10.1

1.) a.) $\{(HTTH), (HHHH), (HTHH), (HHTH)\}$

$4/16 = \boxed{1/4}$

b.) $\{(HHHH), (HHTH), (HHHT), (THHT), (THHH), (HTHH)\}$

$\boxed{6/16}$

c.) $\{(THHH), (TTHH), (THHT)\}$

$\boxed{3/16}$

2.) a.) $\dfrac{(n-1)!}{n} = \boxed{\dfrac{1}{n}}$ b.) $\dfrac{(n-2)!}{n!} = \boxed{\dfrac{1}{n \times (n-1)}}$

c.) $\dfrac{2(n-1)!}{n!} = \boxed{\dfrac{2}{n}}$

4.) a.) $\dfrac{10!}{5! \, 5!} = \boxed{252}$

b.) $2\left(\dfrac{8!}{4! \, 4!}\right) = 140 \longrightarrow \dfrac{252 - 140}{252} = 0.44 = \boxed{44\%}$

c.) $2/252 = \boxed{1/126}$

5.) a.) Total prob: 2598960 $\longrightarrow \dfrac{3706}{2598960} = \boxed{0.00166}$

b.) $\dfrac{54912}{2598960} = \boxed{0.0211}$

c.) $\dfrac{5168}{2598960} = \boxed{0.00198}$

d.) $\dfrac{1098240}{2598960} = \boxed{0.62257}$

10.2

1.) a.) $n\left(\dfrac{1}{2}\right)^n + \left(\dfrac{1}{2}\right)^n = (n+1)\left(\dfrac{1}{2}\right)^n$ b.) $1 - \left(\dfrac{n}{\frac{n+1}{2}}\right)\left(\dfrac{1}{2}\right)^n - \left(\dfrac{n}{\frac{n-1}{2}}\right)\left(\dfrac{1}{2}\right)^n$

c.) $1 - \left(\dfrac{n}{\frac{n}{2}}\right)\left(\dfrac{1}{2}\right)^n$

2.) a.) $\dfrac{2(n-1)!}{n(n-1)} = \boxed{\dfrac{2}{n}}$ b.) $\dfrac{2}{n} - \dfrac{1}{n(n-1)} = \dfrac{2n-3}{n(n-1)}$

c.) $1 - \dfrac{1}{n} = \dfrac{n-1}{n}$ d.) $\dfrac{2(n-1)!}{n!} = \dfrac{2}{n}$

5.) $\dfrac{26^2 \times 10}{62^3} = \dfrac{5 \times 13^2}{31^3} = 0.023$

10.3

1.) a.) $P(A) = 1/2$ $P(B) = 1/6$ $P(C) = 1/6$

    b.) $P(\frac{A}{C}) = \frac{P(A \cap C)}{P(C)} = \frac{3}{6} = (1/2)$

c.) $P(\frac{B}{C}) = \frac{P(B \cap C)}{P(C)} = \frac{2/36}{6/36} = (\frac{1}{3})$

d.) $P(\frac{A}{B}) = \frac{P(A \cap B)}{P(B)} = \frac{3/36}{6/36} = (1/2)$

3.) a.) $\frac{7! \times 2}{8!} = \frac{2}{8} = \frac{1}{4}$

    c.) False; $7!$ ways

    b.) $\frac{7!}{8!} = \frac{1}{8}$

6.) a.) prob 1st flip = 1/3

    prob 2nd flip = 1/3 $\Big\}$ 10th flip = 1/3

    b.) 1st five flips heads = $(1/3)^5$

    last five flips = $(2/3)^5$ $\Big\}$ $\times$ (0.00054)

    c.) prob 1st flip heads = 1/3

    prob next nine tails = $(2/3)^9$ $\Big\}$ $\times$ (0.0087)

10.6

1.) $\dfrac{\frac{1}{2}\left(\frac{27}{1048576}\right)}{\frac{1}{2}\left(\frac{27}{1048576}\right) + \frac{1}{2}\left(\frac{1}{1024}\right)} = \dfrac{27}{27 + 1024} = \dfrac{27}{1051}$

3.) $P(E \mid A) = \frac{288}{482} = (0.59)$

4.) $P(D \mid T) = \dfrac{1(0.0001)}{1 \cdot (0.0001) + (0.025)(0.9999)} = (0.0039)$