Advanced Algebra – Arithmetic Sequences Name _____

Assignment # _____

Find the indicated term for each arithmetic sequence.

1. Find a_{15} where $a_1 = 5$ and $d = 3$

2. Find a_{12} where $a_1 = 18$ and $d = -4$

3. Find a_{40} for 2,7, 12, 17,...

4. Find the 30^{th} term of 2,6,10,14,...

5. $a_1 = 3, d = -3, n = 12$ Find a_{12}

6. $a_1 = -6, d = \frac{1}{2}, n = 10$ Find a_{10}

7. 72 is the _____th term of 16,20,24, ...

8. 16 is the _____th term of 82, 80, 78,...

Advanced Algebra – Arithmetic Sequences Name Key
Assignment # _____

Find the indicated term for each arithmetic sequence.

1. Find a_{15} where $a_1 = 5$ and $d = 3$ $n=15$

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

$a_{15} = 5 + 3(15-1)$

$a_{15} = 5 + 3(14)$

$a_{15} = 5 + 42$

$\boxed{a_{15} = 47}$

2. Find a_{12} where $a_1 = 18$ and $d = -4$ $n=12$

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

$a_{12} = 18 + (-4)(12-1)$

$a_{12} = 18 + (-4)(11)$

$a_{12} = 18 - 44$

$\boxed{a_{12} = -26}$

3. Find a_{40} for 2,7, 12, 17,...

$n=40$ $a_1=2$ $d=5$

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

$a_{40} = 2 + 5(40-1)$

$a_{40} = 2 + 5(39)$

$a_{40} = 2 + 195$

$\boxed{a_{40} = 197}$

4. Find the 30th term of 2,6,10,14,...

$n=30$ $a_1=2$ $d=4$

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

$a_{30} = 2 + 4(30-1)$

$a_{30} = 2 + 4(29)$

$a_{30} = 2 + 116$

$\boxed{a_{30} = 118}$

5. $a_1 = 3, d = -3, n = 12$ Find a_{12}

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

$a_{12} = 3 + (-3)(12-1)$

$a_{12} = 3 + (-3)(11)$

$a_{12} = 3 - 33$

$\boxed{a_{12} = -30}$

6. $a_1 = -6, d = \frac{1}{2}, n = 10$ Find a_{10}

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

$a_{10} = -6 + (.5)(10-1)$

$a_{10} = -6 + (.5)(9)$

$a_{10} = -6 + 4.5$

$\boxed{a_{10} = -1.5}$

7. 72 is the _____th term of 16,20,24, ...

a_n n? $a_1=16$ $d=4$

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

$72 = 16 + 4(n-1)$

$72 = 16 + 4n - 4$

$72 = 4n + 12$

$60 = 4n$

$\boxed{n = 15}$

8. 16 is the _____th term of 82, 80, 78,...

a_n n? $a_1=82$ $d=-2$

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

$16 = 82 + (-2)(n-1)$

$16 = 82 - 2n + 2$

$16 = -2n + 84$

$-68 = -2n$

$\boxed{n = 34}$

pg 629

9) $1, 4, 7, 10, \ldots$

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

$d = 3$ $\quad a_n = 1 + 3(n-1)$

$a_n = 1 + 3n - 3$

$\boxed{a_n = 3n - 2}$

$a_{12} = 3(12) - 2$

$a_{12} = 36 - 2$

$\boxed{a_{12} = 34}$

10) $2, 4, 8, 16, \ldots$

$a_1 = 2$ $\quad a_n = a_1 \cdot r^{n-1}$

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

or

$a_n = 2^n$

$a_{12} = 2(2)^{12-1}$

$a_{12} = 2(2)^{11}$

$a_{12} = 2(2048)$

$\boxed{a_{12} = 4096}$

28) $3, \_\_, 12, \ldots$

$a_1 = 3$ $\quad a_n = a_1 \cdot r^{n-1}$

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

$12 = 3 \cdot r^2$

$4 = r^2$

$2 = r$

missing term $= 3 \cdot 2 = \boxed{6}$

31) $-20, \_\_, \_\_, \_\_, -1.25, \ldots$

$a_1 = -20$ $\quad a_n = a_1 \cdot r^{n-1}$

$a_5 = -1.25$ $\quad -1.25 = -20 \cdot r^{5-1}$

$-1.25 = -20r^4$

$.0625 = r^4$

$\frac{1}{2} = r$

$\boxed{-10, -5, -2.5}$

32) $-\frac{1}{6}, \_\_, \_\_, \_\_, -2\frac{2}{3}$

$a_1 = -\frac{1}{6}$ $\quad a_n = a_1 \cdot r^{n-1}$

$a_5 = -2\frac{2}{3}$ $\quad -2\frac{2}{3} = -\frac{1}{6} r^{5-1}$

$-2\frac{2}{3} = -\frac{1}{6} r^4$

$16 = r^4$

$2 = r$

$\boxed{-\frac{1}{3}, -\frac{2}{3}, -1\frac{1}{3}}$

42) $3 + 1 + \frac{1}{3} + \cdots, S_7$

$a_1 = 3, \; r = \frac{1}{3} \quad n = 7$

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

$S_7 = \frac{3\left(1 - \left(\frac{1}{3}\right)^7\right)}{\left(1 - \frac{1}{3}\right)}$

