

Homework Questions - Probability -

Question 1

Given $A = \{E3, E5, E6, E10\}$ and $B = \{E3, E4, E6, E9\}$,

- What is $A \cap B$?
- What is the union of A and B ?
- Is the union of A and B collectively exhaustive?

Question 2

The sample space contains 5 A's and 7 B's. What is the probability that a randomly selected set of 2 will include 1A and 1B?

Question 3

A fund manager is considering investing in the stock of a health care provider. The manager's assessment of probabilities for rates of return on this stock over the next year is summarized in the accompanying table. Let A be the event "Rate of return will be more than 10%" and B the event "Rate of return will be negative."

Rate of Return	Less than -10%	-10% to 0%	0% to 10%	10% to 20%	More than 20%
Probability	0.04	0.14	0.28	0.33	0.21

- Find the probability of event A .
- Find the probability of event B .
- Describe the event that is the complement of A .
- Find the probability of the complement of A .
- Describe the event that is the intersection of A and B .
- Find the probability of the intersection of A and B .
- Describe the event that is the union of A and B .
- Find the probability of the union of A and B .
- Are A and B mutually exclusive?
- Are A and B collectively exhaustive?

Question 4

A corporation receives a particular part in shipments of 100. Research indicated the probabilities shown in the accompanying table for numbers of defective parts in a shipment.

Number of defective	0	1	2	3	More than 3
Probability	0.29	0.36	0.22	0.10	0.03

- What is the probability that there will be less than 3 defective parts in a shipment?
- What is the probability that there will be more than 1 defective part in a shipment?

Question 5

The probability of A is 0.40 and the probability of B is 0.45 and the probability of either is 0.85. What is the probability of both A and B ?

Question 6

The probability of A is 0.80 and the probability of B is 0.10 and the probability of both is 0.08. What is the conditional probability of A, given B? Are A and B independent in a probability sense?

Question 7

The probability of A is 0.70 and the probability of B is 0.80 and the probability of both is 0.50. What is the conditional probability of A, given B? Are A and B independent in a probability sense?

Question 8

A work crew for a building project is to be made up of two craftsmen and four laborers selected from a total of five craftsmen and six laborers.

- a. How many different combinations are possible?
- b. The brother of one of the craftsmen is a laborer. If the crew is selected at random, what is the probability that both brothers will be selected?
- c. What is the probability that neither brother will be selected?

Question 9

A mail-order firm considers three possible events in filling an order:

A: The wrong item is sent.

B: The item is lost in transit.

C: The item is damaged in transit.

Assume that A is independent of both B and C and that B and C are mutually exclusive. The individual event probabilities are $P(A) = 0.02$, $P(B) = 0.01$ and $P(C) = 0.04$. Find the probability that at least one of these foul-ups occurs for a randomly chosen order.

Question 10

Market research in a particular city indicated that during a week 18% of all adults watch a television program oriented to business and financial issues, 12% read a publication oriented to these issues, and 10% do both.

- a. What is the probability that an adult in this city who watches a television program oriented to business and financial issues reads a publication oriented to these issues?
- b. What is the probability that an adult in this city who reads a publication oriented to business and financial issues watches a television program oriented to these issues?

Question 11

A quality control manager found that 30% of work-related problems occurred on Mondays and that 20% occurred in the last hour of a day's shift. It was also found that 4% of worker-related problems occurred in the last hour of Monday's shift.

- a. What is the probability that a worker-related problem that occurs on a Monday does not occur in the last hour of the day's shift?
- b. Are the events "Problem occurs on Monday" and "Problem occurs in the last hour of the day's shift" statistically independent?

Question 12

Given the table below, answer the questions.

Viewing Frequency	High Income	Middle Income	Low Income	Totals
Regular	0.10	0.15	0.05	0.30
Occasional	0.10	0.20	0.10	0.40
Never	0.05	0.05	0.20	0.30
Totals	0.25	0.40	0.35	1.00

- What is the joint probability of “High income” and “Never”?
- What is the conditional probability of “High income” given “Never”?

Question 13

A survey carried out of a supermarket classified customers according to whether their visits to the store are frequent or infrequent and whether they often, sometimes, or never purchase generic products. The accompanying table gives the proportions of people surveyed in each of the six joint classifications.

Frequency of Visit	Purchase of Generic Products		
	Often	Sometimes	Never
Frequent	0.12	0.48	0.19
Infrequent	0.07	0.06	0.08

- What is the probability that a customer both is a frequent shopper and often purchases generic products?
- What is the probability that a customer who never buys generic products visits the store frequently?
- Are the events “Never buys generic products” and “Visits the store frequently” independent?
- What is the probability that a customer who infrequently visits the store often buys generic products?
- Are the events “Often buys generic products” and “Visits the store infrequently” independent?

Question 14

The grades of a freshman college class, obtained after the first year of college, were analyzed. Seventy percent of the students in the top quarter of the college class had graduated in the upper 10% of their high school class, as had 50% of the students in the middle half of the college class and 20% of the students in the bottom quarter of the college class.

- What is the probability that a randomly chosen freshman graduated in the upper 10% of his or her high school class?
- What is the probability that a randomly chosen freshman who graduated in the upper 10% of his or her high school class will be in the top quarter of the college class?
- What is the probability that a randomly chosen freshman who did not graduate in the upper 10% of his or her high school class will not be in the top quarter of the college class?

Question 15

A student feels that 70% of his college courses have been enjoyable and the remainder have been boring. This student has access to student evaluations of professors and finds out that professors who had previously received strong positive evaluations from their students have taught 60% of his enjoyable courses and 25% of his boring course. Next semester the student decides to take three courses, all from professors who have received strongly positive student evaluations. Assume that this student's reactions to the three courses are independent of one another.

- a. What is the probability that this student will find all three courses enjoyable?
- b. What is the probability that this student will find at least one of the courses enjoyable?

Question 16

Given $P(A1) = 0.40$, $P(B1|A1)=0.60$, and $P(B1|A2)=0.70$. What is the probability of $P(A1|B1)$?

Question 17

Given $P(A1)=0.60$, $P(B1|A1) = 0.60$, and $P(B1|A2)=0.40$. What is the probability of $P(A1|B1)$?

Question 18

A stock market analyst examined the prospects of the shares of a large number of corporations. When the performance of these stocks was investigated one year later, it turned out that 25% performed much better than the market average, 25% much worse, and the remaining 50% about the same as the average. Forty percent of the stocks that turned out to do much better than the market were rated "good buys" by the analyst, and were 20% of those that did about as well as the market and 10% of those that did much worse. What is the probability that a stock rated a "good buy" by the analyst performed much better than the average?