1) $S = \{(1H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T, 6H, 6T\}$

2) a) $P(A') = 0.4$

b) $P(A \cup B) = 0.9$

c) $P(A|B) = \frac{5}{8}$

d) $P(B|A)\frac{5}{6}$

e) $P(A \cap B') = 0.1$

f) Are A and B mutually exclusive? Explain.
No: if they were mutually exclusive, we would have $P(A \cap B) = 0$

g) Are A and B independent? Explain.
No: this can be shown in any one of several ways. Either show that $P(A = capB) \neq P(A)P(B)$, or show that $P(A|B) \neq P(A)$, or show that $P(B|A) \neq P(B)$

3) Let E = "The number that shows is even", and G = "The number is greater than 2"

a) $P(E) = \frac{3}{6} = \frac{1}{2}$

b) Are the events "The number is even" and "The number is greater than 2" independent? Explain.
Yes, because (for example) $P(A \cap B) = \frac{2}{6} = \frac{1}{3}$, and $P(A)P(B) = \frac{1}{2}\frac{4}{6} = \frac{1}{3}$, so $P(A \cap B) = P(A)P(B)$

4) a) All of the probabilities are≥ 0, so all we need to show is that their sum is 1:
$P(1) + P(2) + P(3) + P(4) + P(5) + P(6) = \frac{2}{9} + \frac{1}{9} + \frac{2}{9} + \frac{1}{9} + \frac{2}{9} + \frac{1}{9} = \frac{9}{9} = 1$

b) $P(E) = P(2) + P(4) + P(6) = \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{3}{9} = \frac{1}{3}$

c) Are the events "The number is even" and "The number is greater than 2" independent? Explain.
Yes, because $P(E \cap G) = P(4) + P(6) = \frac{1}{9} + \frac{1}{9} = \frac{2}{9}$, and $P(G) = P(3) + P(4) + P(5) + P(6) = \frac{2}{9} + \frac{1}{9} + \frac{2}{9} + \frac{1}{9} = \frac{6}{9} = \frac{2}{3}$, so
$P(E)P(G) = \left(\frac{1}{3}\right)\left(\frac{2}{3}\right) = \frac{2}{9} = P(E \cap G)$

5)
- $P(T) = 0.5$ (half of all the adults were tobacco smokers)
- $P(T' \cap C) = \frac{25{,}000}{1{,}000{,}000} = 0.025$
- is a smoker? $P(C|T) = \frac{200{,}000}{500.000} = 0.4$
- $P(C) = \frac{225{,}000}{1{,}000{,}000} = 0.225$
- $P(T|C) = \frac{200{,}000}{225{,}000} = \frac{8}{9}$