

Name:

Test 2: Ch. 5, 6

Complete the following problems to the best of your ability. **SHOW ALL OF YOUR WORK.** Unshown work will not be graded. You may use a calculator.

1. [35] We're a gelato company making gelato to sell to the Decision Algorithm Ice Cream Parlour. We make two flavours; Vanilla and Chocolate. A quart of Vanilla requires 2 eggs and 3 cups of cream. A quart of chocolate requires 1 egg and 3 cups of cream. We have 500 eggs and 900 cups of cream in stock. The D.A.I.C.P. will buy our gelato at \$1.50 a quart for vanilla and \$2 a quart for chocolate. How many quarts of each type should we produce to maximise our revenue? What is the maximum revenue?

2. [25] Let  $A = \{x|x \text{ is an even integer}\}$ ,  $B = \{x|x \leq 20\}$ , and  $C = \{x|x > 0\}$ .

(a) Write out the following sets (either by listing the elements or using set builder notation):

i.  $A \cap B$

ii.  $B \cap C$

iii.  $A \cup C$

(b) Give the cardinalities of the following sets (remember,  $\mathbb{Z}$  is the set of all integers):

i.  $n(B \cap C \cap \mathbb{Z})$

ii.  $n(A \cup B)$

3. [10] Let  $A$  be the set of outcomes of rolling a 4-sided die. Let  $B$  be the set of outcomes of flipping a coin. Write out a full list of the elements of  $A \times B$ .

4. How many five-letter words (not necessarily real words) can we make with our 26 letters that fit the following qualities:
- (a) [5] The only letters used are A and B.
  - (b) [5] All five letters are vowels
  - (c) [5] All five letters are vowels, and no letter repeats
  - (d) [10] Three of the letters are T, and the other two are vowels.
  - (e) [10] Two of the letters are the same, the other three are all distinct.