PRODUCT RULE FOR COUNTING – PRACTICE QUESTIONS
CALCULATOR ALLOWED

metatutor

1.
A restaurant has 5 starters and 16 main courses on its menu.

How many different combinations of meals are possible?

$5 \times 16 = 80$

2.
At a school there are 88 girls and 70 boys.
The headmaster is going to pick a boy and a girl at random.

How many different combinations are possible?

$88 \times 70 = 6{,}160$

3.
A group of people have to pick a water activity and a land activity.
Below are the lists of water activities and land activities.

Water activities
Snorkelling
Diving
Kayaking
Canoeing
Surfing

Land activities
Paintballing
Laser Tag
Archery
Fencing
Segway
Climbing
Mountain Biking

How many different combinations of activities are possible?

$5 \times 7 = 35$

4.
A shop sells shirts, jumpers and blazers.
Each is sold in 8 different colours.
Each is sold in 4 different sizes.

How many different items of clothing does the shop sell?

$3 \times 8 \times 4 = 96$

5.
A café sells sandwiches, rolls and baguettes.
Each is sold on 5 different types of bread.
Each is sold with 11 different fillings.

How many different items does the café sell?

$3 \times 5 \times 11 = 165$

6.
A class contains 25 students.
The teacher is going to pick two students at random for an activity.

How many different combinations of students are possible?

$25 \times 24 = 600$

7.
A town contains 31 pubs.
Adrian is going to pick two pubs at random to visit.

How many different combinations of pubs are possible?

$31 \times 30 = 930$

8.
There are 68 people in a supermarket.
Bernadette is going to pick three people at random for a survey.

How many different combinations of people are possible?

$68 \times 67 \times 66 = 300,696$

9.
Four players withdrew from a snooker tournament.
Of the remaining 28 players, four players will be picked to receive byes to the next round.

How many different combinations of players are possible?

$28 \times 27 \times 26 \times 25 = 491,400$

10.
Arianna has a four-digit PIN number for her debit card.
The PIN number contains digits from 0 to 9 and digits can repeat.
She remembers that the first two digits are 3 and 4, but cannot remember the rest.

How many different PIN numbers are possible?

3 4 (10) (10) $10 \times 10 = 100$

11.
Bobby is picking a 5-digit passcode for his iPad.
The passcode contains digits from 0 to 9 and digits can repeat.

How many different passcodes are possible?

(10) (10) (10) (10) (10) $10^5 = 100,000$

12.
Carly is picking a password for her computer.
The password must contain lower case letters only.
The password must be 5 characters long and characters can repeat.

How many different passwords are possible?

(26) (26) (26) (26) (26) $26^5 = 11,881,376$

13.
David is picking a password for his computer.
The password must contain 5 lower case letters followed by a number from 0 to 9.
Characters can repeat.

How many different passwords are possible?

(26) (26) (26) (26) (26) (10) $26^5 \times 10$
$= 118,813,760$

14.
Ed is thinking of a 6-digit even number.
The number contains no zeros.

How many different numbers could Ed be thinking of?

(9) (9) (9) (9) (9) (4)

$9^5 \times 4 = 236,196$

15.
Fran is thinking of a 5-digit odd number.
The number does not contain a 7 or an 8.

How many different numbers could Fran be thinking of?

(7) (8) (8) (8) (4)

$7 \times 8 \times 8 \times 8 \times 4$

$= 14,336$

16.
Georgia is thinking of a 6-digit number.
The first digit is greater than 3.
The last digit is less than 5.

How many different numbers could Georgia be thinking of?

(6) (10) (10) (10) (10) (5)

$6 \times 10 \times 10 \times 10 \times 10 \times 5$

$= 300,000$

17.
Harvey is thinking of a 7-digit number.
The first digit is greater than 7.
The last digit is a multiple of 3.
The number does not contain a 5 or a 6.

How many different numbers could Harvey be thinking of?

8,9 3,9
(2) (8) (8) (8) (8) (8) (2)

$8^5 \times 2^2$

$= 131,072$

18.
India is thinking of a 6-digit number.
The number contains no repeated digits.

How many different numbers could India be thinking of?

(9) (9) (8) (7) (6) (5)

$9 \times 9 \times 8 \times 7 \times 6 \times 5 = 136,080$

19.
Jeff is thinking of a 4-digit number.
The number is larger than 5,999.
The number contains no repeated digits.

How many different numbers could Jeff be thinking of?

(4) (9) (8) (7)

$4 \times 9 \times 8 \times 7 = 2,016$

20.
Kyle is thinking of a 5-digit number.
The number is smaller than 40,000.
The number contains no repeated digits.

How many different numbers could Kyle be thinking of?

3,2,1
(3) (9) (8) (7) (6)

$3 \times 9 \times 8 \times 7 \times 6 = 9,072$

21.
Leonard is thinking of a 4-digit number.
The number is smaller than 3,000.
The number contains no repeated digits and no prime numbers.

How many different numbers could Leonard be thinking of?

Primes = 2, 3, 5, 7

1 _ _ _
(5) (4) (3)

5 × 4 × 3 = 60

22.
Mark is thinking of a 5-digit number.
The number is smaller than 40,000.
The first digit is double the second digit.
The number is odd.

How many different numbers could Mark be thinking of?

