



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.**

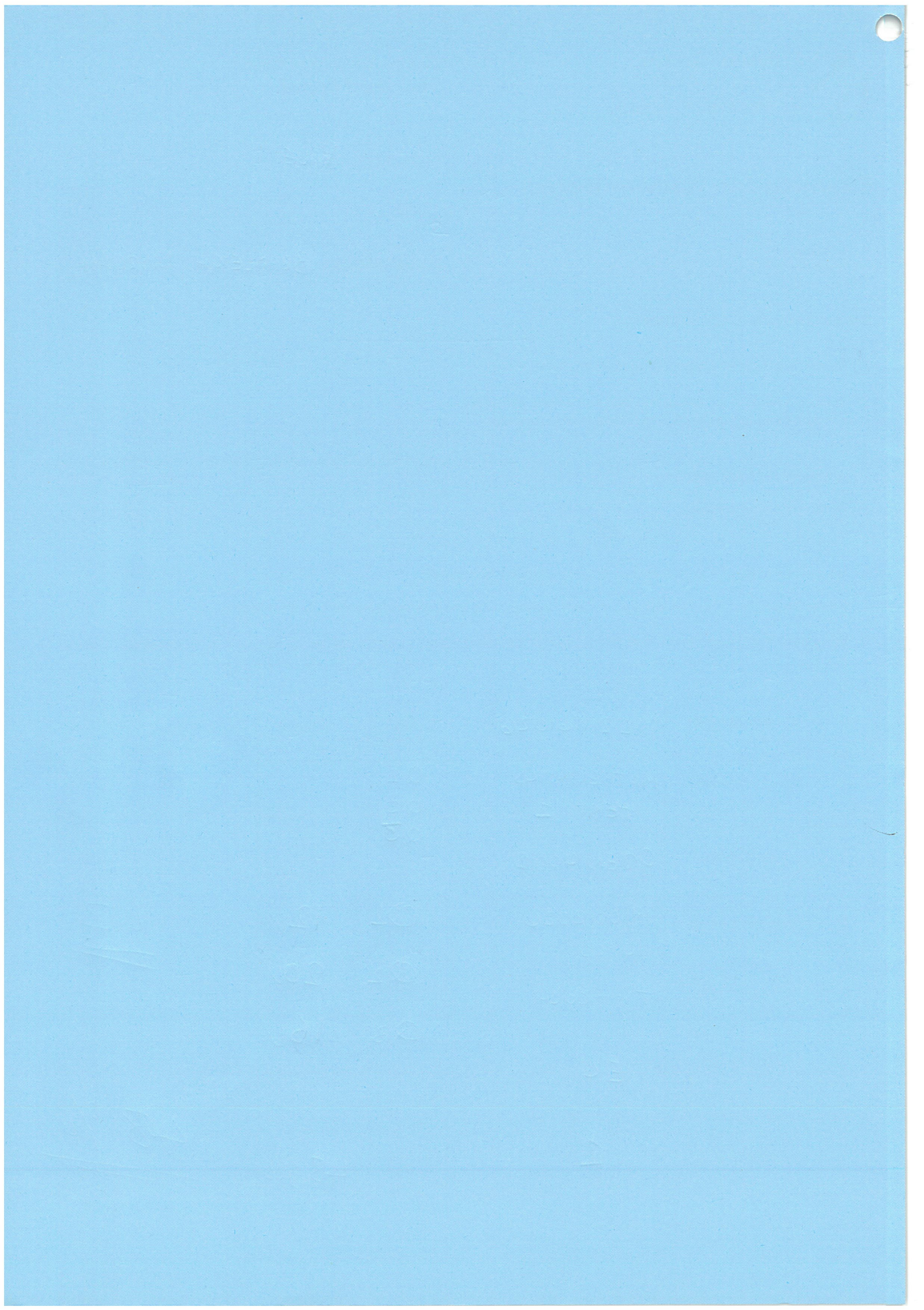
Complete, fold and seal
(see note 2 below)

