Undergraduates: Questions 1-3: 6 points. Question 4: 7 points. Don't do question 5

Graduates: Each question 5 points.

1. Backton is connected to Crestville by three roads, and each road goes across a bridge, and they all use different bridges. The bridges are labeled A, B, and C . The probability that bridge A is up is 98%, the probability that bridge B is up is 97%, and the probability that bridge C is up is 96%. What is the probability that on any day an ambulance can drive from Crestville to the hospital in Backton?

Let A, B, and C represent bridges A, B, and C up respectively
also let E be the case that the ambulance can reach the hospital

$P(E) = P(A) \cdot P(E|A) + P(B) \cdot P(E|B) + P(C) \cdot P(E|C)$

$P(E|A) = P(A) = 0.98$
$P(E|B) = P(B) = 0.97$
$P(E|C) = P(C) = 0.96$

$P(E) = 0.98 \cdot 0.98 + 0.97 \cdot 0.97 + 0.96 \cdot 0.9$
$P(E) = 2.91$

2. Pg 54, #6

Let the probability of rolling an odd face be E and an odd face be O

$E = \{2, 4, 6\}$ $O = \{1, 3, 5\}$

$P(x) = \frac{1}{9}$ for $x \in O$ $P(x) = \frac{2}{9}$ for $x \in E$

$P(x < 4) = P(1, 2, 3) = P(1) + P(2) + P(3)$
$= \frac{1}{9} + \frac{2}{9} + \frac{1}{9} = \frac{4}{9}$

3. Pg 56 #14

a) Total num outcomes $= 6 \cdot 6 = 36$
6 outcomes were a double is rolled
$P(\text{doubles}) = \frac{6}{36} = \frac{1}{6}$

b) 6 possible outcomes of rolling total of 4 or less:
(1-1, 1-2, 1-3, 2-1, 2-2, 3-1)
6 possible outcomes of rolling a double

$$P(\text{Doubles} \mid \text{sum} \leq 4) = \frac{2}{6} = \frac{1}{3}$$

c) Probability of not rolling a 6 on both die is $(\frac{5}{6})^2$

$$P(\text{At least one 6}) = 1 - (\frac{5}{6})^2 = 1 - \frac{25}{36} = \frac{11}{36}$$

d) total outcomes $= 5 \cdot 6 = 30$ P(At least one 6) $= \frac{11}{36}$

$$P(\text{At least one 6} \mid \text{Diff numbers}) = \frac{11}{30}$$

4. Pg 54, #7
Let E denote the event an even number is rolled and O, an odd
The sample space can be represented as a sequence
of E's any O's, ending with the first E. some possible
sample spaces for this experiment include:

~~5. (6 points) Pg 57 #17~~ $S = \{E, OE, OOE, OOOE, OOOOE, \ldots\}$