HW 12-1

1. 18
2. 225
3. 12
4. 20
5. 15,600
6. a) $\frac{4}{11}$ b) $\frac{6}{11}$ c) 0

   d) $\frac{7}{11}$ e) 1
7. a) $\frac{3}{6}$ or $\frac{1}{2}$ b) $\frac{3}{12}$ or $\frac{1}{4}$

   c) $\frac{2}{12}$ or $\frac{1}{6}$ d) $\frac{5}{6}$

   e) The probability of rolling an odd number ($\frac{3}{6}$) is greater because the probability of rolling a 3 is only $\frac{1}{6}$.

Name Key Alg 2 HW 12-1

1. Nicole purchased 3 blouses, 3 jackets, and 2 skirts. How many different outfits using a blouse, a jacket, and a skirt are possible?

$3 \times 3 \times 2 = 18$ outfits

2. An Internet code consists of one digit followed by one letter. The number zero and the letter O are excluded. How many codes are possible?

$9 \times 25 = 225$

3. A hiker can take 4 trails to the lake and then 3 trails from the lake to the cabins. How many routes are there to get to the lake and then to the cabins?

$4 \times 3 = 12$ routes

4. The cheerleading squad is making posters. They have 4 different colors of poster board and 5 different colors of markers. How many different posters can be made by using one poster board and one marker?

$4 \times 5 = 20$ posters

5. How many identification codes are possible by using 3 letters if no letter may be repeated?

$26 \times 25 \times 24 = 15{,}600$ codes

6. A jar contains 2 red marbles, 4 white marbles, and 5 blue marbles. If one marble is chosen at random, find

a. P(white) = $\frac{4}{11}$

b. P(red or white) = $\frac{2}{11} + \frac{4}{11} = \frac{6}{11}$

c. P(black) = 0 (impossible)

d. P(not white) = $\frac{7}{11}$

e. P(red or white or blue) = $\frac{11}{11} = 1$ (a certainty)

7. Consider rolling a 6 sided number cube with numbers 1 - 6 equally possible and flipping a fair coin (heads/tails). Find the probability of

a. rolling an even number. $\frac{3}{6}$ or $\frac{1}{2}$

b. rolling an even number and getting a tails. $\frac{3}{12}$ or $\frac{1}{4}$

c. rolling a multiple of 3 and getting a heads. 3, 6 $\frac{2}{12}$ or $\frac{1}{6}$

d. not rolling a 5. $\frac{5}{6}$

e. Which has the greater probability of happening? Rolling a 3 on the number cube or an odd number? Explain your answer. The probability of rolling an odd number ($\frac{3}{6}$) is greater than rolling a 3 ($\frac{1}{6}$) because $\frac{3}{6} > \frac{1}{6}$.

$P(3) = \frac{1}{6}$

$P(\text{odd}) = \frac{3}{6}$

Day 2 Probability Using Two-Way Tables **Probability Unit**

Two-Way Tables are used as a tool for organizing data in rows and columns.

1. In a class of 20 students, 5 boys and 7 girls like chocolate ice cream. Six boys like vanilla ice cream. What does the missing cell represent?

# of girls who like Vanilla

	Chocolate	Vanilla	
Boys	5	6	11
Girls	7	2	9
	12	8	20

a) Based on this survey, what ice cream flavor was most popular among students? Explain your answer.

Chocolate was most popular at 12 vs 8 for Vanilla.

b) A student is picked at random. If this person is a girl, do you think she would prefer vanilla ice cream? Why or why not?

No, it is not likely. 7 out of 9 girls prefer chocolate.

2. The School Board of Waldo, a rural town in the Midwest, is considering building a new high school primarily funded by local taxes. They decided to interview eligible voters to determine if the school board should build a new high school facility to replace the current high school building. There is only one high school in the town. Every registered voter in Waldo was interviewed. In addition to asking about support for a new school, data on gender and age group were also recorded. The data from these interviews are summarized below.

Table 1a

	Should our town build a new high school?					
	Yes		No		No answer	
Age (in years)	Male	Female	Male	Female	Male	Female
18-25	29	32	8	6	0	0
26-40	53	60	40	44	2	4
41-65	30	36	44	35	2	2
66 and older	7	26	24	29	2	0
Total	119	154	116	114	6	6

273 230 12 515

a) Based on this survey, do you think the school board should recommend building a new high school? Explain your answer.

273/515 ≈ 53%

Since a voter majority recommended building, the school board should recommend building a new high school.

b) An eligible voter is picked at random. If this person is 21 years old, do you think he or she would indicate that the town should build a high school? Why or why not?

