



**THIRD SPACE
LEARNING**

Math Intervention Pack

Identifying functions

Grade 8

How To Use This Resource

1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

2. Prior Learning

Use this slide to review the knowledge that will be required to be successful in this lesson. If students feel confident on the prior learning section of the Title Slide then this slide can be skipped

3. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

4. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

5. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

6. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

How To Use This Resource

7. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

8. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

Standard

8.F.A.1 - Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

Key Mathematical Ideas

1. Identifying that a function has one unique output for each input.
2. Identifying functions in table, equation, graph and description form.

Overview

Terminology

- **Function:** A rule that assigns to each input exactly one output.
- **Independent variable:** The input value in a function; the variable whose value determines the value of the dependent variable.
- **Dependent variable:** The output variable in a function; the variable whose value depends on the independent variable.

Sentence Stems

- This is a function, because...
- This is not a function, because...

Overview

Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Thinking that a function where there is the same y value for multiple x values is not a function.	Highlight that the definition indicates that each x value needs a specific y value, not the other way around.	When students categorize something as a function or not a function, always have them explain why.
Not recognizing a description as a function.	Make it clear that not all functions come in equation, graph or table form. Specifically highlight examples that cannot be represented by an equation, but explain why they are still functions.	When students categorize something as a function or not a function, always have them explain why.

Title Slide

If students...

- get both sections correct:
 - start at You do
- miss the learning goal section only:
 - start at Let's Learn
- miss the prior learning section:
 - start at Prior Learning

Prior Learning

If stuck

- To the side of the table, write each equation that shows how to get from the input to the output.
- a) 4
- Rule: $+4$
- b) 9
- c) $\div 2$
- d) 7

Let's Learn

If stuck

- Ask students for specific values in the function. For example, What is the serving size for an 8 year old? Do this repeatedly and emphasize that there is only one output for each, making it a function.

Questions

- a) Do any of the ages have more than one serving size? (No, each age has just one serving size.)
- b) If you read 5 books, how many points have you earned? (60 points.)
- b) Is it possible to read 5 books, but not have 60 points? (No, the only points for 5 books is 60.)
- c) About how many feet have been traveled in 9.5 minutes? (About 6.)
- c) Is there any point on the graph where the number of minutes has more than one value for feet traveled? (No.)
- d) If the 7% tax for \$20 is \$1.40, will all customers pay this? (Yes, this is the only 7% tax value for \$20.)

Let's Learn

Watch out for

- Students who think example a is not a function, because multiple ages have the same serving size.
- Students who think example c is not a function, because the entire line is not linear.

Answers

- a) age (group)
- b) 12 points
- c) Any number
- d) tax charged

Follow me

Modeling prompts

- Explain that the hours of sleep needed depend on the age, so age is the independent variable.
- In the table, check to see if each
- x has one unique y value and explain that it is a function.
- In the graph, check to see if each x has one unique y value and explain that it is not a function.

Answers

- a) ... is a function because the each independent variable (age) has a unique dependent variable (hours of sleep needed).
- b) ... is not a function because there are two dependent variables (height) for one independent variable (age of puppies)

Your turn

If stuck

- Use similar guidance given in the Modeling prompts.

Questions

- c) What are the units of x and y ? (x is quarts and y is gallons.)
- c) Does each x have one unique value for y ? (Yes.)
- d) Does each x have one unique value for y ? (No, no matter how you define the function, there is not a unique output for each input.)
- e) What is y when $x = 60$? (About 15 and 31.)
- e) Does each x have one unique value for y ? (No, there are parts on the graph of the graph where x has more than one output, like when $x = 60$.)

Watch out for

- Students who do not clearly explain that a function has one unique output for every input.

Answers

- c) ... is a function because one independent variable (quarts) has a unique dependent variable (gallons).
- d) ... is not a function because there are two dependent variables (y) for one independent variable (x)

You do

If stuck

- Use the Support slide for question 2c.

