THIRD SPACE
LEARNING

Product Rule for Counting - Worksheet

Skill

Group A - Selecting from two sets

Work out how many different combinations for each question:

1) A restaurant has 6 starters and 8 main courses on its menu. If you order a starter and a main course how many different combinations of starters and main courses are there?

2) A class has 10 boys and 9 girls. One girl and one boy are to be chosen to represent the class in a quiz. How many different pairs are possible?

3) Luke has 20 different cards. He gives one card to Harry and one card to Gill. How many different ways can he do this?

4) A class has 8 boys and 10 girls. One girl and one boy are to be chosen to represent the class in a quiz. How many different pairs are possible?

5) A restaurant has 4 starters and 6 main courses on its menu. If you order a starter and a main course how many different combinations of starters and main courses are there?

6) A drama club has 15 members: 13 males and 2 females. A male and a female are needed to sing a duet. How many different pairs are possible?

7) Luke has 12 different cards. He gives one card to Harry and one card to Gill. How many different ways can he do this?

8) A drama club has 30 members: 17 males and 13 females. A male and a female are needed to sing a duet. How many different pairs are possible?

9) A class has 10 boys and 12 girls. One girl and one boy are to be chosen to represent the class in a quiz. How many different pairs are possible?

10) A tennis club has 27 members. 12 males and 15 females. A male and a female will be selected for the next match. How many different ways could this happen?

11) Luke has 22 different cards. He gives one card to Harry and one card to Gill. How many different ways can he do this?

12) A restaurant has 8 starters and 10 main courses on its menu. If you order a starter and a main course how many different combinations of starters and main courses are there?

Product Rule for Counting - Worksheet

Group B - Selecting from multiple sets when the order does not matter

Work out how many different combinations for each question:

1) A combination lock has 2 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations are possible?

2) A combination lock has 3 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations are possible?

3) A combination lock has 4 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations are possible?

4) How many different combinations can be used on a 3-digit combination padlock where each dial can be set to $1 - 5$ inclusive?

5) A restaurant has 4 starters, 8 main courses and 6 different deserts on its menu. If you order a starter, a main course and a dessert how many different combinations of 3 course meals are possible?

6) Luke has 15 different cards. He gives one card to Harry, one to Ellie and one card to Gill. How many different ways can he do this?

7) A restaurant has 5 starters, 9 main courses and 3 different deserts on its menu. If you order a starter, a main course and a dessert how many different combinations of 3 course meals are possible?

8) A football team is designing their new team kit. They can choose from 5 different pairs of socks, 6 different pairs of shorts and 14 different tops. How many different team kit designs are possible?

9) A restaurant has 8 starters, 6 main courses and 5 different deserts on its menu. If you order a starter, a main course and a dessert how many different combinations of 3 course meals are possible?

10) Luke has 10 different cards. He gives one card to Harry, one to Ellie and one card to Gill. How many different ways can he do this?

11) How many different combinations, that have 3 different digits, can be used on a 3-digit combination padlock where each dial can be set to $1 - 5$ inclusive?

12) How many different combinations, that have 4 different digits, can be used on a combination lock that has 4 wheels, each having the digits 0 to 9 inclusive on them?

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Product Rule for Counting - Worksheet

Group C - Selecting from multiple sets when the order does matter

Work out how many different combinations for each question:

1) A combination lock has 3 wheels, each having the digits 1 to 5 inclusive on them. How many different combinations that are even numbers are possible?

2) Carl picks a 3-digit number. The first digit is greater than 2. The last digit is a multiple of 4. How many different 3-digit numbers could he pick?

3) A combination lock has 3 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations which are greater than or equal to 900 are possible?

4) Carl picks a 3-digit number. The first digit is less than 2. The last digit is a multiple of 4. How many different 3-digit numbers could he pick?

5) A combination lock has 3 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations which are greater than 299 are possible?

6) Carl picks a 3-digit number. The first digit is less than 5. The last digit is a multiple of 2. How many different 3-digit numbers could he pick?

7) A combination lock has 4 wheels, each having the digits 1 to 5 inclusive on them. How many different combinations that are even numbers that are also greater than 3000 are possible?

8) Carl picks a 4-digit number. The first digit is greater than 2. The last digit is a multiple of 4. How many different 4-digit numbers could he pick?

