



Prifysgol Cymru
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University of Wales
Trinity Saint David

Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

Complete, fold and seal
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SURNAME: GRIFFITHS

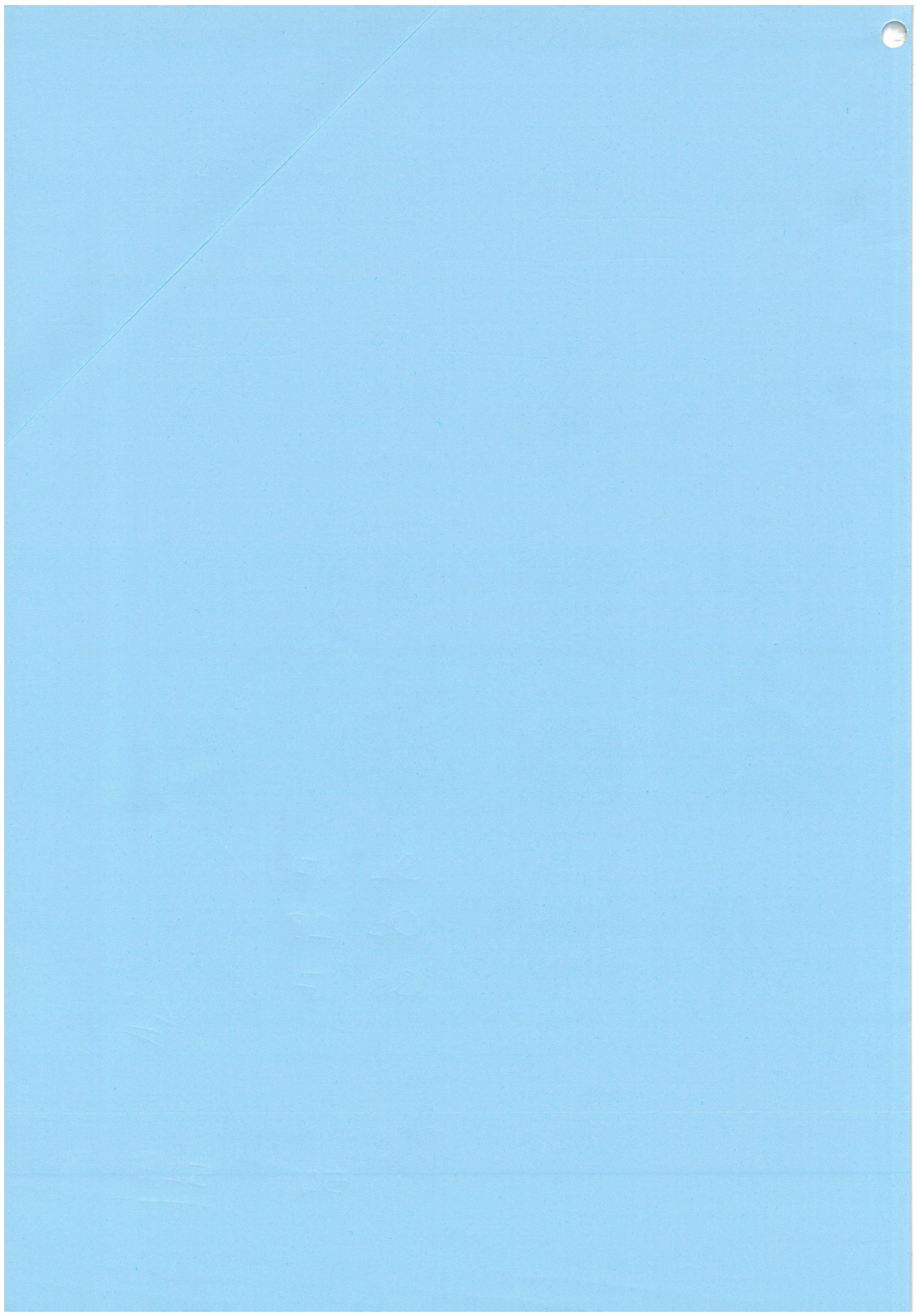
FORENAME(S): JORDAN RAY

1	Student Number	GR125892795
2	Title of Examination Paper	MATHEMATICS TEST 2
3	Module Code	GOEN4001
4	Date and Time of Examination	18.05.26 14.00
5	Examination Venue	TY COCH CAMPUS - MAIN HALL
6	Seat Number	C6

