

10.4

5b) $t_5 = 8$, $t_{10} = \frac{1}{4}$ $t_3 = ?$ Find "a" + "r"

$$\begin{array}{l|l} t_n = ar^{n-1} & t_n = ar^{n-1} \\ t_5 = ar^{5-1} & t_{10} = ar^{10-1} \\ t_5 = ar^4 & t_{10} = ar^9 \\ 8 = ar^4 & \frac{1}{4} = ar^9 \\ 8 = a\left(\frac{1}{2}\right)^4 & \end{array}$$

Elimination

$$\begin{array}{l} \frac{1}{4} = ar^9 \\ \underline{8 = ar^4} \\ \frac{1}{4} \div 8 = r^{9-4} \\ \frac{1}{4} \times \frac{1}{8} = r^5 \\ \frac{1}{32} = r^5 \end{array}$$

$$8 = a\left(\frac{1}{16}\right)$$

$$16 \cdot 8 = \frac{a}{16} \cdot 16$$

$$128 = a$$

$$\left(\frac{1}{32}\right)^{\frac{1}{5}} = \left(r^5\right)^{\frac{1}{5}} \quad \text{or} \quad \frac{\sqrt[5]{1}}{\sqrt[5]{32}} = \sqrt[5]{r^5}$$

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

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

$\frac{128}{4}, \frac{64}{4}, \frac{32}{4}$

$$\begin{array}{l} t_3 = ar^{3-1} \\ t_3 = (128)\left(\frac{1}{2}\right)^2 \\ t_3 = (128)\left(\frac{1}{4}\right) \\ t_3 = \frac{128}{4} = 32 \end{array}$$

10.9

② Find S_7 for $\underline{30}^{-5} + \frac{5}{6} - \dots$

\swarrow \swarrow
 $-\frac{1}{6}$ $-\frac{1}{6}$

Given:

$$a = 30$$

$$r = \frac{-5}{30} = -\frac{1}{6}$$

$$n = 7$$

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

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

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

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

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

$$S_7 = \frac{5}{30} \left(\frac{39991}{-279936} \right) \left(\frac{-6}{7} \right)$$

$\frac{46656}{776}$

$$S_7 = 5 \left(\frac{-39991}{776} \right) \left(\frac{-1}{1} \right) = \boxed{\frac{199955}{776}}$$

or

$$S_7 = \frac{50388660}{1999552} = \boxed{\frac{199955}{776}}$$

10.9

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

\swarrow \searrow
 $-\frac{1}{6}$ $-\frac{1}{6}$

Given:

$$a = 30$$

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

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

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

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

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

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

$$S_7 = \frac{50\,388\,600}{1959\,552} \div 6$$

$$S_7 = \frac{8\,398\,110}{326\,592} \div 2$$

$$S_7 = \frac{4199\,055}{163\,296} \div 21$$

$$S_7 = \frac{199\,955}{776} \text{ or } 25 \frac{555}{776}$$

10.9
 ③ a) $81 + 27 + 9 + \dots$ $S_6 = \frac{81 \left[\left(\frac{1}{3} \right)^6 - 1 \right]}{\left(\frac{1}{3} \right) - 1}$
 $S_6 = ?$
 $a = 81$
 $r = \frac{1}{3}$
 $S_6 = \frac{81 \left[\frac{1}{109} - \frac{1}{1} \right]}{\frac{1}{3} - \frac{1}{1}}$
 $S_6 = \frac{81 \left[\frac{1}{109} - \frac{109}{109} \right]}{\frac{1}{3} - \frac{3}{3}}$
 $S_6 = \frac{81 \left(\frac{-108}{109} \right) \div \frac{-2}{3}}$
 $S_6 = \frac{81 \left(\frac{-108}{109} \right) \left(\frac{-3}{2} \right)}$
 $S_6 = \frac{176904}{1458} = \frac{364}{3}$

