

1.1 Create and Analyze Graphs

PRACTICE

Identify the independent and dependent variable. Create and label a scatter plot. Answer the questions.

1. The area of a square is determined by the length of a side of that square as shown in the table below.

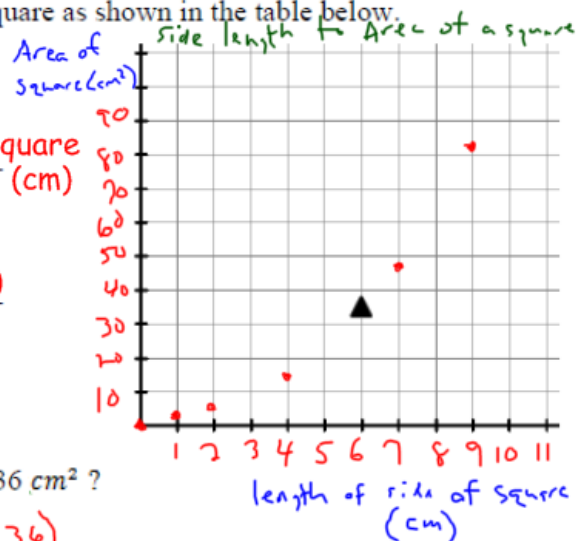
Side (cm)	Area (cm ²)
0	0
1	1
2	4
4	16
7	49
9	81

Independent Variable

S = length of a side of the square (cm)

Dependent Variable

A = area of the square (cm²)



a) What is the length of each side of a square that has an area of 36 cm²?

Mark this point on the graph with a ▲. $\sqrt{36} = 6 \text{ cm}$ (6,36)

b) What does the point (7, 49) mean in this situation?

When the length of a side of the square is 7 cm the area of the square is 49 cm².

Identify the independent and dependent variable. Create and label a scatter plot. Answer the questions.

2. Generic High School Math Club is selling math t-shirts to raise money for new calculators.

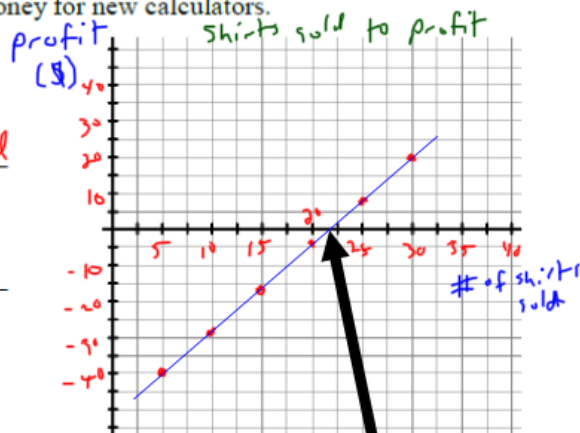
Shirts Sold (#)	Profit (\$)
5	-40
10	-28
15	-16
20	-4
25	8
30	20

Independent Variable

S = number of shirts sold

Dependent Variable

P = profit in dollars



a) Approximately how many shirts must be sold in order for the club to break even? Justify.

To break even would mean no profit.

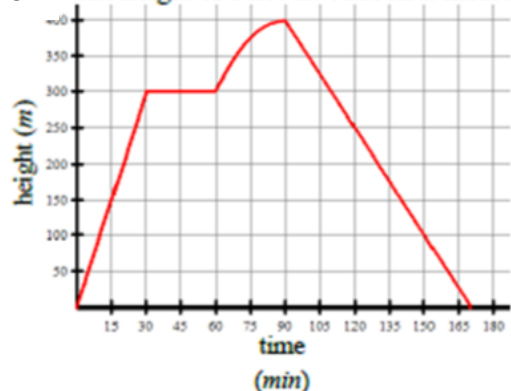
Graphically, the x-axis represents a profit of zero. The points are in a straight line and would cross the x-axis around 23 shirts.

OR

Looking at the table, the profit goes from negative at 20 shirts to positive at 25 shirts, so the profit must be zero somewhere in between, around 23 shirts.

Use the graph to identify the independent and dependent variable. Fill in the table and answer the questions.

3. The height of a hot air balloon is measured over time.



Independent Variable
 $t = \text{time in minutes}$

Dependent Variable
 $h = \text{height of balloon in meters}$

time (min)	height (m)
120	250
75	≈ 375
90	400
15	≈ 150

a) What does the point (135, 175) mean in this situation?

At 135 minutes the hot air balloon is 175 meters in the air.

b) Describe the rate of change of the hot air balloon over the first 30 minutes.

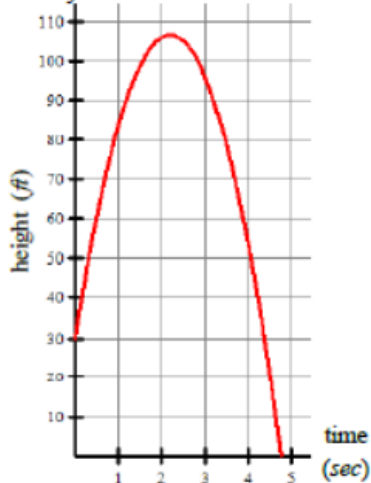
Balloon increases height 300 meters in 30 minutes.

c) Describe what is happening over the interval 30 minutes to 60 minutes.

Balloon is staying at a constant height 300 meters in the air.

d) What is the maximum height of the hot air balloon? 400 meters

4. Mr. Kelly shoots a bottle rocket off the back deck of his house. The graph shows the rocket's height over time.



Independent Variable

$t = \text{time in seconds}$

Dependent Variable

$h = \text{height of rocket in ft}$

time (sec)	height (ft)
4	50
1	≈ 81
≈ 4.5	20
≈ 0.3	≈ 4

a) Use the graph to estimate how long the rocket is in the air.

Approximately 4.8 seconds

b) Use the graph to estimate bottle rocket's maximum height.

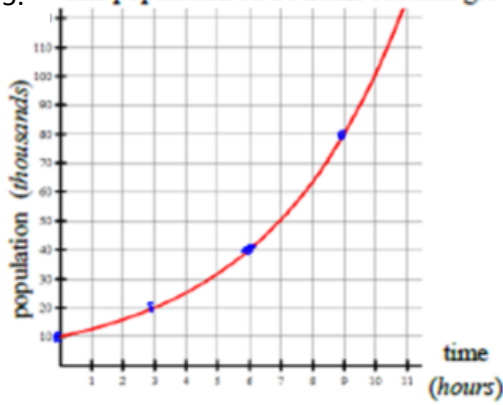
Approximately 107 feet

c) How far off the ground is Mr. Kelly's deck?

Height at time zero which is 30 feet. The deck is 30 feet off the ground.

Use the graph to identify the independent and dependent variable. Fill in the table and answer the questions.

5. The population of a certain bacteria grows over time as shown in the graph below.



Independent Variable
 $t = \text{time in hours}$

Dependent Variable
 $p = \text{bacteria population in thousands}$

bacteria	
time (hrs)	population thousands
3	20
6	40
10	100
≈ 10.7	120

a) What does the point (4, 25) mean in this situation?

After 4 hours, the population of the bacteria is 25,000.

b) What population did the bacteria start with?

10 thousand or 10,000

c) When will the bacteria be 80,000 ?

9 hours

d) How long does it take for the population of bacteria to double? Justify.

The population starts at 10 thousand and doubles 3 hours later at 20 thousand. The pattern continues as it doubles again 3 hours later at 40 thousand and continues to double every 3 hours. See the points above.

(0, 10)
 (3, 20)
 (6, 40)
 (9, 80)