

**QUANTITATIVE METHODS – DECEMBER 2020**

In order to gain full marks, please show full workings step by step.

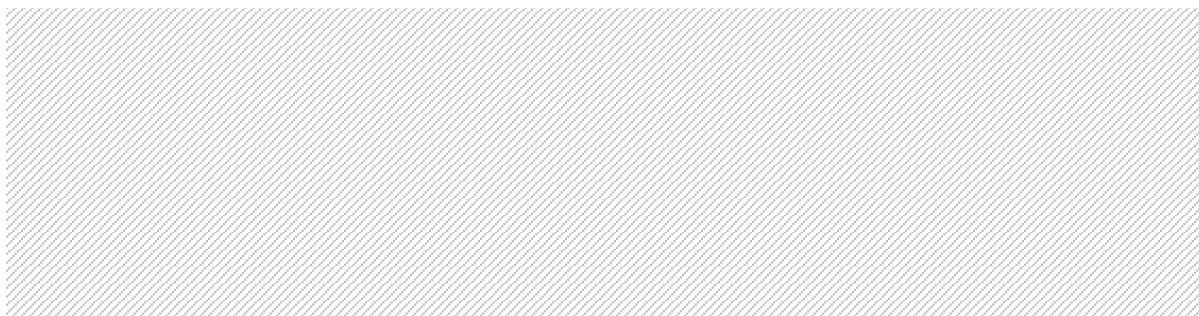
**Case Study 1            Maximum Word Count 1000 words**

The manager of Jana's Juice Bar is looking at cost information for the business. She is looking in particular at the purchases of apple juice, orange juice and pineapple juice.

The following figures were collected for the past three years.

Item	Price (pence)			Quantity Purchased		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Apple juice	120	128	131	2,225	2,412	2,953
Orange juice	152	163	178	1,117	1,588	3,422
Pineapple juice	42	37	36	845	962	743

- (i) Using Year 1 as the base year, calculate the following indices:
- (a) Simple aggregate price indices for Years 2 and 3. **(3 marks)**
- (b) Laspeyres price indices for Years 2 and 3. **(4 marks)**
- (c) Paasche price indices for Years 2 and 3, assuming that Year 3 is the current year. **(4 marks)**
- (ii) Discuss the relevance of these indices for comparing the cost of purchasing fruit juice and compare the relevant merits of each type of index. **(14 marks)**
- (Total 25 marks)**

