

## Homework 2

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**2.7** Four students are selected at random from a chemistry class and classified as male or female. List the elements of the sample space  $S_1$ , using the letter  $M$  for male and  $F$  for female. Define a second sample space  $S_2$  where the elements represent the number of females selected.

**2.15** Consider the sample space  $S = \{\text{copper, sodium, nitrogen, potassium, uranium, oxygen, zinc}\}$  and the events

$$A = \{\text{copper, sodium, zinc}\},$$

$$B = \{\text{sodium, nitrogen, potassium}\},$$

$$C = \{\text{oxygen}\}.$$

List the elements of the sets corresponding to the following events:

(a)  $A'$ ;

(b)  $A \cup C$ ;

(c)  $(A \cap B') \cup C'$ ;

(d)  $B' \cap C'$ ;

(e)  $A \cap B \cap C$ ;

(f)  $(A' \cup B') \cap (A' \cap C)$ .

**2.19** Suppose that a family is leaving on a summer vacation in their camper and that  $M$  is the event that they will experience mechanical problems,  $T$  is the event that they will receive a ticket for committing a traffic violation, and  $V$  is the event that they will arrive at a campsite with no vacancies. Referring to the Venn diagram of Figure 2.5, state in words the events represented by the following regions:

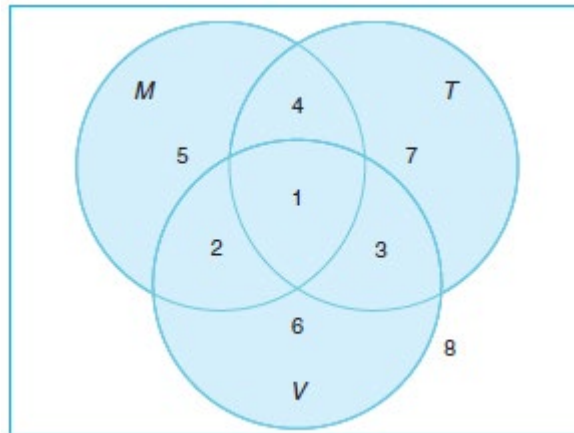
(a) region 5;

(b) region 3;

(c) regions 1 and 2 together;

(d) regions 4 and 7 together;

(e) regions 3, 6, 7, and 8 together.



**2.66** Factory workers are constantly encouraged to practice zero tolerance when it comes to accidents in factories. Accidents can occur because the working environment or conditions themselves are unsafe. On the other hand, accidents can occur due to carelessness or so-called human error. In addition, the worker's shift, 7:00 A.M.–3:00 P.M. (day shift), 3:00 P.M.–11:00 P.M. (evening shift), or 11:00 P.M.–7:00 A.M. (graveyard shift), may be a factor. During the last year, 300 accidents have occurred. The percentages of the accidents for the condition combinations are as follows:

Shift	Unsafe Conditions	Human Error
Day	5%	32%
Evening	6%	25%
Graveyard	2%	30%

If an accident report is selected randomly from the 300 reports,

- what is the probability that the accident occurred on the graveyard shift?
- what is the probability that the accident occurred due to human error?
- what is the probability that the accident occurred due to unsafe conditions?
- what is the probability that the accident occurred on either the evening or the graveyard shift?

**2.80** The probability that an automobile being filled with gasoline also needs an oil change is 0.25; the probability that it needs a new oil filter is 0.40; and the probability that both the oil and the filter need changing is 0.14.

- If the oil has to be changed, what is the probability that a new oil filter is needed?
- If a new oil filter is needed, what is the probability that the oil has to be changed?

**2.99** Suppose that the four inspectors at a film factory are supposed to stamp the expiration date on each package of film at the end of the assembly line. John, who stamps 20% of the packages, fails to stamp the expiration date once in every 200 packages; Tom, who stamps 60% of the packages, fails to stamp the expiration date once in every 100 packages; Jeff, who stamps 15% of the packages, fails to stamp the expiration date once in every 90 packages; and Pat, who stamps 5% of the packages, fails to stamp the expiration date once in every 200 packages. If a customer complains that her package of film does not show the expiration date, what is the probability that it was inspected by John?

**2.49** Find the errors in each of the following statements:

- The probabilities that an automobile salesperson will sell 0, 1, 2, or 3 cars on any given day in February are, respectively, 0.19, 0.38, 0.29, and 0.15.
- The probability that it will rain tomorrow is 0.40, and the probability that it will not rain tomorrow is 0.52.
- The probabilities that a printer will make 0, 1, 2, 3, or 4 or more mistakes in setting a document are, respectively, 0.19, 0.34,  $-0.25$ , 0.43, and 0.29.
- On a single draw from a deck of playing cards, the probability of selecting a heart is  $1/4$ , the probability of selecting a black card is  $1/2$ , and the probability of selecting both a heart and a black card is  $1/8$ .

**2.83** The probability that a vehicle entering the Luray Caverns has Canadian license plates is 0.12; the probability that it is a camper is 0.28; and the probability that it is a camper with Canadian license plates is 0.09. What is the probability that

- a camper entering the Luray Caverns has Canadian license plates?
- a vehicle with Canadian license plates entering the Luray Caverns is a camper?
- a vehicle entering the Luray Caverns does not have Canadian plates or is not a camper?

**2.31** A witness to a hit-and-run accident told the police that the license number contained the letters RLH followed by 3 digits, the first of which was a 5. If the witness cannot recall the last 2 digits, but is certain that all 3 digits are different, find the maximum number of automobile registrations that the police may have to check.