

# Math 102: Section 3

## Exam 1

**Directions:** Write directly on this exam. Use the back of the page if you need more room. Use a calculator. Express all solutions to at least three significant digits. Answer all questions to the best of your ability. Circle your final solution if applicable.

For questions 1 and 2, identify the premise(s) and conclusion of the given propositions. Also briefly mention the fallacy of the argument.

1. Dan's car broke down today. He is too poor to afford a nice car.

2. The sun came up on Monday. The sun came up on Tuesday. The sun came up on Wednesday. Therefore the sun will come up everyday.

3. Fill in all entries of the following truth table.

| $p$ | $q$ | $not\ p$ | $not\ q$ | $if\ p,\ then\ q$ | $if\ q,\ then\ p$ | $if\ not\ p,\ then\ not\ q$ | $if\ not\ q,\ then\ not\ p$ |
|-----|-----|----------|----------|-------------------|-------------------|-----------------------------|-----------------------------|
| T   | T   |          |          |                   |                   |                             |                             |
| T   | F   |          |          |                   |                   |                             |                             |
| F   | T   |          |          |                   |                   |                             |                             |
| F   | F   |          |          |                   |                   |                             |                             |

State the converse, inverse and contrapositive of the following conditional statements in 4 and 5.

4. If you study the course lecture notes, then you will receive a high score on this test.

5. If gas prices reach \$4.00 a gallon, then I will stop driving my car.

6. Which of the converse, inverse, and contrapositive is logically equivalent to the original conditional statement? What is the relationship between the other two?

7. Construct a Venn Diagram based on the following: Of the children on a school bus, 12 play soccer only, 6 play softball only, 2 play soccer and softball, and 4 play neither softball nor soccer.

8. Identify the sets  $A, B, C, D$  and  $E$  in the following Venn Diagram with the sets  $\mathbb{Q}, \mathbb{N}, \mathbb{N} \cup \{0\}, \mathbb{R}$  and  $\mathbb{Z}$ .

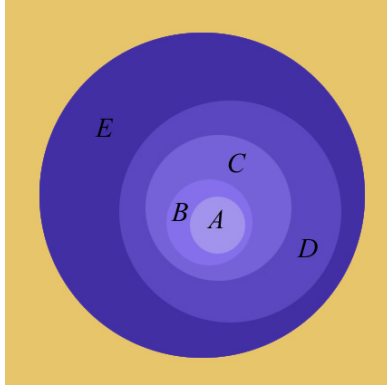


Figure 1: Venn Diagram of Numbers

9. A prime number is any number that has only two divisors. The first few primes numbers are  $\mathbb{P} = \{2, 3, 5, 7, 11, 13, 17, \dots\}$ . A well-known conjecture (educated guess) in mathematics states that every even number greater than 2 can be expressed as the sum of two primes. Give an inductive argument in support of this conjecture by verifying it for the first 7 even numbers greater than 2.<sup>1</sup>

10. Convert 635,212 inches to miles (5280(ft)= 1 mile).

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<sup>1</sup>This is currently no deductive argument for this conjecture.

11. What is the total volume of the Tanner building if it is 70(ft) high, 150(ft) wide, and 400(ft) long?
12. There are 8 ounces in a cup, 4 cups in a quart, and 4 quarts in a gallon. Convert 6 gallons into ounces.
13. Recalling 24 karat gold is pure, how much actual gold is in a 53 gram 16 karat gold necklace?
14. You decide to run a marathon and find your weight decreases from 165 pounds to 143 pounds during training. What is the absolute and relative decrease in your weight?
15. You buy a new computer for \$1499.99. If Utah sales tax is 6.5%, how much do you pay in tax on your computer?

16. The Planck length  $\lambda_P = 1.105 \cdot 10^{-34}(m)$  is a prominent quantity in quantum mechanics. The size of an electron's radius is  $2.8179 \cdot 10^{-15}(m)$ . How many Planck lengths equal the radius of an electron?<sup>2</sup>

17. Write the following sentence using Scientific notation: Total annual energy consumption in the United States is about 100,000,000,000,000,000 joules.

18. For every gallon of gasoline burned by an automobile, approximately 10.2(*kg*) of carbon dioxide are emitted into the atmosphere. Estimate the total amount of carbon dioxide added to the atmosphere by all automobile travel in the United States over the past year.<sup>3</sup>

19. How many significant digits are in the following:

- (a) 45.2 meters
- (b) 241 days
- (c) 0.034001 seconds
- (d)  $4.10 \times 10^7$  years

20. Using significant digit rules, solve the following: At the hardware store, you buy a 50-pound bag of sand. You also buy ten 1.25 kilogram boxes of nails. What is the total weight of your purchases in kilograms ( $1(kg) = 2.2(pounds)$ )?

**Extra Credit** (5pts):

On the back of this page, provide a correct deductive argument for either the Quadratic formula or the Pythagorean Theorem.

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<sup>2</sup>Be sure to express your solution with the correct number of significant digits.

<sup>3</sup>Note you will have to estimate the total number of automobiles in America.