

Lecture Examples

Ex 1 A serial number for a phone has 5 letters followed by 2 numbers.

(a) How many phones can the manufacturer produce before they have to reuse a serial number?

$$\underline{26} \cdot \underline{26} \cdot \underline{26} \cdot \underline{26} \cdot \underline{26} \cdot \underline{10} \cdot \underline{10} = 1,188,137,600$$

(b) What if they want all of their serial numbers to never repeat a letter?

$$\underline{26} \cdot \underline{25} \cdot \underline{24} \cdot \underline{23} \cdot \underline{22} \cdot \underline{10} \cdot \underline{10} = 78,936,000$$

Ex 2 A homeowner interviews 6 people for a 3-bedroom house. How many different choices of pairings of people with bedrooms are there?

$$\frac{6}{\textcircled{1}} \cdot \frac{5}{\textcircled{2}} \cdot \frac{4}{\textcircled{3}} = 120$$

Ex 3 (a) How many possible 4-digit passcodes can you make for your phone?

$$\underline{10} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10} = 10,000$$

(b) How many 6-digit?

$$10^6 = 1,000,000$$

(c) 10-digit?

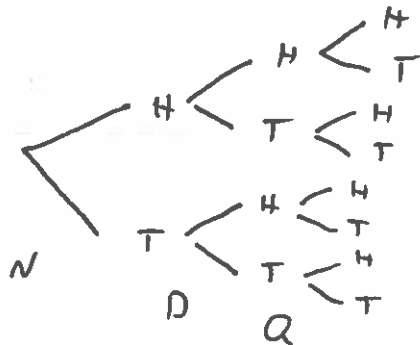
$$10^{10} = 10,000,000,000$$

(d) What if you want a 10-digit passcode to never repeat a ^{digit} letter?

$$\underline{10} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1} = 10! = 3,628,800$$

On-Your-Own Examples

Ex 1 A person tosses a nickel, a dime, and a quarter. How many different possible outcomes are there? Construct a tree diagram depicting all the possible outcomes.



Ex 2 There are 8 people traveling together. How many ways can they be lined up for a picture?

$$\underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1} = 40,320$$

Ex 3 A group of friends is ordering a one-topping pizza. The sizes available are small, medium and large, the sauces are tomato or pesto, and the topping choices are: cheese, sausage, pepperoni, or veggies. How many different pizzas could they order?

$$3 \cdot 2 \cdot 4 = 24$$

Ex 4 A soccer coach chooses 4 people to go on the field and take 4 different positions. How many possible choices are there?

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

Ex 5 A CEO has 11 managers to choose from but only 3 different executive positions to fill. How many possible executive teams are there?

$$11 \cdot 10 \cdot 9 = 990$$

Ex 6 The serial number on a new twenty-dollar bill consists of two letters followed by eight digits and then a letter. How many different serial numbers are possible, given the following conditions?

(a) Letters and digits cannot be repeated.

$$\underline{26} \quad \underline{25} \quad \underline{10} \quad \underline{9} \quad \underline{8} \quad \underline{7} \quad \underline{6} \quad \underline{5} \quad \underline{4} \quad \underline{3} \quad \underline{24} = 28,304,640,000$$

(b) Letters and digits can be repeated.

$$26^3 \cdot 10^8 = 1,757,600,000,000$$

(c) The first and last letters are vowels and could have repeats, but the second letter is a consonant, and the digits can be repeated.

$$\underline{5} \quad \underline{21} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{5} = 52,500,000,000$$

Ex 7 How many license plates are there for a particular state if license plates have

(a) six alpha-numeric characters?

$$36^6 = 2,176,782,336$$

(b) 3 numbers and 3 letters?

followed by $\underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{26} \quad \underline{26} \quad \underline{26} = 17,576,000$

(c) 3 numbers and 3 letters with no repeats?

followed by $\underline{10} \quad \underline{9} \quad \underline{8} \quad \underline{26} \quad \underline{25} \quad \underline{24} = 11,232,000$

Ex 8 Sally eats 10 different kinds of fruit: watermelon, apples, bananas, oranges, grapes, raspberries, blackberries, blueberries, cherries, and strawberries. She wants to choose one different type of fruit for lunch each weekday. How many possible ways can she do it?

$$\underline{10} \quad \underline{9} \quad \underline{8} \quad \underline{7} \quad \underline{6} = 30,240$$

