

Algebra 1 · Functions, Domain, Range and Function Notation · Worksheet Answer Key

Common Core F-IF.A.1, F-IF.A.2, F-IF.B.5 · mathovore.fr

Every solution shows the work, with the final answer in bold. Compare your reasoning, not only your result: for graphs, check that you drew the vertical lines, and for stories, check that your answer includes units.

Algebra 1 Common Core: F-IF.A.1 · F-IF.A.2 · F-IF.B.5

Problem 1: Function from ordered pairs

List the inputs: 1, 2, 3, 4. No input is repeated, so each input has exactly one output.

Yes, it is a function.

Problem 2: Repeated input

The input 2 appears twice: it is paired with 5 and also with 9. One input has two outputs.

No, it is not a function.

Problem 3: Mapping diagram

Inputs 1, 2, 3, 4 each have exactly one arrow. The outputs 5, 5, 7, 9 repeat the 5, which is allowed.

Yes, it is a function.

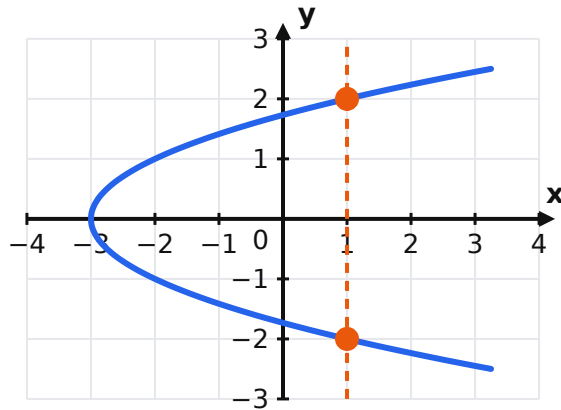
Problem 4: Function from a table

The input $x=2$ appears twice, with outputs 4 and 6.

No, y is not a function of x .

Problem 5: Vertical line test: curve

Draw the vertical line $x=1$. The curve satisfies $1=y^2-3$, so $y^2=4$ and $y=2$ or $y=-2$. The line meets the graph twice.

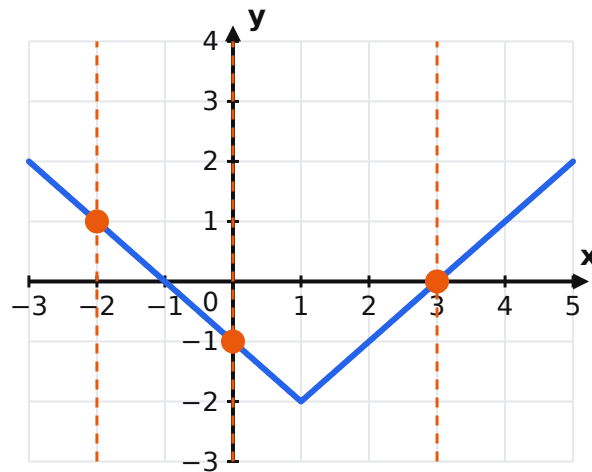


The vertical line $x=1$ meets the curve at $(1,2)$ and $(1,-2)$.

Not a function.

Problem 6: Vertical line test: V shape

Every vertical line meets the V-shaped graph in exactly one point.



Each vertical line meets the V-shaped graph exactly once.

It is a function.

