\[
\Pr\left( (X < 1) \cup (Y < 1) \right) \\
= 1 - \int_0^1 \int_0^{1/2} \frac{x + y}{27} \, dx \, dy - \int_0^1 \int_0^3 \frac{x^2 + 2xy}{54} \, dy \\
= 1 - \int_0^1 \left( 9 + 6y - 1 - 2y \right) dy \\
= 1 - \frac{1}{54} \int_0^3 (8 + 4y) \, dy = 1 - \frac{1}{54} (8y + 2y^2) \bigg|_0^3 = 1 - \frac{32}{54} = \frac{11}{27} = 0.41
\]

79. Solution: E
The domain of \( s \) and \( t \) is pictured below.

Note that the shaded region is the portion of the domain of \( s \) and \( t \) over which the device fails sometime during the first half hour. Therefore,

\[
\Pr \left( S \leq \frac{1}{2} \right) = \int_0^{1/2} \int_0^1 f(s,t) \, ds \, dt + \int_0^{1/2} \int_0^{1/2} f(s,t) \, ds \, dt
\]

(where the first integral covers A and the second integral covers B).

80. Solution: C
By the central limit theorem, the total contributions are approximately normally distributed with mean \( n\mu = (2025)(3125) = 6,328,125 \) and standard deviation \( \sigma \sqrt{n} = 250\sqrt{2025} = 11,250 \). From the tables, the 90th percentile for a standard normal random variable is 1.282. Letting \( p \) be the 90th percentile for total contributions, \( \frac{p - n\mu}{\sigma \sqrt{n}} = 1.282 \), and so \( p = n\mu + 1.282 \sigma \sqrt{n} = 6,328,125 + (1.282)(11,250) = 6,342,548 \).