Marks

[8] **1.** Give numerical example(s) for each of the following terminologies:

(a) Perfect number.

(b) Abundant number.

(c) Deficient number.

(d) Twin primes.

Continued on page 3

[6] **2.** Find the equation of the line passing through $(-1, -2)$ and perpendicular to the line $y + 3x = 7$. Find its x and y-intercepts.

Continued on page 4

[6] **3.** Suppose that the diameter of the circle, shown in the figure, is 8 in. What is the area outside the inscribed square $ABCD$ and inside the circle (i.e., the shaded region).

Continued on page 5

[10] **4.** What is the contrapositive of the conditional statement $p \Rightarrow \sim q$. Use truth tables to prove that the conditional statement $p \Rightarrow \sim q$ and its contrapositive are equivalent.

Continued on page 6

[10] **5.** Solve a triangle ABC, if $A = 40°$, $a = 54$ and $b = 62$.

Continued on page 7

[10] **6.** (a) Sketch the quadratic function $f(x) = -3x^2 + x - 1$. Is it convex or concave?

(b) Find the domain and the range of the function $f(x) = \dfrac{7}{x+2} + \sqrt{x+3}$.

Continued on page 8

[6] **7.** Find the greatest common factor of the two numbers 210 and 560.

Continued on page 9

[6] **8.** Subject identification numbers in a certain scientific research project consist of three letters followed by three digits and then three more letters. Assume repetitions are not allowed within any of the three groups, but letters in the first group of three may occur also in the last group of three. How many distinct identification numbers are possible?

Continued on page 10

[6] **9.** The average length of a fish caught in a given lake is 12.3 in., with a standard deviation of 4.1 in. Assume that the length of the fish is closely approximated by a normal curve. What is the probability that an individual fish caught there will be longer than 18 in.?

Continued on page 11

[8] **10.** Consider the two triangles ABC and ADE shown in the figure. The length of each side is given by:

$\overline{AD} = 3$, $\overline{DE} = 8$, $\overline{AE} = 7$, $\overline{AB} = 6$, $\overline{BC} = 16$ and $\overline{AC} = 14$.

(a) Prove that $\overline{DE}$ is parallel to $\overline{BC}$.

(b) Find the area of the triangle ABC.

Continued on page 12

[8] **11.** Let two cards be dealt successively, without replacement, from a standard 52-card deck. Find the probability of each of the following events.

(a) Spade second, given spade first.

(b) Club second, given diamond first.

(c) The first card is a jack and the second is a face card.

Continued on page 13

[6] **12.** At a large midwestern university, 80 percent of all students have their own personal computers. If five students at that university are selected at random, find the probability that exactly three of them have their own computers.

Continued on page 14

[10] **13.** Consider the following sample of data together with its frequencies.

Value	Frequency
18	15
24	6
14	8
20	14
26	3
16	12
22	10

(a) Find the mean, median, mode(s) and standard deviation.

(b) Draw the histogram and frequency polygon which correspond to the data.

Continued on page 15

Extra sheet provided for #13 question.

Continued on page 16

Formula sheet (Section 202)

Area of a triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

Area of a square $= S^2$

Area of a circle: $A = \pi r^2$, use $\pi = 3.14$

Quadratic formula: $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Combinations: $C(n,r) = \dfrac{n!}{r!(n-r)!}$

Permutations: $P(n,r) = \dfrac{n!}{(n-r)!}$

Number of subsets: 2^n

Fundamental counting principle: $n_1 \times n_2 \times n_3 \times \ldots \times n_k$

Probability of a union: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Probability of an intersection: $P(A \cap B) = P(A) \times P(B|A)$

Complement Rule: $P(A) = 1 - P(A')$

Binomial Formula: $P(x) = C(n,x)p^x q^{n-x}$

Mean: $\mu = \dfrac{\sum x}{n} = \dfrac{\sum xf}{n}$

Median position: $\dfrac{\sum f + 1}{2}$

Standard deviation: $\sigma = \sqrt{\dfrac{\sum (x-\overline{x})^2}{n-1}} = \sqrt{\dfrac{\sum (x-\overline{x})^2 f}{n-1}}$

Standard deviation from the mean: $z = \dfrac{x-\mu}{\sigma}$

sine law $a/\sin A = b/\sin B = c/\sin C$

Cosine law: $c^2 = a^2 + b^2 - 2ab\cos C$

Continued on page 17

Trigonometric Table.

Continued on page 18

Areas under the Standard Normal Curve Table.

The End

Be sure that this examination has 18 pages including this cover

The University of British Columbia

Final Examinations - April, 2005

Mathematics 335

A. Khadra

Closed book examination — Time: 2.5 hours

Name _____ **Signature** _____

Student Number _____ **Instructor's Name** _____

Section Number _____

Special Instructions:

Candidates may bring a calculator. Show enough of your work to **justify** your answers and **all** steps. A Formula Sheet and 2 tables are included.

1		8
2		6
3		6
4		10
5		10
6		10
7		6
8		6
9		6
10		8
11		8
12		6
13		10
Total		100

Rules governing examinations

1. Each candidate should be prepared to produce his library/AMS card upon request.

2. Read and observe the following rules:

No candidate shall be permitted to enter the examination room after the expiration of one half hour, or to leave during the first half hour of the examination. Candidates are not permitted to ask questions of the invigilators, except in cases of supposed errors or ambiguities in examination questions.

CAUTION - Candidates guilty of any of the following or similar practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.

(a) Making use of any books, papers or memoranda, other than those authorized by the examiners.

(b) Speaking or communicating with other candidates.

(c) Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.

3. Smoking is not permitted during examinations.