Questions

- 1a) Do any of the number of dogs have more than the membership cost? (No, each number of dogs has just one membership cost.)
- 1b) If you buy 2 liters, what is the cost? (\$6.40)
- 1b) Is it possible to buy 2 liters, but not pay \$6.40? (No, the only cost for 2 liters is \$6.40)
- 1d) How many minutes does it take to print 30 pages? (16 minutes.)
- 1d) Does each number of pages have one specific time for printing? (Yes.)
- 2a) Does each x have one unique value for y ? (Yes.)
- 2b) Is there any point on the graph where the days posted online has more than one value for the total views? (No.)

Watch out for

- Students who do not clearly explain that a function has one unique output for every input.

Answers

- 1. a) dog
- b) price
- c) time taken
- d) length of time
- 2. a) ... is a function because each value of x has a unique value of y .
- b) ... is a function as each minute has a unique number of feet traveled.
- c) ... is not a function as the output is not unique for each input. E.g. the square root of 9 is +3 or -3.

Go further

If stuck

- Remind students that they do not need to show a real world example, though they can. They can just use numbers to create the functions.

Questions

- What do all the functions have in common? (They all have unique outputs for every x .)
- What do all the “NOT a function”s have in common? (They all do not have unique outputs for every x .)

Watch out for

- Students who do not clearly explain that a function has one unique output for every input.

Answers

- Answers will vary.

Support for Slide(s)

Questions

- a) Why are there two outputs for each input? (The square root of a number can be positive or negative, since a negative times a negative is a positive product.)
- b) Why are there two
- y values for each x value on the graph? (The square root of a number can be positive or negative, since a negative times a negative is a positive product.)

Support for Slide(s)

Answers

• a)

input	output
1	1
1	-1
2	1.414213562...
2	-1.414213562...
3	1.732050808...
3	-1.732050808...

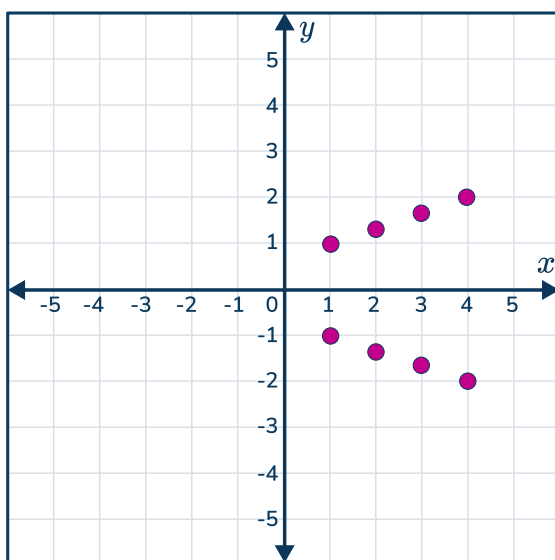
• b) \pm

• y is dependent

• x is independent

• unique output.

• c)



Check your Understanding

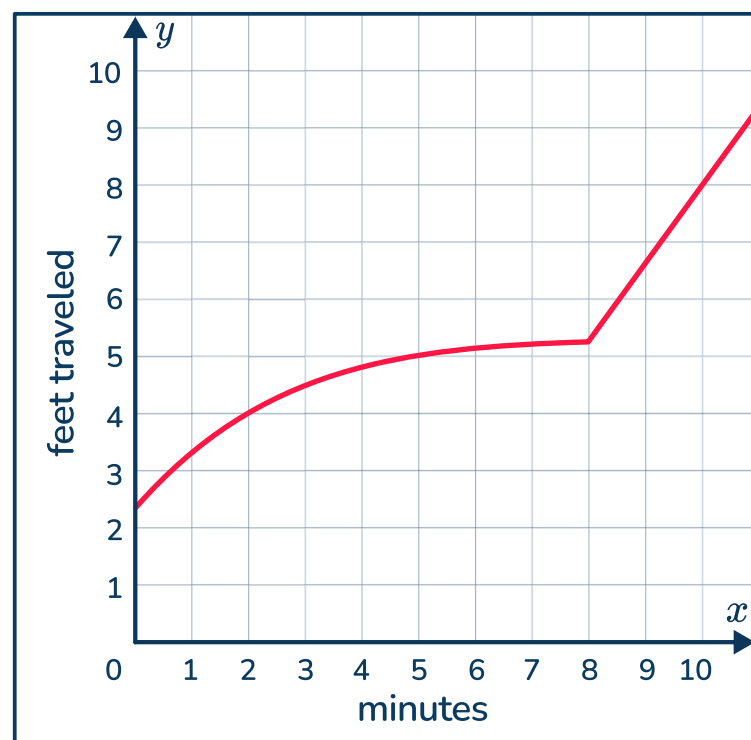
Correct answer:

