Unit 11 Study Guide (Sequences)

- All sequences can be defined recursively.
- Only sequences that have a *common difference* or a *common ratio* can be defined **explicitly**.
- A recursive rule for a sequence defines the *nth* term by relating it to one or more previous terms. In order to find the value of a specific term, you need to know the value of one or more previous terms.
- An **explicit rule** for a sequence *can be used to find any specific term in a sequence* <u>without</u> <u>finding any of the previous terms</u>.
- Arithmetic Sequences can be defined <u>explicitly</u> by $a_n = a_1 + d(n 1)$ where a_1 represents the first term in the sequence and d represents the <u>common difference</u> (+ or -).
- Geometric Sequences can be defined <u>explicitly</u> by $a_n = a_1 \cdot r^{(n-1)}$ where a_1 represents the first term in the sequence and r represents the <u>common ratio</u> (×).
- Arithmetic and Geometric Sequences can be defined *recursively* as follows:

$\mathbf{a}_{n} = \mathbf{a}_{n-1} + \mathbf{d}$		$\mathbf{a}_{n} = \mathbf{a}_{n-1} \cdot \mathbf{r}$	
▶	►	▶	R
the nth term	the previous term in the	the nth term	the previous term in the
	sequence		sequence

Generating Sequences with Recursive Rules

What does the rule say?

 $a_n = \frac{1}{2}a_{n-1} + 5$

The nth term of the sequence = $\frac{1}{2}$ times the previous term plus 5

a₁ = 20

The first term of the sequence is 20

How do we generate the sequence?

 $a_2 = \frac{1}{2}a_1 + 5$ $a_3 = \frac{1}{2}a_2 + 5$ $a_4 = \frac{1}{2}a_3 + 5$ $a_5 = \frac{1}{2}a_4 + 5$ $a_2 = \frac{1}{2}(20) + 5$ $a_3 = \frac{1}{2}(15) + 5$ $a_4 = \frac{1}{2}(12.5) + 5$ $a_5 = \frac{1}{2}(11.25) + 5$ $a_2 = 15$ $a_3 = 12.5$ $a_4 = 11.25$ $a_5 = 10.625$

Sequence: 20, 15, 12.5, 11.25, 10.625, ...