

Adv. Functions - Geometric Sequences WS

1) $6, 12, 72, 360, \dots$

$$\frac{12}{6} = 2, \quad \frac{72}{12} = 6, \quad \frac{360}{72} = 5$$

No, not geometric
where $r = N/A$

2) $7, \frac{14}{3}, \frac{28}{9}, \frac{56}{27}, \dots$

$$\frac{\frac{14}{3}}{7} = \frac{2}{3}, \quad \frac{\frac{28}{9}}{\frac{14}{3}} = \frac{2}{3}, \quad \frac{\frac{56}{27}}{\frac{28}{9}} = \frac{2}{3}$$

Yes, geometric
where $r = \frac{2}{3}$

$$a_5 = \frac{56}{27} \left(\frac{2}{3}\right) = \frac{112}{81}$$

$$a_6 = \frac{112}{81} \left(\frac{2}{3}\right) = \frac{224}{243}$$

$$a_7 = \frac{224}{243} \left(\frac{2}{3}\right) = \frac{448}{729}$$

3) $18, -54, 162, -486, \dots$

$$\frac{-54}{18} = -3, \quad \frac{162}{-54} = -3, \quad \frac{-486}{162} = -3$$

Yes, geometric
where $r = -3$

$$a_5 = -486(-3) = 1458$$

$$a_6 = 1458(-3) = -4374$$

$$a_7 = -4374(-3) = 13122$$

4) $\frac{3}{2}, -\frac{3}{4}, \frac{3}{8}, -\frac{3}{16}, \dots$

$$\frac{-\frac{3}{4}}{\frac{3}{2}} = -\frac{1}{2}, \quad \frac{\frac{3}{8}}{-\frac{3}{4}} = -\frac{1}{2}, \quad \frac{-\frac{3}{16}}{\frac{3}{8}} = -\frac{1}{2}$$

Yes, geometric

$$a_5 = -\frac{3}{16} \left(-\frac{1}{2}\right) = \frac{3}{32}$$

$$a_6 = \frac{3}{32} \left(-\frac{1}{2}\right) = -\frac{3}{64}$$

$$a_7 = -\frac{3}{64} \left(-\frac{1}{2}\right) = \frac{3}{128}$$

5) $a_1 = 5, r = 2, a_6 = ?$

$$a_6 = 5(2)^{6-1}$$

$$a_6 = 5(2)^5$$

$$a_6 = 160$$

6) $a_1 = 53248, r = -\frac{1}{4}, a_{10} = ?$

$$a_{10} = ?$$

$$a_{10} = 53248 \left(-\frac{1}{4}\right)^{10-1}$$

$$a_{10} = 53248 \left(-\frac{1}{4}\right)^9$$

$$a_{10} = -\frac{13}{64}$$

9) $4, 8, 16, \dots$

$$\frac{8}{4} = 2, \quad r = \frac{8}{4} = 2$$

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

7) $-12, -6, -3, \dots, a_8 = ?$

$$r = \frac{-6}{-12} = \frac{1}{2}, \quad a_1 = -12$$

$$a_8 = -12 \left(\frac{1}{2}\right)^{8-1}$$

$$a_8 = -\frac{3}{32}$$

8) $20, 180, 1620, \dots, a_7 = ?$

$$r = \frac{180}{20} = 9, \quad a_1 = 20$$

$$a_7 = 20(9)^{7-1}$$

$$a_7 = 10,628,820$$

10) $36, -12, 4, \dots$

$$\frac{-12}{36} = -\frac{1}{3}, \quad r = \frac{-12}{36} = -\frac{1}{3}$$

$$a_n = 36 \left(-\frac{1}{3}\right)^{n-1}$$

11) $-6, -30, -150, \dots$

$$\frac{-30}{-6} = 5, \quad r = \frac{-30}{-6} = 5$$

$$a_n = -6 \cdot 5^{n-1}$$

12) $-\frac{5}{6}, \frac{5}{9}, -\frac{10}{27}, \dots$

$$\frac{\frac{5}{9}}{-\frac{5}{6}} = -\frac{2}{3}, \quad r = \frac{\frac{5}{9}}{-\frac{5}{6}} = -\frac{2}{3}$$

$$a_n = -\frac{5}{6} \left(-\frac{2}{3}\right)^{n-1}$$

$$13) a_{10} = -50,388,480, r = 6, a_1 = ?$$

$$-50388480 = a_1 (6)^{10-1}$$

$$\frac{-50388480}{10077696} = \frac{a_1 \cdot 10077696}{10077696}$$

$$\boxed{a_1 = -5}$$

$$14) a_1 = 78, a_7 = 1.21875, r = ?$$

$$1.21875 = 78(r)^{7-1}$$

$$\frac{1.21875}{78} = \frac{78r^6}{78}$$

$$.015625 = r^6$$

$$\sqrt[6]{.015625} = \sqrt[6]{r^6}$$

$$\boxed{r = .5 \text{ or } \frac{1}{2}}$$

$$15) 2, 14, 98, \dots, 4802, n = ?$$

$\swarrow \quad \searrow$
 $a_1 \quad r = \frac{14}{2} = 7 \quad \quad \quad \downarrow$
 $\quad \quad \quad \quad \quad \quad \quad \quad a_n$

