105. Solution: A
The calculation requires integrating over the indicated region.

\[ E(X) = \int_0^{12} \int_0^x \frac{8}{3} x^2 y \, dy \, dx = \int_0^{12} \frac{4}{3} x^2 \left( 4x^2 - x^3 \right) \, dx = \int_0^{12} x^4 \, dx = \frac{4}{5} x^5 \bigg|_0^{12} = \frac{4}{5} \]

\[ E(Y) = \int_0^{12} \int_0^x \frac{8}{3} y^2 \, dx \, dy = \int_0^{12} \frac{8}{3} x y^3 \bigg|_0^x \, dx = \int_0^{12} \frac{8}{9} x \left( 8x^3 - x^4 \right) \, dx = \int_0^{12} \frac{56}{9} x^4 \, dx = \frac{56}{45} x^5 \bigg|_0^{12} = \frac{56}{45} \]

\[ E(XY) = \int_0^{12} \int_0^x \frac{8}{3} x^2 y^2 \, dx \, dy = \int_0^{12} \frac{8}{3} x^2 \left( 8x^3 - x^4 \right) \, dx = \int_0^{12} \frac{56}{9} x^3 \, dx = \frac{56}{54} x^4 \bigg|_0^{12} = \frac{28}{27} \]

\[ \text{Cov}(X, Y) = E(XY) - E(X)E(Y) = \frac{28}{27} - \left( \frac{56}{45} \right) \left( \frac{4}{5} \right) = 0.04 \]

106. Solution: C
The joint pdf of X and Y is \( f(x,y) = f_2(y|x) f_1(x) = (1/x)(1/12) \), \( 0 < y < x \), \( 0 < x < 12 \).
Therefore,

\[ E[X] = \int_0^{12} \int_0^x \frac{1}{12x} \, dy \, dx = \int_0^{12} \frac{y}{12} \bigg|_0^x \, dx = \frac{x^2}{12} \bigg|_0^{12} = 6 \]

\[ E[Y] = \int_0^{12} \int_0^x \frac{y}{24x} \, dy \, dx = \int_0^{12} \frac{y^2}{24x} \bigg|_0^x \, dx = \frac{x^2}{24} \bigg|_0^{12} = 144 \bigg| 48 = 3 \]

\[ E[XY] = \int_0^{12} \int_0^x \frac{y^2}{24} \, dy \, dx = \int_0^{12} \frac{x^2}{24} \bigg|_0^{12} = \frac{x^3}{72} \bigg|_0^{12} = (12)^3 = 24 \]