



ADDITIONAL MATHEMATICS

2002 – 2011

CLASSIFIED COMBINATIONS_nPERMUTATIONS

**Compiled & Edited
By**

Dr. Eltayeb Abdul Rhman

www.drtayeb.tk

**First Edition
2011**

7 A team of 6 members is to be selected from 6 women and 8 men.

(i) Find the number of different teams that can be selected.

[1]

*For
Examiner's
Use*

(ii) Find the number of different teams that consist of 2 women and 4 men.

[3]

(iii) Find the number of different teams that contain no more than 1 woman.

[3]

6 (a) A shelf contains 8 different travel books, of which 5 are about Europe and 3 are about Africa.

(i) Find the number of different ways the books can be arranged if there are no restrictions. [2]

(ii) Find the number of different ways the books can be arranged if the 5 books about Europe are kept together. [2]

(b) 3 DVDs and 2 videotapes are to be selected from a collection of 7 DVDs and 5 videotapes.

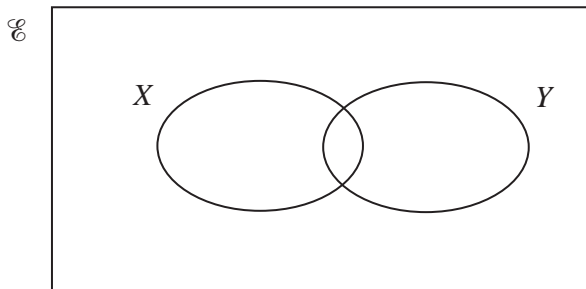
Calculate the number of different selections that could be made. [3]

2 (a) An outdoor club has three sections, walking, biking and rock-climbing. Using \mathcal{C} to denote the set of all members of the club and W , B and R to denote the members of the walking, biking and rock-climbing sections respectively, write each of the following statements using set notation.

(i) There are 72 members in the club. [1]

(ii) Every member of the rock-climbing section is also a member of the walking section. [1]

(b) (i)



On the diagram shade the region which represents the set $X \cup Y'$. [1]

(ii) Using set notation express the set $X \cup Y'$ in an alternative way. [1]

- 4 Six-digit numbers are to be formed using the digits 3, 4, 5, 6, 7 and 9. Each digit may only be used once in any number.

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(i) Find how many different six-digit numbers can be formed. [1]

Find how many of these six-digit numbers are

(ii) even, [1]

(iii) greater than 500 000, [1]

(iv) even and greater than 500 000. [3]

5 Four boys and three girls are to be seated in a row. Calculate the number of different ways that this can be done if

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(i) the boys and girls sit alternately, [2]

(ii) the boys sit together and the girls sit together, [2]

(iii) a boy sits at each end of the row. [2]

5 A school council of 6 people is to be chosen from a group of 8 students and 6 teachers. Calculate the number of different ways that the council can be selected if

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(i) there are no restrictions, [2]

(ii) there must be at least 1 teacher on the council and more students than teachers. [3]

After the council is chosen, a chairperson and a secretary have to be selected from the 6 council members.

(iii) Calculate the number of different ways in which a chairperson and a secretary can be selected. [1]

6 (a) Calculate the number of different 6-digit numbers which can be formed using the digits 0, 1, 2, 3, 4, 5 without repetition and assuming that a number cannot begin with 0. [2]

(b) A committee of 4 people is to be chosen from 4 women and 5 men. The committee must contain at least 1 woman. Calculate the number of different committees that can be formed. [4]

- 7 (i) Find the number of different arrangements of the letters of the word MEXICO.

Find the number of these arrangements

(ii) which begin with M,

(iii) which have the letter X at one end and the letter C at the other end.

[5]

Four of the letters of the word MEXICO are selected at random. Find the number of different combinations if

(iv) there is no restriction on the letters selected,

(v) the letter M must be selected.

[3]

- 2 A committee of 5 people is to be selected from 6 men and 4 women. Find

(i) the number of different ways in which the committee can be selected,

[1]

(ii) the number of these selections with more women than men.

[4]

- 10 A music student needs to select 7 pieces of music from 6 classical pieces and 4 modern pieces. Find the number of different selections that she can make if

(i) there are no restrictions,

[1]

(ii) there are to be only 2 modern pieces included,

[2]

(iii) there are to be more classical pieces than modern pieces.

[4]

- 2 In a singing competition there are 8 contestants. Each contestant sings in the first round of this competition.

(i) In how many different orders could the contestants sing?

[1]

After the first round 5 contestants are chosen.

(ii) In how many different ways can these 5 contestants be chosen?

[2]

These 5 contestants sing again and then First, Second and Third prizes are awarded to three of them.

(iii) In how many different ways can the prizes be awarded?

[2]

12 Answer only **one** of the following two alternatives.

EITHER

- (a) An examination paper contains 12 different questions of which 3 are on trigonometry, 4 are on algebra and 5 are on calculus. Candidates are asked to answer 8 questions. Calculate
- (i) the number of different ways in which a candidate can select 8 questions if there is no restriction,
 - (ii) the number of these selections which contain questions on only 2 of the 3 topics, trigonometry, algebra and calculus.

