Tutorial 2

1. Toss a coin 3 times and record their up face (H or T) in sequence (e.g. HHT)

   (a) Find the sample space

   (b) express in set for the event A: the first toss is H

   (c) express in set for the event B: the second toss is H

   (d) express in set for the event C: the third toss is H

   (e) express in set for the event D: the total Heads is 2

   (f) find A∪B, A∩B, $\bar{A}$, A−B, A∩B∩ C, $A \cup \bar{B}$, A∩ D

2. Suppose the sample space is the real numbers $\Omega = \mathbb{R}$, and $A = (-\infty, 5]$, $B = (0, 10], C = (5, \infty)$. Find A∪B, A∩B, $\bar{A}$, A−B, A∩B∩ C, $A \cup \bar{B}$.

3. The following table is a summary of frequencies from an financial market.

   A_1 = Fund manager graduated from a top-20 MBA program

   A_2 = Fund manager did not graduate from a top-20 MBA program

   B_1 = Fund outperforms the market

   B_2 = Fund does not outperform the market

	B_1	B_2
A_1	.11	.29
A_2	.06	.54

   Based on the frequency probability, find $P(A_1 \cup B_1), P(A_1)$ and $P(A_1 - B_1)$

3.11 With reference to Figure 3.4, if A is the event that the shaft size is too large, B is the event that the windings are improper, and C is the event that the electrical connections are unsatisfactory, what events are represented by

   (a) region 5

   (b) regions 4 and 6 together;

   (c) regions 7 and 8 together;

   (d) regions 1, 2, 3 and 5 together?

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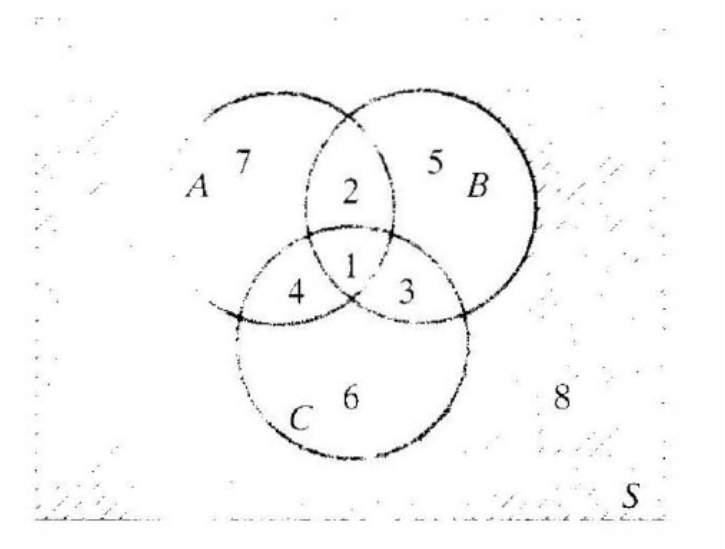

Figure 3.4

3.12 With reference to Figure 3.4, what regions or combinations of regions represent the events that a motor will have

(a) none of the major defects;

(b) a shaft that is large and windings improper;

(c) a shaft that is large and/or windings improper but the electrical connections are satisfactory;

(d) a shaft that is large and the windings improper and/or the electrical connections are unsatisfactory?

3.13 Use Venn diagrams to verify that

(a) $\overline{A \cap B} = \overline{A} \cup \overline{B}$

(b) $A \cup (A \cap B) = A$

(c) $(A \cap B) \cup (A \cap \overline{B}) = A$

(d) $A \cup B = (A \cap B) \cup (A \cap \overline{B}) \cup (\overline{A} \cap B)$

(e) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

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Ignore this questions

3.15 If the five finalists in an international volleyball tournament are Spain, the United States, Uruguay, Portugal, and Japan, draw a tree diagram that shows the various possible first- and second-place finishers.

3.17 In an optics kit there are 6 concave lenses, 4 convex lenses, and 3 prisms. In how many ways can one choose one of the concave lenses, one of the convex lenses, and one of the prisms?

3.19 One engineering group consists of 6 men and 4 women.

(a) How many different project teams can be formed consisting of 2 men and 2 women?