SURNAME: VALE

FORENAME(S): BRADLEIGH MORGAN

1	Student Number	VAL 21861026
2	Title of Examination Paper	MATHEMATICS TEST 1
3	Module Code	GOEN 4001
4	Date and Time of Examination	19/01/2026 14:00
5	Examination Venue	TY - COCH
6	Seat Number	E 4
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q1	
Q2	
Q3	
Q1	12✓
Q2	20✓
Q3	16✓
Total	48/100



Q1.

$$a) i) y = 2x^6 - 5x^3 + 4x - 9$$

$$\frac{dy}{dx} = 12x^5 - 15x^2 + 4$$

$$ii) y = \frac{4}{x^{\frac{1}{2}}} - 5\sqrt{x} + \frac{3}{e^2}$$

$$\frac{dy}{dx} = \cancel{\frac{4}{2x^{\frac{3}{2}}}} - x^{\frac{1}{2}} + e^{-2}$$

$$iii) y = 4\sin(4x) - 2\cos(5x) + 3\tan\left(\frac{x}{3}\right)$$

$$\frac{dy}{dx} = 16\cos 4x + 10\sin 5x + -\frac{x}{3} \sec^2\left(\frac{x}{3}\right)$$

$$iv) y = 5x^4 e^{2x}$$

$$\frac{dy}{dx} = 20x^3 2e^{2x}$$

$$v) y = \frac{3\cos(3x)}{e^x + 5}$$

$$u = 3\cos(3x) \quad v = e^x + 5$$

$$\frac{du}{dx} = -9\sin 3x \quad \frac{dv}{dx} = e^x$$

$$\frac{dy}{dx} = \frac{(e^x + 5)(-9\sin 3x) - 3\cos 3x(e^x)}{(e^x + 5)^2}$$

$$= \frac{dy}{dx} = \frac{v\left(\frac{du}{dx}\right) - u\left(\frac{dv}{dx}\right)}{v^2}$$

Q112/35Q1a10/22

a) vi)

$$y = \frac{2}{7} (3x^4 + 4x)^3$$

$$\frac{dy}{dx} = \frac{6}{7} (3x^4 + 4x)^2 \times 12x^3$$

$$\text{vii) } y = \frac{1}{5} \sqrt[5]{(5x^4 + \sin(2x))}$$

$$\frac{dy}{dx} = \frac{1}{5} (20x^3 + 2\cos 2x)^{\frac{1}{2}} \times 0$$

$$b) w = 3x^4 y^3 + 5x^3 + 6y^2 + e^{2x} - \cos(3y)$$

$$i) \frac{d^2 w}{dx^2} = 9x^4 y^2 + 15x^2 + 2e^{2x}$$

$$\frac{d^2 w}{dx^2} = 36x^3 y^2 + 30x + 2e^{2x}$$

$$ii) \frac{d^2 w}{dy} = 9x^4 y^2 + 12y + 3\cos 3y$$

$$iii) \frac{d^2 w}{dx dy} = 18x^4 y$$

$$x = 12x^3 y^3 + 5x^2 + 2e^{2x}$$

$$y = 9x^4 y^2 + 12y + 3\cos 3y$$

$$iv) \frac{d^2 w}{dy dx} = 18x^4 y$$

Q1b

1/6

$$c) y = 3e^x + x^2$$

$$\frac{dy}{dx} = \cancel{3e^x + x^2} = 3e^x + 2x^{2-1}$$

Q1c1/4

$$d) y = x \sin(x)$$

$$\frac{dy}{dx} = x^2 \cos x$$

$$\frac{dy}{dx} = x^3 \sin x$$

$$\frac{dy}{dx} = x^4 \cos x$$

Q1d0/3

Q2.