9) A combination lock has 3 wheels, each having the digits 1 to 9 inclusive on them. How many different combinations which are multiples of 5 are possible?

10) Carl picks a 4-digit number. The first digit is less than 2. The last digit is a multiple of 4. How many different 4-digit numbers could he pick?

11) A combination lock has 4 wheels, each having the digits 1 to 5 inclusive on them. How many different combinations that are multiples of 5 are possible?

12) Carl picks a 4-digit number. The first digit is less than 5. The last digit is a multiple of 2. How many different 4-digit numbers could he pick?

Product Rule for Counting - Worksheet

Applied

1) **(a)** As part of a meal deal offer you can choose one sandwich, one snack and one drink. There are:

> 8 different sandwiches;
> 4 different drinks;
> 5 different snacks.

How many different meal combinations are there?

(b) Three of the sandwiches have cheese in them.
Two of the drinks are fizzy.

Daniel picks a meal deal at random.

Work out the probability that the sandwich has cheese in it and the drink is fizzy.

2) Paul is choosing a flower and a house plant for his new home.
There are 16 different types of flowers and some house plants at the garden centre. Paul says:

"There are 148 different ways to choose one flower and one house plant".

Could Paul be correct? You must show how you get your answer.

3) There are 10 people in a room. If each person shakes each other person's hand once, work out the number of handshakes that take place.

4) Robert picks a 4-digit even number.
The second digit is a multiple of 4.
How many different numbers could Robert pick?

Product Rule for Counting - Worksheet

5)   Below is a combination lock. This lock requires a 4-digit code.
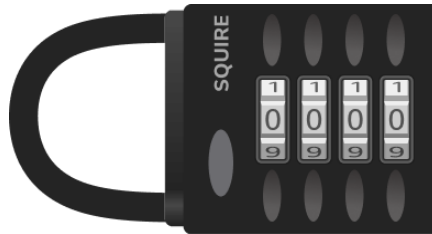
(a)   How many different codes could you have on this combination lock?

(b)   How many different codes could you have that are multiples of 5?

(c)   How many different codes could you have that are even numbers?

(d)   How many different codes could you have that are greater than or equal
to 7000?

Product Rule for Counting - Exam Questions

1) There are 12 boys and 15 girls in a class. One girl and one boy will be selected to represent the class in a debate.

Work out the total number of ways of choosing a boy and a girl.

....

(2 marks)

2) There are 14 girls and x boys in a choir. One girl and one boy will be selected to sing a duet. Tim says there are 152 different ways of choosing a boy and a girl.

Could Taylor be correct?
You must show your working.

....

(2 marks)

3) There are 52 cards in a deck.

Johnny is going to give one card to Carl and one card to Kia.

How many different ways are there of doing this?

....

(2 marks)

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Product Rule for Counting - Exam Questions

4) There are 8 teams in a football tournament. Each team will play every other team once. Work out the total number of games played.

....

(2 marks)

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5) Carole picks a 5-digit even number.

The first digit is a prime number.
The third digit is odd.
The fourth digit is 7.

How many different 5-digit numbers could she pick?

....

(2 marks)

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Product Rule for Counting - Answers

	Question	Answer
	Skill Questions	
Group A	Work out how many different combinations for each question: **1)** A restaurant has 6 starters and 8 main courses on its menu. If you order a starter and a main course how many different combinations of starters and main courses are there?	**1)** 48
	2) A class has 10 boys and 9 girls. One girl and one boy are to be chosen to represent the class in a quiz. How many different pairs are possible?	**2)** 90
	3) Luke has 20 different cards. He gives one card to Harry and one card to Gill. How many different ways can he do this?	**3)** 380
	4) A class has 8 boys and 10 girls. One girl and one boy are to be chosen to represent the class in a quiz. How many different pairs are possible?	**4)** 80
	5) A restaurant has 4 starters and 6 main courses on its menu. If you order a starter and a main course how many different combinations of starters and main courses are there?	**5)** 24
	6) A drama club has 15 members: 13 males and 2 females. A male and a female are needed to sing a duet. How many different pairs are possible?	**6)** 26
	7) Luke has 12 different cards. He gives one card to Harry and one card to Gill. How many different ways can he do this?	**7)** 132
	8) A drama club has 30 members: 17 males and 13 females. A male and a female are needed to sing a duet. How many different pairs are possible?	**8)** 221

