

# Math 1303 - Math in the Liberal Arts

Final Exam - 2014.12.10

Name: \_\_\_\_\_

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## Metric Units

Prefix	Symbol	Meaning
kilo	k	$1000\times$ base unit
hecto	h	$100\times$ base unit
deka	da	$10\times$ base unit
—	—	base unit
deci	d	$\frac{1}{10}$ of base unit
centi	c	$\frac{1}{100}$ of base unit
milli	m	$\frac{1}{1000}$ of base unit

## Water

Volume (cubic)	Volume (litres)	Mass
1 cm <sup>3</sup>	1 ml	1 g
1 dm <sup>3</sup>	1 l	1 kg
1 m <sup>3</sup>	1 kl	1000 kg

## Length

1 inch (in)	= 2.54 centimeters (cm)
1 foot (ft)	= 30 centimeters (cm)
1 yard (yd)	= 0.9 meter (m)
1 mile (mi)	= 1.6 kilometers (km)

## Area

1 square inch (in <sup>2</sup> )	= 6.5 square centimeters (cm <sup>2</sup> )
1 square yard (yd <sup>2</sup> )	= 0.8 square meters (m <sup>2</sup> )
1 square mile (mi <sup>2</sup> )	= 2.6 square kilometers (km <sup>2</sup> )
1 acre	= 0.4 hectare (ha)
1 hectare (ha)	= 10000 square meters (m <sup>2</sup> )

## Volume

1 teaspoon (tsp)	= 5 milliliters (ml)
1 tablespoon (tbsp)	= 15 milliliters (ml)
1 fluid ounce (fl oz)	= 30 milliliters (ml)
1 cup (c)	= 0.24 liters (l)
1 pint (pt)	= 0.47 liters (l)
1 quart (qt)	= 0.95 liters (l)
1 gallon (gal)	= 3.8 liters (l)
1 cubic foot (ft <sup>3</sup> )	= 0.03 cubic meters (m <sup>3</sup> )
1 cubic yard (yd <sup>3</sup> )	= 0.76 cubic meters (m <sup>3</sup> )

## Weight

1 ounce (oz)	= 28 grams (g)
1 pound (lb)	= 0.45 kilograms (kg)
1 ton (T)	= 0.9 tonne (t)

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1. You are working on an ancestry project, and you have found some last names for several people you are trying to relate. The people you are trying to connect are James Kirk, Montgomery Scott and Leonard McCoy.

Kirk = {Barnum, Crusoe, Fetzner, Feziweg, Hanson, Hoffman, Jameson, Johnson, Jones, Keating, Kinsler, Meunster, Smith, Smithee, Westberry, VonBuren}

Scott = {Chapel, Erikkson, Hanson, Hoffman, Jameson, Jones, McAlester, McAvoy, McElroy, Matthews, Pierce, Samuelson, Sinclair, Smith}

McCoy = {Antwerp, Carey, Chancellor, Eccleston, Farrel, Hoffman, Huygens, Jones, Keating, Keenan, Tethys, Von Trapp, Westerson}

[10 pts] (a) Construct a Venn diagram of the three sets.

[5 pts] (b) Compute  $\text{Kirk} \cap \text{Scott}$

[5 pts] (c) Compute  $\text{Kirk} \cap \text{McCoy}$

[5 pts] (d) Compute  $\text{Scott} \cap \text{McCoy}$

[5 pts] (e) Compute  $\text{Scott} \cap \text{McCoy} \cap \text{Montgomery}$ .

[5 pts] (f) Based on your answers to parts (b) through (d), who is closer related (based on number of elements in intersections)?

[5 pts] (g) Based on your answer to part (e), is it possible that all three are related?

2. [25 pts] Construct a truth table for the following sentence:  $[(\sim p \vee q) \rightarrow r] \leftrightarrow [\sim r \wedge (p \vee \sim q)]$

3. [10 pts] Consider the sentence: All students will get an A in this course, or some students will take this class over. Negate the sentence, do not simply put 'It is not true that' at the beginning of the sentence.

4. Convert the following:

[5 pts] (a) 86 inches to kilometers

[5 pts] (b) 280 grams to pounds

[5 pts] (c) 45 cubic meters to fluid ounces

[5 pts] (d) 340000 square inches to hectares

[5 pts] (e) 245 dm<sup>2</sup> to dam<sup>3</sup>

[5 pts] (f) 45 miles per hour to centimeters per second

[15 pts] 5. Compute the prime factorization of the numbers  $x = 360$ ,  $y = 756$ , and  $z = 432$ .

[15 pts] 6. Compute  $\text{GCD}(360, 756)$ ,  $\text{GCD}(756, 432)$ , and  $\text{GCD}(360, 432)$  using your answer to problem 5.

[15 pts] 7. Compute  $\text{LCM}(360, 756)$ ,  $\text{LCM}(756, 432)$ , and  $\text{LCM}(360, 432)$  using your answer to problem 5.

[5 pts] 8. Express the decimal 7.56 as an improper fraction.

[10 pts] 9. Convert the number  $102.\overline{101}$  to an improper fraction.

[10 pts] 10. Perform the following multiplication, your answer should be left in scientific notation:

$$(3.41 \times 10^{21}) \times (1.02 \times 10^{-12}) =$$

[10 pts] 11. Perform the following multiplication. Your answer should be expressed as fraction of integers:

$$\left(\frac{1}{4}\right)^3 \times \left(\frac{1}{2}\right)^{-2} \times 2^3 =$$

[10 pts] 12. Evaluate the following expression, be sure to show all your steps. Leave your answer as an improper fraction.

$$51 \times 4 \div 3 - (4 + 6 \times 8) - 6 \times 2 \wedge 4 \div 5 + 13 \times (2 \times 5 \wedge 2) =$$



[25 pts] 13. You polled a group of students about the grades they thought they would get at the end of their courses. You decided to group the grades into the categories: (1) A's, (2) B's and C's, and (3) D's. Here are the results of your survey:

There were 25 students who thought they would only get A's.

There were four students were going to fail all their courses.

6 students thought they would end up with grades of A, B, C, and D.

34 students thought they would get only B's, C's and D's.

83 students thought they would get at least one A, and pass all their classes.

92 students though they would get at least one D, while passing all their classes.

104 students though they would get at least one grade of a B or C, while passing all their classes.

There were 42 students who thought they would only get D's.

Construct a Venn Diagram to illustrate the above sentences, and use it to determine how many students were polled.

[5 pts] 14. Draw a picture of your favorite animal.