Unit 2 5.6

Arithmetic Sequence Word Problems

Name: _____

Objective: The student will be able to solve real-world problems involving arithmetic sequences.

$$a_n = a_o \pm dn$$

1. Determine which term you want to start with: a_0, a_1, a_2,...
2. Determine the pattern (d). (Adding or subtracting each time?).
3. Write the equation.
   a. Take into consideration which term you started with and subtract from "n". For Example: $a_1 \rightarrow (n-1)$

Ex: Allen is on the football team this year but he has poor time management skills. His mother told him that he is off the team if he fails anything in school. On his first math quiz he earned a 90, then he earned an 86 and an 82 on his next two quizzes. If his grades continue at this rate, what will his quiz grade be on the 8th quiz? Will he still be on the team?

$a_1 = 90$ → $90, 86, 82, \ldots$ **pattern: subtract 4** $(d = -4)$ → $a_n = 90 - 4(n-1)$

Grade on the 8th quiz: $a_8 = 90 - 4(8-1) = 90 - 28 = 62$ → **On the team**

1. A recovering heart attack patient is told to get on a regular walking program. The patient is told to walk a distance of 5 km the first week, 8 km the second week, 11 km the third week and so on for a period of 10 weeks. At that point the patient is to maintain the distance walked during the 10th week. How far will the patient walk during the 10th week?

$a_1 = 5$
$a_2 = 8$ $\quad d = 3$ $\quad a_n = 5 + 3(n-1)$ $\quad a_{10} = 5 + 3(10-1) =$ 32km
$a_3 = 11$

2. You visit the Grand Canyon and drop a penny off the edge of a cliff. The distance the penny will fall is 16 feet the first second, 48 feet the next second, 80 feet the third second, and so on in an arithmetic sequence. What is the total distance the object will fall in 6 seconds?

$a_1 = 16$
$a_2 = 48$ $\quad d = 32$ $\quad a_n = 16 + 32(n-1)$ $\quad a_6 = 16 + 32(6-1) =$ 176 ft
$a_3 = 80$

3. The sum of the interior angles of a triangle is 180°, of a quadrilateral is 360° and of a pentagon is 540°. Assuming this pattern continues, find the sum of the interior angles of a dodecagon (12 sides).

$a_3 = 180$ $\quad a_n = 180 + 180(n-3)$
$a_4 = 360$ $\quad d = 180$ $\quad a_{12} = 180 + 180(12-3) =$ 1800°
$a_5 = 540°$

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4. A house worth $350,000 when purchased was worth $335,000 after the first year and $320,000 after the second year. If the economy does not pick up and this trend continues, what will be the value of the house after 6 years?

$a_0 = 350000$
$a_1 = 335000$ $d = -15000$ $a_n = 350000 - 15000n$
$a_2 = 320000$ $a_6 = 350000 - 15000(6) =$ **#260,000**

5. A runner begins training by running 5 mi. one week. The second week she runs a total of 6.5 mi. The third week she runs 8 mi. Assume this pattern continues. How far will she run in the tenth week?

$a_1 = 5$
$a_2 = 6.5$ $d = 1.5$ $a_n = 5 + 1.5(n-1)$ $a_{10} = 5 + 1.5(10-1)$
$a_3 = 8$ $=$ **18.5 miles**

6. Suppose on Jan. 1 you deposit $1.00 in an empty piggy bank. On Jan. 8 you deposit $1.50; on Jan. 15 you deposit $2.00; and each week thereafter you deposit $0.50 more than the previous week. What amount will you deposit in the 52nd week?

$a_1 = 1$
$a_2 = 1.50$ $d = .50$ $a_n = 1 + 0.5(n-1)$
$a_3 = 2.00$ $a_{52} = 1 + .5(52-1) =$ **#26.50**

7. When you opened your Instagram app this morning, you had 400 followers. You made a rude comment about Mrs. Ver Heecke and people found out. The next day you only had 393 followers, and the day after you were down to 386. At this rate how many followers will you have after 15 days?

$a_0 = 400$
$a_1 = 393$ $d = -7$ $a_n = 400 - 7(n)$
$a_2 = 386$ $a_{15} = 400 - 7(15) =$ **295 followers**

Bonus: A bookshelf has 7 shelves of different widths. Each shelf is narrower than the shelf below it. The bottom shelves are 26 in., 31 in, and 36 in. wide. What is the width of the top shelf? What is the total shelf space of all seven shelves?

$a_1 = 36$
$a_2 = 31$ $d = -5$ $a_n = 36 - 5(n-1)$
$a_3 = 26$ $a_7 = 36 - 5(6) =$ **6 inches**

total $= 36 + 31 + 26 + 21 + 16 + 11 + 6 =$ **147 inches**