

Permutations II (11.1)

p524

day 2

If you are counting permutations and some objects are the same, you have to divide by the number of ways that you can arrange each group of identical objects.

$$P = \frac{n!}{a!b!...}$$

if all different

with a of one thing, b of another

ex1: You can make a signal with coloured flags. How many different signals can you make with 4 red, 3 green, 2 yellow, 1 pink, 1 blue, 1 orange?

$4+3+2+1+1+1 = 12$ flags

$$\frac{12!}{4!3!2!} = 1,663,200$$

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ex2: There are 8 tables at a banquet. How many ways can they be selected to hit the buffet?

$$8! = 40,320$$

ex3: Sandy downloaded 10 new songs. He wants to make a playlist of 6 of them for his run. How many ways can he do that?

$$\frac{10!}{4!} = \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot \cancel{4 \cdot 3 \cdot 2 \cdot 1}}{\cancel{4 \cdot 3 \cdot 2 \cdot 1}} = 151,200$$

$$\frac{10!}{(10-6)!}$$

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ex4: Eilidh's basketball team has 12 players. How many ways can the coach pick the 5 starting positions?

$$\frac{12!}{7!} = 95,040$$

$$12 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

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For a permutation of n objects, we use $n!$

For a permutation of r objects chosen from a group of n , we use ${}_nP_r$

$${}_nP_r = \frac{n!}{(n-r)!}$$

ex5: Calculate:

a) ${}_7P_4 = 840$

b) ${}_{10}P_5 = 30,240$

c) ${}_{12}P_3 = 1320$

d) ${}_9P_9 = 72,880$

e) ${}_9P_0 = 1$

$0! = 1$

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ex6: You're trying to create an account on a very trendy web site. Passwords can be 5, 6 or 7 characters, include only letters (upper or lower case) or numbers, and you can't repeat a character. How many passwords are possible?

$$26 + 26 + 10 = 62$$

Case 1: 5 char ${}_{62}P_5 = *$

Case 2: 6 char ${}_{62}P_6 = *$

Case 3: 7 char ${}_{62}P_7 = *$

add them up

$$2.5 \times 10^{12}$$

ex7: A band is going to play 15 songs at a concert. They have 3 major hits and they are going to play one of them first, one in the middle, and one last. How many ways can they play their set?

3 hits
12 other

$$\frac{3}{6} \times {}_{12}P_6 \times \frac{3}{6} \times {}_{12}P_6 \times \frac{1}{1} = 288 \times 10^6$$

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ex8: If we wanted to create a class exec, how many ways could we pick a President, VP, and secretary from 25 people?

$${}_{25}P_3 = 13,800$$

$$\frac{15}{+ total}$$


ex9: How many lunches can you get at Tim's with 4 kinds of bagel, 3 soups, 6 kinds of coffee, and 9 kinds of doughnut?

$$4 \times 3 \times 6 \times 9 = 648$$

$$\frac{22!}{4!3!9!}$$

$$\frac{4! \times 3! \times 6! \times 9!}{4!3!9!}$$

Attachments

 quiz13.pdf