Name ______

Date ______

...etermine the first 5 terms of the given sequences

1. $a_n = \frac{n}{n+1}$ $= 1/2, 2/3, 3/4, 4/5, 5/6$

$a_5 = \frac{5}{5+1} = \frac{5}{6}$ $a_2 = \frac{2}{3}$

$a_4 = \frac{4}{4+1} = 4/5$ $a_1 = \frac{1}{2}$

$a_3 =$ $3/4$

2. $a_n = ne + n$

$a_5 = 5e+5$

$a_4 = 4e+4$

$a_3 = 3e+3$

$a_2 = 2e+2$

$a_1 = e+1$

3. $a_{n+1} = 4a_n$ if $a_1 = 2$

$a_{1+1} = 4(+2) = -8$

$= 2, 8, 32, 128, 152$

$a_2 = 4$ $a_{1+1} = 4(2) = 8$

$a_3 = 4($ $a_{2+1} = 4(8) = 32$

a_{3+1}

4. $a_n = (-1)^{n-1}(2n)$

$a_1 = (-1)^{1-1}(2(-1))$

$1(-2)$

-2

$= 2, -4, 6, -8, 10$

5. $a_n = -2a_{n+1} - 7$ if $a_1 = -2$

$a_1 = -2$

$a_2 = -2(a_3) - 7$

$-2, -3, -1, -5, 3$

6. $a_n = \frac{n^2}{1+n}$

$\boxed{1/2, 4/3, 9/4, 16/5, 25/6}$

Determine an explicit formula that could be used to find the nth term of the pattern with the given conditions.

7. $1, -4, 9, -16, \ldots$

$-4-1 = -5$

$9 - -4 = 13$

$-16 - 9 = -25$

$\boxed{a_n (-1)^{n-1}(n^2)}$

$(-1)^1(1)^2 = 1$ $a_3 = (-1)^2(3)^2$

8. $-8, -5, -2, 1, 4, \ldots$

$-5 - -8 = 3$

$-2 - -5 = 3$

$d = 3$

$a_1 = -8$

$\boxed{a_n = -8 + 3(n-1)}$

$= -8 + 3n - 3$

$= 3n - 11$

9. $3, -6, 12, -24, \ldots$

$r = -2$

$a_1 = 3$

$\boxed{a_n = 3(-2)^{n-1}}$

10. The 9th term of an arithmetic sequence is 18 and the 53rd term is 7.

$a_9 = 18$

$a_{53} = 7$

$53 - 9 + 1 = \underline{45}$

$7 - 18 = -11$

$d = 1/4$

$a_1 = 20$

$a_n = 20 - 1/4(n-1)$

$18 = a_1 + \frac{1}{4}(9-1)$

$20 = a_1$

11. The 10th term of an arithmetic sequence is -40 and the 82nd term is 176.

$d = 3$

$a_n = -67 + 3(10-1)$

$a_{10} = -67 + 27$

$a_{10} = 47$

$176 = a_1 (3)(82-1)$

$-67 = a_1$

12. The 4th term of a geometric sequence is -20 and the 10th term is $-\frac{4}{3125}$.

$r = 0.2$

$a_n = -2500(.2)^{n-1}$

$-20 = a_1(.2)^{4-1}$

$a_1 = -2500$

13. The 3rd term of a geometric sequence is 81 and the 9th term is $\frac{1}{9}$.

$r = 1/3$

$81 = a_1(1/3)^2$

$a_1 = 729$

$a_n = 729(1/3)^{n-1}$

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will you have in all after 10 days ... $.02 for the second day, $.04 for ...

2,73750

sum of the interior angles of a tri... ...ing this pattern continues, find ...

1. A culture of bacteria ... bacteria will there ...

$r = 1.06$

Determine the sum of each sequence.

