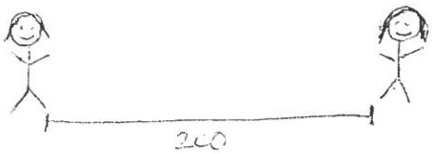
Notes 14.3 Continued

Hannah Alexia are 200inches away from each other. If Hannah walks ½ the remaining distance each time towards Alexia, her steps will be of length 100, 50, 25, 12.5, 6.25, …



Will Hannah ever reach Alexia?
The total distance Hannah traveled is given by the geometric series 100 + 50 + 25 + 12.5 + 6.25

$S_n = t_1 \cdot \frac{1-r^n}{1-r}$ r = .5

as n gets really large, S_n approaches a **limit** $\lim_{n\to\infty} S_n = t_1 * \frac{1}{1-r} =$

$100 * \frac{1}{1-.5} = \boxed{200}$

If | r | < 1, the geometric series will ***converge***.
If | r | ≥ 1, the geometric series will ***diverge.***

If the series converges, find the limit to which it converges.

1. 25 + 20 + 16 + …

$\frac{20}{25} = .8$ $\lim_{n\to\infty} S_n = 25 * \frac{1}{1-.8} = \boxed{125}$

$\frac{16}{20} = .8$

2. 200 – 140 + 98 + …

$\frac{-140}{200} = -.7$ $\lim_{n\to\infty} S_n = 200 * \frac{1}{1+.7} = \boxed{117.65}$

$\frac{98}{-140} = -.7$

Remember Pascal's Triangle:

1	row 0
1 1	row 1
1 2 1	row 2
1 3 3 1	row 3
1 4 6 4 1	row 4
1 5 10 10 5 1	row 5
1 6 15 20 15 6 1	row 6
1 7 21 35 35 21 7 1	row 7

If you expand the binomial series

$(a+b)^5$

$5C0 \cdot a^5b^0 + 5C1 \cdot a^4b^1 + 5C2 \cdot a^3b^2 + 5C3 \cdot a^2b^3 + 5C4 \cdot a^1b^4 + 5C5 \cdot a^0b^5$

Binomial Formula

$$(a+b)^n = \sum_{r=0}^{n} nCr \cdot a^{n-r} \cdot b^r$$

Expand.

3. $(3x+2)^4$

$_4C_0(3x)^4(2)^0 + {_4C_1}(3x)^3(2)^1 + {_4C_2}(3x)^2(2)^2 + {_4C_3}(3x)^1(2)^3 + {_4C_4}(3x)^0(2)^4$

$\boxed{81x^4 + 216x^3 + 216x^2 + 96x + 16}$

4. Find the 4th term of the binomial series $(a+b)^5$
   Means it would contain b^3 (b is one less power than the term it is asking for)
   Means it would contain a^2b^3 since exponents add to n = 5
   So 5C3 a^2b^3 or $10a^2b^3$

5. Find the 8th term of the binomial series $(3-2x)^{12}$

$_{12}C_5\, 3^5(-2x)^7$

$(792)(243)(-128x^7)$

$\boxed{-24{,}634{,}368x^7}$