Extra Practice - Ch. 9 Evens

(2) $a_1 = -1$; $a_n = 3a_{n-1} + 1$

$a_1 = -1$

$a_2 = 3(-1)+1 = -2$

$a_3 = 3(-2)+1 = -5$

$a_4 = 3(-5)+1 = -14$

$a_5 = 3(-14)+1 = -41$

$-1, -2, -5, -14, -41$

(4) $a_n = 5(n-1)$

$a_1 = 5(1-1) = 0$

$a_2 = 5(2-1) = 5$

$a_3 = 5(3-1) = 10$

$a_4 = 5(4-1) = 15$

$a_5 = 5(5-1) = 20$

$0, 5, 10, 15, 20$

(6) $a_n = (n+2)^2$

$a_1 = (1+2)^2 = 9$

$a_2 = (2+2)^2 = 16$

$a_3 = (3+2)^2 = 25$

$a_4 = (4+2)^2 = 36$

$a_5 = (5+2)^2 = 49$

$9, 16, 25, 36, 49$

(8) $7, 9, 13, 21, 37$

$2 \quad 4 \quad 8 \quad 16$

common ration $r=2$
So exponential

$a_n = 2^n + 5$

(10) $60, 30, 15, \frac{15}{2}, \ldots$

$r = \frac{30}{60} = \frac{1}{2}$

$$\boxed{a_n = 60\left(\tfrac{1}{2}\right)^{n-1} \quad \text{or} \quad a_n = 120\left(\tfrac{1}{2}\right)^{n}}$$

(12) $0+3+8+15+24+35$

$$\boxed{\sum_{k=1}^{6} k^2 - 1}$$

(14) $-4-2+0+2+4$

$$\boxed{\sum_{k=1}^{5} 2k-6}$$

(16) expand $\sum_{k=1}^{4} \frac{(2k)^2}{2}$

$$\boxed{2+8+18+32}$$

(18) Evaluate $\sum_{k=1}^{55} k = \frac{55(56)}{2}$

$= \boxed{1540}$

(20) $\sum_{k=1}^{18} k^2 = \frac{18(19)(37)}{6}$

$= \boxed{2109}$

(22) $9.67, 9.34, 9.01, 8.68, \ldots$

yes,
arithmetic
$d = -0.33$
next term:
8.35

(24) 2, 4, 6, 4, 2, ...

$\boxed{\text{not arithmetic}}$

(26) 74, 68, 62, 56, 50, ...

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

$a_8 = 74 + (8-1)(-6)$

$= 74 + (-42)$

$\boxed{a_8 = 32}$

(28) 13, __, __, 37, ...

$37 - 13 = \frac{24}{3} = 8$

$d = 8$

$\boxed{21, 29}$

(30) 10, __, __, __, 26, ...

