1) a) $1-0.3=0.7$

b) $0.6+0.5-0.7=0.4$

c) $0.6-0.4=0.2$

d) $0.7-0.4=0.3$

2) $S \to$ (1,1) (1,2) (1,3) (1,4) ~~(1,5)~~ (1,6)

(2,1)

(3,1)

(4,1)

(5,1)

(6,1)

$((x_1, x_2))$

$P(A) = 5/36$ ((2,6) (6,2) (4,4) (3,5) (5,3))

3) $\frac{1}{2^n-1}$ $\left(\because P = \frac{\frac{1}{2^n}}{\frac{1}{2}}\right)$ (independent).

4) 1. $F_X(x) = pF_d(x) + (1-p)F_c(x)$

2. Couldn't understand how PDF defined for discrete

3. $E[X] = pE[X_d] + (1-p)E[X_c]$

4. Probably $p^2 var(X_d) + (1-p)^2 var(X_c) + 2p^2(1-p)^2 \underline{cov(X_d, X_c)}$? (Need clarity in this & topic further)

5) $cov(Z,W) = E[ZW] - E[Z] \times E[W]$

$= 3 - 1 = 2$

$E[Z] = 1 + E\cancel{[X] + E[X]E[Y^2]}$

$= 1$

$E[W] = 1$

$E[ZW] = 1 + E[X^2]E[Y^2] + E[X^2]$

$= 3$

$E(X^2) = E[Y^2] = 1$

6) No

7) $\mu = 100$, $\sigma^2 = 90$ $n = 1000 \Rightarrow$ Assuming Normal distrn

$P \approx 0.01355$ (from CDF table)

8) $\approx 64 + 2\sigma \approx 64 + 2\sqrt{32} \approx 75.3$ (But answer slightly less because we have to be 95% sure on only one side of dist from mean (no shortage →))

9) 1. $E[X] = E[Y] = 0$

9) 1. $E[X] = E[Y] = 0$

2. $Var(X) = Var(Y) = 1$

3. $Cov(X,Y) = \rho$

10) $X = 1 + k(Y-2) + \cdots \hookrightarrow$ Gaussian $\sim N(0, 4 - \frac{1^2}{3})$

$= 1 + (\frac{1}{3})(\cancel{y} Y-2) + \cdots \hookrightarrow N(0, \frac{11}{3})$

$X|Y=y = 1 + \frac{1}{3}(y-2) + \cdots \hookrightarrow N(0, \frac{11}{3})$

$\Rightarrow X|Y=y \sim N(1 + \frac{1}{3}(y-2), \frac{11}{3})$

11) $E[Z] = 0$

~~$Var(Z) = Var(3X-2Y) = 9Var(X) + 4Var(Y)$~~

$Var(Z) = E[9X^2 + 4Y^2 - 12XY] - (0)^2$

$= 9 + 4\times 4 - 12 = 13$

$Cov(Z,X) = E[ZX] - 0 = E[3X^2 - 2XY] = 3 - 2 = 1$

12) $E[X|Y=y, Z=z] = \mu_X + \frac{1}{\sigma_Y^2\sigma_Z^2 - \sigma_{YZ}^2}\Big((\sigma_{XY}\sigma_Z^2 - \sigma_{XZ}\sigma_{YZ})(y-\mu_Y)$
$+ (\sigma_{XZ}\sigma_X^2 - \sigma_{XY}\sigma_{YZ})(z-\mu_Z)\Big)$

$= \frac{1}{14}(11y + 5z)$ ↳ I simplified matrices, don't know why

$\sigma^2 = \sigma_X^2 - \frac{1}{\sigma_Y^2 + \sigma_Z^2 - \sigma_{YZ}^2}(\sigma_{XY}^2\sigma_Z^2 - 2\sigma_{XY}\sigma_{XZ}\sigma_{YZ} + \sigma_{XZ}^2\sigma_Y^2)$

$= 4 - \frac{1}{14}(27) = \frac{29}{14}$