

**MATH 10120 – Exam I**  
**Thursday, September 20, 2007**

Name: \_\_\_\_\_

Do not remove this answer page, you will turn in the entire exam. You will be allowed 75 minutes to complete the test, although you may leave earlier if you are finished. Calculators are allowed.

Part I consists of 10 multiple choice questions worth 5 points each. Record your answers by placing an x through **one** letter for each problem on this answer sheet. There will be no partial credit for any reason in this portion of the test.

Part II consists of 4 partial credit problems. Show all work on the page where the question appears, along with your answer.

**You are taking this exam under the honor code**

- |    |                            |                            |                            |                            |                            |     |                            |                            |                            |                            |                            |
|----|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1. | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e | 6.  | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e |
| 2. | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e | 7.  | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e |
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| 4. | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e | 9.  | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e |
| 5. | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e | 10. | <input type="checkbox"/> a | <input type="checkbox"/> b | <input type="checkbox"/> c | <input type="checkbox"/> d | <input type="checkbox"/> e |

**For Grading Use**

<b>1-10</b>	
<b>11</b>	
<b>12</b>	
<b>13</b>	
<b>14</b>	
<b>Total</b>	

**Part 1, MULTIPLE CHOICE, 5 Points Each**

**1** Let  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ ,  $A = \{1, 3, 5, 7, 9\}$ , and  $B = \{1, 2, 5, 6\}$ . What is  $A \cap B'$ ?

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

**2** Which of the following sets is equal to

$$\emptyset \cup (S \cup T)'$$

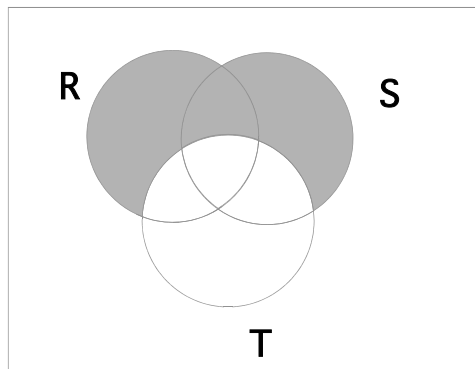
Here  $\emptyset$  denotes the empty set.

- (a)  $\emptyset \cup S' \cup T'$       (b)  $\emptyset$       (c)  $S \cup T$       (d)  $\emptyset \cap S' \cap T'$       (e)  $S' \cap T'$

**3** A group of 30 students who exercise regularly, were asked about their exercise preferences. Fifteen students said they swam, 20 students said they ran, and 5 students said they neither swam nor ran. How many students said they did both types of exercise?

- (a) 5                      (b) 10                      (c) 15                      (d) 20                      (e) 25

**4**



Which of the following sets is represented by the shaded region in the Venn Diagram above?

- (a)  $R \cap S \cap T'$                       (b)  $(R \cup S) \cap T'$                       (c)  $(R \cap S) \cup T'$                       (d)  $R \cup S \cup T'$                       (e)  $(R' \cap S') \cup T$

**5** 100 students were asked whether they like rock, folk, or classical music. Of these 55 liked rock, 45 liked folk, and 20 liked classical music. In addition 21 liked both rock and folk, 5 liked both rock and classical, and 10 liked both folk and classical music. If 18 people liked rock and folk but not classical music, how many liked none of these kinds of music?

- (a) 10            (b) 11            (c) 12            (d) 13            (e) 14

**6** How many 5 letter words can be made from the letters

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if letters cannot be repeated?

- (a)  $9!$             (b)  $9^5$             (c)  $5^9$             (d)  $5!$             (e)  $9 \cdot 8 \cdot 7 \cdot 6 \cdot 5$

7 What is the numerical value of  $P(6, 4)$ ?

(a) 30

(b) 15

(c) 360

(d) 10

(e) 120

8 A stamp collector has 33 especially rare stamps (all different). She wants to give 11 of them to each of her three children, Susan Frank and Bob. In how many ways can she do this?

(a)  $P(33, 3)P(33, 11)^3$

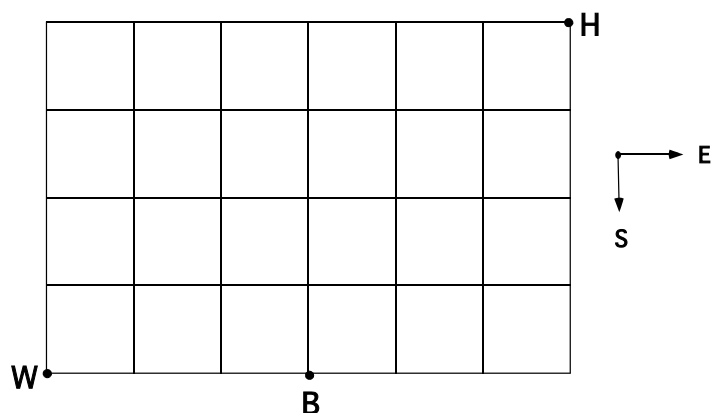
(b)  $C(33, 11)C(22, 11)C(11, 11)$

(c)  $C(33, 11)C(11, 3)$

(d)  $P(33, 3)P(22, 11)P(11, 11)$

(e)  $\frac{1}{3!} \frac{33!}{(11!)^3}$

9 The following is a part of a street map of Walkertown:



A woman visiting the city on business stays in a Hotel at H and will visit a business at W. How many different routes can she choose in walking to the business at W from her Hotel at H, if she wants to stop first at the bank at B? (Assuming she only wants to walk south or west.)

