$t_n = ar^{n-1}$

Find "a", "r", and "t_n" for the following sequence!

$$t_3 = 64,\ t_7 = 4$$

$t_3 = ar^2$ $\qquad$ $t_7 = ar^6$

$ar^2 = 64$ $\qquad$ $ar^6 = 4$

$$\frac{ar^6 = 4}{ar^2 = 64}$$

$$r^4 = \frac{1}{16}$$

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

$$ar^2 = 64$$

$$a\left(\frac{1}{2}\right)^2 = 64$$

$$\frac{a}{4} = 64$$

$$\boxed{a = 256}$$

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

$$t_n = (256)\left(\frac{1}{2}\right)^{n-1}$$

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

$$t_n = (2^8)(2^{-n+1})$$

$$\boxed{t_n = 2^{9-n}}$$

Questions from Homework

② d) $2^{50}, 2^{48}, 2^{46}$

$a = 2^{50}$

$r = \frac{2^{48}}{2^{50}} = \frac{2^{46}}{2^{48}} = 2^{-2}$

$t_{15} = ?$

$t_{15} = (2^{50})(2^{-2})^{15-1}$

$= (2^{50})(2^{-2})^{14}$

$= (2^{50})(2^{-28})$

$\boxed{= 2^{22}}$

② e) $\frac{p^2}{q}, \frac{p^3}{2q}, \frac{p^4}{4q}, \ldots$

$a = \frac{p^2}{q}$

$r = \frac{p^3}{2q} \div \frac{p^2}{q}$

$= \frac{\cancel{p^3}}{2\cancel{q}} \times \frac{\cancel{q}}{\cancel{p^2}}$

$= \frac{p}{2}$

$t_{10} = \left(\frac{p^2}{q}\right)\left(\frac{p}{2}\right)^{10-1}$

$= \left(\frac{p^2}{q}\right)\left(\frac{p}{2}\right)^{9}$

$= \left(\frac{p^2}{q}\right)\left(\frac{p^9}{512}\right)$

$\boxed{= \frac{p^{11}}{512q}}$

② f) $\sqrt{3}, \sqrt{6}, 2\sqrt{3}, \ldots$

$t_9 = ?$

$a = \sqrt{3}$

$r = \sqrt{2}$

Arithmetic Series

Series: The sum of the terms of a sequence. The sum is usually finite: 1+2+3+4+5. However it could be infinite: 2+4+8+16+... You can find the sum of many finite series and certain types of infinite series by using formulas.

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_n = \frac{n}{2}(a + t_n)$$

Find the sum of the first 100 "n" terms of the arithmetic series 1+4+7+10+...

a = 1
d = t_2-t_1 = 3
n = 100

$$S_n = \frac{n}{2}(2a+(n-1)d)$$

$$S_{100} = \frac{100}{2}(2(1)+(100-1)(3))$$

$$= 50(2+99(3))$$

$$= 50(299)$$

$$= \boxed{14\,950}$$

Find the sum of the following series

$$\frac{1}{2}+1+\frac{3}{2}+2,\ldots+20$$

Hint: How many terms are there?

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

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

$t_n = 20$

$n = 40$

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

$$20 = \frac{1}{2}+(n-1)\left(\frac{1}{2}\right)$$

$$20 = \cancel{\frac{1}{2}}+\frac{1n}{2}-\cancel{\frac{1}{2}}$$

$$20 = \frac{n}{2}$$

$$\boxed{n=40}$$

$$S_{40} = \frac{40}{2}\left(\frac{1}{2}+20\right)$$

$$= 20\left(\frac{41}{2}\right)$$

$$= \boxed{410}$$

* $\frac{1}{2}+\frac{20}{1}$

$\frac{1}{2}+\frac{40}{2}$

$\frac{41}{2}$

How many terms are in the series:
3+8+13+...+248 if its sum is 6275?

$a = 3$ $n = ?$
$d = 5$
$S_n = 6275$
$t_n = 248$

$$S_n = \frac{n}{2}(a + t_n)$$

$$6275 = \frac{n}{2}(3 + 248)$$

$$6275 = \frac{n}{2}(251)$$

$$6275 = \frac{251n}{2}$$

$$251n = 12550$$

$$\boxed{n = 50}$$

Find the indicated sums of the following series:

S_{15} of 2+6+10....

$a=2$
$d=4$
$n=15$

$$S_{15}=\frac{15}{2}\left(2(2)+(15-1)(4)\right)$$
$$=\frac{15}{2}\left(4+14(4)\right)$$
$$=\frac{15}{2}(4+56)$$
$$=\frac{15}{2}(60)$$
$$=\boxed{450}$$

S_{20} of -15-10-5+...

$a=-15$
$d=5$
$n=20$

$$S_{20}=\frac{20}{2}\left(2(-15)+(20-1)(5)\right)$$
$$=10\left(-30+19(5)\right)$$
$$=10(-30+95)$$
$$=10(65)$$
$$=\boxed{650}$$

Homework

#1-8