7.4 Concepts of probability --

Determine whether the given events are mutually exclusive.

    1) Obtaining a face card and obtaining a two when a single card is selected from a deck of cards

    2) Being a male and being a nurse

    3) Being over 30 and being in college

    4) Going to the beach and staying home at 2 pm on your birthday

Find the indicated probability.

    5) Find the probability that the sum is at least 7 when two fair dice are rolled.

    6) A card is drawn from a well–shuffled deck of 52 cards. What is the probability of drawing a face card or a 5?

    7) Each digit from the number 5,939,669 is written on a different card. If one of these cards is selected at random, what is the probability of drawing a card that shows 5 or 6?

    8) When two balanced dice are rolled, there are 36 possible outcomes. Find the probability that the second die is 4 or the sum of the dice is 7.

    9) A lottery game has balls numbered 1 through 19. If a ball is selected at random, what is the probability of obtaining an even numbered ball or the number 12 ball?

    10) A card is drawn from a well–shuffled deck of 52 cards. What is the probability of obtaining a diamond or a card smaller than 5? [Assume that ace is low]

11) Of the 40 people who answered "yes" to a question, 7 were male. Of the 75 people who answered "no" to the question, 13 were male. If one person is selected at random from the group, what is the probability that the person answered "yes" or was male?
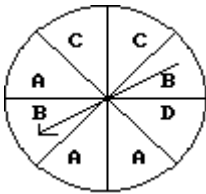
Use a Venn diagram to find the indicated probability.

12) If $P(A \cup B) = 0.63$, $P(A) = 0.37$, and $P(A \cap B) = 0.16$, find $P(B)$.

13) Suppose $P(B) = 0.73$, $P(C) = 0.37$, and $P(B \cap C) = 0.28$.
Find $P(B' \cup C')$.

Find the odds.

14) Find the odds in favor of spinning an A on the spinner pictured below. (The sectors are of equal size.)

15) Find the odds in favor of drawing a red marble when a marble is selected at random from a bag containing 2 yellow, 5 red, and 6 green marbles.

16) Find the odds in favor of getting a sum of 5 or 8 when two fair dice are rolled.

An experiment is conducted for which the sample space is S = {a, b, c, d}. Decide if the given probability assignment is possible for this experiment. If the assignment is not possible, tell why.

17)

Outcomes	Probabilities
a	0.35
b	0.10
c	0.27
d	0.28

Solve the problem.

18) A survey revealed that 36% of people are entertained by reading books, 26% are entertained by watching TV, and 12% are entertained by both books and TV. What is the probability that a person will be entertained by either books or TV? Express the answer as a percentage.

19) For a school project, Sue interviewed a total of 100 persons who were either lawyers or salesmen. She asked them if they were happy or unhappy with their occupation. Of the 56 lawyers interviewed, 14 were unhappy, however, only 8 of the salesmen were unhappy. Suppose that one of the persons interviewed is selected at random. Find the probability that the person selected is a salesman.

20) Below is a table of data from a high school survey given to 500 parents. Find the probability that a randomly chosen parent would agree or strongly agree that the school is clean. Round to the nearest hundredth.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The school is safe	80	131	100	120	69
The school is clean	65	151	100	135	49

21) The odds in favor of Carl beating his friend in a round of golf are 9 : 7 Find the probability that Carl will beat his friend.

7.5 Conditional Probability --

22) If a single fair die is rolled, find the probability of a 4 given that the number rolled is odd.

23) If two cards are drawn without replacement from an ordinary deck, find the probability that the second card is red, given that the first card was a heart.

24) If three cards are drawn without replacement from an ordinary deck, find the probability that the third card is a face card, given that the first card was a queen and the second card was a 5.

Provide an appropriate response.

25) Let A be the event that it will be sunny this afternoon.
Let B be the event that Francia will go shopping this afternoon. Given that $P(A) = 0.8$, $P(B) = 0.9$, and $P(A \cap B) = 0.2$, are events A and B independent? How can you tell?

26) When a coin is tossed three times, eight equally likely outcomes are possible.
HHH HHT HTH HTT
THH   THT TTH   TTT
Let
A = event the first two tosses are the same
B = event the last two tosses are the same.
Find P(A), P(B), and P(A ∩ B).
Are A and B independent events? How can you tell?

Find the indicated probability.

27) Assume that two marbles are drawn without replacement from a box with 1 blue, 3 white, 2 green, and 2 red marbles. Find the probability that both marbles are red.

