Name Key Date _____ Hour _____ Score

Exponential Equations

Find another coordinate pair that fits the geometric sequence. Write the explicit and the recursive formula.

1)

$a_1 = 2$

$r = 2$

1	2
2	4
3	8
4	16
5	32

R: $a_1 = 2$ $a_n = a_{n-1}(2)$

E: $a_n = 2 \cdot 2^{n-1}$

2)

$a_1 = 1$

$r = 3$

1	1
2	3
3	9
4	27
5	81

R: $a_1 = 1$, $a_n = a_{n-1}(3)$

E: $a_n = 1 \cdot 3^{n-1}$

3)

$a_1 = -5$

$r = 5$

1	-5
2	-25
3	-125
4	-625
5	-3125

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

E: $a_n = -5 \cdot 5^{n-1}$

4)

$a_1 = 2$

$r = 3$

1	2
2	6
3	18
4	54
5	162

R: $a_1 = 2$, $a_n = a_{n-1}(3)$

E: $a_n = 2 \cdot 3^{n-1}$

5)

$a_1 = 16$

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

1	16
2	8
3	4
4	2
5	1

R: $a_1 = 16$, $a_n = a_{n-1}(\frac{1}{2})$

E: $a_n = 16(\frac{1}{2})^{n-1}$

6)

$a_1 = -36$

$r = \frac{1}{6}$

1	-36
2	-6
3	-1
4	-1/6
5	$-1/36$

R: $a_1 = -36$, $a_n = a_{n-1}(\frac{1}{6})$

E: $a_n = -36(\frac{1}{6})^{n-1}$

7)

$a_1 = -2$

$r = 2$

1	-2
2	-4
3	-8
4	-16
5	-32
6	-64

R: $a_1 = -2$, $a_n = a_{n-1}(2)$

E: $a_n = -2 \cdot 2^{n-1}$

8)

$a_1 = 48$

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

1	48
2	24
3	12
4	6
5	3
6	3/2

R: $a_1 = 48$, $a_n = a_{n-1}(\frac{1}{2})$

E: $a_n = 48(\frac{1}{2})^{n-1}$

9)

$a_1 = \frac{5}{3}$

$r = 3$

1	5/3
2	5
3	15
4	45
5	135
6	405

R: $a_1 = \frac{5}{3}$, $a_n = a_{n-1}(3)$

E: $a_n = \frac{5}{3} \cdot 3^{n-1}$

10)

$a_1 = 1$

$r = 4$

1	1
2	4
4	64
6	1024
8	16,384
10	262,144

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

E: $a_n = 1 \cdot 4^{n-1}$

11)

$a_1 = 19,683$

$r = \frac{1}{3}$

1	19,683
2	6561
4	729
6	81
8	9
10	1

$a_1 = 19,683$, $a_n = a_{n-1}(\frac{1}{3})$

$a_n = 19,683(\frac{1}{3})^{n-1}$

12)

$a_1 = -2$

$r = 4$

1	-2
2	-8
4	-128
6	-2048
8	-32,768
10	-524,288

$a_1 = -2$, $a_n = a_{n-1}(4)$

$a_n = -2 \cdot 4^{n-1}$

13) Paper Tearing: Begin with 1 piece of paper at stage 1. For stage 2, tear it in 2 pieces. For each succeeding stage tear each piece of paper into two. Keep track of the total pieces of paper.

Sequence Rule: $a_n = 1 \cdot 2^{x-1}$ doubles or $y = 2^{x-1}$

10^{th} number $2 =$

Stage (x)	total pieces (y)
1	1
2	2
3	4
4	8
5	16

Describe the pattern doubles each tear equation: $f(x) = 1 \cdot 2^x$

Describe what the graph would look like starts at (1,1) and for each x-increase, y doubles

14) Gossip: One student tells three other students a secret. These three students each tell three more students. Keep track of the total people who know the secret.

Sequence Rule: $x\,4, , y = 1 \cdot 4^{x-1}$

10^{th} number $1 \cdot 4^9 = 262,144$

1 4 16 64 256

stage (x)	total (y)	
1	1	+ 3 new
2	4	+ 12 new
3	16	+ 48 new
4	64	
5		

Describe the pattern times by 4

$y = 1 \cdot 4^{x-1}$

Name Key Date _____ Hour _____ Score

Exponential Equations

Find another coordinate pair that fits the geometric sequence. Write the explicit and the recursive formula.

