

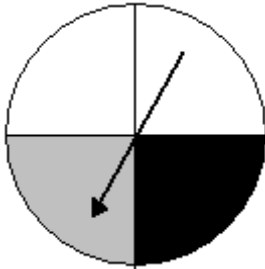
Name _____

PRINT and bring to class

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Give the probability, as a rational number, that the spinner shown would land on the indicated color.

1) black



The probability of an event happening is the ratio (think regular fraction) of the number of ways the chosen event CAN happen (number of favorable outcomes, numerator) over the total number of ways some event happens (total possible outcomes, denominator).

Probability may be shown as a rational fraction, a decimal fraction, or a percent fraction.

First: what is the chosen event (spinner stops on black). How many outcomes result in stops on black (the number of black sectors) ? 1

What are the total number of possible outcome (the total number of sectors of any shade on the dial)? 4

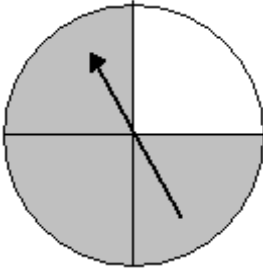
$$P(E) = 1 / 4, \text{ or } \frac{1}{4}$$

What is the probability of gray?

What is the probability of white?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

2) grey



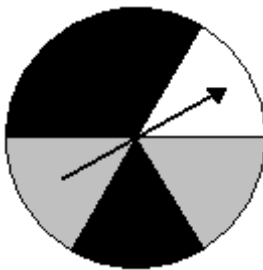
A) $\frac{1}{2}$

B) 3

C) $\frac{1}{3}$

D) $\frac{3}{4}$

3) white



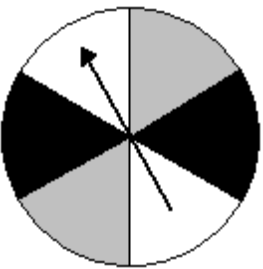
A) $\frac{2}{3}$

B) $\frac{2}{5}$

C) $\frac{1}{5}$

D) $\frac{1}{6}$

4) black



A) $\frac{1}{6}$

B) $\frac{1}{3}$

C) $\frac{1}{2}$

D) $\frac{2}{3}$

Find the probability.

5) A bag contains 6 red marbles, 3 blue marbles, and 1 green marble. What is the probability that a randomly selected marble is not blue?

A) $\frac{3}{10}$

B) 7

C) $\frac{7}{10}$

D) $\frac{10}{7}$

6) A bag contains 17 balls numbered 1 through 17. What is the probability that a randomly selected ball has an even number?

A) 8

B) $\frac{2}{17}$

C) $\frac{8}{17}$

D) $\frac{17}{8}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 7) Two fair 6-sided dice are rolled. What is the probability that the sum of the two numbers on the dice is greater than 10?

You will need to have a table of dice rolls and outcomes:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 8) Three fair coins are tossed. Find the probability of getting exactly two tails.

A) $\frac{1}{2}$ B) $\frac{3}{8}$ C) $\frac{1}{4}$ D) $\frac{5}{8}$

- 9) If a person is randomly selected, find the probability that his or her birthday is in May. Ignore leap years. Assume that all days of the year are equally likely for a given birth.

A) $\frac{1}{31}$ B) $\frac{31}{365}$ C) $\frac{1}{365}$ D) $\frac{1}{12}$

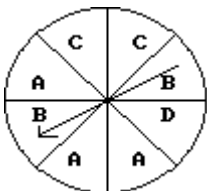
- 10) A class consists of 23 women and 29 men. If a student is randomly selected, what is the probability that the student is a woman?

A) $\frac{29}{52}$ B) $\frac{23}{52}$ C) $\frac{1}{52}$ D) $\frac{23}{29}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

11)



What are the odds in favor of spinning an A on this spinner?

Odds are a different way to show the same thing that Probability shows: the likelihood (chance) that some specific outcome of an event will happen. The difference is that probability compares the likelihood of a favorable outcome to the total number of outcomes. ODDS makes a direct comparison of the favorable outcomes to the unfavorable outcomes (if you add the favorable to the unfavorable outcomes in ODDS, you will get the total number of outcomes). So, if the probability of an event is 1 out of 4, then the odds are 1 to 3, shown as 1:3 (1 favorable to 3 unfavorable, same total of 4 outcomes).

