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

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

$t_n = ar^{n-1}$

$t_3 = ar^{3-1}$ $\quad t_7 = ar^{7-1}$

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

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

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

$r^4 = \frac{4}{64}$

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

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

$ar^2 = 64$

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

$a\left(\frac{1}{4}\right) = 64$

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

$a = 256$

$t_n = ar^{n-1}$

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

$t_n = ar^{n-1}$

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

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

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

$t_n = 2^{9-n}$

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 terms of the arithmetic series 1+4+7+10+...

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

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

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

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

$$= 50(2 + 297)$$

$$= 50(299)$$

$$= 14950$$

Find the sum of the following series

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

Hint: How many terms are there?

a = ½
d = ½
t_n = 20
n =

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

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

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

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

$n = 40$

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

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

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

$= 410$

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

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

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

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

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

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

$$251n = 12550$$

$$\boxed{n = 50}$$

Find the indicated sums of the following series:

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

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

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

$$S_{15} = \frac{15}{2}(2(2)+(15-1)(4))$$

$$S_{15} = \frac{15}{2}(4+14(4))$$

$$S_{15} = \frac{15}{2}(4+56)$$

$$S_{15} = \frac{15}{2}(60)$$

$$\boxed{S_{15} = 450}$$

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

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

$$S_{20} = \frac{20}{2}(2(-15)+(20-1)5))$$

$$= 10(-30+19(5))$$

$$= 10(-30+95)$$

$$= 10(65)$$

$$\boxed{= 650}$$

Homework

#1-7