Yes, because each input has one output

Today you will learn about

Identifying functions

Learning Goal



Decide whether the graph is a function and explain why.

Prior Learning

Find the missing value in the input/output table.

input	output
2	6
3	7
11	15
.....	13

Prior learning

Before we can identify functions, we need to understand **input/output tables**.

An input/output table has a rule that defines the relationship from input to output.

input	output
2	6
3	7
11	15
.....	13

The rule is true for all inputs and outputs, even those not shown on the table.

Let's practice.

input	output
6	3
10	5
14
8	4

a From input to output, is always being added.

Rule :

b Use the rule to complete the table.

c Rule :

d Use the rule to complete the table.

Let's learn

A function is a rule that assigns to each input exactly one output.

Functions can be represented in many ways. Let's look at a few examples and examine why they are functions.

a

Age (years)	Serving size (ounces)
1 - 4	5
5 - 10	7.5
11 - 14	10

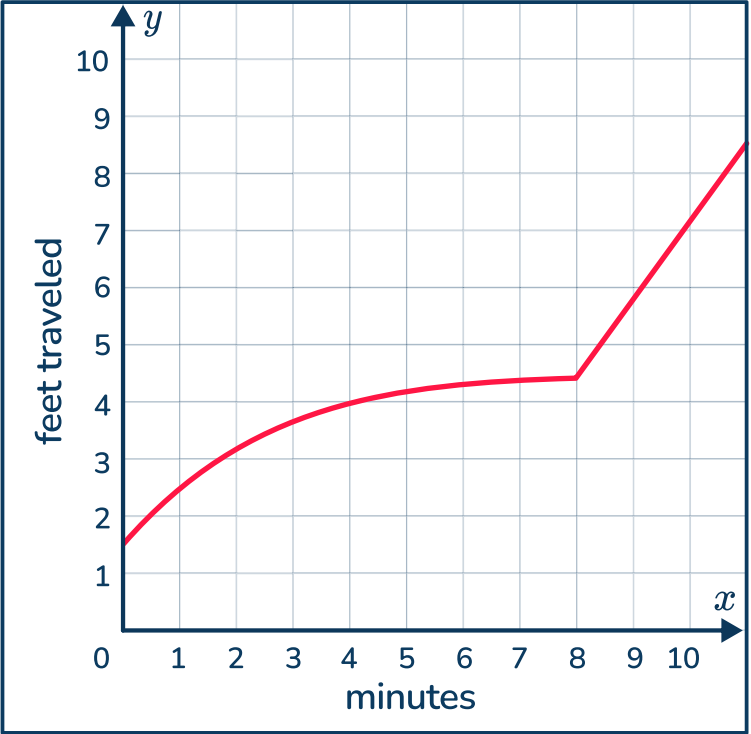
Each has exactly one serving size.

b

The equation $y = 12x$ calculates how many points are earned, given books read. The number of books read has exactly one amount of

.....

c



d

There is a 7% tax charged on the total of every purchase.

Each total, has exactly one amount of

The number

has exactly one value for feet traveled.

Follow me



Let's practice. Decide whether or not each is a function and explain why.

