

Complete, fold and seal
(see note 1 below)

SURNAME: Munghan

FORENAME(S): Jennifer Louise

Candidate's Exam Number:

**Total Books
Handed In:**

1

2

Programme Title: _____

Year/Level/Stage: _____

Examination Paper Title: _____

Examination Paper Ref No.: _____ Desk Letter/Number: _____

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Date: ____ / ____ / 20____ Time: _____ am/pm Room Name or No. : _____

Room Name or No.: _____

Instructions to Candidates:

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Summary of Marks

Question Numbers Answered	1st Examiner	2nd Examiner (optional)	3rd Examiner (optional)
1	~~42~~ 38.5		
2	39		
TOTAL			
RESULT			

i ai $E = mgh$
 $\frac{E}{m} = gh$
 $\frac{E}{mh} = g$

1

ii $T = 2\pi\sqrt{\frac{l}{g}}$

$$\frac{T}{2\pi} = \sqrt{\frac{l}{g}}$$

$$\left(\frac{T}{2\pi}\right)^2 = \frac{l}{g}$$

$$g = \frac{l}{\left(\frac{T}{2\pi}\right)^2}$$

4

iii $v^2 = u^2 + 2gs$
 $v^2 - u^2 = 2gs$
 $\frac{v^2 - u^2}{2s} = g$

2

bi $(pq)^0$ anything to the power 0 = 1
 $\therefore (pq)^0 = 1$

1

ii $(\sqrt{q})^4$

$$= q^{4/2}$$

$$= q^2$$

2

1 biii $(p+q)(3p-q) + (2p+q)(p-q)$

expanding out brackets gives

$$3p^2 - q^2 + 3pq - pq + 2p^2 - q^2 + pq - 2pq$$

collecting like terms

$$3p^2 + 2p^2 - q^2 - q^2 + 3pq - pq + pq - 2pq$$

$$= 5p^2 - 2q^2 + pq$$

3

c $\frac{2}{x-1} + \frac{3}{x-4}$ to get common denominator
multiply by denominators

$$\frac{2}{3} + \frac{1}{4} = \frac{2 \times 4 + 3 \times 1}{12}$$

$$\therefore \frac{2(x-4)}{(x-1)(x-4)} + \frac{3(x-1)}{(x-1)(x-4)}$$

gives $\frac{2(x-4) + 3(x-1)}{(x-1)(x-4)}$

multiply out brackets
in numerator

$$\frac{2x-8+3x-3}{(x-1)(x-4)}$$

$$\frac{2}{x-1} = \frac{2(x+1)}{(x+1)(x-1)} = \frac{2x+2}{x^2-1}$$

$$= \frac{5x-11}{(x-1)(x-4)}$$

$$\frac{2(x+1)(x-1)}{(x+1)(x-1)(x-4)} + \frac{3(x-1)}{(x-1)(x-4)}$$

$$\frac{5x-5}{(x+1)(x-4)} = \frac{A}{x+1} + \frac{B}{x-4} \quad \text{so } A(x-4) + B(x+1) = 5x-5$$

if $x = -1$ $A(-1-4) = 5(-1)-5$ and $A = \frac{-10}{-5} = 2$

$x = 4$ $B(4+1) = 5(4)-5$ and $B = 3$

$$\text{so } \frac{5x-5}{(x+1)(x-4)} = \frac{2}{x+1} + \frac{3}{x-4}$$

8

1 di $2^{3x-5} = 4^{5x-6}$ take logs of both sides
 $\log_{10} 2^{3x-5} = \log_{10} 4^{5x-6}$

using $\log_a A^b = b \log_a A$

$$(3x-5)\log_{10} 2 = (5x-6)\log_{10} 4$$

~~using~~

$$\cancel{3x-5} = \cancel{5x-6} \frac{\log_{10} 4}{\log_{10} 2}$$

~~using $\log a \log b = \log a \log b$~~

$$\cancel{3x-5} = \cancel{5x-6} \log_{10} 2$$

$$(3x-5)(0.3010) = 5x-6 (0.6021)$$

$$0.9031x - 1.5051 = 3.0103x - 3.6124$$

$$-1.5051 + 3.6124 = 3.0103x - 0.9031x$$

$$2.1073 = 2.1072x$$

$$x = 1.00$$

di $\ln(x^2-4) - \ln(x+8) = \ln x$

using $\log a - \log b = \log \frac{a}{b}$

$$\ln\left(\frac{x^2-4}{x+8}\right) = \ln x$$

remove ln's: $\frac{x^2-4}{x+8} = x$

$$x^2-4 = x(x+8)$$

$$\cancel{x^2}-4 = \cancel{x^2} + 8x$$

$$-4 = 8x$$

$$x = -0.5$$

$$1e \quad y = \frac{2-3x}{1-5x^2} \quad \begin{matrix} u \\ v \end{matrix}$$

$$\text{quotient rule} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{dy}{dx} = \frac{(1-5x^2)(-3) - (2-3x)(-10x)}{(1-5x^2)^2}$$

