65) X = repair cost Y = payment made by insurer.

$d = 250$ $X \le d$ $Y = 0$

$X > d$ $Y = X - d$.

$$Y = \begin{cases} 0 & X \le 250 \\ X - 250 & X > 250 \end{cases}$$

$Y = g(X)$ $X \sim \text{Uniform}[0, 1500]$

$$f(x) = \frac{1}{1500 - 0} = \frac{1}{1500}$$

$$\text{Var}(Y) = E[Y^2] - (E(Y))^2$$

$$E(Y) = E(g(X)) = \int_0^{1500} g(x) \cdot f(x)\,dx = \int_0^{250} 0 \cdot f(x)\,dx + \int_{250}^{1500} (x-250)\frac{1}{1500}\,dx$$

$$= \frac{1}{1500}\left(\frac{1}{2}x^2 - 250x\right)\Big|_{250}^{1500} = 521$$

$$E(Y^2) = E[g^2(X)] = \int_0^{1500} g^2(x) \cdot f(x)\,dx$$

$$= \int_0^{250} 0 \cdot f(x)\,dx + \int_{250}^{1500} (x-250)^2 \frac{1}{1500}\,dx = \frac{1}{1500} \times \frac{1}{3}(x-250)^3\Big|_{250}^{1500}$$

$$= 434,028$$

$$\text{Var}(Y) = E(Y^2) - (E(Y))^2 = 434,028 - 521^2$$

$$\text{St. dev.} = \sqrt{\text{Var}(Y)} = 403$$

B