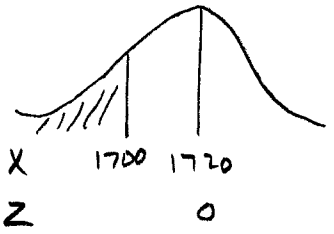
MEI STATISTICS 2 JUNE 2009 Q3 NORMAL

3i) $X \sim N(1720, 90^2)$



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

$$z = \frac{1700 - 1720}{90} = -0.222$$

$$P(X < 1700) = P(Z < -0.222) = 1 - P(Z < 0.222)$$

$$= 1 - 0.5879$$

$$= 0.4121$$

3ii)

$$4C2 \times 0.4121^2 \times 0.5879^2 = 0.3522$$

3iii) $X \sim B(40, 0.4121)$

$np = 40 \times 0.4121$

$= 16.484$

Approximate with

$X \sim N(16.484, 9.691^2)$

$npq = 16.484 \times 0.5879$

$= 9.691$

$P(X > 19.5)$

$$z = \frac{x - \mu}{\sigma} = \frac{19.5 - 16.484}{\sqrt{9.691}}$$

$= P(Z > 0.969)$

$z = 0.969$

$= 1 - P(Z < 0.969)$

$= 1 - 0.8338$

$= 0.1662$

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3iv) $H_0 : \mu = 1720$ lumens

$H_1 : \mu < 1720$ lumens since it is suspected average intensity is less than 1720 lumens

μ is the mean intensity of all the 25 watt low energy bulbs from this manufacturer

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3v) $X \sim N(1720, 90^2)$

For sample of 20 $X \sim N\left(1720, \left(\frac{90}{\sqrt{20}}\right)^2\right)$

For 1-tailed 5% significance level test at bottom end

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

critical $z = -1.645$

When $x = 1703$ $z = \dfrac{1703 - 1720}{\frac{90}{\sqrt{20}}}$

$z = -0.8447$

Since $-1.645 < -0.8447$

there is not sufficient evidence to reject H_0

Conclude the 25 Watt low energy bulbs have the mean intensity of 1720 lumens

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