7	Number of Answer Books handed in	
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List the numbers of the questions you have attempted	Office Use
Q1	17 ✓
Q2	28 ✓
Q3	7 ✓
Total	52/100 ✓

52%



1

$$a) Z_1 = 3 + 7j, \quad Z_2 = 4 + 5j, \quad Z_3 = 2 + 6j$$

$$1. Z_1 + Z_2 = 3 + 7j + 4 + 5j = 7 + 12j \quad \underline{\underline{1}}$$

$$2. Z_2 + 3Z_3 = 4 + 5j + 3(2 + 6j) = 4 + 5j + 6 + 18j \\ = 10 + 23j \quad \underline{\underline{2}}$$

$$3. Z_2^2 + Z_3 = (4 + 5j)(4 + 5j) + 2 + 6j = 16 + 20j + 20j + 25j^2 + 2 + 6j \\ = 18 + 46j - 25 = -7 + 46j \quad \underline{\underline{3}}$$

$$4. Z_1 Z_2 Z_3 = (3 + 7j)(4 + 5j)(2 + 6j) = 12 + 15j + 28j + 35j^2 (2 + 6j) \\ = 12 - 35 + 43j (2 + 6j) = (-23 + 43j)(2 + 6j) \\ = -46 + 86j - 138j + 258j^2 \quad \underline{\underline{4}} \\ = -304 - 52j$$

$$5. \frac{Z_1}{Z_2} = \frac{3 + 7j}{4 + 5j} \times \frac{4 - 5j}{4 - 5j} = \frac{12 - 15j + 28j - 35j^2}{16 - 25j^2} \\ = \frac{47 - 13j}{41} = \frac{47}{41} - \frac{13}{41}j \quad \underline{\underline{5}}$$

$$6. \frac{Z_1^2 - Z_2^2}{Z_1^2 - Z_1 Z_2} = \frac{-Z_2^2}{Z_1 Z_2} = \frac{Z_2}{Z_1} \quad \underline{\underline{6}}$$

Q117/33Q1a15/18

$$b. \quad 2x^2 - 6x + 9 = 0$$

$$a = 2 \quad b = -6 \quad c = 9$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{+6 \pm \sqrt{6^2 - (4 \times 2 \times 9)}}{2 \times 2}$$

$$= \frac{6 \pm \sqrt{-36}}{4}$$

$$= \frac{6 \pm 6j}{4}$$

Q1b2/92

?

c. $(5+3j)^6$

Q1C

0/6

?

1

2.

$$a. A = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 5 \\ 2 & -2 \\ 1 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 5 & 4 \\ -2 & 6 \end{bmatrix}$$

$$D = \begin{bmatrix} 0 & 2 & 2 \\ 3 & 5 & 1 \\ 5 & 1 & 4 \end{bmatrix}$$

$$1. |A| = \begin{vmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{vmatrix} \begin{matrix} 75 + 8 \\ 83 \end{matrix} = 7$$

30 + 60 = 90

$$2. |C| = \begin{vmatrix} 5 & 4 \\ -2 & 6 \end{vmatrix} \begin{matrix} -8 \\ 30 \end{matrix} = 38$$

$$3. AB = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \begin{bmatrix} 3 & 5 \\ 2 & -2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 12 & 2 \\ 14 & -6 \\ 25 & 27 \end{bmatrix}$$

$$\begin{matrix} 3+6+3 & 5-6+3 \\ 0+10+4 & 0-10+4 \\ 15+4+6 & 25-4+6 \end{matrix}$$

$$4. AD = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \begin{bmatrix} 0 & 2 & 2 \\ 3 & 5 & 1 \\ 5 & 1 & 4 \end{bmatrix} = \begin{bmatrix} 24 & 20 & 17 \\ 35 & 29 & 21 \\ 36 & 26 & 36 \end{bmatrix}$$

$$\begin{matrix} 0+9+15 & 2+15+3 & 2+3+12 \\ 0+15+20 & 0+25+4 & 0+5+16 \\ 0+6+30 & 10+10+6 & 10+2+24 \end{matrix}$$