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Product Rule for Counting - Answers

Group A contd	**9)** A class has 10 boys and 12 girls. One girl and one boy are to be chosen to represent the class in a quiz. How many different pairs are possible?	**9)** 120
	10) A tennis club has 27 members. 12 males and 15 females. A male and a female will be selected for the next match. How many different ways could this happen?	**10)** 180
	11) Luke has 22 different cards. He gives one card to Harry and one card to Gill. How many different ways can he do this?	**11)** 462
	12) A restaurant has 8 starters and 10 main courses on its menu. If you order a starter and a main course how many different combinations of starters and main courses are there?	**12)** 80
Group B	Work out how many different combinations for each question:	
	1) A combination lock has 2 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations are possible?	**1)** 100
	2) A combination lock has 3 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations are possible?	**2)** 1000
	3) A combination lock has 4 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations are possible?	**3)** 10 000
	4) How many different combinations can be used on a 3-digit combination padlock where each dial can be set to $1 - 5$ inclusive?	**4)** 125
	5) A restaurant has 4 starters, 8 main courses and 6 different deserts on its menu. If you order a starter, a main course and a dessert how many different combinations of 3 course meals are possible?	**5)** 192

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Product Rule for Counting - Answers

Group B contd	**6)** Luke has 15 different cards. He gives one card to Harry, one to Ellie and one card to Gill. How many different ways can he do this?	**6)** 2730
	7) A restaurant has 5 starters, 9 main courses and 3 different deserts on its menu. If you order a starter, a main course and a dessert how many different combinations of 3 course meals are possible?	**7)** 135
	8) A football team is designing their new team kit. They can choose from 5 different pairs of socks, 6 different pairs of shorts and 14 different tops. How many different team kit designs are possible?	**8)** 420
	9) A restaurant has 8 starters, 6 main courses and 5 different deserts on its menu. If you order a starter, a main course and a dessert how many different combinations of 3 course meals are possible?	**9)** 240
	10) Luke has 10 different cards. He gives one card to Harry, one to Ellie and one card to Gill. How many different ways can he do this?	**10)** 720
	11) How many different combinations, that have 3 different digits, can be used on a 3-digit combination padlock where each dial can be set to $1 - 5$ inclusive?	**11)** 60
	12) How many different combinations, that have 4 different digits, can be used on a combination lock that has 4 wheels, each having the digits 0 to 9 inclusive on them?	**12)** 5040

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Product Rule for Counting - Answers

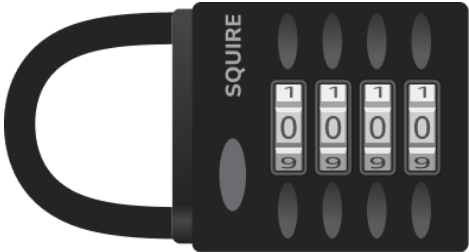| Group C	Work out how many different combinations for each question:	
	1) A combination lock has 3 wheels, each having the digits 1 to 5 inclusive on them. How many different combinations that are even numbers are possible?	**1)** $5 \times 5 \times 2 = 50$
	2) Carl picks a 3-digit number. The first digit is greater than 2. The last digit is a multiple of 4. How many different 3-digit numbers could he pick?	**2)** $7 \times 10 \times 2 = 140$
	3) A combination lock has 3 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations which are greater than or equal to 900 are possible?	**3)** $1 \times 10 \times 10 = 100$
	4) Carl picks a 3-digit number. The first digit is less than 2. The last digit is a multiple of 4. How many different 3-digit numbers could he pick?	**4)** $2 \times 10 \times 2 = 40$
	5) A combination lock has 3 wheels, each having the digits 0 to 9 inclusive on them. How many different combinations which are greater than 299 are possible?	**5)** $7 \times 10 \times 10 = 700$
	6) Carl picks a 3-digit number. The first digit is less than 5. The last digit is a multiple of 2. How many different 3-digit numbers could he pick?	**6)** $5 \times 10 \times 5 = 250$
	7) A combination lock has 4 wheels, each having the digits 1 to 5 inclusive on them. How many different combinations that are even numbers that are also greater than 3000 are possible?	**7)** $3 \times 5 \times 5 \times 2 = 150$

