

Multiple Choice. Select the best answer.

D 1. Which of the following describes the following sequence: $1/4, 1/16, 1/64, \dots$

- a. arithmetic with $d = 1/12$
- b. geometric with $r = 4$
- c. arithmetic with $d = 1/4$
- d. geometric with $r = 1/4$

$$\frac{1/16}{1/4} = 0.25 = 1/4$$

B 2. For a geometric sequence with $a_1 = 6$ and $r = 3$, find the value of a_4 .

- a. 81
- b. 162
- c. 486
- d. 72

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

$$a_4 = 6 \cdot 3^{4-1}$$

$$a_4 = 6 \cdot 3^3$$

$$a_4 = 6 \cdot 27 = 162$$

B 3. Which equation represents: 12, 16, 20, 24, ... ?

- a. $a_n = n + 4$
- b. $a_n = 4n + 8$
- c. $a_n = 4n + 12$
- d. $a_n = n + 12$

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

$$a_n = 12 + 4(n-1)$$

$$a_n = 12 + 4n - 4$$

$$a_n = 4n + 8$$

C 4. Under which value of "r" will an infinite geometric series diverge?

- a. $r = 2/3$
- b. $r = -1/4$
- c. $r = 3.5$
- d. $r = 0$

$$|r| \geq 1 \text{ diverges}$$

$$|r| < 1 \text{ converges}$$

B 5. Which of the following infinite geometric series converges?

- a. $6 + 12 + 18 + 24 + \dots$ Arith. $d = 6$
- b. $24 + 12 + 6 + 3 + \dots$ geom $r = \frac{1}{2}$
- c. $3 + 6 + 12 + 24 + \dots$ geom $r = 2$
- d. $24 + 18 + 12 + 6 + \dots$ Arith $d = -6$

6. In the formula $a_n = a_1 \cdot r^{n-1}$, state what each variable represents.

a_n : value of the n^{th} term

a_1 : value of the 1st term

n : location of term in sequence.

r : common ratio

Solve.

7. Write $\sum_{n=1}^4 (2n+1)$ in expanded form.

$$\sum_{n=1}^4 (2n+1) = \boxed{3+5+7+9}$$

$$2(1)+1 = 3$$

$$2(2)+1 = 5$$

$$2(3)+1 = 7$$

$$2(4)+1 = 9$$

3, 6, 12, 24

8. If a sequence is represented by $a_n = 3 \cdot 2^{n-1}$, write the first four terms of the sequence.

$$a_1 = 3 \cdot 2^{1-1} = 3$$

$$a_2 = 3 \cdot 2^{2-1} = 6$$

$$a_3 = 3 \cdot 2^{3-1} = 12$$

$$a_4 = 3 \cdot 2^{4-1} = 24$$

2430, 810, 270, 90 9. Write the first four terms of a sequence if $a_5 = 30$ and $r = 1/3$.

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

$$30 = a_1 \left(\frac{1}{3}\right)^{5-1}$$

$$30 = a_1 \left(\frac{1}{3}\right)^4$$

$$30 = a_1 \left(\frac{1}{81}\right)$$

$$a_1 = 2430$$

49th term

10. 342 is the _____th term in the following sequence: -42, -34, -26, -18, ...

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

$$342 = -42 + 8(n-1)$$

$$342 = -42 + 8n - 8$$

$$342 = 8n - 50$$

$$392 = 8n$$

$$49 = n$$

50, 70, 90, 110, 130 11. State the five arithmetic means between 30 and 150.

30 — — — — — 150

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

$$150 = 30 + d(7-1)$$

$$150 = 30 + 6d$$

$$120 = 6d$$

$$20 = d$$

-174,762.5 12. Find S_{20} of the following series: $\frac{1}{2} + (-1) + 2 + (-4) + \dots$ 20 terms.

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

$$S_{20} = \frac{0.5(1-(-2)^{20})}{[1-(-2)]}$$

$$= \frac{0.5(1-1048576)}{3}$$

$$= \frac{0.5(-1048575)}{3} = \frac{-524287.5}{3} = -174762.5$$

Solve.

- $d = -2$ 13. In an arithmetic series, the sum of 17 terms is 1462. If the first term in the series is 102, find d .

$$S_n = \frac{n}{2} [2a_1 + d(n-1)]$$

$$1462 = \frac{17}{2} [2(102) + d(17-1)]$$

$$1462 = 8.5 [204 + 16d]$$

$$172 = 204 + 16d$$

$$-32 = 16d$$

$$-2 = d$$

- 14, 28, 56 14. If $a_1 = 7$ and $r = 2$, state the next three terms in the geometric sequence.

$$a_1 = 7 \times 2 = \boxed{14} \times 2 = \boxed{28} \times 2 = \boxed{56}$$

- 15, 45, 135 15. Find three geometric means between 5 and 405.

$$5, _, _, _, 405$$

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

$$405 = 5 \cdot r^{5-1}$$

$$405 = 5 \cdot r^4$$

$$\sqrt[4]{81} = r^4$$

$$3 = r$$

- $r = 2$ 16. In a geometric sequence, find r if $a_1 = \frac{1}{2}$ and $a_{14} = 4096$.

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

$$4096 = 0.5 \cdot r^{14-1}$$

$$4096 = 0.5 r^{13}$$

$$\sqrt[13]{8192} = \sqrt[13]{r^{13}}$$

$$\boxed{r = 2}$$

- 420.875 17. Find S_6 for $128 + 96 + 72 + \dots$ 6 terms

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

$$S_6 = \frac{128(1-0.75^6)}{(1-0.75)}$$

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

$$S_6 = \frac{128(1-0.75^6)}{0.25}$$

$$S_6 = 420.875$$

- 40.5 18. Find the sum, if it exists, of $-54 + 18 + -6 + 2 + \dots$

$$r = \frac{18}{-54} = -\frac{1}{3} \text{ converges}$$

Infinite!

$$S = \frac{a_1}{1-r} = \frac{-54}{1-(-1/3)} = \frac{-54}{4/3} = -40.5$$

Solve.

19. You are offered a job and a choice of two salary plans. Both plans have a starting salary of \$25,000. Under Plan A, you will receive a \$2,500 increase every year. Under Plan B, you will receive a 5% increase every year. Under which plan will you have made more total money during your 40 year career? What will the amounts be?

Sum

Plan A

$$a_1 = 25000$$

$$d = 2500$$

$$n = 40$$

$$S_n = \frac{n}{2} [2a_1 + d(n-1)]$$

$$S_{40} = \frac{40}{2} [2(25000) + 2500(40-1)]$$

$$S_{40} = 20 [50000 + 97500]$$

$$S_{40} = 20 [147,500]$$

$$S_{40} = \$2,950,000$$

Which plan earns you more total \$\$?

circle one: Plan A Plan B

Plan A amount: \$2,950,000

Plan B amount: \$3,019,994.36

Plan B

$$a_1 = 25000$$

$$r = 1.05$$

$$n = 40$$

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

$$S_{40} = \frac{25000(1-1.05^{40})}{(1-1.05)}$$

$$S_{40} = 3,019,994.36$$