Department of Mathematics
University of Notre Dame
Math 10120 – Finite Math
Spring 2012

Name:_____

Instructor: Migliore

Practice Exam I

February 9, 2012

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Place an × through your answer to each problem.

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

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Tot. _____

Multiple Choice

1. (5 pts.) The 16 members of the Hatfield family and the 18 members of the McCoy family have finally arrived at a truce. However, they still hate each other, so the Hatfields **only** shake hands with other Hatfields, and the McCoys **only** shake hands with other McCoys. If everyone shakes hands with all other members of his/her family, how many handshakes take place?

(a) $16! \cdot 18!$

(b) $C(16, 2) + C(18, 2)$

(c) $C(16, 2) \cdot C(18, 2)$

(d) $P(16, 2) \cdot P(18, 2)$

(e) $P(16, 2) + P(18, 2)$

2. (5 pts.) Which of the following is **not** equal to $C(n, r)$?

(a) $\dfrac{n!}{r! \cdot (n - r)!}$

(b) $\dfrac{(n)(n - 1) \cdots (n - r + 1)}{r!}$

(c) $\dfrac{P(n, r)}{r!}$

(d) $C(n, n - r)$

(e) $\dfrac{(n - r)!}{r!}$

3. (5 pts.) There are 11 members of a club, and they need to choose a president, a vice president and a treasurer (who are different people). In how many ways can they do this?

(a)   1331   (b)   165   (c)   3   (d)   30   (e)   990

4. (5 pts.) There are 11 members of a club, 5 of whom are Phillies fans. They need to choose three officers, of whom **at least** one has to be a Phillies fan. In how many ways can they do this?

(a)   165   (b)   75   (c)   145

(d)   150   (e)   335

5. (5 pts.) How many different 4-letter "words" (including nonsense words) can be made from the letters

$$M\ A\ T\ H\ R\ U\ L\ E\ S$$

if one of the letters must be an M and no repetition is allowed?

(a)   1344   (b)   5376   (c)   224   (d)   126   (e)   504

6. (5 pts.) Let

$$
\begin{aligned}
U &= \{a,b,c,d,e,f,g,h\}\\
A &= \{a,e,g,h\}\\
B &= \{b,d,e,g\}\\
C &= \{c,d,e\}
\end{aligned}
$$

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

(a) $\{a,b,c,d,e,f,h\}$ (b) $\emptyset$ (c) $\{e\}$

(d) $\{c,d\}$ (e) U

7. (5 pts.) To order a pizza, you have to first choose a sauce and then choose toppings. There are three kinds of sauces (red, white and green) and five kinds of toppings (mushroom, pepperoni, sausage, green pepper and artichoke). You must choose one of the three sauces, but you can choose any number of toppings, from zero to all five. How many different pizzas can be created?

(a)   15   (b)   96   (c)   18   (d)   48   (e)   35

8. (5 pts.) Let A and B be sets, and assume that

$$n(A \cap B) = 3, \qquad n(A \cup B) = 16, \qquad n(A' \cap B) = 6.$$

Find $n(A \cap B')$

(a)   7   (b)   10   (c)   13   (d)   3   (e)   9

9. (5 pts.) During the course of a season, the Trenton University football team plays 12 games. At the start of each game, a coin is tossed to see who kicks off first. At the end of the 2008 season, it was noticed that the team correctly guessed 8 of the 12 coin tosses, but no one could remember in which games that happened. How many possibilities are there?

(a) $C(12, 8) \cdot C(12, 4)$ (b) $P(12, 8)$ (c) $C(8, 4)$

(d) $P(8, 4)$ (e) $C(12, 8)$

10. (5 pts.) Calculate the value of
$$\frac{100!}{98!} \cdot C(5, 2).$$

(a)   1,000   (b) $\frac{500}{49}$ (c)   99,000

(d)   59,400   (e)   990

Partial Credit

You must show all of your work on the partial credit problems to receive credit! Make sure that your answer is clearly indicated. You're more likely to get partial credit for a wrong answer if you explain your reasoning.

11. (10 pts.) A club decides to hold a chess tournament. There are 8 participants.

(a) If each participant plays every other participant once, how many games will be played? For this problem I'd like a numerical answer.

(b) Suppose instead that each participant is to play every other participant 3 times. In total, how many games will be played? For this problem I'd like a numerical answer.

12. (10 pts.) Both parts of this problem refer to the following city map. For this problem, you may leave your answer in terms of mixtures of combinations and permutations (i.e. $C(n,r)$ and $P(n,r)$ for appropriate n and r) if you like.
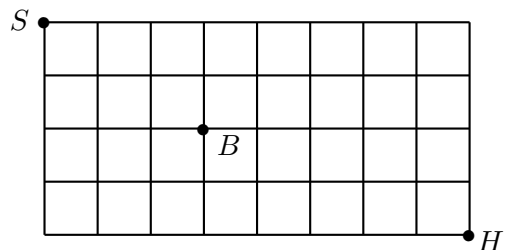
(a) Billy starts at school (marked S) and needs to go home (marked H). Along the way, he has to pass by the bookstore, marked B, to buy a math book. If he has to do it in as few blocks as possible (12), in how many ways can it be done?

(b) Bobby starts at school (marked S) and needs to go to the bookstore (marked B) to buy a math book. However, he has no money, so he has to go home first (marked H). If he needs to do the whole trip in as few blocks as possible (19), in how many ways can it be done? For the first part of the trip, he does **not** need to pass by B on his way to H.

13. (10 pts.) Among the 120 women varsity athletes at State University, suppose 55 play volleyball, 50 play basketball, 70 play softball, 25 play volleyball and softball but not basketball, 15 play volleyball and basketball but not softball, 10 play only volleyball, 20 play only basketball.

(a) Draw and label a Venn Diagram representing the above information.

(b) How many play only softball?

(c) How many do not play any of the three sports?

14. (10 pts.) Seven horses will be in tomorrow's race. To place a bet on the race, you have to predict which horse will finish first, which will finish second, and which will finish third. The other four horses do not matter.

(a) How many different outcomes (predicting the first, second and third place finishers) are possible?

(b) Bob is sure that Stewball will finish either first or second. Taking this into account, how many different outcomes (predicting the first, second and third place finishers) are possible?

(c) Mary is pretty sure that the horse with no legs will finish last. Taking only this into account (i.e. ignore the information from (b)), how many different outcomes (predicting the first, second and third place finishers) are possible?

15. (10 pts.) Five married couples are going to be in a group picture, all lined up in a row.

(a) In how many ways can the 10 people line up? You can give your answer using either C, P or factorial notation, or you can give a numerical answer.

(b) In how many ways can they line up if everyone has to be standing next to their spouse? You can give your answer using either C, P or factorial notation, or you can give a numerical answer.

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