

Math 206 - 1st Final Exam

May 2, 2012

Name key

Score _____

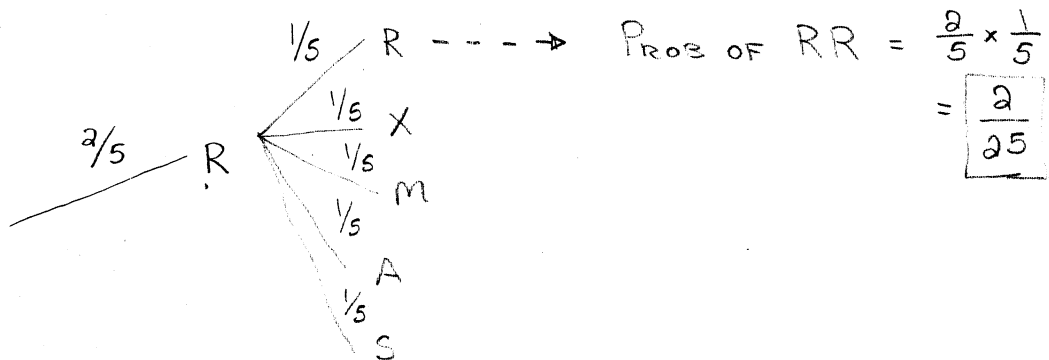
Show all work. Supply explanations where necessary. Use only a compass and a straightedge for constructions. For each construction, the steps you follow must be apparent.

1. A letter is selected at random from the first box and placed into the second box. Then a letter is selected at random from the second box.

MERRY

XMAS

- (a) (3 points) What is the probability that the letter R is selected from the second box?



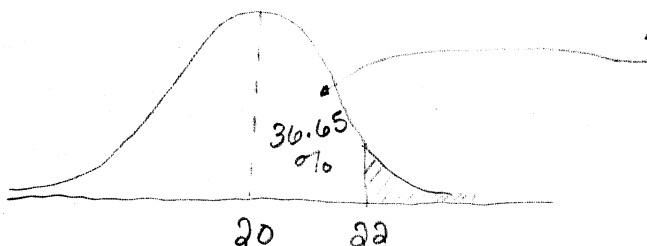
- (b) (2 points) What are the odds in favor of selecting a Y from the first box?

$$\text{Prob of Y} = \frac{1}{5}$$

$$\text{Odds in favor of Y} = \frac{1/5}{4/5} = \frac{1}{4}$$

2. (6 points) The times taken to assemble cars at a certain plant are normally distributed with a mean of 20 hrs and a standard deviation of 1.8 hrs. In a sample of 3700 cars, which were assembled at the plant, about how many took longer than 22 hrs to assemble?

$$Z = \frac{22 - 20}{1.8} = \frac{2}{1.8} \approx 1.11$$



Look up 1.11 to get

$$36.65\%$$

$$50\% - 36.65\% = 13.35\%$$

$$13.35\% \text{ of } 3700$$

$$\text{is about } \underline{\underline{494}}$$

3. (3 points) The organizers of a charity event have planned the following game:

100
BILLS ALL
TOGETHER

Contestants will pay \$5 to randomly select a bill from a box containing one \$100 bill, two \$20 bills, two \$10 bills, five \$5 bills, and ninety \$1 bills.

On average, how much should the event organizers expect to make for each person who plays the game?

$$\text{EXPECTED VALUE} = \frac{1}{100}(100) + \frac{2}{100}(20) + \frac{2}{100}(10) + \frac{5}{100}(5) + \frac{90}{100}(1) = \frac{275}{100} = \$2.75$$

$$\$5 - \$2.75 = \boxed{\$2.25}$$

4. (2 points) Find the measure of each interior angle of a regular nonagon.

