Counting Handout 2
compiled by Joe Kahlig, Fall 2004
The majority of these problems are from *Finite Mathematics, An applied approach* , by Paul Long and Jay Graening.
Video solutions located at:
http://people.tamu.edu/∼kahlig/141-extra-info.html

In the following exercise, use any appropriate technique that has been presented to obtain the count requested.

1. How many nine–card hands have at least one king?
2. From among 80 light bulbs, 10 are defective. How many samples of 8 have at least 1 defective bulb?
3. How many eight–card hands have at least two queens?
4. At the Boy scout camp council, there are two boys from each of the states Iowa, New Mexico, Florida, and Maine. In how many ways can a committee of four be formed from among these boys, in which there is at least one boy from Maine?
5. One card is drawn from a deck of 52 cards. In how many ways can this be done if it is to be
   (a) A king?
   (b) A king or a spade?
   (c) A king and a spade?
   (d) A king and a queen?
   (e) Not a king or not a queen?
   (f) A king or not a spade?
6. For five-digit postal zip codes.
   (a) How many are possible if there are no restrictions on the digits?
   (b) How many are possible if 0 is not allowed as the first digit?
7. A survey of 60 shoppers reveals that in the past week, 20 bought toothpaste, 15 bought deodorant, and 8 bought both of these items. How many of these shoppers
   (a) Bought toothpaste or deodorant last week?
   (b) Bought exactly one of these two items?
8. Seven distinct points are marked on a circle. How many different triangles can be drawn, using these points as vertices?
9. How many different outcomes are there if a coin is tossed eight times?
10. A bag contains eight red apples and four yellow apples. In how many ways can a shopper select a sample of three apples if
    (a) All are to be red?
    (b) There are no restrictions?
    (c) At least two must be yellow?
11. In how many ways can the letters in the word *turkey* be arranged in a row if
    (a) There are no restrictions?
    (b) The first letter must be a k?
    (c) The first letter must be a r and the last letter must be t?
12. In how many distinguishable ways can a row of two S's and nine F's be arranged?
13. A box contains four red and seven green marbles. Two marbles are drawn without replacement. In how many ways is this possible if
    (a) One is red and one is green?
    (b) At least one is red?
    (c) Both are to be red or both are to be green?
14. A box contains two red, four green, six black, and three blue balls. In how many ways can a sample of three balls be selected if
    (a) All of the balls are to be red?
    (b) All are the same color?
    (c) Exactly two of the balls are the same color?
    (d) There are more red balls than green balls?
15. A box contains two red, four green, six black, and three blue balls. In how many ways can a sample of four balls be selected if
    (a) Exactly three of the balls are the same color?
    (b) Exactly one red ball and at least one green ball is drawn?
    (c) At most two blue balls are drawn?
    (d) There are more red balls than green balls?
16. Ten cards are to be selected from a deck of 52 cards. In how many ways can this be done if
    (a) At least 2 are to be spades?
    (b) At least 3 are to be spades?
17. A box contains 12 red, 8 green, and 20 blue marbles. How many different samples of 8 marbles may be selected if
    (a) At least 3 are green?
    (b) All are to be green?
18. Nine people are to travel to dinner in a five-seater van and a four-seater sports car.
    (a) How many different groups of five and four are possible for the trip?
    (b) How many different seating arrangements are possible if two persons, Juanita and Kareem, are designated drivers and the others can sit in any of the remaining seats?
19. How many ways can 3 A's and 6 B's be placed in a row if the A's are not next to each other?
20. In how many ways can 7 people be seated around a circular table?
21. A space shuttle crew consists of a shuttle commander, a pilot, 3 engineers, a scientist, and a civilian. The shuttle commander and pilot are to be chosen from 8 candidates, the 3 engineers from 12 candidates, the scientist from 5 candidates, and the civilian from 2 candidates. How many such space shuttle crews can be formed?
22. In how many ways can four couples be seated in a row of eight seats at a theater if each couple is seated together?
23. A box contains 23 red, 40 green, 30 blue, and 22 yellow balls. How many different samples of 30 balls may be selected if
    (a) At least 3 are red?
    (b) At least 28 are yellow?
    (c) At most 27 are blue?

1. 2,001,968,760
2. 19,547,186,230
3. 80,672,868
4. 55
5. (a) 4
   (b) 16
   (c) 1
   (d) 0
   (e) 52
   (f) 40
6. (a) 100,000
   (b) 90,000
7. (a) 27
   (b) 19
8. 35
9. 256
10. (a) 56
    (b) 220
    (c) 52
11. (a) 720
    (b) 120
    (c) 24
12. 55
13. (a) 28
    (b) 34
    (c) 27
14. (a) 0
    (b) 25
    (c) 250
    (d) 85
15. (a) 236
    (b) 404
    (c) 1353
    (d) 240
16. (a) 12,429,382,108
    (b) 7,630,529,764
17. (a) 14,086,161
    (b) 1
18. (a) 126
    (b) 10,080
19. 35
20. $(7-1)! = 6! = 720$
21. 123,200
22. 384
23. (a) C(115,30) - [C(23,0)*C(92,30) + C(23,1)*C(92, 29) + C(23,2)*C(92,28)]
    (b) 0
    (c) C(115,30) - [C(30, 28)*C(85, 2) + C(30,29)*C(85,1) + C(30, 30)*C(85,0)]