$$a) \frac{5x + 7}{(x+1)(x-3)} = \frac{A}{(x+1)} + \frac{B}{(x-3)}$$

$$= 5x + 7 = A(x-3) + B(x+1)$$

$$\text{let } x = 3$$

$$= 5(3) + 7 = A(3-3) + B(3+1)$$

$$= 15 + 7 = A(0) + B(4)$$

$$22 = B(4)$$

$$\frac{22}{4} = B$$

$$B = 5.5$$

$$\text{let } x = -1$$

$$= 5(-1) + 7 = A(-1-3) + B(-1+1)$$

$$= -5 + 7 = A(-4) + B(0)$$

$$= 2 = A(-4)$$

$$\frac{2}{-4} = A$$

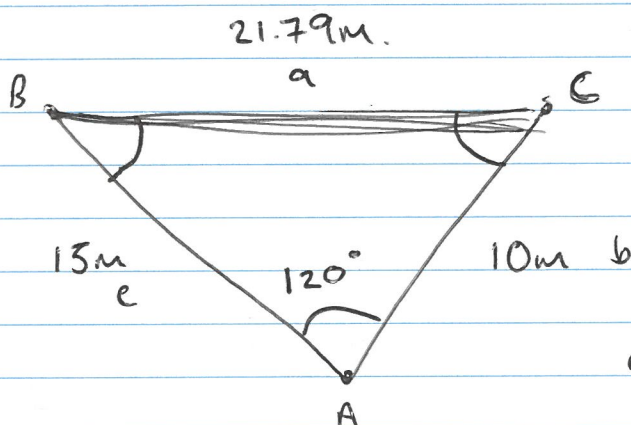
$$A = -0.5$$

Q220/33Q2a9/9

Q2. Continued.

$$\frac{5x + 7}{(x+1)(x-3)} = \frac{-0.5}{(x+1)} + \frac{5.5}{(x-3)}$$

b)



$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$1) BC = AB^2 + AC^2 - 2(AB)(AC) \cos(A)$$

$$BC = 15^2 + 10^2 - 2(15)(10) \cos(120^\circ)$$

$$BC = \sqrt{225 + 100 - 2 \times 15 \times 10 \cos(120^\circ)}$$

$$BC = \sqrt{225 + 100 - 300(-0.5)}$$

$$BC = \sqrt{475}$$

$$= 21.79m$$

$$2) \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\sin C = \frac{c \sin A}{a}$$

$$= \frac{\sin^{-1}(0.5) \times 15}{21.79m} = 20.65^\circ$$

$$\text{Angle } C = 20.65^\circ$$

$$\text{Angle } B = 180^\circ - 20.65^\circ - 120^\circ$$

$$B = 39.35^\circ$$

Q2b

2/5

Q2.

S	A
T	C

$$c) x^2 - 11x + 24$$

$$(x - 8)(x - 3) \quad \underline{\underline{2}}$$

$$\tan^2 x - 11 \tan x + 24 = 0$$

$$= (\tan x - 8)(\tan x - 3) = 0$$

$$= \tan x - 8 = 0$$

$$= \tan x - 3 = 0$$

$$= \tan x = 8$$

$$= \tan x = 3$$

$$x = \tan^{-1}(8)$$

$$x = \tan^{-1}(3)$$

$$x = 82.87^\circ \quad \underline{\underline{2}}$$

$$x = 71.56^\circ \quad \underline{\underline{2}}$$

$$x = 82.87^\circ + 180^\circ$$

$$x = 71.56 + 180^\circ$$

$$x = 262.87^\circ$$

$$x = 251.56^\circ$$

2

Q2c6/6

Q2.

