

Unit 5 Lesson 10: Looking at Rates of Change

1 Falling Prices (Warm up)

Student Task Statement

Let p be the function that gives the cost $p(t)$, in dollars, of producing 1 watt of solar energy t years after 1977. Here is a table showing the values of p from 1977 to 1987.

t	$p(t)$
0	80
1	60
2	45
3	33.75
4	25.31
5	18.98
6	14.24
7	10.68
8	8.01
9	6.01
10	4.51

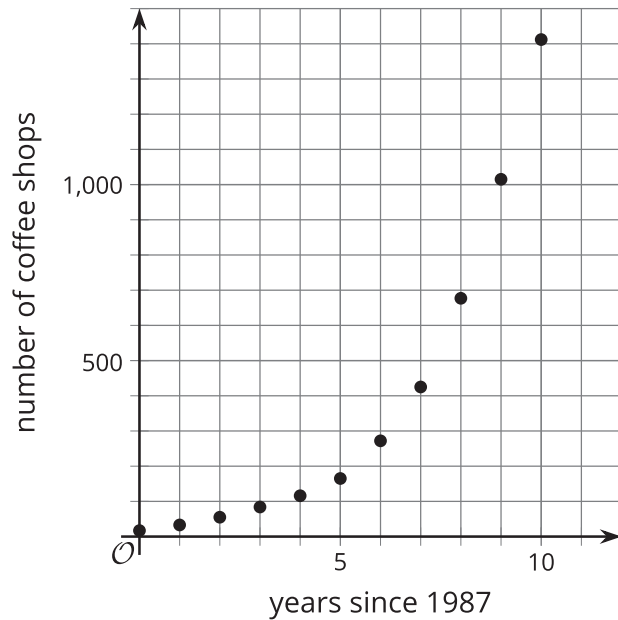
Which expression best represents the average rate of change in solar cost between 1977 and 1987?

1. $p(10) - p(0)$
2. $p(10)$
3. $\frac{p(10) - p(0)}{10 - 0}$
4. $\frac{p(10)}{p(0)}$

2 Coffee Shops

Student Task Statement

Here are a table and a graph that show the number of coffee shops worldwide that a company had in its first 10 years, between 1987 and 1997. The growth in the number of stores was roughly exponential.

