

Relations and Functions: math practice, Grade 9 – download the PDF

22 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Domain and range of a relation

★ ★ ★

Let $R = \{(-3, 2), (0, 5), (4, 5), (7, -1)\}$. List the domain and the range of R .

2 Function or not?

★ ★ ★

Decide whether each relation is a function. Explain.

a. $A = \{(1, 3), (2, 5), (3, 7)\}$

b. $B = \{(0, 4), (0, 6), (1, 8)\}$

c. $C = \{(2, 1), (4, 1), (6, 1)\}$

3 Evaluate a linear function

★ ★ ★

Let $f(x) = 4x + 3$. Find $f(2)$, $f(0)$, and $f(-3)$.

4 Complete a table



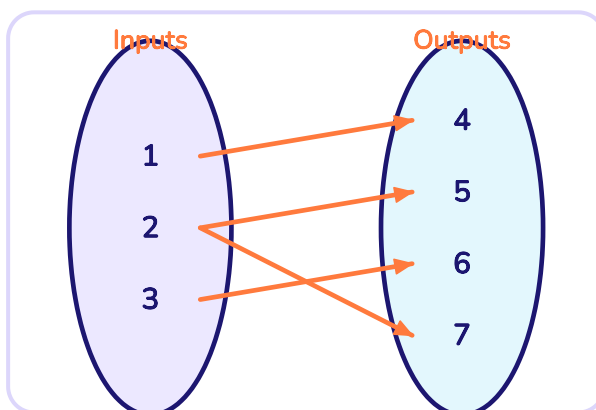
Complete the table for $h(x) = x - 7$.

x	-2	0	5	10
$h(x)$	?	?	?	?

5 Read a mapping diagram



The diagram shows a relation from inputs to outputs.



- Write the relation as ordered pairs.
- Give its domain and range.
- Is it a function?

6 Taxi fare



A taxi charges a flat fee of 3 dollars plus 2 dollars per mile. Write a function $f(m)$ for the fare of a trip of m miles, and find the fare for 6 miles.

7 Next terms of a sequence

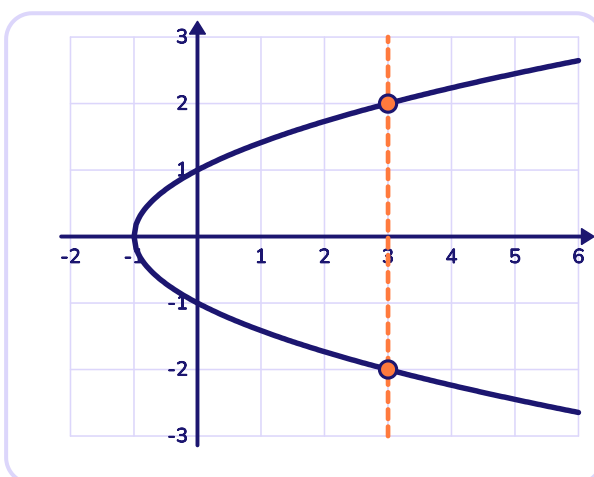


Consider the sequence $7, 12, 17, \dots$. Find the common difference, the next three terms, and the explicit rule a_n .

8 Vertical line test on a graph



The graph below is a sideways parabola.



Does it pass the vertical line test? Is it the graph of a function? Name the two outputs for $x = 3$.

9 Evaluating a quadratic



Let $g(x) = x^2 - 4x + 1$. Find $g(0)$, $g(3)$, $g(-1)$, and $g(5)$.

10 Solve $f(x) = k$



Let $f(x) = 3x - 5$. Find x when (a) $f(x) = 19$, (b) $f(x) = -8$, (c) $f(x) = 0$.

11 Domain and range from a table



A scientist records the values below.

