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(see note 1 below)

69%

SURNAME: McNICHOLAS

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FORENAME(S): JOSEPH, DAVID

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Instructions to Candidates:

Summary of Marks

1. Please give the information requested above and enter your name in the space provided at the top right of this page. If your answers are to be marked under a scheme whereby the examiners will not know your identity, fold over and seal down the top right-hand corner of the page (using the gummed label provided) in order to conceal your name.
2. Commence each answer on a fresh page.
3. Do all rough work in the answer book and cross through it.
4. No part of this booklet is to be torn out.
5. Supplementary answer books if used must:-
 - (a) bear the candidate's name (concealed, where appropriate), reference number and paper title;
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6. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the exam room.
7. Your answers must be legibly written **IN INK**.
The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.

Question Numbers Answered	1st Examiner	2nd Examiner (optional)	3rd Examiner (optional)
2	30.5		
3	25		
	65.5		
TOTAL			
RESULT			

2a) i) $4 - q^2$

$$(2-q)(2+q) = 4 + 2q - 2q - q^2$$

$$(2-q)(2+q) \quad q = 2, -2$$

2

2a) ii) $3ab + 4cd - cb - 12ad$

$$(3a-c)(4d+b)$$

$$(3a-c)(b+4d) \quad 3ab - 12ad - cb + 4cd$$

$$(3a-c)(b-4d) \quad 3ab - 12ad - cb + 4cd$$

4

2a) iii) $p^2 - 2p - 63$

$$(p+9)(p-7)$$

2 marks

not 63

9 and 7

$$(p+9)(p-7) = p^2 - 7p + 9p - 63$$

$$(p-9)(p+7) = p^2 + 7p - 9p - 63 = p^2 - 2p - 63$$

 $p = 9, -7$

3

2a) iv) $q^2 - 4qr$

$$q(q-4r)$$

$$q(q-4r) \rightarrow q^2 - 4qr$$

1

Answer = $q(q-4r)$

2b) $(2x-1)(3x+5) = (6x-5)(x-9)$

$$6x^2 + 10x - 3x - 5 = 6x^2 - 54x - 5x + 45$$

$$7x - 5 = -59x + 45$$

$$63x = 50$$

$$x = \frac{50}{63} = 0.79$$

$$x = 0.79$$

$$-3.00 =$$

2

2b) ii) $\frac{x-4}{5} = \frac{2x-1}{3}$

$$3(x-4) = 5(2x-1)$$

$$3x - 12 = 10x - 5$$

$$1 = 7x$$

$$\frac{1}{7} = x$$

$$x = 0.14$$

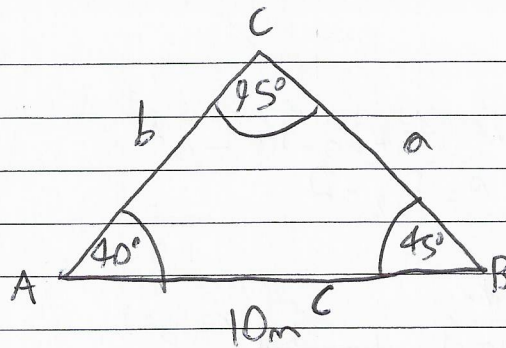
1

$$1 - 2 - 63$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-2 \pm \sqrt{4 - 4(1)(-63)}}{2(1)} = \frac{-2 \pm \sqrt{4 + 252}}{2} = \frac{-2 \pm \sqrt{256}}{2} = \frac{-2 \pm 16}{2}$$

$$x = \frac{-2 + 16}{2} = 7$$

2c)



$$40 + 45 = 85$$

$$180 - 85 = 95^\circ$$

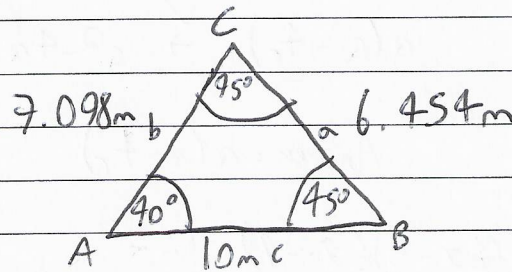
$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)} \rightarrow \frac{a}{\sin 40} = \frac{b}{\sin 45} = \frac{10}{\sin 95}$$

$$\frac{b}{\sin 45} = \frac{10}{\sin 95} \quad b = \frac{10 \times \sin 45}{\sin 95} = \frac{7.071}{0.996} = b = 7.098$$

