Algebra 2
1.4 Arithmetic Sequences and Series Practice WS

Write the first five terms of the sequence. Determine whether or not the sequence is arithmetic. If it is, find the common difference.

1. $a_n = -5 + 13(n-1)$

$-5, 8, 21, 34, 57$
arithmetic $d = 13$

2. $a_n = 9.8 - 3.2n$

$6.6, 3.4, 0.2, -3, -6.2$
arithmetic $d = -3.2$

3. $a_n = \dfrac{1}{n+1}$ not arith.

$\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}, \dfrac{1}{6}$

Write the explicit formula of the sequence and find the 20th term.

4. $a_1 = 2$ and $d = 3$

$a_n = 2 + 3(n-1); \ n \geq 1$
$a_{20} = 59$

5. $-6, -4, -2, \ldots$

$a_n = -6 + 2(n-1); \ n \geq 1$
$a_{20} = 32$

6. $a_1 = 0$ and $d = -\dfrac{2}{3}$

$a_n = -\dfrac{2}{3}(n-1); \ n \geq 1$
$a_{20} = -\dfrac{38}{3}$

7. $\dfrac{2}{5}, \dfrac{1}{15}, -\dfrac{4}{15}, \ldots$

$a_n = \dfrac{2}{5} - \dfrac{1}{3}(n-1); \ n \geq 1$
$a_{20} = \dfrac{-89}{15}$

Find the nth term of the sequence.

8. $a_1 = -4$ and $a_5 = 16$

$d = \dfrac{16 + 4}{5 - 1} = 5$

$a_n = -4 + 5(n-1); \ n \geq 1$

9. $a_3 = 94$ and $a_6 = 85$

$d = \dfrac{85 - 94}{6 - 3} = -3$

$a_n = 94 - 3(n-1); \ n \geq 1$

10. $a_5 = 190$ and $a_{10} = 115$

$d = \dfrac{115 - 190}{10 - 5} = -15$

$a_n = 190 - 15(n-5); \ n \geq 1$

11. $a_6 = -38$ and $a_{11} = -73$

$d = \dfrac{-73 + 38}{11 - 6} = -7$

$a_n = -38 - 7(n-6); \ n \geq 1$

12. $a_3 = 19$ and $a_{15} = -1.7$

$d = \dfrac{-1.7 - 19}{15 - 3} = -1.725$

$a_n = 19 - 1.725(n-1); \ n \geq 1$

13. $a_5 = 16$ and $a_{14} = 38.5$

$d = \dfrac{38.5 - 16}{14 - 5} = 2.5$

$a_n = 16 + 2.5(n-5); \ n \geq 1$

Find the indicated n^{th} partial sum (S_n) of the arithmetic sequence.

14. $8, 20, 32, 44, \ldots \ n = 10$

$a_n = 8 + 12(n-1) \rightarrow a_{10} = 98$
$S_{10} = \dfrac{10}{2}(8 + 98) = 530$

15. $a_1 = -6, \ d = 4, \ n = 50$

$a_n = -6 + 4(n-1) \rightarrow a_{50} = 190$
$S_{50} = \dfrac{50}{2}(-6 + 190) = 4600$

16. $0.5 + 1.3 + 2.1 + \ldots + 70.1$

$a_n = 0.5 + 0.8(n-1)$
$70.1 = 0.5 + 0.8(n-1) \rightarrow n = 88$
$S_{88} = \dfrac{88}{2}(0.5 + 70.1) = 3106.4$

17. $-3 - \dfrac{3}{2} + 0 + \ldots + 30$

$a_n = -3 + \dfrac{3}{2}(n-1)$
$30 = -3 + \dfrac{3}{2}(n-1) \rightarrow n = 23$
$S_{23} = \dfrac{23}{2}(-3 + 30) = 310.5$

18. $a_1 = 100, \ d = -5, \ n = 8$

$a_n = 100 - 5(n-1) \rightarrow a_8 = 65$
$S_8 = \dfrac{8}{2}(100 + 65) = 660$

19. $a_2 = 8, \ a_5 = 9.5, \ n = 12$

$d = \dfrac{9.5 - 8}{5 - 2} = 0.5$

$a_n = 8 + 0.5(n-2) \rightarrow a_1 = 7.5$
$a_{12} = 13$

$S_{12} = \dfrac{12}{2}(7.5 + 13)$
$= 123$

20. How many terms of the arithmetic sequence -2, 3, 8,… must be added to get 1573?

$a_n = -2 + 5(n-1)$

$1573 = \frac{n}{2}\left(-2 + \overset{a_n}{-2+5(n-1)}\right)$ ← a_1, a_n

$n = 26$

21. How many terms of the arithmetic sequence 15, 12, 9,…must be added to get -39?

$a_n = 15 - 3(n-1)$

$-39 = \frac{n}{2}\left(15 + 15 - 3(n-1)\right)$

$n = 13$

22. How many terms of the arithmetic sequence -1, 2, 5,… must be added to get 609?

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

$609 = \frac{n}{2}\left(-1 + -1 + 3(n-1)\right)$

$n = 21$

23. An arithmetic sequence has a 10th term of 17 and a 14th term of 30. Find the common difference.

$d = \frac{30 - 17}{14 - 10} = \frac{13}{4}$

24. The second term of an arithmetic sequence is 7. The sum of the first 4 terms of the arithmetic sequence is 12. Find the first term b_1, and the common difference, d, of the sequence.

