Name: _____

Instructor: _____

Math 10120, Exam I
September 15, 2016

- The Honor Code is in effect for this examination. All work is to be your own.
- You may use a calculator .
- The exam lasts for 1 hour and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 11 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1. (a)   (b)   (c)   (d)   (e)

2. (a)   (b)   (c)   (d)   (e)

....

3. (a)   (b)   (c)   (d)   (e)

4. (a)   (b)   (c)   (d)   (e)

....

5. (a)   (b)   (c)   (d)   (e)

6. (a)   (b)   (c)   (d)   (e)

....

7. (a)   (b)   (c)   (d)   (e)

8. (a)   (b)   (c)   (d)   (e)

....

9. (a)   (b)   (c)   (d)   (e)

10. (a)   (b)   (c)   (d)   (e)

Please do NOT write in this box.

Multiple Choice _____

11.   _____

12.   _____

13.   _____

14.   _____

Total   _____

Multiple Choice

1.(6 pts.) Let

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$
$$A = \{1, 2, 3\}$$
$$B = \{2, 4, 6, 8, 10\}.$$
$$C = \{4, 5, 6, 7, 8\}.$$

Which of the following sets is equal to $(A \cap B) \cup C'$?

(a) $\{1, 2, 3, 9, 10\}$ (b) $\{2, 4, 5, 6, 7, 8\}$ (c) $\{1, 2, 3, 10\}$

(d) $\{2\}$ (e) $\{4, 6, 8\}$

2.(6 pts.) Consider the following sets

U = {English Words}

A = {four letter English words}

B = {English words with at least two different (see below) vowels}

C = {English words starting with the letter "m"}

Which one of the following sets contains **both** of the words "math" and "awesome" ?

[**Note:** two vowels are different if they are different letters of the alphabet. For example the word "bee" is not in the set B but the word "boa" is in the set B]

(a) $B \cap C$ (b) $B' \cap C' \cap A'$ (c) $(A' \cap B) \cup C$

(d) B' (e) $(A \cup B) \cap C$

3.(6 pts.) If A and B are sets in a universal set U, with $n(A) = 10$, $n(B) = 15$, $n(A \cap B') = 3$ and $n(U) = 30$, what is
$$n(A \cup B')?$$

(a)   15   (b)   27   (c)   18   (d)   3   (e)   22

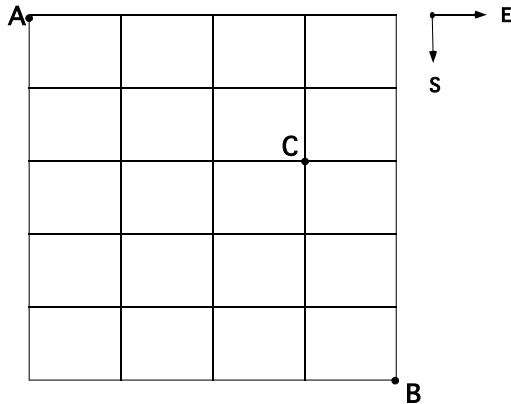**4.**(6 pts.) How many three-letter words, including nonsense words can be made from the letters of the word

TWEETING

assuming that letters <u>can</u> be repeated?

(a) $\dfrac{8!}{2! \cdot 2!}$ (b) 6^3 (c) $6 \cdot 5 \cdot 4$

(d) $8 \cdot 7 \cdot 6$ (e) 8^3

A

E

S

C

B

5.(6 pts.)

The above is a map of the roads in a small country town. A pedestrian wishes to **travel from from A to B along these roads WITHOUT going through the intersection at C**. How many routes can they choose from if they must always walk South or East?

(a)   126   (b)   40   (c)   10   (d)   3   (e)   86

6.(6 pts.) A squash club has 10 members; 7 women and three men. Recsports wishes to take a photograph of 5 club members consisting of three women standing in a row with two men sitting in front of them. How many such photographs are possible?

(a) $7! \cdot 3!$ (b) $C(7,3) \cdot C(3,2)$ (c) $3! \cdot 2!$

(d) $P(7,3) \cdot P(3,2)$ (e) $P(10,5)$

7.(6 pts.) A Chess club wants to select a team of 5 players from its ten regular players to send to a tournament. How many different teams are possible?

(a) C(10, 5) (b) P(10, 5) (c) 5

(d) 2 (e) 5!

8.(6 pts.) A jar containing 20 jelly beans has 4 blue jelly beans, 7 red jelly beans, 3 yellow jelly beans and 6 green jelly beans. Peter selects a sample of five jelly beans from the jar. How many such samples of 5 jelly beans contain at least one yellow jelly bean?