(b) If 2 women have the same boyfriend and refuse to be on the same team together, how many different project teams can be formed consisting of 2 men and 2 women?

3.20 If there are 9 cars in a race, in how many different ways can they place first, second, and third?

3.21 In how many ordered ways can a television director schedule 6 different commercials during the 6 time slots allocated to commercials during the telecast of the first period of a hockey game?

3.23 Determine the number of ways in which a manufacturer can choose 2 of 15 locations for a new warehouse.

3.24 If the order does not matter, in how many different ways can 4 of 18 robotic arms be chosen for a special welding job?

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3.25 A carton of 12 rechargeable batteries contains one that is defective. In how many ways can an inspector choose 3 of the batteries and

(a) get the one that is defective;

(b) not get the one that is defective?

3.26 With reference to Exercise 3.25, suppose that two of the batteries are defective. In how many ways can the inspector choose 3 of the batteries and get

(a) none of the defective batteries;

(b) one of the defective batteries;

(c) both of the defective batteries?

3.27 The supply department has 8 different electric motors and 5 different starting switches. In how many ways can 2 motors and 2 switches be selected for an experiment concerning a tracking antenna?

3.28 (a) A refrigerator manufacturer sold 2,756 units of a new model and 287 required repairs under the warranty. Estimate the probability that a new unit, which has just been sold, will require repairs under the warranty. Explain your reasoning.

(b) Last year 8,400 students applied for the 6,000 student season tickets available for football games. Next year you will apply and would like to estimate the probability of receiving a season ticket. Give your estimate and comment on one factor that might influence your estimate.

Tutorial 2

3.30 A lottery sells tickets numbered from 00001 through 50000. What is the probability of drawing a number that is divisible by 200?

3.31 A car rental agency has 18 compact cars and 12 intermediate-size cars. If four of the cars are randomly selected for a safety check, what is the probability of getting two of each kind?

3.33 In a group of 160 graduate engineering students, 92 are enrolled in an advanced course in statistics, 63 are enrolled in a course in operations research, and 40 are enrolled in both. How many of these students are not enrolled in either course?

3.35 An experiment has the four possible mutually exclusive outcomes A, B, C, and D. Check whether the following assignments of probability are permissible:

(a) $P(A) = 0.38$, $P(B) = 0.16$, $P(C) = 0.11$, $P(D) = 0.35$;

(b) $P(A) = 0.31$, $P(B) = 0.27$, $P(C) = 0.28$, $P(D) = 0.16$;

(c) $P(A) = 0.32$, $P(B) = 0.27$, $P(C) = -0.06$, $P(D) = 0.47$;

(d) $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$, $P(C) = \frac{1}{8}$, $P(D) = \frac{1}{16}$;

(e) $P(A) = \frac{5}{18}$, $P(B) = \frac{1}{6}$, $P(C) = \frac{1}{3}$, $P(D) = \frac{2}{9}$.

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3.41 If A and B are mutually exclusive events, $P(A) = 0.26$, and $P(B) = 0.45$, find

(a) $P(\overline{A})$;

(b) $P(A \cup B)$;

(c) $P(A \cap \overline{B})$;

(d) $P(\overline{A} \cap \overline{B})$.

3.44 The probabilities that a TV station will receive 0, 1, 2, 3, . . . , 8 or at least 9 complaints after showing a controversial program are, respectively, 0.01, 0.03, 0.07, 0.15, 0.19, 0.18, 0.14, 0.12, 0.09, and 0.02. What are the probabilities that after showing such a program the station will receive

(a) at most 4 complaints;

(b) at least 6 complaints;

(c) from 5 to 8 complaints?

3.45 If each point of the sample space of Figure 3.11 represents an outcome having the probability $\frac{1}{32}$, find

(a) $P(A)$;

(b) $P(B)$;

(c) $P(A \cap B)$;

(d) $P(A \cup B)$;

(e) $P(\overline{A} \cap B)$;

(f) $P(\overline{A} \cap \overline{B})$.

