Essential Questions: How can we model situations using a geometric explicit formula? How can we use a geometric explicit formula to help us solve problems?

Do Now:
Find the 8th term of a geometric sequence where $a_2 = 20$ and $r = 5$?

$a_1 = 4$
$r = 5$
$n = 8$

$a_n = 4(5)^{n-1}$
$a_8 = 4(5)^{8-1}$
$a_8 = 4(5)^7$
$a_8 = 312{,}500$

$20 \div 5$
$a_1 = 4$

Problem Solving and Geometric Explicit Formulas

1) The number of bacteria in a culture doubles each hour. The table shows the number of new bacteria for each hour.

n	Hours	1	2	3
A(n)	Number of bacteria	120	240	480

(a) Write an equation that can be used to find the number of new bacteria after n hours.

$a_1 = 120$
$r = 2$

$A(n) = 120(2)^{n-1}$

(b) Find the number of bacteria after 5 hours.

$n = 5$

$A(5) = 120(2)^{5-1}$
$= 120(2)^4$
$= 1920$

(c) After how many hours is the number of bacteria 7680?
n A(n)

$A(n) = 120(2)^{n-1}$
$7680 = 120(2)^{n-1}$

$y = 120(2)^{n-1}$

x	y
	7680

look at table of values →

$x = 7$

7 hours, there will be 7680 bacteria

2) A digital city map displays an area of 544 square units. After you zoom in once, the area is 272 square units. After you zoom in a second time, the area is 136 square units.

(a) Write an equation that can be used to find the area after zooming in n times.

$a_1 = 272$

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

$a_n = 272\left(\frac{1}{2}\right)^{n-1}$

(b) What is the viewable area after you zoom in five times?

a_n n

$n = 5$

$a_5 = 272\left(\frac{1}{2}\right)^{5-1}$

$a_5 = 272\,(.5)^4$

$= 17$

17 square units

3) The table to the right shows the value of a car over a three year period after it had been purchased.

Year	Value ($)
1	18,000
2	15,300
3	13,005

(a) Write an explicit formula that represents the sequence.

$a_1 = 18{,}000$

$r = .85$

$a_n = 18{,}000\,(.85)^{n-1}$

$15{,}300 \div 18{,}000 = .85$

(b) How much will the car be worth after 8 years? *Round your answer to the nearest cent.*

a_n n

$a_n = 18{,}000\,(.85)^{n-1}$

$a_8 = 18{,}000\,(.85)^{8-1}$

$a_8 = \$5{,}770.39$

(c) After how many years will the car have a value of approximately $3,000?

n A_n

graph → $y = 18{,}000\,(.85)^{n-1}$

look for the x value →

x	y
	3000

approx. 12 years

(d) What was the purchase price of the car?

$18{,}000 \div 85$

$\$21{,}176.47$

(e) Would it be reasonable to use this model to predict the number of years it would take for the car's value to decline to about $100? Explain your reasoning.

Graph shows 33 years. Is this reasonable?

No. In general, 10-15 years would be the age of the car before it would be functionable.

4) Michael is sick with the flu but he still comes to school on Monday. He arrives at 8am and by 9am (Hour 1), Michael has already infected two of his friends, Joe and Lia. By 10am (Hour 2), Joe has infected two of his friends, Bill and Ted, and Lia has infected two of her friends, Jenny and Kiara.

(a) If each person with the flu infects two other people in each hour, how many students are infected by 3pm (Hour 7)? Complete the table and graph the points on the grid below.

Hour	n	0	1	2	3	4	5	6	7
Number of students infected each hour	$f(n)$	1	2	4	8	16	32	64	128

(b) Does this situation represent an arithmetic or geometric sequence?

(c) Write an explicit formula to represent the sequence.

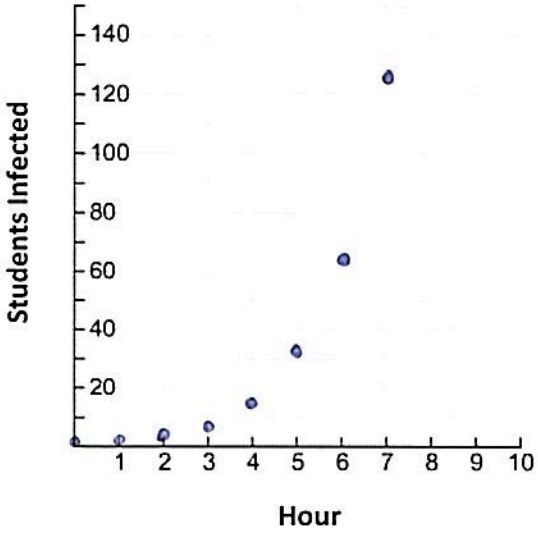
$a_1 = 2$

$r = 2$

$f(n) = 2(2)^{n-1}$

(d) Graph the sequence. Is it a picture of a line?

No, a curve



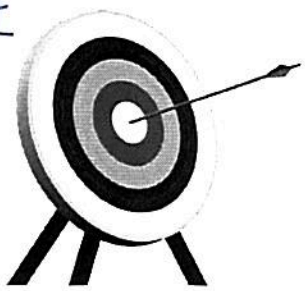
P.I.P.S. CORNER!

An archery competition begins with 256 competitors. After the first round, one-fourth of the competing group remains. After the second round, one-fourth of the now smaller competing group remains. The last round is when there are fewer than five members in the competing group.

round	0	1	2	3	4
competitors	256	64	16	4	1

(a) Which round is the last round?

3rd round



(b) How many competitors are in the last round?

4 competitors