$$b = 7.098 \text{ m}$$

$$\frac{a}{\sin 40} = \frac{10}{\sin 95} \quad a = \frac{10 \times \sin 40}{\sin 95} = \frac{6.428}{0.996} = 6.454$$

$$a = 6.454 \text{ m}$$



$$2d) 0^\circ < x < 360^\circ$$

$$4 \sin x = -3 \rightarrow \sin x = \frac{-3}{4} \quad \sin^{-1} x = -0.75$$

x is a negative

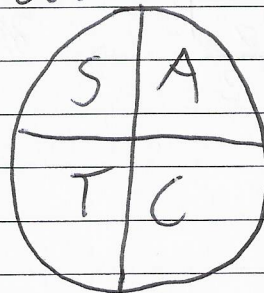
$$\sin^{-1} 0.75 = 48.59$$

$\sin$ is negative in C and T

$$360 - 48.59 = 311.41^\circ$$

$$180 + 48.59 = 228.59^\circ$$

$$x = 311.41^\circ \text{ and } 228.59^\circ$$



2dii) $\cos x = -0.5$

x is negative

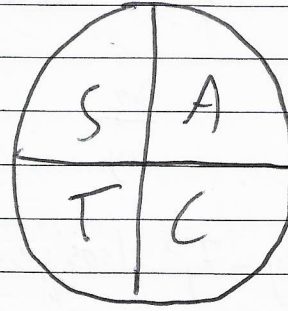
$\cos$ is negative in S and T

$$\cos^{-1} 0.5 = 60^\circ$$

$$180^\circ - 60^\circ = 120^\circ$$

$$180^\circ + 60^\circ = 240^\circ$$

$$x = 120^\circ \text{ and } 240^\circ$$



2

2eii) $y = x^3 e^{2x}$

$$U = x^3$$

$$V = e^{2x}$$

Product rule

$$\frac{du}{dx} = 3x^2$$

$$\frac{dv}{dx} = 2e^{2x}$$

$$\frac{dy}{dx} = U \left(\frac{dv}{dx} \right) + V \left(\frac{du}{dx} \right)$$

$$\frac{dy}{dx} = x^3 (2e^{2x}) + e^{2x} (3x^2)$$

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

2fii) $y = \sin 5x \cos 3x$ $U = \sin 5x$ $V = \cos 3x$

$$\frac{du}{dx} = 5 \cos 5x$$

$$\frac{dv}{dx} = -3 \sin 3x$$

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

$$\frac{dy}{dx} = -\sin 15x^2 + \cos 3x (-5 \cos 5x)$$

2f) $z = 2x^3 y - 7y^3 x + \sin x \cos y$

$$\frac{dz}{dx}$$

$$\frac{dz}{dy}$$

P.T.O

$$2f) z = 2x^3y - 7y^3x + \sin x \cos y$$

$$\frac{\partial z}{\partial x}$$

$$\frac{\partial z}{\partial y}$$

$$\frac{\partial z}{\partial x} = 6x^2y - 7y^3 + \cos y$$

$$\frac{\partial z}{\partial y} = 2x^3 - 21y^2x + \sin x$$

$$\frac{\partial^2 z}{\partial x^2} = 12xy$$

$$\left(\frac{\partial z}{\partial y}\right) \frac{\partial^2 z}{\partial x^2} = 6x^2 - 21y^2$$

$$\frac{\partial^2 z}{\partial y^2} = -42y + 2\cos x$$

$$\left(\frac{\partial z}{\partial x}\right) \frac{\partial^2 z}{\partial x^2} = 6x^2 - 21y^2$$

4 orders are

$$\frac{\partial^2 z}{\partial x^2} = 12xy \quad \left(\frac{\partial z}{\partial y}\right) \frac{\partial^2 z}{\partial x^2} = 6x^2 - 21y^2 \quad \frac{\partial^2 z}{\partial y^2} = -42y + 2\cos x$$

$$\left(\frac{\partial z}{\partial x}\right) \frac{\partial^2 z}{\partial y^2} = 6x^2 - 21y^2$$

