

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  $S_7$ 

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

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

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

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

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

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

10.9

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

$$S_7 = ?$$

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

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

$$a = 30$$

$$n = 7$$

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

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

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

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

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

$$\frac{10.9}{6} \quad S_7 = 1093$$

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

$$n = 7$$

$$a = ?$$

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

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

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

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

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

$$6558a = 4780782$$

$$a = 729$$

$$b) \quad t_4 = ?$$

$$a = 729$$

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

$$n = 4$$

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

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

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

$$t_4 = 27$$

10.9

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

$$a = 2$$

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

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

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

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

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

10.9

③ c)  $81 + 27 + 9 \dots$

$a = 81$

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

$n = 6$

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

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

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

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

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

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

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:

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

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

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

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

$$6 = n - 1$$

$$\boxed{7 = n}$$

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

$$\textcircled{a) } n=? \quad t_n = a + (n-1)d$$

$$a=3 \quad 39 = 3 + (n-1)4$$

$$d=4 \quad 36 = 4n - 4$$

$$t_n = 39 \quad 40 = 4n$$

$$10 = n$$

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

$$\textcircled{b) } t_9 = -6 \quad t_{10} = -12$$

$$t_9 = a + 8d \quad t_{10} = a + 11d$$

$$a + 8d = -6 \quad a + 11d = -12$$

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

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

$$t_5 = ar^4 \quad t_{10} = ar^9$$

$$ar^4 = 8 \quad ar^9 = \frac{1}{4}$$

$$\begin{array}{l} ar^9 = \frac{1}{4} \\ \underline{ar^4 = 8} \\ \hline r^5 = \frac{1}{32} \\ \boxed{r = \frac{1}{2}} \end{array} \quad \begin{array}{l} a\left(\frac{1}{2}\right)^4 = 8 \\ a\left(\frac{1}{16}\right) = 8 \\ \frac{a}{16} = 8 \end{array} \quad \begin{array}{l} t_3 = (128)\left(\frac{1}{2}\right)^3 \\ t_3 = 128\left(\frac{1}{4}\right) \\ t_3 = 32 \end{array}$$

Review

⑩  $t_7 = 192$

$a = t_1 = 3$

$S_8 = ?$

$t_7 = ar^{7-1}$

$t_7 = ar^6$

$ar^6 = 192$

$3r^6 = 192$

$r^6 = 64$

$r = \pm 2$

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

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

$= 3(255)$

$= 765$

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

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

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

$= -255$



