Which line shows a proportional relationship? Explain how the graph shows this.	**Line A is proportional because it passes through (0, 0).**
5	A pattern follows y = 2x + 6. Subtract 6 from every output to make a new pattern. Is the new pattern proportional? Write its rule.	**Yes. The new rule is y = 2x.**
6	Find a rule for this table. Is the relationship proportional?	**The rule is y = 4x + 2. It is not proportional.**

PART 2 · APPLY IT

1. **The costs are equal after 2 months. The app with no sign-up fee has a proportional cost.** Set 6 + 2x = 5x and solve to get x = 2. The app with no sign-up fee costs $5 per month and starts at $0.
2. **The pop-up shop costs $2 less. Its total cost is proportional to the number of hoodies.** The online cost is 12 + 6(5) = $42, and the pop-up cost is 8(5) = $40. Only the pop-up shop starts at $0.

CHALLENGE

Both rates of change are 2, but equal rates do not make both relationships proportional. A is y = 2x + 6, so it does not start at 0. B is y = 2x, so it is proportional.

Accept equivalent explanations that identify a proportional relationship by a constant y/x ratio or a starting value of 0. For the challenge, students must distinguish the shared rate of change from the different starting values.