

# **Sec 4 Maths**

**Exam papers with worked solutions**

## **SET C**

## **PAPER 1**

## **Answer**

Compiled by

**THE MATHS CAFE**

Q	Steps / Answers	Type of Marks	Total Marks	Remarks
1	(a) $\sin x (3 - 4 \tan x) = 0$ $x = 0^\circ, 180^\circ, 360^\circ$ $x = 36.9^\circ, 216.9^\circ$	M1 A1 A1	3	for correct factorisation from $\sin x = 0$ from $\tan x = \frac{3}{4}$
	(b) $\frac{1}{\sin\left(\frac{3}{2}y - 80^\circ\right)} = -2$ Basic Angle = $30^\circ$ $y = 33\frac{1}{3}^\circ, 193\frac{1}{3}^\circ, 273\frac{1}{3}^\circ$	M1 M1 A1	3	for using cosec = $\frac{1}{\sin}$
2	(a) $5(\sin A \cos B + \cos A \sin B)$ $= 7(\sin A \cos B - \cos A \sin B)$ $2 \sin A \cos B = 12 \cos A \sin B$ $\tan A = 6 \tan B$	M1 M1 A1	3	for correct addition formula for correct manipulation
	(b) (i) $\frac{6 \tan B - \tan B}{1 + 6 \tan B(\tan B)}$ 1	M1 A1	2	for correct substitution
	(b) (ii) $\cos A = \frac{1}{\sqrt{5}}$ $\cos 2A = -\frac{3}{5}$	M1 A1	2	
3	(a) $3 \tan^2 x (\sec^2 x)$ $3 \sec^4 x - 3 \sec^2 x$	M1 A1	2	for correct differentiation
	(b) $\int_0^{\frac{\pi}{4}} (3 \sec^4 x - 3 \sec^2 x) dx = [\tan^3 x]_0^{\frac{\pi}{4}}$ $[\tan^3 x]_0^{\frac{\pi}{4}} = 1$ $3 \int_0^{\frac{\pi}{4}} \sec^4 x dx = 1 + 3 \int_0^{\frac{\pi}{4}} \sec^2 x dx$ $\frac{4}{3}$	M1 M1 M1 A1	4	for showing integration is reverse of differentiation for correct substitution of limits for indication of making $\sec^4 x$ the subject
4	$3x - 4 = 2x^2 - x + k$ $2x^2 - 4x + (4 + k) = 0$ $(-4)^2 - (4)(2)(k + 4) < 0$	M1 M1 M1		for equating two eqns for algebraic manipulation for using $b^2 - 4ac < 0$

		$k > -2$	A1	4	
5	(a)	$f(-2) = -8p - 2q - 18$ $-8p - 2q - 18 = 0$ $16x^3 + 3px^2 - 38x + q$ $16(0.5)^3 + 3p(0.5)^2 - 38(0.5) + q$ $p = -8$ and $q = 23$	M1 M1 M1 M1 A1	5	for using factor theorem for correct differentiation for showing $\frac{dy}{dx} = 0$ at stat. pt.
	(b)	294	A1	1	
6		$\frac{\sin^2 x + \cos^2 x}{\cos^2 x + \sin^2 x}$ $\frac{\sin^2 x(1 - \cos^2 x) + \cos^2 x(1 - \sin^2 x)}{\cos^2 x(\sin^2 x)}$ expansion of numerator $\frac{\sin^2 x + 2\cos^4 x - \cos^2 x}{\cos^2 x(\sin^2 x)}$	M1, M1  M1  M1  A1	5	for $\tan = \frac{\sin}{\cos}$ and $\cot = \frac{\cos}{\sin}$ for using $\sin^2 x + \cos^2 x = 1$  for expansion
7		$\log_{16}(3x-1) = \log_4\left(\frac{1}{2}\right)(3x)$ $\frac{\log_4(3x-1)}{\log_4 16} = \log_4 \frac{3x}{2}$ $\frac{\log_4(3x-1)}{2\log_4 4}$ $(3x-1)^{\frac{1}{2}} = \frac{3x}{2}$ $9x^2 - 12x + 4 = 0$ $\frac{2}{3}$	M1  M1  M1  M1  A1	6	for using $\log_a x + \log_a y = \log_a xy$ for changing base  for using $\log_a a = 1$  for changing log form to index form for algebraic manipulation
8	(a)	$\binom{10}{r}(4)^{10-r}(-x^3)^r$ $r = 7$ $\binom{10}{7}(4)^{10-7}(-1)^7(x^{21})$ -7680	M1  M1  M1  A1		for using formula with correct substitution  for correct substitution
	(b)	$(1 + 2x)(\dots - 7680x^{21} \dots)$ -15 360	M1  A1	2	allow B2 for -15 360 seen
9	(a)	$12 - 8x$ (1.5, 9) max point	M1  M1  A1	3	for correct differentiation

	(b)	$6x^2 - 6x$ 120 $180 = 120 \times \frac{dx}{dt}$ 1.5 cm/s	M1 M1 M1 A1	4	for correct differentiation  for correct chain rule with substitution
10	(a)	$PR^2 = 36 + x^2$ $\pi \left( \frac{1}{2} \sqrt{36 + x^2} \right)^2$ $\pi \left( \frac{1}{2} \sqrt{36 + x^2} \right)^2 - 6x$ $9\pi + \frac{\pi}{4} x^2 - 6x$	M1 M1 M1 A1	4	for use of PT for area of circle  for big area – small area
	(b)	$\frac{\pi}{2} x - 6$ $\frac{\pi}{2} x - 6 = 0$ $\frac{12}{\pi}$ min value	M1 M1 A1 A1	4	for correct differentiation  for using $\frac{dA}{dx} = 0$
11	(a)	Gradient = 2 A(0,4) and B(-2, 0) $y = 2x + 4$	M1 M1, M1 A1	4	
	(b)	Gradient = $-\frac{1}{2}$ $2y + x = 8$ solving sim eqns (0.5, 3.75)	M1 M1 M1 A1	4	indication of solving sim eqns
	(c)	$y - 0 = -\frac{1}{2}(x - (-2))$ $2y + x = -2$	M1 A1	2	
	(d)	$\frac{1}{2} \begin{vmatrix} -2 & 0 & 0.5 & 2 & -2 \\ 0 & 4 & 3.75 & 0 & 0 \end{vmatrix}$ 8.75	M1 A1	2	for using formula with correct substitution
12	(a)	centre = (3,4) radius = 3	A1 A1	2	
	(b)	$4(\text{y-coordinate}) + 3(\text{radius}) = 7$	A1	1	