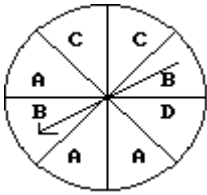
How many sectors labeled A:

How many NOT labeled A: (Remember your complements and ~ negations)

Odds in favor of A: :

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

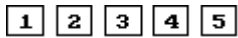
12)



What are the odds against spinning a D on this spinner?

- A) 6:1 B) 7:1 C) 8:1 D) 1:7

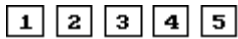
13)



What are the odds in favor of drawing a 3 from these cards?

- A) 1:5 B) 5:1 C) 1:4 D) 4:1

14)



What are the odds against drawing a number greater than 2 from these cards?

- A) 2:5 B) 2:3 C) 5:2 D) 3:2

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

15) The table shows the number of college students who prefer a given pizza topping.

toppings	freshman	sophomore	junior	senior
cheese	13	13	18	26
meat	22	26	13	13
veggie	13	13	22	26

Find the empirical probability (based on experimental data [the results of an experiment]) that a randomly selected junior prefers meat toppings (to 3 decimal places).

What is the goal: that a randomly selected junior prefers meat toppings.

What do we know about the student: the student is a junior.

Based on what we know, do we include freshmen, sophomores or seniors? NO.

So what is the total number of juniors? 53

Of those 53 juniors, how many prefer meat toppings? 13

Find the P that one of those 13 was selected from the total of 53: $13/53 = 0.???$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

16) The table shows the number of college students who prefer a given pizza topping.

<u>toppings</u>	<u>freshman</u>	<u>sophomore</u>	<u>junior</u>	<u>senior</u>
cheese	10	15	24	25
meat	25	25	15	10
veggie	15	10	25	25

Find the empirical probability that a randomly selected freshman prefers cheese toppings.

A) 0.045

B) 0.500

C) 0.135

D) 0.200

17) The distribution of B.A. degrees conferred by a local college is listed below, by major.

<u>Major</u>	<u>Frequency</u>
English	2073
Mathematics	2164
Chemistry	318
Physics	856
Liberal Arts	1358
Business	1676
Engineering	<u>868</u>
	9313

What is the probability that a randomly selected degree is in Engineering?

A) 0.0932

B) 868

C) 0.1028

D) 0.0012

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the indicated probability. {How is this question different than the previous item?}

18) The distribution of B.A. degrees conferred by a local college is listed below, by major.

<u>Major</u>	<u>Frequency</u>
English	2073
Mathematics	2164
Chemistry	318
Physics	856
Liberal Arts	1358
Business	1676
Engineering	<u>868</u>
	9313

What is the probability (to 3 decimal places) that a randomly selected degree is not in Liberal Arts?

What is the goal: find probability that a randomly selected graduate got a degree in something OTHER THAN Liberal Arts {ALWAYS watch for the NOT!!}. This is the same as the complement of a set: If the Universal set has 9313 elements and set L has 1358 elements, how many elements in the complement of L? $n(L') = (9313 - 1358) = 7955$

Find the probability that a randomly select graduate was in the complement of Liberal Arts: $P = 7955/9313 = 0.???$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the indicated probability.

19) The distribution of B.A. degrees conferred by a local college is listed below, by major.

<u>Major</u>	<u>Frequency</u>
English	2073
Mathematics	2164
Chemistry	318
Physics	856
Liberal Arts	1358
Business	1676
Engineering	<u>868</u>
	9313

What is the probability that a randomly selected degree is not in Mathematics?

A) 0.682

B) 0.232

C) 0.303

D) 0.768

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

- 20) Mr. Larsen's third grade class has 22 students, 12 girls and 10 boys. Two students must be selected at random to be in the spring play. What is the probability (as a rational fraction) that one boy and one girl will be chosen? Order is not important.

What is the goal: Select 1 boy, then 1 girl OR 1 girl then 1 boy (order is NOT important). So, we have 2 options, boy first, girl second, OR girl first, boy second.

Option 1: How many ways to select a boy: 10. When selecting the boy first, how many total students: 22. Then, when the girl is selected (still 12) how many total students: (21, because one was taken previously) $P(\text{boy/girl}): (10/22)(12/21) = 20/77$

Option 2: girl first, then boy: $P(\text{girl/boy}): (12/22)(10/21) = 20/77$

The probability is the total of the two options (b/c can be done either way), so add or multiply by 2: $(20/77) * 2 = 40/77$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 21) Mr. Larsen's third grade class has 22 students, 12 girls and 10 boys. Two students must be selected at random to be in the fall play. What is the probability that no boys will be chosen? Order is not important.

