How do you determine if a relation is a function?

Relation

any set of ordered pairs

ex: (1,2) (2,3) (3,4) (3,5)

Function

a relation where every input has exactly one output

X cannot repeat!

ex: (1,2)(2,3)(3,4)(4,5)

not a function

ways to represent relations

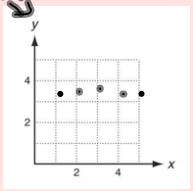
Ordered pairs

{(5, 3), (4, 3), (3, 3), (2, 3), (1, 3)}

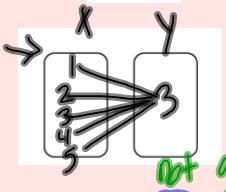
Table →

x	y
1	3
2	3
3	3
4	3
5	3

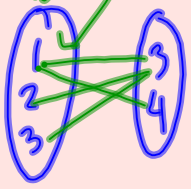
graph



mapping diagram



not a function



Words for x & y

x	y
input	output
independent variable	dependent variable
	f(x)

Domain: the set of all x-values

Range: the set of all y-values

Vertical Line Test

easy way to see if a graph is a function

only 1 once

Function ① Function ② NOT function ③

State the domain and range of each relation, interpret in context, and explain if it is a function or not.

6. The relation represents the age of each student and the number of pets the student has.

Age	Number of Pets
6	3
8	2
9	0
11	1
11	2

① ②

D: {6,8,9,11} → the ages of students

R: {0,1,2,3} → the number of pets

(it repeat

③ No, input of 11 has 2 outputs

What is function notation?

f(x) = y "a function of x"--just another way of representing the output

EX: if f(x) = 2x + 3

If given input:	*if given output:*
What is f(-1)?	What is x if f(x) = 7?
f(-1) = 2 (-1) + 3 *(plug in!)*	7= 2x + 3 *(solve for x!)*
f(-1) = 1	f(2) = 7

7=2x+3
-3 -3
4=2x
2 2
x=2

"y per x"

Keep this in mind when trying to identify the independent and dependent variable

For each example identify the independent and dependent variables. Write an equation in function notation for each situation. Then use the equation to solve the problem.

4. Kate earns $7.50 per hour. How much money will she earn after working 8 hours?

x=8

x → hours (time)
y → dollars (earnings)
↓
f(x)

f(x)=7.50x
f(8)=7.50(8)
f(8)=60

Kate would earn $60 in 8 hours

"Reasonable" Domain & Range

What type of numbers would make sense for x & y?

ex: -can't usually use negatives
-does it need to be whole numbers?
- plug in the domain to find the range OR vice versa!!

Write a function in function notation for each situation. Find a reasonable domain and range for each function.

5. The temperature early in the morning is 17 °C. The temperature increases by 2 °C for every hour for the next 5 hours. Write a function for the temperature in degrees Celsius.

F(x)=17+2x
F(0)=17+2(0)
F(5)=17+2(5)

Domain: 0≤x≤5
Range: 17≤y≤27

6. Takumi earns $8.50 per hour proofreading advertisements at a local newspaper. He works no more than 5 hours a day. Write a function for his earnings.

What information do you need to graph a function?

To graph any function:

Create a table of values--plug in x- values to find y

**Think about what type of numbers would make sense and give you a clear picture*

ex: if it is f(x) = (1/2)x + 3, plug in multiples of 2

Discrete VS Continuous

discrete= set of unconnected points

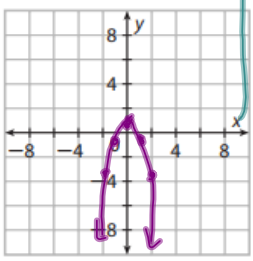
continuous= one line/curve

*Pay careful attention to your intervals!

Examples:

Graph each function.

4. $y = -x^2$

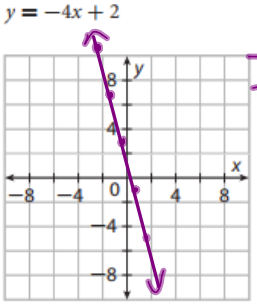


x	$-x^2$	(x,y)
-2	-4	(-2,4)
-1	-1	(-1,-1)
0	0	(0,0)
1	-1	(1,-1)
2	-4	(2,-4)

How'd I get these y values? I plugged in the numbers for X and simplified!

$-(-2)^2 - (4)$

5. $y = -4x + 2$



$-4(-2) + 2$

x	$-4x+2$	(x,y)
-2	10	(-2,10)
-1	6	(-1,6)
0	2	(0,2)
1	-2	(1,-2)
2	-6	(2,-6)

How can you write a rule to describe a sequence?

Sequence — a list of numbers in a specific order

Term — each element in a sequence

Arithmetic Sequences

sequences with a common **difference**--a number being added each time

→ to find, subtract the previous term from the next term

General Recursive Rule	General Explicit Rule
Given $f(1), f(n) = f(n-1) + d$ for $n \geq 2$	$f(n) = f(1) + d(n-1)$

Explicit Rule

→ used to find any term, just plug in for n

first term ↑ difference ↑

$f(n) = f(1) + d(n-1)$ OR $f(n+1) = f(1) + d$ PLUG IN

Your Turn

6. Write the first 4 terms of the sequence defined by the explicit rule. $f(n) = n^2 - 5$

7. Find the 15th term of the sequence defined by the explicit rule. $f(n) = 4n - 3$.

$f(1) = 1^2 - 5 = 1 - 5 = -4$
$f(2) = 2^2 - 5 = 4 - 5 = -1$
$f(3) = 3^2 - 5 = 9 - 5 = 4$
$f(4) = 4^2 - 5 = 16 - 5 = 11$

-4, -1, 4, 11

Recursive Rule

→ uses the previous term to find the next term

$f(1) = f(1)$ *must state the first term*

$f(n) = f(n-1) + d$ OR $f(n+1) = f(n) + d$ USE PREVIOUS

↑ previous term

Write the first 5 terms of the sequence.

10. $f(1) = 35$ and $f(n) = f(n-1) - 2$ for each whole number n greater than 1.

11. $f(1) = 45$ and $f(n) = f(n-1) - 4$ for each whole number n greater than 1.

$f(1) = 35$
$f(2) = 35 - 2 = 33$
$f(3) = 33 - 2 = 31$
$f(4) = 31 - 2 = 29$
$f(5) = 29 - 2 = 27$

35, 33, 31, 29, 27