7(b) 83 166

Warm-Up

Pg. 30 #20 => $-27+(-22)+(-17)$

$t_{15}=43$ $\quad S_{15}=120$

① $a+14d=43$ $\quad 120=\frac{15}{2}[2a+14d]$

② $16=2a+14d$

$a+14d=43$

$2a+14d=16$

$-a=27$

$a=-27$

$-27+14d=43$

$14d=70$

$d=5$

$-27+-22+-17$

Homework

Pg. 27

5 (b) $t_1 = -6$ $t_n = 21$ $S_n = 75$

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

$21 = -6 + (n-1)d$

$27 = (n-1)d$

$75 = \frac{n}{2}[2(-6) + (n-1)d]$

$75 = \frac{n}{2}[-12 + 27]$

$\frac{150}{15} = \frac{15n}{15}$

$10 = n$

7. b) $6+12+18+\cdots+996$

must be multiple of 6

$996=6+(n-1)(6)$

$996=6n$

$n=166$

$S_{166}=\frac{166}{2}\left[2(6)+(165)(6)\right]$

$=83166$

Geometric Series:

- The summation of the terms of a geometric sequence

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

Let's derive this formula that can be used to determine the sum of "n" terms in any geometric series...

$(r)S = (a + ar + ar^2 + ar^3 + \ldots + ar^{n-2} + ar^{n-1}) \cdot r$

- Multiply both sides of this summation by r and then subtract the two equations

$Sr = ar + ar^2 + ar^3 + \cdots + ar^{n-1} + ar^n$

$S = ar + ar^2 + ar^3 + \cdots + ar^{n-1} + a$

$Sr - S = ar^n - a$

$S(r-1) = a(r^n-1)$

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

Example:

Find the sum of each of the following series:

(a) $S = -3 - 6 - 12 - 24 - \ldots - 196608$

$t_n = ar^{n-1}$

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

$= -3 + (-6) + (-12) \cdots + (-196608)$

$\frac{-196608}{-3} = \frac{-3(2)^{n-1}}{-3}$

$65\,536 = (2)^{n-1}$

$(2)^{16} = (2)^{n-1}$

$n = 17$

$S_{17} = \frac{-3(2^{17} - 1)}{(2 - 1)}$

$= -393\,213$

(b) $S = 5 - 10 + 20 - 40 + \ldots + 5242880$

$\frac{5\,242\,880}{5} = \frac{5(-2)^{n-1}}{5}$

$1\,048\,576 = (-2)^{n-1}$

$(-2)^{20} = (-2)^{n-1}$

$n = 21$

$S_{21} = \frac{5((-2)^{21} - 1)}{-2 - 1}$

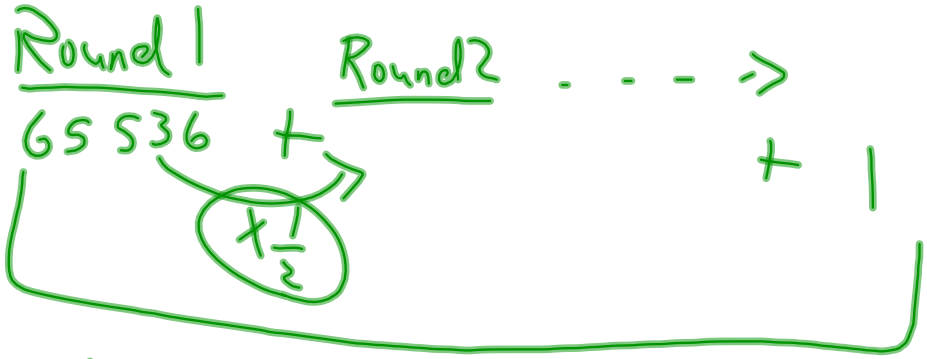
$= 3\,495\,255$

Internet Cribbage tournament ...

131 072 participants

$\Rightarrow$ single elimination

How many games will be played in total?



$1 = 65536\left(\frac{1}{2}\right)^{n-1}$

$\frac{1}{65536} = \left(\frac{1}{2}\right)^{n-1}$

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

$n = 17$

$S_{17} = \frac{65536\left(\frac{1}{2}^{17} - 1\right)}{\frac{1}{2} - 1}$

$= 131071$

Pg. 53

#3, 4, 6, 8, 10, 11, 13, 14, 15, 17, 18

Attachments

applications of sequences.doc