A) $\frac{5}{6}$

B) $\frac{1}{6}$

C) $\frac{2}{7}$

D) $\frac{6}{11}$

Find the probability. Remember: OR means either, so add to find the number of ways either event could happen. Divide the sum by the total ways something happens.

- 22) A fair die is rolled. What is the probability of rolling a 3 or a 6?

A) 2

B) $\frac{1}{6}$

C) $\frac{1}{36}$

D) $\frac{1}{3}$

Find the probability. You will need your table of rolls and sums.

- 23) When two balanced dice are rolled, there are 36 possible outcomes. What is the probability that the sum of the numbers on the dice is 6 or 11?

A) $\frac{1}{66}$

B) $\frac{17}{36}$

C) $\frac{7}{6}$

D) $\frac{7}{36}$

Find the indicated probability.

- 24) The age distribution of students at a community college is given below.

<u>Age (years)</u>	<u>Number of students (f)</u>
Under 21	406
21–25	415
26–30	217
31–35	59
Over 35	25
<hr/>	
	1122

A student from the community college is selected at random. Find the probability that the student is between 26 and 35 inclusive. Round approximations to three decimal places.

- A) 276 B) 0.246 C) 0.193 D) 0.053
- 25) A card is drawn at random from a standard 52-card deck. Find the probability that the card is **not** a queen.
- A) $\frac{3}{4}$ B) $\frac{12}{13}$ C) $\frac{1}{13}$ D) $\frac{1}{4}$
- 26) A card is drawn at random from a standard 52-card deck. Find the probability that the card is an ace or **not** a club.
- A) $\frac{10}{13}$ B) $\frac{35}{52}$ C) $\frac{43}{52}$ D) $\frac{9}{13}$
- 27) A card is drawn at random from a standard 52-card deck. Find the probability that the card is neither an ace nor a heart.
- A) $\frac{35}{52}$ B) $\frac{9}{13}$ C) $\frac{4}{13}$ D) $\frac{21}{26}$
- 28) A bag contains 5 red marbles, 4 blue marbles, and 1 green marble. If a marble is selected at random, what is the probability that it is not blue?
- A) $\frac{5}{3}$ B) 6 C) $\frac{3}{5}$ D) $\frac{2}{5}$

Determine whether the events are independent.

- 29) A bag contains 8 red and 8 green marbles. A marble is drawn, replaced in the bag, then a second marble is drawn. Are the events "first marble is red" and "second marble is green" independent events?
- A) No B) Yes
- 30) Two cards are selected at random from a standard deck of 52 cards without replacement. Are the events "ace on the first draw" and "ace on the second draw" independent?
- A) Yes B) No

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the indicated probability.

31) The table below shows the soft drink preferences of people in three age groups.

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

If one of the 255 subjects is randomly selected, find the probability that the person is over 40 years of age.

How many are over 40? { $20+30+35 = 85$ } What is the total number of people? { 255 }
 $P = 85/255 = 1/3$

What is the probability that an over 40 person prefers lemon-lime? How many over 40's prefer lemon-lime? { 35 } Divide by the total number of over 40's. { 85 } Reduce to lowest terms: $7/17$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

32) The table below shows the soft drink preferences of people in three age groups.

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

If one of the 255 subjects is randomly selected, find the probability that the person is over 40 and drinks cola.

A) $\frac{4}{51}$

B) $\frac{4}{17}$

C) $\frac{4}{19}$

D) None of the above is correct.

33) The table below shows the soft drinks preferences of people in three age groups.

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

If one of the 255 subjects is randomly selected, find the probability that the person is over 40 years of age given that they drink root beer.

A) $\frac{6}{17}$

B) $\frac{2}{5}$

C) $\frac{5}{17}$

D) None of the above is correct.

34) The table below shows the soft drinks preferences of people in three age groups.

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

If one of the 255 subjects is randomly selected, find the probability that the person drinks root beer given that they are over 40.

A) $\frac{2}{17}$

B) $\frac{2}{5}$

C) $\frac{6}{17}$

D) None of the above is correct.

