- Please put your name and ID number on your blue book.
- The exam is CLOSED BOOK, but a PAGE OF NOTES IS ALLOWED.
- Calculators are NOT ALLOWED. You need not evaluate binomial coefficients.
- **You must show your work to receive credit.**

1. Give an example of each of the following or explain why it cannot be done.

    (a) A bijection from $\{1, 2, 3, 4\}$ to $\{a, b, c\}$.

    (b) A permutation of $\{1, 2, 3, 4, 5, 6, 7\}$ that has a cycle of length 4 and also has a cycle of length 5.

2. A committee contains 7 women and 6 men. We want to form a subcommittee with 5 of these people.

    (a) How many ways can this be done?

    (b) How many ways can this be done if the subcommittee must contain at least 2 women and at least 2 men?

3. The table below gives the joint distribution function, $h_{X,Y}$, for two random variables X and Y.

    (a) Find the distribution functions f_X for X and f_Y for Y.
    (b) Are X and Y independent? (You must give a correct reason for your answer.)

$h_{X,Y}$	Y=−1	Y=0	Y=+1
X=−1	1/6	0	1/6
X=0	0	1/3	0
X=+1	1/6	0	1/6

4. A deck of cards has 52 cards and 13 of these cards are spades.

    (a) I take seven cards at random from the deck. What is the probability that I get exactly three spades?

    (b) I take a card at random from the deck, note whether it is a spade, and put it back. If I do this seven times, what is the probability that I get a spade exactly three times?

    Suggestion: Think of spade and non-spade like bad and good.

END OF EXAM