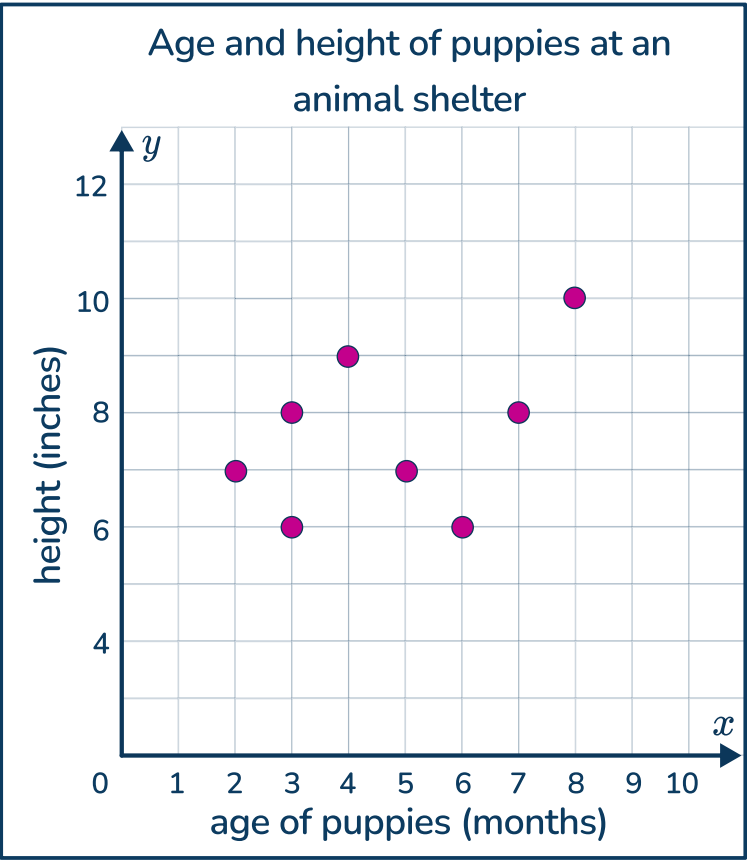
a

.....

Age (years)	14	28	44
Hours of sleep needed	11	7	7

b

.....



Your turn



c

.....

The equation $y = \frac{1}{4}x$ converts quarts to gallons.

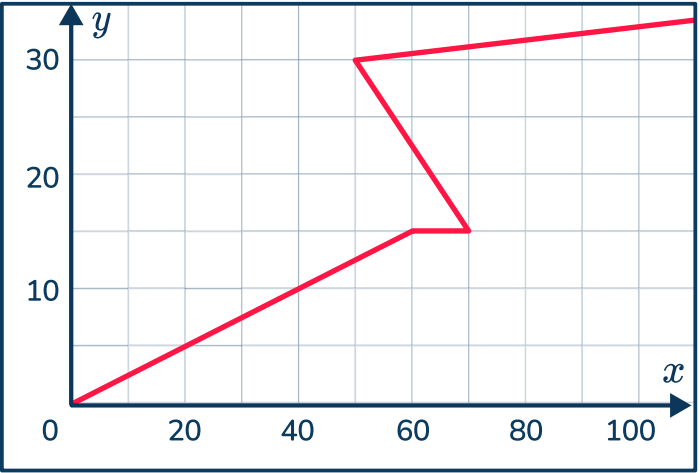
d

.....

Years of experience	5	10	5	7
Hourly pay rate	\$25	\$30	\$28	\$30

e

.....



1 Complete the statement to show why each is a function.

a

No. of dogs	Membership cost (\$)
1	25
2	35
3	40

Each has exactly one membership cost.

d

It takes a printer 8 minutes to print 15 pages.

