Christ Church Grammar School

2021
Test 4

MATHEMATICS METHODS Year 11

Section One:
Calculator-free

Your name Solutions

Teacher's name _____

Time and marks available for this section

Working time for this section:	30 minutes
Marks available:	30 marks

Materials required/recommended for this section

To be provided by the supervisor
This Question/Answer Booklet
Formula sheet

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Instructions to candidates

1. The rules of conduct of the CCGS assessments are detailed in the Reporting and Assessment Policy. Sitting this assessment implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer Booklet using a blue/black pen. Do not use erasable or gel pens.

3. Answer all questions.

4. You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.

5. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

6. **Show all your working clearly**. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

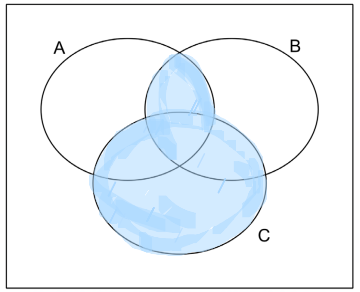
7. It is recommended that **you do not use pencil**, except in diagrams.

See next page

Question 1 **(8 marks)**

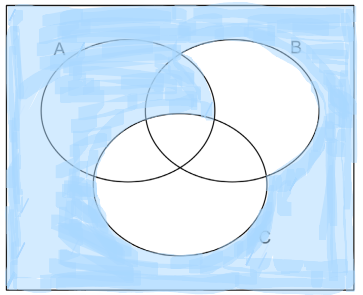
On the diagrams below, shade the area that represents:

(a) $(A \cap B) \cup C$ (1 mark)



√Correct region

(b) $(A \cup \bar{B}) \cap \bar{C}$ (1 mark)



√Correct Shaded area.

See next page

Question 2 (8 marks)

(a) Determine the value of n if $\frac{1}{\sqrt[3]{x^5}} = x^n$ (2 marks)

$\frac{1}{x^{\frac{5}{3}}} = x^n$

$x^{-\frac{5}{3}} = x^n$

$\therefore \quad n = -\frac{5}{3}$

✓Converts power to a single fraction

✓Correct value of n.

(b) Solve for x.

(i) $16^{2x+1} = 32$ (3 marks)

$(2^4)^{2x+1} = 2^5$

$2^{8x+4} = 2^5$

$8x+4 = 5$

$8x = 1$

$x = \frac{1}{8}$

✓Converts to base 2.

✓Expands powers

✓Solves for x.

(ii) $\sqrt[3]{1-5x} + 2 = 0$ (3 marks)

$\sqrt[3]{1-5x} = -2$

$1-5x = (-2)^3$

$1-5x = -8$

$-5x = -9$

$x = \frac{9}{5}$

✓Rearrange in correct order.

✓Shows $\sqrt[3]{}$ to cubed conversion.

✓Solve for x

See next page

Additional working space

Question number: _____

Additional working space

Question number: _____

Question 3 **(2 marks)**

(a) Evaluate $(1.5 \times 10^{8}) \times (2.8 \times 10^{-5})$, expressing your answer in scientific notation. (2 marks)

$= (1.5 \times 2.8)(10^{8} \times 10^{-5})$

$= 4.2 \times 10^{3}$

✓Correct coefficient

✓Correct power

only 1 mark if in standard notation.

(b) Simplify the following

(i) $\left(1+\frac{9}{16}\right)^{-\frac{1}{2}}$ (3 marks)

$\left(\frac{25}{16}\right)^{-\frac{1}{2}} = \left(\frac{16}{25}\right)^{\frac{1}{2}}$

$= \frac{4}{5}$

✓Simplifies inside the bracket

✓ Converts to positive power

✓Square root.

(ii) $\frac{4^{n+1}+4^{n}}{15}$ (3 marks)

$= \frac{4^{n} \times 4^{1} + 4^{n}}{15}$

$= \frac{4^{n}(4^{1}+1)}{15}$

$= \frac{4^{n}}{3}$

✓Expand bases

✓Factorise numerator

✓Simplifies fraction.

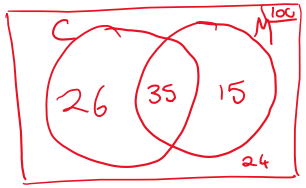
See next page

Question 4 **(6 marks)**

50 men and 50 women were asked whether they prefer coffee or tea (they had to choose one). It was found that 15 men and 24 women preferred tea.

Let **C** represent the people who **prefer coffee**.
Let **M** represent the **men**.

(a) Complete a Venn diagram or two-way table which shows the information given above. (3 marks)



OR

	C	$\bar{C}$	Tot
M	35	15	50
$\bar{M}$	26	24	50
Tot	61	39	100

✓✓✓ Full Venn or two way table correct

✓✓ Less than 2 errors

✓ less than 4 errors

(b) A person who completed the survey is chosen at random. Determine:

(i) $n(\bar{C})$ = 39 (1 mark)

✓ Correct value.

(ii) $P(M|C)$ (2 marks)

$\frac{35}{61}$

✓ Correct $n(M \cap C)$

✓ Correct $n(C)$

Question 5 **(6 marks)**

$P(A) = \frac{1}{4}$ and $P(B) = \frac{3}{7}$.

(a) Determine $P(A \cap B)$, if A and B are

(i) mutually exclusive events. (1 mark)

$P(A \cap B) = 0$

✓ Correct probability

(ii) independent events. (2 marks)

$P(A \cap B) = P(A) \times P(B)$

$= \frac{1}{4} \times \frac{3}{7}$

$= \frac{3}{28}$

✓ multiplies probabilities

✓ Correct fraction.

(b) Determine $P(A|B)$ if $P(A \cup B) = \frac{1}{2}$ (3 marks)

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\frac{1}{2} = \frac{1}{4} + \frac{3}{7} - P(A \cap B)$

$P(A \cap B) = \frac{1}{4} + \frac{3}{7} - \frac{1}{2}$

$= \frac{7}{28} + \frac{12}{28} - \frac{14}{28}$

$= \frac{5}{28}$

✓ Calculates $P(A \cap B)$

✓ Shows $P(A|B) = \frac{P(A \cap B)}{P(B)}$

✓ simplifies.

$P(A|B) = \frac{P(A \cap B)}{P(B)}$

$= \frac{5}{28} \div \frac{3}{7}$

$= \frac{5}{28} \times \frac{7}{3} = \frac{5}{12}$