Yr 11, Ext 1

Name: Date:

Topic: **COUNTING TECHNIQUES**

Question 1 [3 + 1 + 1 + 1 + 1 = 7 marks]

A survey of the 60 Mathematics students at Bristol College produced the following information, on which of the Mathematics courses they chose. One student did Calculus, Statistics and Trigonometry, 16 did Trigonometry only, 16 did Statistics and Calculus, 6 did Statistics and Trigonometry but not Calculus, 1 did Calculus and Trigonometry. Given that all students surveyed do at least one of the subjects and that there were 40 Statistics students then find, by drawing a Venn diagram how many students chose:

(a)

(b) Calculus.

(c) Statistics only.

(d) Trigonometry or Calculus.

(e) at least two of the Mathematics subjects.

Question 2 [1 + 2 + 2 + 1 + 2 = 8 marks]

The letters of the word TRIANGLE are to be formed into words (not necessarily making sense) without repeating any letter twice.

(a) How many 8 letter words can be formed if:
(i) there are no restrictions?

(ii) the words must begin and end with a vowel?

(iii) the words must not have the I, A and N adjacent?

(b) How many 5 lettered words can be formed if:
(i) there are no restrictions?

(ii) the words must contain all the vowels?

Question 3 [1 + 2 + 2 = 5 marks]

A Restaurant offers the following Special Menu.

Entree	**Main**	**Sweet**	**Wine**
Prawns	Fish	Ice cream	Red
Pate	Pasta	Cheesecake	White
Cocktail	Roast	Fruit Salad	
	Steak		

For the cost of $25 you may have one of each of the courses.

Sue goes to the restaurant and decides to have the Special.
How many different meals can she have if:

(a) there are no restrictions.

(b) Red wine cannot be ordered with the Fish.

(c) only White wine can be ordered with Fish or Pasta and only Red wine can be ordered with the Steak or Roast.

Question 4 [1 + 2 + 2 = 5 marks]

A horticulturalist has a box of seeds. There are 6 petunia seeds, 8 pansy seeds and 5 violet seeds. Each seed produces flowers of a different colour. He reaches in to the box and picks out 5 seeds. How many different selections of seeds are possible which include:

(a) only pansies?

(b) at most two violet seeds?

(c) at least one petunia seed?

Question 5 [1 + 1 + 1 + 2 = 5 marks]

Frank owns a computer and to log in he needs to type in 5 letters.
How many different passwords are possible if:

(a) there are no restrictions?

(b) no letter is to be repeated?

(c) the password must begin and end with a letter from his name, and there are no repeated letters?

After typing in the password Frank forgets which letters he used. How many guesses will he need to make before he is assured of getting the right password if:

(d) he knows that F and K were two of the letters and there were no repeated letters?

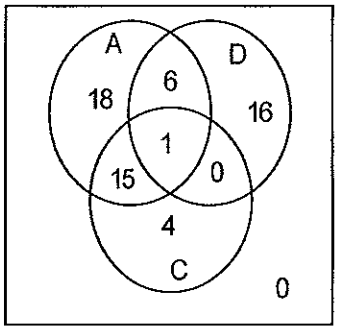
(7 + 8 + 5 + 5 + 5 = 30 marks)

Name: Date:

Topic: **COUNTING TECHNIQUES**

Question 1

(a)



[3]

(b) 20 (c) 18 (d) 42 (e) 22 [1,1,1,1]

Question 2

(a) (i) $8!$ = 40320 [1]

(ii) $3 \times 6! \times 2$ = 4320 [1,1]

(iii) $8! - 6! \times 3!$ = 36000 [1,1]

(b) (i) $8 \times 7 \times 6 \times 5 \times 4$ = 6720 [1]

(ii) $\binom{3}{3}\binom{5}{2} \times 5!$ = 1200 [1,1]

Question 3

(a) $\binom{3}{1}\binom{4}{1}\binom{3}{1}\binom{2}{1}$ = 72 [1]

(b) $\binom{3}{1}\binom{1}{1}\binom{3}{1}\binom{1}{1} + \binom{3}{1}\binom{3}{1}\binom{3}{1}\binom{2}{1}$ = 63 [1,1]

(c) $\binom{3}{1}\binom{2}{1}\binom{3}{1}\binom{1}{1} + \binom{3}{1}\binom{2}{1}\binom{3}{1}\binom{1}{1}$ = 36 [1,1]

Question 4

(a) $\binom{8}{5} = 56$ [1]

(b) $\binom{14}{5} + \binom{14}{4}\binom{5}{1} + \binom{14}{3}\binom{5}{2} = 10647$ [2]

(c) $\binom{19}{5} - \binom{13}{5} = 10341$ [1,1]

Question 5

(a) $26^5 = 11881376$ [1]

(b) $26 \times 25 \times 24 \times 23 \times 22 = 7893600$ [1]

(c) $5 \times 24 \times 23 \times 22 \times 4 = 242880$ [1]

(d) $\binom{2}{2}\binom{24}{3} \times 5! = 242880$ [1,1]

(7 + 8 + 5 + 5 + 5 = 30 marks)