③ b) $1 + \frac{5}{9} + \frac{25}{9} + \dots + \frac{15625}{64}$
 $a = 1$
 $r = \frac{5}{3}$
 $t_n = \frac{15625}{64}$
 Find n :
 $t_n = ar^{n-1}$
 $\frac{15625}{64} = \left(\frac{5}{3} \right)^{n-1}$
 $\frac{15625}{64} = \left(\frac{5}{3} \right)^{n-1}$
 $\left(\frac{5}{3} \right)^6 = \left(\frac{5}{3} \right)^{n-1}$
 $6 = n - 1 + 1$
 $n = 7$
 $\frac{\log \left(\frac{15625}{64} \right)}{\log \left(\frac{5}{3} \right)} = 6$

④ Find S_7
 $S_7 = \frac{1 \left[\left(\frac{5}{3} \right)^7 - 1 \right]}{\left(\frac{5}{3} \right) - 1}$
 $S_7 = \frac{1 \left[\frac{78125}{108} - \frac{1}{1} \right]}{\frac{5}{3} - \frac{1}{1}}$
 $S_7 = \frac{1 \left[\frac{78125}{108} - \frac{108}{108} \right]}{\frac{5}{3} - \frac{3}{3}}$
 $S_7 = \frac{1 \left(\frac{77997}{108} \right) \div \frac{2}{3}}$
 $S_7 = \frac{1 \left(\frac{77997}{108} \right) \left(\frac{3}{2} \right)}$
 $S_7 = \frac{155994}{364} = \frac{25999}{64}$

⑤ $S_7 = 1093$ $S_7 = \frac{a \left[\left(\frac{1}{3} \right)^7 - 1 \right]}{\left(\frac{1}{3} \right) - 1}$
 $r = \frac{1}{3}$
 $a = ?$
 $1093 = \frac{a \left[\frac{1}{2187} - \frac{2187}{2187} \right]}{\frac{1}{3} - \frac{3}{3}}$
 $1093 = \frac{a \left[\frac{-2186}{2187} \right] \div \frac{-2}{3}}$
 $1093 = \frac{a \left(\frac{-2186}{2187} \right) \left(\frac{-3}{2} \right)}$
 $4374 \cdot 1093 = \frac{6558a}{4374} \cdot 4374$
 $4780782 = \frac{6558a}{658} \cdot 658$
 $729 = a$

10.9

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

$$a = 2$$

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

$$n = 4$$

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

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

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

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

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

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

10.9

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

⑧ Given:

$$r = \underline{-2}$$

$$S_5 = \underline{-33}$$

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

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

$$-33 = \frac{a[(-2)^5 - 1]}{(-2) - 1}$$

$$-33 = \frac{a(-32 - 1)}{-3}$$

$$-33 = \frac{a(-33)}{-3}$$

$$\frac{-33}{-3} = \frac{11a}{-3}$$

$$\boxed{-3 = a}$$

$$\begin{aligned} t_n &= ar^{n-1} \\ t_n &= (-3)(-2)^{n-1} \end{aligned}$$

Review:

$$\textcircled{1} \text{ a) } \underline{2}, -4, 8, -16, \dots, 512$$

$$a = 2$$

$$r = \frac{-4}{2} = -2$$

$$t_n = 512$$

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

$$\frac{512}{2} = \frac{(2)(-2)^{n-1}}{2}$$

$$256 = (-2)^{n-1}$$

$$\cancel{(-2)}^8 = \cancel{(-2)}^{n-1}$$

$$8 = n - 1$$

$$\boxed{9 = n}$$

$$\text{b) } \frac{2}{5}, \frac{9}{10}, \frac{7}{5}, \dots, \frac{22}{5}$$

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

$$d = \frac{9}{10} - \frac{2}{5}$$

$$d = \frac{9}{10} - \frac{4}{10}$$

$$d = \frac{5}{10} = \frac{1}{2}$$

$$t_n = \frac{22}{5}$$

$$t_n = a + (n-1)d$$

$$\frac{22}{5} = \left(\frac{2}{5}\right) + (n-1)\left(\frac{1}{2}\right)$$

$$\frac{22}{5} = \frac{n}{2} - \frac{1}{2}$$

$$4 + \frac{1}{2} = \frac{n}{2}$$

$$\frac{8}{2} + \frac{1}{2} = \frac{n}{2}$$

$$\cancel{2} \cdot \frac{9}{2} = \frac{n}{\cancel{2}} \cdot \cancel{2}$$

$$\boxed{9 = n}$$

Review!

