# Level 2 Further Maths

## Product Rule for Counting

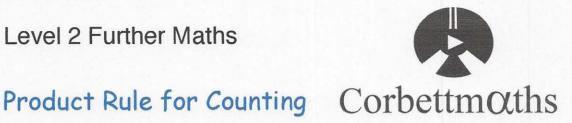**Corbettmaths**

Ensure you have: Pencil or pen

*Answers*

**Guidance**

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

## Revision for this topic

## www.corbettmaths.com/more/further-maths/

1.    Benjamin picks a 4 digit pin for his debit card.

Each digit is a number is 0 to 9.
Benjamin can repeat digits.

His pin starts with 3  6

| 3 | 6 |  |  |

(a)  How many possible codes are there?

$$10 \times 10 = 100$$

................ 100 ................

(1)

The fourth digit is larger than the third digit.

(b)  How many possible codes are there?

3rd digit          Possibilities for 4th

0                    9
1                    8
2                    7
3                    6
4                    5
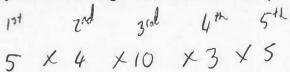5                    4
6                    3
7                    2
8                    1
9                    0

................ 45 ................

(2)

2. Ethan picks a 5-digit <u>even</u> number.

The first digit is odd
The second digit is prime    2   3   5   7
The fourth digit is a multiple of 3   3   6   9

How many different 5-digit numbers could he pick?

1st      2nd      3rd      4th      5th

5 × 4 × 10 × 3 × 5

.......................3000.......................

**(2)**

3. Tiernan has five number cards.

| 1 | 2 | 3 | 4 | 5 |

Tiernan is making 5-digit numbers using the number cards.

How many different ways can Tiernan arrange the number cards?

5 × 4 × 3 × 2 × 1

.......................120.......................

**(3)**
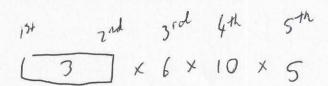
4.  Orla picks a 5-digit odd number.

    3  1
    6  2
    9  3

    The second digit is a third of the first digit.
    The third digit is less than 6

    How many different numbers could she pick?

    1st        2nd      3rd    4th      5th

    [  3  ]  × 6 × 10 × 5

    900

    (3)

5.  Jackson makes 5-digit numbers using all of these cards.

    | 5 | 3 | 9 | 4 | 8 |

    How many different numbers greater than 50000 can Jackson make?

    3 × 4 × 3 × 2 × 1

    72

    (3)

6.    In a gym there are

        9 exercise classes on a Monday
        8 exercise classes on a Wednesday
        15 exercise classes on a Friday

Max is going to attend either

        a class on Monday and a class on Wednesday
    or    a class on Monday and a class on Friday
    or    a class on Monday, Wednesday and Friday.

How many different ways can Max pick which exercise classes he is going to attend?

M    W
$9 \times 8 = 72$

M    F
$9 \times 15 = 135$

M  W  F
$9 \times 8 \times 15 = 1080$

1287

(3)

7.    James is creating a 6-digit code to lock his iPad.

He does not repeat any digit.

(a)  How many possible codes can James create?

$10 \times 9 \times 8 \times 7 \times 6 \times 5$

151200
........................
**(2)**

10
21
32
43
54
65
76
87
98

Kelvin also creates a 6-digit code.

For the first two digits of his code he uses a multiple of 13.   13  26  39  52  65  78  91
← The third digit is one greater than the fourth digit.
For the last two digits, Kelvin uses an odd number between 10 and 80.

11 → 79

(b)  How many possible codes can Kelvin create?

1st     2nd     3rd   4th     5th   6th

[ 7 ]  ×  [ 9 ]  ×  [ 35 ]

2205
........................
**(2)**

8. In a class, there are fifteen girls and thirteen boys.
three of the girls and four of the boys are left handed.
*12 right handed girls        9 right handed boys*
The teacher picks one girl and one boy at random.

What percentage of the possible pairings of students are **both** the students right handed?

$$15 \times 13 = 195$$

$$12 \times 9 = 108$$

$$\frac{108}{195} =$$

........... 55.38% ...........

(3)

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9. Chris makes 5-digit numbers using all of the cards below.

| 1 | 2 | 3 | 5 | 8 |

How many different numbers less than 70000 can he make?

$$4 \times 4 \times 3 \times 2 \times 1$$

........... 96 ...........

(3)

10. In Year 10 there are 80 girls.
Two of the girls are going to be chosen at random to go on a trip.

Work out the number of different pairs that can be chosen.

$$\frac{80 \times 79}{2}$$

3160

(2)

11. How many odd numbers greater than 40,000 can be created using these digits

2    3    4    5    9

using each digit only once.

| 5 | 4 | 9 |
|---|---|---|
| 52349 | 42359 | 92345 |
| 53249 | 42539 | 92435 |
| 52439 | 45239 | 93245 |
| 53429 | 43259 | 94235 |
| 54239 | 45329 | 93425 |
| 54329 | 43529 | 94325 |
| 59423 | 42593 | 95243 |
| 59243 | 42953 | 95423 |
| 52943 | 45293 | 94523 |
| 54923 | 49253 | 92543 |
| 52493 | 49523 | 92453 |
| 54293 | 45923 | 92543 |
| | 49235 | |
| | 49325 | |
| | 42935 | |
| | 43925 | |
| | 42395 | |
| | 43295 | |

42

(3)

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12. A pizza parlour sells 12 different pizza toppings.

Grace orders a pizza with 3 different pizza toppings.

How many different pizzas can Grace order?

$$\frac{12 \times 11 \times 10}{6}$$

$$2 \times 11 \times 10 = 220$$

..........220..........

(4)

13. George has the six number cards below.

4   2   9   1   6   8

(a) How many 4-digit numbers can be made that are less than 5000?

last 3 digits
5 × 4 × 3 = 60

4 _ _ _    gives 60 possibilities
2 _ _ _       "    60    "
1 _ _ _       "    60    "

180

(3)

(b) How many 5-digit **even** numbers can be made that are greater than 30000?

4 × 3 × 2 = [24]

4 _ _ _ 2    gives 24 possibilities
4 _ _ _ 6       "    24    "
4 _ _ _ 8       "    24    "
6 _ _ _ 2       "    24
6 _ _ _ 4       "    24    "
6 _ _ _ 8       "    24    "
8 _ _ _ 2       "    24    "
8 _ _ _ 4       "    24    "
8 _ _ _ 6       "    24    "
9 _ _ _ 2       "    24    "
9 _ _ _ 4       "    24    "
9 _ _ _ 6       "    24    "

9 _ _ _ 8       "    24    "

312

(4)

14. A group of 14 people enter a room.

Each person shakes hands with all the other people in the room.

How many handshakes are there in total?

$13 + 12 + 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1$

91

**(3)**