

Adv. Algebra INCLASS
Sequence & Series Word Problems

Name Muy

1. In February you start a holiday savings account with a deposit of \$20. You increase each monthly deposit by five dollars until the end of the year. How much money will you have saved by the end of the year?

Explicit formula: Arith Ser.

Answer: \$495

$$a_1 = 20 \quad S_n = \frac{n}{2} [2a_1 + d(n-1)]$$

$$d = 5 \quad S_{11} = \frac{11}{2} [2(20) + 5(11-1)]$$

$$n = 11 \quad S_{11} = 5.5 [40 + 50]$$

$$S_{11} = \$495$$

2. An embroidery pattern calls for 5 stitches in the first row and for three more stitches in each successive row. The 25th row, which is the last row, has 77 stitches. Find the total number of stitches in the pattern.

Explicit formula: Arith Ser.

Answer: 1025 stitches

$$a_1 = 5 \quad S_n = \frac{n}{2} (a_1 + a_n)$$

$$d = 3 \quad S_{25} = \frac{25}{2} (5 + 77)$$

$$a_{25} = 77 \quad S_{25} = 12.5 (82)$$

$$n = 25$$

- ★ 3. A one ton sculpture is melting so that it loses one-fifth of its weight per hour. How much of the sculpture will be left after five hours? Need to find 6th term of the sequence

Explicit formula: Geom. Seq.

4096 tons
819.2 lbs
Answer: 655.36 lbs or
.37268 tons(1/2)

$$a_1 = 2000$$

$$r = 1 - \frac{1}{5} = \frac{4}{5}$$

$$n = 6$$

$$a_6 = 2000 \left(\frac{4}{5}\right)^{6-1}$$

$$a_6 = 655.36 \text{ lbs}$$

$$a_6 = 1 \left(\frac{4}{5}\right)^{6-1}$$

$$= .37268 \text{ tons}$$

4. Suppose your business made a profit of \$5500 the first year. If the profit increases 29% per year, find the total profit over the first 5 years.

Explicit formula: Geom. Ser.

Answer: \$48,785.10

$$a_1 = 5500$$

$$r = 1 + .29 = 1.29$$

$$n = 5$$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$S_5 = \frac{5500(1-1.29^5)}{1-1.29}$$

$$S_5 = 48,785.10$$

Adv. Algebra Assignment
Sequence & Series Word Problems

Name Key

1. Each year a volunteer organization expects to add 5 more people to the number of shut-ins for whom the group provides home maintenance services. This year, the organization provides the service for 32 people. How many people would the organization expect to serve in the 20th year?

Explicit formula: Arith. seq.

Answer: 127 people

$$\begin{aligned}d &= 5 \\a_1 &= 32 \\n &= 20\end{aligned}$$

$$\begin{aligned}a_n &= a_1 + d(n-1) \\a_{20} &= 32 + 5(20-1)\end{aligned}$$

$$a_{20} = 32 + 95$$

$$a_{20} = 127$$

2. The deer population in an area is increasing. This year, the population was 1.025 times last year's population of 2537. What will the population be 4 years from now?

Explicit formula: Geom Seq.

Answer: 2800.4 deer

2 2800 deer

$$r = 1.025$$

$$a_1 = 2537$$

$$n = 5$$

$$a_n = a_1 \cdot r^{n-1}$$

$$a_5 = 2537(1.025)^{5-1}$$

$$\text{or } r = 1.025$$

$$a_1 = 2600.425$$

$$n = 4$$

$$a_n = a_1 \cdot r^{n-1}$$

$$a_4 = 2600.425(1.025)^{4-1}$$

3. You enlarge a picture to 150% of its size several times. If the original picture is 1 in. wide, how wide is it after the 12th increase? Need to find the 13th term of the sequence

Explicit formula: Geom Seq.

Answer: 129.7 in

$$a_1 = 1 \text{ in}$$

$$r = 1.5(1 + .5)$$

$$n = 13$$

$$a_n = a_1 \cdot r^{n-1}$$

$$a_{13} = 1 \cdot (1.5)^{13-1} = 129.7463379$$

4. A marching band formation consists of 6 rows. The first row has 9 musicians, the second has 11, the third has 13 and so on. How many musicians are in the last row and how many musicians are there in all?

Explicit formula: Arith Seq + Ser.

