

4.4

Q1 (i)  $\hat{p} = \frac{150}{500} = 0.3$

(ii)  $E = \frac{1}{\sqrt{500}} = 0.04$

(iii)  $0.3 - 0.04 < p < 0.3 + 0.04$   
 $0.26 < p < 0.34$

Q2

(i)  $\hat{p} = \frac{136}{400} = 0.34$

$\therefore$  34% of all shops are selling below the list price

(ii)  $E = \frac{1}{\sqrt{400}} = 0.05$

$0.34 - 0.05 < p < 0.34 + 0.05$   
 $0.29 < p < 0.39$

Q4

$\hat{p} = \frac{45}{150} = 0.3$

$E = \frac{1}{\sqrt{150}} = 0.082$

$0.3 - 0.082 < p < 0.3 + 0.082$   
 $0.218 < p < 0.382$

$$\text{Q6} \quad E = \frac{1}{\sqrt{n}}$$

$$(i) \quad \frac{1}{\sqrt{n}} = 0.05$$

$$\frac{1}{n} = (0.05)^2$$

$$\frac{1}{(0.05)^2} = n$$

$$400 = n.$$

$$(ii) \quad E = 3\%$$

$$\frac{1}{\sqrt{n}} = 0.03$$

$$\frac{1}{n} = (0.03)^2$$

$$\frac{1}{(0.03)^2} = n$$

$$1111 = n$$

$$(iii) \quad E = 1.5\%$$

$$\frac{1}{\sqrt{n}} = 0.015$$

$$\frac{1}{n} = (0.015)^2$$

$$\frac{1}{(0.015)^2} = n$$

$$4444 = n$$

Q8

$H_0$  : The true proportion is 0.4

$H_1$  : The true proportion is not 0.4

$$\hat{p} = \frac{357}{1000} = 0.357$$

$$E = \frac{1}{\sqrt{1000}} = 0.0316$$

$$0.357 - 0.0316 < P < 0.357 + 0.0316$$

$$0.3254 < P < 0.3886$$

$$32.5\% < P < 38.9\%$$

0.4 or 40% is not within this interval,  $\therefore$  reject the null hypothesis  $H_0$  and accept the alternative hypothesis  $H_1$ . We conclude that The Leader's belief is not justified at the 95% confidence interval.

Q10 (i)  $\hat{p} = \frac{52}{240} = 0.216$

(ii)  $E = \frac{1}{\sqrt{240}} = 0.0645$

(iii)  $P(6) = \frac{1}{6} = 0.16$

(iv)  $H_0$  : The dice is not biased

$H_1$  : the dice is biased.

$$0.216 - 0.0645 < P < 0.216 + 0.0645$$

$$0.1516 < P < 0.2816$$

Since 0.16 lies within this interval we accept  $H_0$  and conclude the dice is not biased.

Q12  $H_0$ : 20% will not be red  
 $H_1$ : 20% will be red.

$$\hat{p} = \frac{11}{82} = 0.134$$

$$E = \frac{1}{\sqrt{82}} = 0.11$$

$$0.134 - 0.11 < p < 0.134 + 0.11$$

$$0.024 < p < 0.244$$

$$2.4\% < p < 24.4\%$$

Since 20% lies within this interval we reject  $H_0$  and accept  $H_1$  and conclude that the companies claim is correct in the 95% confidence interval.

Q13  
~~Q13~~

$H_0$ : At least 60% do not have 3<sup>rd</sup> level degree  
 $H_1$ : At least 60% do have 3<sup>rd</sup> level degree.

$$\hat{p} = \frac{208}{312} = 0.6$$

$$E = \frac{1}{\sqrt{312}} = 0.0566$$

$$0.6 - 0.0566 < p < 0.6 + 0.0566$$

$$0.5434 < p < 0.6566$$

$$54.34\% < p < 65.66\%$$

Since 60% does not lie within this interval we reject  $H_0$  and accept  $H_1$  and conclude that the companies claim is justified.

Q14

$$(i) \hat{p} = \frac{45}{300} = 0.15$$

$$E = \frac{1}{\sqrt{300}} = 0.0577$$

$$0.15 - 0.0577 < p < 0.15 + 0.0577$$

$$0.092 < p < 0.207$$

$$9.2\% < p < 20.7\%$$

(ii) If a number of samples were taken we would expect 95% of them to have between 9.2% and 20.7% of defective items.

(iii) 95% of 200 = 190 of the 200 samples would have between 9.2% and 20.7% defective items.