**9.1**

**14.**

**b.** Let A, B, and C denote the three people. There are 8 possible outcomes to this event:

* 0 or 3 people become ill (2 outcomes)
* One person becomes ill and the other two people do not (3 outcomes)
* A & B are ill and C is not
* A & C are ill and B is not
* B & C are ill and A is not

Therefore the probability that at least two people become ill is 4/8 = 50%

**c.** Continuing from the outcomes in part b, 1/8 = 12.5% chance that none of the people become ill.

**20.**

**a.** There are 5 equally possible cases for which door contains the prize before the host opens another. Therefore, sticking with the original choice of door A, does not change the probability of winning so it’s 1/5 = 20%

**b.** We know the remaining doors have a 4/5 chance of containing the prize and the remaining three doors are equally probable to contain it, while the original choice is still 1/5. So, the probability to win the prize is

**9.2**

**10.**

**a.** There are three routes from North Point to Boulder Creek, two routes from Boulder Creek to Beaver Dam, and two routes from Beaver Dam to Star Lake. So, there are possible routes by the Multiplication Rule.

**b.** There are three routes from North Point to Boulder Creek, and four routes directly from Boulder Creek to Star Lake which bypasses Beaver Dam. So, possible routes by the Multiplication Rule.

**15.**

**a.** There are 30 choices for each of the three numbers. So there are possible combinations by the Multiplication Rule.

**b.** The first number can be any of the 30 possible numbers, the second number can be any of the remaining 29 numbers and the third number can be any of the remaining 28 numbers not used for first or second. So by the Multiplication Rule: possible combinations.

**9.3**

**17.**

**a.** There are 16 possible choices for the first digit, 15 for the second digit, 14 for the third digit, and 13 for the fourth digit. So by the Multiplication Rule: strings without repeated digits.

**b.** The set of all four digit strings is and by part a, the total number without repeated digits is 43680. So the total amount of strings with at least one repeated digit is , by the Difference Rule.

**c.** By part b, the probability is

**9.4**

**28.**

By the contrapositive form of generalized pigeonhole principle: Suppose not. Suppose the programmer wrote 29 lines of code per day. This would imply that the total number of lines is at most . But this contradicts the fact that the programmer wrote 500 lines of code. So there must have been at least one day were the programmer wrote 30 or more lines of code.

**9.5**

**10.** The first group for drug A can be assigned in ways. The remaining 38 mice can be assigned to drug B in ways. The control group is the unassigned 16 mice remaining which is ways. So by the Multiplication Rule, the total amount of possible assignments is:

**16.**

**a.**  different samples

**b.** Since we have one board chosen, which is defective, we have 39 remaining computer boards to choose from and we only need to choose four more from the 39 remaining. Thus, samples contain at least one defective board.

**c.** By parts a and b, the probability of choosing a sample with a least one defective board is:

**9.6**

**2b.** By part a, there are 15 multisets possible:

[x,x,x,x] ; [x,x,x,y] ; [x,x,x,z] ; [x,x,y,y] ; [x,x,z,z] ; [x,x,y,z]

[y,y,y,y] ; [y,y,y,x] ; [y,y,y,z] ; [y,y,z,z] ; [y,y,x,z]

[z,z,z,z] ; [z,z,z,x] ; [z,z,z,y] ; [z,z,x,y]

**4a.** The types of batteries are the n categories and the batteries in inventory are the r objects, so . The amount of ways the batteries can be distributed among the types is:

**9.7**

**30.** To get x7, we set in the binomial theorem, resulting in:

So the coefficient is 6,480.

**32.** To get u16v4, we set in the binomial theorem, resulting in:

So the coefficient is 45.

**34.** To get x9y10, we set in the binomial theorem, resulting in:

So the coefficient is -249,080,832.

**10.1**

**4.**

v4

e1

v5

e4

v1

v2

v3

e2

e3

**37.**

**c. e.**

v1

v2

v3

v4

v5

v6

V2

V1

v1

v2

v3

v4

v5

V2

V1

**d.** Suppose the graph is bipartite. Then, v5 is in one subset of the partition, V1. Since v5 is connected by edges to v2 and v4, both v2 and v4 must be in the opposite subset of the partition, V2. But, v2 and v4 are connected by an edge to each other and in the same subset, which contradicts the definition of a bipartite graph. Thus, the supposition is false, and the graph is not bipartite.

**f.** Suppose the graph is bipartite. Then, v1 is in one subset of the partition, V1. Since v1 is connected by edges to v2 and v5, both v2 and v5 must be in the opposite subset of the partition, V2. Also, v3 is connected by edges to v2 and v4 so, v3 must be in the subset V1 since v2 is already in V2. Likewise v4 must be in the opposite subset as v3, so v4 is in V2. But, v5 and v4 are connected by an edge to each other and in the same subset, which contradicts the definition of a bipartite graph. Thus, the supposition is false, and the graph is not bipartite.