

Counting Handout 1

compiled by Joe Kahlrig, Spring 2005

The majority of these problems are from *Finite Mathematics, An applied approach*, by Paul Long and Jay Graening.

**Video solutions located at:**

<http://www.math.tamu.edu/~kahlrig/141-extra-info.html>

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

1. **Social Security Number** How many different Social Security numbers are there if
  - (a) There are no restrictions?
  - (b) No number can begin with zero?
  - (c) Neither of the first two digits can be zero?
2. **Telephone Numbers** How many different seven-digit telephone numbers can be put on the 501 area code if
  - (a) There are no restrictions?
  - (b) No telephone number can begin with zero?
  - (c) No telephone number can begin with zero and the last digit must be odd?
3. **Arrangements** In how many ways can five boys and three girls be seated in a row if
  - (a) There are no restrictions?
  - (b) Boys and girls are seated alternately?
  - (c) A girl must be seated in both end seats?
4. **Arrangements** In how many ways can five boys and five girls be seated in a row if
  - (a) Boys and girls are seated alternately?
  - (b) Boys sit side by side and girls sit side by side?
  - (c) One of the girls, Sue, must be seated on the left end?
5. **Arrangements** In how many ways can eight books be arranged on a shelf if
  - (a) There are no restrictions?
  - (b) One of the books, *Of Mice and Men*, must be displayed on the left end?
6. **Forming Numbers** How many three-digit numbers can be formed from the digits 2, 3, 4, 5, 6, 7 if
  - (a) There are no restrictions?
  - (b) The numbers formed must all be even?
  - (c) The numbers formed must all be even and no digit may be repeated?
7. **Forming Numbers** How many four-digit numbers can be formed if
  - (a) There are no restrictions? (Zero is not the first digit.)
  - (b) Zero cannot be the first digit and no digit can be repeated?
  - (c) Zero cannot be the first digit, no digit can be repeated, and each number formed must be even?
8. **Serial Number** Serial numbers assigned to calculators by a manufacturer have as a first symbol one of the letters J, H, or T to indicate the plant in which made, followed by one of the numbers 01, 02, . . . , 12, to indicate the month in which made, followed by four digits. How many different serial numbers are possible?
9. **ID Numbers** If a firm has 600 employees, what is the smallest number of digits that an employer I.D. number can have if each I.D. number has  $x$  digits? What is the smallest number if the firm has 12,000 employees?
10. **Quiz** In how many ways can a ten-question True/False test be answered?
11. **Test** In how many ways can a ten-question multiple-choice test be answered if there are four choices for each question?
12. **Licenses** How many different car license plates can be made using three letters followed by three digits if
  - (a) There are no restrictions?
  - (b) No letter can be repeated?
  - (c) No letter can be repeated and 0 cannot be used as the first digit?
13. **Licenses** How many different car license plates can be made using two letters followed by four digits if
  - (a) There are no restrictions?
  - (b) No letter can be repeated?
  - (c) The last digit must be a four and no digit can be repeated?
14. **Call Letters** How many different four-letter radio station call letters are there if
  - (a) Each must begin with a K or a W?
  - (b) Each must begin with a K or a W, and no letter can be repeated?
  - (c) Each must begin with a K or a W, no letter may be repeated, and the last letter must be a Z?
15. **Call Letters** How many four-symbol radio station call signals are there that use either all letters or one letter followed by three digits if
  - (a) The first letter must be a K or a W?
  - (b) The first letter must be a K or a W and no digit is repeated?
  - (c) The first letter must be a K or a W and no letter or digit may be repeated?
16. Five people, 3 guys and 2 women, are each asked to write down a integer between 1 and 15 (inclusive). In how many ways can they pick numbers if
  - (a) Everybody picks a different number.
  - (b) The guys pick the same number and the women pick numbers different from the guys and different from each other.
  - (c) Exactly two of the people pick an even number.
17. **Arrangements** Bill and Sue and five of their friends go to the movies. They all sit next to each other in the same row. How many ways can this be done if
  - (a) Sue and Bill must sit next to each other?
  - (b) Sue must sit in the middle?
  - (c) Sue must not sit next to Bill?
  - (d) Sue sits on one end of the row and Bill sits on the other end of the row?
  - (e) Sue, Bill, or Jan sit in the middle seat?
  - (f) Sue, Bill, and Jan sit in the middle seats?

1. (a) 1,000,000,000  
(b) 900,000,000  
(c) 810,000,000
2. (a) 10,000,000  
(b) 9,000,000  
(c) 4,500,000
3. (a) 40,320  
(b) 0  
(c) 4,320
4. (a) 28,800  
(b) 28,800  
(c) 362,880
5. (a) 40,320  
(b) 5,040
6. (a) 216  
(b) 108  
(c) 60
7. (a) 9,000  
(b) 4,536  
(c) 2,296
8. 360,000
9. 3; 5
10. 1,024
11. 1,048,576
12. (a) 17,576,000  
(b) 15,600,000  
(c) 14,040,000
13. (a) 6,760,000  
(b) 6,500,000  
(c) 340,704
14. (a) 35,152  
(b) 27,600  
(c) 1,104
15. (a) 37,152  
(b) 36,592  
(c) 29,040
16. (a) 360360  
(b) 2730  
(c) 250880
17. (a) 1,440  
(b) 720  
(c) 3,600  
(d) 240  
(e) 2160  
(f) 144