

Rate and Start

Connect rates and starting values to linear equations.

GRADE 8 • MA.8.AR.3

MA.8.AR.3 "Extend understanding of proportional relationships to two-variable linear equations."

NAME _____

DATE _____

BUILD THE EQUATION

A two-variable linear equation can be written as $y=mx+b$. The number m tells the change in y for each increase of 1 in x , and b tells the value of y when $x=0$. When $b=0$, the relationship is proportional.

WORKED EXAMPLE

For $y=8x+11$, find y when $x=1$.

1. Substitute $x=1$: $y=8(1)+11$.
2. Multiply: $y=8+11$.
3. Add: $y=19$.

Answer: $y=19$

PRACTICE 6 problems

- 1** Find y when $y=4x+2$ and $x=6$.

ANSWER _____

- 2** In $y=5x+9$, identify the rate of change and the initial value.

ANSWER _____

- 3** A relationship has a rate of change of 7 and an initial value of 4. Write an equation.

ANSWER _____

- 4** The table shows a linear relationship. Write its equation. x : 0, 2, 4 y : 6, 12, 18

ANSWER _____

- 5** Is $y=6x$ a proportional relationship? Explain briefly.

ANSWER _____

- 6** Is $y=4x+2$ a proportional relationship? Explain briefly.

ANSWER _____

APPLY IT Show your work

- 1** A school music club charges a \$4 service fee plus \$2 for each ticket. Let x be the number of tickets and y be the total cost. Write an equation, then find the total cost for 5 tickets.

WORK SPACE

ANSWER _____

- 2** A pet-sitting app pays Dev \$5 for each dog walk and gives a \$9 bonus. Let x be the number of walks and y be Dev's total pay. Write an equation, find the pay for 4 walks, and decide whether the relationship is proportional.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Two game download plans have these costs: Plan A, $y=2x+12$; Plan B, $y=4x+2$. For what number of downloads do the plans cost the same? What is that cost?

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Find y when $y=4x+2$ and $x=6$.	$y=26$
2	In $y=5x+9$, identify the rate of change and the initial value.	Rate of change: 5; initial value: 9
3	A relationship has a rate of change of 7 and an initial value of 4. Write an equation.	$y=7x+4$
4	The table shows a linear relationship. Write its equation. x : 0, 2, 4 y : 6, 12, 18	$y=3x+6$
5	Is $y=6x$ a proportional relationship? Explain briefly.	Yes. The initial value is 0.
6	Is $y=4x+2$ a proportional relationship? Explain briefly.	No. The initial value is 2, not 0.

PART 2 • APPLY IT

- $y=2x+4$; \$14** The cost increases by \$2 per ticket and starts with a \$4 fee, so $y=2x+4$. Substitute $x=5$ to get $y=14$.
- $y=5x+9$; \$29; not proportional** The rate is \$5 per walk and the starting amount is \$9, so $y=5x+9$. For 4 walks, $y=29$; it is not proportional because the initial value is not 0.

CHALLENGE

They cost the same at 5 downloads, and the cost is \$22.

Accept equivalent equation forms, such as $2x+4=y$. For proportionality explanations, accept any correct statement that the equation has an initial value of 0 or does not have an initial value of 0.