$$E[x+z] = \iint (x+z)\, P(x,z)\, dx\, dz$$

$$= \iint (x+z)\, P(x)\, P(z)\, dx\, dz$$

$$= \int x\, P(x)\, dx + \int z\, P(z)\, dz$$

$$= E[x] + E[z]$$

$$var[x+z] = \cancel{\bigotimes} E\left[\left((x+z) - E[x+z]\right)^2\right]$$

$$= \iint \left((x+z) - E[x+z]\right)^2 P(x,z)\, dx\, dz$$

$$= \iint \left((x - E[x]) + (z - E[z])\right)^2 P(x)\, P(z)\, dx\, dz$$

$$= \iint \left((x - E[x])^2 + (z - E[z])^2 + \underbrace{2(x - E[x])(z - E[z])}_{=\,0}\right) P(x)\, P(z)\, dx\, dz$$

$$= \iint (x - E[x])^2 P(x)\, dx \int (z - E[z])^2 P(z)\, dz$$

$$= var[x] + var[z]$$