Test 3

1. How many 5 letter "words" can be formed from the letters in the word "whiskey"?
2. How many 8 letter "words" can be formed from the letter in the word "calculus"?
3. Write the first 8 levels of Pascal's triangle.
4. Use the 5th level to expand $(a+b)^5$
5. Find the coefficient of the term x^7 in the expansion of $(x-2)^{12}$
6. Show that if there are 30 students in a class, at least two must have last names that begin with the same letter.
7. Show that among any group of 6 integers, there is a pair x, y with $x \equiv y(\text{ mod } 5)$
8. How many cards must be drawn from a deck to ensure that there are either 4 clubs, 3 hearts, 2 spades or 1 diamond selected?
9. Verify Pascal's identity
$$\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$$
for $n = 6, k = 4$
10. Let A be the set $\{1,2,3,4,5\}$ and R be the relation $R = \{(x,y)|x \text{ divides } y\}$
    (a) Write R as a set.
    (b) Draw a diagram for R
    (c) IsR reflexive? Be explicit.
    (d) Is R symmetric?
    (e) Transitive?
11. The sets $\{a,b\}, \{c,d\}\{e\}$ form a partition of $S = \{a,b,c,d,e\}$ Diagram the corresponding equivalence relation.
12. Let $A = \{0,1,2,3,4,5,6\}$and R be the relation $R = \{(x,y)|x \equiv y \text{ mod } 3\}$
    (a) Show explicitly that R is and equivalence relation.
    (b) What are the equivalence classes of R?

13. Add $\sum_{k=0}^{\infty} \left(\frac{2}{3}\right)^k$

14. Add $\sum_{k=100}^{200} (4k-5)$

15. Add $\sum_{k=1}^{50} k^3 + k$

16. Add $\sum_{k=2}^{\infty} \frac{3}{(k-1)(k+2)}$

17. Prove the well ordered principle is logically equivalent to strong induction.