Find the probability. {Remember: The number of options is the base and the number of items is the exponent}

35) Find the probability of correctly answering the first 3 questions on a multiple choice test if random guesses are made and each question has 5 possible answers.

A) $\frac{5}{3}$

B) $\frac{3}{5}$

C) $\frac{1}{125}$

D) $\frac{1}{243}$

Find the probability.

36) In one town, 73% of adults have health insurance. What is the probability that 7 adults selected at random from the town all have health insurance?

A) 0.73

B) 5.11

C) 0.096

D) 0.11

Use the general multiplication rule to find the indicated probability. {Find the probability of each event, then multiply the 2 probabilities.}

37) You are dealt two cards successively (without replacement) from a shuffled deck of 52 playing cards. Find the probability that both cards are black.

A) $\frac{13}{51}$

B) $\frac{25}{51}$

C) $\frac{25}{102}$

D) $\frac{1}{2652}$

38) You are dealt two cards successively (without replacement) from a shuffled deck of 52 playing cards. Find the probability that the first card is a king and the second card is a queen.

A) $\frac{13}{102}$

B) $\frac{4}{663}$

C) $\frac{2}{13}$

D) $\frac{1}{663}$

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

A) $\frac{9}{56}$

B) $\frac{3}{32}$

C) $\frac{3}{8}$

D) $\frac{3}{28}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the conditional probability. {UNDERSTAND the condition!}

40) If a single fair die is rolled, find the probability that the number rolled is 5 given that it is odd.

Condition: The number rolled is odd. How many odd numbers on 1 die? { 3 } Of those odd numbers, how many are a 5? { 1 } Divide and give the Probability as a fraction in lowest terms.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

41) If two fair dice are rolled, find the probability that the sum is 6 given that the roll is a "double".

A) $\frac{1}{3}$

B) $\frac{1}{5}$

C) $\frac{1}{6}$

D) $\frac{1}{4}$

42) Suppose one card is selected at random from an ordinary deck of 52 playing cards. Let

A = event a queen is selected

B = event a diamond is selected.

Determine $P(B | A)$. {Given that A happened, what is the probability that B happens?}

A) $\frac{1}{2}$

B) $\frac{1}{52}$

C) $\frac{1}{13}$

D) $\frac{1}{4}$

43) If two cards are drawn at random without replacement from a standard deck, find the probability that the second card is a face card, given that the first card was a queen.

A) $\frac{4}{17}$

B) $\frac{3}{13}$

C) $\frac{5}{17}$

D) $\frac{11}{51}$

- 44) If three cards are drawn at random without replacement from a standard 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.

A) $\frac{3}{13}$

B) $\frac{6}{25}$

C) $\frac{11}{50}$

D) $\frac{1}{5}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Construct a stem and leaf display for given data.

- 45) Here are the final scores for the last 16 games played by the local basketball team.

45 54 53 65
67 75 57 59
87 86 79 74
67 75 87 65

A stem and leaf display for 2 digit numbers has 2 columns. The first column has the tens digit (smallest to largest) and the second column lists the ones digits for that tens digits (smallest to largest). The two columns are separated by a vertical line.

4 | 5
5 | 3 4 7 9
6 | 5 5 7 7
7 | 4 5 5 9
8 | 6 7 7

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 46) Mr. Johnson wants to display his employees' ages in a graph. Below are their ages.

23 36 45
42 34 53
34 27 24

A)

2 | 23 24 27
3 | 34 36
4 | 42 44
5 | 43

B)

2 | 3 4 7
3 | 4 6
4 | 2 4
5 | 3

C)

2 | 3 4 7
3 | 4 4 6
4 | 2 5
5 | 3

D)

2 | 23 24 27
3 | 34 34 36
4 | 42 44
5 | 43

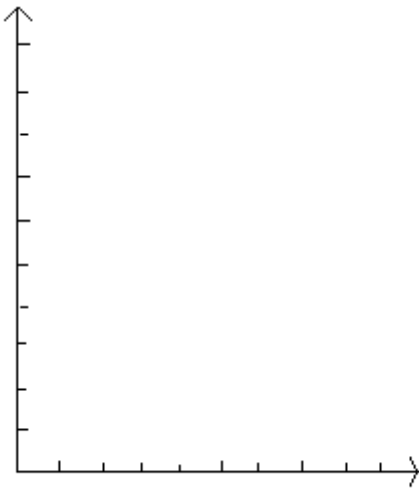
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Construct the specified histogram. A graph of connected bars.

