1. (7%) Give the prime factorization of 3030 and 748. Add $\frac{1}{3030}$ and $\frac{1}{748}$ and express your answer in lowest terms.

2. (5%) Evaluate 2362.30×-1.567. Express the answer as both a decimal and as a fraction.

3. (9%) You draw three cards from the standard 52-card deck at random. What is the probability that there are two 2s, and one Queen? Leave your answer as a fraction.

4. (5%) Draw a picture in the Cartesian plane to show that $3 \times (2 + 2) = (3 \times 2) + (3 \times 2)$. This illustrates one of the standard laws of arithmetic. Which one?

5. (10%) Massive flu and measles epidemics hit at the same time in Weirdia, but the town won big on the lottery. Only 15 people in Weirdia escaped both diseases, but shared in the lottery prize. 50 unfortunates got both diseases and won no money. 60 got the flu and neither measles nor money, 150 measles and money but no flu, 210 measles but neither flu nor money, 50 got the flu and the measles and some lottery money. 300 of the town's 1000 inhabitants got neither of the diseases but didn't share in the money either. How many got the flu and lottery money but not the measles?

6. (7%) Referring to the previous question, what percentage of the populace got measles? What percentage got both measles and the flu? Of those who got measles, what percentage also got the flu?

7. (9%) You are given a triangle in Cartesian 3-space with vertices $(7, 9, 5)$, $(6, 7, 4)$ and $(7, 6, 5)$. Show that it is a right triangle. What is its area, exactly?

8. (9%) What rotational and reflectional symmetries does a regular decagon have? (Give the angles for the rotational symmetries, and the lines for the reflectional ones. Remember, a decagon has 10 sides.)

9. (9%) Give equations for the following in 3-space: (1) the plane passing through $(1, 0, 0)$, $(0, 3, 0)$ and $(0, 0, 5)$. (2) The sphere with centre $(1, 5, 2)$ and radius 4. Draw some kind of picture in each case.

10. (7%) Your lipstick is a cylinder with a hemisphere on top; the radius of the cylinder and hemisphere are the same. The whole thing is 7cm. high. What's the volume and surface area?

11. (7%) Your small course "Advanced Muffins, II" did well, with marks of 81%, 100%, 43% (too many almonds), 100%, 91% and the marks of two other students, which were the same. What were they, if the class average was 82%? What were the median and mode?

12. (10 %) The line segment from $(2, 0)$ to $(2, 2)$ is first translated up by the vector $\vec{v} = (0, 3)$; then it's rotated $45°$ around the origin, and then reflected across the y-axis. Where are the endpoints now? Suppose instead we reflected it across the y-axis first, rotated the thing $45°$ around the origin then, and *then* translated it by $\vec{v}$; where is it this time? (Recall, our rotations are counterclockwise.)

13. (6%) Draw a line straight down the middle from the top to the bottom of the title page of this exam and shade in the right half of the page from top to bottom. Now draw a semicircle with centre at the middle of the bottom and diameter the bottom line; shade that in, too. What's the area of everything you have shaded in? (First with π in it, and then approximated to 2 decimal place; π is about 3.142.)

McGILL UNIVERSITY

FACULTY OF SCIENCE

FINAL EXAMINATION

MATHEMATICS 189-111B

MATHEMATICS FOR EDUCATION STUDENTS

Examiner: Professor J. Loveys   Date: Wednesday, April 12, 2000
Associate Examiner: Professor W.G. Brown   Time: 2:00 P.M. - 5:00 P.M.

INSTRUCTIONS

Answer all questions in the booklet(s) provided.
Graph paper will be provided for geometry problems.
You may use rulers, compasses and protractors,
but NO calculators are permitted.
Good luck, have a fine summer, J.L.

This exam comprises the cover and two pages of questions.