LESSON MAKER PRO

Parametric Puzzle Paths

Remove the parameter to connect x and y.

HIGH SCHOOL · P.CED.A.1

P.CED.A.1 "Create a single equation, using rectangular coordinates, that is equivalent to a pair of parametric equations."

NAME _____ DATE _____

ELIMINATE THE PARAMETER

A pair of parametric equations uses t to describe x and y. Solve one equation for t, then substitute that expression into the other to get a single equation in x and y. When t can be any real number, check that your new equation gives the same coordinate pairs.

WORKED EXAMPLE

Create one rectangular equation equivalent to $x = 11t + 13$ and $y = 17t - 19$, where t can be any real number.

1. Solve for t: $x - 13 = 11t$.
2. Divide by 11: $t = (x - 13)/11$.
3. Substitute into y: $y = 17(x - 13)/11 - 19$.
4. Multiply by 11 and simplify: $11y = 17x - 430$.

Answer: $11y = 17x - 430$

PRACTICE 6 problems

1 Eliminate t from $x = 2t + 3$ and $y = 5t - 1$. Let t be any real number.

ANSWER _____

2 Eliminate t from $x = 4 - t$ and $y = 3t + 2$. Let t be any real number.

ANSWER _____

3 Eliminate t from $x = t/3 + 2$ and $y = 2t - 5$. Let t be any real number.

ANSWER _____

4 Eliminate t from $x = 3t - 2$ and $y = t^2 + 1$. Let t be any real number.

ANSWER _____

5 Eliminate t from $x = t^2 + 4$ and $y = t - 1$. Let t be any real number.

ANSWER _____

6 Eliminate t from $x = -2t + 7$ and $y = (t + 1)^2 - 2$. Let t be any real number.

ANSWER _____

APPLY IT Show your work

1 In an augmented reality game, a marker's position is $x = 3t - 6$ and $y = 4t + 8$. The player can set t to any real number. Write one equation in x and y that describes exactly the marker's possible positions.

WORK SPACE

ANSWER _____

2 A music visualizer places a dot at $x = t^2 + 9$ and $y = t - 6$, where t is a setting that can be any real number. Write one equation in x and y that describes exactly where the dot can appear.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Create one rectangular equation equivalent to $x = 2t^2 - 8t + 3$ and $y = 3t - 6$ for any real t. In two sentences, explain why your equation has no extra points.

WORK SPACE AND ANSWER

ANSWER KEY

Parametric Puzzle Paths

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Eliminate t from x = 2t + 3 and y = 5t - 1. Let t be any real number.	**2y = 5x - 17**
2	Eliminate t from x = 4 - t and y = 3t + 2. Let t be any real number.	**y = 14 - 3x**
3	Eliminate t from x = t/3 + 2 and y = 2t - 5. Let t be any real number.	**y = 6x - 17**
4	Eliminate t from x = 3t - 2 and y = t^2 + 1. Let t be any real number.	**y = $(x + 2)^2/9 + 1$**
5	Eliminate t from x = t^2 + 4 and y = t - 1. Let t be any real number.	**x = $(y + 1)^2 + 4$**
6	Eliminate t from x = -2t + 7 and y = $(t + 1)^2$ - 2. Let t be any real number.	**y = $(x - 9)^2/4 - 2$**

PART 2 · APPLY IT

1. **3y = 4x + 48** From x = 3t - 6, get t = (x + 6)/3. Substitute into y = 4t + 8 and simplify.
2. **x = $(y + 6)^2 + 9$** Solve y = t - 6 to get t = y + 6, then substitute into the equation for x.

CHALLENGE

The equation is $9x = 2y^2 - 45$. For any point on it, choosing t = (y + 6)/3 gives both original coordinates, so there are no extra points.

Accept algebraically equivalent equations. All parameters can take any real value, so no separate restrictions on x or y are needed.