Name:_____

Computations - Show all your work. (30 pts)

1. Fractions.

a. $\dfrac{1}{7} + \dfrac{1}{5}$ 　　　　 b. $\dfrac{12}{5} \cdot \dfrac{5}{9}$ 　　　　 c. $\dfrac{6}{8} - \dfrac{2}{16}$ 　　　　 d. $\dfrac{1}{6} + \dfrac{2}{5} + \dfrac{3}{4}$

2.a Powers of ten.

i. $\dfrac{10^3}{10^{-2}}$ 　　　　 ii. $10^{-2} \cdot 10^6$ 　　　　 iii. 10^0 　　　　 iv. $(10^5)^3$

2.b Powers of other bases.

a. 2^5 　　　　 b. 4^{-2} 　　　　 c. $64^{1/3}$ 　　　　 d. $4^2 + 3^3$

3. Express the number in three forms: reduced fraction, decimal, and percentage.

a.   40%   b.   .25   c.   140%   d. $\dfrac{9}{5}$

$=$ $=$ $=$ $=$

$=$ $=$ $=$ $=$

4.a Convert each of the following from scientific to ordinary notation.

i. $6.2 \cdot 10^2$ ii. $3.6 \cdot 10^5$ iii. $5 \cdot 10^{-2}$ iv. $4.3 \cdot 10^{-4}$

4.b Write each of the following in scientific notation.

i. 7658   ii. 546.87   iii. 0.0053   iv. 0.2456

5. Factorials.

a. $4!$　　　　　b. $\dfrac{6!}{3!}$　　　　　c. $\dfrac{5! \cdot 4!}{2! \cdot 3!}$　　　　　d. $\dfrac{5!}{(5-3)! \cdot 3!}$

6. Given that $\log_{10} 2 = 0.3$, find each of the following

a. $\log_{10} 8$　　　　　b. $\log_{10} 2000$　　　　　c. $\log_{10} 0.5$

d. $\log_{10} 64$　　　　　e. $\log_{10} \dfrac{1}{8}$　　　　　f. $\log_{10} 0.2$

7. Solve for x.

    a. $9^{3x} = 460$ b. $7 \cdot 6^x = 20$ c. $4\log_{10}(4x) = 4$ d. $5\log_{10}(14 + x) = 5$

8.a Express the following in terms of $\log_{10} a$, $\log_{10} b$, and $\log_{10} c$.

    a. $\log_{10} \sqrt{a\sqrt{b\sqrt{c}}}$ b. $\log_{10} \dfrac{a^3}{\sqrt[3]{b^2 c}}$

8.b Express the following as a single logarithm.

    a. $\log_{10} \pi + 2\log_{10} r - \log_{10} 2$ b. $\log_{10} 1 + \log_{10} 2 + ... + \log_{10}(n-1) + \log_{10} n$

Multiple Choice - Show your work for partial credit. (30 pts)

_____ **1.** The natural numbers can be represented by which of the following sets?

a. $\{..., -3, -2, -1, 0, 1, 2, 3, ...\}$ b. $\{1, 2, 3, 4...\}$

c. $\{0, 1, 2, 3, 4...\}$ d. $\{\frac{x}{y} :$ where x and y are integers and $y \neq 0\}$

_____ **2.** 1 inch is equal to :

a. 25.4 mm   b. 2.54 cm   c. .0254 m   d. All of the above

_____ **3.** One cubic foot holds about 7.5 gallons of water, and one gallon of water weighs about 8 pounds. How much does a cubic foot of water weigh in pounds?

a. 8 pounds   b. 240 pounds   c. 60 pounds   d. 7.5 pounds

_____ **4.** Suppose that a bank is offering an outrageous 100% interest on new bank accounts compounded annually. You decide to take advantage of this, and you make a one time deposit of $1,000 into a new bank account. In 5 years how much money will be in your account?

a. $32,000   b. $100,000   c. $14,265.21   d. $2,000

_____ **5.** Distribution A has higher variation than distribution B. If the standard deviation of distribution A is SD_A and the standard deviation of distribution B is SD_B, what can you say about these values?

a. Nothing   b. $SD_A = SD_B$ c. $SD_A > SD_B$ d. $SD_A < SD_B$

_____ **6.** Suppose the scores of a test are normally distributed with a mean of 75. Student A scores an 86 and is found to be in the 81st percentile. Student B has a score of 64. In what percentile is student B?

a. 39th   b. 50th   c. 19th   d. Not enough information.

