INTERNATIONAL SCHOOL OF LATVIA

June Year 1 Semester 2 Exam 2022

Name: KEY

Grade: 11 Mathematics

Subject: Application and Interpretation **Examination Component: Paper 2**

Subject Teacher(s): Maciej Flisak

Time allotted: 5 min. reading time + 60 min. writing time **Total Marks for this exam: 51**

Instructions to Candidate:

- Do not open this examination paper until instructed to do so.
- You ARE permitted access to a calculator for this paper.
- Answer all questions. Answers must be written within the boxes provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or to 3 sig. fig.
- A clean copy of the mathematics: application and interpretation formula booklet is required.
- Use Black or Blue ink to complete this exam. Do NOT use erasable ink pens for writing these exams.
- You may not use white out or correction tape.

  If you make an error, draw a line through any work you do not want to be considered for assessment.
- You may NOT use dictionaries or translation devices of any kind in this exam.

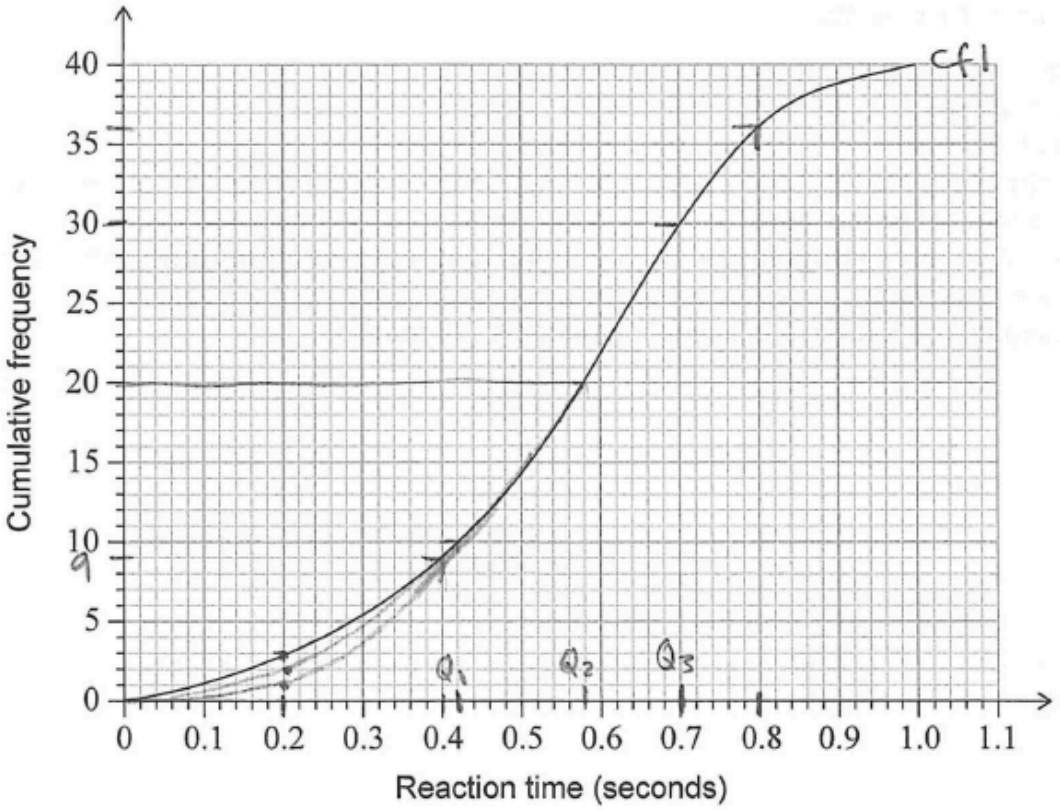
Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working. Answer all questions in the space provided.

PAPER 2

Question 1

[Maximum mark: 17]

Mackenzie conducted an experiment on the reaction times of teenagers. The results of the experiment are displayed in the following cumulative frequency graph.



(a) Use the graph to estimate the

(i) median reaction time; $Q_2 = 0.58$ s.

(ii) interquartile range of the reaction times. $Q_3 - Q_1 = 0.7 - 0.42$ [4]
$= 0.28$ s.

(b) Find the estimated number of teenagers who have a reaction time greater than 0.4 seconds. 31 [2]

(c) Determine the 90th percentile of the reaction times from the cumulative frequency graph. [2]

(This question continues on the following page)

$0.9(40) = 36$

90th percentile: 0.8 s.

Mackenzie created the cumulative frequency graph using the following grouped frequency table.

Reaction time, t (s)	Frequency	cf1	cf2	cf3
$0 < t \leq 0.2$	3/2/1	3	2	1
$0.2 < t \leq 0.4$	a 6/7/8	9	9	9
$0.4 < t \leq 0.6$	13	22	22	22
$0.6 < t \leq 0.8$	14	36	36	36
$0.8 < t \leq 1.0$	b	40	40	40

(d) Write down the value of

(i) a; $= 6$

(ii) b. $= 4$ [2]

(e) Write down the modal class from the table. $0.6 < t \leq 0.8$ [1]

(f) Use your graphic display calculator to find an estimate of the mean reaction time. [2]

Upon completion of the experiment, Mackenzie realized that some values were grouped incorrectly in the frequency table. Some reaction times recorded in the interval $0 < t \leq 0.2$ should have been recorded in the interval $0.2 < t \leq 0.4$.

