Problem of the Week
Problem A and Solution
Friendship Bracelets

Problem

Naomi is making bracelets to raise money for the hospital in her town. On her first day of bracelet making, Naomi makes 7 bracelets. Each day after, Naomi makes one more bracelet than she did the day before.

a) How many bracelets has she made after 7 days?

b) If the materials for a single bracelet cost \$2.50, and she sells each bracelet for \$4.50, how much money will she be able to donate to the hospital if she sells all of the bracelets?

c) If she wants to raise at least \$200.00 for the hospital, and she continued to make bracelets at the same rate (making one more bracelet each day), how many more days does she have to make bracelets?

Solution

a) We can make a table of the pattern:

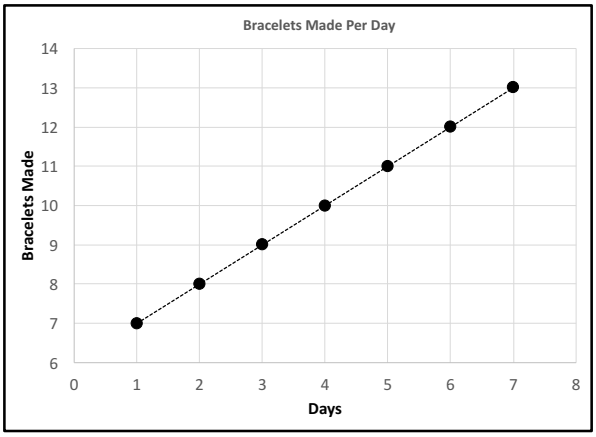
Day	1		2		3		4		5		6		7	
Bracelets	7	+	8	+	9	+	10	+	11	+	12	+	13	= 70 bracelets

b) Naomi makes a profit of \$4.50 − \$2.50 = \$2.00 for each bracelet. This means for 70 bracelets, her profit is 70 × \$2.00 = \$140.00.

c) To get to \$200.00, Naomi needs to earn \$200.00 − \$140.00 = \$60.00 more after day 7. If the pattern continues, on day 8 Naomi would make 14 bracelets for a profit of 14 × \$2.00 = \$28.00. Then on day 9 Naomi would make 15 bracelets for a profit of 15 × \$2.00 = \$30.00. This is a total of \$28.00 + \$30.00 = \$58.00. That is not quite enough to make a total of \$200.00. Naomi needs to make at least one more bracelet. So it would take her 10 days to earn a profit of at least \$200.00.

Teacher's Notes

The pattern seen in part (a) represents a linear relationship between the number of days and the number of bracelets made on that day. Using the table we could make a chart where the horizontal axis marks the days, and the vertical axis marks the number of bracelets made that day, and plot a point for each entry in the table.

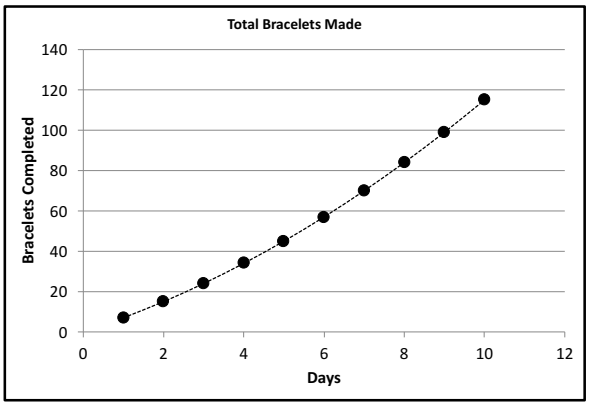


If we connect the points, they form a straight line showing a *linear* relationship. We can even write an equation representing the line:

$$b = 6 + d$$

where d represents the day, and b represents the number of bracelets made on day d.

We could also calculate the total number of bracelets made at the end of each day. For example, after the first day Naomi made 7 bracelets. At the end of the second day she made $7 + 8 = 15$ bracelets. If we calculate the totals for each day and then plot the points on a chart and connect them, we see that they form a curve rather than a straight line.



The result shows a *quadratic* relationship between the number of days and the total number of bracelets made. Again, we can write an equation representing the curve:

$$t = \frac{d^2 + 13d}{2}$$

where d represents the day, and t represents the total number of bracelets made up to day d. This relationship is quadratic because we can describe the relationship using an equation that includes the number of days squared (d^2) and the curved line that is formed is part of a shape known as a parabola.