

Shift the Line

Turn a proportional equation into a line with a starting value.

GRADE 8 • 8.PAR.4.1

8.PAR.4.1 "Use the equation $y = mx$ (proportional) for a line through the origin to derive the equation $y = mx + b$ (non-proportional) for a line intersecting the vertical axis at b ."

NAME _____

DATE _____

ADD THE STARTING VALUE

A proportional line starts at 0 on the vertical axis, so its equation is $y=mx$. If the line crosses the vertical axis at b instead, add b to the equation: $y=mx+b$. The value m is the slope, and b is the vertical-axis intercept.

WORKED EXAMPLE

A line has slope 3 and crosses the vertical axis at 5. Write its equation.

1. Start with the proportional form: $y=mx$.
2. Add the vertical-axis intercept: $y=mx+b$.
3. Substitute $m=3$ and $b=5$: $y=3x+5$.

Answer: $y=3x+5$

PRACTICE 6 problems

- 1** For $y=2x-7$, state the slope and the vertical-axis intercept.

ANSWER _____

- 2** A line has slope -4 and crosses the vertical axis at 6. Write its equation.

ANSWER _____

- 3** Use the table to write an equation. x : 0, 1, 2
 y : -8, -6, -4

ANSWER _____

- 4** The proportional equation is $y=-x$. The line is shifted up 9 units. Write the new equation.

ANSWER _____

- 5** Is $y=1/4x+8$ proportional or non-proportional? State why.

ANSWER _____

- 6** A line passes through (0,-6) and (4,2). Write its equation.

ANSWER _____

APPLY IT Show your work

- 1** A gaming platform charges \$8 for a season pass and \$6 for each avatar pack. Let x be the number of avatar packs and y be the total cost. Write an equation, then find the total cost for 2 avatar packs.

WORK SPACE

ANSWER _____

- 2** A bike-share service charges a \$4 unlock fee and \$7 per hour of riding. Let x be the number of hours and y be the total cost. Write an equation, then find the cost for 6 hours.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A line passes through (1,4) and (7,16). Write an equation in the form $y=mx+b$. Explain how you found b .

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	For $y=2x-7$, state the slope and the vertical-axis intercept.	$m=2$, $b=-7$
2	A line has slope -4 and crosses the vertical axis at 6. Write its equation.	$y=-4x+6$
3	Use the table to write an equation. x: 0, 1, 2 y: -8, -6, -4	$y=2x-8$
4	The proportional equation is $y=-x$. The line is shifted up 9 units. Write the new equation.	$y=-x+9$
5	Is $y=1/4x+8$ proportional or non-proportional? State why.	Non-proportional, because $b=8$, not 0.
6	A line passes through (0,-6) and (4,2). Write its equation.	$y=2x-6$

PART 2 • APPLY IT

- $y=6x+8$; for 2 avatar packs, $y=20$ dollars.** The \$6 cost per pack is the slope, and the \$8 season pass is the vertical-axis intercept. Substitute $x=2$ into $y=6x+8$.
- $y=7x+4$; for 6 hours, $y=46$ dollars.** The hourly charge is the slope, and the unlock fee is the vertical-axis intercept. Substitute $x=6$ into $y=7x+4$.

CHALLENGE

$y=2x+2$. The slope is $(16-4)/(7-1)=12/6=2$. Substitute (1,4): $4=2(1)+b$, so $b=2$.

Accept equivalent equation forms with the same slope and vertical-axis intercept, such as $y=-7+2x$. For the challenge, accept any clear explanation that uses a point and the slope to find $b=2$.