14.2

$E[X_i] = 0.25 = \frac{1}{4}$

$Var(X_i) = 0.0375 = \frac{3}{80}$

$S_{625} = X_1 + \cdots X_{625}$

$E[S_{625}] = \frac{625}{4}$

$Var(X_i) = \frac{375}{16}$

$P(S_{625} < 170)$

$= P\left(\frac{S_{625} - E[S_n]}{\sigma_{625}}\right) < P\left(\frac{170 - E[S_n]}{\sigma_{625}}\right)$

$= P(Z_{625}) < P\left(\frac{170 - 156.25}{4.84}\right)$ $\rightarrow 13.75$

$= \Phi(2.84) = 0.997$

14.4

$E[T_i] = \frac{1}{0.5} = 2$

$Var[T_i] = \frac{1}{0.5^2} = 4$

$S_{T_{30}} = T_i + \cdots + T_{30}$

$E[S_{T_{30}}] = 60$, $Var(S_{T_{30}}) = 120$

$$P(S_{T30} \le 60) \Rightarrow P\left(\frac{S_{T30} - E[S_{T30}]}{Var(S_{T30})}\right) \le P\left(\frac{60-60}{120}\right)$$

$$\Rightarrow P(Z_{T30}) \le \Phi(0) = 0.5$$

14.b

$$P(X<26) = P(X \le 25.9)$$

$$E[\bar{X}] = np$$

$$Var(X) = np(1-p)$$

$$P\left(\frac{X-np}{\sqrt{np(1-p)}}\right) \le P\left(\frac{25.9-np}{\sqrt{np(1-p)}}\right)$$

$$= P\left(\frac{25.9-25}{\sqrt{25 \times 0.75}}\right)$$

$$= \Phi(0.2078)$$

14.9

$P(T_1 + \cdots T_{1002} < 50)$

$E[S_{T_{1002}}] = 0.05 \times 1002 \approx 50.1$

$Var(S_{T_{1002}}) = n\,Var(T_i) = 1002 \times 4 \times 10^{-4} = 0.4008$

$P(S_{T_{1002}} < 50)$

$\Rightarrow P\left(Z_{T_{1002}} < \frac{50 - E[S_{T_{1002}}]}{\sqrt{Var(S_{T_{1002}})}}\right)$

$= P(Z_{T_{1002}} < -0.158)$

$=$