14. $\sum_{k=1}^{5}(10)$

50

15. $\sum_{m=2}^{7}(2m+4)$

78

16. $\sum_{i=-2}^{3}(i^2+i)$

22

17. $\sum_{n=0}^{\infty}\left[5\left(\frac{2}{3}\right)^n\right]$

$S = \frac{5}{1-2/3} = 15$

18. $\sum_{n=3}^{\infty}\left[4\left(\frac{1}{3}\right)^n\right]$

$S = \frac{4/27}{1-1/3} = 2/9$

19. $\sum_{i=1}^{\infty}(2+i)$

∞

Express each series in summation notation

20. $1+4+7+\cdots+82$ $d=3$

$\boxed{\sum_{n=1}^{28}(3n-2)}$

$1+3(n-1)$
$1+3n-3$
$3n-2$
$82=3n-2$
$84=3n$

21. $23+17+11+\cdots-229$ $d=-6$

$\boxed{\sum_{1}^{43}(29-6n)}$

$a_n = 23-6(n-1)$
$23-6n+6$
$29-6n$
$-229 = 23-6n+6$
$-258=-6n$

22. $5+15+45+\cdots+3645$ $r=3$

$\boxed{\sum_{n=1}^{7}(5)(3)^{n-1}}$

$a_n = 5(3)^{n-1}$
$3645 = 5(3)^{n-1}$
$729 = (3)^{n-1}$
$\log_3 729 = n-1$
$6 = n-1$
$n=7$

23. $2+\frac{1}{2}+\frac{1}{8}+\cdots+\frac{1}{2048}$

$\frac{1}{2} \div \frac{4}{2} = \frac{3}{2}$ $\quad \frac{1}{8}-\frac{4}{2} = \frac{-3}{8}$

$\frac{1/2}{2} = 1/4$ $\quad \frac{1/8}{1/2} = 1/4$

$r = 1/4$

$\boxed{\sum_{n=1}^{7}2(1/4)^{n-1}}$

$a_n = 2(1/4)^{n-1}$
$\frac{1}{2048} = 2(1/4)^{n-1}$
$1/4096 = (1/4)^{n-1}$
$\log_{1/4}(1/4096) = n-1$
$6 = n-1$
$n=7$

24. $1-4+9-16+25+\cdots+121$

$\boxed{\sum_{1}^{11}(-1)^{n-1}\cdot n^2}$

Determine the number of terms in the sequence

25. $S_n = 4047,\ a_1 = 15,\ d = 2$

$4047 = \frac{n}{2}(15+13+2n)$
$8094 = 28n + 2n^2$
$0 = 2n^2+28n-8094$

$a_n = 15+2(n-1)$
$a_n = 15+2n-2$
$a_n = 13+2n$

$n=57$

26. $S_n = 315,\ a_1 = 315,\ d = -9$

$a_n = 315-9(n-1)$
$315-9n+9$
$324-9n$

$315 = \frac{n}{2}(315+324-9n)$
$630 = 639n - 9n^2$
$9n^2 - 639n + 630 = 0$

$n = 70$ 1

27. $S_n = -32767,\ a_1 = -1,\ r = 2$

$-32767 = -1\frac{(1-2^n)}{1-2}$ $\quad a_n = (-1)(2)^{n-1}$

$-32767 = \frac{-1(1-2^n)}{-1}$

$-32768 = -2^n$

$2^n = 32768$
$\log_2(32768) = n$
$n=15$

28. $S_n = 531440,\ a_1 = 2,\ r = 3$

$531440 = 2\frac{(1-3^n)}{1-3}$
$531440 = -1(1-3^n)$
$-531440 = 1-3^n$
$-531441 = -3^n$
$531441 = 3^n$

$\log_3(531441) = n$
$n=12$

29. You visit the Grand Canyon and drop a penny off the edge of a cliff. The distance the penny will fall is 16 feet the first second, 48 feet the next second, 80 feet the third second, and so on. What is the total distance the object will fall after 6 seconds? 16 48 80.... $d=32$

$a_n = 16+32(n-1)$
$a_2 = 16+32(2-1)$
$a_6 = 16+32(6-1)$
$=176$

$S_n = \frac{6}{2}(16+176)$
$= 576$ ft total

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...e sum of the interior angles of a triangle is 180°, of a quadrilateral is 360° and of a pentagon is 540°. ...ming this pattern continues, find the sum of the interior angles of a pentacontagon (50 sides).

