1. (a) If you sell your computer to your friend your utility is: \(100 - (10 - 4)^2 = 64\). If you offer it for sale on eBay at a cost of $100, with probability \(\frac{2}{6} + \frac{1}{6}\) your are going to get an offer not exceeding $400 and therefore you will go back to your friend and end up with \($400 - 100\) = $300, with probability \(\frac{2}{6}\) you are going to sell for $600 (hence end up with $500) and with probability \(\frac{1}{6}\) you are going to end up with \($800 - 100\) = $700. Thus the expected utility of offering it for sale on eBay is:

\[
\frac{3}{6}[100 - (10 - 3)^2] + \frac{2}{6}[100 - (10 - 5)^2] + \frac{1}{6}[100 - (10 - 7)^2] = 65.66
\]

Hence you are better off offering it for sale on eBay.

(b) In this case if you offer it for sale on eBay and get an offer of less than $400 you will have to accept it since you cannot go back to your friend and sell to him for $400. Thus the expected utility of offering it for sale on eBay is:

\[
\frac{2}{6}[100 - (10 - 1)^2] + \frac{1}{6}[100 - (10 - 3)^2] + \frac{2}{6}[100 - (10 - 5)^2] + \frac{1}{6}[100 - (10 - 7)^2] = 55.
\]

Thus in this case you are better off selling to your friend.

2. Since Paul is risk-neutral and Meg is risk-averse, Pareto efficiency requires that all the risk be borne by Paul, hence Meg should be guaranteed a fixed wage. For the contract to be acceptable to Meg, it must guarantee her a utility of at least 1. A contract according to which Meg gets 1 for sure is Pareto efficient and acceptable to both, because Meg's utility is \(\sqrt{1} = 1\) and Paul's expected utility is

\[
\frac{1}{4}(1 - 1) + \frac{1}{4}(2 - 1) + \frac{1}{4}(3 - 1) + \frac{1}{4}(4 - 1) = \frac{3}{2} > 1.
\]

3. Let date 0 be the current year. The discounted present value of her income over the next 10 years if she takes the job is

\[
\sum_{i=0}^{9} \frac{50,000}{1.08^i} + \sum_{i=3}^{9} \frac{60,000}{1.08^i} = 139,163.24 + 267,817.39 = $406,980.63
\]

If she goes to Law School, then she will start earning from the fourth year onwards and her net salary will be (after repaying her loan) \(120,000 - 18,000 = $112,000\) per year, whose present value is: \(\sum_{i=3}^{9} \frac{102,000}{1.08^i} = $455,289.56\). Thus she should go to Law school.
4. (a) For the H type expected utility of no insurance is \( \frac{1}{3} \ln(6) + \frac{2}{3} \ln(15) = 2.4026 \). The maximum premium that the H type would be willing to pay for full insurance is the solution to 
\[ \ln \left( \frac{15,000 - h}{1,000} \right) = 2.4026 \]
which is \$3,947.91. The monopolist would offer such a contract and its expected profit would be:

per contract: \$3,947.91 - \frac{1}{3} (9,000) = \$947.91, total profits: 947.91(1,800) = \$1,705,518.

(b) First we need to calculate the average probability of loss \( \bar{p} \):
\[
\bar{p} = \frac{1}{3} \left( \frac{N_H}{N_H + N_L} \right) + \frac{1}{12} \left( \frac{N_L}{N_H + N_L} \right) = \frac{2}{15}
\]
Option 2 is profitable if and only if the reservation indifference curve of the L type is steeper at the no-insurance point than the average zero-profit line, that is, if and only if
\[
\frac{p_L}{1 - p_L} \left( \frac{U'(9,000)}{U'(15,000)} \right) > \frac{\bar{p}}{1 - \bar{p}} \quad \text{that is} \quad \frac{5}{22} > \frac{2}{13} \quad \text{which is true.}
\]

(c) The profit-maximizing contract under Option 2 is given by the solution to the following equations (the first says that the L types are indifferent between insuring and not insuring and the second equation says that, at the offered contract, the slope of the L-type indifference curve is equal to the slope of the average isoprofit line; note that \( U'(x) = \frac{1}{x} \)):
\[
\frac{1}{12} \ln \left( \frac{15,000 - h - d}{1,000} \right) + \frac{11}{12} \ln \left( \frac{15,000 - h}{1,000} \right) = \frac{1}{12} \ln \left( \frac{15,000 - 9,000}{1,000} \right) + \frac{11}{12} \ln \left( \frac{15,000}{1,000} \right)
\]
\[
\frac{11}{12} \left( \frac{15,000 - h}{15,000 - h - d} \right) = \frac{2}{13} \frac{\bar{p}}{1 - \bar{p}}
\]

(d) First calculate the expected utility from now insurance for each type:

Type H: \( \mathbb{E}[U_H(NI)] = \frac{1}{3} \ln(6) + \frac{2}{3} \ln(15) = 2.4026 \) (this was calculated in part (a))

Type L: \( \mathbb{E}[U_L(NI)] = \frac{1}{12} \ln(6) + \frac{11}{12} \ln(15) = 2.6317 \)

- \( \mathbb{E}[U_H(C_h)] = \frac{1}{3} \ln(10.8) + \frac{2}{3} \ln(11.4) = 2.4156 > \mathbb{E}[U_H(NI)] \) and thus \( IR_H \) is satisfied.
- \( \mathbb{E}[U_L(C_L)] = \frac{1}{12} \ln(12.8) + \frac{11}{12} \ln(13) = 2.6825 > \mathbb{E}[U_L(NI)] \) and thus \( IR_L \) is satisfied.
- \( \mathbb{E}[U_H(C_L)] = \frac{1}{3} \ln(12.8) + \frac{2}{3} \ln(13) = 2.6462 > \mathbb{E}[U_H(C_h)] \) and thus \( IC_H \) fails.
- \( \mathbb{E}[U_L(C_H)] = \frac{1}{12} \ln(10.8) + \frac{11}{12} \ln(11.4) = 2.4291 \) and thus \( IC_L \) is satisfied.

(e) From Part (d) we deduce that both types would choose contract \( C_L = (h = 200, d = 2000) \). Thus the expected profit per contract is (recall from Part (b) that the average probability of loss is \( \frac{2}{15} \)):
\[
200 - \frac{2}{15} (9,000 - 2,000) = \$733.33.
\]
Thus total expected profits are \((-733.33)(N_H + N_L) = (-733.33)(9,000) = -6,599,970\): a huge loss!

(f) The contract \(C_L = (h_L, d_L)\) targeted to the L types should be such that (1) the L type is indifferent between contract \(C_L = (h_L, d_L)\) and no insurance (this is the first of the two equations below) and (2) the H type is indifferent between \(C_H\) and \(C_L\) (this is the first of the two equations below)

\[
\frac{1}{12} \ln \left( \frac{15,000 - h_L - d_L}{1,000} \right) + \frac{11}{12} \ln \left( \frac{15,000 - h_L}{1,000} \right) = 2.6317
\]

\[
\frac{1}{3} \ln \left( \frac{15,000 - 3,600 - 600}{1,000} \right) + \frac{2}{3} \ln \left( \frac{15,000 - 3,600}{1,000} \right) = \frac{1}{3} \ln \left( \frac{15,000 - h_L - d_L}{1,000} \right) + \frac{2}{3} \ln \left( \frac{15,000 - h_L}{1,000} \right)
\]

The solution is \(h_L = 64.57\) and \(d_L = 8,643.30\).