Chapter 3 Essential Practice Questions Group A

1. A class consists of 10 students (5 boys and 5 girls) and one teacher.
In how many ways can the students:

a) sit in a row of chairs if there are no restrictions?
b) stand in a line, if a boy must be first in line
c) stand in a row for a picture with the teacher if the teacher must stand on the left end of the row?
d) elect a President and a Vice President from the students in the class?
e) elect a king and queen from the students in the class (the king must be a boy and the queen must be a girl)?

2. For the same class with 10 students (5 boys and 5 girls) and one teacher:
In how many ways can the teacher

a) award 3 identical prizes to 3 different students?
b) award 3 different prizes to 3 different students if a student CAN be a repeat winner?
c) award 3 different prizes to 3 different students if a student CANNOT be a repeat winner?
d) send the class hamster, rabbit and gerbil home with 3 different students for the summer if 4 students have allergies and are not allowed to be considered?
e) choose 4 students to serve on a committee if there are no restrictions?
f) choose 4 students to serve on a committee to plan a party if the committee must have 2 boys and 2 girls?
g) choose 4 students to serve on a committee if there must be exactly 1 girl on the council?
h) choose and arrange 4 of the 10 students in a row in the front of the classroom?
i) choose 2 students to wash the boards?
j) choose 3 girls for 3 different parts in the class play?
k) award 3 different prizes to 3 different students if first prize must go to a girl?

3. A urn contains 7 red, 6 white and 5 blue marbles. You reach in and randomly choose 4 marbles. In how many ways can the 4 marbles be selected so that:

a) all 4 marbles are red?
b) all 4 marbles are white?
c) exactly two marbles are white?
d) exactly one marble is blue?
e) none of the selected marbles is red?

4. A fair coin is tossed 6 times and the result of heads/tails is noted on each flip. How many outcomes are in the sample space for this experiment?

5. You have an unlimited supply of red and black jelly beans in a huge jar. You randomly choose and eat a jelly bean and you continue to do this until you either eat a black jelly bean or until you have eaten 5 jelly beans. How many outcomes are in this sample space?

6. A test has 15 true/false questions, and 10 multiple choice questions with 4 choices each. Assuming that you answer all questions, in how many different ways could you answer the questions?

7. Given a set with 4 elements, how many different subsets containing exactly 2 elements can be formed?

8. Given a set with 4 elements, what is the total number of subsets of any size that can be formed?

Answers to Chapter 3 Essential Practice Questions Group A

1.
a. 10! = 3,628,800
b. 5*9*8*7*6*5*4*3*2*1 = 5 * (9!) = 1,814,400
c. 1*10! = 3,628,800
d. P(10,2) = 10*9 = 90
e. 5*5 = 25

2.
a. C(10,3) = 120
b. 10*10*10 = 1000
c. P(10,3) = 10*9*8 = 720
d. P(6,3) = 6*5*4 = 120
e. C(10,4) = 210
f. C(5,2)*C(5,2) = 10*10 = 100
g. C(5,1)*C(5,3) = 5*10 = 50
h. P(10,4) = 5040
i. C(10,2) = 45
j. P(5,3) = 5*4*3 = 60
k. 5*9*8 = 360

3.
a. C(7,4) = 35
b. C(6,4) = 15
c. C(6,2)*C(12,2) = 15*66 = 990
d. C(5,1)*C(13,3) = 5*286 = 1430
e. C(11,4) = 330

4. **2^6 or (2 to the 6^{th} power) = 64**

5. **Use a tree diagram: 6 outcomes**

6. **(2^15)*(4^10) or (2 to the 15^{th} power) times (4 to the 10^{th} power)**

7. **C(4,2) = 6**

8. **2^4 or (2 to the 4^{th} power) = 16**

Chapter 3 Essential Practice Questions Group B

9. A class consists of 10 students (5 boys and 5 girls) and one teacher.
In how many ways can the students:

a) sit in a circle?
b) sit in a row if all boys sit together and all girls sit together?
c) sit in a row if boys cannot sit next to other boys and girls cannot sit next to other girls?
d) stand in a row for a picture if the teacher must stand on one end or the other?
e) One student is named THOMAS. How many distinguishable arrangements of the letters in his name can be formed?
f) Another student is named CASSANDRA. How many distinguishable arrangements of the letters in her name can be formed?
g) In how many different orders can the teacher schedule parent-teacher conferences for her 10 students if there are no restrictions?
h) Thomas and Cassandra's parents will ride to parent-teacher conferences together. In how many different orders can the conferences for the 10 students be arranged if Thomas and Cassandra must have their conferences back-to-back (in either order)?
i) In how many ways can the teacher choose 4 students to serve on the class council if there must be at least 1 girl on the council?
j) In how many ways can the teacher choose 4 students to serve on the class council if there must be no more than 2 girls on the council?
k) In how many ways can the teacher divide the class into 2 groups of 5 where one group will get ice cream and the other group will get nothing?
l) In how many ways can the teacher divide the class into 5 groups of 2 where each group will get a different snack?
m) In how many ways can the teacher divide the class into two groups of 5 where the groups will be treated the same?
n) In how many ways can the teacher divide the class into pairs where the pairs will be treated the same?

10. An urn contains 6 red, 8 white and 4 blue marbles. You reach in and randomly choose 3 marbles. In how many ways can the marbles be selected so that:

a) exactly 1 marble is blue?
b) all 3 marbles are white?
c) all 3 marbles are the same color?
d) all 3 marbles are different colors?
e) at least one marble is blue?
f) at least one marble is not white?
g) at least two marbles are red?

11. 5 cards are drawn from a standard deck of 52 cards. How many 5-card hands have:

a) All red cards
b) All 5 cards of the same suit
c) Exactly 2 red cards
d) At least 3 aces

e) At least 1 card from each suit

12. There are 10 people at a party. Each person shakes hands with everybody else once. How many handshakes will occur?

13. A factory line inspector inspects light bulbs to see if they are defective or not. He checks bulbs until he finds a defective one or until he has checked 4 bulbs. How many outcomes are in the sample space for this experiment?

Answers to Chapter 3 Essential Practice Questions Group B

9.
- **a. 9! = 362,880**
- **b. 10*4*3*2*1*5*4*3*2*1 = 28,800**
- **c. 10*5*4*4*3*3*2*2*1*1 = 28,800**
- **d. 10! * 2 = 7,257,600**
- **e. 6! = 720**
- **f. 9!/(3!*2!) = 30,240**
- **g. 10! = 3,628,800**
- **h. 9! * 2 = 725,760**
- **i. C(10,4) - C(5,4) = 205**
- **j. C(5,0)*C(5,4) + C(5,1)*C(5,3) + C(5,2)*C(5,2) = 155**
- **k. 10! / (5! * 5!) = 252**
- **l. 10! / (2! * 2! * 2! * 2! *2!) = 113,400**
- **m. 10! / (5! * 5! * 2!) = 126**
- **n. 10! / (2! * 2! * 2! * 2! *2! *5!) = 945**

10.
- **a. C(4,1)*C(14,2) = 364**
- **b. C(8,3) = 56**
- **c. C(6,3) + C(8,3) + C(4,3) = 80**
- **d. C(6,1)*C(8,1)*C(4,1) = 192**
- **e. C(18,3) – C(14,3) = 452**
- **f. C(18,3) – C(8,3) = 760**
- **g. C(6,2)*C(12,1) + C(6,3) = 200**

11.
- **a. C(26,5) = 65,780**
- **b. 4*C(13,5) = 5,148**
- **c. C(26,2)* C(26,3) = 845,000**
- **d. C(4,3)*C(48,2) + C(4,4)*C(48,1) = 4,560**
- **e. 4*C(13,2)*C(13,1)*C(13,1)*C(13,1) = 685,464**

12. C(10,2) = 45

13. Use a tree diagram: 5 outcomes