X unknown pdf with μ and $Var(X) = \sigma^2$

chebyshev's Theorem :

$$P(|X-\mu| \geq k\sigma) \leq \frac{1}{k^2} \quad \text{or} \quad P(|X-\mu| \leq k\sigma) \geq 1-\frac{1}{k^2}$$

كذلك يعني $\Rightarrow$ $P(X \geq \mu+k\sigma \text{ or } X \leq \mu-k\sigma) \leq \frac{1}{k^2}$ or $P(\mu-k\sigma \leq X \leq \mu+k\sigma) \geq 1-\frac{1}{k^2}$

Q1

a) $P(-6 < X < 26)$ → $-6 = \mu - k\sigma \Rightarrow -6 = 10 - k4 \Rightarrow k = 4$

or → $26 = \mu + k\sigma \Rightarrow 26 = 10 + k4 \Rightarrow k = 4$

$\therefore P(-6 < X < 26) = P(|X-10| \leq 16) \geq 1 - \frac{1}{k^2} = 1 - \frac{1}{16} = \frac{15}{16}$

b) $P(|X-10| \leq 12) \rightarrow 12 = k\sigma \Rightarrow 12 = k4 \Rightarrow k = 3$

$\therefore P(|X-10| \leq 12) \geq 1 - \frac{1}{k^2} = 1 - \frac{1}{9} = \frac{8}{9}$

c) $P(|X-10| > 12) \rightarrow 12 = k\sigma \Rightarrow 12 = k4 \Rightarrow k = 3$

$\therefore P(|X-10| > 12) \leq \frac{1}{k^2} = \frac{1}{9}$

Q2 data set with $\mu = 145$ and $\sigma = 17$ for unknown dis. for X.

$P(161 < X < 224)$ → $224 = \mu + k\sigma \Rightarrow 224 = 145 + 17k \Rightarrow k = 2$

or → $161 = \mu - k\sigma \Rightarrow 161 = 195 - 17k \Rightarrow k = 2$

$\therefore P(161 < X < 224) = P(|X-145| < 34) \geq 1 - \frac{1}{k^2} = 1 - \frac{1}{4} = \frac{3}{4}$