Problem 7: Evaluate a linear function

$$f(4) = 3(4) - 5 = 12 - 5 = 7$$

$$f(-2) = 3(-2) - 5 = -6 - 5 = -11$$

$$f(0) = 3(0) - 5 = -5$$

$$f(4) = 7, f(-2) = -11, f(0) = -5$$

Problem 8: Evaluate a quadratic function

$$g(3) = 9 + 6 - 8 = 7$$

$$g(-4) = (-4)^2 + 2(-4) - 8 = 16 - 8 - 8 = 0$$

$$g(0) = 0 + 0 - 8 = -8$$

$$g(3) = 7, g(-4) = 0, g(0) = -8$$

Problem 9: Evaluate an absolute value function

$$h(1) = |1 - 4| + 3 = |-3| + 3 = 3 + 3 = 6$$

$$h(4) = |0| + 3 = 3$$

$$h(9) = |5| + 3 = 8$$

$$h(1) = 6, h(4) = 3, h(9) = 8$$

Problem 10: Negative and fractional inputs

$$k(-3) = -2(9) + 5(-3) = -18 - 15 = -33. \text{ Square first: } (-3)^2 = 9.$$

$$k\left(\frac{1}{2}\right) = -2 \cdot \frac{1}{4} + \frac{5}{2} = -\frac{1}{2} + \frac{5}{2} = 2$$

$$k(-3) = -33 \text{ and } k\left(\frac{1}{2}\right) = 2$$

Problem 11: Find the input

$$2x + 7 = 19, \text{ so } 2x = 12 \text{ and } x = 6. \text{ Check: } 2(6) + 7 = 19.$$

$$2x + 7 = -5, \text{ so } 2x = -12 \text{ and } x = -6. \text{ Check: } 2(-6) + 7 = -5.$$

$$x = 6 \text{ and } x = -6$$

Problem 12: Read a function table

Find the column with $x = 2$: the output is 0, so $f(2) = 0$.

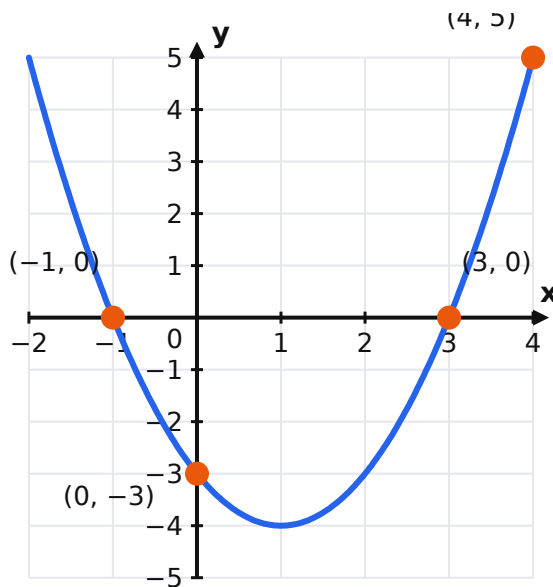
The column $x = -1$ has output 3, so $f(-1) = 3$.

Outputs equal to 3 appear for $x = -1$ and $x = 3$.

$$f(2) = 0, f(-1) = 3, \text{ and } x = -1 \text{ or } x = 3$$

Problem 13: Read a function graph

At $x=0$ the graph is at $y=-3$. At $x=4$ it is at $y=5$. The graph touches the x -axis at $x=-1$ and $x=3$.



The graph of $f(x) = x^2 - 2x - 3$.

$f(0) = -3$, $f(4) = 5$, and $x = -1$ or $x = 3$

Problem 14: Input with a variable

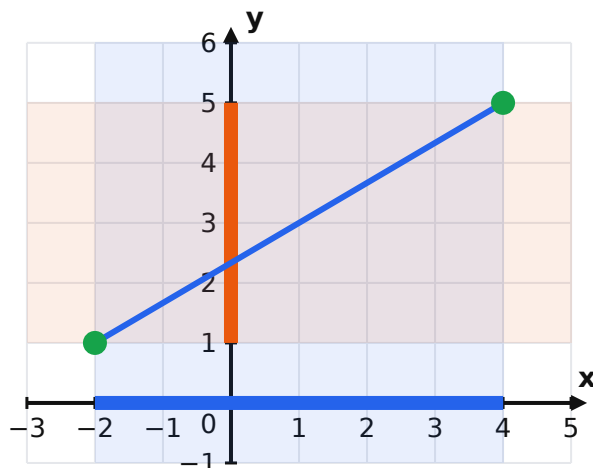
$$f(a+1) = 3(a+1) - 2 = 3a + 3 - 2 = 3a + 1$$

$$f(2a) = 3(2a) - 2 = 6a - 2$$

$$f(a+1) = 3a + 1 \text{ and } f(2a) = 6a - 2$$

Problem 15: Domain and range of a segment

The graph runs from $x = -2$ to $x = 4$, and both endpoints are closed. It runs from $y = 1$ to $y = 5$.

