

Name: _____

Instructor: _____

Math 10120, Exam I
September 18, 2014

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- Please turn off all cellphones and electronic devices.
- Calculators **are** allowed
- The exam lasts for 1 hour and 15 min.
- Be sure that your name and section number are on the front page of your exam.
- 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)
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Please do NOT write in this box.

Multiple Choice _____

11. _____

12. _____

13. _____

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15. _____

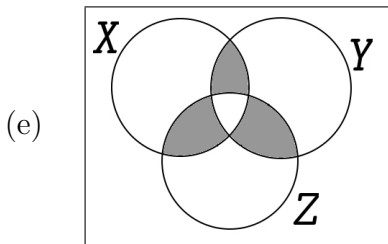
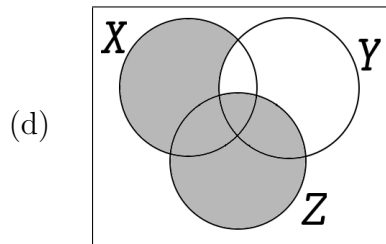
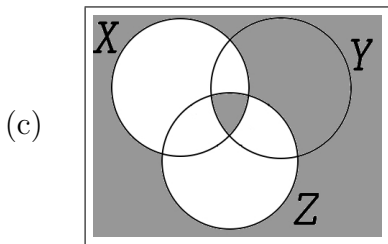
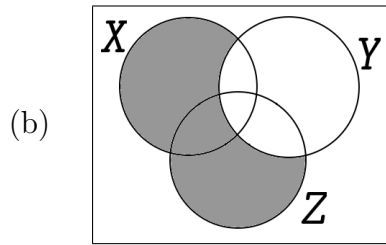
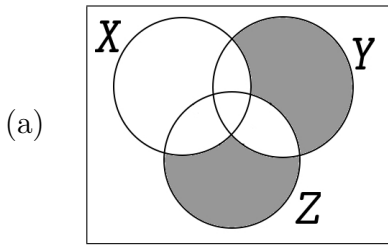
Total _____

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Multiple Choice

1.(5 pts.) Which Venn diagram below has $(X \cap Y^c) \cup Z$ shaded?



2.(5 pts.) If $A = \{1, 3, 5, \dots, 11\}$, $B = \{1, 4, 7, 10, 13\}$ and $D = \{2, 4, 6, \dots, 20\}$ find $(A \cup B) \cap D$.

(a) $\{1, 7, 10, 13\}$

(b) $\{3, 5, 9, 11\}$

(c) $\{12, 14, 16, 18, 20\}$

(d) \emptyset , the empty set

(e) $\{4, 10\}$

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3.(5 pts.) A deli offers 5 different types of bread, 4 types of meat and 6 types of vegetables. A sandwich must have one bread and at least one meat or one vegetable. It can have up to all 4 meats and all 6 vegetables. How many sandwich options does this deli offer?

- (a) 1,275 (b) 4,415 (c) 5,115 (d) 1,530 (e) 32,736

4.(5 pts.) Let

$$U = \{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z\}$$

be the Latin alphabet. Let B be the set of letters in the word “baboon”. Find B' . In all the answers, the letters are in alphabetical order.

- (a) $\{c, d, e, f, g, i, j, k, l, m, p, q, r, s, t, u, v, w, x, y, z\}$
(b) $\{c, d, e, f, h, i, j, k, l, m, p, q, r, s, t, u, w, x, y, z\}$
(c) $\{a, d, e, f, g, h, i, j, k, l, m, p, q, r, s, t, u, v, w, x, y, z\}$
(d) $\{c, d, e, f, g, h, i, j, k, l, m, p, q, s, t, u, w, x, y, z\}$
(e) $\{c, d, e, f, g, h, i, j, k, l, m, p, q, r, s, t, u, v, w, x, y, z\}$

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5.(5 pts.) You need to drive from here to Chicago. Alas your car is not very reliable so you plan to make the trip in three segments. There are 3 routes from here to Michigan City. Then there are 5 routes you can take to Gary. Once in Gary there are 3 routes into Chicago. How many routes are possible?

- (a) 15 (b) 22 (c) 45 (d) 1,671 (e) 11

6.(5 pts.) Tara has 20 books and is allowed to bring at most three on vacation. How many subsets of Tara's twenty books have at most three elements?

Note: no books is an option.

