Name: __Key__   Math 125   Practice Test #1

1) The SPCA collects the following data about the dogs they house. Which of the variables is categorical?

[A) Breed]   B) Age   C) Weight
D) # of days housed   E) Veterinary Costs

Breed has NO unit of measure

2) Last weekend police ticketed 18 men whose mean speed was 72 miles per hour, and 30 women going an average of 64 mph. Overall, what was the mean speed of _ALL_ people ticketed?

[A) 67 mph]   B) 68 mph   C) 69 mph
D) 70 mph   E) 72 mph

$$\frac{18(72) + 30(64)}{48} = 67$$

3) Name two types of graphs you could use for categorical data and two types you could use for quantitative data.
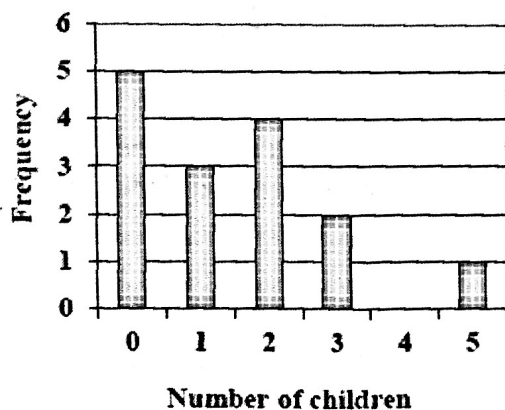
categorical data
Pie chart   freq. table
bar chart

quantitative data
histogram   boxplot

4) A group of adults were asked how many children they have in their families. The bar graph shows the number of adults who indicated each number of children.

Number of children

a. How many adults where questioned?   5 + 3 + 4 + 2 + 1 = [15]

b. What percentage of the adults questioned had 0 children? $\frac{5}{15} \approx .667 = [66.7\%]$

5) Find the mean and the 5-number summary for these "12" numbers listed.

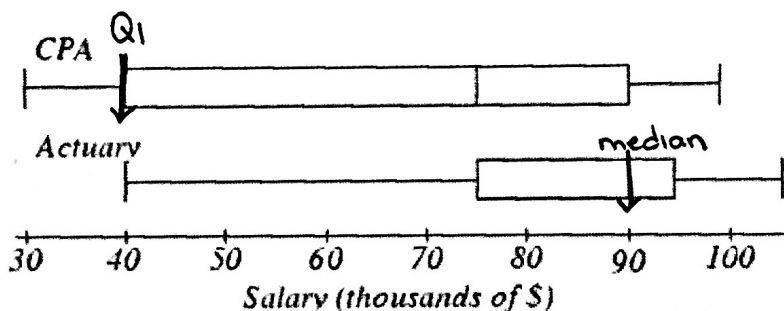$$\{2, 4, \overset{Q_1}{6,} 7, 11, 15, \overset{med}{18,} 21, 24, \overset{Q_3}{28,} 38, 44\}$$

$$\text{mean} = \frac{\text{Sum}}{n} = \frac{218}{12} \approx 18.17$$

$$\text{min} = 2 \qquad Q_1 = 6.5 \qquad \text{MED} = 16.5 \qquad Q_3 = 26 \qquad \text{max} = 44$$

6)

The box plot below shows salaries for Actuaries and CPAs. Kendra makes the median salary for an Actuary. Kelsey makes the first quartile salary for a CPA. Who makes more money? How much more?

Salary (thousands of $)

Kendra makes $ 50,000 more

$$90 - 40 = 50 \; (\text{thousands of } \$)$$

7) Determine the standard deviation for the sample data: 5, 3, 7, 14, 16

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

$$\text{SD} = \sqrt{\frac{(5-9)^2 + (3-9)^2 + (7-9)^2 + (14-9)^2 + (16-9)^2}{5-1}} = \sqrt{\frac{16+36+4+25+49}{4}} = \sqrt{\frac{130}{4}} \approx 5.7$$

8) Find the mean for the set of data shown in the frequency table below:

Income (thousands of dollars)		Frequency	
15	multiply	2	= 30
20	"	11	= 220
25	"	16	= 400
30	"	9	= 270
35	"	4	= 140
40	"	2	= 80
45	"	4	= 180
50	"	1	= 50
		49	1370

$$\text{mean} = \frac{1370}{49} \approx 27.96$$

(in thousands)

mean: $ 27,959.18

9)

Determine the mean, median, and mode of weights of recent patients seen at a clinic:
126, 186, 217, 189, 154, 193, 190, 293, 315, 210, 184, 145, 173, 189

mode : 189

mean : 197

median : 189

10)

