

No Graphing Calculators are allowed. Show all work of good form for full marks. Good luck!

K/U	APP	THK	COMM
13 /15	7 /10	4 /4	4.5 /5

Knowledge and Understanding

/15



Multiple Choice Identify the choice that best completes the statement or answers the question. Write your answer on the line provided in CAPITAL letters.

1. Which of the following does not represent an arithmetic sequence?

- a. $2t_n + 3 = \frac{1}{3}t_{n-1}, t_1 = 3$ c. $5t_n - 3n + 2 = 0$
 b. $f(n) = 13n - 4$ d. $nt_n + 7 = 14n$

D

2. If the first term of a sequence is 3 and the common difference is 4, what is the 23rd term in the sequence?

- a. 88 c. 95
 b. 87 d. 91

D

3. The 11th term of a sequence is 24. If the first term is 374, then what is the common difference?

- a. -35 c. -34
 b. -27 d. -28

A

4. What is the common ratio of the sequence: $\frac{3}{2}, 1, \frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \dots$

- a. $\frac{2}{3}$ c. $\frac{3}{4}$
 b. $\frac{3}{2}$ d. $\frac{4}{3}$

A

5. What is the general term of the sequence: 6, 42, 294, 2058, 14406, ...

- a. $t_n = 6(7)^n$ c. $t_n = 6(7)^{n-1}$
 b. $t_n = 6(6)^{n-1}$ d. $t_n = 7(6)^{n-1}$

C

6. If the 9th term in a geometric sequence is 45 927 and the common ratio is 3, then what is the first term?

- a. 8
b. 7
c. 6
d. 9

B ✓

7. Find the next three terms of the sequence: 4, 8, 5, 10, 7, 14, 11, ...
 $\times 2 - 3 \times 2 - 3 \times 2 - 3$

- a. 20, 17, 37
b. 22, 18, 30
c. 19, 16, 25
d. 22, 19, 38

D ✓

8. Determine the general form for the arithmetic sequence whose 5th term is 10 and consecutive terms decrease by 4.

- a. $22 - 4(n - 1)$
b. $-2 + 4(n - 1)$
c. $26 - 4(n - 1)$
d. $-6 + 4(n - 1)$

C ✓

9. Determine S_{26} for the series: $\overset{56}{-452 - 396 - 340 - 284 - \dots}$

- a. 7176
b. 6448
c. 12298
d. 6200

✓

10. Calculate the sum of the first 6 terms of the geometric series with 3rd term 6 and common ratio $\frac{2}{3}$.

- a. $\frac{1330}{243}$
b. $\frac{211}{6}$
c. $\frac{665}{18}$
d. $\frac{665}{729}$

C ✓

11. Determine the number of terms in the sequence: 5240, 4365, 3490, 2615, ..., -2635

- a. 8
b. 10
c. 11
d. 9

1 2 3 4

B ✓

12. The number of chairs in a row at an opera house follows the arithmetic series: $t_n = 25 + (n - 1)4$. If there are going to be 50 rows, how many chairs does the opera house have?

- a. 6273
b. 6027
c. 6250
d. 6150

D ✓

13. How many terms will there be in the expansion of $(2x + 5)^5$?

- a. 4
b. 5
c. 6
d. 10

C ✓

14. What row in Pascal's Triangle does this sequence represent 1, 8, 28, 56, ..., 1?

- a. 9
b. 8
c. 10
d. 7

B ✓

15. Expand and simplify the first three terms in the binomial expansion $\left(3 + \frac{x}{\sqrt{5}}\right)^6$.

a. $729 + 1458 \frac{x}{\sqrt{5}} + 243 \frac{x^2}{5}$

b. $729 + 243 \frac{x}{\sqrt{5}} + 81 \frac{x^2}{5}$

B

/2

c. $729 + 1458 \frac{x}{\sqrt{5}} + 243x^2$

d. $729 + 1215 \frac{x}{\sqrt{5}} + 486x^2$

Application

/10

All questions must be answered algebraically using the appropriate formula learned in this unit!

