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- Commence each answer on a fresh page.
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- 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.

Summary of Marks

Question Numbers Answered	1st Examiner	2nd Examiner (optional)	3rd Examiner (optional)
1	35.5		
2	25		
	60.5		
TOTAL			
RESULT			

② a) i) $4 - a^2$
 $(2-a)(2+a)$

2

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

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

4

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

3

iv) $q^2 - 4qr$
 $q(q-4r)$

1

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

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

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

$7x + 59x = 45 + 5$

$66x = 50$

$x = \frac{50}{66}$

$x = 0.75 \quad x = 0.00$

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

$0x^2 + 66x - 50 = 0$
 $\begin{matrix} a & b & c \end{matrix}$

4

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

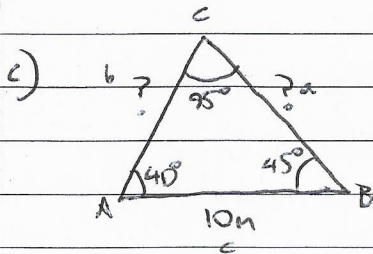
$3x-4 = 10x-5$

$-7x = -1$

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

$x = -0.14$

 $\frac{1}{2}$



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

$$\frac{6.45}{\sin 40} = \frac{7.1}{\sin 45} = \frac{10}{\sin 95}$$

$$a = \left(\frac{10}{\sin 95} \right) \times \sin 40 = 6.45 \text{ m}$$

$$b = \left(\frac{10}{\sin 95} \right) \times \sin 45 = 7.1 \text{ m}$$

d) i) $4 \sin x = -3$

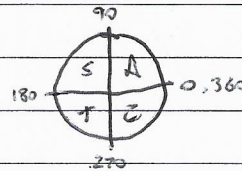
$$\sin x = -\frac{3}{4}$$

ignore
minus

$$\sin x = 0.75$$

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

$$= 48.59$$



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

$$270 + 48.59 = 318.59^\circ$$

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

$$270 - 48.59 = 221.41^\circ$$

ii) $\cos x = -0.5$

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

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

$$x = 60^\circ$$

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

ignore
minus

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

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

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

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

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

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

$$u = \sin 5x \quad v = \cos 3x$$

$$\frac{du}{dx} = 5 \cos 5x \quad \frac{dv}{dx} = -3 \sin 3x$$

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

$$= -3 \sin^2 15x + 5 \cos^2 15x$$

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

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

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

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

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

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

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

35 1/2

① a) i) $E = mgh$
 $g = \frac{mh}{E}$

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

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

$$g(2\pi T)^2 = l$$

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

b) i) $(pq)^0$
 $= 1$

ii) $(\sqrt{q})^4$
 $= (\sqrt{q})(\sqrt{q})(\sqrt{q})(\sqrt{q})$
 $= q^2$

iii) $(p+q)(3p-q) + (2p+q)(p-q)$
 $3p^2 - pq + 3pq - q^2 + 2p^2 - 2pq + pq - q^2$
 $p^2 + pq - q^2$

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

$$5x-5 = A(x-4) + B(x+1)$$

say x is 4 $5(4)-5 = A(4-4) + B(4+1)$ say x is -1 $5(-1)-5 = A(-1-4) + B(-1+1)$
 $15 = 0 + 5B$ $-10 = -5A + 0$
 $\frac{15}{5} = B$ $\frac{-10}{-5} = A$
 $B=3$ $A=2$

