Final Exam Instructions

Here are the types of questions you can expect for the final exam.

- Solve any of the following equations

    - linear (or systems of linear equations)
    - quadratic
    - exponential
    - logarithmic
    - trigonometric

- Calculate slopes and y-intercepts of linear equations. Draw diagrams of linear equations.

- Solve any plane or spherical triangle.

- Simplify algebraic expressions, especially radicals, exponents, logarithms, and using factoring. Algebraic expressions are expressions containing variables such as x, y, etc.

- Identify conic sections and calculate their features from a given equation.

- Use vectors to find bearings/angles and lengths in coordinate systems or for force problems.

- Solve word problems involving the normal distribution or the approximation of the binomial distribution by the normal distribution.

- Solve word problems using any of the methods in this list.

Here are some exam instructions.

1. You are allowed to use any hand-held calculator you want. No devices that are not primarily used as calculators are permitted (such as a smartphone).

2. You may compose your own formula sheet. It must be 8 1/2 by 11 and be hand-written. You may write on the back and the front.

3. You must show your work. Results without work leading to those results do not earn points.

Here are some problems to practice for the final exam not covered in the term tests.

1. 39.5% of Canadians voted for the Liberals in the last election. Approximate the probability that a random sample of 50 Canadians contains 18–22 people who voted for the Liberals?

2. The amount of sugar in a 10kg bag is normally distributed. The mean is $\mu = 10.09$kg; the standard deviation is $\sigma = 0.045$kg. What percentage of 10kg bags contains less than 10kg?

3. Warranty issues for a refrigerator arise after a certain number of days which is normally distributed. The mean is $\mu = 432$ days; the standard deviation is $\sigma = 47$ days. If the warranty covers the cost of a repair within 365 days, what is the percentage of warranty issues that the company providing the warranty has to cover?

4. How many people with an IQ of over 140 would you expect to live in Canada? Use a normal distribution with mean $\mu = 100$, standard deviation $\sigma = 15$, and 36.3 million for Canada's population.

5. Santiago in Chile (longitude 70°W) and Sydney in Australia (longitude 151°E) both have a latitude of 33°S. How far apart are they along a great circle? Use Napier's miraculous pentagram.

6. Santa lives near Resolute Bay in Nunavut at 74°42′N, 94°50′W. His reindeer go to London, England, roughly south-east, covering a distance of 4687km. Santa goes roughly south-west at an exact right angle to where the reindeer went. He covers a distance of 3000km. How far is he from London?

7. Solve the following right spherical triangles for the side or angle specified. C is the right angle.

   (a) $a = 16°13′, b = 59°7′$ find angle A
   (b) $c = 107°13′, A = 63°14′$ find side b
   (c) $A = 135°27′15″, B = 82°21′30″$ find side a
   (d) $b = 0.7089, B = 1.1781$ find angle A

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8. Find the shortest distance between the following cities along the great circle.

  (a) Vancouver (49°15′N, 123°6′W) and Taipei City (25°2′N, 121°38′E)

  (b) Vancouver (49°15′N, 123°6′W) and Rio de Janeiro (22°54′S, 43°12′W)

  (c) Lomé (6°8′N, 1°13′E) and Hanoi (21°2′N, 105°51′E)

9. Find the distance, the initial course, and the final course in traveling from the first city listed in each problem below to the second.

  (a) San Francisco (37°47′N, 122°26′W) and Honolulu (21°18′N, 157°52′W)

  (b) Melbourne (37°50′S, 144°59′E) and Quito (0°14′S, 78°30′W)

  (c) Moscow (55°45′N, 37°34′E) and New York (40°49′N, 73°57′W)

10. Solve the following spherical triangles.

  (a) $a = 38°, b = 45°, B = 65°$

  (b) $B = 110°10′, C = 132°59′, b = 146°6′$

  (c) $a = \frac{13\pi}{36}, b = \frac{7\pi}{9}, c = \frac{11\pi}{18}$

  (d) $A = 126°14′, B = 115°37′, c = 43°15′$

  (e) $A = 128°19′, B = 112°13′, C = 78°14′$

11. The spherical triangle lies on the sphere with radius R. Find the length of a, not represented as an angle.

  (a) $A = 60°, B = 70°, C = 100°, R = 90$

  (b) $A = 31°5′, b = 78°10′, c = 91°7′, R = 24.2$