16. To ensure he never eats the whole cake, Bobby only decides to eat half of what's left for each serving. Bobby starts eating when there's $\frac{2}{3}$ of the cake left, and no one else but Bobby eats it.

a) Write the explicit formula for the general term of the sequence representing the amount of cake he has left over. (2)

$$t_n = ar^{n-1} \rightarrow : \frac{2}{3} \left[\left(\frac{1}{2}\right)^n - \left(\frac{1}{2}\right)^1 \right]$$

$$t_n = \frac{2}{3} \left(\frac{1}{2}\right)^{(n-1)} \rightarrow : \frac{2}{3} [0.5^n - 0.5] \\ = \frac{2}{3} (0.5^n) - \frac{1}{3}$$

b) Write a recursive formula for this sequence. (2)

$$t_n = t_{n-1} \left(\frac{1}{2}\right)$$

c) How much cake will Bobby have eaten by his 5th serving? (2)

$$\begin{array}{ccccc} ① & ② & ③ & ④ & ⑤ \\ \frac{2}{3} & \frac{1}{3} & \frac{1}{6} & \frac{1}{12} & \frac{1}{24} \end{array}$$

$$\begin{aligned} & \frac{1}{3} \\ & \frac{2}{3} - \frac{1}{24} \\ & = \frac{16}{24} - \frac{1}{24} \\ & = \frac{15}{24} \end{aligned}$$

1.

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he would have eaten $\frac{15}{24}$

6 12 24 98304

17. Given the series $3(2) + 3(4) + 3(8) + \dots + 3(2^n) = 196602$, find the value of n .

(4 marks)

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

$$196602 = \frac{6(2^n - 1)}{2 - 1}$$

therefore, $n = 15$

$$196602 = 6(2^n - 1) \rightarrow n = 15$$

$$196608 = 6(2^n)$$

$$2^n = 32768$$

$$2^n = 2^{15}$$



Thinking

/4

18. For a particular sequence, the series formula is $S_n = n^2 - n$. Find t_6 .

(4 marks)

$$S_1 = 1^2 - 1$$

$$= 0$$

$$\therefore t_1 = 0$$

$$d = (+2)$$

$$S_6 = 36 - 6$$

$$= 30$$

Neat solution!

$$30 = 6\left(\frac{0+t_6}{2}\right)$$

$$5 = \frac{0+t_6}{2}$$

$$t_6 = 10$$

therefore, $t_6 = 10$

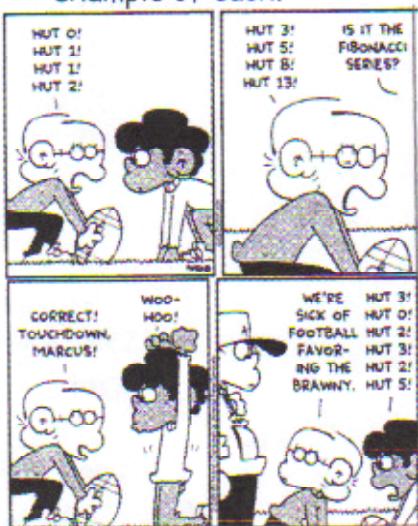


Communication (+3 marks for form)

/5

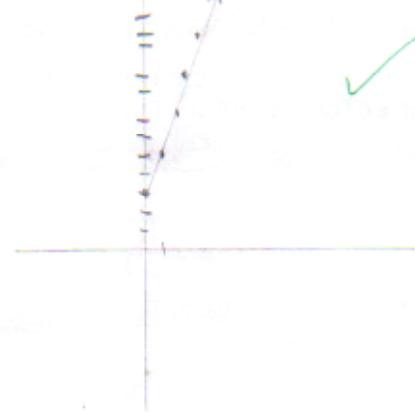
19. Explain the difference between the graphs of arithmetic and geometric sequences. Give an example of each.

(2 marks)



arithmetic has a common difference, so the graph is linear.

$$\text{eg. } 3 \ 5 \ 7 \ 9 \ 11$$



geometric has a common multiplier. common ratio diff, so its exponential

