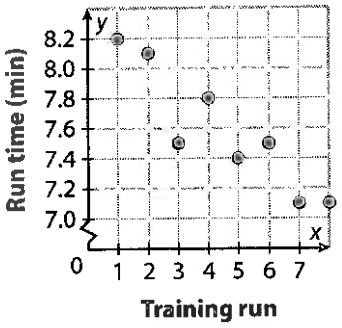
4. Rafael is training for a race by running a mile each day. He tracks his progress by timing each trial run.

Trial	Run Time (min)
1	8.2
2	8.1
3	7.5
4	7.8
5	7.4
6	7.5
7	7.1
8	7.1



$r = -1$ (Strong negative correlation)

8.

Training Run	Run Time (min)
1	8.2
2	8.1
3	7.5
4	7.8
5	7.4
6	7.5
7	7.1
8	7.1

By hand: $(1, 8.2)(7, 7.2)$

$m = \frac{7.2 - 8.2}{7 - 1} = \frac{-1}{6}$

$y - 8.2 = -\frac{1}{6}(x - 1)$

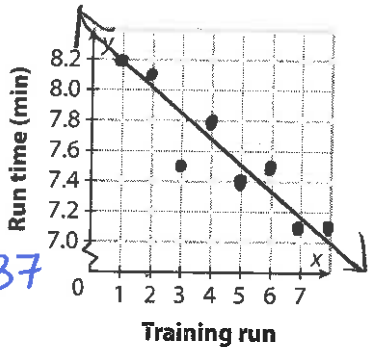
$y - 8.2 = -\frac{1}{6}x + \frac{1}{6}$

$y = -\frac{1}{6}x + 8.37$

On Calc:

$y = -.156x + 8.289$

$r = -.919$



11. How much money might Raymond hope to earn 8 weeks after opening if the trend continues?

12. What mile time does Rafael expect for his next run?

From Calc Eqn:

$y = -.156(9) + 8.289$

$y = 6.885$ minutes

Extrapolation

14. Researchers at an auto insurance company are studying the ages of its policyholders and the number of accidents per 100 policyholders. The researchers compared each year of age from 16 to 65. After analyzing the data, the researchers found that as age increases, the number of accidents per 100 policyholders decreases.

Variables: Age of drivers and # of accidents

Negative correlation

It is likely that increased age causes less accidents

It is unlikely that a decrease in accidents increases the age of the driver

EXERCISES

Write the first 4 terms of each sequence following the given rule. *(Lesson 4.1)*

1. $f(n) = n^2 - 4$

-3, 0, 5, 12

2. $f(1) = -12, f(n) = 2f(n-1)$

-12, -24, -48, -96

Determine if each of the following sequences is arithmetic. If so, write a recursive rule and an explicit rule for the sequence. If not, explain why. *(Lesson 4.2)*

3. −8, −1, 6, 13…

+7 +7 +7 Arithmetic

Rec: $f(n) = f(n-1) + 7$; $f(1) = -8$

Exp: $f(n) = 7n - 15$

4. 1, 8, 27, 81…

+7 +19 Not Arithmetic; No Common difference

5. The table below shows the balance of a savings account each month after being opened. The balance can be represented with an arithmetic sequence. Write an explicit rule and a recursive rule for the sequence. What will the account balance be after 10 months? *(Lesson 4.3)*

Time (months)	1	2	3	4
Balance ($)	750	715	680	645

-35 -35 -35

Rec: $f(n) = f(n-1) - 35$; $f(1) = 750$

Exp: $f(n) = -35n + 785$

$f(10) = -35(10) + 785$

$= 435$

$435

MODULE PERFORMANCE TASK

There Has to Be an Easier Way

Quick, now, what's the sum: 1 + 2?

Okay, you got that one. How about this: 1 + 2 + 3?

You're really sailing along! Okay, how about this one: 1 + 2 + 3 + ... + 98 + 99 + 100?

Whoops. That's the problem that mathematician Carl Friedrich Gauss solved quickly when he was 10 years old. And that's the problem you're being asked to solve now. Getting the right answer isn't as important as coming up with some interesting observations about the problem or some ideas that might lead you in the direction of the right answer.

Gauss was 10 years old in 1787, so he didn't have a calculator! No calculator for you either—just use your own paper to work on the task. Then use numbers, words, pictures, or algebra to explain how you reached your conclusion.

Ready to Go On?

4.1–4.3 Patterns and Sequences

- Online Homework
- Hints and Help
- Extra Practice

Write the first 4 terms of each sequence defined by the rule given. *(Lesson 4.1)*

1. $f(1) = 8, f(n) = f(n-1) - 4$

8, 4, 0, -4

2. $f(n) = \frac{n^2}{2}$

$\frac{1}{2}, 2, \frac{9}{2}, 8$

Write a recursive rule and an explicit rule for each arithmetic sequence. Then, find the 20th term of each sequence. *(Lessons 4.2, 4.3)*

3. 2, 0, −2, −4...

-2 -2 -2

Rec: $f(n) = f(n-1) - 2 ; f(1) = 2$

Exp: $f(n) = -2n + 4$

$f(20) = -2(20) + 4$

$= -40 + 4$

$f(20) = -36$

4. 45, 55, 65, 75...

+10 +10 +10

Rec: $f(n) = f(n-1) + 10 ; f(1) = 45$

$f(n) = 10n + 35$

$f(20) = 10(20) + 35$

$f(20) = 235$

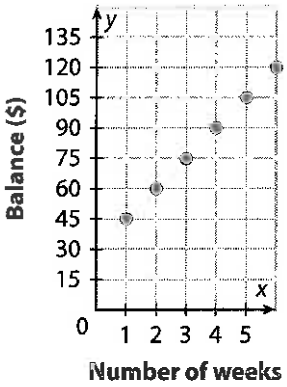
5. Each Saturday, Tina mows lawns to earn extra money which she puts into a savings account. The graph shows the balance of Tina's savings account over the first six weeks of mowing lawns. Write an explicit function to describe this sequence. According to this pattern, how much will Tina have in her account after 15 weeks of mowing lawns? *(Lesson 4.3)*

$d = 15$

$f(n) = 15n + 30$

$f(15) = 15(15) + 30$

$f(15) = 255$



ESSENTIAL QUESTION

6. What are two ways of representing an arithmetic sequence?

Recursive Rule

Explicit Rule