LESSON MAKER PRO

Two Ways to Fit

Build a model from paired data.

HIGH SCHOOL · P.CED.A.2

P.CED.A.2 "Given a data set, create a parametric equation and a single equation using rectangular coordinates to fit the data."

NAME _____ DATE _____

FROM TIME TO COORDINATES

Use the change in x and y over each change in t to write x(t) and y(t). Then solve x(t) for t and substitute into y(t) to get one equation relating x and y.

WORKED EXAMPLE

Write parametric equations for the data, then write y in terms of x.

SAMPLE DATA

t	x	y
0	41	61
1	45	67
2	49	73

1. For each increase of 1 in t, x increases by 4 and y increases by 6.
2. At t = 0, x = 41 and y = 61, so x(t) = 41 + 4t and y(t) = 61 + 6t.
3. Solve for t: t = (x - 41)/4. Substitute: y = 61 + 6(x - 41)/4.

Answer: x(t) = 41 + 4t, y(t) = 61 + 6t; y = (3x - 1)/2

PRACTICE 6 problems

1 Write x(t) and y(t) for the data. Then write y in terms of x.

DATA SET 1

t	x	y
0	1	2
1	3	8
2	5	14

ANSWER _____

2 Write x(t) and y(t) for the data. Then write y in terms of x.

DATA SET 2

t	x	y
0	2	9
1	5	7
2	8	5

ANSWER _____

3 Write x(t) and y(t) for the data. Then write y in terms of x.

DATA SET 3

t	x	y
0	-3	-2
2	1	0
4	5	2

ANSWER _____

4 Write x(t) and y(t) for the data. Then write y in terms of x.

DATA SET 4

t	x	y
1	0	3
2	2	2
3	4	1

ANSWER _____

5 Write x(t) and y(t) for the data. Then write y in terms of x.

DATA SET 5

t	x	y
0	6	-1
1	4	1
2	2	3

ANSWER _____

6 Write x(t) and y(t) for the data. Then write y in terms of x.

DATA SET 6

t	x	y
0	-2	9
2	0	3
4	2	-3

ANSWER _____

APPLY IT Show your work

1 An e-bike rider records time t in hours, distance x in miles, and battery charge y as a percent. Write x(t) and y(t), then write an equation relating battery charge to distance.

E-BIKE RIDE

t (hours)	x (miles)	y (% charge)
0	0	100
1	5	85
2	10	70

ANSWER _____

2 A student tracks a gaming clip. Let t be days since tracking began, x be total views in hundreds, and y be total likes. Write x(t) and y(t), then write an equation relating likes to views in hundreds.

GAMING CLIP

t (days)	x (hundreds of views)	y (likes)
0	2	10
1	5	22
2	8	34

ANSWER _____

CHALLENGE One step up

This data does not follow a line. Find a model with x linear in t and y quadratic in t, then write y in terms of x. Explain how the changes in y show that a linear model will not fit.

CURVED DATA

t	x	y
0	-1	6
1	0	3
2	1	2
3	2	3

WORK SPACE AND ANSWER

Two Ways to Fit

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write x(t) and y(t) for the data. Then write y in terms of x.	**x(t) = 1 + 2t, y(t) = 2 + 6t; y = 3x - 1**
2	Write x(t) and y(t) for the data. Then write y in terms of x.	**x(t) = 2 + 3t, y(t) = 9 - 2t; y = (31 - 2x)/3**
3	Write x(t) and y(t) for the data. Then write y in terms of x.	**x(t) = -3 + 2t, y(t) = -2 + t; y = (x - 1)/2**
4	Write x(t) and y(t) for the data. Then write y in terms of x.	**x(t) = 2t - 2, y(t) = 4 - t; y = 3 - x/2**
5	Write x(t) and y(t) for the data. Then write y in terms of x.	**x(t) = 6 - 2t, y(t) = -1 + 2t; y = 5 - x**
6	Write x(t) and y(t) for the data. Then write y in terms of x.	**x(t) = -2 + t, y(t) = 9 - 3t; y = 3 - 3x**

PART 2 · APPLY IT

1. **x(t) = 5t, y(t) = 100 - 15t; y = 100 - 3x** Distance rises by 5 miles per hour while charge drops by 15 percentage points per hour. Substitute t = x/5 into y(t).
2. **x(t) = 2 + 3t, y(t) = 10 + 12t; y = 4x + 2** Views rise by 3 hundreds per day and likes rise by 12 per day. Substitute t = (x - 2)/3 into y(t).

CHALLENGE

x(t) = t - 1, y(t) = t^2 - 4t + 6; y = x^2 - 2x + 3. For equal increases in t, the changes in y are -3, -1, and 1, so they are not constant.

Accept equivalent simplified equations and equivalent parametric forms that match every data point at its stated t. In the challenge, y = $(x - 1)^2$ + 2 is equivalent to the given rectangular equation.