29+32 61+14

Most eligible voters, 61 of 75 (81%), in the 18-25 group voted yes. It's reasonable to predict a 21 year old would answer yes.

c) An eligible voter is picked at random. If this person is 55 years old, do you think he or she would indicate that the town should build a high school? Why or why not?

No. A 55 year old likely would not recommend building because most, 79 out of 149 (53%) of the 41-65 age group, said no.

or 66/149 = only 44% said yes

d) The School Board wondered if the probability of recommending a new high school was different for different age categories. Why do you think the survey classified voters using the age categories 18-25 years old, 26-40 years old, 41-65 years old, and 66 years old and older.

The different age groups represent different interests in regards to building a new high school. 26 - 40 year olds are more likely to have children in school than the other age groups. 66+ group gets no benefit, but pays extra taxes.

e) It might be helpful to organize the data in a two-way frequency table. Use the given data to complete the following two-way frequency table. Note that the age categories are represented as rows, and the possible responses are represented as columns. Fill in the missing values.

Table 1b

	Yes	No	No answer	Total
18 - 25 years old	29+32=61	8+6 =14	0	75
26 - 40 years old	113	84	6	203
41 - 65 years old	66	79	4	149
66 years old and older	33	53	2	88
Total	273	230	12	515

f) A local news service plans to write an article summarizing the survey results. Three possible headlines for this article are provided below. Is each headline accurate or inaccurate? Support your answer using probabilities calculated in parts a – d above.

Headline 1: *Waldo Voters Likely to Support Building a New High School*

Yes - Accurate. 273 out of 515 = .530 or 53%
Since this is greater than .5, it is likely voters would vote yes.

Headline 2: *Older Voters Less Likely to Support Building a New High School*

Yes - Accurate for the 41+ age group. 132 out of 237 = .557 or 55.7%
These voters indicated No.
Even more accurate for 66+ group (60.2%)

Headline 3: *Younger Voters Not Interested in Building a New High School*

No - not accurate for the 25 & under age group.
61 out of 75 = .813 or 81.3% indicated Yes.

3. Health officials in Milwaukee, Wisconsin were concerned about teenagers with asthma. People with asthma often have difficulty with normal breathing. In a local research study, researchers collected data on the incidence of asthma among students enrolled in a Milwaukee Public High School.

Students in the high school completed a survey that was used to begin this research. Students were also asked if they had at least one family member living in their house who smoked.

Below is a hypothetical 1000 two-way table to better understand the probabilities since the data is given as probability information not actual populations. Pretend the probabilities were calculated from a population of 1000 students.

Discuss what each cell represents relative to the context of the data.

Table 2

	No household member smokes	At least one household member smokes	Total
Student indicates he or she has asthma	Cell 1	Cell 2	Cell 3
Student indicates he or She does not have asthma	Cell 4	Cell 5	Cell 6
Total	Cell 7	Cell 8	**1,000**

Table 2

	No household member smokes	At least one household member smokes	Total
Student indicates he or she has asthma	Cell 1 73	Cell 2 120	Cell 3 193
Student indicates he or She does not have asthma	Cell 4 506	Cell 5 301	Cell 6 807
Total	Cell 7 579	Cell 8 421	1,000

a) The probability that a randomly selected student (r.s.s.) at this high school has asthma is 0.193.

Cell: 3 Value: 193 .193(1000)=193

b) The probability that a r.s.s. has at least 1 household member who smokes is 0.421.

Cell: 8 Value: 421 .421(1000)

c) Additionally, the probability that a r.s.s. has at least one household member who smokes and has asthma is 0.120.

Cell: 2 Value: 120 .120(1000)

d) Complete the two-way frequency table above by calculating the values of the other cells in the table.

An abbreviated copy of the table we just completed on the front.

	No member smokes	At least 1 member smokes	Total
Student has asthma	73	120	193
Student does not have asthma	506	301	807
Total	579	421	**1,000**

e) Based on your completed two-way table, estimate the following probabilities as a fraction and also as a decimal (rounded to three decimal places):

1. A randomly selected student has asthma. What is the probability this student has at least 1 household member who smokes?

Given

$120/193 = .622$

2. A randomly selected student does not have asthma. What is the probability he or she has at least one household member who smokes?

Given

$301/807 = .373$

3. A randomly selected student has at least one household member who smokes. What is the probability this student has asthma?

Given

$120/421 = .285$

f) Do you think that whether or not a student has asthma is related to whether or not this student has at least one family member who smokes? Explain your answer.

Yes - Out of the students who have asthma (193), 62.2% have at least one smoker in the house as in part e-1 above.

→ a person who has asthma is more likely to have a smoker in their house (62%) than someone w/out asthma

Tonight's HW 12-2: Give all probabilities in fraction and decimal form. For #2 round to nearest thousandth and #3 to nearest hundredth.