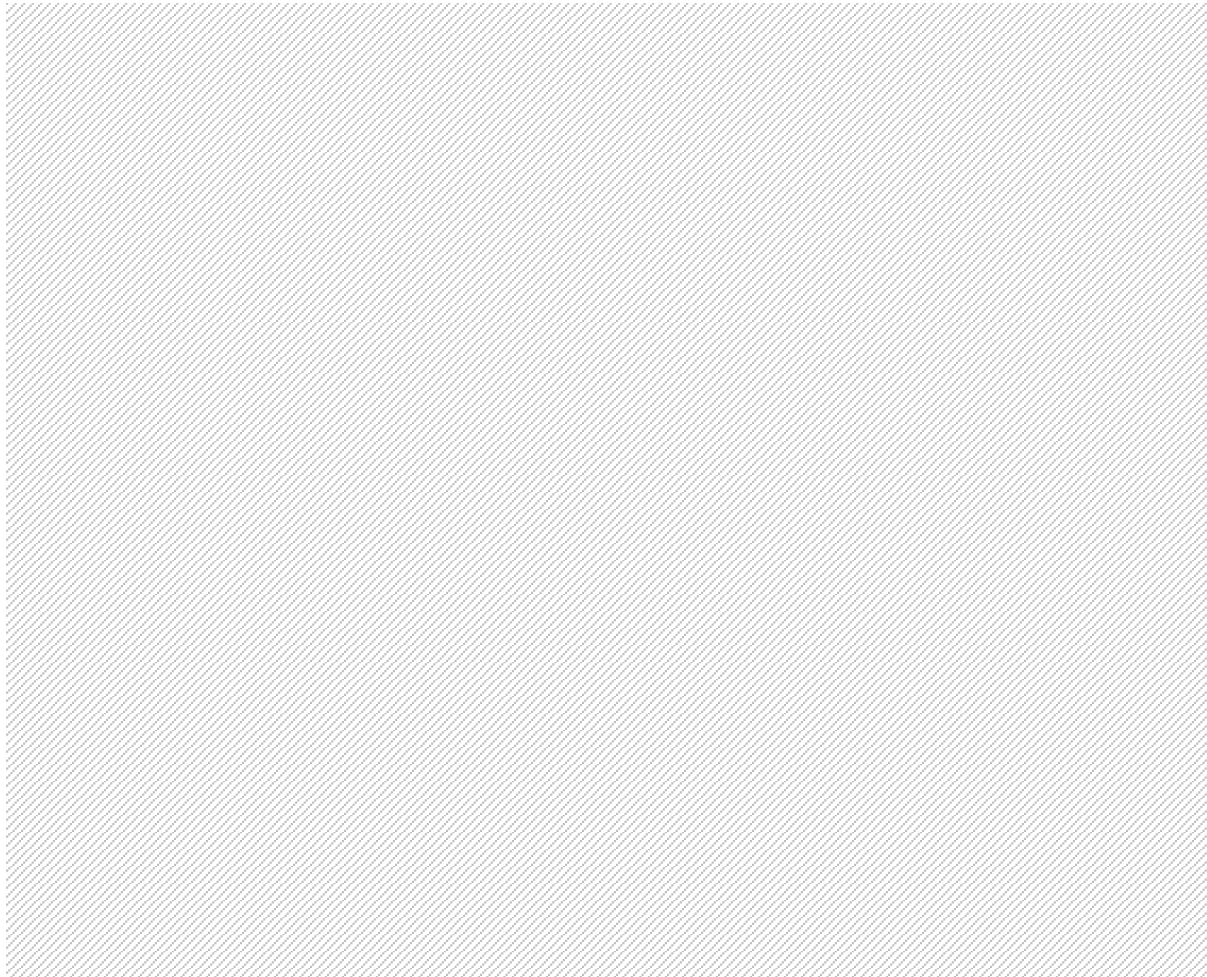


**Case Study 2                      Maximum Word Count 1000 words**

Masiko's Televisions have been conducting a survey in Kampala and Nansana on the age of televisions in the two cities. A sample was taken from each city and it was found that in Kampala the average age of televisions was 33 months, with a variance of 225 months, and in Nansana the average was 42 months, with a variance of 400 months. In each city there were 51 television owners surveyed.

- (i)      Use an appropriate hypothesis test to show whether the average age of televisions in Nansana is significantly higher than the average age of televisions in Kampala.  
**(7 marks)**
  
- (ii)     Use an appropriate hypothesis test to determine whether the variance in Nansana is significantly higher than the variance in Kampala.  
**(5 marks)**
  
- (iii)    Write a report on your findings, detailing any assumptions you have made and any further information that should be obtained.  
**(13 marks)**

**(Total 25 marks)**



### Case Study 3      Maximum Word Count 1000 words

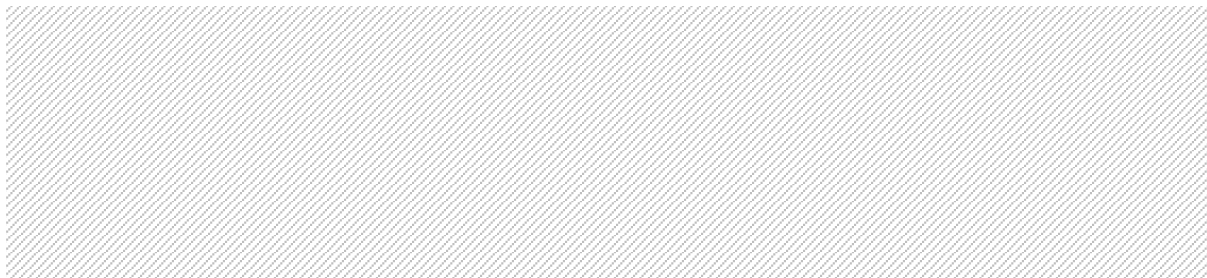
The Operations Manager at GKA Ltd is looking at the number of times that employees in his factory turn up late for work. He is interested in examining the relationship between an employee's annual salary and the number of late days in 2020. He has collected the following data:

Annual Salary (£000s)	Late Days in 2020
$x$	$y$
15	9
49	1
33	2
24	4
30	4
42	2
36	2
13	8
51	0
36	1
40	9
47	5
28	8
17	0

The following summary statistics have been calculated:

$$\begin{array}{llll} \Sigma(x - \bar{x})^2 & = & 2018.93 & \Sigma(y - \text{fitted } y)^2 & = & 118.71 \\ \Sigma(y - \bar{y})^2 & = & 144.93 & \Sigma(x - \bar{x})(y - \bar{y}) & = & -230.07 \end{array}$$

- (i) Calculate the regression statistics and determine whether the relationship is significant using an appropriate hypothesis test. (10 marks)
- (ii) Write a report on the analysis of the data. Indicate any additional information you would require to complete a fuller analysis and include any recommendations for further analysis that you would require. (15 marks)
- (Total 25 marks)**



**Case Study 4                      Maximum Word Count 1000 words**

The manager of Jana's Juice Bar commissioned a report into the sales in Harare over the past year. She has collected the following data for the period January–December 2020:

<b>Harare Sales 2020</b>	
<b>Month</b>	<b>Sales in \$000s</b>
Jan	250
Feb	284
Mar	302
Apr	316
May	246
Jun	380
Jul	405
Aug	428
Sept	386
Oct	292
Nov	242
Dec	230

- (i) Analyse the data using Holt's method, with  $\alpha = 0.4$  and  $\gamma = 0.3$ , and produce a forecast for the next four months.
- (ii) Write a report describing any assumptions you have made and commenting on the reliability of the forecasts. Discuss the relevance of any alternative models that could have been used.

**(10 marks)**

**(15 marks)**

**(Total 25 marks)**

**TOTAL OF 100 MARKS**

**END OF PAPER**