Q228/33Q2a15/17

5. CD = NOT POSSIBLE ~~1~~

6. $w = \begin{bmatrix} x & 3 & -4 \\ 4 & 4 & 2 \\ -2 & 5 & (x+2) \end{bmatrix}$ $\begin{matrix} 32+10x \\ 4x^2+8x \end{matrix}$ $\begin{matrix} +12x+24 \\ -12 \end{matrix}$ $\begin{matrix} 56x+34 \\ -80 \end{matrix}$ $\begin{matrix} 4x^2+8x-92 \end{matrix}$

$$4x^2 + 8x - 92 - 56x + 34$$

$$4x^2 - 48x - 12658 = 4$$

$$x^2 - 12x - 14.5 = 0$$

$$4x^2 - 48x = 130$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\sqrt{4x^2 - 48x} = \sqrt{130}$$

$$2 \pm \sqrt{48^2 - (4 \times 1 \times 14.5)}$$

$$4x - 12x = 11.4$$

$$= \frac{12 \pm \sqrt{2304 + 2016}}{2}$$

$$-44x = 11.4$$

$$0 - 12 + 32 = 20$$

$$32 + 0 - 24$$

$$2 \pm \sqrt{48^2 - 165.7}$$

$$= \frac{12 \pm \sqrt{12^2 - (4 \times 1 \times 14.5)}}{2}$$

correct

method

$$2 \pm \sqrt{48^2 - 165.7} = 12$$

$$= \frac{12 \pm \sqrt{144 - 58}}{2} = \frac{12 \pm 9}{2}$$

$$\begin{bmatrix} -2 & 3 & -4 \\ 4 & 4 & 2 \\ -2 & 5 & 0 \end{bmatrix} \begin{matrix} 32 & -20 & 0 \\ -2 & 3 \\ -8 & -12 & -80 \end{matrix}$$

$$12$$

$$= 10.5$$

or

$$= 1.5$$

$$\begin{bmatrix} 14 & 3 & -4 \\ 4 & 4 & 2 \\ -2 & 5 & 16 \end{bmatrix} \begin{matrix} 14 & 3 \\ 4 & 4 \\ -2 & 5 \end{matrix}$$

$$\begin{bmatrix} 9 & 3 & -4 \\ 4 & 4 & 2 \\ -2 & 5 & 16 \end{bmatrix} \begin{matrix} 1.5 \\ 4 \\ 2 \end{matrix}$$

$$12 - 12 - 80$$

$$896 - 12 - 80$$

$$16 - 12 - 80$$

$$21 - 12 + 32$$

$$41$$

$$32 + 20 + 88$$

$$-4 - 12 - 80$$

$$-96$$

$$32 + 15 + 42$$

$$b. \quad A = \begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} \quad \begin{matrix} 0 & 60 & +18 \\ 6 & 3 \\ 2 & 0 \\ 4 & 2 \end{matrix} \quad \begin{matrix} 78 \\ 2 \\ 2 \end{matrix}$$

$$A^{-1} = \frac{1}{\det A} \quad \begin{matrix} 0+60+18 \\ 64 \end{matrix}$$

$$|A| = -14$$

$$= \begin{bmatrix} -10 & -14 & 4 \\ 6 & 14 & 0 \\ 15 & 28 & -6 \end{bmatrix}$$

$$= \begin{bmatrix} -10 & 14 & 4 \\ -6 & 14 & 0 \\ 15 & -28 & -6 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} -10 & -6 & 15 \\ 14 & 14 & -28 \\ 4 & 0 & -6 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-14} \begin{bmatrix} -10 & -6 & 15 \\ 14 & 14 & -28 \\ 4 & 0 & -6 \end{bmatrix}$$

$$0 - 10$$

$$6 - 20$$

$$4 - 0$$

$$9 - 3$$

$$18 - 4$$

$$12 - 12$$

$$15$$

$$30 - 2$$

$$0 - 6$$

Show workings.

