Name:	Class:
Topic:	Date:

Main Ideas/Questions	Notes
Geometric Sequences	a sequence in which the pattern of the sequence is being multiplied
Common Ratio (fraction)	$\frac{\text{2nd term}}{\text{1st term}}$ = , $\frac{\text{3rd term}}{\text{2nd}}$ = } common ratio
Identifying a Geometric Sequence	**Determine whether the following represent geometric sequences. If yes, identify the common ratio.**
	1. 2, 10, 50, 250, … $\frac{10}{2}=5$ $\frac{50}{10}=5$ $\frac{250}{50}=5$ yes r = 5
	2. 135, 45, 15, 5, … $\frac{45}{135}=\frac{1}{3}$ $\frac{15}{45}=\frac{1}{3}$ $\frac{5}{15}=\frac{1}{3}$ yes; r = $\frac{1}{3}$
	3. 6, 18, 24, 30, … $\frac{18}{6}=3$ $\frac{24}{18}=\frac{4}{3}$ No
	4. 7, -14, 28, -56, … $\frac{-14}{7}=-2$ $\frac{28}{-14}=-2$ $\frac{-56}{28}=-2$ yes, r = -2
	5. 80, -40, 20, -10, … $\frac{-40}{80}=-\frac{1}{2}$ $\frac{20}{-40}=-\frac{1}{2}$ $\frac{-10}{20}=-\frac{1}{2}$ r = $-\frac{1}{2}$
	6. -9, -36, -144, -576, … $\frac{-36}{-9}=4$ $\frac{-144}{-36}=4$ $\frac{-576}{-144}=4$ yes, r = 4
Continuing Geometric Sequences	**Given the geometric sequence, find the next three terms.**
	7. 7, -21, 63, −189, 567, −1701 $r=\frac{-21}{7}=-3$ So Mult each # by -3
	8. 3072, 768, 192, 48, 12, 3 $r=\frac{768}{3072}=\frac{1}{4}$; Mult each # by $\frac{1}{4}$
	9. 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$ $r=\frac{4}{8}=\frac{1}{2}$
	10. -5, -25, -125, −625, −3125, 15625 $r=\frac{-25}{-5}=5$
Geometric Sequence Formula	**The n^{th} term of a geometric sequence can be found using the following formula:** Explicit rule: $a_n=a_1(r)^{n-1}$, a_1 = 1st # in list recursive rule: a_1 = 1st # in list, $a_n=(r)a_{n-1}$
Examples	**Write the rule for the nth term, then find a_7.**
	11. 3, 9, 27, … $r=\frac{9}{3}=3$; $a_1=3$; $a_n=3(3)^{n-1}$ explicit; $a_1=3$, $a_n=(3)a_{n-1}$ recursive
	12. -4, 20, -100, … $r=\frac{20}{-4}=-5$; $a_1=-4$; $a_n=-4(-5)^{n-1}$ explicit; $a_1=-4$, $a_n=(-5)a_{n-1}$ recursive

$a_7=3(3)^{7-1}$
$a_7=2187$

$a_7=-4(5)^{7-1}$
$a_7=-62{,}500$

13. 400, 200, 100, …

$r = \frac{200}{400} = \frac{1}{2}$

$a_1 = 400$

$a_n = 400\left(\frac{1}{2}\right)^{n-1}$ Explicit

$a_1 = 400$, $a_n = \left(\frac{1}{2}\right)a_{n-1}$ Recursive

$a_7 = 400\left(\frac{1}{2}\right)^{7-1}$ $a_7 = \frac{25}{4}$

14. 1, 5, 25, …

$r = \frac{5}{1} = 5$

$a_1 = 1$

$a_n = 1(5)^{n-1}$ Explicit

$a_1 = 1$, $a_n = (5)a_{n-1}$ recursive

$a_7 = 1(5)^{7-1}$ $a_7 = 15625$

15. -1, -4, -16, …

$r = \frac{-4}{-1} = 4$

$a_1 = -1$

$a_n = -1(4)^{n-1}$ Explicit

$a_1 = -1$, $a_n = (4)a_{n-1}$ recursive

$a_7 = -1(4)^{7-1}$ $a_7 = -4096$

16. 729, -243, 81, …

$r = \frac{-243}{729} = -\frac{1}{3}$

$a_1 = 729$

$a_n = 729\left(-\frac{1}{3}\right)^{n-1}$ Explicit

$a_1 = 729$, $a_n = \left(-\frac{1}{3}\right)a_{n-1}$ recursive

$a_7 = 729\left(-\frac{1}{3}\right)^{7-1}$ $a_7 = 1$

17. 6, -12, 24, …

$r = \frac{-12}{6} = -2$

$a_1 = 6$

$a_n = 6(-2)^{n-1}$ Explicit

$a_1 = 6$, $a_n = (-2)a^{n-1}$ recursive

$a_7 = 6(-2)^{7-1}$ $a_7 = 384$

18. 8, 12, 18, …

$r = \frac{12}{8} = \frac{3}{2}$

$a_1 = 8$

$a_n = 8\left(\frac{3}{2}\right)^{n-1}$ Explicit

$a_1 = 8$, $a_n = \left(\frac{3}{2}\right)a_{n-1}$ recursive

$a_7 = 8\left(\frac{3}{2}\right)^{7-1}$ $a_7 = \frac{729}{8} \approx 91.12$

Application

Year	Value ($)
1	10,000
2	8,000
3	6,400

The table to the left shows a car's value for 3 years after it is purchased.

$a_1 = 10000$ $r = \frac{8000}{10000} = \frac{4}{5}$

19. Write a rule to represent the car's depreciation.

$a_n = 10000\left(\frac{4}{5}\right)^{n-1}$

20. What will be the value of the car after 10 years?

$a_{10} = 10000\left(\frac{4}{5}\right)^{10-1}$

$a_{10} = \$1342.18$

Summary: ______________________________