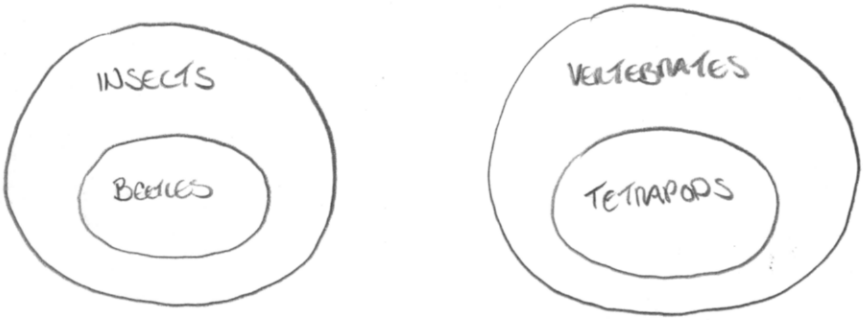
Name: *ANSWER KEY* 11/5/2014

Math 150 Mathematics for the Contemporary World **Midterm Exam**

Please show all work and **box your final answers**. If you need more room, you may use the backs of the pages. Calculators are allowed, but cellphones are not. Good luck!

1. Consider the following arguments. Draw a carefully labeled diagram for each one to test the validity of each argument. State whether the argument is valid or invalid.

   (a) (4 points) *Premises*: All beetles are insects. No insects are vertebrates. All tetrapods are vertebrates.
   Conclusion: No beetles are tetrapods.



VALID

   (b) (4 points) *Premises*: All sports drinks contain electrolytes. Gatorade contains electrolytes.
   Conclusion: Gatorade is a sports drink.

INVALID.

GATORADE COULD BE IN EITHER PLACE. ALL WE ARE TOLD IS THAT IT'S IN THE LARGER CIRCLE.

2. Suppose a trail map is scaled so that 2 inches on the map represents 1 mile in reality.

   (a) (4 points) In reality, how far a part are two point A and B if they measure 7 inches apart on the map?

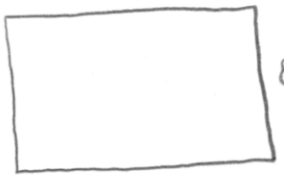
$$7 \text{ in} \cdot \frac{1 \text{ mi}}{2 \text{ in}} = \frac{7}{2} \text{ mi} = \boxed{3.5 \text{ mi}}$$

   (b) (4 points) Assuming you hike at an even pace of 3 miles per hour, how many minutes would it take to hike between point A and B?

$$3.5 \text{ mi} \cdot \frac{60 \text{ min}}{3 \text{ mi}} = \frac{3.5 \times 60}{3} \text{ min}$$

$$= \boxed{70 \text{ min}}$$

3. (4 points) How much would it cost to cover a floor that measure 10 yards long and 8 yards wide in carpet that costs \$1.65 per square foot.
   Warning: This question contains mixed units: yards and feet.



8 yd = 24 ft

10 yd = 30 ft

$\text{AREA} = 30 \text{ ft} \times 24 \text{ ft} = 720 \text{ ft}^2$

$$720 \text{ ft}^2 \cdot \frac{\$1.65}{1 \text{ ft}^2} = \boxed{\$1,188}$$

4. (a) (2 points) Convert 0.004007001 to scientific notation.

4.007001×10^{-3}

(b) (2 points) Convert 54678.930 to scientific notation.

5.467893×10^{4}

5. A statistical study is to be performed to test whether smoking crack is an effective way to prevent baldness in men.

(a) (2 points) Would this study be conducted as an experiment or as an observational case study? Why?

OBSERVATIONAL CASE STUDY.

IT IS UNETHICAL TO FORCE PARTICIPANTS IN A STUDY TO SMOKE CRACK. HOWEVER, SOME PEOPLE WILL SMOKE CRACK WITHOUT BEING FORCED TO DO SO, & RESEARCHERS CAN OBSERVE.

(b) (2 points) Which group of men would be the control group?

THOSE THAT DO NOT SMOKE CRACK.

6. (4 points) Suppose a stock broker buys some shares of a stock at noon. Between noon and 1pm the price of the stock increases by 2%. Between 1pm and 2pm the price of the stock increases by 5%. At this point, what is the overall percent change in the price of the stock since it was purchased?

NOON: \$100

1PM: $\$100 \times 1.02 = \$102$

2PM: $\$102 \times 1.05 = \$107.10$

OVERALL: $\$100 \longrightarrow \$107.10$

INCREASED 7.1%

7. (4 points) Suppose you are taking a cab with your friend Jamie, who always insists on paying and always tips cab drivers exactly 20%, no matter what. While exiting the cab, you see that Jamie gives the driver exactly \$27. How much was the fare for the ride (not including tip)?

LET F = FARE FOR THE RIDE

$$1.20 \times F = 27$$

$$F = \frac{27}{1.20} = 22.5$$

\$22.50

8. (4 points) Use the fact that 1 inch is equal to 25.4 millimeters to convert 1 mile to kilometers.
Hint: Perform the following conversions:

miles→feet→inches→millimeters→meters→kilometers.

$$1 \text{ mi} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{25.4 \text{ mm}}{1 \text{ in}} \cdot \frac{1 \text{ m}}{1000 \text{ mm}} \cdot \frac{1 \text{ km}}{1000 \text{ m}}$$

$$= \frac{5280 \times 12 \times 25.4}{1000 \times 1000} \text{ km} = 1.609344 \text{ km}$$

$$\approx 1.61 \text{ km}$$

9. The following table shows how the Consumer Price Index has changed over the indicated years.

Year	CPI
1920	19.3
1950	23.5
1980	77.8
2010	216.7

(a) (4 points) In 1920, the Ford Model T automobile sold for \$395. Simply adjusting for inflation, how much would a Ford Model T automobile have sold for in 2010?

$$395\ \$_{1920} \cdot \frac{216.7\ \$_{2010}}{19.3\ \$_{1920}} = \frac{395 \cdot 216.7}{19.3}$$

$$= \boxed{\$4{,}435.05}$$

(b) (4 points) What was the rate of inflation from 1950 to 2010?

$$\frac{216.7 - 23.5}{23.5} \times 100\% = \boxed{822.13\%}$$

(c) (4 points) It is a fact that a single ride on the NYC subway cost \$0.10 in 1950 and \$2.25 in 2010. What was the percent change in cost from 1950 to 2010?

$$\frac{2.25 - 0.10}{0.10} \times 100\% = \boxed{2150\%}$$