1. First convert the outcomes into utilities:

probability	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{6}$
state $\rightarrow$	s_1	s_2	s_3	s_4	s_5
act $\downarrow$					
a	3	4	1	8	6
b	6	2	4	5	8
c	2	3	0	7	5

(a) Since act *c* is strictly dominated by act *a*, we only need to compute the expected utility of *a* and the expected utility of *b*. $EU(a) = \frac{1}{12}3 + \frac{2}{12}4 + \frac{4}{12}1 + \frac{3}{12}8 + \frac{2}{12}6 = \frac{51}{12} = 4.25$ and $EU(b) = \frac{1}{12}6 + \frac{2}{12}2 + \frac{4}{12}4 + \frac{3}{12}5 + \frac{2}{12}8 = \frac{57}{12} =$ 4.75. **Thus she will choose act *b*.**

(b) (b.1) If she received information $\{s_1, s_2\}$ then, using Bayes' rule to update the probabilities, $EU\left(a \mid \{s_1, s_2\}\right) = \frac{1}{3}3 + \frac{2}{3}4 = \frac{11}{3} = 3.67$ and $EU\left(b \mid \{s_1, s_2\}\right) = \frac{1}{3}6 + \frac{2}{3}2 = \frac{10}{3} = 3.33$. Thus **she would choose act *a***. If she received information $\{s_3, s_4, s_5\}$ then, again using Bayes' rule, $EU\left(a \mid \{s_3, s_4, s_5\}\right) = \frac{4}{9}1 + \frac{3}{9}8 + \frac{2}{9}6 = \frac{40}{9} = 4.44$ and $EU\left(b \mid \{s_3, s_4, s_5\}\right) = \frac{4}{9}4 + \frac{3}{9}5 + \frac{2}{9}8 = \frac{47}{9} = 5.22$. Thus **she would choose act *b***.

(b.2) Her expected utility is $\frac{3}{12}\frac{11}{3} + \frac{9}{12}\frac{47}{9} = \frac{58}{12} = 4.83$

(c) It is $\frac{58}{12} - \frac{57}{12} = \frac{1}{12} = 0.083$

2. **(a)** It is given by the solution to $(0.6)(0.9)100 = (0.6)(0.9)(100 - 10 - p) + (0.6)(0.9)^2 40$ which is $p = 26$.

(b) It is given by the solution to $100 - 10 = 100 - 10 - p + (0.6)(0.9)40$ which is $p = 21.6$

(c) $U_0(A: \textit{not join}) = (0.6)(0.9)100 = 54$, $U_0(B: \textit{join and no exercise}) = (0.6)(0.9)(100 - 10) = 48.6$, $U_0(C: \textit{join and exercise}) = (0.6)(0.9)(100 - 10 - 23) + (0.6)(0.9)^2 40 = 55.62$. Thus your ranking is $C \succ A \succ B$ and your most preferred plan is to join and exercise.

(d) $U_1(D: \textit{no exercise}) = M - F = 90$, $U_1(E: \textit{exercise}) = M - F - p + \beta\delta b = 88.6$. Thus your ranking is $D \succ E$ and you prefer not to go to the gym.

(e) No, because at date 0 you would plan to join and exercise and then at date 1, when you are a member, you prefer not to go to the gym.

(f) The tree is as follows and the backward-induction solution is shown by double edges. Here M = 100, F = 10, p = 23, b = 40, β = 0.6 and δ = 0.9.