For problems 7-12, consider the sets below, and indicate if each statement is true or false.
A = {1, 2, 3, 4, 5}   B = {1, 3, 5}   C = {4, 6}   U = {0,1,2,3,...,10}

7. $3 \in B$ 8. $5 \in C$ 9. $B \subset A$ 10. $C \subset A$ 11. $C \subseteq B$ 12. $C \subsetneq D$
   T   F   T   F   F   N/A

Using the sets from above, and treating U as the universal set, find each of the following:

13. $A \cup B$ 14. $A \cup C$ 15. $A \cap C$ 16. $B \cap C$ 17. A^c 18. B^c
{1,2,3,4,5}   {1,2,3,4,5,6}   {4}   { }   {6,7,8,9,10} {2,4,6,7,8,9,10}

Consider the sets D = {b, a, c, k}, E = {t, a, s, k}, and F = {b, a, t, h}. Using these sets, find the following:

19. $D^c \cap E$ 20. $F^c \cap D$ 21. $(D \cap E) \cup F$
{t, s}   { c, k } $(D \cap E) = \{ a, k \}$

                                          $(D \cap E) \cup F = \{ b, a, t, h, k \}$

11)

45. Use the given information to complete a Venn diagram, then determine: a) how many students have seen exactly one of these movies, and b) how many had seen only *Star Wars*.
    18 had seen *The Matrix*   (M)   24 had seen *Star Wars (SW)*
    20 had seen *Lord of the Rings (LotR)*   10 had seen M and SW
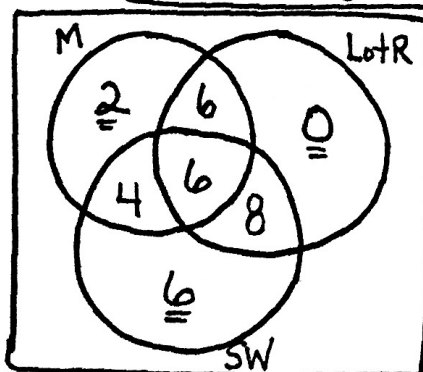   14 had seen *LotR* and *SW*   12 had seen M and *LotR*
    6 had seen all three

SEE BELOW

12) What is the probability of flipping a coin and getting tails and then getting a blue marble from a bag that contains 4 red, 6 green, 8 blue and 2 orange marbles?

11.

a) 2 + 0 + 6
   = 8 students

b) 6 students

12. P(Tails and blue)

$= \left(\frac{1}{2}\right)\left(\frac{8}{20}\right) = \frac{8}{40}$

$= \boxed{\frac{1}{5}} = \boxed{.2}$

13) You play tennis regularly with a friend, and from past experience, you believe that the outcome of each match is independent. For any given match you have a probability of 0.6 of winning. The probability that you win the next two matches is:

$$P(\text{Win and Win}) = (.6)(.6) = \boxed{.36}$$

14) At a school there are 100 students in the Senior Class and:
10 Students play Baseball, Basketball and Football
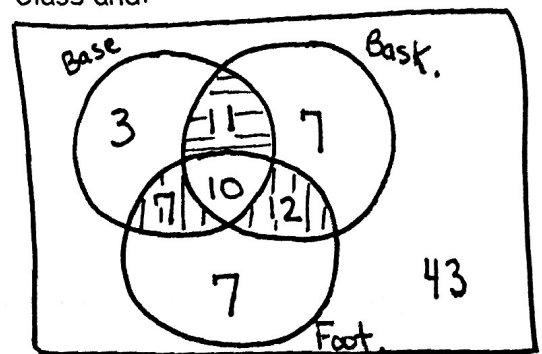17 Students play Baseball and Football
21 Students play Baseball and Basketball
22 Students play Basketball and Football
31 Students play Baseball
36 Students play Football
40 Students play Basketball

- Draw a Venn diagram to represent this scenario, make sure to include students that do not play any sports.

SEE ABOVE

- What is the probability that you randomly select one student and they do not play any of these sports?

$$\frac{43}{100} = .43$$

- What is the probability of selecting one student at random that plays just Football?

$$\frac{7}{100} = .07$$

- What is the probability that if you select two students they both play _exactly_ two sports? Shaded region is exactly two sports

$$11 + 7 + 12 = 30$$

$$\left(\frac{30}{100}\right)\left(\frac{29}{99}\right) \approx .0879$$

$$\left(\frac{\cancel{30}^{1}}{100}\right)\left(\frac{29}{\cancel{99}_{33}}\right) = \frac{29}{330} \approx .0879$$

15)
Giving a test to a group of students, the grades and gender are summarized below. If one student was chosen at random, find the probability that the student was female.