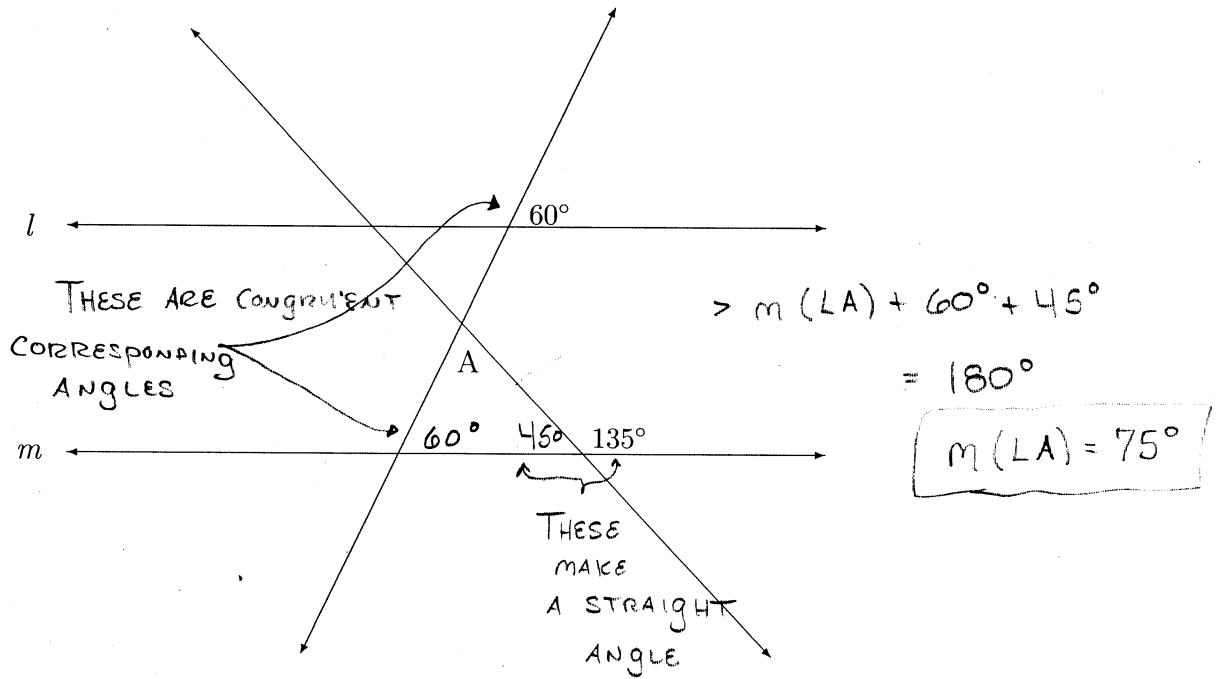
$$(9-2) \cdot 180^\circ = 1260^\circ$$

$$\frac{1260^\circ}{9} = \boxed{140^\circ}$$

5. (3 points) The mean weight of seven tackles on a football team is 230lb, and the mean weight of the four backfield members is 190lb. What is the mean weight of the 11-person team?

$$\frac{7 \cdot 230 + 4 \cdot 190}{11} = \frac{1610 + 760}{11} = \frac{2370}{11} \approx \boxed{215.45 \text{ lbs}}$$

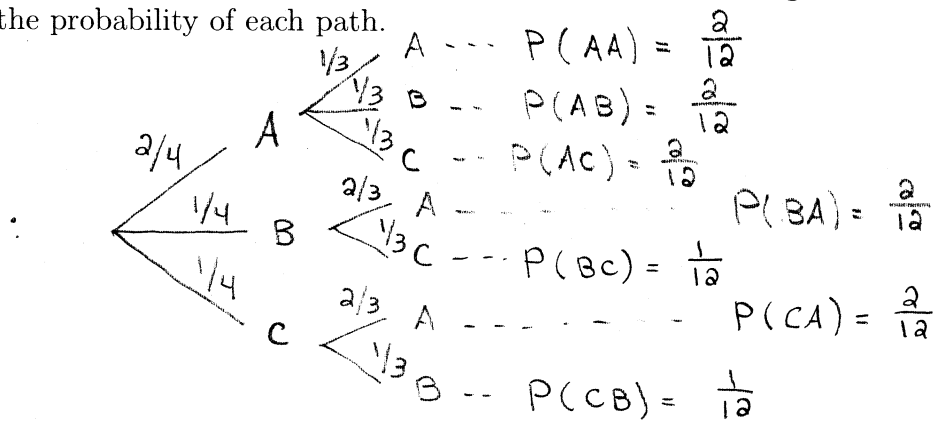
6. (4 points) In the figure below, line l and line m are parallel. Find the measure of the angle A .