Answer: last row 19 musicians
total 84 musicians

$$n = 6$$

$$a_1 = 9$$

$$d = 2$$

$$a_n = a_1 + d(n-1)$$

$$a_6 = 9 + 2(6-1)$$

$$a_6 = 9 + 10$$

$$a_6 = 19$$

$$S_n = \frac{n}{2} [2a_1 + d(n-1)]$$

$$S_6 = \frac{6}{2} [2 \cdot 9 + 2(6-1)]$$

$$S_6 = 3 [18 + 10]$$

$$S_6 = 3(28)$$

$$S_6 = 84$$

5. The end of a pendulum travels 50 cm on its first swing. Each swing after the first travels 99% as far as the preceding one. How far will the pendulum travel before it stops? in 10 swings? (Before it stops?)

Explicit formula: Geom Ser.

Answer: 478.1 cm

$$a_1 = 50$$

$$r = .99$$

$$n = 10$$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$S_{10} = \frac{50(1-.99^{10})}{1-.99}$$

$$S_{10} = 478.089625$$

$$S = \frac{a_1}{1-r} \text{ Before it stops.}$$

$$S = \frac{50}{1-.99}$$

$$S = 5000 \text{ cm}$$

6. Suppose you begin to work selling ads for a newspaper. You will be paid $\overbrace{\$50/\text{wk}}^{a_1}$ plus a minimum of \$7.50 for each potential customer you contact. What is the least amount of money you can earn after contacting eight businesses in one week? *Need to find 9th term in sequence.*

Explicit formula: Arith Seq.

Answer: \$110

$$a_1 = 50$$

$$d = 7.50$$

$$n = 9$$

$$a_n = a_1 + d(n-1)$$

$$a_9 = 50 + 7.50(9-1)$$

$$a_9 = 50 + 60$$

$$a_9 = 110$$

7. The first year a toy manufacturer introduces a new toy its sales total \$495,000. The company expects its sales to drop 10% each succeeding year. Find the total expected sales in the first 6 years.

Explicit formula: Geom. Series

Answer: \$2,319,367.05

$$a_1 = 495,000$$

$$r = 1 - .10 = .9$$

$$n = 6$$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$S_6 = \frac{495,000(1-.9^6)}{1-.9}$$

$$S_6 = 2,319,367.05$$

8. In March, Jaime starts a savings account for a mountain bike. He initially deposits \$15.00. He decides to increase each deposit by \$8.00. How much is his seventeenth deposit?

Explicit formula: Arith Seq.

Answer: \$143

$$a_1 = 15.00$$

$$d = 8$$

$$n = 17$$

$$a_n = a_1 + d(n-1)$$

$$a_{17} = 15 + 8(17-1)$$

$$a_{17} = 15 + 128$$

$$a_{17} = 143$$

9. An outdoor amphitheater has 45 rows of seats. The first row has 89 seats. The last row has 177 seats. Each row has 2 more seats than the previous row. How many seats are in the 45 rows?

Explicit formula: Arith Seq.

Answer: 5985 seats

$$n = 45$$

$$a_1 = 89$$

$$a_{45} = 177$$

$$d = 2$$

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_{45} = \frac{45}{2}(89 + 177)$$

$$S_{45} = 22.5(266) = 5985$$

10. Geraldo's current salary is \$40,000 per year. His annual pay raise is always a percent of his salary at the time. What would his salary be if he got four consecutive 4% increases?

Explicit formula: Geom Seq.

Answer: \$46,794.34

$$a_1 = 40,000$$

$$r = 1 + .04 = 1.04$$

$$n = 5$$

Need to find 5th term in sequence

$$a_n = a_1 \cdot r^{n-1}$$

$$a_5 = 40000(1.04)^{5-1}$$

$$a_5 = 46,794.3424$$

11. This month, Julia deposits \$400 to save for a vacation. She plans to deposit 10% more each successive month for the next 11 months. How much will she have saved after the 12 deposits?

Explicit formula: Geom Seq.

Answer: \$8553.71

$$a_1 = 400$$

$$r = 1 + .10 = 1.1$$

$$n = 12$$

$$S_n = \frac{a_1(1-r^n)}{(1-r)}$$

$$S_{12} = \frac{400(1-1.1^{12})}{1-1.1}$$

$$S_{12} = 8553.713507$$