Version 1.0

Level 2 Certificate in Further Mathematics

Practice Paper Set 2

Paper 2 8360/2

Mark Scheme

Mark Schemes

Principal Examiners have prepared these mark schemes for practice papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

It is not possible to indicate all the possible approaches to questions that would gain credit in a 'live' examination. The principles we work to are given in the glossary on page 3 of this mark scheme.

- Evidence of any method that would lead to a correct answer, if applied accurately, is generally worthy of credit.
- Accuracy marks are awarded for correct answers following on from a correct method. The correct method may be implied, but in this qualification there is a greater expectation that method will be appropriate and clearly shown.

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Glossary for Mark Schemes

These examinations are marked in such a way as to award positive achievement wherever possible. Thus, for these papers, marks are awarded under various categories.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M Dep	A method mark dependent on a previous method mark being awarded.
B Dep	A mark that can only be awarded if a previous independent mark has been awarded.
ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$

Paper 2 - Calculator

Q	Answer	Mark	Comments
1(a)	$y = \frac{1}{3}x$	B2	oe B1 (gradient) $\frac{1}{3}$ oe B1 $y = mx$ ($\pm$ 0) $m \neq \frac{1}{3}$ oe
1(b)	$6^2 + 2^2$ (= 36 + 4 = 40)	M1	
	$\sqrt{6^2 + 2^2}$	M1 Dep	
	6.32(4…) or 6.325	A1	2 sf answer needed
	6.3	B1 ft	ft Any answer seen > 2 sf that is rounded correctly to 2sf
2(a)	m^{10}	B1	
2(b)	m^{16}	B1	
2(c)	m^2	B1	
2(d)	m^{-3}	B2	B1 $\sqrt{m^{-6}}$ **or** $\frac{1}{m^3}$
3	(4, 0)	B1	
	(0, –10)	B1	
	$\frac{1}{2}$ × their 4 × their 10	M1	
	20	A1 ft	
4	$5(x - 4) + 3x = 30$	M1	Allow one error
	$5x - 20 + 3x = 30$	M1	ft Their one error if made
	$8x = 50$	A1	
	6.25	A1 ft	oe ft From M1

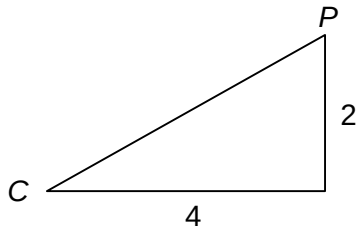
Q	Answer	Mark	Comments
5(a)	-3	B1	
5(b)	2	B1	
5(c)	$x^2 = 4$ **or** $14 = 3x$	M1	
	$(x =)$ 2	A1	Do not allow if $(x =) -2$ also included as a solution
	$(x =) \frac{14}{3}$	A1	
5(d)	f(0) (= –4) **or** f(3) (= 5) **or** f(5) (= –1)	M1	
	$-4 \leq f(x) \leq 5$	A2	oe eg, [–4, 5] A1 Answer uses –4 **and** 5 but incorrect notation used eg, $-4 \leq x \leq 5$
6(a)	-2 **and** 5	B1	
6(b)	$x = \frac{3}{2}$	B1	oe
6(c)	$-2 \leq x \leq 5$	B2 ft	ft Their two values in (a) B1 $-2 < x < 5$
7	$\frac{1}{2} \times 18 \times 10 \times \sin p$ $(= 90\sin p)$	M1	
	$\sin p = \frac{27}{\text{their } 90}$	M1 Dep	
	162.5 …	A1	Accept 163 with correct working SC2 17.4 … **or** 17.5

