

Question #7

a) Since $P(Y=-1)=0.4$, using the given distribution

$$P(Y=-1) = a + 0.1 \Rightarrow \boxed{a = 0.3}$$

As total probability is 1 so,

$$0.3 + 0.1 + 0 + 0.4 + 0.2 + b = 1 \Rightarrow \boxed{b = 0}$$

b) The expected value of Y is

$$E(Y) = \sum Y P(Y=Y) = -1(0.4) + 0(0.3+0.4) + 1(0.2+0) = \boxed{-0.2}$$

c) We first find expectation x

$$E(X) = \sum x P(X=x) = 0(0.3+0+0.2) + 1(0.1+0.4+0) = \boxed{0.5}$$

Now using the laws of expected value, we get

$$E(Z) = E(X) + E(Y) = 0.5 - 0.2 = \underline{\underline{0.3}}$$

d) Z can take values from $-1, 2$

$$Z = -1, \text{ if } X=0, Y=-1$$

$$\Rightarrow P(Z=-1) = 0.3$$

$$Z = 0, \text{ if } (X=0, Y=0) \text{ or } (X=1, Y=-1)$$

$$\Rightarrow P(Z=0) = 0 + 0.1 = 0.1$$

$$Z = 1, \text{ if } (X=0, Y=1) \text{ or } (X=1, Y=1)$$

$$\Rightarrow P(Z=1) = 0.4 + 0.2 = 0.6$$

$$Z = 2, \text{ if } (X=1, Y=1)$$

$$\Rightarrow P(Z=2) = 0$$

So we have

Z	-1	0	1	2
$P(Z)$	0.3	0.1	0.6	0

So,

$$E(Z) = -1(0.3) + 0(0.1) + 1(0.6) + 2(0) = \boxed{0.3}$$