_____ **7.** A bag of candy contains ten red skittles and five green skittles. If you pick randomly and eat each skittle after choosing it, what is the probability of choosing three green skittles in a row?

a. $\dfrac{5 \cdot 4 \cdot 3}{15 \cdot 15 \cdot 15}$ b. $\dfrac{5 \cdot 4 \cdot 3}{15 \cdot 14 \cdot 13}$ c. $\dfrac{1}{3}$ d. $\dfrac{1}{3} \cdot \dfrac{1}{3} \cdot \dfrac{1}{3}$

_____ **8.** Consider a lottery in which a $1 ticket gives a 1 in 10 million chance of winning $4 million with no other prizes. What is the expected value of this lottery?

a. $1   b. $.40   c. $-$.60   d. $-$1

_____ **9.** How many 4 character passwords can you make if you only use lowercase and uppercase letters and numbers 0 through 9?

a. 62   b. $26^4 + 26^4 + 10^4$ c. 62^4 d. $_{62}C_4$

_____ **10.** Let n and k be two positive integers such that $n \geq k$. What can you say about the two quantities $_nC_k$ and $_nP_k$?

a. $_nC_k = {_nP_k}$ b. $_nC_k \geq {_nP_k}$ c. $_nC_k \leq {_nP_k}$ d. $_nC_k \neq {_nP_k}$

Short Answer - Show all your work. (40 pts)

1.a To what elementary logical statement does the following truth table correspond? (Write your answer in the blank column entry.)

p	q	
T	T	T
T	F	F
F	T	F
F	F	F

1.b Make a truth table below for the statement "p and ($not q$)", where p, and q represent propositions.

2. The pH of a substance is a measure of the density of Hydrogen ions on a logarithmic scale. We measure pH with the following formula, pH$= -\log_{10}(h)$, where h is the concentration of Hydrogen ions. How much more acidic (i.e. how does h differ) is substance A with pH=6.2 versus substance B with pH=7.2?

3. Two drugs, A and B, were tested on a group of 2,000 people of which half were men and half were women. Drug A was given to 1,000 of those people 100 of which were men and 900 were women. Drug B was given to the remaining 1,000 consisting of 900 men and 100 were women. The results of the study are given below.

	Women	Men
Drug A	5 of 100 cured	450 of 900 cured
Drug B	90 of 900 cured	98 of 100 cured

a. Give numerical evidence that supports the claim that Drug A is a better than Drug B.

b. Give numerical evidence that supports the claim that Drug B is a better than Drug A.

4. Suppose you make a one time deposit of $1,000 into an account with interest that is compounded continuously. What interest rate do you need in order to have $10,000 in the account after 20 years? (Leave as an expression)

5.a You are given 10 to 1 odds against rolling a double number (for example, (1,1) or (4,4)) with the roll of two fair dice, meaning you win $10 if you succeed and lose $1 if you fail. Calculate the expected value of this game.

5.b Suppose in addition to these winnings, if you choose to flip coin and it lands on heads you double your money (to $20), and if it lands on tails, you lose your money (meaning you lost your $10, thus overall you break even winning $0). Assume that every time you succeed in the double roll you risk your winnings with a coin flip. Calculate the expected value of this game with this additional round. (Hint: first try to come up with the possible events)

6. Find the probability distribution of the number of heads that appear when flipping three fair two sided coins.

7.a Suppose that 5 employees are paid 10, 5, 10, 15, 10, 20, and 35 dollars. per hour. Find the mean, median, and mode of this distribution.

7.b Find the standard deviation of this distribution.

8.a Suppose you buy a deck of cards to play texas hold'em, and you forget to remove the two jokers leaving a total of 54 cards in the deck. According to the rules of texas hold'em each player is dealt two cards. What is the probability that you are dealt both jokers?

8.b What is the probability that only one of the cards that you are dealt is a joker and the other card is an ace? (hint: first try to figure out the possible two card hands you could have, like $\{J_1, A\spadesuit\}$, $\{J_2, A\heartsuit\}$, etc.)