

## Probability Worksheet

1. A single die is rolled. Find the probability of rolling a 2 or an odd number.
2. Suppose that 37.4% of all college football teams had winning records in 1998, and another 24.8% broke even. What is the probability that a randomly chosen college football team had a losing record in 1998?
3. A couple plans to have four children. Assuming that boys and girls are equally likely, find the probability that the couple will have at least one boy?
4. If the odds against a student receiving an A grade in a mathematics class are 7 to 3, what is the probability that a student in a mathematics class will receive an A grade.
5. Suppose that 6% of the people in the United States are unemployed. What are the odds against a person in the United States having a job?
6. A card is drawn from a standard deck of 52 cards.
  - a. What is the probability the 7 of spades is drawn?
  - b. What is the probability that a 7 is drawn?
  - c. What is the probability that a face card is drawn?
  - d. What is the probability that a heart is drawn?
  - e. What are the odds that a heart is drawn?
  - f. What are the odds that a king or queen is drawn?
7. A 12-sided die with sides numbered 1 through 12 is rolled. Assuming that all sides are equally likely to be rolled, what is the probability that the number rolled is a multiple of 3? Give your answer as a fraction in lowest terms.
8. If 37% of high school graduates eventually graduate from college, what are the odds against a high school graduate earning a college degree?
9. One card is drawn at random from a deck of cards. What is the probability that the card will be a red ace?
10. Suppose that 39% of a town's population have type O blood, 15% are Rh-negative, and 7% have type O blood and are Rh-negative. What is the probability that a randomly selected individual in the town will neither have type O blood nor be Rh-negative?
11. Seven hundred and fifteen tickets were sold for a raffle. If you bought 12 of them, what is the probability that you have the winning ticket?
12. Suppose the odds against winning a 3\$ prize in a lottery game are 8 to 3. What is the probability of winning \$3 in the game?

13. If the probability of writing the correct answer to a question on an exam is  $\frac{2}{5}$ , what are the odds against writing the correct answer?
14. Suppose the house odds against a particular horse in the Preakness are 11 to 2. If that horse won the race, how much would a person who placed a \$5 bet on that horse win in addition to having the wager returned.
15. Suppose that 54% of a town's population have brown eyes, 51% have black hair, and 37% have both brown eyes and black hair. What is the probability that a randomly selected individual in the town will have brown eyes or black hair?
16. In a class of 28 students, 15 earned an A on the final exam, 10 earned an A for the entire course, and 7 earned an A for both the final exam and the entire course. What is the probability that a randomly selected student in this class did not earn an A on the final exam and did not earn an A for the entire course?
17. Suppose that a town named Sunnyvale had 217 sunny days in 1998. What is the empirical probability that it will be sunny in Sunnyvale on a random day?

If a single fair die is rolled, find the probability of rolling:

18. a 2, given that the number rolled was odd.
19. an even number, given that the number rolled was a 6.
20. If two fair dice are rolled, find the probability of rolling a sum of 6, given the roll was a "double".

If two cards are drawn without replacement from a standard deck, find the probability that

21. the second is a heart, given that the first is a heart.
22. the second is black, given that the first is a spade.

If five cards are drawn without replacement from a standard deck, find the probability that all the cards are

23. diamonds.
24. diamonds, given that the first four were diamonds
25. the same suit.

Two marbles are drawn without replacement from a jar with four black and three white marbles. Find the probability that

26. both are black.
27. the first is black and the second is white.

A pet shop has 10 puppies, 6 of them males. There are 3 beagles (1 male) 1 cocker spaniel (male), and 6 poodles. Construct a table similar to the one above and find the probability that one of these puppies, chosen at random, is

28. a beagle
29. a beagle, given that it is a male.

30. a cocker spaniel, given that it is a female.

31. a female, given that it is a beagle.