Q2b

7/10

$$\begin{aligned}
 C. \quad & 2x - y - 2z = -2 \\
 & -x + y + z = 0 \\
 & x - 2y + z = 8
 \end{aligned}$$

Q2C6/6

$$\begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix}$$

$$\Delta = \begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{matrix} 2 & -1 & -5 \\ -1 & 1 & -3 \\ 1 & -2 & -3 \end{matrix} = 2$$

$$\Delta x = \begin{bmatrix} -2 & -1 & -2 \\ 0 & 1 & 1 \\ 8 & -2 & 1 \end{bmatrix} \begin{matrix} -2 & -1 & -12 \\ 0 & 1 & 2 \\ 8 & -2 & -10 \end{matrix} = 2$$

$$x = \frac{\Delta x}{\Delta} = \frac{2}{2} = 1$$

$$\Delta y = \begin{bmatrix} 2 & -2 & -2 \\ -1 & 0 & 1 \\ 1 & 8 & 1 \end{bmatrix} \begin{matrix} 2 & -2 & 18 \\ -1 & 0 & 18 \\ 1 & 8 & 14 \end{matrix} = -4$$

$$y = \frac{\Delta y}{\Delta} = \frac{-4}{2} = -2$$

$$\Delta z = \begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 0 \\ 1 & -2 & 8 \end{bmatrix} \begin{matrix} 2 & -1 & 6 \\ -1 & 1 & 6 \\ 1 & -2 & 12 \end{matrix} = 6$$

$$z = \frac{\Delta z}{\Delta} = \frac{6}{2} = 3$$

3

a.

$$1. \int x(2x^3 + 3x^2 - 3x + 5) dx$$

$$= \frac{2x^4}{4} + \frac{3x^3}{3} - \frac{3x^2}{2} + 5x + c$$

$$= 0.5x^4 + x^3 - \frac{3}{2}x^2 + 5x + c$$

$$2. \int (\sin 3x + \cos 5x + (3x+1)(4x+3)) dx$$

$$(\sin 3x + \cos 5x + 12x^2 + 4x + 9x + 3) dx$$

$$(\sin 3x + \cos 5x + 12x^2 + 13x + 3) dx$$

$$= -\frac{1}{3} \cos 3x + \frac{1}{5} \sin 5x + \frac{12x^3}{3} + \frac{13x^2}{2} + 3x + c$$

$$= -\frac{1}{3} \cos 3x + \frac{1}{5} \sin 5x + 4x^3 + \frac{13}{2}x^2 + 3x + c$$

$$3. \int_0^3 (4x^3 + 3x^2 + 2x - 3) dx$$

$$= \left[\frac{4x^4}{4} + \frac{3x^3}{3} + \frac{2x^2}{2} - 3x \right]_0^3 + c$$

$$= x^4 + x^3 + x^2 - 3x + c$$

$$(3^4 + 3^3 + 3^2 - 3(3) + c) - (0^4 + 0^3 + 0^2 - 3(0) + c)$$

$$81 + 27 + 9 - 9 + c$$

$$= 108 + c$$

Q37/34Q3a7/2033

$$4. \int_1^2 (e^{2x} + 2x^3 + 7) dx$$

$$= \left[\frac{1}{2} e^{2x} + \frac{2x^4}{4} + 7x \right]_1^2 + c$$

1
?

$$5. \int_1^4 (\sqrt{x} - 3)(\sqrt{x} + 5) dx$$

$$= \left(\frac{x^{-\frac{1}{2}}}{-\frac{1}{2}} - 3x \right) \left(\frac{x^{-\frac{1}{2}}}{-\frac{1}{2}} + 5x \right) + c$$