$26 - 10 = \frac{16}{4} = 4$

$d = 4$

$\boxed{14, 18, 22}$

(32) $a_4 = 16$; $a_7 = -2$

$16 = a_1 + (4-1)d$ | $-2 = a_1 + (7-1)d$

$16 = a_1 + 3d$ | $-2 = a_1 + 6d$

$16 = a_1 + 3d$

$-\ -2 = a_1 + 6d$

$18 = -3d$

$-6 = d$

$-2 = a_1 + 6(-6)$

$+36 \qquad +36$

$34 = a_1$

$a_n = 34 + (n-1)(-6)$

$34 + -6n + 6$

$a_n = -6n + 40$

$a_9 = -6(9) + 40 = \boxed{-14}$

(34) $a_5 = 3\frac{1}{3}$; $a_7 = 2\frac{2}{3}$

$3\frac{1}{3} = a_1 + (5-1)d$ | $2\frac{2}{3} = a_1 + (7-1)d$

$3\frac{1}{3} = a_1 + 4d$ | $2\frac{2}{3} = a_1 + 6d$

$3\frac{1}{3} = a_1 + 4d$

$-\ 2\frac{2}{3} = a_1 + 6d$

$\frac{2}{3} = -2d$

$-\frac{1}{3} = d$

$2\frac{2}{3} = a_1 + 6(-\frac{1}{3})$

$+2 \qquad +2$

$4\frac{2}{3} = a_1$

$a_n = 4\frac{2}{3} + (n-1)-\frac{1}{3}$

$a_n = 4\frac{2}{3} - \frac{1}{3}n + \frac{1}{3}$

$a_n = 5 - \frac{1}{3}n$

$a_9 = 5 - \frac{1}{3}(9)$

$= 5 - 3 = \boxed{2}$

(36) $S_n = n\left(\frac{a_1 + a_n}{2}\right)$

$S_{15} = 15\left(\frac{20 + -1}{2}\right) = \boxed{142.5}$

$a_n = 20 + (n-1)(-1.5)$

$20 + -1.5n + 1.5$

$a_n = -1.5n + 21.5$

$a_{15} = -1.5(15) + 21.5 = -1$

(38) $\sum_{k=1}^{20}(-2.75k+15)$

$S_{20}=20\left(\frac{12.25+-40}{2}\right)=\boxed{-277.5}$

$a_1=-2.75(1)+15=12.25$

$a_{20}=-2.75(20)+15=-40$

(40) 7, 14, 21, 28, 35, ...

$\boxed{\text{arithmetic } d=7}$

(42) 25.5, 31, 36.5, 42, 47.5, ...

$\boxed{\text{arithmetic } d=5.5}$

(44) $4, 1, \frac{1}{4}, \frac{1}{16}, \frac{1}{64}, \ldots$

$\boxed{\text{geometric } r=\frac{1}{4}}$

(46) 200, 100, 50, 25, 12.5, ...

$a_n=200\left(\frac{1}{2}\right)^{n-1}$

$a_7=200\left(\frac{1}{2}\right)^{7-1}=200\left(\frac{1}{64}\right)=\boxed{3.125}$

(48) 7, 70, 700, 7000, ...

$a_n=7(10)^{n-1}$

$a_7=7(10)^{7-1}=\boxed{7{,}000{,}000}$

(50) $a_4=16$; $a_6=256$

$16=a_1r^{4-1}$ $\quad$ $256=a_1r^{6-1}$

$16=a_1r^3$ $\quad$ $256=a_1r^5$

$\frac{16}{r^3}=a_1$

$256=\frac{16}{r^3}\cdot r^5$

$16=r^2$

$4=r$

$a_1=\frac{16}{4^3}=\frac{16}{64}=\frac{1}{4}$

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

$a_8=\frac{1}{4}(4)^{8-1}$

$=\frac{1}{4}4^7$

$=4^6=\boxed{4096}$

(52) $a_4 = 4$; $a_7 = 864$

$4 = a_1 r^{4-1}$ $864 = a_1 r^{7-1}$

$4 = a_1 r^3$ $864 = a_1 r^6$

$\frac{4}{r^3} = a_1$

$864 = \frac{4}{r^3} \cdot r^6$

$216 = r^3$

$a_1 = \frac{4}{6^3} = \frac{4}{216} = \frac{1}{54}$ $6 = r$

$a_n = \frac{1}{54}(6)^{n-1}$

$a_8 = \frac{1}{54}(6)^{8-1} = \boxed{5184}$

(54) S_6 for $\frac{3}{4}, 3, 12, 48, \ldots$

$r = 4$

$S_6 = \frac{3}{4}\left(\frac{1-(4)^6}{1-4}\right)$

$= \frac{\cancel{3}^{1}}{4}\left(\frac{1-(4)^6}{\cancel{-3}_{1}}\right)$

$= -\frac{1}{4}(1-(4)^6)$

$= -\frac{1}{4}(1-4096)$

$= -\frac{1}{4}(-4095)$

$= \boxed{1023\frac{3}{4}}$

(56) $\sum_{k=1}^{7} (-4)^{k-1}$

$S_7 = 1\left(\frac{1-(-4)^7}{1-(-4)}\right)$

$= 1\left(\frac{1+16384}{5}\right)$

$= \boxed{3277}$