$$\frac{dy}{dx} = \frac{-3 + 15x^2 + 20x - 30x^2}{(1-5x^2)^2}$$

$$\frac{dy}{dx} = \frac{-15x^2 + 20x - 3}{(1-5x^2)^2}$$

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

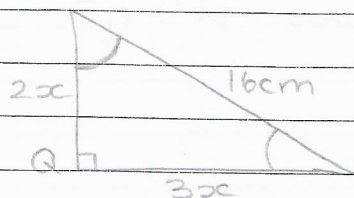
$$\frac{dy}{dx} = \frac{15(-1)^2 + 20(-1) - 3}{(1-5(-1)^2)^2}$$

$$= \frac{15 - 20 - 3}{(1-5)^2} = \frac{-8}{16}$$

$$x = -0.5$$

3½

1f



using pythagoras' theorem $a^2 + b^2 = c^2$

$$(2x)^2 + (3x)^2 = 16^2$$

$$4x^2 + 9x^2 = 256$$

$$~~4x^2 + 9x^2~~$$

$$x^2(4+9) = 256$$

$$x^2 = \frac{256}{4+9}$$

$$x = \pm \sqrt{\frac{256}{4+9}} = \pm 4.44$$

$\therefore$ one side = $2x = 2 \times 4.44 = 8.88 \text{ cm}$

and the other = $3x = 3 \times 4.44 = 13.31 \text{ cm}$

~~56.3 + 10 +~~

6

40
38.5

2ai $4 - q^2 \Rightarrow$ difference between 2 squares $2^2 - q^2$
 $= (2 - q)(2 + q)$

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

iii $p^2 - 2p - 63$ quadratic $63 = 9 \times 7$
 $(p - 9)(p + 7)$

(V) $q^2 - 4qr$?

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

multiply out brackets:

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

$$6x^2 + 7x - 5 = 6x^2 - 59x + 45$$

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

$$66x = 50$$

$$x = 50/66$$

$$x = 0.76$$

bii $\frac{x-4}{5} = \frac{2x-1}{3}$ cross multiply

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

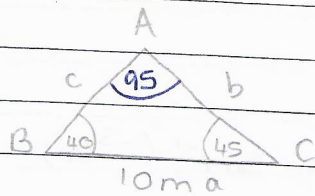
$$3x - 12 = 10x - 5$$

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

$$-7 = 7x$$

$$x = -1.00$$

2c



$$180 - 40 - 45 = 95$$

$$\text{Sine Rule} = \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{10}{\sin 95} = \frac{b}{\sin 40} = \frac{c}{\sin 45}$$

to find b: $\frac{10}{\sin 95} = \frac{b}{\sin 40}$

$$\frac{10 \sin 40}{\sin 95} = b$$

$$b = 6.5 \text{ m}$$

to find c: $\frac{10}{\sin 95} = \frac{c}{\sin 45}$

$$\frac{10 \sin 45}{\sin 95} = c$$

$$c = 7.1 \text{ m}$$

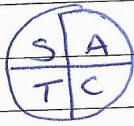
The two sides have lengths of 6.5m and 7.1m

2 di $4 \sin x = -3$

$$\sin x = -\frac{3}{4}$$

$$x = \sin^{-1}\left(-\frac{3}{4}\right) \quad \text{if } x \text{ is +ve } \sin^{-1}\left(-\frac{3}{4}\right) = 48.6$$

$$x = -48.6$$



$\sin x = -ve$ in C & T quadrants

so in T: $180 + 48.6 = 228.6^\circ$

in C: $360 - 48.6 = 311.4^\circ$

x is 228.6° and 311.4°

3

ii $\cos x = -0.5$

$$x = \cos^{-1}(-0.5)$$

if $x = +ve \Rightarrow \cos^{-1}(0.5) = 60^\circ$



$\cos$ is $-ve$ in S & T quadrants

so in S: $180 - 60 = 120^\circ$

in T: $180 + 60 = 240^\circ$

x is 120° and 240°

2

2ei

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

$$u = x^3 \quad v = e^{2x}$$

product rule : $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$

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

$$= 2x^3 e^{2x} + 3x^2 e^{2x}$$

$$= x^2 e^{2x} (2x + 3)$$

2

ii

$$y = \sin 5x \cos 3x$$

product rule $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$

$$u = \sin 5x$$

$$v = \cos 3x$$

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

$$= -3 \sin 3x \sin 5x + 5 \cos 5x \cos 3x$$

2

4

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

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

$$\frac{d^2z}{dx^2} = 12xy - \sin x \cos y$$

$$\frac{d^2z}{dydx} = 6x^2 - 21y^2 - \sin y \cos x$$

$$\frac{dz}{dy} = 2x^3 - 21y^2x - \sin y \sin x$$

$$\frac{d^2z}{dy^2} = -42yx - \cos y \sin x$$

$$\frac{d^2z}{dxdy} = 6x^2 - 21y^2 - \cos x \sin y$$

7

39



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RESULT			

Examination Answer Book

Candidate's Exam Number

Date

Page No.