~~x~~ 0

$$6. \int_0^2 \frac{x+1}{x^2+3x+2} dx = ? \quad \underline{\underline{1}}$$

Q3b

0/6

Q3c

0/8

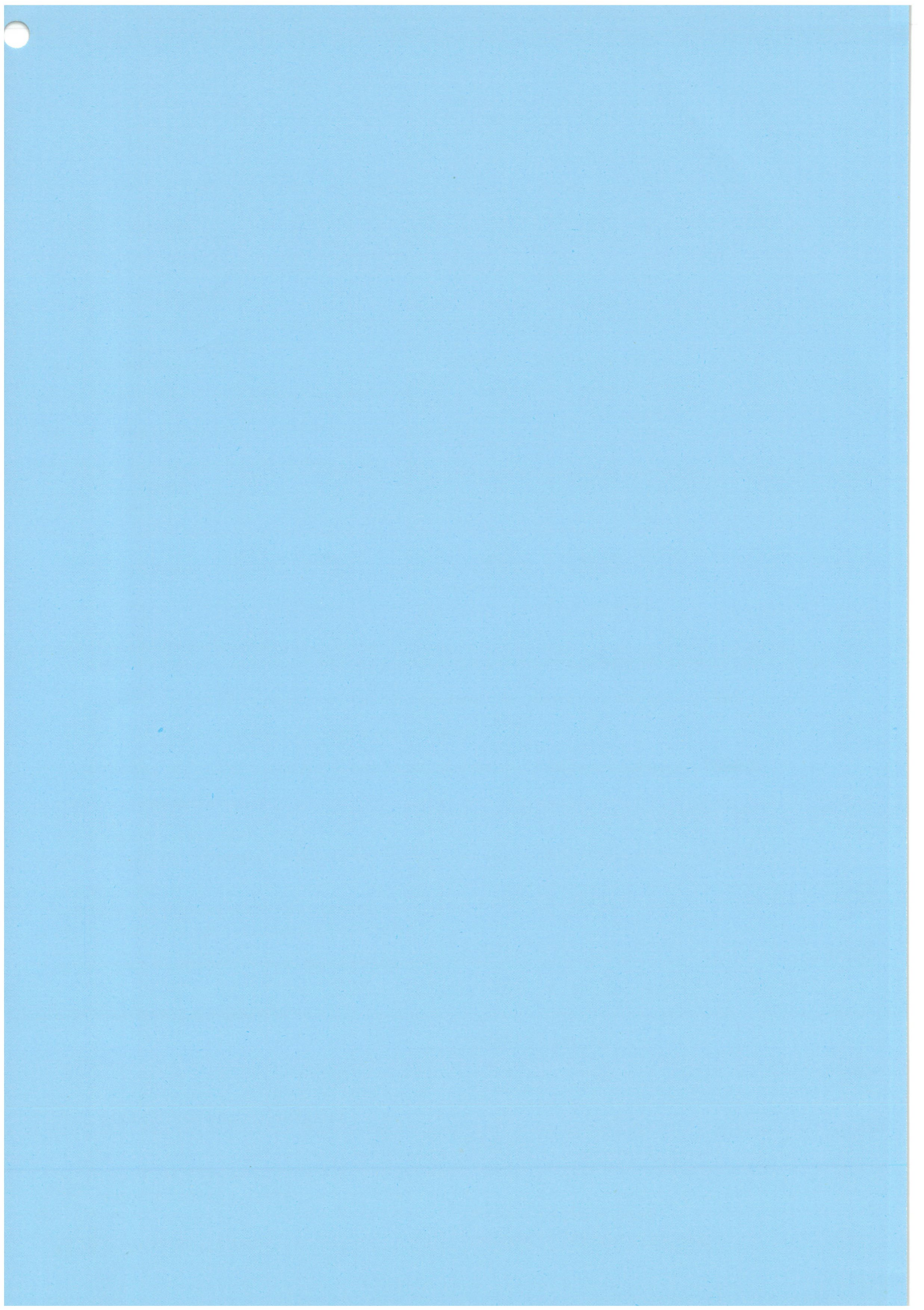


Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn





Llyfr Atebion Arholiadau

12 Tudalen

Cyfarwyddiadau i Ymgeiswyr

1. Rhwch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhwch eich enw yn y lle a ddarparwyd ar y dde, plygwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarlennadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarllennadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.
6. Ni ddylid rhwgo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyllwyr/gwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

Llenwch, plygwch a seliwch
(gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF:

Rhestwch ritau'r
cwestiynau a
ymgeisiwyd
gennych
At Ddibenion y
Swyddfa

Cyfanswm

1	Rhif Myfyriwr	
2	Teitl y Papur Arholiad	
3	Cod y Modwl	
4	Dyddiad ac Amser yr Arholiad	
5	Lleoliad yr Arholiad	
6	Rhif Sedd	
7	Nifer y Llyfrau Atebion a gyflwynwyd	

(See the other side for English version)