

CSE 312 [A/B] (DO NOT INCLUDE YOUR NAME)

Winter 2018

HW #[1-9]

### Problem 1 (example)

**Answer:**

$$\frac{1}{4!} = \frac{1}{24} \approx \mathbf{0.04167}.$$

(In general, we want to see **both** a formula like  $3! \cdot \binom{5}{2}$  and its explicit numerical value of 60.)

**Explanation:**

We need to get exactly DABC, and there are  $4 \cdot 3 \cdot 2 \cdot 1 = 4!$  ways to arrange those 4 letters, so we have a  $\frac{1}{24}$  probability of getting a random permutation in that order.

(Remember to start each new problem on its own page. Do not include the problem statement in your solution as it takes up too much space and we already know the problem statement.)

**Problem 2 (multi-part example, and large numbers)****Part (a)****Answer:**

$$20! \cdot \binom{13}{5} \approx 3.131 \cdot 10^{21}$$

(Please give the raw formula you used, **and** its value, possibly in scientific notation if it is too large).

**Explanation:**

Explain here.

**Part (b)****Answer:***answer here***Explanation:**

Explain here.

### Problem 3 (proof problem example)

**Proof:**

(Short way)

$$\begin{aligned}\mathbb{P}(E|F) &= \frac{\mathbb{P}(E \cap F)}{\mathbb{P}(F)} \quad [\text{def of conditional prob}] \\ &= \frac{\mathbb{P}(F|E)\mathbb{P}(E)}{\mathbb{P}(F)} \quad [\text{chain rule}]\end{aligned}$$

(Long way)

First, by the chain rule, we have

$$\mathbb{P}(E|F)\mathbb{P}(F) = \mathbb{P}(E \cap F)$$

Switching the roles of  $E$  and  $F$  gives

$$\mathbb{P}(F|E)\mathbb{P}(E) = \mathbb{P}(F \cap E)$$

Since  $\mathbb{P}(E \cap F) = \mathbb{P}(F \cap E)$ , we can set them equal to get

$$\mathbb{P}(E|F)\mathbb{P}(F) = \mathbb{P}(F|E)\mathbb{P}(E)$$

But dividing by  $\mathbb{P}(F) > 0$  gives Bayes Theorem

$$\mathbb{P}(E|F) = \frac{\mathbb{P}(F|E)\mathbb{P}(E)}{\mathbb{P}(F)}$$