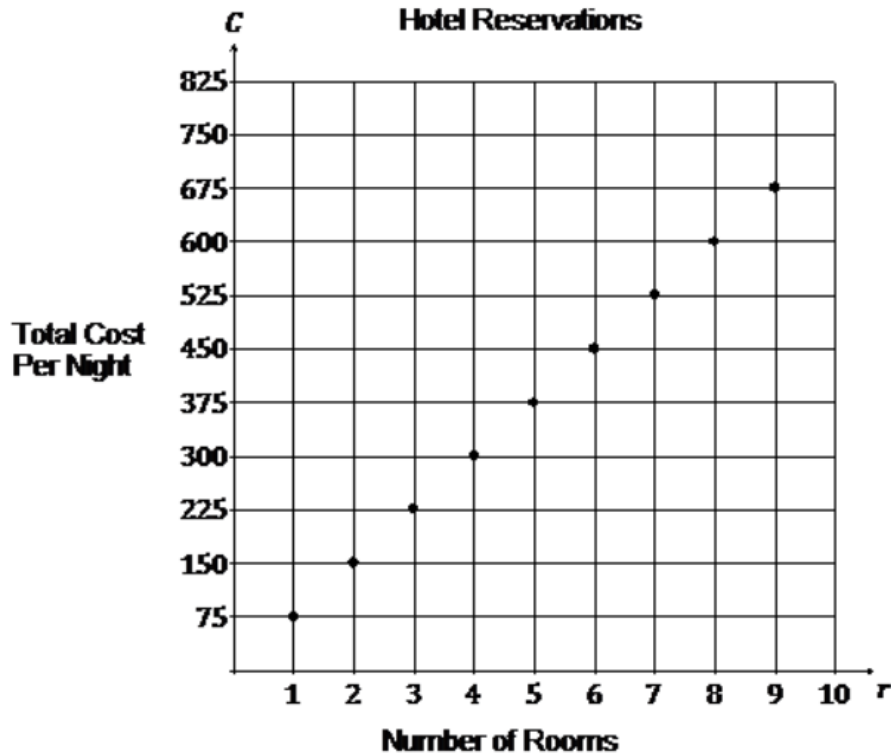


Section 5.5 Graphs of Linear Relations and Functions

Example 1

The cost of booking rooms for a night at a local hotel is graphed below.

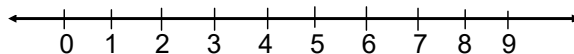


- a) Should the points on this graph be connected or not? Explain

Discrete Domain : A set of independent or x-values that consists of only certain numbers. (no fractions or decimals)

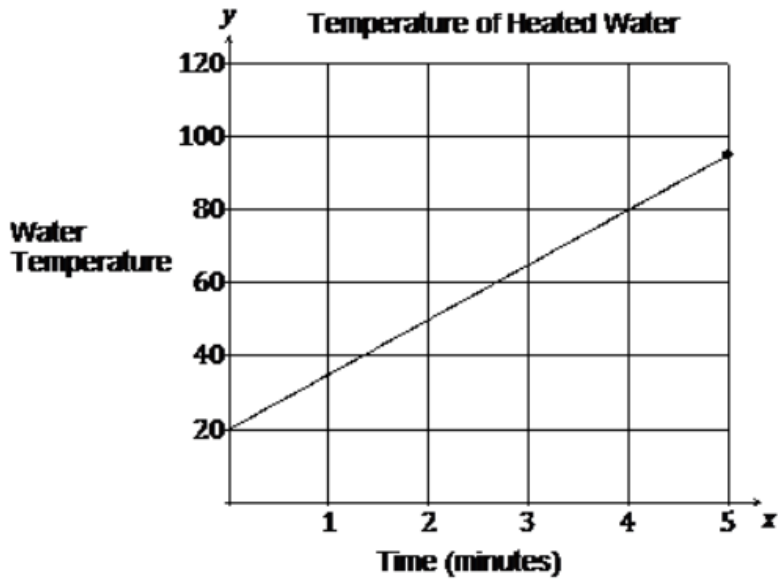
- b) What is the domain?

Look at the x-axis only



Example 2

The temperature increase for heating water is graphed below.

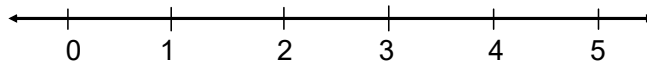


a) Should the points on this graph be connected or not? Explain.

Continuous Domain : a set of independent or x-values that consist of all numbers in an interval. (Includes decimals and fractions).

b) What is the domain?

Look at the x-axis only



Remember the Symbols:

$<$ less than

$>$ greater than

\leq less than or equal to

\geq greater than or equal to

Remember the Symbols used for the number sets.