$$\textcircled{2} \text{ a) } -5 -1 +3 +7 + \dots +51$$

$$a = -5$$

$$d = 4$$

$$t_n = 51$$

(i) Find n :

$$t_n = a + (n-1)d$$

$$51 = \textcircled{-5} + (n-1)4$$

$$\frac{56}{4} = \frac{(n-1)4}{4}$$

$$14 = \textcircled{n-1}$$

$$15 = n$$

(ii) Find S_n or S_{15}

$$S_n = \frac{n}{2} [a + t_n]$$

$$S_{15} = \frac{15}{2} [-5 + 51]$$

$$S_{15} = \frac{15}{2} (46) = \boxed{345}$$

Review

(a) b) $16 + 8 + 4 + 2 + \dots + \frac{1}{32}$

$\underbrace{16}_{\frac{1}{2}} + \underbrace{8}_{\frac{1}{2}} + \underbrace{4}_{\frac{1}{2}} + 2 + \dots + \frac{1}{32}$

$$a = 16$$

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

$$t_n = \frac{1}{32}$$

(i) Find n:

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

$$\frac{1}{32} = \overset{\div 16}{(16)} \left(\frac{1}{2}\right)^{n-1} \quad \div 16$$

$$\frac{1}{512} = \left(\frac{1}{2}\right)^{n-1}$$

$$\left(\frac{1}{2}\right)^9 = \left(\frac{1}{2}\right)^{n-1} \quad \frac{\log \frac{1}{512}}{\log \frac{1}{2}} = 9$$

$$9 = n - 1$$

$$10 = n$$

(ii) Find S_n or S_{10}

$$S_n = \frac{a[r^n - 1]}{r - 1}$$

$$S_{10} = \frac{16 \left[\left(\frac{1}{2}\right)^{10} - 1 \right]}{\frac{1}{2} - 1}$$

$$S_{10} = \frac{16 \left[\frac{1}{1024} - \frac{1024}{1024} \right]}{\frac{1}{2} - \frac{2}{2}}$$

$$S_{10} = \frac{16 \left[\frac{-1023}{1024} \right] \left(-\frac{2}{1} \right)}{\frac{1}{2} - \frac{2}{2}}$$

$\frac{S_{10}}{32}$

$$S_{10} = \frac{1023}{32}$$

Review:

$$\begin{array}{l|l} \textcircled{3} \quad t_3 = 7 & t_9 = 55 \\ t_n = a + (n-1)d & t_n = a + (n-1)d \\ t_3 = a + (3-1)d & t_9 = a + (9-1)d \\ t_3 = a + 2d & t_9 = a + 8d \\ 7 = a + 2d & 55 = a + 8d \\ a + 2d = 7 & a + 8d = 55 \end{array}$$

Elimination
by subtracting

$$\begin{array}{r} a + 8d = 55 \\ \Leftrightarrow a + 2d = 7 \\ \hline 6d = 48 \\ \quad 6 \quad 6 \\ \boxed{d = 8} \end{array} \quad \left. \begin{array}{l} a + 2d = 7 \\ a + 2(8) = 7 \\ a + 16 = 7 \\ \boxed{a = -9} \end{array} \right\}$$

$$\begin{aligned} t_n &= a + (n-1)d \\ t_n &= -9 + (n-1)(8) \end{aligned}$$

$$\begin{aligned} t_n &= -9 + 8n - 8 \\ \boxed{t_n} &= \boxed{8n - 17} \end{aligned}$$

Review:

$$\textcircled{4} \quad \begin{array}{l|l} t_4 = -36 & t_7 = 972 \\ t_n = ar^{n-1} & t_n = ar^{n-1} \\ t_4 = ar^{4-1} & t_7 = ar^{7-1} \\ t_4 = ar^3 & t_7 = ar^6 \\ -36 = ar^3 & 972 = ar^6 \end{array}$$