Q	Answer	Mark	Comments
8	16 – –5 (= 21) **or** –5 – 16 (= –21) **or** –3 – 11 (= –14) **or** 11 – –3 (= 14)	M1	
	$\frac{4}{7}$ × their (–)21 (= (–) 12) **or** $\frac{4}{7}$ × their (–) 14 (= –8)	M1	$\frac{3}{7}$ × their (–) 21 (= (–) 9) **or** $\frac{3}{7}$ × their (–) 14 (= (–) 6)
	16 – their 12 **or** 16 + their –12 **or** –3 + their 8 **or** –3 – their –8	M1	–5 + their 9 **or** –5 – their – 9 **or** 11 – their 6 **or** 11 + their – 6
	(4, 5)	A1	
9	$85^2 + 72^2 - 2 \times 85 \times 72 \times \cos 40$ (= 3032.6 …)	M1	
	$\sqrt{\text{their } 3032.6...}$	M1 Dep	
	55(.0 …) or 55.1	A1	
	102	B1 ft	ft 85 + 72 – their 55
10	$2(3x + 4)$	B1	
	$x(9x^2 - 16)$	M1	$(3x^2 - 4x)(3x + 4)$ **or** $(3x - 4)(3x^2 + 4x)$
	$x(3x - 4)(3x + 4)$	A1	
	$\frac{x(3x-4)}{2}$	A1	oe eg, $\frac{3}{2}x^2 - 2x$

Q	Answer	Mark	Comments
11(a)	$a \times 1 + b = a + b$ **and** $b \times 1 + a = b + a$	B1	
11(b)	$2a + b$ **or** $3b + a$	M1	
	$2a + b = 3b + a$ (leading to $a = 2b$)	A1	
11(c)	$\frac{2bn + b}{bn + 2b}$	M1	Allow for correct numerator **or** denominator correct
	$b(2n + 1)$ **or** $b(n + 2)$	M1	Factorises either their numerator **or** their denominator
	$\frac{b(2n + 1)}{b(n + 2)}$ **and** shows simplification	A1	
12(a)	$1 - 9 + 24 - 16$	B1	
12(b)	$(0, -16)$	B1	
12(c)	$3x^2 - 18x + 24$	B2	B1 Any one correct term
12(d)	Their $3x^2 - 18x + 24 = 0$	M1	
	$(x - 2)(x - 4)$ **or** $\frac{--6 \pm \sqrt{(-6)^2 - 4 \times 1 \times 8}}{2 \times 1}$	M1	oe eg, $(3x - 6)(x - 4)$
	$x = 2$ **and** $x = 4$	A1 ft	$x = 2$ **and** $y = 4$
	$y = 4$ **and** $y = 0$	A1 ft	$x = 4$ **and** $y = 0$
12(e)	Curve passing through (1, 0) **and** their (0, –16) **and** one maximum point at their (2, 4) **and** one minimum point at their (4, 0)	B2 ft	B1 ft Curve with at least two of the four properties

Q	Answer	Mark	Comments
13(a)	$\pi x^2 + \pi x^2 + 2\pi x^2$ $(= 4\pi x^2)$	M1	oe
	$\pi x^2 + \pi x^2 + 4\pi x^2$ $(= 6\pi x^2)$	M1	oe
	Their $4\pi x^2$ = their $6\pi y^2$	M1	Allow if equating curved surface areas
	Shows working leading to $x^2 = \frac{3}{2}y^2$	A1	
13(b)	$x = \sqrt{\frac{3}{2}}y$	M1	oe
	B **and** $x = 1.2\ldots y$ which is less than $2y$	A1	oe
14	$(x + 1)$ **or** $(x - 2)$ **or** $(x - 5)$	M1	
	$x^2 - x - 2$ **or** $x^2 - 4x - 5$ **or** $x^2 - 7x + 10$	A1	
	Product of their remaining linear factor and their quadratic eg, $x^3 - x^2 - 2x - 5x^2 + 5x + 10$	M1	Allow one error but no omissions
	$x^3 - 6x^2 + 3x + 10$	A1 ft	
15(a)	$a = -3$	B1	
	$b = -4$	B1 ft	ft $5 - (\text{their} - 3)^2$
15(b)	$(p - 1)^2 = 12 - m$	M1	oe eg, $m - 12 = -(p - 1)^2$
	$p - 1 = (\pm)\ \sqrt{\text{their}\,12 - m}$	M1	
	$p = \pm\ \sqrt{\text{their}\,12 - m} + 1$	A2 ft	ft From one sign error A1 ft $p = \sqrt{\text{their}\,12 - m} + 1$