7. Two letters are selected at random, one at a time without replacement, from the following box.

A A B C

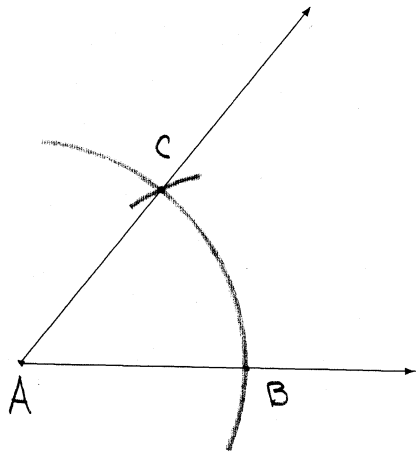
- (a) (4 points) Sketch the probability tree diagram associated with this two-stage experiment and find the probability of each path.



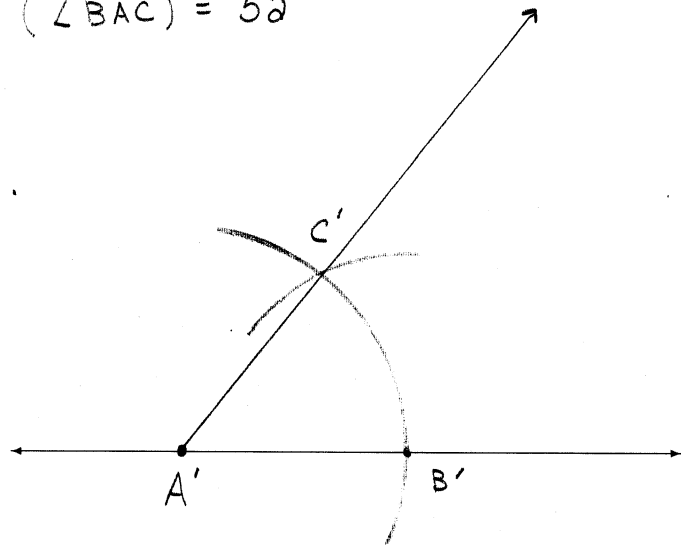
- (b) (1 point) What is the probability that exactly one of the selected letters is a C?

$$P(AC) + P(BC) + P(CA) + P(CB) = \frac{2}{12} + \frac{1}{12} + \frac{2}{12} + \frac{1}{12} = \frac{6}{12} = \frac{1}{2}$$

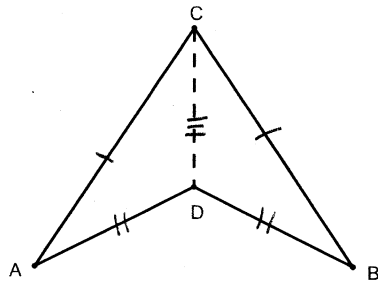
8. (5 points) Copy the given angle so that its initial side lies on the given line. Then use your protractor to find the measure of the angle.



$$m(\angle BAC) = 52^\circ$$



9. (5 points) The figure shown below is a kite. Carefully explain how we can be sure that $\triangle ACD \cong \triangle BCD$.



By DEFINITION OF KITE,

$$\overline{AC} \cong \overline{BC}$$

$$\overline{AD} \cong \overline{BD}$$

WE ALSO HAVE

$$\overline{CD} \cong \overline{CD}$$

THREE SIDES OF $\triangle ACD$
ARE CONGRUENT TO THREE
SIDES OF $\triangle BCD$.

$$\triangle ACD \cong \triangle BCD$$

By SSS.

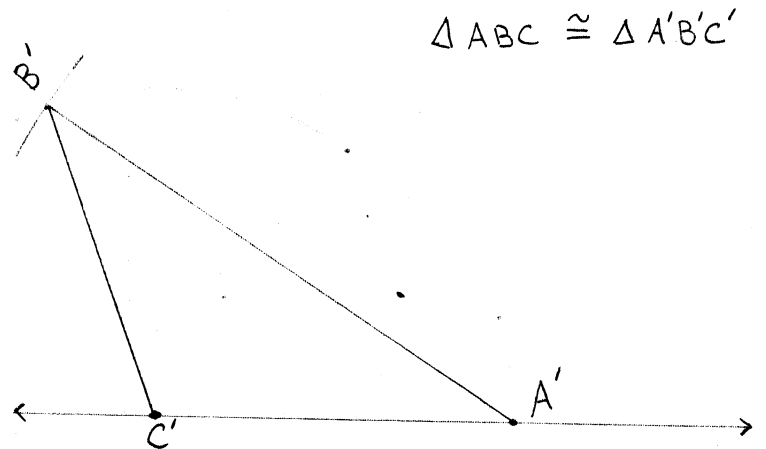
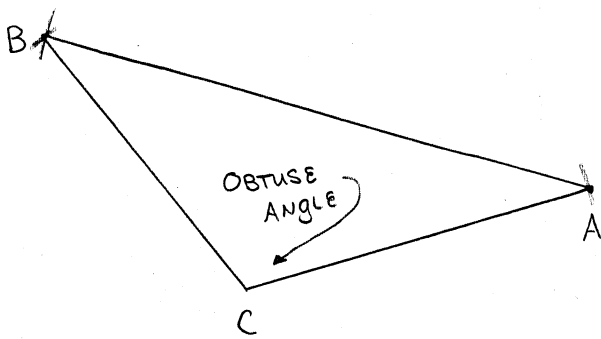
10. (4 points) A letter is selected at random from the word *MISSISSIPPI*. Give a possible sample space for this experiment. Is your sample space uniform? Explain. How you would determine the **experimental** probability of selecting the letter *M*?