\mathbb{R} is for Real Numbers

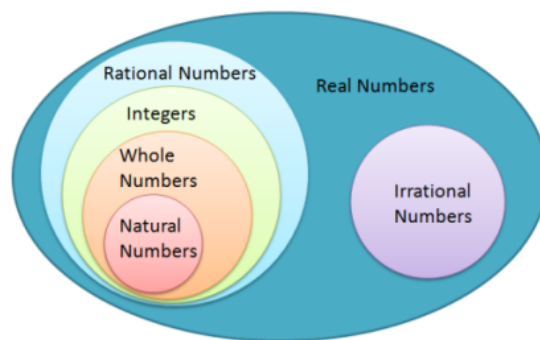
\mathbb{I} is for Integers

\mathbb{Q} is for Rational Numbers

\mathbb{N} is for Natural Numbers

$\overline{\mathbb{Q}}$ is for Irrational Numbers

\mathbb{W} is for Whole Numbers



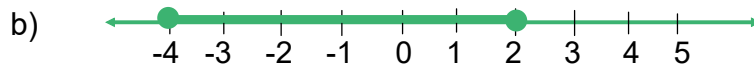
Set Notation is a formal mathematical way to give the value for domain and/or range.

Domain:

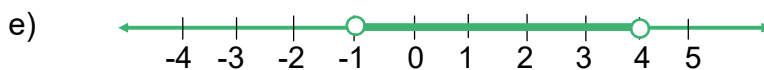
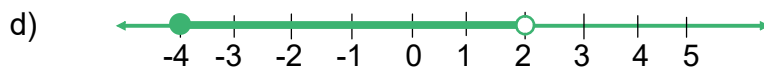
| | |
|--|---|
| use curly brackets $\{ \}$ they mean "the set of..." | |
| x | means "all the values of x " |
| $/$ | means "such that" |
| $0 \leq x$ | means all values of x greater than or equal 0 |
| $x \leq 5$ | means all values of x less than or equal to 5 |
| \in | means "is an element of" or "belongs to" |
| \mathbb{R} | means "the set of Real Numbers" |

Example 3

From each graph below, write the domain in set notation.



What if the endpoint was not included? This would be indicated on the number line using a hollow dot. Write the domain in set notation.



Note

Because it's all the numbers in between two points, we shade the line and indicate it is real numbers. Solid dots \geq , \leq and hollow dots $>$, $<$

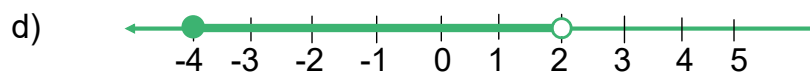
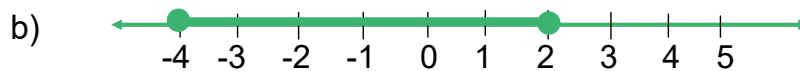
Any real/continuous number line, can also be written in interval notation.

Interval Notation: brackets are used to indicate an interval of the set of Real Numbers.

- $[]$ is the type of bracket used if the end number **is** included
 - $()$ is the type of bracket used if the end number **is not** included
-

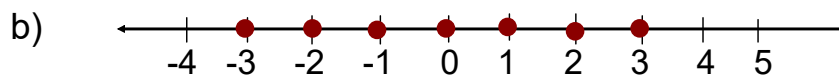
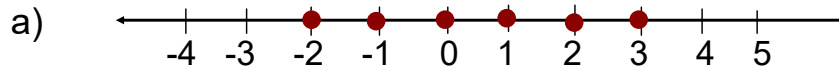
Example 4

Write each domain in interval notation.



What if these number lines were discrete? How would set notation change?

Example 5: From each graph below, write the domain in set notation.