[4]

- (b) A fashion magazine runs a competition, in which 8 photographs of dresses are shown, lettered *A, B, C, D, E, F, G* and *H*. Competitors are asked to submit an arrangement of 5 letters showing their choice of dresses in descending order of merit. The winner is picked at random from those competitors whose arrangement of letters agrees with that chosen by a panel of experts.

- (i) Calculate the number of possible arrangements of 5 letters chosen from the 8.

Calculate the number of these arrangements

- (ii) in which *A* is placed first,
- (iii) which contain *A*.

[6]

- 2 A student has a collection of 9 CDs, of which 4 are by the Beatles, 3 are by Abba and 2 are by the Rolling Stones. She selects 4 of the CDs from her collection. Calculate the number of ways in which she can make her selection if

- (i) her selection must contain her favourite Beatles CD, [2]
- (ii) her selection must contain 2 CDs by one group and 2 CDs by another. [3]

- 7 (a) 7 boys are to be seated in a row. Calculate the number of different ways in which this can be done if 2 particular boys, Andrew and Brian, have exactly 3 of the other boys between them. [4]
- (b) A box contains sweets of 6 different flavours. There are at least 2 sweets of each flavour. A girl selects 3 sweets from the box. Given that these 3 sweets are not all of the same flavour, calculate the number of different ways she can select her 3 sweets. [3]

- 7 A team of 6 members is to be selected from 6 women and 8 men.
- (i) Find the number of different teams that can be selected. [1]
- (ii) Find the number of different teams that consist of 2 women and 4 men. [3]
- (iii) Find the number of different teams that contain no more than 1 woman. [3]
- 10 (a) How many different four-digit numbers can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 if no digit may be repeated? [2]
- (b) In a group of 13 entertainers, 8 are singers and 5 are comedians. A concert is to be given by 5 of these entertainers. In the concert there must be at least 1 comedian and there must be more singers than comedians. Find the number of different ways that the 5 entertainers can be selected. [6]
- 6 (a) A sports team of 3 attackers, 2 centres and 4 defenders is to be chosen from a squad of 5 attackers, 3 centres and 6 defenders. Calculate the number of different ways in which this can be done. [3]
- (b) How many different 4-digit numbers greater than 3000 can be formed using the six digits 1, 2, 3, 4, 5 and 6 if no digit can be used more than once? [3]
- 11 (a) Each day a newsagent sells copies of 10 different newspapers, one of which is *The Times*. A customer buys 3 different newspapers. Calculate the number of ways the customer can select his newspapers
- (i) if there is no restriction, [1]
- (ii) if 1 of the 3 newspapers is *The Times*. [1]
- (b) Calculate the number of different 5-digit numbers which can be formed using the digits 0,1,2,3,4 without repetition and assuming that a number cannot begin with 0. [2]
- How many of these 5-digit numbers are even? [4]

- 6 (a) A shelf contains 8 different travel books, of which 5 are about Europe and 3 are about Africa.
- (i) Find the number of different ways the books can be arranged if there are no restrictions. [2]
- (ii) Find the number of different ways the books can be arranged if the 5 books about Europe are kept together. [2]
- (b) 3 DVDs and 2 videotapes are to be selected from a collection of 7 DVDs and 5 videotapes.
- Calculate the number of different selections that could be made. [3]
- 4 A badminton team of 4 men and 4 women is to be selected from 9 men and 6 women.
- (i) Find the total number of ways in which the team can be selected if there are no restrictions on the selection. [3]
- Two of the men are twins.
- (ii) Find the number of ways in which the team can be selected if exactly one of the twins is in the team. [3]
- 7 (a) Find the number of different arrangements of the 9 letters of the word SINGAPORE in which S does **not** occur as the first letter. [2]
- (b) 3 students are selected to form a chess team from a group of 5 girls and 3 boys. Find the number of possible teams that can be selected in which there are more girls than boys. [4]
- 5 (a) The producer of a play requires a total cast of 5, of which 3 are actors and 2 are actresses. He auditions 5 actors and 4 actresses for the cast. Find the total number of ways in which the cast can be obtained. [3]
- (b) Find how many different odd 4-digit numbers less than 4000 can be made from the digits 1, 2, 3, 4, 5, 6, 7 if no digit may be repeated. [3]

- 9** A musician has to play 4 pieces from a list of 9. Of these 9 pieces 4 were written by Beethoven, 3 by Handel and 2 by Sibelius. Calculate the number of ways the 4 pieces can be chosen if
- (i)** there are no restrictions, [2]
 - (ii)** there must be 2 pieces by Beethoven, 1 by Handel and 1 by Sibelius, [3]
 - (iii)** there must be at least one piece by each composer. [4]
- 2** A 4-digit number is formed by using four of the seven digits 2, 3, 4, 5, 6, 7 and 8. No digit can be used more than once in any one number. Find how many different 4-digit numbers can be formed if
- (i)** there are no restrictions, [2]
 - (ii)** the number is even. [2]
- 6** A 4-digit number is formed by using four of the seven digits 1, 3, 4, 5, 7, 8 and 9. No digit can be used more than once in any one number. Find how many different 4-digit numbers can be formed if
- (i)** there are no restrictions, [2]
 - (ii)** the number is less than 4000, [2]
 - (iii)** the number is even and less than 4000. [2]



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