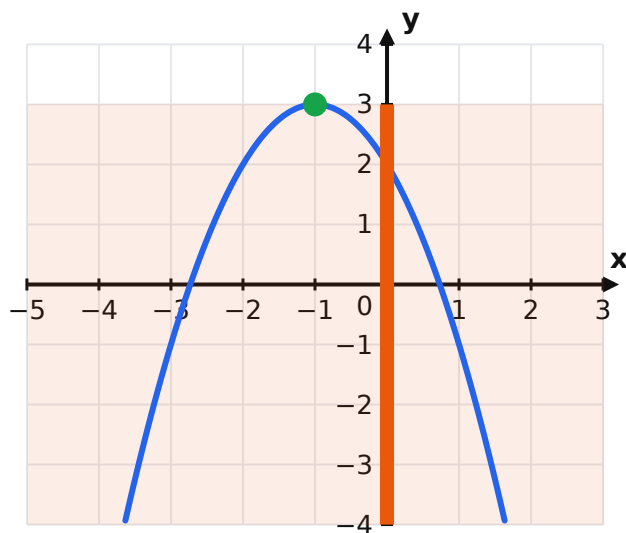


Domain $-2 \leq x \leq 4$ (blue). Range $1 \leq y \leq 5$ (orange).

Domain: $-2 \leq x \leq 4$. **Range:** $1 \leq y \leq 5$.

Problem 16: Domain and range of a parabola

The graph extends left and right without end, so every real number is an input. The highest point is the vertex $(-1, 3)$ and the graph goes down forever.



The highest point is $(-1, 3)$, so every y -value is 3 or less.

Domain: all real numbers. **Range:** $y \leq 3$.

Problem 17: Cupcake sale (discrete)

Only whole numbers of cupcakes make sense: the domain is $\{1, 2, 3, 4, 5, 6\}$. Then $C(n) = 3n$ gives 3, 6, 9, 12, 15, 18.

Domain: $\{1,2,3,4,5,6\}$. **Range:** $\{3,6,9,12,15,18\}$ **dollars. Discrete.**

Problem 18: Birthday relation

Each student has exactly one birthday, so every input (student) has one output (date):
students to birthdays is a function.

Two students in the same class can share a birthday. Then one date would be paired with two students, so **birthdays to students is not a function.**

Problem 19: Plumber charges

The input 3 is hours and the output 115 is dollars. So a 3-hour job costs \$115. Check:
 $25(3)+40=115$.

$$C(2.5)=25(2.5)+40=62.5+40=102.5$$

A 3-hour job costs \$115; $C(2.5)=\$102.50$.

Problem 20: Height of a tossed ball

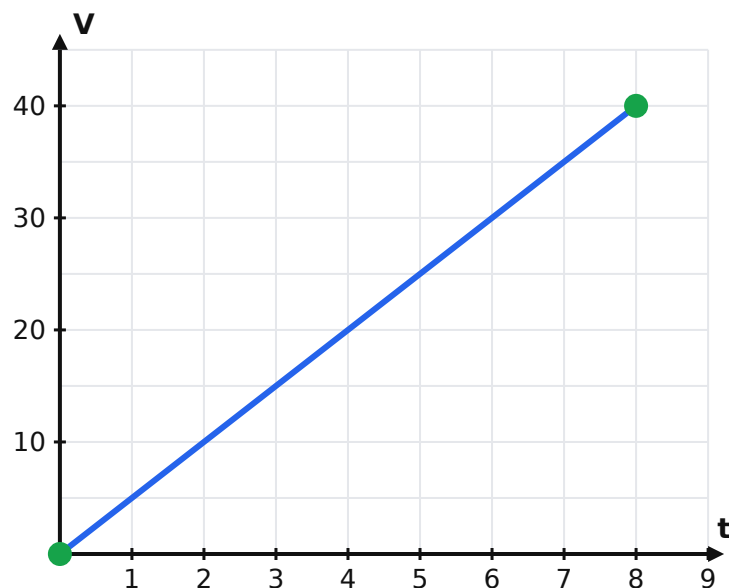
Check: $h(2)=-16(4)+48(2)+4=-64+96+4=36$. It means that 2 seconds after the toss, the ball is 36 feet high.