Sample Space = $\{M, I, S, P\}$ THIS IS NOT A UNIFORM SAMPLE SPACE BECAUSE ALL LETTERS ARE NOT EQUALLY LIKELY, e.g. $P(\{M\}) = \frac{1}{11}$ AND $P(\{S\}) = \frac{4}{11}$

TO DETERMINE THE EXPERIMENTAL PROB OF DRAWING *M*:

- ① PLACE LETTERS IN A JAR ② DRAW A LETTER, RECORD, AND REPLACE
 ③ REPEAT MANY TIMES ④ Exp. Prob = $\frac{\# \text{ OF } M\text{'S}}{\# \text{ OF DRAWS}}$

11. (4 points) Use a straightedge to sketch an obtuse triangle. Then use the SSS property to construct a congruent triangle. Use only compass and straightedge.



12. (5 points) Compute the median, the first and third quartiles, the IQR, and the outlier cutoffs. Then sketch the corresponding boxplot.

120 121 121 124 126 128 132
 134 140 142 147 150 152 160

← NUMBERS ARE ALREADY IN NUMERICAL ORDER

$$\text{MEDIAN} = \frac{132 + 134}{2} = 133$$

$$Q_1 = 124$$

$$Q_3 = 147$$

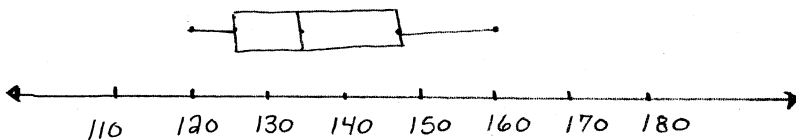
$$\text{IQR} = 147 - 124 = 23$$

CUTOFFS:

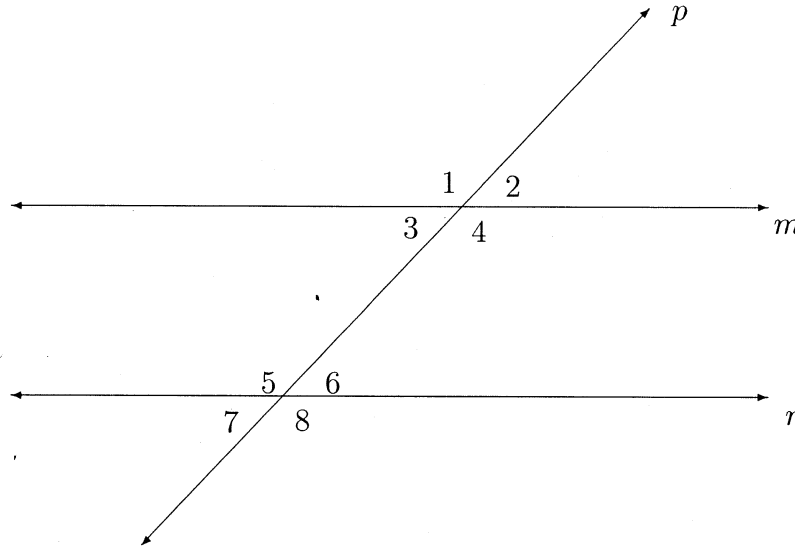
$$124 - 1.5(23) = 89.5$$

$$147 + 1.5(23) = 181.5$$

NO OUTLIERS!



13. (6 points) In the following figure, the parallel lines m and n are being cut by transversal p .



