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Let F_i = Firm i for $i = 1, \ldots, 4$

Let (F_i, F_j) be the outcome: contract 1 is for firm i and contract 2 is for firm j.

$$S = \{(F_i, F_j) \text{ for } i, j = 1, 2, 3, 4\}$$

$$|S| = (4)(4) = 16.$$

Let A = "event that all contracts go to the same company".

$$A = \{(F_i, F_i) \text{ for } i = 1, 2, 3, 4\}$$

$$|A| = 4$$

Then $P(A) = \frac{|A|}{|S|} = \frac{4}{16} = \frac{1}{4}$.

Let B = "event firm i obtains at least one contract",

$$B = \{(F_i, F_i), (F_i, F_j), (F_j, F_i), \text{ for } j \neq i\}$$

$$|B| = 3$$

$$\Rightarrow P(B) = \frac{|B|}{|S|} = \frac{3}{16}.$$

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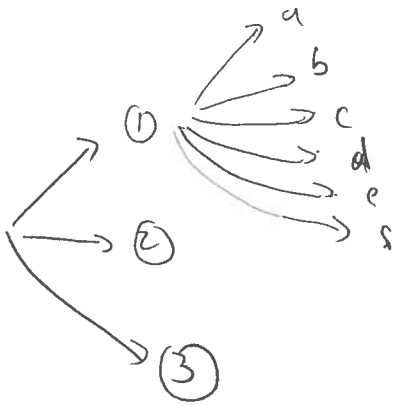

= different ways = (3)(6) = 18.

40

a. $8 \times 7 = 56 = P_2^8$ (Permutations) ← order matters

b $\binom{8}{2} = \binom{8}{2} = \frac{8 \times 7}{2} = 28$. (Combinations) ← order doesn't matter.

42 $4! = 24$.

The first task can be done in 4 different ways, the second in 3, the third in 2 and the last one in one.

or $P_4^4 = \frac{4!}{0!} = 4!$.

48

Let A = "Event of Choosing two bulbs and neither one is defective".

$$P(A) = \frac{\#\text{ Pairs with no defective bulbs}}{\#\text{ total possible Pairs of bulbs}} = \frac{\binom{5}{2}}{\binom{8}{2}} = \frac{\frac{5!}{2!\,3!}}{\frac{8!}{2!\,6!}} = \frac{5!\,2!\,6!}{2!\,3!\,8!} = \frac{5!(6)(5)!}{8!}$$

$$= \frac{5\times 4}{8\times 7} = \frac{5}{2\times 7} = \frac{5}{14}.$$

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$$\frac{\binom{10}{7}+\binom{10}{8}+\binom{10}{9}+1}{2^{10}}$$