

Function Builders Lab

Turn changing quantities into useful rules.

HIGH SCHOOL • HSF-BF.A

CCSS.Math.Content.HSF-BF.A "Build a function that models a relationship between two quantities"

NAME _____

DATE _____

BUILD THE RULE

A function matches each input with exactly one output. When a quantity starts at b and changes by m for each unit of x , use $f(x)=mx+b$. Choose a variable for the input, then use the starting amount and rate of change to build the rule.

WORKED EXAMPLE

A bike rental shop charges a \$9 starting fee and \$7 for each hour. Write $C(h)$, then find $C(4)$.

1. Let h be the number of hours rented.
2. The hourly cost is $7h$.
3. Add the starting fee: $C(h)=7h+9$.
4. Substitute 4: $C(4)=7(4)+9=37$.

Answer: $C(h)=7h+9$; $C(4)=\$37$

PRACTICE 6 problems

- 1** A social-media account begins with 18 followers and gains 3 followers each day. Write $F(d)$ for the number of followers after d days.

ANSWER _____

- 2** The table shows a linear relationship. Write y as a function of x : x : 0, 1, 2; y : 11, 16, 21.

ANSWER _____

- 3** A ride service costs \$6 per mile, with no starting fee. Write $p(m)$ for the cost of m miles.

ANSWER _____

- 4** A rectangle has length x and width $20-x$. Write $A(x)$ for its area.

ANSWER _____

- 5** A tile pattern has 2 tiles at stage 0. The number of tiles doubles at each new stage. Write $T(n)$ for the number of tiles at stage n .

ANSWER _____

- 6** A linear function passes through (3, 15) and (5, 25). Write the function $f(x)$.

ANSWER _____

APPLY IT Show your work

- 1** You are saving for a concert. You already have \$20 and earn \$13 for each hour you babysit. Write $S(h)$ for your savings after h hours. Then find your savings after 5 hours.

WORK SPACE

ANSWER _____

- 2** Your club orders custom shirts. The printer charges an \$8 design fee plus \$13 per shirt. Write $C(n)$ for the total cost of n shirts. Then find the cost of 6 shirts.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Two phone data plans have monthly costs. Plan A charges \$11 plus \$2 per gigabyte. Plan B charges \$23 plus \$1 per gigabyte. Write both functions. Find the number of gigabytes where the plans cost the same, and explain which plan costs less when x is below or above that amount.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A social-media account begins with 18 followers and gains 3 followers each day. Write $F(d)$ for the number of followers after d days.	$F(d)=3d+18$
2	The table shows a linear relationship. Write y as a function of x : x : 0, 1, 2; y : 11, 16, 21.	$y=5x+11$
3	A ride service costs \$6 per mile, with no starting fee. Write $p(m)$ for the cost of m miles.	$p(m)=6m$
4	A rectangle has length x and width $20-x$. Write $A(x)$ for its area.	$A(x)=x(20-x)$, or $A(x)=20x-x^2$
5	A tile pattern has 2 tiles at stage 0. The number of tiles doubles at each new stage. Write $T(n)$ for the number of tiles at stage n .	$T(n)=2(2^n)$, or $T(n)=2^{(n+1)}$
6	A linear function passes through (3, 15) and (5, 25). Write the function $f(x)$.	$f(x)=5x$

PART 2 · APPLY IT

1. **$S(h)=13h+20$; $S(5)=\$85$** The starting savings is 20, and the savings increase by 13 for each hour. Substitute $h=5$ to get $13(5)+20=85$.
2. **$C(n)=13n+8$; $C(6)=\$86$** The design fee is the starting amount, and each shirt adds 13 dollars. Substitute $n=6$ to get $13(6)+8=86$.

CHALLENGE

$A(x)=2x+11$ and $B(x)=x+23$. The plans cost the same at $x=12$ gigabytes, when both cost \$35. Plan A costs less when $x<12$, and Plan B costs less when $x>12$, because $A(x)-B(x)=x-12$.

Accept equivalent algebraic forms, including $20x-x^2$ for the rectangle and $2^{(n+1)}$ for the tile pattern. For context problems, accept a clear variable definition and restrict inputs to nonnegative values when appropriate.