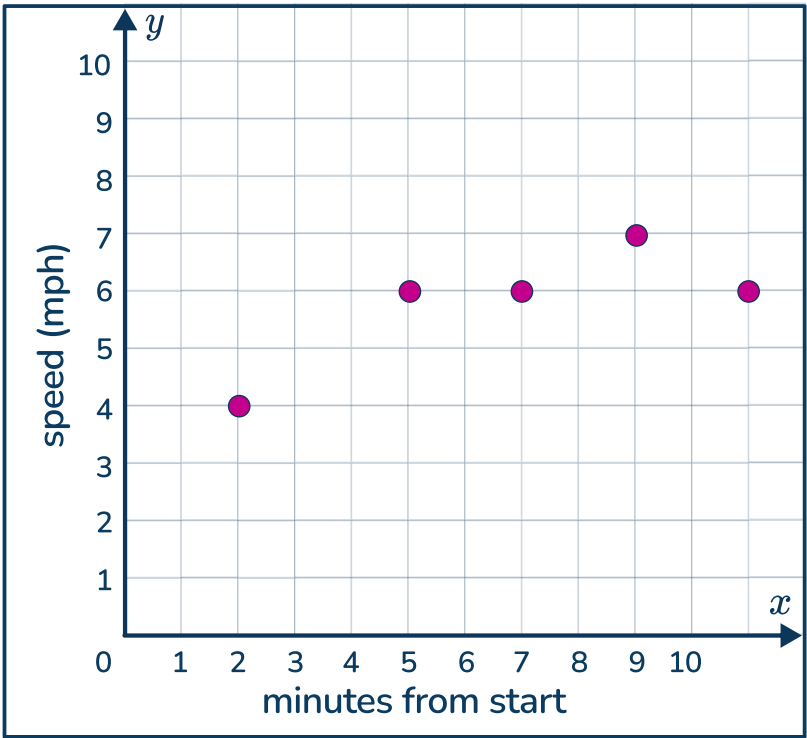
The total pages printed, has exactly one

b

The equation $y = 3.2x$ calculates the price per liter.

The number of liters bought has exactly one

c



The

has exactly one speed.

2 Decide whether or not each is a function and explain why.

a

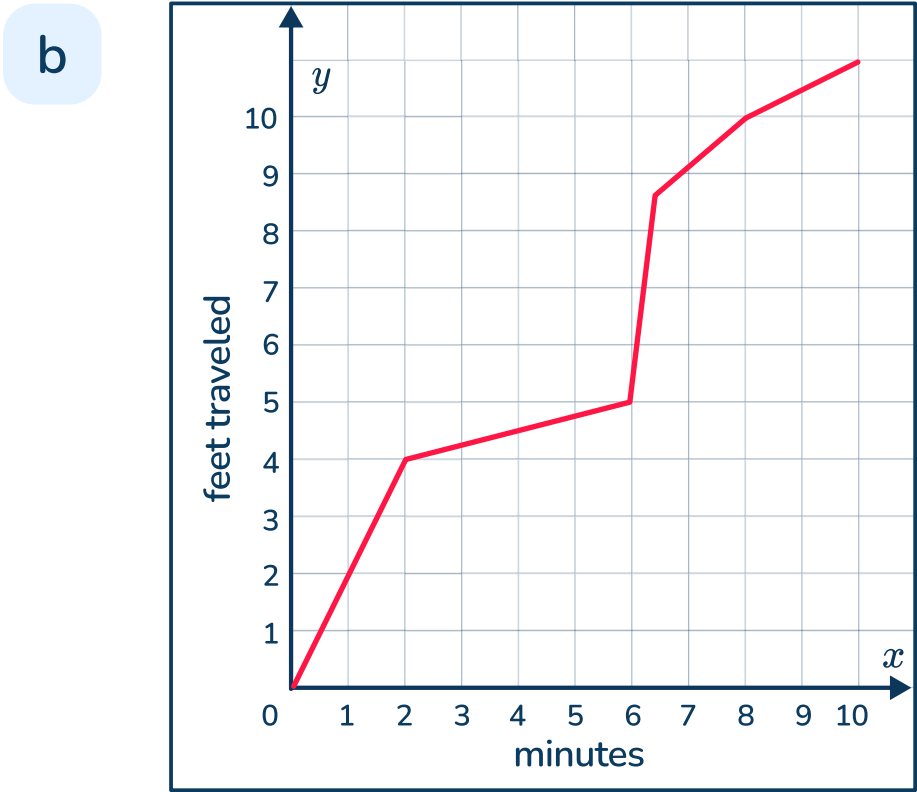
x	y
4	11
5	12
8	3
14	5
22	14

.....

c

Input: The set of all whole numbers
Output: The square root of the input

.....



.....

Go further

Create your own examples for the representations below.

