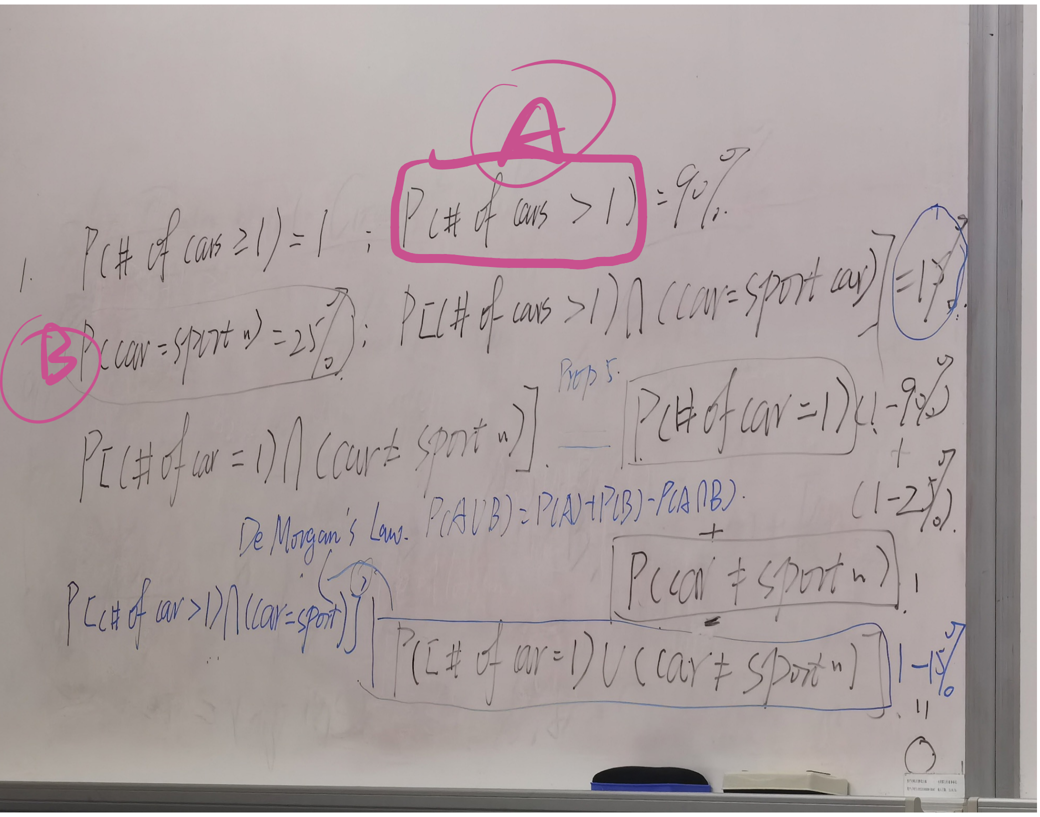
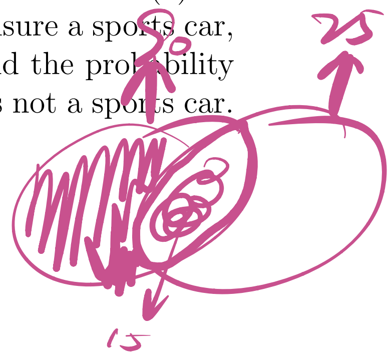
STA2001 Tutorial 1

1. An insurance company looks at its auto insurance customers and finds that (a) all insure at least one car, (b) 90% insure more than one car (c) 25% insure a sports car, and (d) 15% insure more than one car, including a sports car. Find the probability that a customer selected at random insures exactly one car and it is not a sports car.





$P_{A \cap B} = 15\%$

$90 + 25 - 15 = 100$

2. 1.2-4. The "eating clu" is hosting a make-your-own sundae at which the following are provided:

Ice Cream Flavors	Toppins
Chocolate	caramel
Cookies 'n' cream	Hot fudge
Strawberry	Marshmallow
Vanilla	M&Ms
	Nuts
	Strawberries

$C_6^3 = \frac{6\,5\,4}{3\,2} = 20$

$20 \times 4 = 80$

(a). How many sundaes are possible using one flavor of ice cream and three different toppings?

(b). How many sundaes are possible using one flavor of ice cream and from zero to six (different) toppings?

$4 \times (C_6^0 + C_6^1 + C_6^2 + C_6^3 + C_6^4 + C_6^5 + C_6^6) = 256$

(c). How many different combinations of flavors of three scoops of ice cream are possible if it is permissible to make all three scoops the same flavor?

$4^3 = 64$

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1 flavour $\binom{4}{1} = 4$

2 flavours $\binom{4}{2} \times 2 = 6 \times 2$

3 flavours $\binom{4}{3} = 4$

$\Rightarrow 20$

题目有不懂啊找我

3. 1.2-7. In a state lottery, four digits are drawn at random one at a time with replacement from 0 to 9. Suppose that you win if any permutation of your selected integers is drawn. Give the probability of winning if you select

   (a). 6, 7, 8, 9.

   (b). 6, 7, 8, 8.

   (c). 7, 7, 8, 8.

   (d). 7, 8, 8, 8.

(a) $\frac{4!}{10^4}$ (b) $\frac{\frac{4!}{2}}{10^4}$ (c) $\frac{\frac{4!}{2!\,2!}}{10^4}$ (d) $\frac{\frac{4!}{3!}}{10^4}$

4. Suppose that an experiment is repeated n times. The number of times that an event A actually occurred throughout these n performances is called the *frequency* of A, denoted by $\mathcal{N}(A)$. The ratio $f(A) := \mathcal{N}(A)/n$ is called the relative frequency of event A in these n repetitions of the experiment.

   1. For the sample space S, show $f(S) = 1$. $\mathcal{N}(S) = n$
   2. For two events A and B, if A and B are *mutually exclusive* (i.e., $A \cap B = \emptyset$), prove $f(A \cup B) = f(A) + f(B)$.

      证明...
   3. For any two events A and B, show that

$$f(A \cup B) = f(A) + f(B) - f(A \cap B).$$

$$\mathcal{N}(A \cup B) \stackrel{?}{=} \mathcal{N}(A) + \mathcal{N}(B)$$