$$d) y = x^2 - 4x + 3 = 2x + 1$$

$$y = x^2 - 4x + 3 - 2x + 1 = 0$$

$$y = x^2 - 6x + 4 = 0$$

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

$$\frac{-(-4) + \sqrt{(-4)^2 - 4(1)(3)}}{2(1)} = 3$$

$$\frac{-(-4) - \sqrt{(-4)^2 - 4(1)(3)}}{2(1)} = 1$$

$$e) i) 2 \sin x = 0.75$$

$$\sin x = \frac{0.75}{2}$$

$$\sin x = 0.375$$

$$x = \sin^{-1}(0.375)$$

$$x = 22.02^\circ$$

$$x = 180^\circ - 22.02^\circ = 157.98^\circ$$

S	A
T	C

Q2d2/6

e)

$$\text{ii) } 4 \cos x = 1 \Rightarrow$$

=

$$\text{iii) } -5 \tan x = 1$$

$$= \tan x = \frac{1}{-5}$$

$$x = \tan^{-1}\left(\frac{1}{-5}\right)$$

$$x = 11.30^\circ$$

$$x = 180^\circ + 11.30^\circ = 191.30^\circ$$

Q3.

$$\text{i) } \ln(2x-3) + \ln(3) = \ln(5x+9)$$

$$= \frac{1}{(2x-3)} + \frac{1}{(3)} = \frac{1}{(5x+9)} = \log(2x-3) + \log(3) = \log(5x+9)$$

$$\text{ii) } \log(3x+2) + \log(x+1) = \log 15$$

$$= \log(3x+2)(x+1) = \log 15$$

$$= \log 3x^2 + 3x + 2x + 3 = \log 15$$

$$= \log 3x^2 + 3x + 3 = \log 15$$

Q3.

Q3

$$\text{iii)} \quad 4^{(x+3)} \times 2^{(2-x)} = 8^{(x+1)}$$

$$= \log 4^{(x+3)} \times \log 2^{(2-x)} = \log 8^{(x+1)} \quad \underline{\underline{1}}$$

16/32

$$= \cancel{\log 4} (x+3) \log 4 \times (2-x) \log 2 = (x+1) \log 8$$

Q3a2/18

$$\text{b)i)} \quad p^2 - 13p + 42$$

$$= (p-7)(p-6) \quad \underline{\underline{2}}$$

Q3b

$$\text{ii)} \quad 4b^2 - 49$$

$$(2b+7)(2b-7) \quad \underline{\underline{2}}$$

6/6

$$\text{iii)} \quad mn + 5mp + 3nq + 15pq$$

$$(m+3q)(n+5p) \quad \underline{\underline{2}}$$

Q3c

$$\text{c)i)} \quad 6m^2 + 17m + 12 = 0$$

$$(3m+4)(2m+3) = 0 \quad \underline{\underline{1}} \quad m=??$$

4/6

$$\text{ii)} \quad y^2 + 13y + 40 = 0 \quad \underline{\underline{1}}$$

$$(y+8)(y+5) = 0 \quad \underline{\underline{1}} \quad y=??$$

Q3.