47) The frequency table below shows the number of days off in a given year for 30 police detectives.

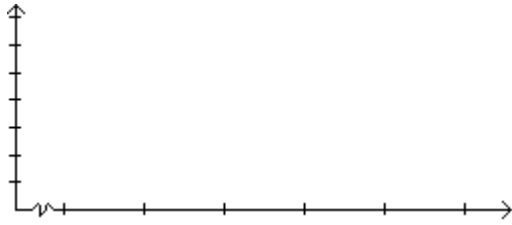
Days off	Frequency
0 - 1	10
2 - 3	1
4 - 5	7
6 - 7	7
8 - 9	1
10 - 11	4

Construct a histogram.



48) In a survey, 20 voters were asked their age. The results are summarized in the frequency table below. Construct a histogram .

Age of voters	Number of voters
20-29	5
30-39	5
40-49	6
50-59	0
60-69	4



Find the mean of the set of data. Arithmetic average = sum of scores / number of scores

49) 11, 13, 7, 12, 2

$$5 \text{ scores; sum} = 11 + 13 + 7 + 12 + 2 = 45$$

$$\text{mean} = 45/5 = 9$$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

50) 2, 19, 14, 20, 19, 14, 5

A) 16

B) 14

C) 7

D) 12

Find the median. The number that divides the scores into 2 sets with the same number of elements. First, put the scores in either increasing or decreasing order. If an even number of scores, add the 2 middle scores and divide by 2. If an odd number of scores, use the score in the middle.

51) 4, 4, 18, 27, 33, 39, 49

A) 27

B) 33

C) 18

D) 25

52) 15, 30, 39, 52, 61, 63, 89

A) 50

B) 39

C) 61

D) 52

Find the mode or modes. The mode is the score or scores that occur most often; the most frequent score, if one exists.

53) 5, 9, 49, 3, 2, 8, 77, 1, 4, 16

A) 8

B) No mode

C) 16.8

D) 9

54) 20, 45, 46, 45, 49, 45, 49

A) 46

B) 49

C) 45

D) 42.7

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the mean for the given frequency distribution.

Value	Frequency
14	1
19	5
23	2
28	6
32	3

The subtotal for each value is the product of the value times the frequency; example: the value 23 has a frequency of 2, so the subtotal is 46. Divide the sum of the subtotals by the total of the frequencies.

Value	Frequency	Subtotal
14	1	14
19	5	95
23	2	46
28	6	168
32	3	96

Frequency sum = 17; Subtotal sum = 419; mean = $419/17 = 24.6$

Optional method on TI-83/84:

[STAT] EDIT 1: Edit

Input values in L1 and Frequencies in L2. Check that all numbers are correct.

Press [STAT] button again. Choose CALC menu, 1: 1-Var Stats

Screen displays 1-Var Stats ___

Add L1, L2 [ENTER]

Screen displays:

1-Var Stats

$\bar{x} = 24.64705882$

\bar{x} is the mean

$\Sigma x = 419$

Σx is the sum of the subtotals

$\Sigma x^2 = 10835$

will not use, so ignore

$Sx = 5.634061329$

Standard deviation of the sample

$\sigma x = 5.465842344$

Standard deviation of the population

$\downarrow n = 17$

total of frequencies {down arrow means scroll down}

$\uparrow x = 17$

$\text{min}x = 14$

minimum value

$Q1 = 19$

$\text{Med} = 28$

Median value

$Q3 = 32$

$\text{max}X = 32$

maximum value

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

56)

Value	Frequency
13	2
21	20
24	17
27	15
33	9

A) 1.9

B) 24.7

C) 26.3

D) 25.5

Find the median for the given frequency distribution.

57)

Value	Frequency
20	4
30	6
40	5
50	3
80	1

A) 44

B) 35

C) 40

D) 30

58)

Value	Frequency
0	8
1	12
2	15
3	20
4	20
5	14

A) 2.5

B) 4

C) 3

D) 3.5

Find the range for the set of data given. {Range of data is $\max X - \min X$ }

59)

Value	Frequency
14	3
21	3
26	3
30	6
35	1

A) 20

B) 21

C) 22

D) 49

60)

<u>Value</u>	<u>Frequency</u>
12	3
18	6
23	3
30	5
32	2

A) 19

B) 21

C) 44

D) 20