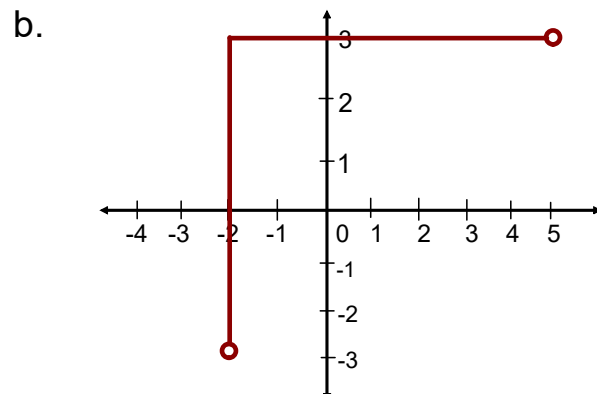
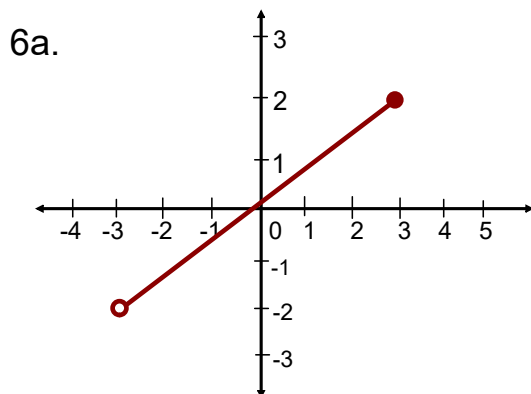
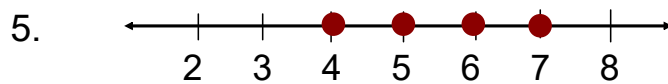
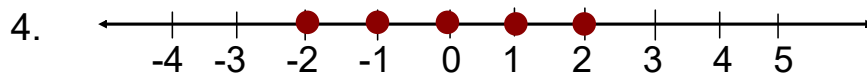
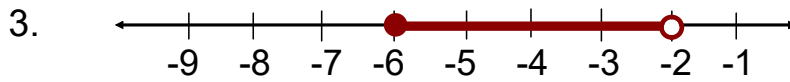
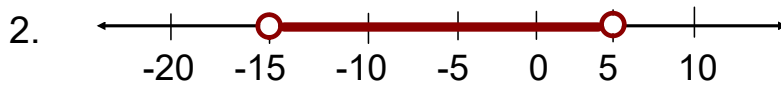
Interval notation CANNOT be used for discrete graphs.

What we have learned so far

| Continuous/ Real Graphs | Discrete/ Integer Graphs |
|--|---|
| <ul style="list-style-type: none"> ● can be written in set notation and interval notation. ● is a solid line ● solid dot use \geq or \leq ● hollow dot use $>$ or $<$ ● $x \in \mathbf{R}$ | <ul style="list-style-type: none"> ● can be written in set notation only, or listed. ● is a dotted line ● solid dot use \geq or \leq ● hollow dots are not necessary but if shown use $>$ or $<$ ● $x \in \mathbf{I}$ |

Instructions:

For each number line write the solution for the domain in set notation and interval notation, where possible.



Example 6

Draw a number line to represent each set notation.
Write in interval notation, where possible.

a) $\{x / -2 \leq x \leq 3, x \in R\}$

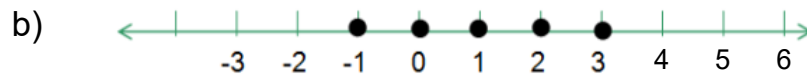
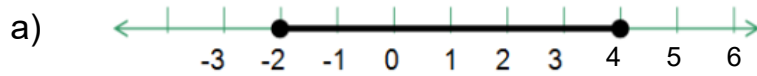
b) $\{x / -1 \leq x < 4, x \in R\}$

c) $\{x / -2 \leq x \leq 3, x \in I\}$

d) $\{x / -1 \leq x < 4, x \in I\}$

Example 7

Describe each graph using set notation and interval notation where possible.



Example 8

Take each description in words and rewrite using set notation, interval notation and draw a number line.

a) All real numbers less than or equal to -5.

b) All real numbers greater than or equal to -1 .

c) All real numbers less than 2 .

Summary

- The numbers keep going in one direction. There is only one endpoint.
- A shaded arrow indicates that the numbers keep going.
- In interval notation, ∞ , the infinity symbol is used if there is no endpoint in the positive direction and $-\infty$ is used for the negative direction. A round bracket must also be used.

Example 9

Take each description in words and rewrite using set notation and draw a number line.

a). All integers greater than -3 .

b). All integers greater than or equal to -1 .

c). All integers less than 2 .

Example 10

Describe each graph using set notation and interval notation where possible.

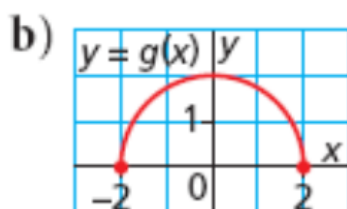
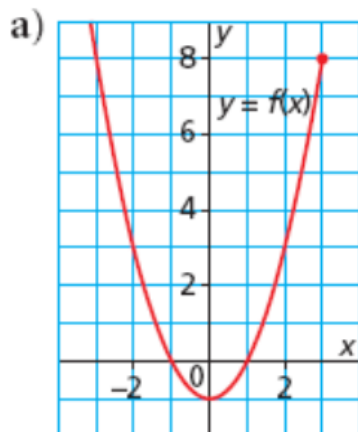


Note:

Set notation, number lines and interval notation can also be done for the range (y-values) of data too!

Example 11

Determine the domain and range of the graph for each function.



Work Book Questions

p.294 - 297 #4a, 7abcd, 8abcde, 10ab,
11abc, 19a

Extra Practice Questions

p.294 - 297 #4bc, 9abcd,
10cd, 19b