1. A jar contains 100 marbles, identical except that 30 are red, 20 black, 5 green and the rest white. If a marble is taken from the jar *at random*, what is the probability that the marble is:
   a. red ? b. black or green? c. not red? d. multicolor?

2a. What does "10% chance of rain" mean? Over the past 60years, careful weather records have been kept for a town in Georgia. Out of 96 February days in which the temperature, barometric pressure, cloud cover, winds, and weather patterns in nearby locations were similar to what they are today, the next day was rainy only 24 times. Based on this, a meteorologist would say the probability of rain tomorrow is ___. Why?

2b, A *fair* coin is being tossed. The coin has turned up tails every time on the last five tosses. What is the probability the coin will turn up tails on the next toss? Why?

3. We are playing with a short deck, as shown at right.
   Let "F" be the event the card drawn is a face card (JQK).
   Let "D" be the event the card drawn is a diamond.
   Let "A" be the event the card is an ace.

A♥	A♦	A♣	A♠
K♥	K♦	K♣	K♠
Q♥	Q♦	Q♣	Q♠
J♥	J♦	J♣	J♠

   a. Find P(F ∪ A) = P(F or A) (i.e. Find the probability the outcome is F or A.)
   b. Find P(D ∩ A) = P (D and A)
   c. Find P(D ∪ A) = P (D or A)
   d. What probability "rules" provide a model for the answers in parts a and c ?
   e. Are events F and A mutually exclusive? Are D and A?

4. Half the faces of a fair die are painted blue, half yellow. The die is rolled twice. What is the probability the die will turn up blue both times? Can you cite a probability "rule" that models your answer?

5. A jar contains six marbles, identical except that three are blue and three are yellow. Two marbles are taken from the jar, one with the right hand, then one with the left. What is the probability that both hands are holding blue marbles? Can you cite a probability "rule" that models your answer?

6. Draw detailed probability trees for the experiments in #4 and #5 (if you did not already do so). Explain the difference between #4 and #5.

7. A fair coin is tossed three times. Find the probability of...
   a. getting exactly one head.
   b. at least one toss being "tails".

8. You play a game in which, to win, you must roll a die and get a 3 or 4, toss a coin and get "tails", and select a card from an ordinary deck and get a red card. What is the probability you will win?

9. A letter is randomly selected from the English alphabet. What are the odds it is a vowel?

10. A class is comprised of 30 women and 20 men. If a class member is selected at random,
    a. what is the probability the selectee is a woman?
    b. What are the odds in favor of selecting a woman?
    c. What are the odds against selecting a woman?

11. If the odds in your favor of "winning" are 7 to 3, what is the probability you will win?
    In another game, the odds are against you, 5 to 4. What is the probability you will win?

12. A class contains 3 girls to every 2 boys. What fraction of the class is boys?
    W hat is the probability a student selected at random from this class is a boy? What are the odds?

* 13. Jan has won three prizes at the ring-toss booth. The prizes available are:
    A– straw finger trap B– Green Goo C– plastic spider D– trick ink E– silly putty
    Assuming her selections are random, with no duplicates, what is the probability Jan will select
    a. B first, then A, then D ?
    b. A first, then D, then B ?
    c. Everything except the spider and the silly putty?

* 14. Suppose that in experiment #5, you win a Mercedes if the marble in your left hand is blue. What is the probability you will win the Mercedes? Use the tree diagram to find the answer. How could we obtain the answer quite simply without the tree diagram?

(You must show work or reasoning to support your answers.)

SPQ…W answers in brief:

1a. $^3/_{10}$

1b. $^1/_4$

1c. $^7/_{10}$

1d. 0

2a. $^1/_4$
Because that's the proportion of the time that it has rained under these conditions, and weather history is pretty much all they have to go on.
When the weather report says "10% chance of rain tomorrow" that means that out of all the times that conditions have matched the current conditions, in 10% of those instances, rain was experienced the next day.

2b. $^1/_2$ Because that's the probability of tails every time a fair coin is tossed. Previous results do not affect the chances.

3a. 1

3b. $^1/_{16}$

3c. $^7/_{16}$

3d. The "addition rules" …
in part a, for mutually exclusive events: P(A or B) = P(A) + P(B)
in part c, the general rule: P(A or B) = P(A) + P(B) – P(AandB)).

3e. Yes (you should explain how you know)

4. ¼ P(AandB) = P(A) P(B) for independent events, A & B

5. $^1/_5$

6. In #5: B_1, and B_2 are independent (this is the short answer; you should supply more)

In #6: B_1 and B_2 are DEPENDENT

7a. $^3/_8$

7b. (Hint: what is the probability of getting NO tails?) $1 - {}^1/_8 = {}^7/_8$

8. $^1/_3 \bullet {}^1/_2 \bullet {}^1/_2$

9. 5:21 (assuming one takes the view that the vowels are *a*, *e*, *i*, *o*, and *u* only)

10a. $^3/_5$

10b. 3:2

10c. 2:3

11. $^7/_{10}$; $^4/_9$

12. $^2/_5$; $^2/_5$; 2:3

13a. $^1/_5 \bullet {}^1/_4 \bullet {}^1/_3$ assuming she does not want to duplicate any prize. $^1/_5 \bullet {}^1/_5 \bullet {}^1/_5$ if duplicates are OK.

13b. Same answer as part a.

13c. $6 \bullet {}^1/_5 \bullet {}^1/_4 \bullet {}^1/_3$ Making the assumption of no duplicates.

14. $^1/_2$