- (a) 56 (b) 1,351 (c) 1,048,576
(d) 211 (e) 1,140

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7.(5 pts.) When ordering a burger at Paul's Famous Hamburger's in Sydney, you must first choose one type of meat, from Chicken or Beef. You then choose a subset of the eight optional fillings, tomato, lettuce, egg, bacon, cheese, pineapple, beetroot and cooked onions for your burger. After you have chosen your preferred subset of fillings, you choose one sauce from the five available sauces, BBQ, Sweet Chilli, Hot Chilli, Mustard or Paul's special sauce. If you wish to order a burger with at most two fillings, how many different burgers are possible?

Note: No fillings is a possibility.

- (a) 370 (b) 560 (c) 2,560 (d) 2,470 (e) 280

8.(5 pts.) A poker hand consists of a selection of 5 cards from a standard deck of 52 cards. There are 13 denominations, aces, kings, queens, ..., twos, and 4 suits, hearts, diamonds, spades and clubs in a standard deck. How many poker hands have three aces and two cards which are not aces but which are of the same denomination?

- (a) 48 (b) 6 (c) 288 (d) 156 (e) 24

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9.(5 pts.) A class of 15 students are visiting the Louvre and their teacher wants to take a photograph of 5 of them lined up under the Mona Lisa. How many such photographs are possible?

- (a) 2^{15} (b) $P(15, 5)$ (c) $15!$ (d) $C(15, 5)$ (e) 15^5

10.(5 pts.) In an experiment a coin will be flipped 10 times and the resulting ordered sequence of heads and tails will be recorded. How many of the possible sequences that might result from this experiment have exactly 4 heads?

- (a) 1,024 (b) 151,200 (c) 5,040 (d) 210 (e) 52,920

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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 sums and/or products of numbers and symbols for factorials and numbers of permutations and combinations.

11.(12 pts.) On your floor of your dorm there are 20 students, 5 are seniors, 5 juniors, 5 sophomores and 5 freshmen. The rector wants to meet with all of you in groups of 4.

(a) How many ways can the 5 groups be selected if does not matter which group is first, second, ... ?

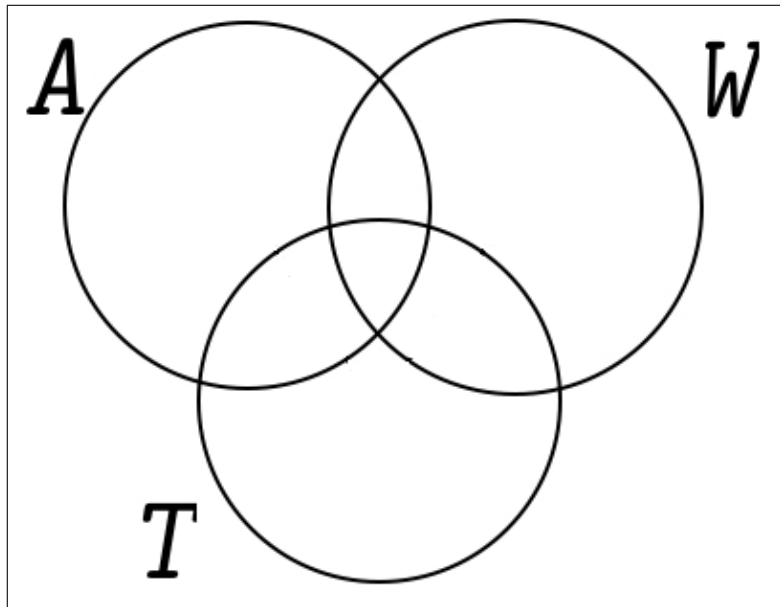
(b) How many ways can the 5 groups be selected if does not matter which group is first, second, ... but there is to be one member of each class in each group?

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12.(12 pts.) Suppose given three sets A , T and W in a universe consisting of 90 elements. Suppose $n(A) = 27$, $n(T) = 28$ and $n(W) = 22$. Further suppose $n(A \cup T) = 40$, $n(T \cup W) = 38$ and $n(A \cup W) = 36$ and $n(A \cap T \cap W) = 10$. Fill in the Venn diagram below. Please work out the answer on the back of the previous page first and then neatly label the supplied diagram.

Hint: You will need the Inclusion-Exclusion Principle.



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13.(12 pts.)

SENSELESS

(a) How many words (including nonsense words) can be made by rearranging the letters of the above word?

(b) How many different 3 letter words (including nonsense words) can be made from the letters of the above word if letters cannot be repeated?

(c) How many different 3 letter words (including nonsense words) can be made from the letters of the above word if letters cannot be repeated and the words must end with a vowel?

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15.(2 pts.) You will get this 2 points if your instructor can read your name easily on the front page of the exam and you mark the answer boxes with an X (as opposed to a circle or any other mark).

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