



ACHIEVE ACADEMY

GCSE Maths — Higher Tier

Product Rule for Counting · Practice Booklet

NAME: _____

CLASS: _____

DATE: _____

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

Product Rule for Counting

Total marks available: 124

● Product Rule for Counting

✓36

Q1 · ● Developing · 3 marks

METHOD

$$2 \times 3 \times 3 \times 2 = 36$$

✓67600

Q2 · ● Developing · 4 marks

METHOD

$$\text{Letters: } 26^2 = 676$$

$$\text{Digits: } 10^2 = 100$$

$$676 \times 100 = 67600$$

✓6760000

Q3 · ● Developing · 4 marks

METHOD

$$\text{Letters: } 26^2 = 676$$

$$\text{Digits: } 10^4 = 10000$$

$$676 \times 10000 = 6760000$$

✓36

Q4 · ● Developing · 3 marks

METHOD

$$2 \times 2 \times 3 \times 3 = 36$$

✓80

Q5 · ● Developing · 3 marks

METHOD

$$2 \times 5 \times 2 \times 4 = 80$$

✓676000

Q6 · ● Developing · 4 marks

METHOD

Letters: $26^2 = 676$

Digits: $10^3 = 1000$

$676 \times 1000 = 676000$

✓17576000

Q7 · ● Developing · 4 marks

METHOD

Letters: $26^3 = 17576$

Digits: $10^3 = 1000$

$17576 \times 1000 = 17576000$

✓48

Q8 · ● Developing · 3 marks

METHOD

$3 \times 4 \times 2 \times 2 = 48$

✓144

Q9 · ● Developing · 3 marks

METHOD

$4 \times 3 \times 4 \times 3 = 144$

✓135

Q10 · ● Developing · 3 marks

METHOD

$5 \times 3 \times 3 \times 3 = 135$

✓720

Q11 · ● Secure · 4 marks

METHOD

$$10 \times 9 \times 8 = 720$$

✓24

Q12 · ● Secure · 4 marks

METHOD

Hana's seat is fixed, so the remaining 4 people are arranged in the remaining 4 seats.

$$4 \times 3 \times 2 \times 1 = 4! = 24$$

✓504

Q13 · ● Secure · 4 marks

METHOD

$$9 \times 8 \times 7 = 504$$

✓720

Q14 · ● Secure · 4 marks

METHOD

$$10 \times 9 \times 8 = 720$$

✓24

Q15 · ● Secure · 4 marks

METHOD

Fiona's seat is fixed, so the remaining 4 people are arranged in the remaining 4 seats.

$$4 \times 3 \times 2 \times 1 = 4! = 24$$

✓24

Q16 · ● Secure · 4 marks

METHOD

Eli's seat is fixed, so the remaining 4 people are arranged in the remaining 4 seats.

$$4 \times 3 \times 2 \times 1 = 4! = 24$$

✓5040

Q17 · ● Secure · 4 marks

METHOD

Ivo's seat is fixed, so the remaining 7 people are arranged in the remaining 7 seats.

$$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 7! = 5040$$

✓720

Q18 · ● Secure · 4 marks

METHOD

Fiona's seat is fixed, so the remaining 6 people are arranged in the remaining 6 seats.

$$6 \times 5 \times 4 \times 3 \times 2 \times 1 = 6! = 720$$

✓504

Q19 · ● Secure · 4 marks

METHOD

$$9 \times 8 \times 7 = 504$$

✓720

Q20 · ● Secure · 4 marks

METHOD

$$10 \times 9 \times 8 = 720$$

✓6720

Q21 · ● Greater Depth · 5 marks

METHOD

First digit: 4 choices

Remaining digits: $8 \times 7 \times 6 \times 5 = 1680$

$$4 \times 1680 = 6720$$

✓12096

Q22 · ● Greater Depth · 5 marks

METHOD

First digit: 4 choices

Remaining digits: $9 \times 8 \times 7 \times 6 = 3024$

$4 \times 3024 = 12096$

✓480

Q23 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $6! = 720$

Arrangements with Amir and Chen together (treat as one block, which can be internally ordered 2 ways): $2 \times 5! = 240$

Not adjacent: $720 - 240 = 480$

✓480

Q24 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $6! = 720$

Arrangements with Hana and Chen together (treat as one block, which can be internally ordered 2 ways): $2 \times 5! = 240$

Not adjacent: $720 - 240 = 480$

✓72

Q25 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $5! = 120$

Arrangements with Jade and Ivo together (treat as one block, which can be internally ordered 2 ways): $2 \times 4! = 48$

Not adjacent: $120 - 48 = 72$

✓480

Q26 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $6! = 720$

Arrangements with Beth and Fiona together (treat as one block, which can be internally ordered 2 ways): $2 \times 5! = 240$

Not adjacent: $720 - 240 = 480$

✓3600

Q27 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $7! = 5040$

Arrangements with Kofi and Jade together (treat as one block, which can be internally ordered 2 ways): $2 \times 6! = 1440$

Not adjacent: $5040 - 1440 = 3600$

✓9072

Q28 · ● Greater Depth · 5 marks

METHOD

First digit: 3 choices

Remaining digits: $9 \times 8 \times 7 \times 6 = 3024$

$3 \times 3024 = 9072$

✓30240

Q29 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $8! = 40320$

Arrangements with Beth and Gus together (treat as one block, which can be internally ordered 2 ways): $2 \times 7! = 10080$

Not adjacent: $40320 - 10080 = 30240$

✓30240

Q30 · ● Greater Depth · 5 marks

METHOD

Total arrangements: $8! = 40320$

Arrangements with Eli and Leah together (treat as one block, which can be internally ordered 2 ways): $2 \times 7! = 10080$

Not adjacent: $40320 - 10080 = 30240$