- (a)  $3!4!$                       (b)  $2^3C(7, 4)$                       (c)  $C(7, 3)$                       (d) 12                      (e)  $P(7, 3)$

10 How many different poker hands of 5 cards from a standard 52 card deck contains 3 cards of one denomination and 2 cards of a different denomination?

- (a)  $12 \cdot C(52, 3) \cdot C(48, 2)$                       (b)  $13 \cdot 12 \cdot C(4, 3) \cdot C(4, 2)$                       (c)  $13 \cdot 12 \cdot P(4, 3) \cdot P(4, 2)$   
 (d)  $C(13, 2) \cdot C(4, 3) \cdot C(4, 2)$                       (e)  $6 \cdot C(52, 5)$

**Part II, PARTIAL CREDIT, 10 Points Each.**

**Show all of your work for credit**

**11(10 Pts)** Let  $\mathbf{FB} = \{\text{all students at Notre Dame who regularly attend football games}\}$

Let  $\mathbf{M} = \{\text{all male students at Notre Dame}\}$

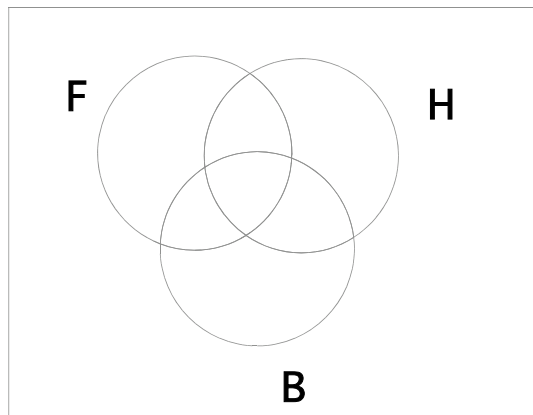
(a) Describe, in words, the set  $FB \cap M'$ .

(b) Describe, in words, the set  $(FB \cap M)'$ .

(c) A survey about game attendance was filled out by 10 students. The answers to each question, given by each student is shown below (“y” denotes “yes” and “n” denotes “no” and the first letter of each students name is given above their answers) :

	<i>J</i>	<i>M</i>	<i>P</i>	<i>S</i>	<i>A</i>	<i>C</i>	<i>B</i>	<i>Z</i>	<i>W</i>	<i>R</i>
Do you regularly attend football games	<i>y</i>	<i>y</i>	<i>n</i>	<i>y</i>	<i>y</i>	<i>y</i>	<i>y</i>	<i>y</i>	<i>n</i>	<i>y</i>
Do you regularly attend basketball games	<i>n</i>	<i>y</i>	<i>y</i>	<i>n</i>	<i>n</i>	<i>n</i>	<i>y</i>	<i>y</i>	<i>y</i>	<i>y</i>
Do you regularly attend Hockey games	<i>n</i>	<i>n</i>	<i>y</i>	<i>n</i>	<i>y</i>	<i>y</i>	<i>n</i>	<i>y</i>	<i>y</i>	<i>y</i>

Fill in the number of people surveyed who belong in each section of the following Venn diagram. Here, F denotes those who regularly attend football games, B denotes those who regularly attend basketball games and S denotes those who regularly attend soccer games.



**12**(10 Pts) A factory ships ipods in boxes of 100. A quality control inspector chooses a sample of 5 ipods from the box for inspection prior to shipping. If no defectives are found, the box will be shipped. If at least one defective is found in the sample, the box will not be shipped.

(a) Suppose a box of 100 ipods contains exactly 20 defective ipods. In how many ways can a sample of size 5 be drawn from the box?

(b) Suppose a box of 100 ipods contains exactly 20 defective ipods. In how many ways can a sample of size 5 with no defective ipods be drawn from this box?

(c) Suppose a box of 100 ipods contains exactly 20 defective ipods. In how many ways can a sample of size 5 with at least one defective ipod be drawn from this box?



**13(20 Points)** (a) In how many ways can you choose 10 people from the 20 people on your dorm floor to make up a bookstore basketball squad?

(b) For the first game you must assign 7 out of the 10 people on your squad to play on the team and you must assign 2 people to be substitutes. In how many ways can you do this?

(c) In how many ways can you line up your Bookstore basketball squad for a photograph, with the team of 7 standing in the back row and the other 3 squad members sitting in front?

(d) Suppose there are 128 teams in the first round of bookstore basketball. The organizing committee has made a schedule for 64 games with a time and place for each game arranged. In how many ways can the teams be divided into pairs to play the 64 matches. (Each Team plays one match).

**14(10 Pts)** (a) If you flip a coin 10 times, how many sequences of heads and tails (of length 10) can result?

(b) How many of the above sequences (resulting from 10 flips of a coin) have exactly 3 Heads?

(c) How many sequences of heads and tails resulting from 10 flips of a coin have exactly 3 tails?

(d) How many sequences of heads and tails resulting from 10 flips of a coin have exactly 8 tails?

(e) How many sequences of heads and tails resulting from 10 flips of a coin have at least 3 tails?