$$d) \quad \begin{matrix} (a) & (b) & (c) \\ 3w^2 & -2w & -8 \end{matrix} = 0$$

$$\begin{aligned} a &= 3 \\ b &= -2 \\ c &= -8 \end{aligned}$$

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

$$w = \frac{-(-2) + \sqrt{(-2)^2 - 4(3)(-8)}}{2(3)} = 2$$

$$w = \frac{-(-2) - \sqrt{(-2)^2 - 4(3)(-8)}}{2(3)} = -1.3$$

~~scribbled out text~~

Q3d

4/4

4

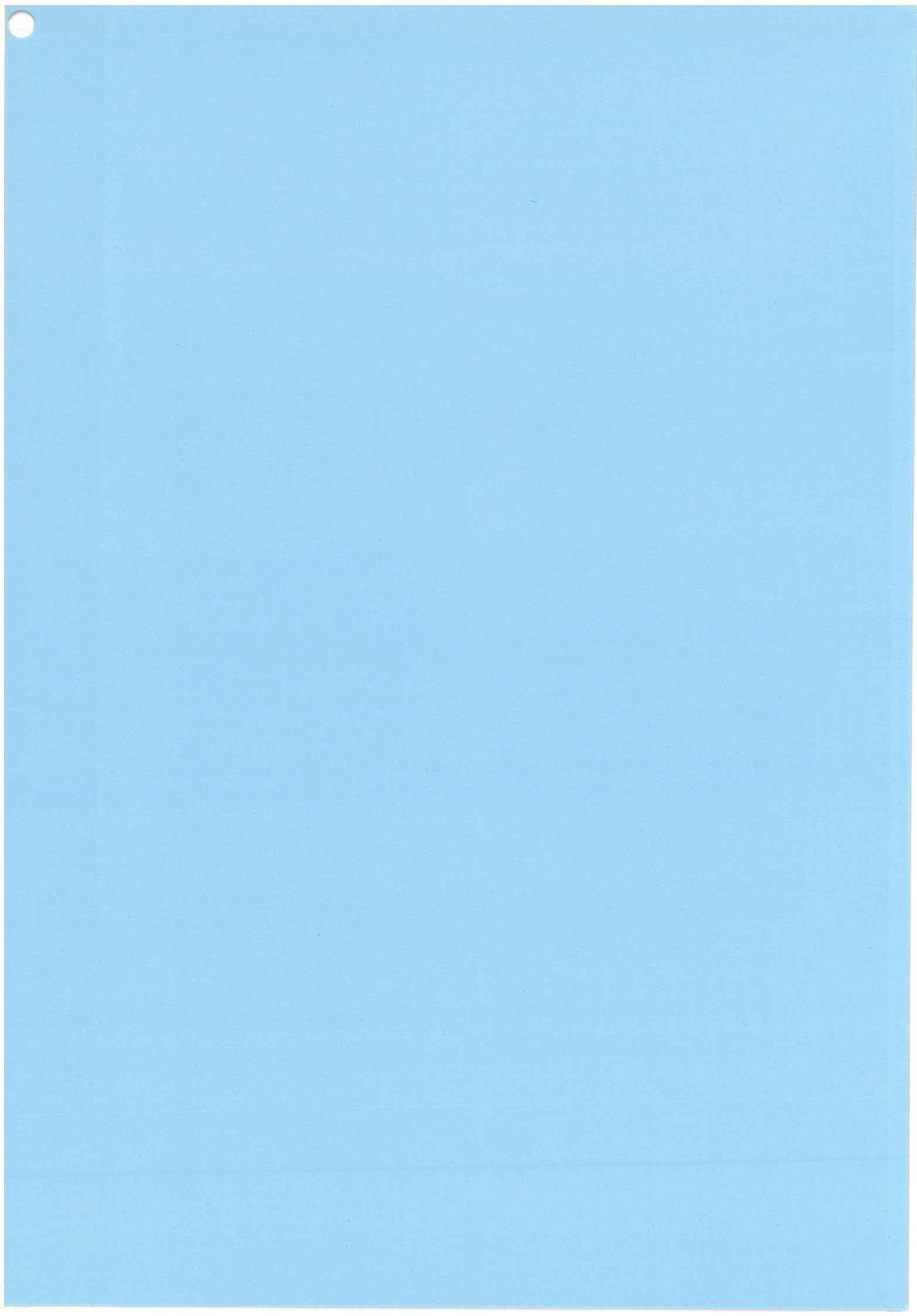


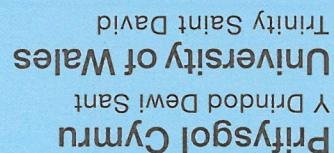
Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn





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, plynwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.

3. Rhaid i'r atebion fod mewn llawysgriften ddarllenadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarllenadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.

4. Ysgriennwch eich atebion mewn inc.

5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnwch 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 gwylwyr/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.

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	

[illegible]

(See the other side for English version)

Llenwch, plygwrch a seilwch
(gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF:

ENW(AU) CYNTAF: