Know

$$S_5 = \frac{u_1(1-r^5)}{1-r} = 3798 \qquad S_7 =$$

$$S_\infty = \frac{u_1}{1-r} = 4374 \qquad u_1 = \qquad r =$$

$$(1-r^5)\,\frac{u_1}{1-r} = 4374(1-r^5)$$

$$\frac{4374(1-r^5)}{4374} = \frac{3798}{4374}$$

$$\frac{u_1}{1-\frac{2}{3}} = 4374$$

$$\frac{u_1}{\frac{1}{3}} = 4374$$

$$u_1 = 1458$$

$$\cancel{1} - r^5 = \frac{3798}{4374} - 1$$

$$r^5 = -\frac{3798}{4374} + 1$$

$$r = \frac{2}{3}$$

Cornell Notes	Topic/Objective: 6.8 Applications of Geometric + Arithmetic patterns	Name:
AVID Decades of College Dreams		Class/Period: 4
		Date: 5/1/17

Essential Question: What are some of the applications of sequences + series?

Questions:	Notes:
	① Compound Interest.
	$A = P(1 + \frac{r}{n})^{nt}$
	P = Principal
	r = interest rate
	n = # times compounded anually
	t = # of years
	Ex) In a geometric sequence $v_1 = 6, r = 1.5$ In an arith. seq. $u_1 = 75$ and $d = 100$ after how many terms will the sum of the geo seq > sum arith?
6L p. 182 1-4	$S_{Geo} \frac{6(1.5^n - 1)}{1.5 - 1} > \frac{n}{2}(2(75) + (n-1)100) = S_{arith}$
	6.9 Pascal's Triangle
	1 1
	1 2 1
	1 3 3 1
	1 4 6 4 1
	⋮
	To be continued....

1. $u_6 = 3u_4$

$u_8 = 50$

$u_1 =$

$u_n = u_1 + (n-1)d$

$u_4 = u_1 + 3d$

$u_6 = 3u_4 = 3(u_1 + 3d)$

$u_6 = u_1 + 5d$

$u_1 = -2d$

$u_1 = -20$

$u_8 = u_6 + 2d$

$u_8 = u_1 + 7d$

$50 = -2d + 7d$

$d = 10$

2. $u_1 = 12$, $u_5 = 15$

$u_5 = u_1 + 4d$

$15 = 12 + 4d$

$d = \frac{3}{4}$

a. $u_{20} = u_1 + 19d$

b. $u_n \geq 100$

$12 + (n-1)\left(\frac{3}{4}\right) \geq 100$

$n > 118$

$\underline{119}$

3. $A = p\left(1 + \frac{r}{n}\right)^{nt}$

$p = 2500$

$r = .06$

$t = 8$

a. $n = 1$

b. $n = 4$

c. $n = 12$

Questions:	Notes: Combinations
	- primarily in probability
	a combination of n items taken r at a time is written
	${}_nC_r$, $\binom{n}{r}$, or C^n_r
	* Recall:
	$P(\text{Event}) = \frac{\text{\# of ways an event can happen}}{\text{Total \# of poss. outcomes}}$
	Ex) 5 balls, 1Y, 1R, 1B, 1G, 1P
	How many ways can 2 balls be chosen?
	YR YB YG YP
	RB RG RP 10
	BG BP
$5! = 5\cdot\underbrace{4\cdot3\cdot2\cdot1}$	GP
$5!$	
$5\cdot4!$	Combinations
	1. by hand $\binom{n}{r} = {}_nC_r$
	$= \frac{n!}{r!(n-r)!} =$
HW 6M	ex) $n=5, r=2$
p. 185	$\binom{5}{2} = \frac{5!}{2!(5-2)!}$
# 1-6	
	$= \frac{5\cdot4\cdot\cancel{3!}}{2\cdot1\cdot\cancel{3!}} = 10$
	2 By Calculator

Questions:	Notes:

expand

$(a+b)^2 = a^2 + 2ab + b^2$

$(a+b)^3 = a^2 + 3a^2b + 3ab^2 + b^3$

$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

$(a+b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$

Patterns

1. The number of terms is $n+1$
2. Powers of a decrease
   $a^n + a^{n-1} + \cdots + a^0$
3. Powers of b increase
   $b^0 + b^1 + \cdots + b^n$
4. Coefficients are from the nth row of Pascal's Triangle

THE BINOMIAL THEOREM States that for any power of binomial, Where $n \in \mathbb{N}$,

$$(a+b)^n = \binom{n}{0}a^n b^0 + \binom{n}{1}a^{n-1}b^1 + \cdots + \binom{n}{n}a^0 b^n$$

$$= \sum_{r=0}^{n}\left[\binom{n}{r}a^{n-r}b^r\right]$$

Questions:	Notes: Ex) use the Binomial Thm to expand
$(2x+4)^5$	$(x+3)^5 = \binom{5}{0}x^5 3^0 + \binom{5}{1}x^4 3^1 + \binom{5}{2}x^3 3^2$
	$+\binom{5}{3}x^2 3^3 + \binom{5}{4}x^1 3^4 + \binom{5}{5}x^0 3^5$
	$= x^5 + [(5)x^4(3)] + [(10)x^3(9)] + [(10)x^2(27)]$
	$+ [(5)x(81)] + [243]$
	$= x^5 + 15x^4 + 90x^3 + 270x^2 + 405x + 243$
	Ex) In the expression $(2x+1)^n$, the coefficient of the x^3 term is 80. Find the value of n
	$\binom{n}{3}(2x)^3 1^{n-3} = 80x^3$
	$\frac{n!}{3!(n-3)!}\frac{(8x^3)}{8x^3} = \frac{80x^3}{8x^3}$
Hw 60 p. 188 1,4,9	
	$\frac{n!}{3!(n-3)!} = 10$
6	$\frac{n\cdot(n-1)\cdot(n-2)\cdot\cancel{(n-3)!}}{3\cdot2\cdot1\ \cancel{(n-3)!}} = 10\cdot6$
	$n^3 - 3n^2 + 2n = 60$
	put in calculator find 0 $n^3 - 3n^2 + 2n - 60 = 0$