Sec. 9.1 Mathematical Patterns

Sequence: an ordered list of numbers $a_1, a_2, a_3 \ldots a_n$

a_1: 1st term; a_2: 2nd term; a_3: 3rd term; a_n: n^{th} term

explicit formula: finds the n^{th} term using the number n

recursive formula: relates each term after the first term to the one before it

Problem 1:

A sequence has an explicit formula $a_n = n^2 - 10$. What is the term a_8 in the sequence?

$$a_8 = 8^2 - 10 = 64 - 10 = \boxed{54}$$

Problem 2

What is a recursive definition for the sequence 4, 14, 44, 134?

$4 \cdot 3 + 2$ $14 \cdot 3 + 2$ $42 + 2$

$a_n = 3a_{n-1} + 2$

a_8 a_7

Problem 3

What is an explicit formula for the sequence 1, −1, 1, −1, . . .

a_2 a_3 a_4

1 $1(-1)^1$ $1(-1)^2$ $1(-1)^3$

$a_n = 1(-1)^{n-1}$

$a_n = (-1)^{n-1}$

Problem 4:

In a certain kind of online auction, the price of an item begins high and falls over time until someone purchases the item. If an item begins at $100 and decreases by 25% every 5 minutes, what is the price after a half hour?

a_0 a_1 a_2

100 $100(.75)^1$ $100(.75)^2$

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$a_n = 100(0.75)^n$

a_1

$a_6 = 100(0.75)^6$

$\$17.80$