1

(a) size of sample space $= 6^4 = 1296$

(b) $A = \{ \{1,1,1,1\}$
$\{2,2,2,2\}$
$\{3,3,3,3\}$
$\{4,4,4,4\}$
$\{5,5,5,5\}$
$\{6,6,6,6\} \}$

$\therefore P(A) = \frac{6}{1296} = \frac{1}{216}$

(c) $(1296-6) = 1290$ elements in A^c

(d) $B = 6 \times 5 = 30$

since exactly 3, exclude the one with 4

6 possibilities

(e) $n_C = n(A \cup B) = 30+6 = 36$

$n_D = n(A \cap B) = 0$

(2)

(a) $6 \times 6 = 36$ pairs

(b) $A = \{(1,4), (2,3), (3,2), (4,1)\}$

(c) $B = (\text{sum} == 8)$

$= \{(3,5), (4,4), (6,2), (5,3), (2,6)\}$

$P(B) = \frac{1}{4}$ [since laplace experiment]

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(3)

$w = 10,\ y = 5,\ b = 10$

(a) $P(y) = \frac{5}{25} = 1/5$

$P(b^c) = 1 - \frac{10}{25} = 1 - \frac{2}{5} = \frac{3}{5}$

(iv) $P(y \mid b^c) = \dfrac{P(y \cap b^c)}{P(b^c)}$ $\rightarrow P(y)$

$$= \frac{1 \times 5}{5 \times 3} = 1/3$$

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(5)

$$E = \mu = 1 \times 0.1 + 6 \times 0.3 + 0.15 \times (2+3+4+5)$$

$$= 2.1 + 0.1 + 1.8$$

$$= 4$$

$$\sigma^2 = \frac{1}{4} \times (3^2 + 2^2 + 1^2 + 0^2 + 1^2 + 2^2)$$

$$= \frac{1}{4}(9 + 4 + 1 + 1 + 2)$$

$$= \frac{17}{4} = 4.25$$

$$\sigma = \sqrt{17/4} = \frac{\sqrt{17}}{2} = 2.062$$

6

$n = 16$

(a) $$H(x) = -\frac{1}{16} \sum_{i=1}^{16} \log_2 \frac{1}{16}$$

$$= -\log_2 2^{-4}$$

$$= 4 \times 1 = 4$$

(b) $$H(x) = \frac{-1}{14} \sum_{i=1}^{14} \log_2 \frac{1}{14} - \frac{3}{14} \sum_{i=1}^{2} \log_2 \frac{3}{14}$$

$$= -\log_2 1/14 - \frac{3}{7} \log_2 3/14$$

$$= 4.76$$

since probability has changed the entropy will change too and in this case the outcome will be more uncertain.