FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

N5: Counting strategies

Reason with systematic listing and the product rule

20 marks · 25 minutes · Non-calculator

1) A café has 4 starters and 3 main courses. Rob says there are 7 possible two-course meals. Explain his mistake and give the correct number.

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[Question 1: 2 marks]

2) Show that there are 24 ways to arrange 4 different books on a shelf.

[Question 2: 2 marks]

3) Codes are made from 3 different letters from A, B, C, D and E. Show that there are 60 possible codes.

[Question 3: 2 marks]

4) Kit makes two-digit numbers from 1, 3, 5 and 7. Digits may be repeated. He says there are 12 numbers. Explain why he is wrong.

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[Question 4: 2 marks]

5) Explain why there are 10, not 20, ways to choose a pair of people from 5 people.

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[Question 5: 2 marks]

6) Show that there are 900 three-digit whole numbers.

[Question 6: 2 marks]

7) Three-digit numbers are made from the digits 1 to 6, with repeats allowed. Show that 108 of them are even.

[Question 7: 2 marks]

8) Which gives more possible passwords: 2 letters followed by 2 digits, or 4 digits? Show how you decide.

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[Question 8: 2 marks]

9) Is it true that 3 shirts and 3 pairs of trousers give more outfits than 2 shirts and 5 pairs of trousers? Explain.

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[Question 9: 2 marks]

10) Explain why we multiply, rather than add, the number of choices when counting combinations.

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[Question 10: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	12	Should multiply (C1); $4 \times 3 = 12$ (B1).
2	Shown	$4 \times 3 \times 2 \times 1$ (M1); 24 (C1).
3	Shown	$5 \times 4 \times 3$ (M1); 60 (C1).
4	16	He has not allowed repeats (C1); $4 \times 4 = 16$ (B1).
5	Explanation	20 counts each pair twice, e.g. AB and BA (C1); $20 \div 2$ (C1).
6	Shown	$9 \times 10 \times 10$ or $999 - 99$ (M1); 900 (C1).
7	Shown	Last digit 2, 4 or 6 (M1); $6 \times 6 \times 3 = 108$ (C1).
8	Letters and digits	$26^2 \times 100 = 67\,600$ and $10\,000$ (M1); conclusion (C1).
9	No	9 and 10 (M1); conclusion (C1).
10	Explanation	Each choice of one item can go with every choice of the other (C2).