2 1 _ _ 3,5,7,9
(7) (6) (4)

7 × 6 × 4 = 168

23.
Norman is thinking of a 5-digit number.
The number is larger than 5,999.
The first digit is even.
The last digit is half the first digit.

How many different numbers could Norman be thinking of?

6,8 _ _ _ 3,4
(2) (8) (7) (6) (2)

2 × 8 × 7 × 6 × 2 = 1,344

24.
A restaurant menu has 5 different starters, 15 different main courses and 11 different desserts.
Oliver is going to pick a starter, main course and dessert from the menu.

(a) How many different combinations of meals could Oliver pick?

$5 \times 15 \times 11 = 825$

Penny is vegetarian.
She is also going to pick a starter, main course and dessert from the menu.
3 of the starters and 11 of the main courses contain meat.

(b) How many different combinations of meals could Penny pick?

$2 \times 4 \times 11 = 88$

25.
At Robin's school, there are 18 different after-school clubs on Monday, 15 different after-school clubs on Wednesday and 11 different after-school clubs on Friday.

Robin is either going to attend after-school clubs on all three days or attend an after-school club on Monday and Friday.

How many different combinations of after-school clubs are possible?

All 3 days $= 18 \times 15 \times 11 = 2,970$
Mon & Fri $= 18 \times 11 = 198$

$2,970 + 198 = 3,168$

26.
Shane has forgotten his password for his computer.
The password contains either lower case letters or numbers from 0 to 9.
Shane knows that his password is either 5 or 6 characters long.

How many different passwords are possible?

5 characters $= 36^5 = 60,466,176$
6 characters $= 36^6 = 2,176,782,336$

$36^5 + 36^6 = 2,237,248,512$

27.
Tamsin is trying to make a note of a car's number plate.
Part of the number plate is blocked by another car.

Number plates can either be of the form XXYY XXX or XXY XXX, where X is a letter and Y is a number.

How many different number plates are possible?

XXYYXXX = 10 × 26 × 26 × 26 = 175,760

XXY XXX = 26 × 26 × 26 = 17,576

175,760 + 17,576 = 193,336

28.
A football team is picking its kit for the new season.
There are 4 different sock designs, 10 different shorts designs and 20 different shirt designs.
2 of the sock designs, 1 of the shorts designs and 8 of the shirt designs are striped.

What percentage of the total possible kits do not contain any striped designs?

Total possible kits = 4 × 10 × 20 = 800

No striped kits = 2 × 9 × 12 = 216

$\frac{216}{800} \times 100 = 27\%$

29.
A class contains 15 girls and 10 boys.
7 of the girls and 5 of the boys wear glasses.
The teacher is going to pick 2 girls and 1 boy at random from the class.

In what percentage of the possible combinations do all three students wear glasses?

Total combinations = $15 \times 14 \times 10 = 2100$

All glasses combinations = $7 \times 6 \times 5 = 210$

$\frac{210}{2100} \times 100 = 10\%$

30.
Carla is going to make a five-digit number using each of the below cards once.

What percentage of the numbers that Carla could make are larger than 60,000?

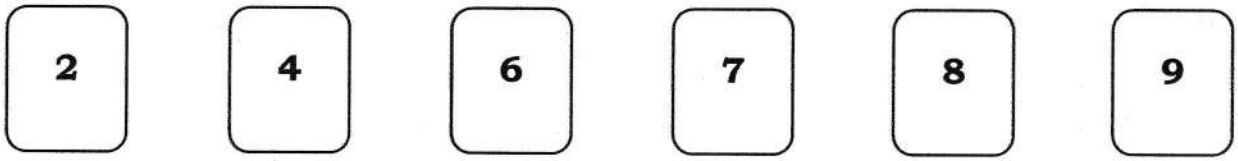
Total numbers = $5 \times 4 \times 3 \times 2 \times 1 = 120$

Larger than 60,000: $\underline{8}$ $\overline{(4)}$ $\overline{(3)}$ $\overline{(2)}$ $\overline{(1)}$

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

$\frac{24}{120} \times 100 = 20\%$

31.
Dawn is going to make a six-digit number using each of the below cards once.



What fraction of the numbers that Dawn could make are smaller than 500,000?

Total numbers = $6 \times 5 \times 4 \times 3 \times 2 \times 1$

$= 720$

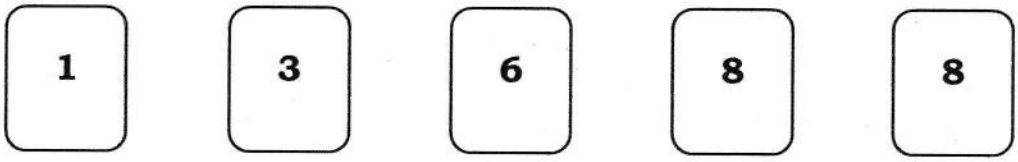
Smaller than 500,000: 2,4 _ _ _ _ _

(2) (5) (4) (3) (2) (1)

$= 2 \times 5 \times 4 \times 3 \times 2 \times 1 = 240$

$\frac{240}{720} = \frac{1}{3}$

32.
Eamonn is going to make a five-digit number using each of the below cards once.



How many odd numbers less than 16,000 can Eamonn make?

1 3 6,8,8 6,8,8 6,8,8

answer = 0