

10.4

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

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

Elimination

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

$$\frac{1}{4} \div 8 = r^{9-4}$$

$$\frac{1}{4} \times \frac{1}{8} = r^5$$

$$\frac{1}{32} = r^5$$

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

16. $r = \frac{a}{16} \cdot 16$

$128 = a$

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

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

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

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

$$t_3 = ar^{3-1}$$

$$t_3 = (128)\left(\frac{1}{2}\right)^2$$

$$t_3 = (128)\left(\frac{1}{4}\right)$$

$$t_3 = \frac{128}{4} = 32$$

10.9

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

Given:

$a = 30$

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

$n = 7$

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

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

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

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

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

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

~~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

② $\underline{30} - 5 + \frac{5}{6}$
 (Blue checkmarks and $-\frac{1}{6}$ annotations are present under the terms)

Given:

$a = 30$

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

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

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

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

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

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

$$S_7 = \frac{50\ 388\ 660}{1959\ 552} \div 6$$

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

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

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

10.9

③ a) $81 + 27 + 9 + \dots$ $S_n = \frac{a[r^n - 1]}{r - 1}$

$S_6 = ?$
 $a = 81$
 $r = \frac{1}{3}$

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

$n = 6$

$$S_6 = \frac{81 \left[\frac{1}{729} - 1 \right]}{\frac{1}{3} - 1}$$

$$S_6 = \frac{81 \left[\frac{1}{729} - \frac{729}{729} \right]}{\frac{1}{3} - \frac{3}{3}}$$

$$S_6 = \frac{81 \left(\frac{-728}{729} \right)}{\frac{-2}{3}} = \frac{-2}{3}$$

$$S_6 = 81 \left(\frac{-728}{729} \right) \left(\frac{-3}{2} \right)$$

③ b) $1 + \frac{5}{9} + \frac{25}{9} + \dots + \frac{15625}{64}$

$$S_6 = \frac{176904}{1458}$$

$$S_6 = \frac{364}{3}$$

$a = 1$
 $r = \frac{5}{9}$

Find n :

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

$$t_n = \frac{15625}{64} = \left(\frac{5}{9}\right)^{n-1}$$

$$\frac{15625}{64} = \left(\frac{5}{9}\right)^{n-1}$$

$$\left(\frac{5}{9}\right)^6 = \left(\frac{5}{9}\right)^{n-1}$$

$$6 = n - 1 + 1$$

$$\boxed{n = 7}$$

$$\frac{\log\left(\frac{15625}{64}\right)}{\log\left(\frac{5}{9}\right)} = 6$$

④ Find S_1

$$S_1 = \frac{(1) \left[\left(\frac{5}{9}\right)^1 - 1 \right]}{\left(\frac{5}{9}\right) - 1}$$

$$S_2 = \frac{1 \left[\frac{25}{81} - \frac{1}{1} \right]}{\frac{5}{9} - \frac{1}{1}}$$

$$S_3 = \frac{1 \left[\frac{125}{729} - \frac{128}{729} \right]}{\frac{5}{9} - \frac{8}{9}}$$

$$S_4 = \frac{1 \left(\frac{17997}{108} \right)}{\frac{3}{2}}$$

$$S_5 = \frac{1 \left(\frac{17997}{108} \right) \left(\frac{3}{2} \right)}{\frac{3}{2}}$$

$$S_1 = \frac{155994}{384} = \frac{25999}{64}$$

⑤ $S_7 = 1093$ $S_7 = \frac{a \left[\left(\frac{1}{3}\right)^7 - 1 \right]}{\left(\frac{1}{3}\right) - 1}$

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

$a = ?$

$$1093 = \frac{a \left[\frac{1}{2187} - \frac{2187}{2187} \right]}{\frac{1}{3} - \frac{3}{3}}$$

$$1093 = \frac{a \left[\frac{-2186}{2187} \right]}{\frac{-2}{3}}$$

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

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

$$4780782 = \frac{6558a}{6558}$$

$$\boxed{729 = a}$$

10.9

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

$$a = 2$$

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

$$n = 4$$

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

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

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

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

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

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

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 $r = -2$

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

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

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

$$= -255$$

10.9

⑧ Given:

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

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

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

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

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

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

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

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

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

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

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

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

$$a = ?$$

(i) Find a .

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

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

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

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

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

$$1093 = a \left(\frac{\overset{1093}{-2186}}{\underset{729}{2187}} \right) \left(\frac{\overset{3}{3}}{\underset{1}{2}} \right)$$

$$\cancel{729} \cdot 1093 = \frac{1093a}{\cancel{729}} \cdot \cancel{729}$$

$$\frac{796797}{1093} = \frac{1093a}{1093}$$

$$\boxed{729 = a}$$

Review:

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

$$a = 2$$

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

$$t_n = 512$$

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

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

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

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

$$8 = n - 1$$

$$\boxed{9 = n}$$

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

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

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

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

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

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

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

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

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

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

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

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

$$\boxed{9 = n}$$

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}

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

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

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

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

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

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:

$$S_5 = 1089$$

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

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

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

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

$$1089 = a\left(\frac{\overset{1}{121}}{\underset{81}{-242}}\right)\left(\frac{\overset{1}{-3}}{\underset{2}{2}}\right)$$

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

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

$$729 = a$$

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

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

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

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

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

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

$a = 1$

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

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

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

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

$$a = 81$$

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

$$n = 6$$

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

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

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

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

$$= \frac{-728}{\cancel{9}} \times \frac{\cancel{72}}{-\cancel{2}}$$

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

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

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

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

$$\begin{aligned} \textcircled{b) } t_9 &= -6 & t_{12} &= -12 \\ t_9 &= a + 8d & t_{12} &= a + 11d \\ \boxed{a + 8d} &= -6 & \boxed{a + 11d} &= -12 \end{aligned}$$

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

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

$$\begin{aligned} t_5 &= ar^4 & t_{10} &= ar^9 \\ \boxed{ar^4} &= 8 & \boxed{ar^9} &= \frac{1}{4} \end{aligned}$$

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

$$5|a = a(-a)^{n-1}$$

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

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

$$8 = n - 1$$

$$9 = n$$

Review

⑩ $t_7 = 192$

$a = t_1 = 3$

$S_8 = ?$

$t_7 = ar^{7-1}$

$t_7 = ar^6$

$ar^6 = 192$

$3r^6 = 192$

$r^6 = 64$

$r = \pm 2$

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

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

$$= 3(255)$$

$$= 765$$

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

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

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

$$= -255$$