32. Suppose  $S$  is a sample space and  $A$  and  $B$  are two events in the sample space. If  $P(A) = \frac{3}{4}$ ,

$P(A \cap B) = \frac{3}{8}$ , and  $P(A \cup B) = \frac{7}{8}$ , find each of the following.

a)  $P(A') =$  \_\_\_\_\_

d)  $P(B | A) =$  \_\_\_\_\_

b)  $P(B) =$  \_\_\_\_\_

e) Odds against  $A =$  \_\_\_\_\_

c)  $P(A | B) =$  \_\_\_\_\_

f) Odds against  $B =$  \_\_\_\_\_

g) Are  $A$  and  $B$  independent events? Why or why not?

The Midtown Bank has found that most customers at the tellers' windows either cash a check or make a deposit. The chart below indicates the transactions for one teller for one day.

	Cash Check	No Check	Totals
Make deposit	50	20	70
No deposit	30	10	40
Totals	80	30	110

Letting  $C$  represent "cashing a check" and  $D$  represent "making a deposit," express each of the following probabilities in words and find its value.

33.  $P(C | D)$

34.  $P((C \cap D)')$

35.  $P(C' | D')$

Assume that boy and girl babies are equally likely. If a couple have three children, find the probability that all the children are girls given that

36. the first is a girl

37. the second is a girl

38. at least two are girls

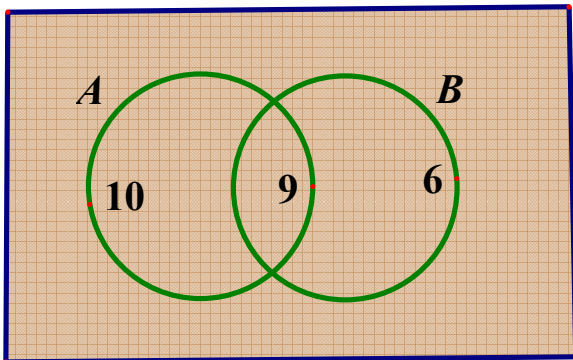
The Motor Vehicle Department has found that the probability of a person passing the test for a driver's license on the first try is .75. The probability that an individual who fails on the first test will pass on the second try is .80, and the probability that an individual who fails the first and second tests will pass the third time is .70. Find the probability that an individual

39. fails both the first and second tests.

40. will require at least two tries to pass the test.

41. Suppose that 53.2% of car owners are male and that 12.7% of all car owners change their own oil. If 31.5% of male car owners change their own oil, what is the probability that a randomly selected car owner is male and changes his own oil?
42. Someone thinks of a 2-digit number (the first digit cannot be 0) and asks you to guess what it is. What is the probability that your first guess will be correct?
43. A box of 15 chocolates has 6 that are caramel, 5 that contain nuts, and 4 that are nougat. If you randomly select 3 chocolates, what is the probability that you will get all nuts?
44. A city council has 12 members. Five are Democrats and seven are Republicans. In how many ways can a four member committee be selected?
45. A student organization has 8 freshman members, 5 sophomores, 10 juniors, and 6 seniors. In how many ways can an eight member committee be chosen if there must be two members from each class?
46. A department has 25 members. They must select a chair, an assistant chair, and an advisory committee of three members (neither the chair nor the assistant chair can be on the advisory committee). In how many ways can this be done?
47. The diagram below shows the number of outcomes in a sample space  $S$  and outcomes in event  $A$  and  $B$ .

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Find each of the following probabilities:

- $P(A \cap B) = \underline{\hspace{2cm}}$
- $P(A) = \underline{\hspace{2cm}}$
- $P(B) = \underline{\hspace{2cm}}$
- $P(A | B) = \underline{\hspace{2cm}}$
- $P(B | A) = \underline{\hspace{2cm}}$
- Odds against  $A = \underline{\hspace{2cm}}$
- Odds against  $B = \underline{\hspace{2cm}}$
- Are  $A$  and  $B$  independent events?  
Why or why not?

