LESSON MAKER PRO

Find the Rule

Use rates and starting values to model change.

GRADE 8 · PA.A.2.2

PA.A.2.2 "Identify, describe, and analyze linear relationships between two variables."

NAME _____ DATE _____

THE BIG IDEA

In a linear relationship, y changes by the same amount each time x increases by 1. Write the rule as y = mx + b, where m is the rate of change and b is the value of y when x = 0.

WORKED EXAMPLE

A line passes through (14, 67) and (18, 83). Write its rule.

1. Find the rate: (83 - 67)/(18 - 14) = 16/4 = 4.
2. Use (14, 67) to find b: 67 = 4(14) + b.
3. Solve: b = 67 - 56 = 11.

Answer: y = 4x + 11

PRACTICE 6 problems

1 Use the table to find the rate of change and write a rule for y in terms of x.

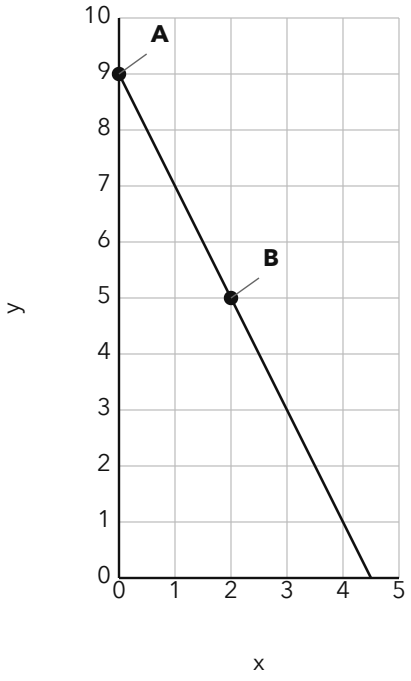
x	y
0	19
1	21
2	23
3	25

ANSWER _____

2 Write an equation for the line through (1, 8) and (5, 20).

ANSWER _____

3 Use the graph to write an equation for the line. State whether y increases or decreases as x increases.



ANSWER _____

_____

4 For y = 5x - 9, find y when x = 2 and give the y-intercept.

ANSWER _____

_____

5 Is the relationship in the table linear? Use the changes in y to justify your answer.

x	y
0	0
1	2
2	5
3	10

ANSWER _____

_____

6 Use the table to write a rule for y in terms of x. Then find y when x = 6.

x	y
0	12
2	8
5	2

ANSWER _____

_____

APPLY IT Show your work

1 A gaming club charges a sign-up fee plus the same cost for each session. After 2 sessions, Mina has paid $19. After 5 sessions, she has paid $34. Write a rule for the total cost C of x sessions. What does the starting value mean? How much will 8 sessions cost?

WORK SPACE

ANSWER _____

2 Your tablet has 50 GB of free space. Each video you save uses 2 GB. Write a rule for the free space F, in GB, after you save x videos. How many videos can you save before no free space remains?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Music app A costs $12 per month plus $3 per album download. App B costs $20 per month plus $2 per album download. How many albums make the monthly costs equal, and what is that cost? Explain which app costs less if you download more albums than that.

WORK SPACE AND ANSWER

ANSWER KEY

Find the Rule

GRADE 8 · PA.A.2.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the table to find the rate of change and write a rule for y in terms of x.	**Rate of change: 2; rule: y = 2x + 19.**
2	Write an equation for the line through (1, 8) and (5, 20).	**y = 3x + 5**
3	Use the graph to write an equation for the line. State whether y increases or decreases as x increases.	**y = -2x + 9; y decreases as x increases.**
4	For y = 5x - 9, find y when x = 2 and give the y-intercept.	**When x = 2, y = 1; the y-intercept is -9.**
5	Is the relationship in the table linear? Use the changes in y to justify your answer.	**No. As x increases by 1 each time, y increases by 2, then 3, then 5.**
6	Use the table to write a rule for y in terms of x. Then find y when x = 6.	**y = -2x + 12; when x = 6, y = 0.**

PART 2 · APPLY IT

1. **C = 5x + 9; the sign-up fee is $9; 8 sessions cost $49.** The cost rises $15 over 3 sessions, so each session costs $5. Substituting x = 2 gives a starting cost of $9, and C = 5(8) + 9 = 49.
2. **F = 50 - 2x; 25 videos.** The free space starts at 50 GB and falls by 2 GB per video. Set F = 0 and solve 0 = 50 - 2x to get x = 25.

CHALLENGE

The costs are equal at 8 albums, when both cost $36. For more than 8 albums, app B costs less because each additional album adds $2 instead of $3.

Accept equivalent equations and explanations. In the tablet problem, 25 is the maximum number of whole videos that fit under the stated conditions.