Complete all of the following problems and hand in your solutions to your tutor by 1:50pm on Tuesday 28 October, 2003. **Make sure that your name and student number are on each sheet of your answers**. Solutions to all the problems will be distributed later.

Completing 5 out of the 6 assignments is compulsory and each of the five assignments will contribute 4% towards your final grade. Late assignments will not be accepted unless you have a very good excuse.

1. **(a)** Show that $(\mathbb{R}, +, \times)$ is a field, where $+$ and $\times$ denote regular addition and multiplication, respectively.

(b) Explain why $(\mathbb{Z}_8, \oplus, \odot)$ is not a field, where $\oplus$ denotes addition modulo 8 and $\odot$ denotes multiplication modulo 8.

2. Complete the following problems from the textbook:

- Section 6.1: pages 279–280: Questions 8bc, 11, 18
- Section 6.2, pages 292-295: Questions 5, 15, 30, 37
- Section 6.3, pages 303-306: Questions 10, 22, 24
- Section 6.4, pages 320-322: Questions 7, 13bc, 16, 20

3. Find simplified expressions for each of the following.

(a) $\binom{y+1}{y-2}$ **(b)** $\binom{10}{4} + \binom{9}{4} + \binom{9}{5}$

4. **(a)** Use the Binomial Theorem to expand and simplify $(2x - y)^5$.

(b) Find the coefficient of p^3q^5 in the expansion of $(p - q)^8$.

5. **(Bonus Question, Section 6.5)**
An Italian restaurant sells 10 different pasta dishes.

(a) You and four friends attend the restaurant for dinner and you each order a pasta dish. How many possible selections of five pasta dishes are there?

(b) How many selections of the five pasta dishes are there in which exactly two of you choose the ravioli with pesto sauce?

(c) How many selections of the five pasta dishes are there in which at least two of you choose the ravioli with pesto sauce?