Ex: Each coefficient in equation $ax^2 + bx + c = 0$is obtained by throwing a fair die. Find the probability that the equation has real roots?

Sol\

To solve the equation $ax^2 + bx + c = 0$ we use

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac \geq 0 \; the \; equation \; has \; real \; root$$

$$b^2 - 4ac < 0 \; the \; equation \; has \; imaginary \; root$$

a	c	$4ac$	$b^2 \geq 4ac$	Number of cases
1	1	4	2,3,4,5,6	5
1	2	8	3,4,5,6	4
1	3	12	4,5,6	3
1	4	16	4,5,6	3
1	5	20	5,6	2
1	6	24	5,6	2
2	1	8	3,4,5,6	4
2	2	16	4,5,6	3
2	3	24	5,6	2
2	4	32	6	1
3	1	12	4,5,6	3
3	2	24	5,6	2
3	3	36	6	1
4	1	16	4,5,6	3
4	2	32	6	1
5	1	20	5,6	2
6	1	24	5,6	2
sum				43

Pr {probability that the equation has real roots} $= \frac{43}{6*6*6} = \frac{43}{216}$

Ex: Six men stand in one of the rooms with their wife's

1) If two of them are chosen randomly, find the probability that
   1. they are married
   2. one of them is a man and the other is a woman
2) If four of them choose it randomly, find the probability that he will choose
   1. Two men and their wife's
   2. exactly one married couple is among of the 4

Sol\

1-1 $Pr(they\ are\ married) = \frac{\binom{6}{1}}{\binom{12}{2}} = \frac{6}{66} = \frac{1}{11}$

1-2 $pr(one\ male\ and\ one\ femail) = \frac{\binom{6}{1}\binom{6}{1}}{\binom{12}{2}} = \frac{6*6}{66} = \frac{36}{66}$

2-1 $pr(two\ man\ and\ ther\ wife) = \frac{\binom{6}{2}}{\binom{12}{4}} = \frac{15}{495}$

2-2 $pr(exactly\ one\ married\ couple\ is\ among\ of\ 4) = \frac{\binom{6}{1}\binom{2}{1}\binom{2}{1}\binom{5}{2}}{\binom{12}{4}} = \frac{240}{495}$