

11-18-13

Permutations

Imagine you have a 2 question Multiple Choice quiz with options A, B, and C. List out all possible outcomes.

AA	BA	CA	9 possible outcomes
AB	BB	CB	
AC	BC	CC	

$$\frac{3}{\#1} \cdot \frac{3}{\#2} = 9$$

My passcode is 2 letters followed by 2 digits. How many possibilities exist?

$$\frac{26}{L} \cdot \frac{26}{L} \cdot \frac{10}{D} \cdot \frac{10}{D} = 67,600$$

Real world

Passcode must be 8 letters, digits, or special characters. If you can use 6 different characters and capital letters are unique, how many possibilities exist?

$$\frac{68}{1^{st}} \cdot \frac{68}{2^{nd}} \cdot \frac{68}{3^{rd}} \dots = 68^8$$

↑
26+26+10+6

$$\approx 457,163,239,700,000$$

Old VA license plates were 6 letters or digits long. They were usually 3 letters followed by 3 digits. How many existed this way?

$$\frac{26}{L} \frac{26}{L} \frac{26}{L} \frac{10}{D} \frac{10}{D} \frac{10}{D}$$

17,576,000 possibilities

B.) What if order of letters and numbers didn't matter?

$$\frac{36}{1^{st}} \frac{36}{2^{nd}} \frac{36}{3} \frac{36}{4} \frac{36}{5} \frac{36}{6}$$

$$2,176,782,336$$

At BTO's you have 11 choices of yogurt and then 35 toppings. If I go and get yogurt and add 3 toppings, how many different tastes can I create for my pallet?

$$\frac{11}{\text{Yogurt}} \times \frac{35}{T_1} \times \frac{34}{T_2} \times \frac{33}{T_3} =$$

431,970

How many zip codes exist?

$$\frac{10}{1^{\text{st}}} \times \frac{10}{2^{\text{nd}}} \times \frac{10}{3} \times \frac{10}{4} \times \frac{10}{5}$$

100,000

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4th Trig

Let's say you have a 2 question multiple choice quiz with options A, B, C, D. List out all possible answers.

AA BA CA DA
AB BB CB DB 16 possible
AC BC CC DC
AD BD CD DD

$$\frac{4 \cdot 4 = 16}{1^{\text{st}} \quad 2^{\text{nd}}}$$

My passcode is 3 letters and then 2 digits. How many passcodes can be made?

$$\frac{26 \cdot 26 \cdot 26 \cdot 10 \cdot 10}{1^{\text{st}} L \quad 2^{\text{nd}} L \quad 3^{\text{rd}} \quad D \quad D} = 1,757,600$$

Real World

Passcode is 8 characters long. You can use lower case or capital letters, digits, and any of 8 special characters.

How many passcodes exist?

$$\frac{70 \cdot 70 \cdot 70 \cdot \dots \cdot 70}{1^{\text{st}} \quad 2^{\text{nd}} \quad 3^{\text{rd}} \quad \dots \quad 8^{\text{th}}}$$

\uparrow
 $26 + 26 + 10 + 8$

$$\approx 576480109000000$$

VA license plates used to be 3 letters followed by 3 digits. How many plates can be made?

$$\frac{26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10}{L \quad L \quad L \quad D \quad D \quad D} = 17,576,000$$

B.) What if I could mix # and letters?

$$\frac{36 \cdot 36 \cdot 36 \cdot 36 \cdot 36 \cdot 36}{1^{\text{st}} \quad 2^{\text{nd}} \quad 3^{\text{rd}} \quad 4^{\text{th}} \quad 5^{\text{th}} \quad 6^{\text{th}}} = 2,176,782,336$$

At BTO's you can pick between 12 yogurts and 40 toppings. If I so get a yogurt and add 4 different toppings, how many different possibilities can I create?

$$\frac{12}{Y} \cdot \frac{40}{T1} \cdot \frac{39}{T2} \cdot \frac{38}{T3} \cdot \frac{37}{T4}$$

$$26,320,320$$

How many zipcodes exist assuming you can't have a zipcode of 00000?

$$\frac{10}{1^{\text{st}}} \cdot \frac{10}{2} \cdot \frac{10}{3} \cdot \frac{10}{4} \cdot \frac{10}{5} = 10^5$$

$$\begin{array}{r} 100,000 \\ - 1 \\ \hline 99,999 \end{array}$$