Section 1: Introducing hypothesis testing

Solutions to Exercise level 1

1. (i) $H_0 : p = \frac{1}{6}$
$H_1 : p < \frac{1}{6}$

(ii) Let X be the number of sixes in 20 throws
$X \sim B(20, \frac{1}{6})$
$P(X \leq 1) = 0.130$
The p-value is 0.130

(iii) $0.130 > 0.05$ so accept H_0. There is insufficient evidence to suggest that the dice is biased.

2. (i) $H_0 : p = \frac{1}{6}$
$H_1 : p > \frac{1}{6}$

(ii) Let X be the number of ones in 12 throws
$X \sim B(12, \frac{1}{6})$
$P(X \geq 5) = 1 - P(X \leq 4)$
$= 1 - 0.9636$
$= 0.0364$
The p-value is 0.0364

(ii) $0.0364 < 0.1$ so reject H_0. The evidence suggests that the dice is biased towards a 1.

3. (i) $H_0 : p = 0.9$
$H_1 : p < 0.9$

(ii) Let X be the number of times the bus is late in 15 journeys
$X \sim B(15, 0.9)$
$P(X \leq 10) = 0.012$
The p-value is 0.012

(iii) $0.012 < 0.05$ so reject H_0. The evidence suggests that the bus is on time in less than 90% of journeys.

4. (i) $H_0 : p = 0.8$
$H_1 : p > 0.8$

Edexcel AS Maths Hypothesis testing 1 Exercise solns

(ii) Let X be the number of times the bus is late in 16 journeys

$X \sim B(16, 0.8)$

$P(X \geq 15) = 1 - P(X \leq 14)$

$= 1 - 0.859$

$= 0.141$

The p-value is 0.141

(iii) $0.141 > 0.1$, so accept H_0. There is insufficient evidence that the bus is on time more than 80% of the time.