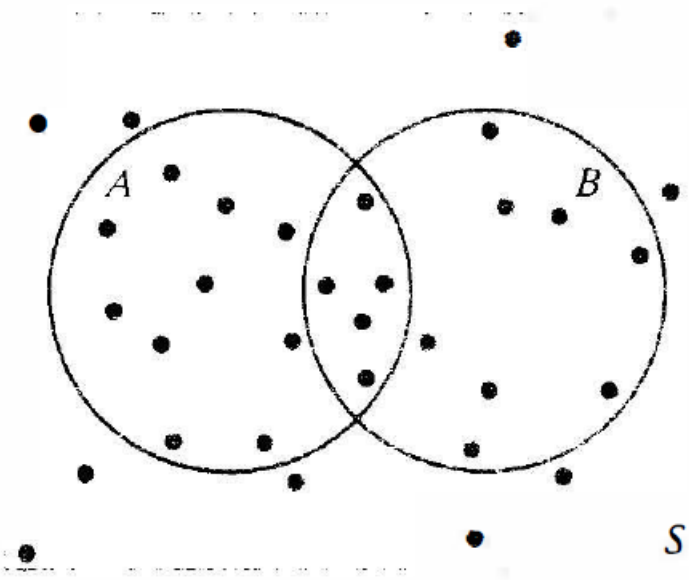

Figure 3.11 Diagram for Exercise 3.45

3.47 The probability that a new airport will get an award for its design is 0.16, the probability that it will get an award for the efficient use of materials is 0.24, and the probability that it will get both awards is 0.11.

(a) What is the probability that it will get at least one of the two awards?

(b) What is the probability that it will get only one of two awards?

3.48 Given $P(A) = 0.35$, $P(B) = 0.65$, and $P(A \cap B) = 0.12$, find

(a) $P(A \cup B)$;

(b) $P(\overline{A} \cap B)$;

(c) $P(A \cap \overline{B})$;

(d) $P(\overline{A} \cup \overline{B})$.

Tutorial 2

3.49 It can be shown that for any three events A, B, and C, the probability that at least one of them will occur is given by

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$

Verify that this formula holds for the probabilities of Figure 3.12.

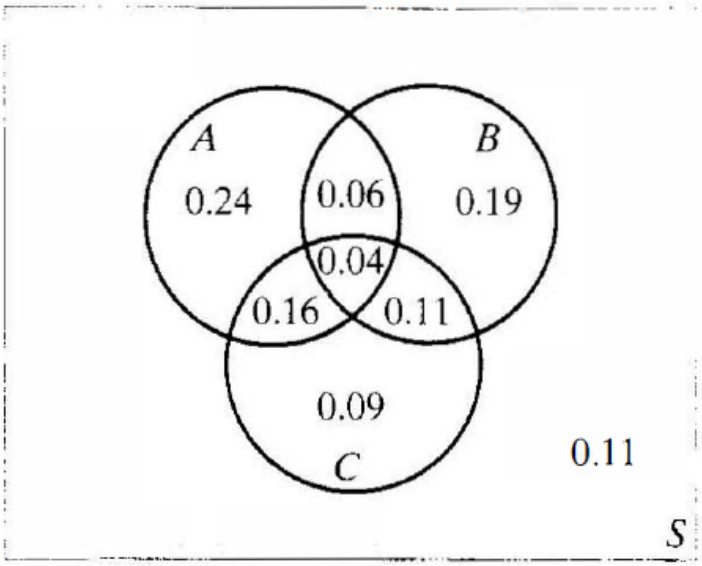

Figure 3.12 Diagram for Exercise 3.49

3.50 Suppose that in the maintenance of a large medical-records file for insurance purposes the probability of an error in processing is 0.0010, the probability of an error in filing is 0.0009, the probability of an error in retrieving is 0.0012, the probability of an error in processing as well as filing is 0.0002, the probability of an error in processing as well as retrieving is 0.0003, and the probability of an error in processing and filing as well as retrieving is 0.0001. What is the probability of making at least one of these errors?

The information given is not sufficient to solve the questions. Please add that

The probability of an error in filing as well as retrieving is also 0.0003.