

Grade 8 · Introduction to Functions · Worksheet Answer Key

Common Core 8.F.A.1, 8.F.A.2, 8.F.A.3 · mathovore.fr

Every solution shows the reasoning, not only the result. Final answers are in bold. If your answer differs, recheck whether any input has two outputs, then recompute each output from the rule step by step before looking at the rate of change.

Grade 8 Common Core: 8.F.A.1 · 8.F.A.2 · 8.F.A.3

Problem 1: Function machine

$$3(1)+2=5, 3(2)+2=8, 3(3)+2=11, 3(4)+2=14.$$

The outputs are **5, 8, 11 and 14**.

x	y
1	5
2	8
3	11
4	14

The completed input-output table.

Problem 2: Mapping diagram

Each input has exactly one arrow: 1 goes to 4, 2 goes to 5, and 3 goes to 6.

Yes, it is a function. The rule is $y = x + 3$.

Problem 3: Two arrows from one input

The input 2 has two arrows, to 3 and to 6. One input has two outputs.

No, it is not a function. (The outputs 9 for both 5 and 7 would be fine by themselves.)

Problem 4: Repeated input in a table

The input 2 appears twice, with outputs 6 and 7.

One input has two different outputs, so **the relation is not a function**.

Problem 5: Same output every time

Every input has exactly one output, which is 5. Different inputs sharing an output is allowed.

Yes, it is a function (the equation is $y = 5$).

Problem 6: Ordered pairs

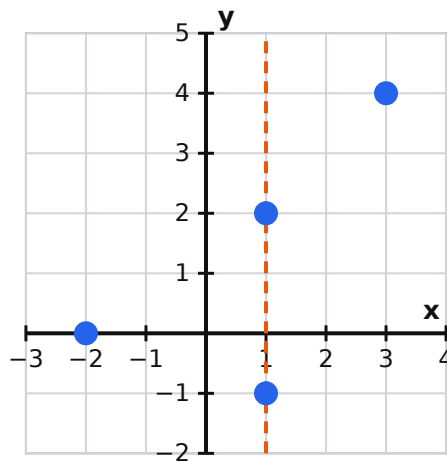
The inputs 1, 2, 3, 4 are all different, so each has one output.

Each output is double its input: **yes, a function with rule** $y = 2x$.

Problem 7: Points on a graph

The points $(1,2)$ and $(1,-1)$ have the same input 1 but different outputs 2 and -1 .

A vertical line at $x=1$ touches two points, so **it is not a function**.



A vertical line through $x=1$ hits two points.

Problem 8: Evaluate a function

$$f(-3) = -2(-3) + 7 = 6 + 7 = 13.$$

$$f(0) = -2(0) + 7 = 7.$$

$$f(4) = -2(4) + 7 = -8 + 7 = -1.$$

The values are **13, 7 and -1** .

Problem 9: Write the rule

The outputs rise by 3 each time, so the rate of change is 3: $y = 3x + b$.

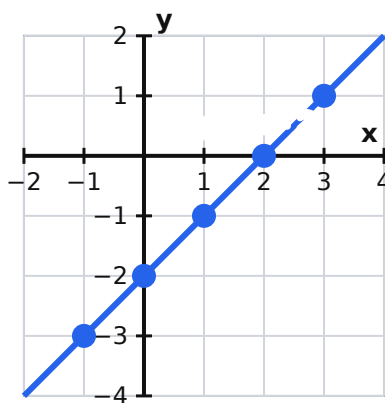
When $x = 1$, $3(1) + b = 7$, so $b = 4$.

$y = 3x + 4$. Check: $3(4) + 4 = 16$.

Problem 10: Graph a function

$x = -1: y = -3$. $x = 0: y = -2$. $x = 1: y = -1$. $x = 2: y = 0$. $x = 3: y = 1$.

The points $(-1, -3), (0, -2), (1, -1), (2, 0), (3, 1)$ lie on a **straight line**, so the function is linear.



The graph of $y = x - 2$.

Problem 11: Linear form

The equation has the form $y = mx + b$ with $m = 4$ and $b = -1$.

Yes, it is linear: the rate of change is 4 and the graph crosses the y-axis at -1 .

Problem 12: Area of a square

Areas: $1^2 = 1$, $2^2 = 4$, $3^2 = 9$, $4^2 = 16$.

As the side grows by 1, the area grows by 3, 5 and 7. The change is not constant.

The function is nonlinear.

Problem 13: Linear or nonlinear tables

- The outputs rise by 3 each time: **linear**, $y = 3x + 2$.
- The outputs rise by 3, 5, 7: **nonlinear**, since the rate is not constant.

Problem 14: Which are linear?

$y=5x$ has the form $y=mx+b$ with $b=0$. $y=7-x$ is $y=-x+7$.

x^2 and $\frac{2}{x}$ make the graph curve.

$y=5x$ and $y=7-x$ are linear.