Elimination
by Division

$$\frac{972 = ar^6}{-36 = ar^3}$$

$$-27 = r^3$$

$$\boxed{-3 = r}$$

$$\begin{array}{l} -36 = ar^3 \\ -36 = a(-3)^3 \end{array}$$

$$\frac{-36}{-27} = \frac{-27a}{-27}$$

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

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

$$t_n = \left(\frac{4}{3}\right)(-3)^{n-1}$$

Review

$$\textcircled{5} \text{ a) } S_6 = 1365$$

$$r = \frac{1}{4}$$

$$n = 6$$

$$a = ?$$

$$\text{b) } t_n = ar^{n-1}$$

$$t_8 = (1024) \left(\frac{1}{4}\right)^{8-1}$$

$$t_8 = 1024 \left(\frac{1}{16384}\right)$$

$$t_8 = \frac{1024}{16384} = \boxed{\frac{1}{16}}$$

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

$$1365 = \frac{a\left(\frac{1}{4}^6 - 1\right)}{\frac{1}{4} - 1}$$

$$1365 = a \left(\frac{\frac{1}{4096} - \frac{4096}{4096}}{\frac{1}{4} - \frac{4}{4}} \right)$$

$$1365 = a \left(\frac{\overset{1365}{-4095}}{\underset{1024}{4096}} \right) \left(\frac{-4}{3} \right)$$

$$1365 = \frac{1365a}{1024}$$

$$\boxed{1024 = a}$$

4. If the sum of the first five terms of a geometric series is 1089 and the common ratio is $\frac{1}{3}$, find:

a) The first term

b) The 9th term

Given:

$$S_5 = 1089$$

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

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

$$1089 = \frac{a\left[\left(\frac{1}{3}\right)^5 - 1\right]}{\frac{1}{3} - 1}$$

$$1089 = \frac{a\left[\frac{1}{243} - \frac{243}{243}\right]}{\frac{1}{3} - \frac{3}{3}}$$

$$1089 = a\left(\frac{\frac{1}{243}}{\frac{243}{81}}\right)\left(\frac{-\frac{3}{243}}{-\frac{2}{243}}\right)$$

$$81 \cdot 1089 = \frac{121a}{81} \cdot 81$$

$$\frac{88209}{121} = \frac{121a}{121}$$

$$729 = a$$

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

$$t_9 = (729)\left(\frac{1}{3}\right)^{9-1}$$

$$t_9 = 729\left(\frac{1}{3}\right)^8$$

$$t_9 = 729\left(\frac{1}{6561}\right)$$

$$t_9 = \frac{729}{6561} = \frac{1}{9}$$

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

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

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

$$n = 7$$

$$a = ?$$

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

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

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

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

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

$$6558a = 4780782$$

$$a = 729$$

$$b) t_4 = ?$$

$$a = 729$$

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

$$n = 4$$

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

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

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

$$t_4 = 27$$

10.9

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

$$a = 2$$

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

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

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

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

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

10.9

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

$$a = 81 \quad r = \frac{1}{3} \quad n = 6$$

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

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

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

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

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

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

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:

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

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

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

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

$$6 = n - 1$$

$$\boxed{7 = n}$$

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

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

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

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

$$t_9 = a + 8d \quad t_{12} = a + 11d$$

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

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

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

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

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

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

$$51a = a(-a)^{n-1}$$

$$a5b = (-a)^{n-1}$$

$$\cancel{(-a)}^8 = \cancel{(-a)}^{n-1}$$

$$8 = n - 1$$

$$9 = n$$

Review

⑩ $t_7 = 192$

$a = t_1 = 3$

$S_8 = ?$

$t_7 = ar^{7-1}$

$t_7 = ar^6$

$ar^6 = 192$

$3r^6 = 192$

$r^6 = 64$

$r = \pm 2$

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

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

$$= 3(255)$$

$$= 765$$

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

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

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

$$= -255$$