$$\frac{4802}{2} = \frac{2(7)^{n-1}}{2}$$

$$2401 = 7^{n-1}$$

$$\log 2401 = \log 7^{n-1}$$

$$\frac{\log 2401}{\log 7} = \frac{(n-1) \log 7}{\log 7}$$

$$n = \frac{\log 2401}{\log 7} + 1$$

$$n = 5 \rightarrow \boxed{5^{\text{th}} \text{ term}}$$

$$17) a_1 = 2, a_2 = 10, 781250, \text{ part of seq? } n = ?$$

$$\frac{781250}{2} = \frac{2(5)^{n-1}}{2}$$

$$390625 = 5^{n-1}$$

$$1 + \frac{\log 390625}{\log 5} = \frac{(n-1) \log 5}{\log 5} + 1$$

$$n = 9 \rightarrow \boxed{\text{Yes, it's the 9th term}}$$

$$16) a_4 = 16, a_8 = 1, r = ?$$

$$\begin{cases} 1 = a_1 r^7 \\ 16 = a_1 r^3 \end{cases}$$

$$\frac{1}{16} = r^4$$

$$\sqrt[4]{\frac{1}{16}} = \sqrt[4]{r^4}$$

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

$$18) a_5 = -98304, a_3 = -1536, a_n = ? \rightarrow a_1 = ? r = ?$$

$$\begin{cases} -98304 = a_1 r^4 \\ -1536 = a_1 r^2 \end{cases}$$

$$64 = r^2$$

$$\sqrt{64} = \sqrt{r^2}$$

$$r = 8$$

$$-1536 = a_1 (8)^2$$

$$\frac{-1536}{64} = \frac{a_1 \cdot 64}{64}$$

$$a_1 = -24$$

$$\boxed{\begin{matrix} n^{\text{th}} \text{ term} \rightarrow \\ a_n = -24(8)^{n-1} \end{matrix}}$$

$$19) a_6 = 3, r = 2, a_{12} = ?$$

$$3 = a_1 (2)^{6-1} \rightarrow a_1 = ?$$

$$3 = a_1 2^5$$

$$a_n = \frac{3}{32} (2)^{n-1}$$

$$\frac{3}{32} = \frac{a_1 \cdot 32}{32}$$

$$a_{12} = \frac{3}{32} (2)^{12-1}$$

$$a_{12} = 192$$

$$a_1 = \frac{3}{32}$$

$$21) a_9 = 32805, a_{12} = 885735, a_{18} = ?$$

$$\begin{cases} 885735 = a_1 r^{11} \\ 32805 = a_1 r^8 \end{cases}$$

$$27 = r^3$$

$$\sqrt[3]{27} = \sqrt[3]{r^3}$$

$$r = 3$$

$$32805 = a_1 (3)^8$$

$$\frac{32805}{6561} = \frac{a_1 \cdot 6561}{6561}$$

$$a_n = 5 (3)^{n-1}$$

$$a_1 = 5$$

$$a_{18} = 5 (3)^{18-1}$$

$$a_{18} = 645700815$$

$$23) \begin{array}{ccccccc} & a_2 & a_3 & a_4 & & & \\ & ? & ? & ? & & & \\ 1 & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \\ a_1 & \times 3 & \times 3 & \times 3 & \times 3 & \times 3 & \\ & & & & & & 81 \\ & & & & & & \downarrow \\ & & & & & & a_5 \end{array}$$

$$81 = 1 (r)^{5-1}$$

$$81 = 1 r^4$$

$$\sqrt[4]{81} = \sqrt[4]{r^4}$$

$$r = 3$$

$$a_2 = 1 \times 3 = 3$$

$$a_3 = 3 \times 3 = 9$$

$$a_4 = 9 \times 3 = 27$$

$$a_5 = 27 \times 3 = 81 \checkmark$$

$$20) a_1 = -4, r = 3.2 \quad \begin{matrix} -0.038147 \\ \text{part of seq?} \\ n = ? \end{matrix}$$

$$\frac{-0.038147}{-4} = \frac{-4 (3.2)^{n-1}}{-4}$$

$$.00953675 = (3.2)^{n-1}$$

$$1 + \frac{\log .00953675}{\log 3.2} = \frac{(n-1) \log (3.2)}{\log 3.2} + 1$$

$$n = -2.999999384$$

No, -0.038147 is not part of of sequence since $n = \text{neg \#}$ + it's not a whole #!

$$22) \begin{array}{ccccccc} & a_2 & a_3 & a_4 & & & \\ & ? & ? & ? & & & \\ 4 & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \\ a_1 & \times 2 & \times 2 & \times 2 & \times 2 & \times 2 & \\ & & & & & & 64 \\ & & & & & & \downarrow \\ & & & & & & a_5 \end{array}$$

$$64 = 4 (r)^{5-1}$$

$$\frac{64}{4} = \frac{4 r^4}{4}$$

$$16 = r^4$$

$$\sqrt[4]{16} = \sqrt[4]{r^4}$$

$$r = 2$$

$$a_2 = 4 \times 2 = 8$$

$$a_3 = 8 \times 2 = 16$$

$$a_4 = 16 \times 2 = 32$$

$$a_5 = 32 \times 2 = 64 \checkmark$$

$$24) \begin{array}{ccccccc} & a_2 & a_3 & a_4 & a_5 & & \\ & ? & ? & ? & ? & & \\ 32 & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \\ a_1 & \times \frac{1}{2} & \times \frac{1}{2} & \times \frac{1}{2} & \times \frac{1}{2} & \times \frac{1}{2} & \\ & & & & & & a_6 \end{array}$$

$$1 = 32 (r)^{6-1}$$

$$\frac{1}{32} = \frac{32 (r)^5}{32}$$

$$\frac{1}{32} = r^5$$

$$\sqrt[5]{\frac{1}{32}} = \sqrt[5]{r^5} \quad r = \frac{1}{2}$$

$$a_2 = 32 \times \frac{1}{2} = 16$$

$$a_3 = 16 \times \frac{1}{2} = 8$$

$$a_4 = 8 \times \frac{1}{2} = 4$$

$$a_5 = 4 \times \frac{1}{2} = 2$$

$$a_6 = 2 \times \frac{1}{2} = 1 \checkmark$$