$a_n = 7 + d(n-2); n \geq 1$

$12 = \frac{4}{2}\left(\overset{a_1}{7 + d(-1)} + \overset{a_4}{7 + d(4-2)}\right) \rightarrow d = 6$

25. The first, second, and the nth terms of an arithmetic sequence are 2, 6, and 58 respectively,

a. Find the value of n.

$a_n = 2 + 4(n-1)$

$58 = 2 + 4(n-1) \rightarrow n = 15$

b. For the value of n in part a, find the exact value of the sum of those n terms.

$S_{15} = \frac{15}{2}(2 + 58) = 450$

26. The 10th term of an arithmetic sequence is 10 and the sum of the first 10 terms is -35. Find the first term a_1, and the common difference, d, of the sequence.

$a_n = 10 + d(n-10) \rightarrow a_1 = 10 - 9d$

$-35 = \frac{10}{2}(\underset{a_1}{10 - 9d} + \underset{a_{10}}{10})$

$d = 3$

Find the sums of the following arithmetic series in summation notation.

27. $\sum_{n=1}^{50} n = \frac{50}{2}(1 + 50)$

$= 1275$

28. $\sum_{n=51}^{100} 2(n) = \frac{50}{2}(100 + 198)$

$= 7450$

29. $\sum_{n=75}^{500} (n+6) = \frac{426}{2}(81 + 506)$

$= 125031$

30. $\sum_{n=100}^{250} (600 - n)$

$= \frac{151}{2}(500 + 350)$

$= 64175$

31. $\sum_{n=11}^{30} n - \sum_{n=1}^{10} n$

$= \frac{20}{2}(11 + 30) - \frac{10}{2}(1 + 10)$

$= 355$

32. $\sum_{n=2}^{17} 2n - \sum_{n=5}^{10} n$

$= \frac{16}{2}(4 + 34) - \frac{6}{2}(5 + 10)$

$= 259$

33. Jerry deposited $20,000 on an investment that will give $1,750 for every year that his money stays in the account. How much money will he have in his account by the end of year 8?

end year $1 \rightarrow \$21,750$

$a_n = 21,750 + 1750(n-1) \rightarrow a_8 = \$34,000$

34. There is a stack of logs in the backyard. There are 15 logs in the 1st layer, 14 in the second, 13 in the third, 12 in the fourth, and so on with the last layer having one log. How many logs are in the stack?

$b_n = 15 - (n-1)$

$1 = 15 - (n-1)$

$n = 15$

$S_{15} = \frac{15}{2}(15+1)$

$= 120 \text{ logs}$

35. In his piggy bank, Bingo dropped $1.00 on May 1, $1.75 on May 2, $2.50 on May 3 and so on until the last day of May.

a. How much did he drop in his piggy bank on May 19?

$u_n = 1 + 0.75(n-1)$

$u_{19} = \$14.50$

b. What was his total deposit in his piggy bank for the month of May?

$S_{31} = \frac{31}{2}(1 + 23.50)$

$= \$379.75$

$u_{31} = 23.50$

36. There are 20 rows of seats on a concert hall: 25 seats are in the 1st row, 27 seats on the 2nd row, 29 seats on the 3rd row, and so on. If the price per ticket is $2 30 , how much will be the total sales for a one-night concert if all seats are taken?

$a_n = 25 + 2(n-1)$

$a_{20} = 63$

$S_{20} = \frac{20}{2}(25+63)$

$= 880 \text{ seats} \rightarrow \$184,000$

37. Sonia has 55 blocks. She decides to stack up all the blocks so that each row has one less block than the row below. She wants to end up with just 1 block on top. How many should she put in the bottom row?

$u_1 = 1 \qquad u_n = 1 + 1(n-1)$

$55 = \frac{n}{2}(1 + 1 + 1(n-1)) \rightarrow n = 10$

38. A theater has 32 rows of seats. If there are 26 seats in the 1st row, 30 in the 2nd, 34 in the 3rd, and so on, how many seats are there in all?

$b_n = 26 + 4(n-1)$

$b_{32} = 150$

$S_{32} = \frac{32}{2}(26 + 150)$

$= 2816 \text{ seats}$

39. A tube well is bored 800 meters deep. The 1st meter costs $250 and the cost per meter increases by $50 for every subsequent meter. Find the cost of boring the 750th meter and the total cost incurred for the entire job.

$a_n = 250 + 50(n-1) \rightarrow a_{750} = \$37,700$

$a_{800} = \$40,200$

$S_{800} = \frac{800}{2}(250 + 40,200)$

$= \$16,180,000$