

Trial Examination 2022

Question and Response Booklet

QCE General Mathematics Units 1&2

Paper 2

Student's Name: _____

Teacher's Name:			
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Time allowed

- Perusal time 5 minutes
- Working time 90 minutes

General instructions

- Answer all questions in this question and response booklet.
- Write using black or blue pen.
- QCAA-approved scientific calculator permitted.
- Formula sheet provided.
- Planning paper will not be marked.

Section 1 (40 marks)

7 short response questions

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SECTION 1

Instructions

- Questions worth more than one mark require mathematical reasoning and/or working to be shown to support answers.
- If you need more space for a response, use the additional pages at the back of this booklet.
 - On the additional pages, write the question number you are responding to.
 - Cancel any incorrect response by ruling a single diagonal line through your work.
 - Write the page number of your alternative/additional response, i.e. See page ...
 - If you do not do this, your original response will be marked.

DO NOT WRITE ON THIS PAGE

THIS PAGE WILL NOT BE MARKED

QUESTION 1 (6 marks)

A family receives two quotes to hire play equipment for their child's party. Hiring play equipment from company ABC costs \$20 per hour with a set-up fee of \$50. Company XYZ offers the same service for \$40 per hour with no set-up fee.

a)	Identify the equation for the total cost (C), in dollars, of hiring company ABC's play equipment for n hours.	[1 mark]
b)	Identify the equation for the total cost, (C) , in dollars, of hiring company XYZ's play equipment for n hours.	[1 mark]

c) Sketch the relationship between *C* and *n* for both companies using the grid. [3 marks]



d) Use the graph from part c) to determine when it is cheaper to hire company XYZ's play equipment.

[1 mark]

QUESTION 2 (5 marks)

During a school athletics carnival, the number of students who received an award (first, second or third place) for the four school houses were recorded in the table.

		Award	
School house	First place	Second place	Third place
Red	39	39	47
Blue	33	61	48
Green	51	25	40
Orange	45	43	33

Students who are awarded first place receive 7 points, students who are awarded second place receive 5 points and students who are awarded third place receive 3 points.

- a) Construct a column matrix that represents the points given to each award (first, second or third place). [1 mark]
- b) Use matrix multiplication to determine which school house earns the most points. [4 marks]

QUESTION 3 (4 marks)

A class of 20 students were asked how many posts they had uploaded to social media over the last week. The results were recorded in the stem-and-leaf plot shown.

 Stem
 Leaf

 0
 0 0 0 1 1 2 3 3 4 7 9

 1
 1 3 4 5 7

 2
 2 3

 3
 1

 4
 6

Using the data in the stem-and-leaf plot, construct a box plot on the axes provided. Show all working to check for outliers.



QUESTION 4 (5 marks)

Containers A and B are shown in the diagram. Container A is filled with liquid.



Determine how many containers with the same dimensions as container B would be required to hold the liquid from container A.



QUESTION 5 (6 marks)

Two teachers were reviewing the results of their classes (class A and class B) on a recent exam when one of them accidently deleted a student's result. They remembered that the combined average of their two classes was 68% and class A had an average of 72%.

Each class has only 12 students and the missing result is from class B. The remaining 11 results from class B, as percentages, are shown.

	23	72	81	56	48	80	83	45	92	66	57
Deteri	nine the	median	for clas	s B.							

QUESTION 6 (6 marks)

Otto is relocating to Australia from London, England. He has $\pm 35\ 000$ (British pounds) in savings and, when he arrives in Australia, he exchanges the money into Australian dollars before depositing it into a savings account with an interest rate of 2.5% p.a. compounded monthly. After two years, his savings have grown to \$66\ 888.25.

Determine the exchange rate that Otto would have received when he exchanged his savings into Australian dollars to account for this growth in savings, and evaluate the reasonableness of this solution.