- (a) Name a pair of alternating exterior angles.

$$\angle 2 \text{ \& } \angle 7, \quad \angle 1 \text{ \& } \angle 8$$

- (b) Name a pair of corresponding angles.

$$\angle 1 \text{ \& } \angle 5, \quad \angle 2 \text{ \& } \angle 6, \quad \angle 3 \text{ \& } \angle 7, \quad \angle 4 \text{ \& } \angle 8$$

- (c) Name a pair of alternating interior angles.

$$\angle 3 \text{ \& } \angle 6, \quad \angle 4 \text{ \& } \angle 5$$

- (d) Name a pair of vertical angles.

$$\angle 1 \text{ \& } \angle 4, \quad \angle 3 \text{ \& } \angle 2, \quad \angle 5 \text{ \& } \angle 8, \quad \angle 7 \text{ \& } \angle 6$$

- (e) Name a pair of adjacent angles.

$$\angle 1 \text{ \& } \angle 2, \quad \angle 1 \text{ \& } 3, \quad \angle 2 \text{ \& } \angle 4, \quad \dots$$

- (f) Name a pair of supplementary angles that are not adjacent.

$$\angle 2 \text{ \& } \angle 5, \quad \angle 1 \text{ \& } \angle 6, \quad \angle 3 \text{ \& } \angle 5, \quad \dots$$

14. (4 points) Convert $56^{\circ} 14' 32''$ to degrees in decimal form. Round your final answer to the nearest thousandth.

$$56^{\circ} \quad \frac{14'}{1} \cdot \frac{1^{\circ}}{60'} = 0.2\overline{3} \quad \frac{32''}{1} \cdot \frac{1^{\circ}}{3600''} = 0.00\overline{8}$$

$$56 + 0.2333\overline{3} + 0.0088\overline{8} = 56.24\overline{2} \approx \boxed{56.242^{\circ}}$$

15. (2 points) Suppose A and B are events with probabilities 0.15 and 0.75, respectively. If $P(A \cup B) = 0.87$, find $P(A \cap B)$.

$$P(A \cap B) = P(A) + P(B) - P(A \cup B) \\ = 0.15 + 0.75 - 0.87 = \boxed{0.03}$$

16. (2 points) What does CPCTC stand for?

CORRESPONDING PARTS OF CONGRUENT TRIANGLES
ARE CONGRUENT

17. (1 point) A quadrilateral with at least one pair of parallel sides is called a TRAPEZOID.

18. (5 points) Find the mean, median, mode, and standard deviation for the following set of test scores. (You may use your calculator only for the standard deviation.)

~~72~~ ~~68~~ 88 ~~55~~ ~~92~~
~~72~~ ~~72~~ ~~39~~ ~~92~~ ~~80~~

$$\bar{X} = \frac{39 + 55 + 68 + 72 + 72 + 72 + 80 + 88 + 92 + 92}{10} \\ = \frac{730}{10} = 73$$

$$\text{MEDIAN} = \frac{72 + 72}{2} = 72$$

$$\text{MODE} = 72$$

$$\sigma = \sqrt{\frac{2504}{10}} \approx 15.824$$

19. (4 points) For each of the following situations, tell which type of graph would best display the data. Choose from *line plot*, *bar graph*, *histogram*, *line graph*, *stem-and-leaf plot*, or *circle graph*.

- (a) A teacher has just returned the graded tests to a class of twenty-seven students. The test scores are whole numbers that range from 48 to 96. The teacher would like to show the entire list of scores.

STEM-AND-LEAF PLOT

(THE ONLY OTHER OPTION IS A LINE PLOT,
BUT THE RANGE IS TOO BIG FOR A LINE PLOT.)

- (b) A botany class spent the day at Morton Arboretum collecting leaves from mature elm trees. The leaves were measured, placed into groups according to lengths, and counted. The class would like to draw a graph to illustrate the numbers of leaves in the different groups.

HISTOGRAM --- CONTINUOUS DATA
PLACED INTO GROUPS
AND COUNTED

- (c) A company's annual budget is \$457,000. This money is budgeted into eight different categories. The company's president would like to make a chart showing the employees how the budget is divided into the eight categories.

CIRCLE GRAPH --- SHOWS PARTS
OF WHOLE

(BAR GRAPH MIGHT BE APPROPRIATE, BUT CIRCLE GRAPH
IS BETTER.)

- (d) Going back to 1990, the student government has obtained the total number of enrolled students for each academic year. The Student Government Association wants to make a chart showing how the enrollment has changed over the years.

LINE GRAPH --- SHOWS TRENDS
WITH TIME