

Line Check

Decide which functions have a constant rate of change.

GRADE 8 • MA.8.F.1.2

MA.8.F.1.2 "Given a function defined by a graph or an equation, determine whether the function is a linear function. Given an input-output table, determine whether it could represent a linear function."

NAME _____

DATE _____

SPOT A LINEAR FUNCTION

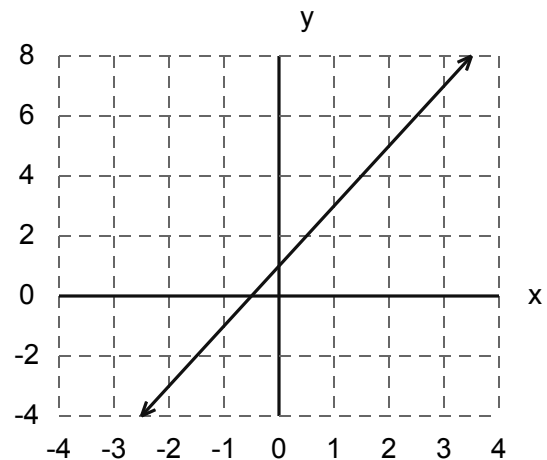
A linear function has a constant rate of change and a straight-line graph; it can be written $y = mx + b$, including $m = 0$. In a table, divide each change in y by its matching change in x . Repeated inputs with different outputs do not define a function. Even when a table could be linear, its finite samples do not prove what happens between them.

WORKED EXAMPLE

The graph represents $y = 2x + 1$. Is this a linear function?

1. The graph is a straight line.
2. Its rise is 2 for each run of 1, everywhere on the line.
3. The equation has the form $y = mx + b$.

Answer: Yes. Its constant slope is 2.



PRACTICE 6 problems

1 Is $y = -2x + 7$ linear? Give a reason.

ANSWER _____

2 Is $y = x^2 + 2$ linear? Give a reason.

ANSWER _____

- 3** Could the table represent a linear function?
Compare rates, not just changes in y .

ANSWER _____

INPUT-OUTPUT PAIRS

x	y
0	1
2	5
5	11

- 4** Does this table define a function? Could it represent a linear function? Explain.

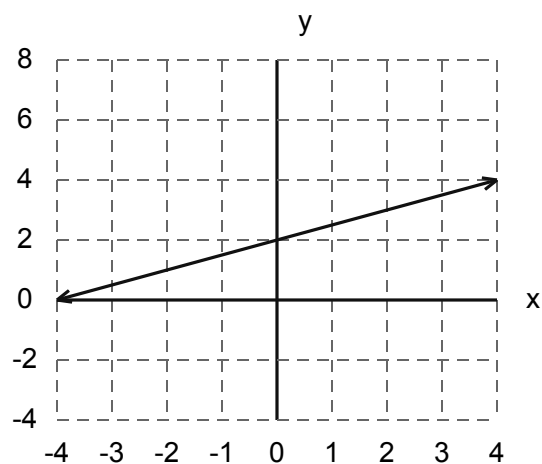
ANSWER _____

INPUT-OUTPUT PAIRS

x	y
-2	8
0	6
0	9
5	1

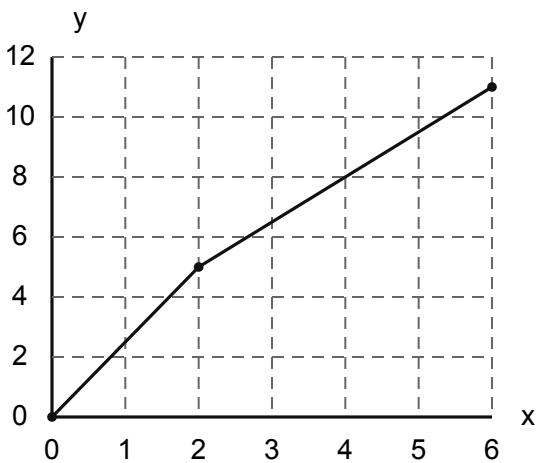
- 5** The entire function graph is shown. Is it linear?
Explain.

ANSWER _____



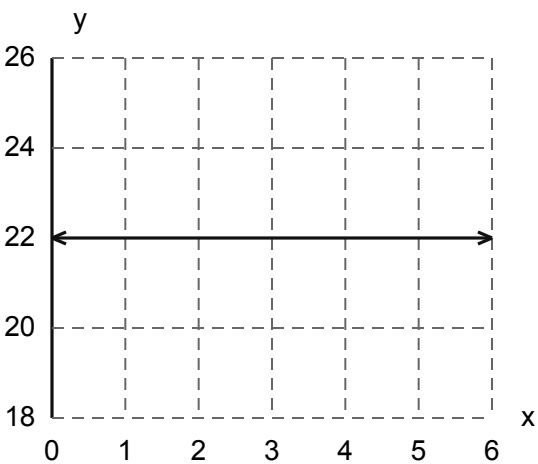
6 The entire function graph is shown as two connected segments. Is it linear? Compare the rates.

ANSWER _____



APPLY IT Show your work

1 A thermostat model is $T = 22$, where T is temperature in $^{\circ}\text{C}$ and x is elapsed hours. Is T a linear function of x ? Explain what its rate means.



2 A tablet battery is recorded during a trip. Could the table represent a linear function of time? Show the rate over each interval.

BATTERY DURING A TRIP	
Hours	Battery %
0	100
2	84
5	66
7	50

CHALLENGE One step up

Could the table represent a linear function? If yes, does the table prove that the actual function **MUST** be linear between the listed inputs? Explain both answers.

SAMPLED INPUTS AND OUTPUTS

x	y
-5	-9
-1	-1
2	5
8	17

WORK SPACE AND ANSWER

Require reasons from the given representation. Constant functions are linear with zero slope. Unequal input gaps require ratios. Distinguish a table that could fit a line, a table that cannot be linear, and a repeated-input table that is not a function. All displayed graph tasks specify their complete function graph.

PRACTICE 1

Yes. It has constant slope -2 and the form $y = mx + b$.

PRACTICE 2

No. The squared term gives a changing rate; for example, y changes by 1 then 3 as x goes 0,1,2.

PRACTICE 3

Yes. Rates are $(5-1)/(2-0) = 2$ and $(11-5)/(5-2) = 2$.

PRACTICE 4

No to both: input 0 has two different outputs, 6 and 9.

PRACTICE 5

Yes. It is one straight line, with constant slope $1/2$.

PRACTICE 6

No. The rates are $5/2$ and $(11-5)/(6-2) = 3/2$; they differ.

APPLY IT 1

Yes. $T = 0x + 22$ has slope 0; temperature remains constant.
Zero change per hour is still a constant rate.

APPLY IT 2

No. The rates are -8 , -6 and -8 percentage points per hour, so they are not constant.
Divide each percentage change by its corresponding time change.

CHALLENGE

It could: every interval has rate 2. But no: a finite table does not show values between the sampled inputs; a nonlinear function could agree at those inputs.