Q	Answer	Mark	Comments
16	$\begin{pmatrix} 2 & 5 \\ a & a+b \end{pmatrix}$ and $\begin{pmatrix} 2+a & 3+b \\ a & b \end{pmatrix}$	B3	B2 At least six entries correct B1 At least three entries correct
	their 2 = their 2 + a **or** their 5 = their 3 + b **or** their $a + b$ = their b	M1	Equates any pair correctly
	$a = 0$ **and** $b = 2$	A1 ft	
17(a)	$\frac{x}{x+5} = \frac{1.3(0) \times 10^8}{1.95 \times 10^8}$	M1	oe eg, $\frac{x+5}{x} = \frac{3}{2}$
	$1.95x = 1.3(0)(x + 5)$	M1	oe eg, $2(x + 5) = 3x$
	10	A1	
17(b)	$\frac{\text{their } 10+4}{\text{their } 10} \times 1.3(0) \times 10^8$ (= 182 000 000)	M1	$\frac{\text{their } 10+4}{\text{their } 10+5} \times 195 \times 10^8$ (= 182 000 000)
	1.82×10^8	A1 ft	ft Their 10 if answer in standard form
18(a)	$2s^2 - 2s + s - 1$	M1	4 terms with at least 3 correct
	$2s^2 - s - 1$	A1	
18(b)	$(2\sin\theta + 1)(\sin\theta - 1)$ **or** $\frac{--1 \pm \sqrt{(-1)^2 - 4 \times 2 \times -1}}{2 \times 2}$	B1	
	90° **and** 210° **and** 330°	B2 ft	ft Their factorisation or formula B1 ft At least one correct solution

Q	Answer	Mark	Comments
19(a)	$\frac{1}{2}$	B1	
19(b)	y = their $\frac{1}{2}x + c$	M1	oe Point where tangent intersects y-axis (0, 13) **and** $(13 - y)^2 = 4^2 + (5 - y)^2 + 4^2 + 8^2$
	Substitutes (4, 5) ie, 5 = their $\frac{1}{2} \times 4 + c$	M1	$169 - 13y - 13y + y^2 =$ $16 + 25 - 10y + y^2 + 16 + 64$ ft From their 13 Allow two errors in expansions but must not omit any terms
	$c = 3$	A1	$y = 3$
	$(5 - \text{their } 3)^2 + 4^2$ (= 20)	M1	
	$x^2 + (y - \text{their } 3)^2 = \text{their } 20$	A1 ft	
Alt 19(b)		M2	M1 Diagram with only one of 4 and 2 correct
	$c = 3$	A1	$y = 3$
	$(5 - \text{their } 3)^2 + 4^2$ (= 20)	M1	
	$x^2 + (y - \text{their } 3)^2 = \text{their } 20$	A1ft	
20	$(-1)^3 + 4(-1)^2 - 25(-1) - 28$ $(= -1 + 4 + 25 - 28)$	M1	Allow one slip $(4)^3 + 4(4)^2 - 25(4) - 28$ $(= 64 + 64 - 100 - 28)$
	$(x + 1)$ a factor	A1	$(x - 4)$ a factor
	$(x + 1)(x^2 \ldots\ldots - 28)$	M1	$(x - 4)(x^2 \ldots\ldots + 7)$
	$(x + 1)(x^2 + 3x - 28)$	A1	$(x - 4)(x^2 + 8x + 7)$
	$(x + 1)(x + a)(x + b)$ ab = their -28 or $a + b$ = their 3	M1	$(x - 4)(x + c)(x + d)$ ab = their 7 or $c + d$ = their 8
	$(x + 1)(x - 4)(x + 7)$	A1	SC2 Exactly one correct linear factor seen SC4 Exactly two correct linear factors seen