$\boxed{S_7 \approx 4.5 \left(4\frac{121}{243}\right)}$

43) $1 + 2 + 4 + \cdots, S_5$

$a_1 = 1 \quad r = 2, \; n = 5$

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

$S_5 = \frac{1(1 - (2)^5)}{(1 - 2)}$

$\boxed{S_5 = 31}$

44) $80 - 40 + 20 - \cdots, S_8$

$a_1 = 80, \; r = -\frac{1}{2}, \; n = 8$

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

$S_8 = \frac{80\left(1 - \left(-\frac{1}{2}\right)^8\right)}{\left(1 - \left(-\frac{1}{2}\right)\right)}$

$\boxed{S_8 = 53.125}$

45) $12 + 2 + \frac{1}{3} + \cdots, S_4$

$a_1 = 12, \; r = \frac{1}{6}, \; n = 4$

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

$S_4 = \frac{12\left(1 - \left(\frac{1}{6}\right)^4\right)}{\left(1 - \frac{1}{6}\right)}$

$\boxed{S_4 \approx 14.39 \left(14\frac{7}{18}\right)}$

46) $150 + 30 + 6 + \cdots$

$r = \frac{1}{5}$, converges

$S = \frac{150}{1 - \frac{1}{5}} = \boxed{187.5}$

47) $2.2 + 2.42 + 2.662 + \cdots$

$r = 1.1$, diverges

No sum

48) $-10 - 20 - 40 - \cdots$

$r = 2$ diverges, no sum

49) $\frac{2}{3} + \frac{4}{9} + \frac{8}{27} + \cdots$

$r = \frac{2}{3}$, converges

$S = \frac{\frac{2}{3}}{1 - \frac{2}{3}} = \boxed{2}$

over →

Pg 632

1) 7, 13, 19, 25, 31, ...

$a_1 = 7$, $d = 6$

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

$a_n = 7 + 6(n-1)$

$a_n = 7 + 6n - 6$

$\boxed{a_n = 6n + 1}$

$a_{12} = 6(12) + 1$

$a_{12} = 72 + 1$

$\boxed{a_{12} = 73}$

2) 10, 20, 40, 80, 160, ...

$a_1 = 10$, $r = 2$

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

$\boxed{a_n = 10(2)^{n-1}}$

$a_{12} = 10(2)^{12-1}$

$a_{12} = 10(2)^{11}$

$a_{12} = 10(2048)$

$\boxed{a_{12} = 20,480}$

4) 23, 27, 31, 35, 39, ...

Arithmetic

$a_1 = 23$, $d = 4$, $n = 10$

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

$a_{10} = 23 + 4(10-1)$

$a_{10} = 23 + 4(9)$

$a_{10} = 23 + 36$

$\boxed{a_{10} = 59}$

5) $-12, -5, 2, 9, 16, \ldots$

Arithmetic

$a_1 = -12$, $d = 7$, $n = 10$

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

$a_{10} = -12 + 7(10-1)$

$a_{10} = -12 + 7(9)$

$a_{10} = -12 + 63$

$\boxed{a_{10} = 51}$

6) $-5, 15, -45, 135, -405, \ldots$

Geometric

$a_1 = -5$, $r = -3$, $n = 10$

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

$a_{10} = -5(-3)^{10-1}$

$a_{10} = -5(-3)^9$

$a_{10} = -5(-19683)$

$\boxed{a_{10} = 98,415}$

10) geometric, $r = 1/3$

11) arithmetic, $d = -3$

12) geometric, $r = 2$

13) $a_1 = 2$, $r = -2$

$\boxed{2, -4, 8, -16, 32}$

14) $a_1 = 3$, $d = 7$

$\boxed{3, 10, 17, 24, 31}$

15) $a_1 = -100$, $r = \frac{1}{5}$

$\boxed{-100, -20, -4, \frac{-4}{5}, \frac{-4}{25}}$

16) $a_1 = 19$, $d = -4$

$\boxed{19, 15, 11, 7, 3}$

19) $0.5 + 0.05 + 0.005 + \ldots$

$a_1 = 0.5$, $r = \frac{1}{10}$

$S = \frac{0.5}{1 - 1/10} = \boxed{\frac{5}{9}}$

20) $1 - \frac{1}{2} + \frac{1}{4} - \ldots$

$a_1 = 1$, $r = -\frac{1}{2}$

$S = \frac{1}{1 - \left(\frac{-1}{2}\right)} = \boxed{\frac{2}{3}}$

21) $6 + 5 + \frac{25}{6} + \ldots$

$a_1 = 6$, $r = \frac{5}{6}$

$S = \frac{6}{1 - \frac{5}{6}} = \boxed{36}$

22) $2 + 7 + 12 + \ldots, S_8$

Arithmetic

$a_1 = 2$, $d = 5$, $n = 8$

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

$S_8 = \frac{8}{2}[2(2) + 5(8-1)]$

$S_8 = 4(4 + 35)$

$S_8 = 4(39) = \boxed{156}$

23) $5000 + 1000 + 200 + \ldots, S_{15}$

Geometric

$a_1 = 5000$, $r = 1/5$, $n = 15$

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

$S_{15} = \frac{5000(1 - (1/5)^{15})}{(1 - 1/5)}$

$\boxed{S_{15} = 6250}$

24) $1 + 0.01 - 0.98 - \ldots, S_5$

Arithmetic

$a_1 = 1$, $d = -.99$, $n = 5$

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

$S_5 = \frac{5}{2}[2(1) + (-.99)(5-1)]$

$S_5 = 2.5(2 - 3.96)$

$S_5 = 2.5(-1.96) = \boxed{-4.9}$