(g) Suggest how, if at all, the estimated mean and estimated median reaction times will change if the errors are corrected. Justify your response. [4]

f) $\bar{x} \approx 0,55$

g) "Some" implies either one or two of the three recorded in $0 < t \leq 0.2$.
The median will remain unchanged.
The mean can now be:

$\bar{x} \approx 0.555$ (if 1 value moved)

$\bar{x} \approx 0.56$ (if 2 values moved)

Question 2

[Maximum mark: 18]

The Voronoi diagram below shows four supermarkets represented by points with coordinates A(0, 0), B(6, 0), C(0, 6) and D(2, 2). The vertices X, Y, Z are also shown. All distances are measured in kilometres.

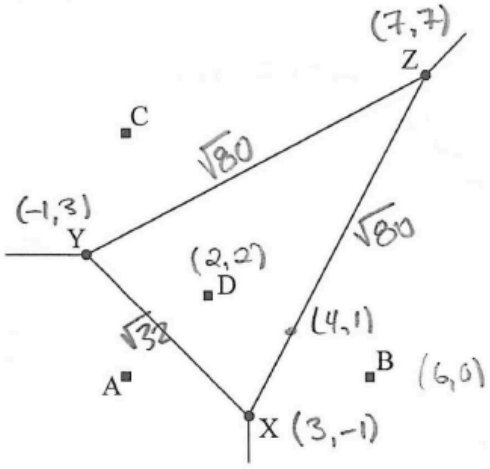


diagram not to scale

(a) Find the midpoint of [BD]. [2]

(b) Find the equation of (XZ). [4]

The equation of (XY) is $y = 2 - x$ and the equation of (YZ) is $y = 0.5x + 3.5$.

(c) Find the coordinates of X. [3]

The coordinates of Y are (–1, 3) and the coordinates of Z are (7, 7).

(d) Determine the exact length of [YZ]. [2]

(e) Given that the exact length of [XY] is $\sqrt{32}$, find the size of $X\hat{Y}Z$ in degrees. [4]

(f) Hence find the area of triangle XYZ. [2]

A town planner believes that the larger the area of the Voronoi cell XYZ, the more people will shop at supermarket D.

(g) State one criticism of this interpretation. [1]

Question 3

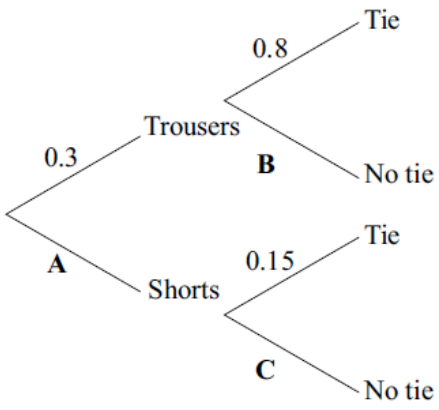
[Maximum mark: 16]

Tomek is attending a conference in Singapore. He has both trousers and shorts to wear. He also has the choice of wearing a tie or not.

The probability Tomek wears trousers is 0.3. If he wears trousers, the probability that he wears a tie is 0.8.

If Tomek wears shorts, the probability that he wears a tie is 0.15.

The following tree diagram shows the probabilities for Tomek's clothing options at the conference.



(a) Find the value of

(i) A;

(ii) B;

(iii) C. *[3]*

(b) Calculate the probability that Tomek wears

(i) shorts and no tie;

(ii) no tie;

(iii) shorts given that he is not wearing a tie. *[8]*

continued on next page

The conference lasts for two days.

(c) Calculate the probability that Tomek wears trousers on both days. *[2]*

(d) Calculate the probability that Tomek wears trousers on one of the days, and shorts on the other day. *[3]*

(a) (i) $0.7 \left(\frac{70}{100}, \frac{7}{10}, 70\%\right)$ ***(A1)***

(ii) $0.2 \left(\frac{20}{100}, \frac{2}{10}, \frac{1}{5}, 20\%\right)$ ***(A1)***

(iii) $0.85 \left(\frac{85}{100}, \frac{17}{20}, 85\%\right)$ ***(A1)*** ***[3 marks]***

(b) (i) 0.7×0.85 ***(M1)***

Note: Award ***(M1)*** for multiplying their values from parts (a)(i) and (a)(iii).

$= 0.595 \left(\frac{119}{200}, 59.5\%\right)$ ***(A1)*(ft)*(G1)***

Note: Follow through from part (a).

(ii) $0.3 \times 0.2 + 0.7 \times 0.85$ ***(M1)(M1)***

Note: Award ***(M1)*** for their two products, ***(M1)*** for adding their two products.

$= 0.655 \left(\frac{131}{200}, 65.5\%\right)$ ***(A1)*(ft)*(G2)***

Note: Follow through from part (a).

(iii) $\frac{0.595}{0.655}$ ***(A1)*(ft)*(A1)*(ft)***

Notes: Award ***(A1)*(ft)** for correct numerator, ***(A1)*(ft)** for correct denominator. Follow through from parts (b)(i) and (ii).

$= 0.908 \left(0.90839..., \frac{119}{131}, 90.8\%\right)$ ***(A1)*(ft)*(G2)*** ***[8 marks]***

(c) 0.3×0.3 ***(M1)***

$= 0.09 \left(\frac{9}{100}, 9\%\right)$ ***(A1)(G2)*** ***[2 marks]***

(d) 0.3×0.7 *(M1)*

$0.3\times0.7\times2$ **OR** $(0.3\times0.7)+(0.7\times0.3)$ *(M1)*

Note: Award *(M1)* for their correct product seen, *(M1)* for multiplying their product by 2 or for adding their products twice.

$=0.42\left(\frac{42}{100}, \frac{21}{50}, 42\%\right)$ *(A1)*(ft)*(G2)* *[3 marks]*

Note: Follow through from part (a)(i).

Total [16 marks]