Section 9.1: Sequences

#1-12: Write the first 4 terms of the sequence. (Assume n begins with 1.)

1) \( a_n = 3n \)  
2) \( a_n = 4n \)  
3) \( a_n = 3n - 5 \)  
4) \( a_n = 4n + 3 \)  
5) \( a_n = 3^n \)  
6) \( a_n = 4^n \)  
7) \( a_n = (-3)^n \)  
8) \( a_n = (-4)^n \)  
9) \( a_n = (-1)^n \)  
10) \( a_n = (-1)^{n+1} \)  
11) \( a_n = \frac{(-1)^{n+1}}{2n} \)  
12) \( a_n = \frac{(-1)^n}{3n} \)  

#13-24: Find the indicated term

13) \( a_n = 3n; \ a_8 \)  
14) \( a_n = 4n; \ a_{21} \)  
15) \( a_n = 3n - 5; \ a_{16} \)  
16) \( a_n = 4n + 3; \ a_{11} \)  
17) \( a_n = 3^n; \ a_5 \)  
18) \( a_n = 4^n; \ a_5 \)  
19) \( a_n = (-3)^n; \ a_6 \)  
20) \( a_n = (-4)^n; \ a_6 \)  
21) \( a_n = (-1)^n; \ a_{50} \)  
22) \( a_n = (-1)^{n+1}; \ a_{30} \)  
23) \( a_n = \frac{(-1)^{n+1}}{2n}; \ a_{12} \)  
24) \( a_n = \frac{(-1)^n}{3n}; \ a_{24} \)  

#25-40: write an expression for the \( n \)th term of the sequence

25) \( 2, 4, 6, 8, 10 ... \)  
26) \( 3, 6, 9, 12, 15 ... \)  
27) \( 3, 5, 7, 9, 11, 13 ... \)  
28) \( 5, 8, 11, 14, 17 ... \)  
29) \( -3, -1, 1, 3, 5 ... \)  
30) \( -8, -5, -2, 1, 4 ... \)  
31) \( 6, 10, 14, 18, 22 ... \)  
32) \( 3, 8, 13, 18, 21 ... \)  
33) \( 7, 13, 19, 25 ... \)  
34) \( 0, 8, 16, 24, 32 ... \)  
35) \( 2, 4, 8, 16, 32 ... \)  
36) \( 3, 9, 27, 81 ... \)  
37) \( 6, 12, 24, 48 ... \)  
38) \( 6, 18, 54, 162 ... \)  
39) \( 1, 2, 4, 8, 16 ... \)  
40) \( 1, 3, 9, 27 ... \)  

#41-48: Write the first 5 terms of the recursively defined sequence.

41) \( a_1 = 6, \ a_{k+1} = a_k + 3 \)  
42) \( a_1 = 3, \ a_{k+1} = a_k + 2 \)  
43) \( a_1 = 6, \ a_{k+1} = 2(a_k - 1) \)  
44) \( a_1 = -2, \ a_{k+1} = 5(a_k + 7) \)  
45) \( a_1 = -3, \ a_{k+1} = 2a_k + 3 \)  
46) \( a_1 = -4, \ a_{k+1} = -5a_k + 2 \)  
47) \( a_1 = 6, \ a_{k+1} = \frac{1}{2}a_k + 4 \)  
48) \( a_1 = 9, \ a_{k+1} = \frac{1}{3}a_k + 3 \)
Section 9.1 sequences

#49-58: find the indicated sum

49) \[ \sum_{k=1}^{4} 2k \]
50) \[ \sum_{k=1}^{5} 3k \]
51) \[ \sum_{k=2}^{6} (2k - 3) \]

52) \[ \sum_{k=3}^{5} (3k - 4) \]
53) \[ \sum_{k=0}^{4} 2^k \]
54) \[ \sum_{k=0}^{3} 3^k \]

55) \[ \sum_{k=4}^{8} (-1)^k \]
56) \[ \sum_{k=1}^{3} (-2)^k \]
57) \[ \sum_{k=1}^{3} \frac{2}{k} \]

58) \[ \sum_{k=2}^{4} \frac{2}{k + 1} \]
59) \[ \sum_{k=1}^{5} 5 \]
60) \[ \sum_{k=1}^{8} 2 \]
Section 9.2: Arithmetic sequences:

#1-8: show that each sequence is arithmetic. Find the common difference and write out the first 4 terms.

1) \(a_n = 3n + 5\)  \(\quad\) 2) \(a_n = 2n - 1\)  \(\quad\) 3) \(a_n = 5n - 2\)  \(\quad\) 4) \(a_n = 6n + 3\)

5) \(a_n = 3 - 4n\)  \(\quad\) 6) \(a_n = 2 - 3n\)  \(\quad\) 7) \(a_n = 4 - 6n\)  \(\quad\) 8) \(a_n = 9 - 2n\)

#9-18: Find a formula for the \(n^{th}\) term of the arithmetic sequence with initial term \(a_1\) and common difference \(d\).

9) \(a_1 = 4; \ d = 3\)  \(\quad\) 10) \(a_1 = 3; \ d = 4\)  \(\quad\) 11) \(a_1 = -2; \ d = 1\)  \(\quad\) 12) \(a_1 = 5, \ d = 2\)

13) \(a_1 = 4; \ d = -3\)  \(\quad\) 14) \(a_1 = 3; \ d = -4\)  \(\quad\) 15) \(a_1 = -2; \ d = -1\)  \(\quad\) 16) \(a_1 = 5, \ d = -2\)

#17-24: Find the indicated term in each arithmetic sequence.

