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?

Arithmetic Sequence

$a = 43 \quad d = -2 \quad n = ? \quad t_n = 1$

$43, 41, 39, \ldots 11$

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

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

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

$11 = -2n + 45$

$\dfrac{-34}{-2} = \dfrac{-2n}{-2}$

$n = 17$

∴ there are 11 rows in the wall.

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

$$t_n = 1200(0.7)^{n-1}$$

$$t_n = 1200(0.7)^{7-1}$$

$$t_n = 1200(0.7)^6$$

$$t_n = 1200 \times (0.117649)$$

$$t_n = 141$$

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

$2, 4, 8, 16, 32, 64, 128, 256, 512, 1024$

$a = 2 \quad r = 2$

$t_n = 2^n$

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

$S_{10} = \dfrac{2(2^{10} - 1)}{1}$

$S_{10} = 2046$

∴ You're researching 2046 People.

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

20, 25, 30, ... 200

$a = 20$ $d = 5$ $n = ?$ $t_n = 200$

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

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

$200 = 5n + 15$

$185 = 5n$

$n = 37$

∴ There are 37 multiples of 5 from 20 to 200

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

$\rightarrow$ arithmetic

$a = 12 \qquad d = 6 \qquad t_n = 996$

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

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

$996 = 12 + 6n - 6$

$990 = 6n$

$165 = n$

$\therefore$ There are 165 multiples ~~between~~ ~~of six~~ 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.

$a = x - 4$

$5x + 4 - (2x + 1)$
$= 3x + 3$

$t_1 = x - 4$

$2x + 1 - (x - 4)$
$= x + 5$

$t_2 = 2x + 1$

$3x + 3 = x + 5$

$t_3 = 5x + 4$

$2x = 2$

$x = 1$

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

$$t_n = ar^{n-1}$$

$$r = \frac{2-x}{x-2} = \frac{x+10}{2-x}$$

$$(2-x)(2-x) = (x+10)(x-2)$$

$$4 - 2x - 2x + x^2 = x^2 - 2x + 10x - 20$$

$$0 = x^2 + 8x - 20 - 4 + 4x - x^2$$

$$0 = 12x - 24$$

$$-12x = -24$$

$$x = 2 \qquad \therefore \text{No solution}$$

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