180, 360, 540 d = ~~$80~~ 180

$a_n = 180 + 180(n-3)$

$a_4 = 180 + 180(4-3) = 360$

$a_5 = 180 + 180(5-3)$
$180 + 360 = 540$

$a_{50} = 180 + 180(50-3)$
$= 8640$ sides

31. A culture of bacteria increases by 6% every 2 hours. If there are 500 bacteria at the beginning, how many bacteria will there be after 24 hours?

$r = 1.06$
$a_1 = 500$
$n = 12$

$a_n = 500(1.06)^n = 1006.098$

$a_{12} = 500(1.06)^{12} = $ ~~949.15~~ 1006.098

32. You are promised $2500 the first day of a job and each day after that you will receive 45% of the previous day's amount?

$a_n = 2500(.55)^{n-1}$

$2500(.55)^{n-1}$

33. A one-ton ice sculpture is melting so that it loses one-fifth of its weight per hour. How much of the sculpture will be left after 5 hours in pounds?

$a_n = 2000(4/5)^n = 655.36$ pounds

$a_5 =$

655.36 $2000(4/5)^n$

34. Expand $(2x^3 - 3)^4$ completely

$(2x^3)^4 \; (2x^3)^3 \; (2x^3)^2 \; (2x^3)^1 \; (2x^3)^0$
1 4 6 4 1
$(-3)^0 \; (-3)^1 \; (-3)^2 \; (-2)^3 \; (-3)^4$

$1(16x^{12}) + 4(8x^9)(-3) + 6(4x^6)(9) + 4(2x)^3(-2)^3 + (-3)^4$

$\boxed{= 16x^{12} - 96x^9 + 216x^6 - 64x^3 + 81}$

1st	1 1
2nd	1 2 1
3rd	1 3 3 1
4th	1 4 6 4 1
5th	1 5 10 10 5 1
6th	1 6 15 20 15 6 1
	1 7 21 35 35 21 7
8th	1 8 28 56 70 56 28 8 1
9th	1 8 26 84 126 126 84 36 9 1

