

1. Complete the following formulas.

Arithmetic $a_n = \frac{a_1 + (n-1) \cdot d}{1}$ $S_n = \frac{n(a_1 + a_n)}{2}$

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

2. Find the next two terms in each sequence. Then decide whether each sequence is arithmetic, geometric, or neither. If possible, identify the common difference or common ratio.

	Next 2 terms	Arithmetic/Geometric/Neither	d/r
a) 2, 6, 18, ...	54, 162	G	r = 3
b) -4, -1, 3, 8, ...		N	
c) 3, 9, 15, 21, ...	27, 33	A	d = 6
d) 1, 4, 9, 16, ...		N	
e) -128, 32, -8, ...	2, -1/2	G	r = -1/4

3. Find the indicated term and the general term, a_n .

a) -729, 243, -81, ...
 $r = -\frac{1}{3}$
 $a_{27} = -729 \left(-\frac{1}{3}\right)^{26}$
 $a_n = a_1 \cdot r^{(n-1)} = -729 \left(-\frac{1}{3}\right)^{(n-1)}$

b) 5.2, 4.5, 3.8, 3.1, ...
 $d = -0.7$
 $a_9 = -0.4$
 $-0.7(9) + 5.9 = -6.3 + 5.9 = -0.4$
 $a_n = -0.7n + 5.9$
 $a_n = 5.2 + (n-1)(-0.7) = -0.7n + 5.9$

c) $\frac{15}{4}, \frac{3}{4}, \frac{3}{20}, \dots$
 $r = \frac{1}{5}$
 $a_7 = 0.0024$
 $\frac{15}{4} \cdot \left(\frac{1}{5}\right)^6 = 0.0024$
 $a_n = \frac{15}{4} \cdot \left(\frac{1}{5}\right)^{(n-1)}$

d) -117, -105, -93, ...
 $d = +12$
 $a_{21} = 123$
 $a_{21} = 12(21) - 129 = 123$
 $a_n = -117 + (n-1) \cdot 12 = 12n - 129$

4. Find the indicated values.

a) $a_1 = 3, r = 4, a_7 =$ 1 2 2 8 8

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

$$a_7 = 3 \cdot 4^6$$

b) $a_1 = 18, d = 5, a_9 =$ 58

$$a_9 = 18 + (9-1) \cdot 5$$

$$= 18 + 8 \cdot 5$$

$$= 58$$

c) $a_6 = 25, a_{15} = 52, a_1 =$ 10 $d =$ 3

6, 25 15, 52

$$\frac{52 - 25}{15 - 6} = \frac{27}{9} = \boxed{3 = d}$$

$$a_6 = a_1 + (6-1) \cdot 3$$

$$25 = a_1 + 15$$

$$\boxed{a_1 = 10}$$

e) $a_3 = 64, a_7 = \frac{1024}{81}, r = \pm \frac{2}{3}, a_1 =$ 144

$$\frac{1024}{81} = a_1 \cdot r^6$$

$$64 = a_1 \cdot \left(\frac{2}{3}\right)^6$$

$$64 = a_1 \cdot \left(\frac{4}{9}\right)^3$$

$$144 = a_1$$

$$\frac{1024}{81} \cdot \frac{1}{64} \cdot \frac{16}{81} = r^4 \quad r = \pm \frac{2}{3}$$

d) $a_5 = -1250, r = -5, a_6 =$ 156250

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

$$-1250 = a_1 \cdot (-5)^4$$

$$\frac{-1250}{625} = a_1$$

$$\boxed{a_1 = -2}$$

f) $a_{22} = 153, a_{33} = 186, a_1 =$ 90 $d =$ 3

$$d = \frac{186 - 153}{11} = \frac{33}{11} = 3$$

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

$$153 = a_1 + (22-1) \cdot 3$$

$$153 = a_1 + 63$$

$$90 = a_1$$

5. Find the indicated means

a) 3 arithmetic means between 24 and 96

a_1 a_5
24 42 60 78 96

$$d = \frac{96 - 24}{5-1} = \frac{72}{4} = \boxed{18 = d}$$

b) 5 geometric means between -16 and -1024

-16 32 -64 128 -256 512 -1024

$$-1024 = a_1 \cdot r^6$$

$$-16 = a_1$$

$$64 = r^6$$

$$r = \pm 2$$

6. a) In the arithmetic sequence 3, 11, 19, 27, 35, ..., which term is 163?

$$a_1 = 3$$

$$d = 8$$

$$a_n = 163$$

find n

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

$$163 = 3 + (n-1) \cdot 8$$

$$160 = 8n - 8$$

$$168 = 8n$$

$n = 21$
21st term

b) In the arithmetic sequence $\frac{17}{5}, 4, \frac{23}{5}, \dots$, which term is -14?

$$a_1 = \frac{17}{5}$$

$$a_n = -14$$

$$d = \frac{3}{5}$$

NO SOLUTION !

