1. (i) \( \mu = .06 \) and \( \sigma = .10 \): Find \( P(X < 0) = P \left( Z < \frac{0-.06}{.10} \right) = P(Z < -.6) \).

Turning to the normal tables we find that the probability associated with the critical value of \(-.6\) is 27.43%. That is 27.43% of the time, and thus approximately 13 years, the return on corporate bonds was less than 0%.

(ii) \( \mu = .11 \) and \( \sigma = .16 \): Find out what the rate of return is for the worst five years of the S&P. That is: what was the rate of return for the worst 10% of the last 48 years. We must solve for \( a \) : 

\[ .10 = P(X < a) = P \left( Z < \frac{a-.11}{.16} \right) \].

Turning to the normal tables we find that the critical value leading to a .10 outcome is \(-1.28\). Thus find \( a \) such that 

\[ -1.28 = \frac{a-.11}{.16} \]

\[ a = -.09 \]

This tells us (approximately) that in the worst 5 years of the last 48 years the S&P lost 9% or more.

2. \( r = 0.12 \).

   i) NPV = \(-75,000 + 140,000/(1+r)^5 = -75,000 + 79,439.76 = 4439.76 \).

   ii) Yes, since Venkatesh can borrow against the return from selling the land.

   iii) Keeping future consumption unchanged means Venkatesh borrows against the entirety of his return, i.e., he borrows \( 140,000/(1+0.12)^5 = 79,439.76 \) at \( t=0 \). So \( C_0=Y_0 - 75,000 + 79,439.76 = Y_0 + 4439.76 \). The effect on \( C_0 \) is \( 4439.76 = \) NPV.

   iv) Venkatesh is willing to pay up to the PV of his returns on the land, or $79,439.8.
3. Work (39,39) → PV_W = 39+39/(1+r);
Law school (23,65) → PV_L = 23 + 65/(1+r).

Note that if the budget constraint is linear, Hang-Ro will allocate half of PV to each periods consumption.

**Situation I**: r = 30%. Hence, slope = -(1+r) = -1.3 and PV_W = 69, PV_L = 73.
Her optimal consumption plan is;
Work: C_0 = 69/2 = 34.5, C_1 = (34.5) (1.3) = 44.9 → Lending = 39 - 34.5 = 4.5.
Law: C_0 = 73/2 = 36.5, C_1 = (36.5) (1.3) = 47.5 → Borrowing = 36.5 -23 = 13.5.
Since the law school budget constraint is everywhere outside the work budget constraint, Hang-Ro will clearly choose Law school, independent of her preference.

**Situation II**: r = 50%. Hence slope = -1.5 and PV_W = 65, PV_L = 66.3.
i) In this situation, we need to know preferences. If preferences were different, she might choose L over W.
ii) Work: If borrowing was unrestricted, then
\[ C_0 = 65/2 = 32.5, \quad C_1 = 32.5 \times 1.5 = 48.8. \]
This point is in fact on the relevant portion of the constraint, and Hang-Ro will consume at (32.5, 48.8), lending 39.5- 32.5 = 6.5, and attain a utility level of 32.5 \times 48.8 = 1586.

Law: If borrowing were unrestricted, then
\[ C_0 = 66.3/2 = 33.2, \quad C_1 = 33.2 \times 1.5 = 49.8. \]
Unfortunately, this point is infeasible. She will end up at the kink, borrowing 3 at t=0, and consuming C_0 = 26, C_1 =60.5, thus enjoying a utility of 26 \times 60.5 = 1573.
Now, she is slightly better off working right away.