U7D6_T Applications

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Applicatio...

U7D6MCR 3UI

Sequences & Series Story Questions

Some hints for solving Story Questions:

1. If possible, write out the first few terms of the series.
2. Determine if it is Arithmetic or Geometric, and a Sequence or Series.
3. List "Given" and "Unknowns"
4. Determine which fomula(s) you need to use.
5. Solve and write a conclusion.

Examples:

1. A wall of blocks is built up so that each row has 2 less blocks from the previous row. If there are 43 blocks in the first row and 11 blocks in the top row, how many rows high is the wall?

$$43, 41, 39, 37 \ldots 11$$

$$11 = 43 + (n-1)(-2)$$

$$-32 = -2n + 2$$

$$-34 = -2n$$

$$17 = n$$

$t_n = 11$
$a = 43$
$d = -2$
$n = ?$

$$t_n = 45 - 2n$$

∴ There are 17 rows

2. A stereo system costing $1200 depreciates by 30 % per year. Find the value of the stereo after 6 years.

$1200, 840, 588, 411.6$

$0.7 \quad 0.7 \quad 0.7$

1200×0.3
$= 360$
$1200 - 360 = 840$
$840 \times 0.3 = 252$
$840 - 252 = 588$

$t_n = ar^{n-1}$
$= 1200(0.7)^{7-1}$
$= 1200(0.7)^6$
$= 141.18$

∴ the cost of the stereo after 6 years is $141.18

3. Suppose you researched your ancestors back ten generations. How many people would you research?

$a = 2 \qquad r = 2 \qquad n = 10$

$2, 4, 8, 16 \ldots$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_n = \frac{2(2^{10} - 1)}{2 - 1}$$

$$S_n = \frac{2(1023)}{1}$$

$$S_n = 2046$$

$\therefore$ you would research 2046 people

$\underline{}$
L.T

4. How many multiples of 5 are from 20 to 200?

$$20, 25, 30, 35, 40, \ldots, 200$$

$a = 20$

$d = 5$

$t_n = 200$

$n = ?$

$t_n = a + (n-1)(d)$

$200 = 20 + (n-1)5$

$200 = 20 + 5n - 5$

$185 = 5n$

$\boxed{37 = n}$

$t_n = 15 + 5n$

∴ There are 37 terms in the finite sequence

Arithmetic

5. How many multiples of 6 are there between 10 and 1000?

$12, \ldots 996$

$a = 12 \quad d = 6 \quad t_n = 996 \quad n = ?$

$t_n = a + (n-1)d$

$996 = 12 + (n-1)(6)$

$996 = 12 + 6n - 6$

$990 = 6n$

$165 = n$

$\therefore$ there are 165 multiples of 6 between 10 and 1000

6. Determine the value of x, such that
   $x - 4, \ 2x + 1, \ 5x + 4,$ are consecutive terms
   of an arithmetic sequence.

$t_1 \qquad t_2 \qquad t_3$

$$x - 4 \ , \ 2x + 1 \ , \ 5x + 4$$

$$\begin{array}{cc} 2x + 1 & 5x + 4 \\ - \ \ x + 4 & - \ 2x + 1 \\ \hline x + 5 & 3x + 3 \end{array}$$

$x + 5 = 3x + 3$

$3x - x = 5 - 3$

$\dfrac{2x}{2} = \dfrac{2}{2}$

$\boxed{x = 1}$

$\therefore \ x = 1$

7. Determine the value of x such that,
   $x - 2, \; 2 - x, \; x + 10$, are consecutive terms
   of a geometric sequence.

$x - 2, \; 2 - x, \; x + 10, \; \ldots$

$\dfrac{2 - x}{x - 2} = r$ where

$\dfrac{x + 10}{2 - x} = r$ $x \neq 2$

$\dfrac{2 - x}{x - 2} = \dfrac{x + 10}{2 - x}$

$4 - 4x + x^2 = x^2 + 8x - 20$

$2 - 2, \; 2 - 2, \; 2 + 10$

$0, 0, 12$

$24 = 12x$

$2 = x$

$\therefore$ no solution

U7D6 Practice: p. 470 #11, 13-20, p. 477 #7-13