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VCE Specialist Mathematics ½
Combinatorics I [5.1]
Test

26.5 Marks. 1 Minute Reading. 27 Minutes Writing.

Results:

Test Questions	_____ / 26.5
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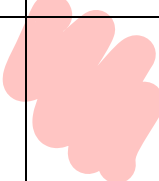



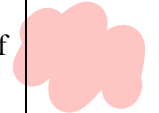




$${}^nC_r = \binom{n}{r}$$

Section A: Test Questions (26.5 Marks)

Question 1 (3.5 marks)

Tick whether the following statements are **true** or **false**.

Statement	True	False
a. The multiplication principle states that if there are n ways to perform the first task and m ways to perform the second task, then there are $n \times m$ ways to perform both tasks.		
b. In a permutation, order matters.		
c. Combinations are used when order doesn't matter.		
d. The formula for combinations is $\frac{n!}{r! \times (n-r)!}$.		
e. In combination, the number of subsets of size r that can be chosen from a set of size n is given by nC_r .		
f. The number of ways to choose k objects from a set of n identical objects is nC_k .		
g. The addition principle states that if there are m ways to do one thing and n ways to do another, then there are $m + n$ ways to do <u>both things</u> .		

Space for Personal Notes

Question 2 (1 mark)

An ice cream shop offers 4 types of cones and 6 different flavours of ice cream. How many possible ice cream cone combinations are there?

$$4 \cdot 6 = 24 \text{ ways}$$

Space for Personal Notes

Question 3 (4 marks) Tech-Active.

- a. A teacher wants to randomly choose four people from the class of 20 to help out at the open-day BBQ. In how many ways can this be done? (2 marks)

$${}^{20}C_4 = 4845$$

- b. A teacher wants to award prizes for 1st, 2nd, 3rd and 4th in the class of 20. In how many ways can the prizes be awarded (assuming no two students tie)? (2 marks)

$${}^{20}P_4 = 116280 \text{ ways}$$

Space for Personal Notes

Question 4 (8 marks)

①

②

Decide whether or not the order of selection is important, and then write the formula to work out the following:

- a. How many different sets of four colours can be selected from the colours red, orange, yellow, green, blue, and violet? (2 marks)

① not

② 6C_4

- b. In how many ways can a team of female basketball players (5 people) be selected from 9 girls? (2 marks)

① not

② 9C_5

- c. A race has 24 runners. In how many ways can the first three places be decided? (2 marks)

① yes

② ${}^{24}P_3$

- d. A secretary has eight letters and only five ~~distinct~~ stamps. How many ways can he select the letters for posting? (2 marks)

 8C_5

Question 5 (3 marks) Tech-Active.

How many arrangements of the letters of the word "~~arrangements~~" are there?

Combinations

$$\frac{12!}{2!2!2!} = 59875200 \text{ ways}$$

Space for Personal Notes

Question 6 (4 marks)

For each of the following, write the answer in factorial notation:

→ assume order doesn't matter

- a. In a lottery, you select 8 numbers out of 50. How many ways are there to do this? (2 marks)

$${}_{50}C_8 = \frac{50!}{8!42!}$$

- b. A student must select 6 subjects. In how many ways can they do that if there are 20 subjects and 1 is compulsory? (2 marks)

choosing: 5 out of 19

$${}_{19}C_5 = \frac{19!}{5!14!}$$

Space for Personal Notes

Question 7 (3 marks)

In how many ways can you choose 3 chocolates from a bag containing 12 different chocolates?

$${}^{12}C_3 = 220 \text{ ways}$$

Space for Personal Notes



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