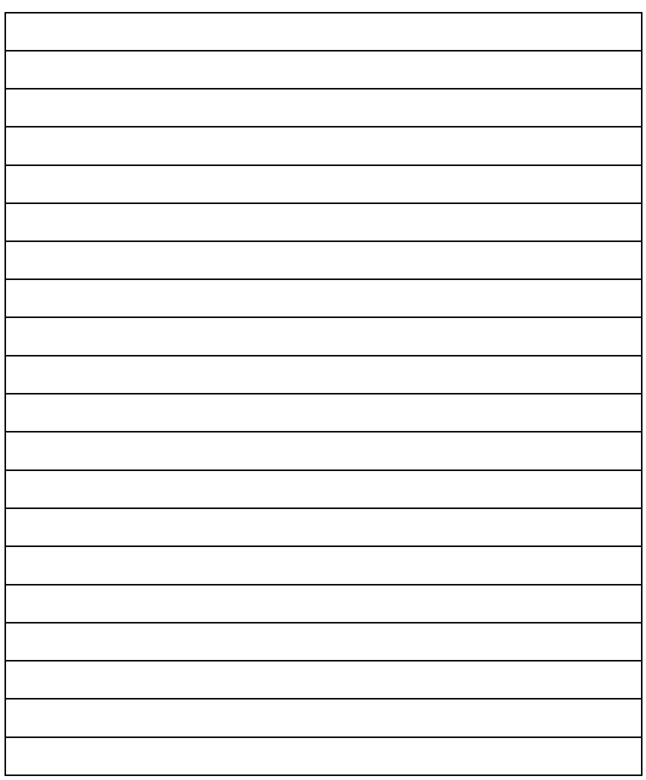
Math 137 Exam 1 Review NAMES:

Chapters 1-3, 5, Inductive and Deductive Reasoning,
Fundamental Counting Principle

1. (3) A costume contest was held at Maria's Halloween party. Out of the 23 people who attended, prizes were given for the top three costumes. How many possible ways could the prizes be given? Explain your answer.

2. (4) You must draw a clear diagram for this problem. Use it to explain your solution. A blank scaled wall is provided. Label an appropriate scale and then use it to do the problem.

Amanda is learning how to rock climb. She is learning on a 20-foot climbing wall. She climbs 5 feet in 2 minutes but then slips back down 2 feet in 10 seconds. This continues until she reaches the top. How long will it take her to reach the top of the wall?



3. (3) Make and label a systematic list of the possibilities for the rectangle described below.

A rectangle has an area of 60 square meters. If the length and width of this rectangle are whole numbers (meaning from the set {0, 1, 2, 3, …}), make a list of the possible dimensions of the rectangle. (Hint: The area of any rectangle is found by multiplying the length and width.)

4. (3) Draw a diagram for this problem and then use it to solve the problem.

Marty is building a swimming pool. The pool measures 12 feet by 20 feet. He will build a concrete walking path directly around the pool that is 3 feet wide on all sides. What is the area of the concrete walking path? (Hint: The area of a rectangle is found by multiplying the length and width.)

5. (5) Most calculators cannot give you the exact value of $91 \times 444{,}444{,}444{,}444$ since the answer has more than ten digits. One way to find the answer is to determine if a pattern exists when 91 is multiplied by smaller numbers whose digits are all 4's. Try this method to predict the actual value of $91 \times 444{,}444{,}444{,}444$. I have included a table to get you started. Complete the table, filling in **all** the empty cells, to get full credit. (Use commas for big numbers.)

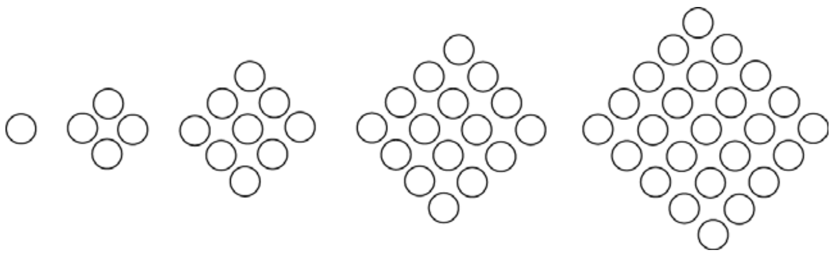
Product	**Final Answer**
91×44	
91×444	
$91 \times 4{,}444$	
$91 \times 44{,}444$	
$91 \times 444{,}444$	

Complete the next two entries in the first column and all entries in the second column.

What is your prediction for the value of $91 \times 444{,}444{,}444{,}444$? (Notice it would be quite a ways further down the table.)

6. (3) Which type of reasoning (inductive or deductive) did you use on the previous question? Explain.