35. Expand $(3x^3 + 4)^6$ completely

$729x^{18} + 5832x^{15} + 19440x^{12} + 34560x^9 + 34560x^6 + 18432x^3 + 4096$

36. Determine the coefficient of y^3 when the binomial $(y + 2)^9$ is fully expanded.

$84(y)^3(2)^6 = 5316$

37. Determine the coefficient of y^3 when the binomial $(y + 2)^9$ is fully expanded.

38. Determine the 7th term when $(2a - 3b)^{10}$ is fully expanded?

$210(2a)^4(-3b)^6 = 2449440a^4b^6$

39. Determine the 5th term when $(x^2 + 4y)^9$ is fully expanded?

a b

$126((x)^2)^5(4y^4) = 32256x^{10}y^4$

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1.) $a_n = \frac{n}{n+1}$

$a_1 = \frac{1}{1+1} = 1/2$

$a_2 = \frac{2}{2+1} = 2/3$

$a_3 = \frac{3}{3+1} = 3/4$

$a_4 = 4/_{4+1} = 4/5$

$a_5 = 5/6$

2.) $a_n = ne + n$

$a_1 = e+1$

$a_2 = 2e+2$

$a_3 = 3e+3$

$a_4 = 4e+4$

$a_5 = 5e+5$

3.) $a_{n+1} = 4a_n$, $a_1 = 2$

$a_{1+1} = 4(2) = 8$

$a_{2+1} = 4(8) = 32$

$a_{3+1} = 4(32) = 128$

$a_{4+1} = 4(128) = 512$

4.) $a_n = (-1)^{n-1}(2n)$

$a_1 = (-1)^{1-1}(2(1))$

$= 1(2) = 2$

$a_2 = (-1)^{2-1}(2(2))$

$(-1)(4) = -4$

$a_3 = (-1)^{3-1}(2(3))$

$1(6) = 6$

$a_4 = (-1)^{4-1}(2(4))$

$-1(8) = -8$

$a_5 = (-1)^{5-1}(2(5))$

$1(10) = 10$

5.) $a_n = -2a_{n+1} - 7$, $a_1 = -2$

~~$a_2 = -2n$~~

$a_1 = -2a_2 - 7$

$-2 = -2a_2 - 7$

$5 = -2a_2$

$-5/2 = a_2$

$a_2 = -2a_3 - 7$

$-5/2 = -2a_3 - 7$

$9/2 = -2a_3$

$-9/4 = a_3$

$a_3 = -2a_4 - 7$

$-9/4 = -2a_4 - 7$

$19/4 = -2a_4$

$-19/8 = a_4$

$a_4 = -2a_5 - 7$

$-19/8 = -2a_5 - 7$

$37/8 = -2a_5$

$-37/16 = a_5$

6.) $a_n = \frac{n^2}{1+n}$

$a_1 = \frac{1^2}{1+1} = \frac{1}{2}$

$a_2 = \frac{2^2}{1+2} = \frac{4}{3}$

$a_3 = \frac{3^2}{1+3} = \frac{9}{4}$

$a_4 = \frac{4^2}{1+4} = \frac{16}{5}$

$a_5 = \frac{25}{6}$

7 $a_n = (-1)^{n-1}(n^2)$

$a_1 = (-1)^{1-1}(-1)^2$

$= 1(1) = 1$ $a_2 = (-1)^{2-1}(2)^2$

$= -1(4) = -4$

8 $d = 3$

$a_1 = 8$

$a_n = -8 + 3(n-1)$

$= 3d - 11$

9 $r = -2$

$a_1 = 3$

$a_n = 3(-2)^{n-1}$

10 $\frac{7-18}{53-9} = \frac{-11}{44} = \boxed{-\frac{1}{4} = d}$

$a_9 = a_1 + d(n-1)$

$18 = a_1 + -\frac{1}{4}(9-1)$

$18 = a_1 - 1/4(8)$

$18 = a_1 - 2$

$20 = a_1$

$a_n = 20 - \frac{1}{4}(n-1)$

$= 20 - \frac{1}{4}n + \frac{1}{4}$

$= 81/4 - 1/4 n$

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(11) $d = \frac{176 - -40}{82 - 10} = \frac{216}{72} = 3$

$-40 = a_1 + 3(10-1)$
$-40 = a_1 + 27$
$-67 = a_1$

$a_n = -67 + 3(n$
$= -67 + 3n$
$= 3n - 70$

(12) $r = \frac{-4}{\frac{3125}{-20}} = \frac{4}{62500}$

$10 - 4 = 6 \quad \sqrt[6]{r^6} = \sqrt[6]{\frac{4}{62500}} = 0.2$

$-20 = a_1(.2)^3$
$-20 = a_1(.008)$
$a_1 = -2500$

$a_n = -2500(0.2)^{n-1}$

(13) $a_3 = 81$
$a_9 = 1/9$

$r = \frac{1/9}{81} = \frac{1}{729}$

$9 - 3 = 6 \quad r^6 = \frac{1}{729} = \frac{1}{3}$

$81 = a_1(1/3)^2$
$81 = a_1(1/9)$
$729 = a_1$

(14) $\sum_{K=1}^{5} 10 = \underset{1}{10} + \underset{2}{10} + \underset{3}{10} + \underset{4}{10} + \underset{5}{10} = 50$

(15) $a_2 = 8$
$a_7 = 18$

$S_n = \frac{6}{2}(8 + 18)$
$3(26) = 78$

(16) $2 + 0 + 0 + 2 + 6 + 12$
$S = 22$

(17) $S = \frac{a_1}{1-r} = \frac{5}{1-2/3} = \frac{5}{1/3} = 15$

Converges!

(18) $\cancel{S = \frac{4}{1-1/3} = \frac{4}{2/3} = 6}$

Converges

$a_3 = 4\left(\frac{1}{3}\right)^3$
$4(1/27)$

$S = \frac{4/27}{1-1/3}$

$\frac{4/27}{2/3} = \boxed{\frac{2}{9}}$

(19) ∞

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