

$$\textcircled{1} \text{ b) } \underline{2} + \frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \dots$$

$$a = 2$$

$$\begin{aligned} r &= \frac{2}{3} \div \frac{2}{1} \\ &= \frac{\cancel{2}}{3} \times \frac{1}{\cancel{2}} \\ &= \frac{1}{3} \end{aligned}$$

$$n = 4$$

$$S_4 = \frac{(2) \left[\left(\frac{1}{3} \right)^4 - 1 \right]}{\left[\left(\frac{1}{3} \right) - 1 \right]}$$

$$= \frac{2 \left[\frac{1}{81} - \frac{81}{81} \right]}{\left[\frac{1}{3} - \frac{3}{3} \right]}$$

$$= \frac{2 \left(-\frac{80}{81} \right)}{\left(-\frac{2}{3} \right)}$$

$$= \cancel{2} \left(-\frac{80}{\cancel{81} \cancel{2}} \right) \left(-\frac{\cancel{3}}{\cancel{2} \cancel{1}} \right)$$

$$= \frac{480}{162}$$

$$= \frac{80}{27}$$

① Given:

$$t_7 = 192$$

$$a = 3$$

$$S_8 = ?$$

(1) Find r :

$$t_n = ar^{n-1}$$

$$192 = (3)r^{7-1}$$

$$\frac{192}{3} = \frac{3r^6}{3}$$

$$64 = r^6$$

$$\pm 2 = r$$

if $r = 2$

$$S_8 = \frac{(3)[(2)^8 - 1]}{(2) - 1}$$

$$= \frac{3(256 - 1)}{1}$$

$$= 3(255)$$

$$= 765$$

if $r = -2$

$$S_8 = \frac{(3)[(-2)^8 - 1]}{(-2) - 1}$$

$$= \frac{3(256 - 1)}{-3}$$

$$= \frac{\cancel{3}(255)}{\cancel{-3}}$$

$$= -255$$

10.9

$$\textcircled{5} \text{ b) } 1 + \frac{5}{2} + \frac{25}{4} + \dots + \frac{15625}{64} \leftarrow \text{last term}$$

$$a = 1$$

$$r = \frac{5}{2}$$

$$t_n = \frac{15625}{64}$$

① Find n .

$$t_n = ar^{n-1}$$

$$\frac{15625}{64} = (1) \left(\frac{5}{2}\right)^{n-1}$$

$$\frac{15625}{64} = \left(\frac{5}{2}\right)^{n-1}$$

$$\left(\frac{5}{2}\right)^6 = \left(\frac{5}{2}\right)^{n-1}$$

$$6 = n - 1$$

$$7 = n$$

② Find S_7

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

$$S_7 = \frac{(1) \left(\frac{5}{2}\right)^7 - 1}{\frac{5}{2} - 1}$$

$$S_7 = \frac{1 \left(\frac{78125}{128} - \frac{128}{128}\right)}{\frac{5}{2} - \frac{2}{2}}$$

$$S_7 = \left(\frac{77997}{128}\right) \div \left(\frac{3}{2}\right)$$

$$S_7 = \left(\frac{77997}{128}\right) \left(\frac{2}{3}\right)$$

$$S_7 = \frac{155994}{384} = \frac{25999}{64}$$

10.9

$$\textcircled{a} \quad 30 - 5 + \frac{5}{6} \dots$$

$$S_7 = ?$$

$$S_7 = \frac{30 \left(\left(\frac{-1}{6} \right)^7 - 1 \right)}{-\frac{1}{6} - 1}$$

$$r = -\frac{1}{6}$$

$$a = 30$$

$$n = 7$$

$$S_7 = \frac{30 \left(\frac{-1}{279936} - 1 \right)}{-\frac{1}{6} - \frac{6}{6}}$$

$$S_7 = \frac{30 \left(\frac{-1}{279936} - \frac{279936}{279936} \right)}{-\frac{7}{6}}$$

$$S_7 = \frac{30}{1} \left(\frac{-279937}{279936} \right) \times -\frac{6}{7}$$

$$S_7 = \frac{50388660}{1959552}$$

$$S_7 = \frac{199955}{7776} \text{ or } 25 \frac{5555}{7776}$$

10.9

$$\textcircled{6} S_7 = 1093$$

$$r = \frac{1}{3}$$

$$n = 7$$

$$a = ?$$

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

$$1093 = \frac{a\left(\left(\frac{1}{3}\right)^7 - 1\right)}{\frac{1}{3} - 1}$$

$$1093 = a \frac{\left(\frac{1}{2187} - \frac{2187}{2187}\right)}{\frac{1}{3} - \frac{3}{3}}$$

$$1093 = a \left(\frac{-2186}{2187} \right) \times -\frac{3}{2}$$

$$1093 = \frac{6558a}{4374}$$

$$6558a = 4780782$$

$$a = 729$$

$$b) t_4 = ?$$

$$a = 729$$

$$r = \frac{1}{3}$$

$$n = 4$$

$$t_4 = (729)\left(\frac{1}{3}\right)^{4-1}$$

$$t_4 = 729\left(\frac{1}{27}\right)$$

$$t_4 = \frac{729}{27}$$

$$t_4 = 27$$

10.9

$$\textcircled{1} \text{ b) } 2 + \frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \dots$$

