Simplify:

$-3(p-5p^2)+3p^2-6p$

$-3p+15p^2+3p^2-6p$

$18p^3-9p$

A. $-12p^2-9p$

B. $18p^2-9p$

C. $9p^2-6p$

D. $9p^2$

Geometric Sequence

A **geometric sequence** is a sequence in which the ratio between any two consecutive terms, $\frac{a_n}{a_{n-1}}$, is constant. This constant value is called the **common ratio**. Another way to think of this is that each term is multiplied by the same value, the common ratio, to get the next term.

the general rule is $a_n = a_1(r)^{n-1}$, where r is the common ratio.

$$a_n = a_1(r)^{n-1}$$

Write a general rule for the geometric sequence $64, 32, 16, 8, \ldots$

$a_1 = 64$

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

$\div$ by 2 = $\cdot \frac{1}{2}$

$a_n = a_1 (r)^{n-1}$

$$\boxed{a_n = 64\left(\frac{1}{2}\right)^{n-1}}$$

Find the nth term rule for the sequence $81, 54, 36, 24, \ldots$ and hence find the 12th term.

$\frac{54}{81} \div 9 \quad \frac{6}{9} = \frac{2}{3}$

$a_1 = 81$

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

$\frac{36}{54} = \div 6 = \frac{6}{9} = \frac{2}{3}$

$$\boxed{a_n = 81\left(\frac{2}{3}\right)^{n-1}}$$

$a_n = 81\left(\frac{2}{3}\right)^{12-1} = 81\left(\frac{2^{11}}{3^{11}}\right) = 81\left(\frac{2048}{177147}\right)$

$= \frac{165888}{177147}$

The following sequence shows the distance (in centimeters) a pendulum travels with each successive swing. Write a general rule for the geometric sequence. 80, 72, 64.8, 58.32, ...

a_1

$\frac{72}{80} = \div 8$ $\frac{9}{10} = r$

$$\boxed{a_n = 80\left(\frac{9}{10}\right)^{n-1}}$$

Identify which of the following are geometric sequences. If the sequence is geometric, find the common ratio.

Example 2

$5, 10, 15, 20, \ldots$

arithmetic

no

Example 3

$1, 2, 4, 8, \ldots$

yes

$r = 2$

Example 4

$243, 49, 7, 1, \ldots$

no

Example 5

Find the general rule and the 20th term for the sequence $3, 6, 12, 24, \ldots$

$a_1 = 3$

$r = 2$

$$\boxed{a_n = 3(2)^{n-1}}$$

$a_{20} = 3(2)^{20-1}$

$= 3(2)^{19}$

$a_{20} = 3(524288)$

$$\boxed{a_{20} = 1{,}572{,}864}$$

Find the value of a 10 year old car if the purchase price was $22,000 and it depreciates at a rate of 9% per year.

$9\% = .09$ $\quad 100 - 9 = 91\% = .91$

$\boxed{r = .91}$

0) $22,000

A) $20,020

$a_1 = 22,000$

$a_n = 22,000(.91)^{n-1}$

$a_{10} = 22,000(.91)^{10-1}$

$a_{10} = 22,000(.91)^9$

$a_{10} = 22,000(.43)$

$a_{10} = \$9460$

1) 2, 4, 6, 8 arithmetic

4) $24, -16, \frac{32}{3}, \frac{-64}{9}$ $r = \frac{-2}{3}$ $24\left(\frac{-2}{3}\right) = \frac{-48}{3} = -16$

arithmetic = + or −

geometric = · or ÷

$\frac{-16}{24} \div 8 = \boxed{\frac{-2}{3} = r}$

7) $a_1 = 32$ $r = 32$ $a_n = 32(32)^{n-1}$

32, 1024, 32768, 1048576, 33554432

11) 162, 108, 72,

$\frac{108}{162} = \frac{54}{81} \div 3$ $\frac{18}{27} \div 9 = \frac{2}{3}$ $a_n = 162\left(\frac{2}{3}\right)^{n-1}$