8 - Probability 2

Examples. What's wrong with each situation?

(a) A printer makes 0, 1, or 2 mistakes printing a document are 0.20, 0.35, -0.25, 0.70.

Probability cannot be negative.

(b) In (a): probabilities are 0.10, 0.10, 0.30, 0.70.

Probabilities of all outcomes must sum to 1. (P(sample space)=1.)

(c) The probability it rains today is 0.40; The probability it does not rain today is 0.52.

P(not rain) = 1 - P(rain) = 1 - 0.4 = 0.6.

(d) Draw a card: the probability the card is both heart and black is 1/8.

A card cannot be heart and black. Probability of an impossible event is 0, not 1/8.

Example 2. Two dice are rolled. Find the probability at least one die roll is ≥ 3.

Answer 1: Let A = {1st die roll is ≥ 3} and B = {2nd die roll is ≥ 3}:

P(A) = 4/6 (since 2nd roll does not affect the 1st roll)

P(B) = 4/6 (since 1st roll does not affect the 2nd roll)

P(A∩B) = P(both rolls are ≥ 3) = (4x4)/(6x6)

So P(A or B) = P(A∪B) = 2/3 + 2/3 - 4/9 = 8/9.

Answer 2 (Complement):

1 - P(both rolls are 2 or less) = 1 - (2x2)/(6x6) = 1-1/9 = 8/9.

Example 3. The probability a poker hand of 5 cards has at least one red card:

Answer: = 1 - P(5-card hand has no red card) = 1 - (26 choose 5) / (52 choose 5)

Exercise.

1. Find ?:

Language spoken by Canadians:	English	French	Asian/Pacific	Other
Probability:	0.63	0.22	0.06	?

2. The probability that an American industry will be located in Shanghai, China, is 0.6, the probability that it will be located in Beijing, China, is 0.4, and the probability that it will be located in either Shanghai or Beijing or both is 0.9. What is the probability that the industry will be located: (a) in both cities? (b) in neither city?

3. If each coded item in a catalog begins with 2 distinct letters followed by 3 distinct nonzero digits, find the probability of randomly selecting one of these coded items with the first letter a vowel and the last digit even.

4. In a poker hand consisting of 6 cards, find the probability of holding
(a) 3 aces. (b) 4 hearts and 2 clubs. (c) 4 hearts or 2 clubs.

5. Of 100 students, 54 studied math, 69 studied history, and 35 studied both math and history. If one of these students is selected at random, find the probability that
(a) the student took math or history;
(b) the student did not take either of these subjects;
(c) the student took history but not math.

6. A raffle randomly selects two separate winners from Ann, Bob, Cass, Dan, and Em. Each has the same chance of winning. Find the probability Dan does not win.

Answers:
1. 0.09
2. (a) 0.1 (b) 0.1
3. 10/117 = 0.0855
4. (a) 0.0034 (b) 0.0027 (c) 0.7455
5. (a) 22/25 (b) 3/25 (c) 17/50
6. 3/5