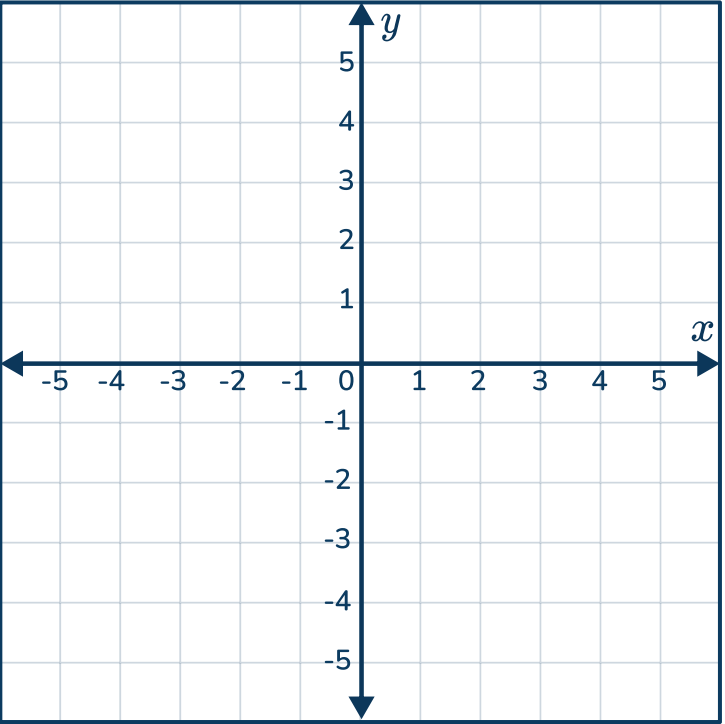
a A FUNCTION

x	y

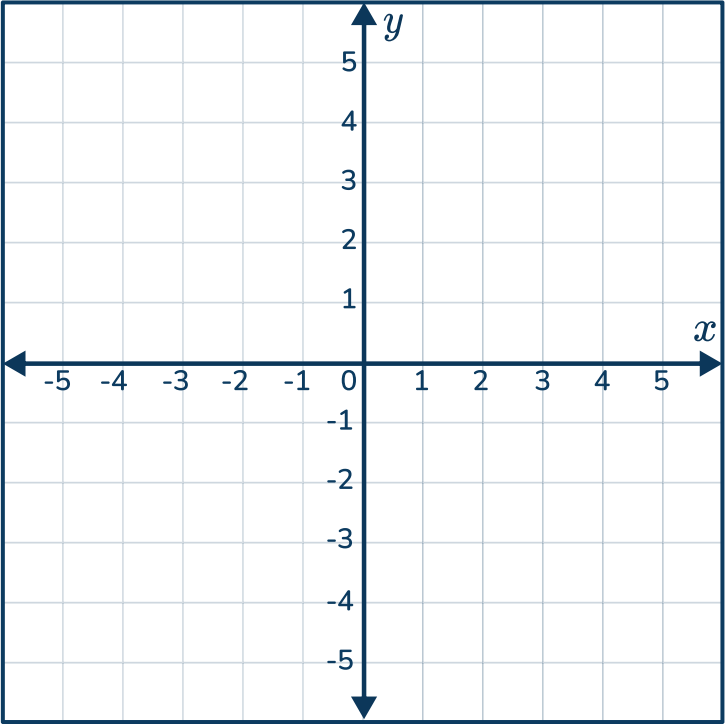
b NOT A FUNCTION

x	y

c A FUNCTION



d NOT A FUNCTION



e A FUNCTION

$y =$

f NOT A FUNCTION

$y =$

Let's look at different representations for this function.