28) Assume that two marbles are drawn without replacement from a box with 1 blue, 3 white, 2 green, and 2 red marbles. Find the probability that the first marble is white and the second marble is blue.

Find the probability.

29) If 81% of scheduled flights actually take place and cancellations are independent events, what is the probability that 3 separate flights will all take place?

30) A basketball player hits her shot 42% of the time. If she takes four shots during a game, what is the probability that she misses the first shot and hits the last three? Express the answer as a percentage, and round to the nearest tenth (if necessary). Assume independence of shots.

Solve the problem.

31) In a certain U.S. city, 51.6% of adults are women. In that city, 13.5% of women and 9.5% of men suffer from depression. If an adult is selected at random from the city, find the probability that the person suffers from depression.

32) Two stores sell a certain product. Store A has 33% of the sales, 1% of which are of defective items, and store B has 67% of the sales, 3% of which are of defective items. The difference in defective rates is due to different levels of pre–sale checking of the product. A person receives one of this product as a gift. What is the probability it is defective?

Use the given table to find the indicated probability.

33) College students were given three choices of pizza toppings and asked to choose one favorite. The following table shows the results.

Toppings	Freshman	Sophomore	Junior	Senior	Totals
Cheese	12	12	28	29	81
Meat	23	29	12	12	76
Veggie	12	12	23	29	76

A student is selected at random. Find the probability that the student's favorite topping is meat given that the student is a junior.

34) People in a survey were given three choices of soft drinks and asked to choose one favorite. The following table shows the results.

	cola	root beer	lemon–lime	totals
under 21 years of age	40	25	20	85
between 21 and 40	35	20	30	85
over 40 years of age	20	30	35	85

One of the participants is selected at random. Find the probability that the person prefers root beer given that they are over 40.

Find the indicated probability.

35) The following contingency table provides a joint frequency distribution for the popular votes cast in the 1984 presidential election by region and political party. Data are in thousands, rounded to the nearest thousand.

Political Party

Region	Democratic	Republican	Other	Totals
Northeast	9046	11,336	101	20,483
Midwest	10,511	14,761	169	25,441
South	10,998	17,699	136	28,833
West	7022	10,659	214	17,895
Totals	37,577	54,455	620	92,652

A person who voted in the 1984 presidential election is selected at random. Compute the probability that the person selected voted Democrat.

36) The following contingency table provides a joint frequency distribution for a group of retired people by career and age at retirement.

Age at Retirement

	50–55	56–60	61–65	Over 65	Total
Attorney	12	39	83	39	173
College Professor	11	48	74	32	165
Administrative Assistant	21	45	63	49	178
Store Clerk	18	44	70	50	182
Total	62	176	290	170	698

Suppose one of these people is selected at random. Compute the probability that the person either retired between 56 and 60 or was an administrative assistant.

Find the probability.

37) Assuming that boy and girl babies are equally likely, find the probability that a family with three children has all boys given that the first two are boys.

38) Assuming that boy and girl babies are equally likely, find the probability that a family with four children has all boys given that at least one is a boy.

Provide an appropriate response.

39) Can $P(A|B) = P(B|A)$ if A and B are different?

40) If A and B are independent events, how many of the following statements must be true?
  (i)   A' and B are independent.
  (ii) A and B' are independent.
  (iii) A' and B' are independent.

1) Yes
2) No
3) No
4) Yes
5) $\dfrac{7}{12}$

6) $\dfrac{4}{13}$

7) $\dfrac{3}{7}$

8) $\dfrac{11}{36}$

9) $\dfrac{9}{19}$

10) $\dfrac{25}{52}$

11) 0.461
12) 0.42
13) 0.72
14) 3 to 5
15) 5 to 8
16) 1 to 3
17) Yes
18) 50%
19) 0.44
20) 0.37
21) $\dfrac{9}{16}$

22) 0
23) $\dfrac{25}{51}$

24) $\dfrac{11}{50}$

25) No, because $P(A \cap B) \neq P(A) \cdot P(B)$

26) $P(A) = \dfrac{1}{2}$, $P(B) = \dfrac{1}{2}$, and $P(A \cap B) = \dfrac{1}{4}$

   Yes; $P(A) \cdot P(B) = P(A \cap B)$.

27) $\dfrac{1}{28}$

28) $\dfrac{3}{56}$

29) 0.53
30) 4.3%
31) 0.116
32) 0.023

33) 0.190

34) $\dfrac{6}{17}$

35) 0.406

36) 0.443

37) $\dfrac{1}{2}$

38) $\dfrac{1}{15}$

39) Yes

40) All