5.2 Finding Probabilities (continued)

1. equation for finding probabilities

$$P\{A\} = \frac{\#\text{ of outcomes in event } A}{\#\text{ of outcomes in the sample space}}$$

   (a) the probability of each outcome is between 0 and 1

   (b) the sum of all individual probabilities (for each outcome separately) is 1

2. probabilities about a pair of events.

3. some events are not expressed so simply, we could have

   (a) outcome is "not" some other event

   (b) outcomes are in one event and in another

   (c) outcomes are in one event or in another

4. example : birthdays.

5. complement : for an event A, the complement are events not in A. we write A^c.

6. we can use a Venn diagram

7. we also note $P\{A^c\} = 1 - P\{A\}$.

8. disjoint events : two events A and B are disjoint if they do not share any outcomes in common.

9. example a Venn diagram of exactly two heads and exactly one head in three flips.

10. consider A and A^c, they share no common outcomes, so they are disjoint.

11. intersection and union of two events

    (a) the intersection of events A and B consist of outcomes that are in A and B.

    (b) the union of A and B consists of outcomes occurring in A or B (possibly both).

    (c) Venn diagrams to illustrate.

12. example let A be the event that the first of three flips of a coin is a head. let B be the event that there are exactly two heads in three flips. find $A \cup B$ (or). find $A \cap B$ (and).

13. the probability of A or B is given as

$$P\{A \text{ or } B\} = P\{A\} + P\{B\} - P\{A \text{ and } B\}$$

14. example consider a family w/ two children. let A = first child is a girl and B = second child a girl. find $P\{A \text{ or } B\}$.

15. probability of events A and B occurring, if A and B are independent is given as

$$P\{A \text{ and } B\} = P\{A\}P\{B\}$$

16. remember the definition of "independence"

17. example three question multiple choice quiz. one of the students is completely unprepared and will be guessing the correct answer. each question has 5 options. when guessing, the response on one questions will not influence responses on any other question.

    (a) $A =$ correctly guessing the answer. find $P\{A\}$.

    (b) can we assume independence?

    (c) find the probabilities of the possible outcomes.

    (d) find the probability the student passes, answering at least two correctly.

    (e) find the probability of acing the quiz.