

U7/L3 p.459 1, 3bdf, 4ab, 5b, 6f, 7, 8, 11

1.a) $6 + 18 + 54 + \dots$ b) $100 + 50 + 25 + \dots$ c) $8 - 24 + 72 - \dots$ d) $\frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \dots$

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

$$S_7 = \frac{6[(3)^7 - 1]}{3 - 1}$$

$$= \frac{3^6(2186)}{2}$$

$$= 6558$$

$$S_7 = \frac{100\left[\left(\frac{1}{2}\right)^7 - 1\right]}{\frac{1}{2} - 1}$$

$$= 100 \left(\frac{1}{128} - \frac{128}{128} \right) \div \left(-\frac{1}{2} \right)$$

$$= \frac{25}{100} \left(\frac{-127}{128} \right) \times \frac{-1}{2}$$

$$= \frac{3175}{16}$$

$$S_7 = \frac{8[(-3)^7 - 1]}{-3 - 1}$$

$$= \frac{2}{8} \left(-2188 \right)$$

$$= 4376$$

$$S_7 = \frac{\frac{1}{3}\left[\left(\frac{1}{2}\right)^7 - 1\right]}{\frac{1}{2} - 1}$$

$$= \frac{1}{3} \left[\frac{1}{128} - \frac{128}{128} \right] \div \left(-\frac{1}{2} \right)$$

$$= \frac{1}{3} \left(\frac{-127}{128} \right) \times \frac{-2}{1}$$

$$= \frac{127}{192}$$

3.b) $-11 - 33 - 99 - \dots$

$$a = -11$$

$$r = 3$$

$$(i) t_n = ar^{n-1}$$

$$t_6 = (-11)(3)^5$$

$$t_6 = -2673$$

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

$$S_6 = \frac{-11[(3)^6 - 1]}{3 - 1}$$

$$= \frac{-11(728)}{2}$$

$$= -4004$$

3.d) $\frac{4}{5} + \frac{8}{15} + \frac{16}{45} + \dots$

$$a = \frac{4}{5}$$

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

$$(i) t_n = ar^{n-1}$$

$$t_6 = \frac{4}{5} \left(\frac{2}{3} \right)^5$$

$$= \frac{4}{5} \left(\frac{32}{243} \right)$$

$$= \frac{128}{1215}$$

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

$$S_6 = \frac{\frac{4}{5}\left[\left(\frac{2}{3}\right)^6 - 1\right]}{\frac{2}{3} - 1}$$

$$S_6 = \frac{4}{5} \left(\frac{64}{729} - \frac{729}{729} \right) \div \left(-\frac{1}{3} \right)$$

$$= \frac{4}{5} \left(\frac{-665}{729} \right) \cdot \frac{-3}{-1}$$

$$= \frac{532}{243}$$

3.f) $1 + 3x^2 + 9x^4 + \dots$

$$a = 1$$

$$r = 3x^2$$

$$(i) t_n = ar^{n-1}$$

$$t_6 = 1(3x^2)^5$$

$$= 243x^{10}$$

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

$$S_6 = \frac{1[(3x^2)^6 - 1]}{3x^2 - 1}$$

$$= \frac{729x^{12} - 1}{3x^2 - 1}$$

$$4.a) 5+10+15+20+\dots$$

$$\therefore d = 5$$

\therefore the series is arithmetic

$$b) 7+21+63+189+\dots$$

$$\therefore r = 3 \quad \therefore \text{geometric}$$

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

$$S_8 = \frac{7[(3)^8 - 1]}{3 - 1}$$

$$= \frac{7(6560)}{2}$$

$$= 22960$$

$$5.b) a = 11, t_7 = 704 \text{ find } S_7$$

$$(i) \quad t_n = ar^{n-1}$$
$$t_7 = (11)r^6$$
$$704 = 11 \cdot r^6$$
$$64 = r^6$$
$$r = 2$$

$$(ii) \quad S_n = \frac{a(r^n - 1)}{r - 1}$$
$$S_7 = \frac{11[(2)^7 - 1]}{2 - 1}$$
$$= 11(127)$$
$$= 1397$$

$$6.f) 4+2+1+\dots+\frac{1}{1024}$$

$$a = 4$$

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

$$t_{n+1} = \frac{1}{1024} \cdot \frac{1}{2}$$
$$= \frac{1}{2048}$$

$$S_n = \frac{t_{n+1} - t_1}{r - 1}$$

$$= \left[\frac{1}{2048} - 4 \right] \div \left(\frac{1}{2} - 1 \right)$$

$$= -\frac{8191}{2048} \cdot -2^{-1}$$

$$= \frac{8191}{1024}$$

$$7. \quad a = 3 \text{ m}$$

$$r = 0.6 \text{ or } \frac{3}{5}$$

$$S_5 = ?$$

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

$$S_5 = 3 \left[\left(\frac{3}{5} \right)^5 - 1 \right] \div \left(\frac{3}{5} - 1 \right)$$

$$= 3 \left(\frac{243}{3125} - \frac{3125}{3125} \right) \div \frac{-2}{5}$$

$$= 3 \left(\frac{144}{-2882} \right) \cdot \frac{5}{2}$$

$$625$$

$$= \frac{4323}{625}$$

? Text says approx 10.8m

$$\approx 6.9 \text{ m}$$

8. If $r=1$, all terms of the series are the same i.e. $a+a+a+\dots$
 so with 'n' terms, $S_n = n \cdot a$

$$11. \quad a = 5$$

$$r = 3$$

$$n = 7$$

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

$$= \frac{5[(3)^7 - 1]}{2}$$

$$2$$

$$= 5(1093)$$

$$= 5465$$

\therefore The company has 5465 employees.