$$a = 2$$

$$r = \frac{1}{3}$$

$$S_n = \frac{2\left(\frac{1}{3}^n - 1\right)}{\frac{1}{3} - 1}$$

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

$$= \cancel{2}\left(\frac{1}{3}^n - 1\right) \times \frac{3}{-\cancel{2}}$$

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

10.9

$$\textcircled{3} \text{ c) } 81 + 27 + 9 + \dots$$

$$a = 81$$

$$r = \frac{1}{3}$$

$$n = 6$$

$$S_6 = \frac{81 \left(\left(\frac{1}{3} \right)^6 - 1 \right)}{\frac{1}{3} - 1}$$

$$= \frac{81 \left(\frac{1}{729} - \frac{729}{729} \right)}{\frac{1}{3} - \frac{3}{3}}$$

$$= \frac{\cancel{81} \left(\frac{-728}{\cancel{729}} \right)}{-\frac{2}{3}}$$

$$\frac{-2184}{-18}$$

$$= \frac{-728}{\cancel{9}} \times \frac{\cancel{3}}{-2}$$

$$= \frac{364}{3} = 121 \frac{1}{3}$$

Ex 10.9

$$\textcircled{5} \text{ b) } \textcircled{1} + \frac{5}{2} + \frac{25}{4} + \dots + \frac{15625}{64}$$

$$S_n = ?$$

$$a = 1$$

$$r = \frac{5}{2}$$

$$t_n = \frac{15625}{64}$$

Solve for n:

$$t_n = ar^{n-1}$$

$$\frac{15625}{64} = \left(\cancel{1} \right) \left(\frac{5}{2} \right)^{n-1}$$

$$\frac{15625}{64} = \left(\frac{5}{2} \right)^{n-1}$$

$$\left(\frac{5}{2} \right)^6 = \left(\frac{5}{2} \right)^{n-1}$$

$$6 = n - 1$$

$$\boxed{7 = n}$$

Find S_7 :

$$S_7 = \frac{1 \left(\left(\frac{5}{2} \right)^7 - 1 \right)}{\frac{5}{2} - 1}$$

$$= \frac{1 \left(\frac{78125}{128} - \frac{128}{128} \right)}{\frac{5}{2} - \frac{2}{2}}$$

$$= \left(\frac{77997}{128} \right) \div \left(\frac{3}{2} \right)$$

$$= \frac{77997}{128} \times \frac{2}{3}$$

$$= \frac{155994}{384} = \boxed{\frac{25999}{64}}$$

Review

$$\begin{array}{l} \textcircled{2} a) \quad n=? \quad t_n = a + (n-1)d \\ \quad \quad \quad a=3 \quad \quad 39 = 3 + (n-1)4 \\ \quad \quad \quad d=4 \quad \quad 36 = 4n - 4 \\ \quad \quad \quad t_n = 39 \quad 40 = 4n \\ \quad \quad \quad \quad \quad 10 = n \end{array}$$

$$3, 7, 11, 15, 19, 23, 27, 31, 35, 39$$

$$\begin{array}{l} \textcircled{1} b) \quad t_9 = -6 \quad t_{12} = -12 \\ \quad \quad \quad t_9 = a + 8d \quad t_{12} = a + 11d \\ \quad \quad \quad \boxed{a + 8d = -6} \quad \boxed{a + 11d = -12} \end{array}$$

$$\begin{array}{l} a + 11d = -12 \\ \leftarrow \begin{array}{l} \text{(-)} \frac{a + 8d = -6}{3d = -6} \\ \quad \quad \quad \boxed{d = -2} \end{array} \quad \begin{array}{l} a + 8(-2) = -6 \\ a - 16 = -6 \\ \quad \quad \quad \boxed{a = 10} \end{array} \quad \begin{array}{l} t_n = a + (n-1)d \\ t_n = 10 + (n-1)(-2) \\ t_n = 10 - 2n + 2 \\ t_n = 12 - 2n \end{array} \end{array}$$

$$\textcircled{2} b) \quad t_5 = 8 \quad t_{10} = \frac{1}{4} \quad t_3 = ?$$

$$\begin{array}{l} t_5 = ar^4 \quad t_{10} = ar^9 \\ \boxed{ar^4 = 8} \quad \boxed{ar^9 = \frac{1}{4}} \end{array}$$

$$\begin{array}{l} \frac{ar^9 = \frac{1}{4}}{ar^4 = 8} \\ \quad \quad \quad r^5 = \frac{1}{32} \\ \quad \quad \quad \boxed{r = \frac{1}{2}} \end{array} \quad \begin{array}{l} a \left(\frac{1}{2}\right)^4 = 8 \\ a \left(\frac{1}{16}\right) = 8 \\ \quad \quad \quad \frac{a}{16} = 8 \\ \quad \quad \quad \boxed{a = 128} \end{array} \quad \begin{array}{l} t_3 = (128) \left(\frac{1}{2}\right)^2 \\ t_3 = 128 \left(\frac{1}{4}\right) \\ t_3 = 32 \end{array}$$

Review

⑩ $t_7 = 192$

$a = t_1 = 3$

$S_8 = ?$

$t_7 = ar^{7-1}$

$t_7 = ar^6$

$ar^6 = 192$

$3r^6 = 192$

$r^6 = 64$

$r = \pm 2$

$$S_8 = \frac{3(2^8 - 1)}{2 - 1}$$

$$= \frac{3(256 - 1)}{1}$$

$$= 3(255)$$

$$= 765$$

$$S_8 = \frac{3((-2)^8 - 1)}{(-2) - 1}$$

$$= \frac{3(256 - 1)}{-3}$$

$$= \frac{3(255)}{-3}$$

$$= -255$$