17) 50\(^{th}\) term of, 3,6,9,12...  \(\quad\) 18) 30\(^{th}\) term of, 2,4,6,8...

19) 100\(^{th}\) term of 5, 8, 11, 14...  \(\quad\) 20) 75\(^{th}\) term of 9,13,17,21...

21) 80\(^{th}\) term of 5,2,-1,-4...  \(\quad\) 22) 40\(^{th}\) term of 11,8,5,2...

23) 25\(^{th}\) term of 20, 18,16,14...  \(\quad\) 24) 200\(^{th}\) term of 100, 95,90,85...

25) A local theater has 30 seats in the first row and 50 rows in all. Each successive row contains two additional seats. How many seats are in the 50\(^{th}\) row of the theater?

26) A staircase is made from bricks and has a total of 15 steps. The bottom step requires 50 bricks. Each successive step requires 2 less bricks. How many bricks are needed to construct the 15\(^{th}\) step?

27) An outdoor amphitheater has 40 seats in the first row, 41 seats in the second row, 42 seats in the third row. The pattern continues. The amphitheater has 40 rows. How many seats are in the 30\(^{th}\) row of the theater?

28) An outdoor amphitheater has 100 seats in the first row, 105 seats in the second row, 110 seats in the third row. The pattern continues. The amphitheater has 20 rows. How many seats are in the 20\(^{th}\) row?
Section 9.2: Arithmetic sequences:

#29 – 40 Find the indicated sum

<table>
<thead>
<tr>
<th></th>
<th>Sum Expression</th>
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</thead>
<tbody>
<tr>
<td>29</td>
<td>$\sum_{k=1}^{40} 2k$</td>
</tr>
<tr>
<td>30</td>
<td>$\sum_{k=1}^{50} 3k$</td>
</tr>
<tr>
<td>31</td>
<td>$\sum_{k=1}^{60} (2k - 3)$</td>
</tr>
<tr>
<td>32</td>
<td>$\sum_{k=1}^{30} (3k - 4)$</td>
</tr>
<tr>
<td>33</td>
<td>$\sum_{k=1}^{40} (5 - 2k)$</td>
</tr>
<tr>
<td>34</td>
<td>$\sum_{k=1}^{35} 4 - 3k$</td>
</tr>
<tr>
<td>35</td>
<td>$\sum_{k=1}^{20} (60 - 5k)$</td>
</tr>
<tr>
<td>36</td>
<td>$\sum_{k=1}^{33} (7 - 3k)$</td>
</tr>
</tbody>
</table>

37) A local theater has 30 seats in the first row and 50 rows in all. Each successive row contains two additional seats. How many seats are in the theater?

38) A staircase is made from bricks and has a total of 15 steps. The bottom step requires 50 bricks. Each successive step requires 2 less bricks. How many bricks are needed to construct the staircase?

39) An outdoor amphitheater has 40 seats in the first row, 41 seats in the second row, 42 seats in the third row. The pattern continues. The amphitheater has 70 rows. How many seats does the amphitheater contain?

40) An outdoor amphitheater has 100 seats in the first row, 105 seats in the second row, 110 seats in the third row. The pattern continues. The amphitheater has 20 rows. How many seats does the amphitheater contain?
Section 9.3: Geometric Sequences and Series:

#1-10: List the first 4 terms of the geometric series and find the common ratio (r).

1) \( a_n = 2^n \)  2) \( a_n = 3^n \)  3) \( a_n = 3(2^n) \)  4) \( a_n = 2(3^n) \)

5) \( a_n = \left( \frac{1}{2} \right)^n \)  6) \( a_n = \left( \frac{1}{3} \right)^n \)  7) \( a_n = 2^n \)  8) \( a_n = 3^{2n} \)

9) \( a_n = 2(3^{2n}) \)  10) \( a_n = 5(4^{2n}) \)

#11-18: Find a formula for the \( n^{th} \) term of the geometric sequence with first term \( a_1 \) and common ratio \( r \).

11) \( a_1 = 2; \; r = 3 \)  12) \( a_1 = 2; \; r = 4 \)  13) \( a_1 = 6; \; r = 2 \)  14) \( a_1 = 4; \; r = 2 \)

15) \( a_1 = 1; \; r = \frac{1}{2} \)  16) \( a_1 = 1; \; r = \frac{1}{3} \)  17) \( a_1 = 4; \; r = \frac{1}{2} \)  18) \( a_1 = 6; \; r = \frac{1}{3} \)

#19-26: Find the indicated term of the geometric sequence

19) The \( 10^{th} \) term; 6,18,54,162,...  20) The \( 12^{th} \) term; 6, 12, 24, 48,...

21) The \( 9^{th} \) term; 5,20,80,160,...  22) The \( 11^{th} \) term; 2,12,72,...

23) The \( 14^{th} \) term; 200,100,50,25,...  24) The \( 18^{th} \) term; 5000, 1250, \( \frac{625}{2}, \frac{625}{8},... \)

25) The \( 20^{th} \) term; 39366, 13122, 4374,...  26) The \( 10^{th} \) term; 5120, 1280, 320, 80...

27) Jess currently has a salary of $40,000 per year. She expects to get an annual raise of 2%. What will her salary be when she begins her \( 10^{th} \) year?

28) Jess currently has a salary of $20,000 per year. She expects to get an annual raise of 4%. What will her salary be when she begins her \( 15^{th} \) year?

29) The price of the average Phoenix home is $135,000. The price is expected to increase by 2.5% per year. What will the average price of a Phoenix home be in 8 years?

30) The price of the average Phoenix home is $135,000. The price is expected to increase by 2% per year. What will the average price of a Phoenix home be in 30 years?