1 1/2

1

1

1

30 1/2

$$\begin{array}{rcl}
 3a) & 7x + 4y = 46 & \text{for } x \times 3 = 21x + 12y = 138 \\
 & 8x + 6y = 57 & \times 2 \quad 16x + 12y = 114 \\
 & & 5x = 24 \\
 & & x = \frac{24}{5} = 4.8
 \end{array}$$

$$x = 4.8$$

$$\begin{array}{rcl}
 & 7x + 4y = 46 & \text{for } y \times 8 = 56x + 32y = 368 \\
 & 8x + 6y = 57 & \times 7 \quad 56x + 42y = 399 \\
 & & -10y = -31 \\
 & & y = \frac{-31}{-10} = 3.1
 \end{array}$$

$$y = 3.1$$

$$7(4.8) + 4(3.1) = 46$$

$$8(4.8) + 6(3.1) = 57$$

$$3b) \quad 3x^2 + 5x - 2 = 0 \quad a=3 \quad b=5 \quad c=-2$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-2)}}{2 \times 3}$$

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

$$\rightarrow \frac{-5 \pm \sqrt{25 - 24}}{6}$$

$$\frac{-5 \pm 1}{6}$$

$$\rightarrow \frac{-5+1}{6} = \frac{-4}{6} = -0.66$$

$$\frac{-5-1}{6} = \frac{-6}{6} = -1$$

$$x = -0.66, -1$$

$$3c) i) x^2 + 11x + 30 = 0$$

$$\begin{array}{l}
 \text{and } 5 \\
 (x+5)(x+6) \rightarrow x^2 + 6x + 5x + 30 \\
 = x^2 + 11x + 30
 \end{array}$$

$$\text{ANSWER} = (x+5)(x+6)$$

$$\text{ANSWER} = x = -5, -6$$

3c ii) $x^2 - 11x = 0$
 ~~$(x+1)(x-11)$~~ $x(x-11) \rightarrow x^2 - 11x = 0$ ✓
 ANSWER = $x(x-11)$ $x=11$ ✓

3

3c iii) $x^2 - 4 = 0$
 $(x-2)(x+2) \rightarrow x^2 + 2x - 2x - 4$
 $= x^2 - 4$
 ANSWER = $(x-2)(x+2)$ ✓
 $x=2, -2$

3

3d i) $y = 6x^2(x^3 - 2x^2 + 5x - 1)$
 $6x^5 - 12x^4 + 30x^3 - 6x^2$
 $\frac{dy}{dx} = 30x^4 - 48x^3 + 90x^2 - 12x$
 ANSWER = $30x^4 - 48x^3 + 90x^2 - 12x$ ✓

3

3d ii) $y = \frac{7}{x^2} - \frac{4}{x} + 8 \rightarrow 7x^{-2} - 4x^{-1} + 8$ ✓
 $\frac{dy}{dx} = -14x^{-3} + 4x^{-2}$
 ANSWER = $-14x^{-3} - 4x^{-2}$

3

3d iii) $y = \frac{\sin x}{\cos x}$ $y = \frac{\cos x}{-\sin x}$
 ANSWER = $\frac{\cos x}{-\sin x}$

3e i) $y = (2x^2 - 5x + 1)^7 \rightarrow 2x^2 - 5x + 1$ $u = 2x^2 - 5x + 1$

$\frac{dy}{dx} = 7(2x^2 - 5x + 1)^6 \cdot \frac{du}{dx}$ $\frac{du}{dx} = 4x - 5$ $u = 2x^2 - 5x + 1$

$\frac{dy}{dx} = 7(2x^2 - 5x + 1)^6 \cdot (4x - 5)$

$\frac{dy}{dx} =$

→ CONTINUED

177.7104 108.36

3c) $\sqrt{s(s-a)(s-b)(s-c)}$

$$s = \frac{a+b+c}{2}$$

$$4.5\text{cm}, 8.8\text{cm}, 12.5\text{cm}$$

$$\sqrt{12.9(12.9-4.5)(12.9-8.8)(12.9-12.5)}$$

$$\sqrt{12.9(8.4)(4.1)(0.4)}$$

$$s = \frac{4.5+8.8+12.5}{2}$$

$$\sqrt{177.7104}$$

$$s = \frac{25.8}{2} \quad | \quad s = 12.9$$

$$= 13.331\text{cm}^2$$

$$\text{Area of triangle} = 13.331\text{cm}^2$$

3d i) $y = (2x^2 - 5x + 1)^7$

u is a function of x

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$y = (4x - 5)^7 \rightarrow y =$$

$$u = 4x - 5$$

$$\frac{dy}{du} = 4$$

$$y = 4x$$

$$4(4x-5)$$

3d ii) e^{x^2+4}

 $\rightarrow$

$$\frac{dy}{du} \times \frac{du}{dx}$$

$$\frac{e^{x^2}}{du} \times \frac{du}{dx}$$

25

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