$$h(1.5)=-16(2.25)+48(1.5)+4=-36+72+4=40$$

At 2 seconds the ball is 36 ft high; $h(1.5)=40$ ft.

Problem 21: Filling a tank (continuous)

The tank is full when $5t=40$, so $t=8$ minutes. Time can be any value from 0 to 8, and the volume can be any value from 0 to 40.



Gallons in the tank after t minutes: a connected segment.

Domain: $0 \leq t \leq 8$. **Range:** $0 \leq V \leq 40$. **Continuous.**

Problem 22: Taxi fare

$F(6) = 2.50 + 1.75(6) = 2.50 + 10.50 = 13$, so a 6-mile ride costs \$13.00.

Solve $2.50 + 1.75m = 20$: $1.75m = 17.50$, so $m = 10$.

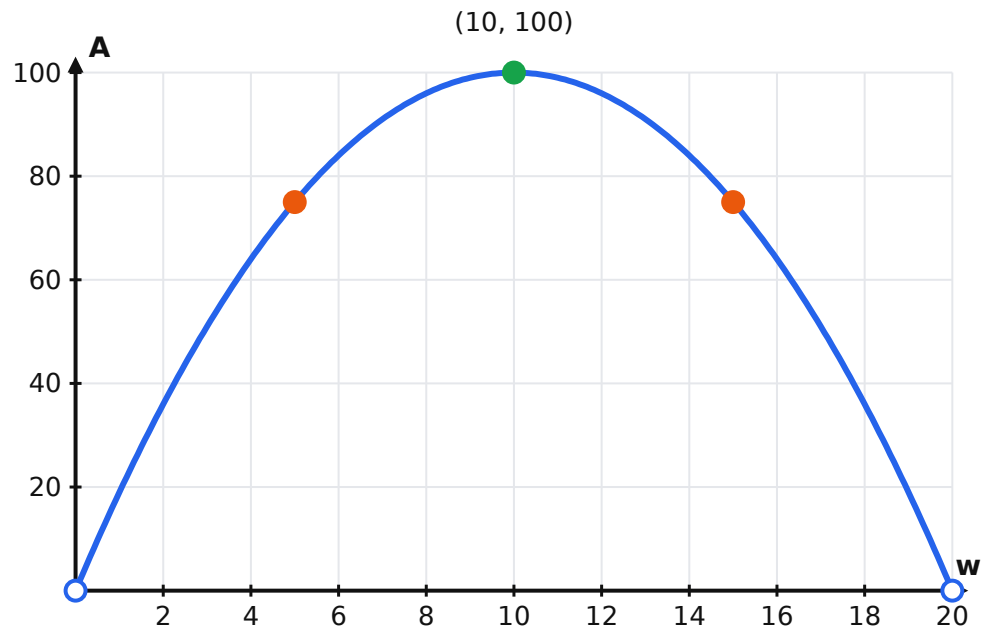
$F(6) = \$13.00$; a \$20.00 ride is 10 miles.

Problem 23: Garden area

$A(8) = 8(12) = 96$.

Test widths: $A(5) = 5(15) = 75$ and $A(15) = 15(5) = 75$, so $w = 5$ or $w = 15$.

Both width and length must be positive, so $0 < w < 20$. The area is largest at $w = 10$: $A(10) = 100$.
The area is always positive, so $0 < A \leq 100$.



Area of the garden for each width. The highest point is (10,100) .

$A(8) = 96 \text{ ft}^2$; $w = 5 \text{ or } 15 \text{ ft}$; **domain** $0 < w < 20$; **range** $0 < A \leq 100$.