The pattern below is illustrated by these figures.



7. Complete the equations to the right.

$$1 = 1$$
$$1+2+1 =$$
$$1+2+3+2+1 =$$
$$1+2+3+4+3+2+1 =$$
$$1+2+3+4+5+4+3+2+1 =$$

8. Look at the numbers on the right side of the equations. Write the sequence down and fill in the next two entries (along with the first five entries from above).

9. Explain how the sums such as “1 + 2 + 3 + 2 + 1” are shown in the figures. Independently, explain how the square numbers such as “9” can be found from the figures. (This will help explain why the equations are true.)

10. (3) Use the method of eliminating possibilities to solve the following problem. Give me the correct answer and then pick two other days and tell me specifically why those days cannot be the answer.

> *Jim tells lies on Fridays, Saturdays, and Sundays. He tells the truth on all other days. Freda tells lies on Tuesdays, Wednesdays, and Thursdays. She tells the truth on all other days. If they both say "Yesterday I lied," then what day is it?*

11. (3) A math quiz has ten questions. They are all multiple-choice questions with four answers each. How many possible answer keys are there for this quiz? Explain.

12. (3) Marty has invited ten of his friends to a movie. The first row of the theatre has five seats and he takes the seat at the end of the row (leaving four seats). How many ways can four of his ten invited friends take seats in this row?

13. (3) Draw a tree diagram to help find all of the various possibilities for this problem. Make sure your diagram has every possibility for the three places listed (preferably to the right).

Three cats named Ash, Bat, and Candy are entered in a beauty contest. How many ways can the 1^{st}, 2^{nd}, and 3^{rd} places be awarded?

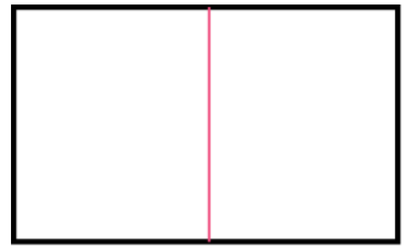
14. (3) The Fibonacci sequence (from the pairs of rabbits problem) is reproduced below for the first few entries. Complete the next three entries and state, in words, the rule that assigns each entry.

1, 1, 2, 3, 5, 8, 13, _____, _____, _____

15. (3) Find the 50^{th} digit to the right of the decimal point in the decimal expansion of $\frac{7}{27}$.

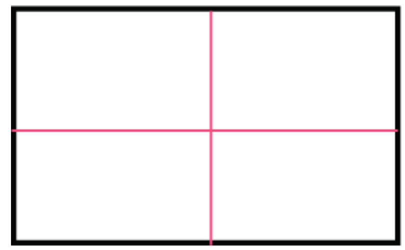
(Divide 7 by 27 on your calculator. The answer is called its decimal expansion. The answer as given will probably be rounded on the calculator so do not trust the last digit.) Explain how you arrived at your answer.

Among the terms sometimes used by the book industry to indicate the size of a book's pages are folio, quarto, and octavo. These words refer to the number of pages that can be obtained from large printer's sheets by folding them as shown by the gray or red lines in the figure on the right. Smaller pages obtained from the large sheets are referred to as 16 *mo*, 32 *mo*, and 64 *mo*.



Folio

16. (3) This number sequence starts off with 2, 4, 8 as shown by the pictures. Write the next three terms of this sequence.



Quarto

Octavo

17. (3) Why does the folding of the sheets result in this particular sequence? Fold your sample sheet of paper if it helps.

18. (3) Margie has many nickels. She has less than 100 nickels. When she stacks her nickels in piles of 10, there are none left over. When she stacks them in piles of 3, there are none left over. When she stacks them in piles of 4, there are none left over. How many nickels does she have? Explain.

19. (6) Complete each pattern. Explain each pattern in words.

a.) 3, 6, 9, 12, _______, _______, _______, _______

In words:

b.) 1000, 500, 250, 125, _______, _______, _______, _______

In words:

c.) 4, 7, 14, 25, 40, _______, _______, _______, _______

In words:

20. (6) Do the following trick with two different numbers. Then in the fourth column of the table, write down the symbolic proof used to show that it will always work. We do this by using a little square (□) to denote the original number and little circles (∘) to denote numbers we add or subtract (like 5 or 10). Answer the question that follows the table.

	First example	Second example	Symbolic Proof
step 1: Choose a number			
step 2: Add 5			
step 3: Multiply the result by 2			
step 4: Add the original number to this result			
step 5: Subtract 10			

What will you always get as a result, in terms of the original number? Do more examples if you need.

21. (3) Which is your favorite problem solving method or type of problem we have learned so far. Why?