

# Sequences and Series

Name: \_\_\_\_\_

1. Is each sequence geometric? If it is, state the common ratio and a formula to determine the general term in the form  $t_n = t_1 r^{n-1}$ .

a) 11, 33, 99, 297, ...

*geometric*  
 $t_n = 11(3)^{n-1}$

b) 6, 12, 18, 24, ...

*not geometric*

c)  $\frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{8}{3}, \dots$

*geometric*  
 $t_n = \frac{1}{3}(2)^{n-1}$

d) 0.5, 0.2, 0.08, 0.032, ...

*geometric*

2. Write the first four terms of each geometric sequence.

a)  $t_1 = 7, r = -3$

*7, -21, 63, -189*

b)  $t_1 = -8, r = \frac{1}{2}$

*-8, -4, -2, -1*

c)  $t_n = 3(0.6)^{n-1}$

*3, 1.8, 1.08, 0.648*

d)  $t_n = (-4)^n$

*-4, 16, -64, 256*

3. Determine the number of terms in each geometric sequence.

a) 4, 12, 36, ..., 78 732

b)  $5\sqrt{2}, 10, 10\sqrt{2}, \dots, 640$

c)  $t_1 = 5, r = -\frac{1}{2}, t_n = \frac{5}{64}$  *10*

d)  $t_1 = \frac{1}{4}, r = 3, t_n = 44 286.75$  *14*

4. Determine the  $n$ th term of each geometric sequence.

a)  $t_1 = 2, r = 7$

b)  $6, -18, 54, -164, \dots$

c)  $t_1 = 7, t_5 = 1792$   
 $t_n = 2(7)^{n-1}$

d)  $r = \frac{1}{4}, t_8 = \frac{1}{4}$   
 $t_n = 6(-3)^{n-1}$

$t_n = 7(4)^{n-1}$

$t_n = 4096\left(\frac{1}{4}\right)^{n-1}$

5. Determine the unknown terms in each geometric sequence.

a)  $18, \square, \square, 6174$   
 $126 \quad 882$

b)  $\square, 4, \square, \square, 108$   
 $\frac{4}{3} \quad 12 \quad 36$

c)  $5, \square, \square, \square, 80$   
 $10 \quad 20 \quad 40$   
 $-10 \quad 20 \quad 40$

6. The first term of a geometric sequence is 0.1; the tenth term is 26 214.4. Determine the value of the common ratio.

7. Determine the first term, the common ratio, and an expression for the general term of each geometric sequence.

a)  $t_5 = 900, t_7 = 0.09$

b)  $t_3 = -1728, t_6 = 373\,248$

$t_1 = 9 \times 10^{10}, r = \pm 0.01$   
 c)  $t_5 = 28, t_{11} = 1792$

$t_n = (9 \times 10^{10})(\pm 0.01)^{n-1}$

$t_1 = 1.75$   
 $r = \pm 2$

$t_n = (1.75)(\pm 2)^{n-1}$

$t_1 = -48$   
 $r = -6$   
 $t_n = (-48)(-6)^{n-1}$   
 d)  $t_2 = 3, t_4 = 0.75$

$t_1 = \pm 6$   
 $r = \pm 0.5$

$t_n = 6(\pm 0.5)^{n-1}$

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8. The following sequences are geometric. What is the value of each variable?

a)  $8x - 12, 16, 64, 256, \dots$   
 $x = 2$

b)  $25, 5, 1, 2y - 1, \dots$

$$y = \frac{6}{10} \text{ or } \frac{3}{5}$$

9. For a geometric sequence  $t_4 = 4x + 8$  and

$t_7 = x - 4$ . If the common ratio is  $\frac{1}{2}$ , what is the first term?

$$384$$

10. An excavating company has a digger that was purchased for \$240 000. It is depreciating at 12% per year.

a) Determine the next three terms of this geometric sequence.

$$\text{\$ } 211\,200, \text{\$ } 185\,856, \text{\$ } 163\,553$$

b) Determine the general term. Define your variables.

$$t_n = \text{value of digger}$$
$$n-1 = \text{years since purchase}$$

$$t_n = 240\,000(0.88)^{n-1}$$

c) How much will the digger be worth in 7 years?

$$\text{\$ } 98\,082$$

d) How long will it take before the equipment is worth less than \$120 000?

$$6 \text{ years}$$