Product Rule for Counting - Answers

Group C contd	**8)** Carl picks a 4-digit number. The first digit is greater than 2. The last digit is a multiple of 4. How many different 4-digit numbers could he pick?	**8)** $7 \times 10 \times 10 \times 2 = 1400$
	9) A combination lock has 3 wheels, each having the digits 1 to 9 inclusive on them. How many different combinations which are multiples of 5 are possible?	**9)** $9 \times 9 \times 1 = 81$
	10) Carl picks a 4-digit number. The first digit is less than 2. The last digit is a multiple of 4. How many different 4-digit numbers could he pick?	**10)** $2 \times 10 \times 10 \times 2 = 400$
	11) A combination lock has 4 wheels, each having the digits 1 to 5 inclusive on them. How many different combinations that are multiples of 5 are possible?	**11)** $5 \times 5 \times 5 \times 1 = 125$
	12) Carl picks a 4-digit number. The first digit is less than 5. The last digit is a multiple of 2. How many different 4-digit numbers could he pick?	**12)** $5 \times 10 \times 10 \times 5 = 2500$

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Product Rule for Counting - Answers

	Question	Answer
	Applied Questions	
1)	As part of a meal deal offer you can choose one sandwich, one snack and one drink. There are: 8 different sandwiches. 4 different drinks. 5 different snacks.	
a)	How many different meal combinations are there?	**a)** $8 \times 4 \times 5 = 160$
b)	Three of the sandwiches have cheese in them. Two of the drinks are fizzy. Daniel picks a meal deal at random. Work out the probability that the sandwich has cheese in it and the drink is fizzy.	**b)** $3 \times 2 \times 5 = 30$ Probability $= \frac{30}{160} = \frac{3}{16}$
2)	Paul is choosing a flower and a house plant for his new home. There are 16 different types of flowers and some house plants at the garden centre. Paul says: 'There are 148 different ways to choose one flower and one house plant' Could Paul be correct? You must show how you get your answer.	$148 \div 16 = 9.25$ Paul cannot be correct, the number of house plants would need to be an integer.
3)	There are 10 people in a room. If each person shakes each other person's hand once, work out the number of handshakes that take place.	$\frac{10 \times 9}{2} = 45$ Need to divide by 2 or everyone will have shaken hands with each other twice.
4)	Robert picks a 4-digit even number. The second digit is a multiple of 4. How many different numbers could Robert pick?	$10 \times 2 \times 10 \times 5 = 1000$

Product Rule for Counting - Answers

5)	Below is a combination lock. This lock requires a 4-digit code.		
	a) How many different codes could you have on this combination lock?	**a)**	$10 \times 10 \times 10 \times 10 = 10000$
	b) How many different codes could you have that are multiples of 5?	**b)**	$10 \times 10 \times 10 \times 2 = 2000$
	c) How many different codes could you have that are even numbers?	**c)**	$10 \times 10 \times 10 \times 5 = 5000$
	d) How many different codes could you have that are greater than or equal to 7000?	**d)**	$3 \times 10 \times 10 \times 10 = 3000$

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Product Rule for Counting - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	There are 12 boys and 15 girls in a class. One girl and one boy will be selected to represent the class in a debate. Work out the total number of ways of choosing a boy and a girl.	12×15 180	**(1)** **(1)**
2)	There are 14 girls and x boys in a choir. One girl and one boy will be selected to sing a duet. Tim says there are 152 different ways of choosing a boy and a girl. Could Taylor be correct? You must show your working.	$152 \div 14 = 10.857....$ No, the number of boys would need to be an integer	**(1)** **(1)**
3)	There are 52 cards in a deck. Johnny is going to give one card to Carl and one card to Kia. How many different ways are there of doing this?	52×51 2652	**(1)** **(1)**
4)	There are 8 teams in a football tournament. Each team will play every other team once. Work out the total number of games played.	$\frac{8 \times 7}{2}$ 28	**(1)** **(1)**
5)	Carole picks a 5-digit even number. The first digit is a prime number. The third digit is odd. The fourth digit is 7. How many different 5-digit numbers could she pick?	$4 \times 10 \times 5 \times 1$ 200	**(1)** **(1)**