

## ANNEX B

### IJC H2 Preliminary Examination (Paper 2)

Qn/No	Topic Set	Answers
1	Inequalities	$x < -1$ or $-\frac{\sqrt{3}}{2} \leq x < -\frac{3}{4}$ or $x \geq \frac{\sqrt{3}}{2}$ ; $x < \ln\left(\frac{\sqrt{3}}{2}\right)$
2	AP and GP	(i) 9 (iii) $x \geq 8755$ (last part) Software Y is unable to remove all the comments because eventually it is only able to remove 150 000 comments.
3	Differential Equations	(i) $x = \frac{5e^{\frac{1}{3}t}}{4 + e^{\frac{1}{3}t}}$ (ii) $2\ln\left(\frac{8}{3}\right)$ years (iii) The population of wild boars will increase and stabilise at 500 eventually.
4	Vectors (Lines and Planes)	(i) $\theta = 67.8^\circ$ (ii) $(-1, 1, -3)$ (iii) $\begin{pmatrix} -2 \\ 0 \\ -4 \end{pmatrix}$ (iv) $\mathbf{r} = \begin{pmatrix} -1 \\ 1 \\ -3 \end{pmatrix} + \alpha \begin{pmatrix} 4 \\ 1 \\ -2 \end{pmatrix}, \alpha \in \mathbb{R}$
5	Sampling Methods	(i) Systematic sampling (ii) (slower, more difficult to collect) Systematic sampling is a more tedious process to select the employees, whereas quota sampling is quick and easy.
6	Sampling distribution (Central Limit Theorem)	143
7	Probability	(i) 0.902 (ii) 0.199
8	Hypothesis Testing	(i) 44.1; 3.52 (ii) The battery life of a PI-99 calculator is assumed to be normally distributed.

		<p>(iii) <math>H_0 : \mu = k</math>  <math>H_1 : \mu \neq k</math></p> <p>(iv) <math>\{k \in \mathbb{R} : 42.97 &lt; k &lt; 45.24\}</math></p>
9	Poisson Distribution	<p>(i) The average number of faults detected by each system (for the track and the train) is constant from one day to another.</p> <p>(ii) 0.629</p> <p>(iii) 8</p> <p>(iv) 0.237</p>
10	Binomial Distribution	<p>(i) Ben's performance (i.e. whether he loses or wins) in a game is independent of any other games that he plays with Alex.</p> <p>(ii) 0.850</p> <p>(iii) 14</p> <p>(iv) 0.910</p>
11	Correlation & Regression	<p>(ii)(a) <math>-0.8454</math>  (ii)(b) <math>-0.9961</math>  (iii) <math>m</math> and <math>\ln t</math> is the better model;  <math>m = 179 - 31.2 \ln t</math>  (iv) 22.61 micrograms per litre ;</p> <p>The estimate obtained is reliable, because the given value of <math>t = 150</math> lies within the given sample data range for <math>t</math> and the product moment correlation coefficient between <math>m</math> and <math>\ln t</math> is very close to <math>-1</math> , hence indicating a strong negative linear correlation between the variables <math>m</math> and <math>\ln t</math> .</p>
12	Normal Distribution	<p>(i) 0.809  (ii) 0.375  (last part) 0.916</p>