1)

1	2
2	4
3	8
4	16
5	32

$a_n = a_{n-1} \cdot 2 \quad a_1 = 2$

$f(x) = 2 \cdot 2^{x-1}$

$a_n = 2 \cdot 2^{n-1}$

2)

1	1
2	3
3	9
4	27
5	81

$a_n = a_{n-1} \cdot 3$

$a_1 = 1$

$f(x) = 3^{x-1}$

$a_n = 1 \cdot 3^{n-1}$

3)

1	-5
2	-25
3	-125
4	-625
5	-3125

$a_n = a_{n-1} \cdot 5$

$a_1 = -5$

$f(x) = -5 \cdot 5^{x-1}$

$a_n = -5 \cdot 5^{n-1}$

4)

1	2
2	6
3	18
4	54
5	162

$a_n = a_{n-1} \cdot 3$

$a_1 = 2$

$f(x) = 2 \cdot 3^{x-1}$

$a_n = 2 \cdot 3^{n-1}$

5)

1	16
2	8
3	4
4	2
5	1

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

$a_1 = 16$

$f(x) = 16 \cdot \left(\frac{1}{2}\right)^{x-1}$

$a_n = 16 \cdot \left(\frac{1}{2}\right)^{n-1}$

6)

1	-36
2	-6
3	-1
4	-1/6
5	-1/36

$a_n = a_{n-1} \cdot \frac{1}{6}$

$a_1 = -36$

$f(x) = -36 \cdot \left(\frac{1}{6}\right)^{x-1}$

$a_n = -36 \cdot \left(\frac{1}{6}\right)^{n-1}$

7)

2	-4
3	-8
4	-16
5	-32
6	-64

$a_n = a_{n-1} \cdot 2$

$a_2 = -4$

$f(x) = -4 \cdot 2^{x-2}$

$a_n = -2 \cdot 2^{n-1}$

8)

2	24
3	12
4	6
5	3
6	3/2

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

$a_2 = 24$

$f(x) = 24 \cdot \left(\frac{1}{2}\right)^{x-2}$

$a_n = 48 \cdot \left(\frac{1}{2}\right)^{n-1}$

9)

2	5
3	15
4	45
5	135
6	405

$a_n = a_{n-1} \cdot 3$

$a_2 = 5$

$f(x) = 5 \cdot 3^{x-2}$

$a_n = 5/3 \cdot 3^{n-1}$

10)

2	4
4	64
6	1024
8	16,384
10	262,144

$a_n = a_{n-2} \cdot 16$

$a_2 = 4$

$f(x) = 4 \cdot 4^{x-2}$

$a_n = 1 \cdot 4^{n-1}$

11)

2	6561
4	729
6	81
8	9
10	1

$a_n = a_{n-2} \cdot \frac{1}{9}$

$a_2 = 6561$

$f(x) = 6561 \cdot \left(\frac{1}{3}\right)^{x-2}$

$a_n = 19683 \cdot \left(\frac{1}{3}\right)^{n-1}$

12)

2	-8
4	-128
6	-2048
8	-32,768
10	-524,288

$a_n = a_{n-2} \cdot 16$

$a_2 = -8$

$f(x) = -8 \cdot 4^{x-2}$

$a_n = (-2) \cdot 4^{n-1}$

13) Paper Tearing: Begin with 1 piece of paper at stage 1. For stage 2, tear it in 2 pieces. For each succeeding stage tear each piece of paper into two. Keep track of the total pieces of paper.

Sequence Rule: $a_n = a_{n-1} \cdot 2$, $a_1 = 1$

10^{th} number: 512

Stage (x)	total pieces (y)
1	1
2	2
3	4
4	8
5	16
6	32

Describe the pattern: Double each time equation: $f(x) = 2^{x-1}$ or $\frac{1}{2} \cdot 2^x$

Describe what the graph would look like: exponential

14) Gossip: One student tells three other students a secret. These three students each tell three more students. Keep track of the total people who know the secret.

Sequence Rule: $a_n = a_{n-1} \cdot 3 + 1$, $a_1 = 1$

10^{th} number: 29,524

1 4 13 40 121

364 1093 3280 9841 29524

stage (x)	total (y)
1	1
2	4
3	13
4	40
5	121

Describe the pattern: triple plus 1