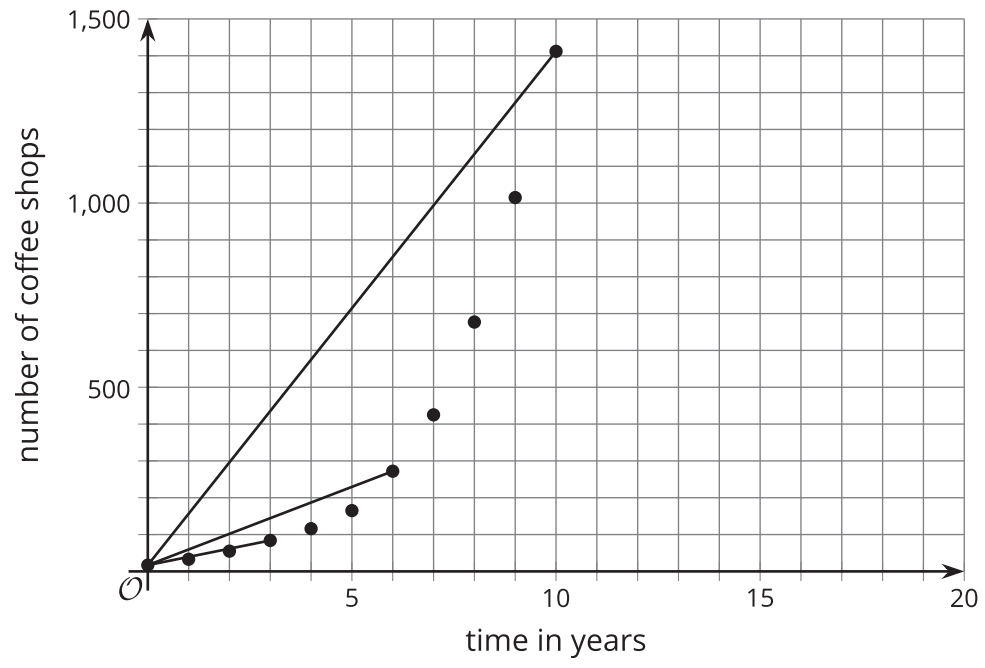


year	number of stores
1987	17
1988	33
1989	55
1990	84
1991	116
1992	165
1993	272
1994	425
1995	677
1996	1,015
1997	1,412

1. Find the average rate of change for each period of time. Show your reasoning.
 - a. 1987 and 1990
 - b. 1987 and 1993
 - c. 1987 and 1997
2. Make some observations about the rates of change you calculated. What do these average rates tell us about how the company was growing during this time period?

3. Use the graph to support your answers to these questions. How well do the average rates of change describe the growth of the company in:
- the first 3 years?
 - the first 6 years?
 - the entire 10 years?
4. Let f be the function so that $f(t)$ represents the number of stores t years since 1987. The value of $f(20)$ is 15,011. Find $\frac{f(20) - f(10)}{20 - 10}$ and say what it tells us about the change in the number of stores.

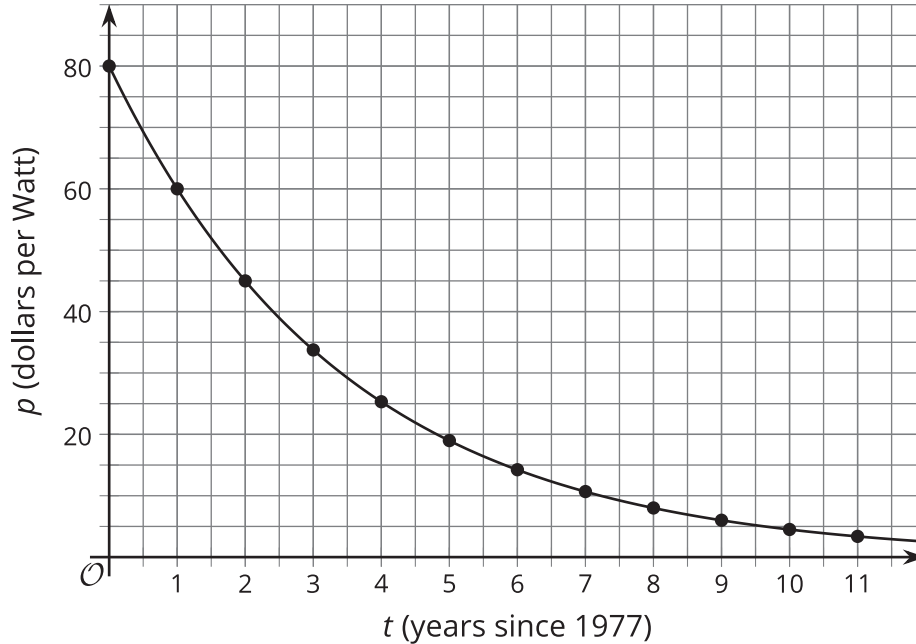
Activity Synthesis



3 Revisiting Cost of Solar Cells

Student Task Statement

Here is a graph you saw in an earlier lesson. It represents the exponential function p , which models the cost $p(t)$, in dollars, of producing 1 watt of solar energy, from 1977 to 1988 where t is years since 1977.



1. Clare said, "In the first five years, between 1977 and 1982, the cost fell by about \$12 per year. But in the second five years, between 1983 and 1988, the cost fell only by about \$2 a year." Show that Clare is correct.
2. If the trend continues, will the average decrease in price be more or less than \$2 per year between 1987 and 1992? Explain your reasoning.