(a) $C(5,1) + C(5,2) + C(5,3) + C(5,4) + C(5,5)$

(b) $C(5,1)$

(c) $C(17,5) + C(3,1)$

(d) $C(20,5) - C(17,5)$

(e) $C(17,4)C(3,1)$

9.(6 pts.) How many different poker hands (5 cards from a standard deck of 52) consist of two kings and 3 cards from another denomination?

Recall there are 13 denominations in a standard deck of cards.

(a) $P(4,2) \cdot 13 \cdot P(4,3)$ (b) $P(4,2) \cdot 12 \cdot P(4,3)$ (c) $C(4,2) \cdot 12 \cdot C(4,3)$

(d) $C(4,2) \cdot 12$ (e) $C(4,2) \cdot 13 \cdot C(4,3)$

10.(6 pts.) Bob's pizza parlor is offering a special price on a medium pizza. To order such a pizza, you must choose one type of crust from three types on offer, one type of cheese from 2 types on offer, and at most 4 toppings from a list of ten toppings on offer. (You may choose zero toppings if you wish). How many different pizzas can be ordered using the above guidelines?

(a) 1260   (b) 391   (c) $68,040,000$

(d) 2316   (e) 1056

Partial Credit
You must show your work on the partial credit problems to receive credit!

Where applicable, answers may be given in the form of products of numbers and symbols for factorials and symbols for numbers of permutations and combinations.

11.(14 pts.) A group of 150 students who exercise regularly were asked whether they swam, jogged or did weight training regularly. The survey revealed that 40 swam regularly, 50 jogged regularly and 65 did weight training on a regular basis. Also 16 swam and did weight training regularly, 26 swam and jogged regularly and 18 jogged and did weight training regularly. Finally 6 of the students did all three activities regularly.

(a)   Represent this information on the Venn Diagram given below.
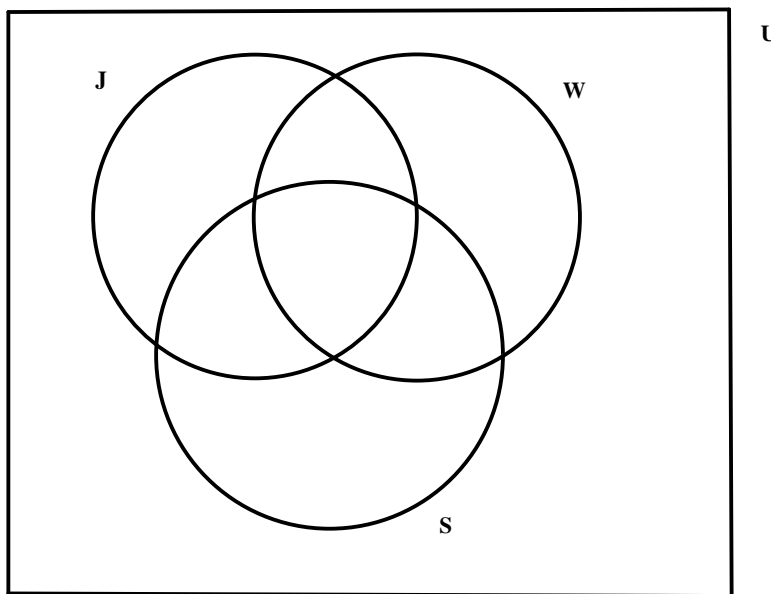
J = Students who jog regularly

S = Students who swim regularly

W = Students who do weight training regularly

(b)   How many of the students interviewed didn't do any of the three activities regularly?

(c)   How many of those interviewed only swam regularly?

12.(12 pts.) (a) Seven runners are in a race. There are seven lanes on the track. In how many ways can the runners be assigned to the lanes, so that Jeremy is in the inside lane?

(b) For the runners in Part (a), prizes will we awarded to those in first, second and third place only. In how many ways can first, second and third place be awarded with Jeremy among the prizewinners.

13.(12 pts.) (a)   A coin is flipped 6 times resulting in a sequence of heads and tails. How many of the resulting possible sequences have exactly four heads?

(b)   How many of the resulting possible sequences have at least four heads?

(c)   How many of the resulting possible sequences have at most four tails?

14.(12 pts.) (a)   How many different words (including nonsense words) can be made by rearranging the letters of the word show below?

NUMISMATISTS

(b)   Peter has a collection of rare coins from various parts of the world. He has 10 United States coins, 4 Irish coins and 5 Australian coins in his rare coin collection. Peter wants to bring part of his collection to school for Show and Tell. He will bring

- at least one coin from each of the three countries,
- at most three coins from the United States,
- at most two coins from Australia and
- at least 2 Irish coins.

In how many different ways can he select the coins for Show and Tell?

Name: _____

Instructor: _____

Rough Work