Input: The set of all whole numbers

Output: The square root of the input

Complete the missing parts of each representation.

a

input	output
1	1
1
2	1.414213562...
2
3
3	-1.732050808...

b

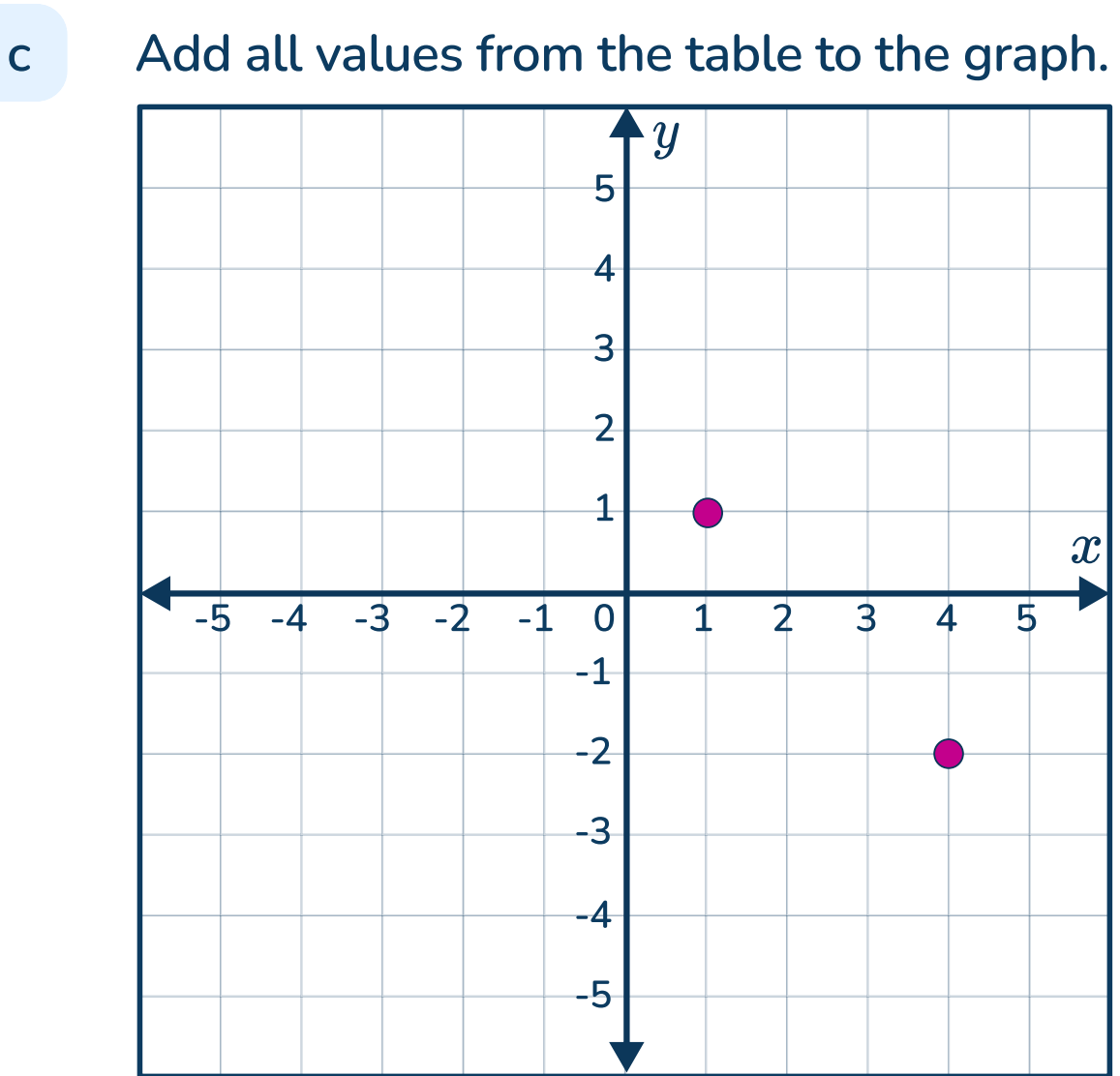
$y = \sqrt{x}$

Define the units.

y is

x is

Each representation of the function shows that for the input there is NOT a



Check your understanding

Decide whether the table is a function and explain why.

Temperature setting (F)	350	375	400	425
Over heating time (mins)	7	8	9	10

Why do I need to try this question on my own first?

- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing



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- ✓ Aligned to your state's standards
- ✓ Scaffolded learning to close gaps

“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

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