	A	B	C	Total
Male	8	18	13	39
Female	10	4	12	26
Total	18	22	25	65

$$P(Female) = \frac{26}{65}$$

16)
Giving a test to a group of students, the grades and gender are summarized below. What is the probability that a student chosen at random did not earn a C?

	A	B	C	Total
Male	8	18	13	39
Female	10	4	12	26
Total	18	22	25	65

$$P(Not\ C) = \frac{40}{65} = \frac{8}{13}$$

17)
Suppose we draw one card from a standard deck. What is the probability that we get a black card or a Queen?

$$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$$

$$P(Black) + P(Queen) - P(Black\ and\ Queen)$$

$$\frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \boxed{\frac{7}{13}}$$

18)
A jar contains four red marbles numbered 1 to 4 and 8 blue marbles numbered 1 to 8. A marble is drawn at random from the jar. Find the probability the marble is
   a. Odd-numbered given that the marble is blue.
   b. Blue given that the marble is odd-numbered.

$\underline{1}, 2, \underline{3}, 4$

$\underline{1}, 2, \underline{3}, 4, \underline{5}, 6, \underline{7}, 8$

a) $P(ODD\ |\ BLUE) = \frac{1}{2}$

b) $P(BLUE\ |\ ODD) = \frac{4}{6} = \frac{2}{3}$

19)

Suppose a math class contains 25 students, 14 females (three of whom speak French) and 11 males (two of whom speak French). Compute the probability that a randomly selected student is male, given that the student speaks French.

$$P(\text{Male} \mid \text{Speak French}) = \frac{2}{5}$$

20)

A certain virus infects one in every 2000 people. A test used to detect the virus in a person is positive 96% of the time if the person has the virus and 4% of the time if the person does not have the virus. Let A be the event "the person is infected" and B be the event "the person tests positive".

  a. Find the probability that a person has the virus given that they have tested positive; that is, find P(A | B).

  b. Find the probability that a person does not have the virus given that they test negative; that is, find P(not A | not B).

$$\Big(\ \text{Not on exam \# 1}\ \Big)$$

21)

At a restaurant you can choose from three appetizers, eight entrees, and two desserts. How many different three-course meals can you have?

$$(3)(8)(2) = 48 \text{ meals}$$

22)

Seven Olympic sprinters are eligible to compete in the 4 x 100 m relay race for the USA Olympic team. How many four-person relay teams can be selected from among the seven athletes?

$$_7C_4 = \frac{7!}{4!(7-4)!} = \frac{7 \cdot \cancel{6} \cdot 5 \cdot \cancel{4!}}{\cancel{4!}\ \cancel{3} \cdot 2 \cdot \cancel{1}} = 35$$

23)

A jury pool consists of 27 people, 14 men and 13 women. Compute the probability that a randomly selected jury of 12 people is all male.

$$P(\text{All Male}) = \frac{14}{27} \cdot \frac{13}{26} \cdot \frac{12}{25} \cdot \frac{11}{24} \cdot \frac{10}{23} \cdot \frac{9}{22} \cdot \frac{8}{21} \cdot \frac{7}{20} \cdot \frac{6}{19} \cdot \frac{5}{18} \cdot \frac{4}{17} \cdot \frac{3}{16}$$

$$\approx .00000523$$

24)

A friend devises a game that is played by rolling a single six-sided die once. If you roll a 6, he pays you $3; if you roll a 5, he pays you nothing; if you roll a number less than 5, you pay him $1. Compute the expected value for this game. Should you play this game?

X	3	0	-1
P(x)	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{4}{6}$

$E(x) = 3\left(\frac{1}{6}\right) + 0\left(\frac{1}{6}\right) - 1\left(\frac{4}{6}\right)$

$= \frac{1}{2} + 0 - \frac{2}{3} = \boxed{-\frac{1}{6}} \approx \overset{\$}{-}0.17$

25)

The probability distribution of random variable, X, is defined as follows:

X	0	1	2	3	4
Probability	0	0.3	0.1	0.3	0.3
X · P(x)	0	+.3	+.2	+.9	+1.2	= 2.6

A. Is the above a valid probability model?
   a. Yes
   b. No   Probabilities add up to 1

B. The expected value of the probability distribution is 2.6 .

C. Fill in the blank. The $P(X > 0) =$ 1 .

D. Fill in the blank. The $P(X = 5) =$ 0 .