Solution 1a:
Let E – Event that sum of the 2 numbers of dice landings is 'i'
E1 – Event that dice lands on '6'.
P(E1|E) is the required probability.

Case -1:
We know by conditional probability that, p(E|E1) = $p(E \cap E1)/p(E)$
If 'i' lies in [2,6], then $P(E \cap E1) = 0$
=> P(E|E1) = 0

Case – 2:
Here, 'i' belongs to [7,12] .
$P(E \cap E1) = (1/6) * (1/6) = 1/36$
Note, that if dice - 1 lands on 6, then dice - 2 must land on 'i-6', for the sum to be 'i'. Therefore, the second dice only has one choice.

Notation:
[(x,y) is a tuple means , dice – 1 landed on x, and dice – 2 landed on y]

Note that P(E), depends on the value of 'i'.
a) i=7:
All possible scenarios are (1,6), (6,1), (2,5), (5, 2), (3,4), (4,3).
=> p(E) = 6/36
=> p(E1|E)=1/6

b) i=8:
All possible scenarios are (2,6), (6,2), (3,5), (5,3), (4,4).
=>p(E)=5/36.
=>p(E1|E)=1/5.

c) i=9:
All possible scenarios are (3,6), (6,3), (5,4), (4,5)
=> p(E) = 4/36.
=> p(E1|E)= ¼.

d) i=10:
All possible scenarios are (4,6), (6,4), (5,5).
=> p(E) = 3/36.
=> p(E1|E) = 1/3.

e) i=11:
All possible scenarios are (6,5), (5,6).
=> p(E) = 2/36.
=> p(E1|E) = ½.
f) i=12:
The only case possible is (6,6).
=> p(E) = 1/36.
=> p(E1|E) = 1.

Solution 1b:
Let E1 – randomly chosen bulb initially lights.
Let E2 – bulb chosen will still be working after 1 week.

By conditional probability formula, we know that,
p(E2|E1) = $p(E1 \cap E2)/p(E1)$

p(E1) = (No. of bulbs in good condition + Number of partially defective bulbs) / total number of bulbs.
= (5+10)/25.
= 3/5.
$p(E1 \cap E2)$ = Number of good bulbs / Total number of bulbs.
= 5/25 = 1/5.
=> p(E2|E1) = 1/3, which is the desired result.

Solution 2:
Let E – letter taken at random is a vowel.
Let A – man is an englishman.
Let B – man is an american.

p(A) = 0.4
p(B) = 0.6

p(E) = $p(E \cap A)$ + $p(E \cap B)$
= p(A) * p (E|A) + p(B) * p(E|B)
= 0.4 * 0.5 + 0.6 * 0.4
= 0.44
$p(E \cap A)$ = 0.4 * 0.5
= 0.2

=> p(A|E) = 0.2/0.44
= (5/11).