Chapter 12 Objectives: by test day you should be able to say…

I can:

- Find the nth term of a sequence using recursive and explicit formulas
- Write recursive and explicit formulas
- Apply the knowledge of sequences to real life situations

- Write series in sigma (summation) notation
- Evaluate the partial sum of a series from sigma notation
- Apply the knowledge of series to real life situations

- Identify arithmetic sequences vs. other sequences
- Finding the nth term of arithmetic sequences
- Finding sums of arithmetic sequences
- Apply the knowledge of arithmetic sequences/series to real life situations

- Identify geometric sequences vs. other sequences
- Finding the nth term of geometric sequences
- Finding sums of geometric sequences
- Apply the knowledge of geometric sequences/series to real life situations

- Determine divergence/ convergence of an infinite geometric series.
- Find sums of infinite geometric series

Write each series in summation notation.

1. $6 + 12 + 24 + 48 + 96$

2. $\dfrac{3}{2} + \dfrac{3}{4} + \dfrac{1}{2} + \dfrac{3}{8} + \dfrac{3}{10} + \dfrac{1}{4} + \dfrac{3}{14}$

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3. $1 - 1 + 1 - 1 + 1 - 1 + 1$

4. $10 + 1 + \dfrac{1}{10} + \dfrac{1}{100} + \dfrac{1}{1000}$

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5. $-\dfrac{1}{4} + 2 + \dfrac{23}{4} + 11 + \dfrac{71}{4} + 26$

6. $0 + 2 + 6 + 12 + 20 + 30$

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Find the geometric mean of each pair of numbers.

7. 9 and 25

8. 12 and 27

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Find the 12th term of each arithmetic sequence.

9. $a_4 = 88$ and $a_8 = 29$

10. $a_{10} = -17$ and $a_{22} = 13$

11. $a_{20} = 1.4$ and $a_{30} = 7.2$

12. $a_{42} = 52.2$ and $a_{51} = 50.4$

Find the indicated sum for each arithmetic series.

13. S_{12} for $101 + 95 + 89 + 83 + \dots$

14. S_{30} for $-4.2 + (-1) + 2.2 + 5.4 + \dots$

Find the indicated sum for each geometric series.

15. S_{25} for $-1 + 2 - 4 + 8 - 16 + 32 - 64 + \dots$

16. S_9 for $2500 + 1500 + 900 + 540 + \dots$

17. Determine if the sequence is arithmetic. If it is, find the common difference, the 52nd term, and the explicit formula.
A) 34, 24, 14, 4, ...
B) –34, –14, 6, 26, ...
C) 37, 46, 55, 64, ...

18. Given the first term and the common difference of an arithmetic sequence find the 52nd term and the explicit formula.
A) $a_1 = -10$, $d = -2$
B) $a_1 = 2$, $d = 9$
C) $a_1 = -23$, $d = -6$

19. Given a term in an arithmetic sequence and the common difference find the 52nd term and the explicit formula.
A) $a_{34} = -296$, $d = -10$
B) $a_{25} = 445$, $d = 20$
C) $a_{15} = -104$, $d = -9$

20. Given two terms in an arithmetic sequence find the 52nd term and the explicit formula.
A) $a_{20} = -155$ and $a_{35} = -275$
B) $a_{20} = -3815$ and $a_{34} = -6615$
C) $a_{18} = 193$ and $a_{33} = 343$

21. Determine if the sequence is geometric. If it is, find the common ratio, the 8th term, and the explicit formula.
A) –3, –9, –27, –81, ...
B) –2, 6, –18, 54, ...
C) –2, –4, –8, –16, ...

22. Given the first term and the common ratio of a geometric sequence find the 8th term and the explicit formula.

A) $a_1 = 1, r = 2$

B) $a_1 = -1, r = 6$

C) $a_1 = -3, r = -5$

23. Given a term in a geometric sequence and the common ratio find the 8th term and the explicit formula.

A) $a_5 = -324, r = -3$

B) $a_2 = 3, r = -3$

C) $a_5 = -768, r = -4$

24. Given two terms in a geometric sequence find the 8th term and the explicit formula.

A) $a_2 = 5$ and $a_6 = 3125$

B) $a_3 = 100$ and $a_5 = 2500$

C) $a_3 = -36$ and $a_4 = 216$

25. Evaluate each arithmetic/ geometric series described.

A)
$$\sum_{k=1}^{15} (11 - 2k)$$

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

C) S_{15} for $8 + 10 + 12 + 14...$

D) S_{15} for $-4 - 8 - 16 - 32...$

E) S_{15} for $1 + 4 + 16 + 64...$

26.   Jacie is considering a job that offers a monthly starting salary of $4000 and guarantees her a monthly raise of $190 during her first year on the job. Find the general rule for this sequence and her monthly salary at the end of her first year.