Problem 15: Slope and starting value

Rate of change $m=-\frac{1}{2}$; initial value $b=6$.

$$y=-\frac{1}{2}(4)+6=-2+6=4.$$

Rate $-\frac{1}{2}$, initial value 6, output 4.

Problem 16: Equation versus table

Function A: rate 2, initial value 3.

Function B: the outputs rise by 4 each time, so rate 4, and the output at $x=0$ is 1, so initial value 1.

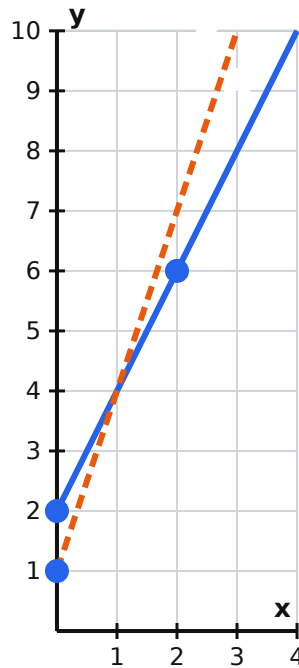
B has the greater rate (4 versus 2); A has the greater initial value (3 versus 1).

Problem 17: Graph versus equation

Function A: rate $\frac{6-2}{2-0}=2$, initial value 2.

Function B: rate 3, initial value 1.

B has the greater rate (3 versus 2); A starts higher (2 versus 1).



Function B (dashed) rises faster than function A.

Problem 18: Car rental

The cost rises by \$35 each day, so $C = 35d + b$. For $d = 1$, $35 + b = 55$, so $b = 20$.

Rule: $C = 35d + 20$. For 6 days: $35(6) + 20 = 230$.

$C = 35d + 20$; the cost for 6 days is \$230.

Problem 19: Comparing savings

Maya saves \$6 per week. Jamal's amount rises by \$5 per week, so his rule is $J = 40 + 5w$.

After 10 weeks: Maya $12 + 6(10) = 72$ dollars; Jamal $40 + 5(10) = 90$ dollars.

Maya saves faster (\$6 versus \$5 per week), but Jamal has more after 10 weeks (\$90 versus \$72).

Problem 20: Garden square

Areas: 9, 25, 64 square feet. Perimeters: 12, 20, 32 feet.

From $s = 3$ to $s = 6$: area goes from 9 to 36 (four times as large); perimeter goes from 12 to 24 (twice as large).

The perimeter function $P = 4s$ is linear; $A = s^2$ is nonlinear.

Problem 21: Homeroom function

Student to room: each student has exactly one room, so **it is a function**.

Room to student: room 12 goes to both Maya and Sofia, so one input has two outputs. **It is not a function**.

Problem 22: Temperature conversion

$$1.8(0)+32=32; 1.8(10)+32=50; 1.8(25)+32=77; 1.8(100)+32=212.$$

The rule has the form $y=mx+b$ with $m=1.8$ and $b=32$.

The values are 32, 50, 77 and 212 degrees Fahrenheit; the function is linear.

Problem 23: Falling object

$$h(0)=100; h(1)=100-16=84; h(2)=100-64=36.$$

The height drops by 16 in the first second and by 48 in the next. Equal time steps give unequal changes.

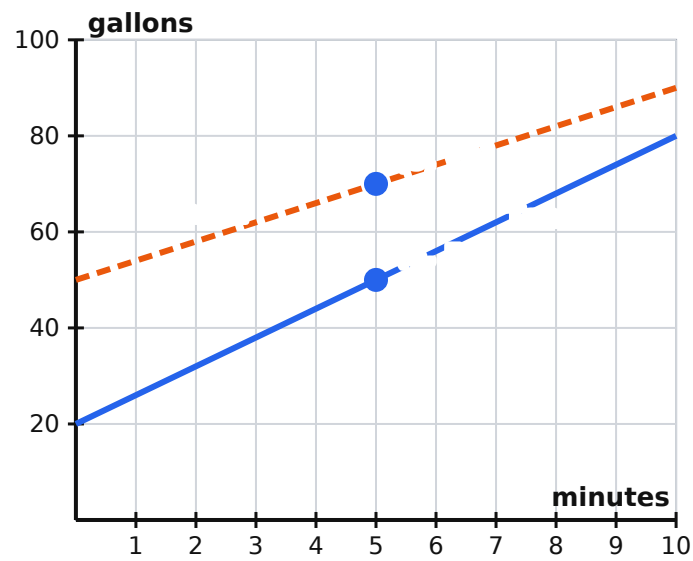
Heights 100, 84 and 36 feet; the function is nonlinear.

Problem 24: Two tanks

Tank A at 5 minutes: $50+4(5)=70$ gallons.

Tank B: rate $\frac{80-20}{10}=6$ gallons per minute, so $V=20+6t$; at 5 minutes $20+6(5)=50$ gallons.

Tank A has more at 5 minutes (70 versus 50 gallons); tank B fills faster (6 versus 4 gallons per minute).



Points at 5 minutes: 70 gallons (A) and 50 gallons (B).