Connect the Dots: From Points to a Line

Every input has one output, so every input is a point, and all the points of a linear rule sit on one line. Then decide: connect the dots (continuous) or leave them separate (discrete)?

Name _____ Date _____

Words we use

say the math word, then the plain English

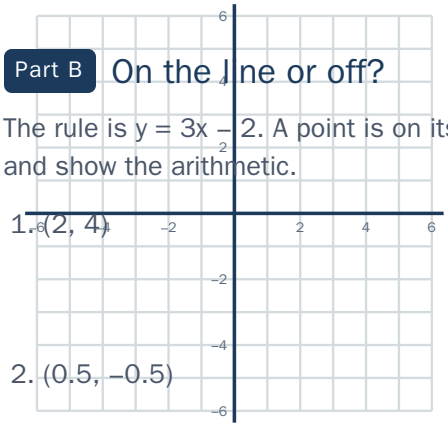
WORD	PLAIN ENGLISH	WHAT YOU DO
Line	All of the points of a rule at once. Every input you could choose, with its one output, drawn together.	Draw it through the dots when every in-between input is real.
In-between input	An input that is not a whole number, like 0.5 or 2.25 or –1.5.	Feed it into the rule exactly like any other number. Its point lands on the line.
Continuous	You can connect the dots, because every in-between input is real. Time, temperature, distance, and height are like this.	Draw a solid line.
Discrete	Separate dots, with no in-between. People, tickets, pizzas, and text messages are like this.	Leave the dots separate. Do not draw a line.
Function	A rule with one output for each input. That promise is why every input gives exactly one point.	Trust the rule for any input, not just the whole numbers.
Ordered pair	A point's address (x, y): the input, then its output.	Every row of a table, and every in-between input, is one.

Part A Fill the table, then the gaps

The rule is y = 2x + 1. Fill in the whole-number rows first. Then fill in the in-between rows the same way. Row 1 is done for you.

X	Y = 2X + 1	POINT (X, Y)
–2	2(–2) + 1 = –3	(–2, –3)
0		
1		
3		
0.5		
1.5		
–0.5		

Plot all seven points on the grid, then draw the line through them.



Part B On the Line or off?

The rule is y = 3x − 2. A point is on its line only when its y equals the rule's output for its x. Decide for each point, and show the arithmetic.

1. (2, 4)

2. (0.5, −0.5)

3. (1, 0)

4. (−1, −5)

Part C Continuous or discrete?

Write C (continuous, connect the dots) or D (discrete, separate dots), and one reason.

SITUATION	C OR D	BECAUSE
Number of bikes and total wheels		
Height of a balloon as seconds pass		
Number of shirts bought at $12 each		
Temperature of soup as it cools		
Number of people and the cost of their bus tickets		

Part D In your own words

1. The rule is y = x + 4. Find y when x = 2.5 and when x = –3.5, and write both points. Then explain why both points are on the line through the table's dots.

2. What does the line through the dots stand for? Use the words input and output.

3. A friend connected the dots on a graph of pizzas ordered against slices received. What would you tell them, and why?

Part E Exit ticket

1. y = 2x – 1 at x = 3.5: find y and the point.

2. Candle height over time: continuous or discrete, and why?

Answer key

Part A. (0, 1), (1, 3), (3, 7), (0.5, 2), (1.5, 4), (–0.5, 0). All seven points lie on one line.

Part B. (2, 4): 3(2) – 2 = 4, on. (0.5, –0.5): 3(0.5) – 2 = –0.5, on. (1, 0): 3(1) – 2 = 1, not 0, off. (–1, –5): 3(–1) – 2 = –5, on.

Part C. Bikes: D (whole bikes). Balloon: C (any second is real). Shirts: D. Soup: C. People and tickets: D.

Part D. 1. (2.5, 6.5) and (–3.5, 0.5). Both came from the rule, and every point of the rule is on the one line. 2. All of the points of the rule at once: every input, each with its one output. 3. Do not connect them: there is no such thing as 2.5 pizzas, so there is no in-between point.

Part E. y = 6, the point (3.5, 6). Continuous: any amount of time is real.