27.   Find the sum of the first 20 terms of the arithmetic sequence: -12, -6, 0, 6, . . .

28.   Find the sum of the first 30 terms of the arithmetic sequence: 10, 5, 0, -5, . . .

29.   As part of her retirement savings plan, Patricia deposited $250 in a bank account during her first year in the workforce. During each subsequent year, she deposited $45 more than the previous year. Find how much she deposited during her twentieth year in the workforce. Find the total amount deposited in the twenty years.

MULTIPLE CHOICE

30. What is a formula for the nth term of sequence B shown below?

$B = 10, 12, 14, 16, ...$

1) $b_n = 8 + 2n$

2) $b_n = 10 + 2n$

3) $b_n = 10(2)^n$

4) $b_n = 10(2)^{n-1}$

31. What is the formula for the nth term of the sequence $54, 18, 6, \ldots$?

1)
$$a_n = 6\left(\frac{1}{3}\right)^n$$

2)
$$a_n = 6\left(\frac{1}{3}\right)^{n-1}$$

3)
$$a_n = 54\left(\frac{1}{3}\right)^n$$

4)
$$a_n = 54\left(\frac{1}{3}\right)^{n-1}$$

32. What is the common difference of the arithmetic sequence $5, 8, 11, 14$?

1) $\dfrac{8}{5}$ 3) 3

2) -3 4) 9

33. What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?

1) $\dfrac{3}{4}$ 3) $\dfrac{4}{3}$

2) $\dfrac{64}{81}$ 4) $\dfrac{37}{3}$

34. Find the 7th term of the geometric sequence for which $a_1 = 6$ and $r = -\dfrac{1}{2}$.

(1) 2   (3) $-\dfrac{3}{64}$

(2) $\dfrac{5}{2}$ (4) $\dfrac{3}{32}$

35. Jonathan's teacher required him to express the sum $\dfrac{2}{3} + \dfrac{3}{4} + \dfrac{4}{5} + \dfrac{5}{6} + \dfrac{6}{7}$ using sigma notation. Jonathan proposed four possible answers. Which of these four answers is *not* correct?

1)
$$\sum_{k=3}^{7} \frac{k-1}{k}$$

3)
$$\sum_{k=1}^{5} \frac{k+1}{k+2}$$

2)
$$\sum_{k=1}^{5} \frac{k}{k+1}$$

4)
$$\sum_{k=2}^{6} \frac{k}{k+1}$$

36. Find the first three terms of the recursive sequence defined below.
$$a_1 = -3$$

$$a_n = a_{(n-1)} - n$$

Look over:
- More story problems
- All previous WS's from Ch 12

1) Common Difference: $d = -10$
   $a_{52} = -476$
   Explicit: $a_n = 44 - 10n$

2) Common Difference: $d = 20$
   $a_{52} = 986$
   Explicit: $a_n = -54 + 20n$

3) Common Difference: $d = 9$
   $a_{52} = 496$
   Explicit: $a_n = 28 + 9n$

4) $a_{52} = -112$
   Explicit: $a_n = -8 - 2n$

5) $a_{52} = 461$
   Explicit: $a_n = -7 + 9n$

6) $a_{52} = -329$
   Explicit: $a_n = -17 - 6n$

7) $a_{52} = -476$
   Explicit: $a_n = 44 - 10n$

8) $a_{52} = 985$
   Explicit: $a_n = -55 + 20n$

9) $a_{52} = -437$
   Explicit: $a_n = 31 - 9n$

10) $a_{52} = -411$
    Explicit: $a_n = 5 - 8n$

11) $a_{52} = -10215$
    Explicit: $a_n = 185 - 200n$

12) $a_{52} = 316$
    Explicit: $a_n = 4 + 6n$

13) Common Ratio: $r = 3$
    $a_8 = -6561$
    Explicit: $a_n = -3 \cdot 3^{n-1}$

14) Common Ratio: $r = -3$
    $a_8 = 4374$
    Explicit: $a_n = -2 \cdot (-3)^{n-1}$

15) Common Ratio: $r = 2$
    $a_8 = -256$
    Explicit: $a_n = -2 \cdot 2^{n-1}$

16) $a_8 = 128$
    Explicit: $a_n = 2^{n-1}$

17) $a_8 = -279936$
    Explicit: $a_n = -6^{n-1}$

18) $a_8 = 234375$
    Explicit: $a_n = -3 \cdot (-5)^{n-1}$

19) $a_8 = 8748$
    Explicit: $a_n = -4 \cdot (-3)^{n-1}$

20) $a_8 = 2187$
    Explicit: $a_n = -(-3)^{n-1}$

21) $a_8 = 49152$
    Explicit: $a_n = -3 \cdot (-4)^{n-1}$

22) $a_8 = 16384$
    Explicit: $a_n = 4^{n-1}$

23) $a_8 = -312500$
    Explicit: $a_n = 4 \cdot (-5)^{n-1}$

24) $a_8 = 279936$
    Explicit: $a_n = -(-6)^{n-1}$

25) -75