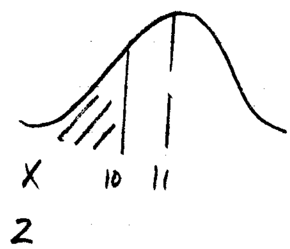
MEI STATISTICS 2 JUNE 2007 Q1 NORMAL

1) i) $X \sim N(11, 3^2)$



$P(X < 10)$

$= P(Z < -0.333)$

$= 1 - \Phi(0.333)$

$= 1 - 0.6304$

$= 0.3696$

$z = \dfrac{x - \mu}{\sigma}$

$z = \dfrac{10 - 11}{3} = -0.333$

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ii) ${}^8C_3 \times 0.3696^3 \times 0.6304^5 = 0.2815$

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iii) $X \sim B(100, 0.3696)$

$np = 36.96$

$npq = 36.96 \times 0.6304$

$= 23.300$

Approximate with

$X \sim N(36.96, \sqrt{23.3}^2)$

Find $P(X > 49.5)$

$= P(Z > 2.598)$

$= 1 - \Phi(2.598)$

$= 1 - 0.9952$

$= 0.0048$

$z = \dfrac{x - \mu}{\sigma}$

$z = \dfrac{49.5 - 36.96}{\sqrt{23.3}}$

$z = 2.598$

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1iv) $X \sim N(11, 3^2)$

For sample of 25 $\quad X \sim N\left(11, \left(\frac{3}{\sqrt{25}}\right)^2\right)$

$H_0 : \mu = 11$

$H_1 : \mu > 11$

where μ is the mean time taken by new hairdresser for all the haircuts she does

1v)

$z = \Phi^{-1}(0.95)$
$z = 1.645$

For 5% significant level test, critical value of $z = 1.645$

$$z = \frac{x - \mu}{\frac{\sigma}{\sqrt{25}}} = \frac{12.34 - 11}{\frac{3}{5}} = 2.233$$

Since $2.233 > 1.645$

reject H_0 and accept H_1

There is sufficient evidence to suggest that the mean time taken for a haircut by new hairdresser > 11 minutes