7. Find the indicated partial sum for each arithmetic series.

a) $a_1 = 14, a_{15} = -283, S_{15} =$

$$S_{15} = \frac{15(14 + (-283))}{2} = \frac{15(-269)}{2} = -2017.5$$

c) $4 + 11 + 18 + \dots + 172 =$

$$d = 7 \quad 172 = 4 + (n-1) \cdot 7$$

$$a_1 = 4 \quad 168 = 7n - 7$$

$$a_n = 172 \quad 175 = 7n \quad (n=25)$$

8. Find the indicated partial sum for each geometric series.

a) $a_1 = 2, r = 3; S_9 =$

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

$$S_9 = \frac{2(1-3^9)}{1-3} = -1(1-3^9)$$

9. For each geometric series, find a_1 .

a) $r = -3, S_9 = 34447$

$$n = 9$$

$$34447 = \frac{a_1(1-(-3)^9)}{4}$$

$$137788 = 19684 a_1$$

$$a_1 = 7$$

b) $r = \frac{1}{2}, S_5 = -\frac{93}{16}$

$$S_5 = \frac{a_1(1-(\frac{1}{2})^5)}{-1/2}$$

$$-\frac{93}{16} = \frac{a_1(1-\frac{1}{32})}{-1/2}$$

$$-\frac{93}{16} = a_1(-3)$$

10. Write the arithmetic series in expanded form, and then find its sum.

a) $\sum_{n=1}^7 (8n-5) =$

$$3 + 11 + 19 + 27 + 35 + 43 + 51$$

$$S_7 = \frac{7(3+51)}{2} = 7 \cdot 27 = 189$$

b) $\sum_{k=12}^{17} (3k+4) =$

$$40 + 43 + 46 + 49 + 52 + 55$$

$$S_6 = \frac{6(40+55)}{2} = 3(95) = 285$$

11. Write the geometric series in expanded form, and then find its sum.

a) $\sum_{n=1}^8 \frac{3}{5}(5^{n-1})$

$$1, 5, 25, 125, \dots, 78125$$

$$a_1 = \frac{3}{5} \quad r = 5$$

$$a_8 = 78125$$

$$n = 8$$

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

$$S_8 = \frac{\frac{3}{5}(1-5^8)}{1-5}$$

b) $\sum_{k=2}^7 -3^{(k-1)} =$

$$-3 + -9 + -27 + \dots + -729$$

$$r = 3$$

$$a_1 = -3 \quad a_6 = -729$$

$$S_6 = \frac{-3(1-3^6)}{1-3} = -1092$$

12. Express in sigma notation the sum of the first six terms for each.

a) $7 + 10 + 13 + \dots =$ _____

$$\sum_{n=1}^6 (3n+4)$$

$d=3$
 $a_1=7$
 $a_n = a_1 + (n-1)d$
 $a_n = 7 + 3n - 3$
 $a_n = 3n + 4$

b) $\frac{3}{32} + \frac{3}{4} + 6 + \dots =$ _____

$r=8$ $a_1 = \frac{3}{32}$
 $a_n = \frac{3}{32} \cdot 8^{(n-1)}$
 $\sum_{n=1}^6 \left[\frac{3}{32} \cdot 8^{(n-1)} \right]$

c) $(-81) + (-27) + (-9) + \dots =$ _____

$r = \frac{1}{3}$
 $a_1 = -81$
 $\sum_{n=1}^6 \left[-81 \left(\frac{1}{3} \right)^{(n-1)} \right]$
 $a_n = a_1 \cdot r^{n-1}$
 $a_n = -81 \left(\frac{1}{3} \right)^{n-1}$

d) $1.2 + 2.6 + 4 + 5.4 + \dots =$ _____

$d=1.4$ $a_1=1.2$
 $\sum_{n=1}^6 [1.2 + (n-1) \cdot 1.4]$

13. As shown in the table, the cost of renting a car is related to the number of miles driven. If a rental car is driven 600 miles, what is the cost?

Rental Car Cost					
Miles	100	200	300	400	500
Cost	\$44.75	\$53.25	\$61.75	\$70.25	\$78.75

\$ 87.25

$d = 8.50$
 $78.75 + 8.50 = 87.25$

14. Donna is employed by a doctor. She placed a sample of bacteria in a culture dish and recorded the number of bacteria present each 30 minutes beginning at 12:00 PM. The table shows Donna's data. If the pattern of bacterial growth remains constant, how many bacteria should be present in the culture dish at 3:00 PM?

Bacterial Growth			
Time	12:00 PM	12:30 PM	1:00 PM
Bacteria Present	120	360	1080

let $a_1 = 12 \text{ p.m.}$
 $a_2 = 12:30 \text{ p.m.}$
 $a_7 = 3 \text{ p.m.}$

$r=3$
 $a_n = a_1 \cdot r^{(n-1)}$
 $a_7 = 120 \cdot (3)^6 = 87480$

15. You acquired a baseball card of a famous rookie. A shop owner tells you that it is currently worth 5 dollars and that it will appreciate 20% each year. If you save it for seven years and then give it to your little brother, how much will it be worth?

5 (1.2) after 1 year

want a_7 let $a_1 = \text{value after 1 year}$
 $a_7 = a_1 \cdot r^{(n-1)}$
 $a_7 = 6 \cdot (1.2)^6 = \17.92

OR $5 = a_1$
 look for a_8

16. In order to calculate your grades for this semester, you need to add up the scores on all of your tests. If you scored 65 points on your first test, but raised your score by 7 points each time.

a) Find the total points you have for the six tests this semester.

$65 + 72 + 79 + 86 + 93 + 100$

OR $S_n = \frac{n(a_1 + a_n)}{2}$
 $= \frac{6(65 + 100)}{2}$
 $= 3(165)$
 $= 495 \text{ points}$

b) What is the average number of points you earned per test?

$\frac{495}{6} = 82.5$