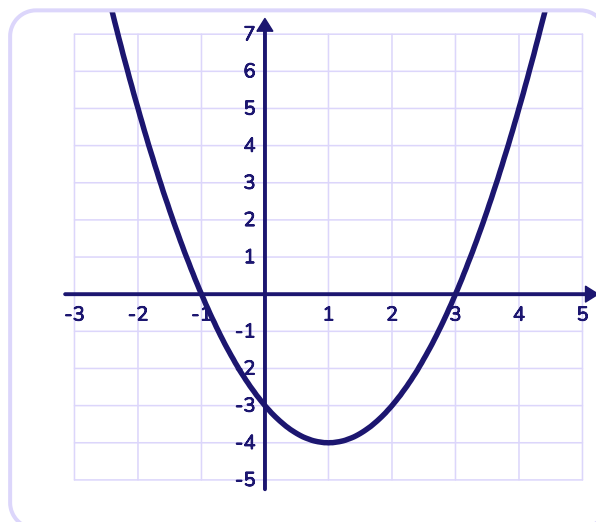
x	0	1	2	3	4
y	6	6	3	3	0

Is y a function of x ? Give the domain and the range.

12 Reading a graph



The graph shows a function f .



Read: (a) $f(0)$, (b) $f(1)$, (c) the x -values where $f(x) = 0$, (d) the x -values where $f(x) = 5$.

13 Find the rule from a table

A linear function f has this table.

x	1	2	3	4
$f(x)$	7	10	13	16

Write the rule $f(x)$, then find $f(20)$.

14 Saving money

Mia saves 15 dollars in week 1 and adds 6 dollars more each week, so her weekly deposits form an arithmetic sequence. Write a_n , find the deposit in week 12, and find the first week when her deposit is above 100 dollars.

15 Temperature function

The function $F(c) = 1.8c + 32$ converts degrees Celsius to degrees Fahrenheit. Find $F(0)$, $F(100)$, $F(-40)$, and the Celsius temperature that gives 50°F .

16 True or false?

True or false? Justify each answer with a short reason or a counterexample.

- Every function is a relation.
- Every relation is a function.
- In a function, two different inputs can never have the same output.
- The graph of $x = 4$ is the graph of a function.
- The graph of $y = 7$ is the graph of a function.

17 Evaluating with expressions

★★★

Let $f(x) = 2x - 3$. Simplify (a) $f(a + 1)$, (b) $f(2x)$, (c) $f(x) + f(1)$. Is $f(x + 1)$ equal to $f(x) + f(1)$?

18 Fencing a garden

★★★

A rectangular garden has a perimeter of 40 feet and a width of w feet. Its length is $20 - w$ feet.

- Write the area as a function $A(w)$.
- Find $A(5)$, $A(10)$, $A(15)$.
- Give a reasonable domain, and explain why $0 < A(w) \leq 100$.

19 Two sequences race

★★★

Sequence a starts at 3 and adds 7 each step. Sequence b starts at 40 and subtracts 5 each step.

- Write a_n and b_n .
- Compare a_4 with b_4 , and a_5 with b_5 .
- Is there a position n where $a_n = b_n$?

20 Find the missing constant

★★★

The function $f(x) = ax + 5$ satisfies $f(3) = 14$. Find a , then compute $f(-4)$.

21 Far terms of a sequence

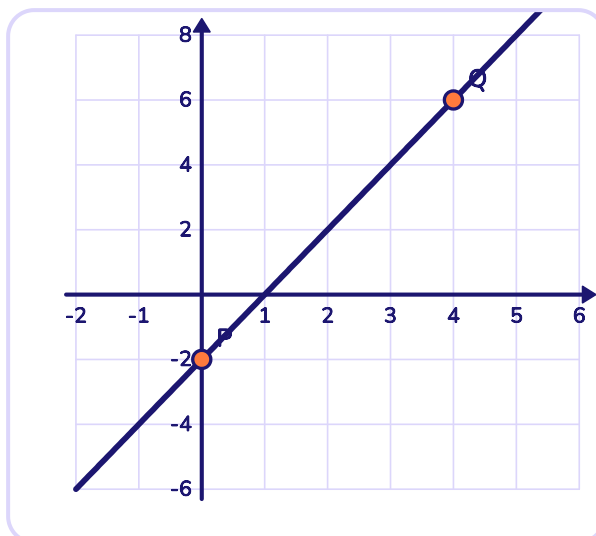
★★★

An arithmetic sequence has $a_4 = 17$ and $a_9 = 42$. Find d , a_1 , and a_n . Then find a_{50} and decide whether 500 or 502 is a term.

22 Rule from a graph



The line shown is the graph of a linear function f through $P(0, -2)$ and $Q(4, 6)$.



Find the slope, the rule $f(x)$, the value $f(10)$, and the input for which $f(x) = -10$.



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