Student Information

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Answer 1

a)

The probability density function of the uniform distribution is: $f(x) \; \{ \begin{array}{cc} \frac{1}{b-a} & a < x < b \\ 0 & elsewhere \end{array}$
In our function $a = 60$ and $b = 180$. Therefore, our function is:
$f(x) \; \{ \begin{array}{cc} \frac{1}{120} & 60 < x < 180 \\ 0 & elsewhere \end{array}$

b)

The mean is $E(x) = \frac{a+b}{2} = \frac{180+60}{2} = 120$
The variance is $Var(x) = \frac{(b-a)^2}{12} = \frac{(180-60)^2}{12} = 1200$
The standard deviation is $\sqrt{Var(x)} = \sqrt{1200} = 34.641$

c)

$P\{90 < x < 120\} = (base).(height) = (120 - 90).(\frac{1}{120}) = \frac{1}{4} = 0.25$

d)

$P\{(x > 150)|(x > 120)\} = \frac{P\{(x>150) \cap (x>120)\}}{P\{x>120\}} = \frac{P\{x>150\}}{P\{x>120\}} = \frac{(180-150).(\frac{1}{120})}{(180-120)=.(\frac{1}{120})} = \frac{1}{2} = 0.5$

Answer 2

a)

In normal approximation to binomial distribution: $Binomial(n,p) \approx Normal(\mu = np, \sigma = \sqrt{np(1-p)})$
$p = 0.02, n = 500$ (our sample size). Therefore,
The mean is $\mu = 500.(0.02) = 10$
The standard deviation is $\sigma = \sqrt{500.(0.02)(1-0.02)} = \sqrt{9.8} = 3.13$

b)

$P(x < 8) = P(x \leq 7) = P(x < 7.5)$(continuity correction)
$P(\frac{x-\mu}{\sigma} < \frac{7.5-\mu}{\sigma}) = P(\frac{x-10}{3.13} < \frac{7.5-10}{3.13}) = P(\frac{x-10}{3.13} < -0.7987) = \Phi(-0.7987) = 0.2122$

c)

$P(x > 15) = P(x \geq 14) = P(x > 14.5)$(continuity correction)
$P(\frac{x-\mu}{\sigma} > \frac{14.5-\mu}{\sigma}) = P(\frac{x-10}{3.13} > \frac{14.5-10}{3.13}) = P(\frac{x-10}{3.13} > 1.4377) = 1 - \Phi(1.4377) = 0.0753$

d)

$P(7 \leq x \leq 14) = P(6.5 < x < 14.5)$(continuity correction)
$P(\frac{6.5-\mu}{\sigma} < \frac{x-\mu}{\sigma} < \frac{14.5-\mu}{\sigma}) = P(\frac{6.5-10}{3.13} < \frac{x-10}{3.13} < \frac{14.5-10}{3.13}) = P(-1.1182 < \frac{x-10}{3.13} < 1.4377) = \Phi(1.4377) - \Phi(-1.1182) = 0.793$

Answer 3

a), b)

In exponential distribution, the fact of having waited for t minutes gets "forgotten," and it does not affect the future waiting time.(memory-less property) Therefore, the answers of a) and b) are same. Which is:
$P(t > 1) = 1 - F(t \leq 1) = 1 - (1 - e^{-1.1})$
(cdf of exponential distribution is $F(x) = 1 - e^{-\lambda t}$)
$= e^{-1} = 0.3679$