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Programme Title

Work Station

Examination Paper Title

Examination Paper No.

Page

1

2

3

4

5

Summary of Tests

Instructions to Candidates

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10. The candidate must write their answer in the space provided.

11. The candidate must write their answer in the space provided.

12. The candidate must write their answer in the space provided.

$$3a \quad \begin{aligned} 7x + 4y &= 46 & (1) \\ 8x + 6y &= 57 & (2) \end{aligned}$$

$$(3) = (1) \times 3 \Rightarrow 21x + 12y = 138$$

$$(4) = (2) \times 2 \Rightarrow 16x + 12y = 114$$

$$\begin{aligned} (3) - (4) &= (21-16)x + (12-12)y = (138-114) \\ \Rightarrow 5x &= 24 \\ x &= 4.8 \end{aligned}$$

$$\begin{aligned} (1) \quad 7(4.8) + 4y &= 46 \\ 33.6 + 4y &= 46 \\ 4y &= 46 - 33.6 \\ 4y &= 12.4 \\ y &= 3.1 \end{aligned}$$

check in (2)

$$\begin{aligned} 8(4.8) + 6(3.1) &= \\ 8(4.8) + 6(3.1) &= \end{aligned}$$

So to 1 dp $x = 4.8$ and $y = 3.1$
to 1 sig fig $x = 5$ and $y = 3$

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

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

$$a = 3, b = 5, c = -2$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \times 3 \times -2}}{6} \Rightarrow \frac{-5 \pm \sqrt{25 + 24}}{6}$$

$$x = \frac{-5 \pm 7}{6}$$

$$\begin{aligned} x &= \frac{-5 + 7}{6} \text{ and } x = \frac{-5 - 7}{6} \\ x &= 0.33 \text{ and } x = -2.00 \end{aligned}$$

3ci $x^2 + 11x + 30 = 0$
 $(x+6)(x+5) = 0$
 $x = -6$ and $x = -5$

$$\begin{array}{r} 10 \ 3 \\ 15 \ 2 \\ 5 \ 6 \end{array}$$

3

cii $x^2 - 11x = 0$
 $(x-0)(x-11) = 0$
 $x = 0$ or $x = 11$

3

iii $x^2 - 4 = 0$
 $x^2 - 2^2 = 0$
 $(x+2)(x-2) = 0$
 $x = 2$ or $x = -2$

3

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

3

ii $y = \frac{7}{x^2} - \frac{4}{x} + 8$
 $y = 7x^{-2} - 4x^{-1} + 8$
 $\frac{dy}{dx} = (7 \times -2)x^{-3} - (4 \times -1)x^{-2}$
 $= -14x^{-3} + 4x^{-2}$
 $= \frac{-14}{x^3} + \frac{4}{x^2}$

4

iii $y = \frac{\sin x}{\cos x} \Rightarrow y = \tan x$
 $\frac{dy}{dx} = \sec^2 x$

2

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

let $u = (2x^2 - 5x + 1)$

so $y = u^7$

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

$$= 7u^6 \times 4x - 5$$

$$= 7(2x^2 - 5x + 1)(4x - 5)$$

$$= 7(4x - 5)(2x^2 - 5x + 1)$$

$$= (28x - 35)(2x^2 - 5x + 1)$$

ii $y = e^{x^2+4}$

let $u = x^2 + 4$

so $y = e^u$

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

$$\frac{dy}{dx} = u e^u \times 2x$$

$$= (x^2 + 4)(e^{x^2+4})2x$$

$$= 2x(x^2 + 4)e^{x^2+4}$$

$$= (2x^3 + 8x)e^{x^2+4}$$

122

3eiii

$$y = \cos^3 2x$$

$$y = (\cos 2x)^3$$

let $u = \cos 2x$ so $y = u^3$

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

$$\frac{dy}{dx} = 3u^2 \times -2\sin 2x$$

$$= 3(\cos 2x)^2(-2\sin 2x)$$

$$= -6 \sin 2x \cos^2 2x$$

3

3f ~~Cosine Rule~~:

$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{1}{2}(a+b+c)$$

$$s = \frac{1}{2}(4.5 + 8.8 + 12.5)$$

$$= 12.9$$

$$\therefore \text{area} = \sqrt{12.9(12.9-4.5)(12.9-8.8)(12.9-12.5)}$$

$$= \sqrt{12.9 \times 8.4 \times 4.1 \times 0.4}$$

$$= \sqrt{177.7104}$$

$$= 13.3 \text{ cm}^2$$

5

39

Question No.

Examiner Only

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Question No.

Examiner Only

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