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

$$d) i) 2^{3x-5} = 4^{5x-8}$$

$$3x \ln 2 - 5 \ln 2 = 5x \ln 4 - 6 \ln 4$$

$$6 \ln 4 - 5 \ln 2 = 5x \ln 4 - 3x \ln 2$$

$$8.3178 - 3.4657 = 6.9315x - 2.0794x$$

$$4.8521 = 4.8521x$$

$$\frac{4.8521}{4.8521} = x$$

$$x = 1$$

$$ii) \frac{1}{n}(x^2-4) - \frac{1}{n}(x+8) = \frac{1}{n}x$$

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

$$(x+8)$$

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

$$-4 = 8x$$

$$\frac{-4}{8} = x$$

$$x = -0.5$$

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

$$u = (2-3x)$$

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

$$\frac{du}{dx} = (-3)$$

$$\frac{dv}{dx} = (-10x)$$

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

$$= \frac{-3 + 15x^2 + 20x - 30x^2}{1-5x^2-5x^2+25x^4}$$

$$= \frac{-15x^2 + 20x - 3}{25x^4 - 10x^2 + 1}$$

$$\text{when } x \text{ is } -1 \quad \frac{dy}{dx} = \frac{-15(-1)^2 + 20(-1) - 3}{25(-1)^4 - 10(-1)^2 + 1}$$

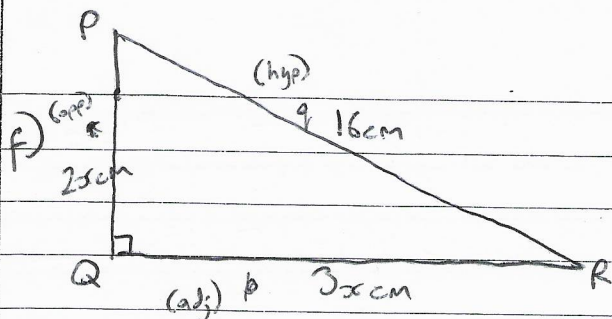
$$= \frac{-15 - 20 - 3}{25 - 10 + 1}$$

$$= \frac{-48}{16}$$

$$= -3$$

8

4



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

$$\frac{2x}{\sin 90} = \frac{16}{\sin 30} = \frac{3x}{\sin 60}$$

$$a^2 + b^2 = c^2$$

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

$$5x^2 = 256$$

$$x^2 = \frac{256}{5}$$

34

$$2x \times \frac{1}{2} \sin 90 = \frac{1}{2} \times 16$$

$$\frac{2x}{16} = 0.125$$

$$2x = 0.125 \times 16$$

$$2x - 0.125x = 16$$

$$1.875x = 16$$

$$x = \frac{16}{1.875} = 8.53$$

2

$$x^2 = 51.2$$

$$x = \sqrt{51.2}$$

$$x = 7.155$$

$$x = 4.44$$

$$2x = 8.88$$

$$3x = 13.32$$

$$8.88$$

$$2x = 14.31 \text{ cm}$$

$$3x = 21.47 \text{ cm}$$

$$78.8544$$

$$177.4224$$

$$256.2768$$

$$2 \times 8.53 = 17.06$$

Say or 155

$$2(5) = 10 \quad 10^2 = 100$$

$$3(5) = 15 \quad 15^2 = 225$$

$$\text{say } x:4 = 8^2 = 64$$

$$12^2 = 144$$

$$\text{say } x:4.5 = 9^2 = 81$$

$$12.5^2 = 156.25$$

$$263.25$$

$$8.8^2 = 77.44$$

$$13.2^2 = 174.24$$

$$251.68$$

$$79.21$$

$$178.2225$$

$$257.4325$$

$$78.4996$$

$$176.6241$$

$$③ a) 7x + 4y = 46 \quad \times 6$$

$$8x + 6y = 57 \quad \times 4$$

$$42x + 24y = 276$$

$$32x + 24y = 228$$

$$10x + 0 = 48$$

$$x = \frac{48}{10} = 4.8$$

$$7(4.8) + 4(6.7) =$$

$$7x + 4y = 46 \quad \times 7$$

$$8x + 6y = 57 \quad \times 8$$

$$56x + 28y = 322$$

$$56x + 48y = 456$$

$$0 - 20y = -134$$

$$y = \frac{-134}{-20} = 6.7$$

25

Question No.

Examiner Only

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