QUESTION 7 (8 marks)

A farmer owns a fruit farm that contains two adjoining fields, as shown in the diagram. The left field, field C, is already planted with cherry trees and the right field, field N, is to be planted with nectarine trees. There are 1458 cherry trees planted in field C, which has a density of 667 trees per hectare (1 hectare = $10\ 000\ \text{m}^2$). The nectarine trees that will be planted in field N have a planting density of 919 trees per hectare.



Not to scale

The farmer believes that 5050 nectarine trees can be planted in field N.

Determine if the farmer is correct. Show all mathematical procedures and reasoning used in your answer.

END OF PAPER

ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.



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Formula Booklet

QCE General Mathematics Units 1&2

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Mensuration				
circumference of a circle	$C = 2\pi r$	area of a cir	cle	$A = \pi r^2$
area of a parallelogram	A = bh	area of a tra	pezium	$A = \frac{1}{2}(a+b)h$
area of a triangle	$A = \frac{1}{2}bh$	total surface of a cone	e area	$S = \pi r s + \pi r^2$
total surface area of a cylinder	$S = 2\pi r h + 2\pi r^2$	surface area of a sphere $S = 4\pi r^2$		
volume of a cone	$V = \frac{1}{3}\pi r^2 h$	volume of a cylinder		$V = \pi r^2 h$
volume of a prism	V = Ah	volume of a pyramid $V = \frac{1}{3}Ah$		$V = \frac{1}{3}Ah$
volume of a sphere	$V = \frac{4}{3}\pi r^3$			
Heron's rule	$A = \sqrt{s(s-a)(s-b)(s-c)}, \text{ where } s = \frac{a+b+c}{2}$			
Earth geometry	$D = 111.2 \times \text{angular distance}$ $D = 111.2 \cos\theta \times \text{angular distance}$			

Finance				
simple interest	I = Pin	compound i	nterest	$A = P(1+i)^n$
effective annual rate of interest	$i_{\text{effective}} = \left(1 + \frac{i}{n}\right)^n - 1$	dividend yie	eld	$\frac{\text{dividend}}{\text{share price}} \times 100$
price to earnings ratio (of a share)	$P/E \text{ ratio} = \frac{\text{market price per share}}{\text{annual earnings per share}}$			
recurrence relation for reducing balance loans	$A_{n+1} = rA_n - R$ recurrence for compou interest		relation nd	$A_{n+1} = rA_n$
recurrence relation for annuities	$A_{n+1} = rA_n + d$			
annuities	$A = M\left(\frac{\left(1+i\right)^n - 1}{i}\right)$		$A = M\left(\frac{1-\alpha}{2}\right)$	$\frac{(1+i)^{-n}}{i} \bigg)$

Sequences	
arithmetic sequence	$t_n = t_1 + (n-1)d$
geometric sequence	$t_n = t_1 r^{(n-1)}$

Networks and matrices	
Euler's formula	v + f - e = 2

Trigonometry				
Pythagoras' theorem	$c^2 = a^2 + b^2$			
trigonometric ratios	$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$	$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$	$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$	
cosine rule	$c^2 = a^2 + b^2 - 2ab\cos C$			
sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$			
area of a triangle	area = $\frac{1}{2}bc\sin A$			

Statistics	Statistics		
mean	$\overline{x} = \frac{\sum x_i}{n}$		
median	$\left(\frac{n+1}{2}\right)^{\text{th}}$ data value		
least-squares line (slope)	$b = \frac{\sum (x_i - \overline{x})(y_i - \overline{y})}{\sum (x_i - \overline{x})^2} = r \frac{s_y}{s_x}$		
least-squares line (intercept)	$a = \overline{y} - b\overline{x}$		
correlation coefficient (r)	$r = \frac{1}{n-1} \sum \left(\frac{x_i - \overline{x}}{s_x} \right) \left(\frac{y_i - \overline{y}}{s_y} \right)$		
standard deviation	$s = \sqrt{\frac{\Sigma(x_i - \overline{x})^2}{n - 1}}$		
outliers (identifying)	$Q_1 - 1.5 \times IQR \le x \le Q_3 + 1.5 \times IQR$		