Version 1.0

Level 2 Certificate in Further Mathematics

Practice Paper Set 4

Paper 1 8360/1

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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqamaths.aqa.org.uk

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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
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.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between *a* and *b* inclusive.
3.14 …	Allow answers which begin 3.14 eg 31.4, 3142, 3.149
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Paper 2 - Calculator

Q	Answer	Mark	Comments
1	$(1\frac{1}{2})^2 - (1\frac{1}{5})^2$	M1	or $\frac{9}{4} - \frac{36}{25}$ or $w^2 + (1\frac{1}{5})^2 = (1\frac{1}{2})^2$
	$\frac{225-144}{100}$ or $\frac{225}{100} - \frac{144}{100}$	M1	
	$\sqrt{(1\frac{1}{2})^2 - (1\frac{1}{5})^2}$ or $\sqrt{(\frac{9}{4} - \frac{36}{25})}$ or $\sqrt{\text{their }\frac{81}{100}}$	M1 dep	Dep on 1st M1 Use of 3, 4, 5 Δ, with $1\frac{1}{2} = \frac{15}{10}$ or 1.5 and $1\frac{1}{5} = \frac{12}{10}$ or 1.2 scores M3
	$\frac{9}{10}$	A1	oe
	Alternative method		
	$1.5^2 - 1.2^2$	M1	or $w^2 + 1.2^2 = 1.5^2$
	$2.25 - 1.44$ or $(1.5 + 1.2)(1.5 - 1.2)$	M1	0.81
	$\sqrt{(1.5)^2 - (1.2)^2}$ or $\sqrt{(2.25)^2 - (1.44)^2}$ or $\sqrt{\text{their }0.81}$	M1 dep	Dep on 1st M1 Use of 3, 4, 5 Δ, with $1\frac{1}{2} = \frac{15}{10}$ or 1.5 and $1\frac{1}{5} = \frac{12}{10}$ or 1.2 scores M3
	0.9	A1	oe

Q	Answer	Mark	Comments
2	$4hx - 4 - 3x - 3h$	M1	Allow one error or $5x + 5k$ (no errors)
	$4hx - 3x = 5x$ or $-4 - 3h = 5k$	M1 dep	oe equating their x terms or constant terms
	$h = 2$	A1	
	$k = -2$	A1 ft	ft their h if M marks gained

Q	Answer	Mark	Comments
3(a)	$\frac{x}{y} = \frac{3}{2}$	M1	oe
	$x = \frac{3y}{2}$	A1	oe
3(b)	$2x + y = 3y + y$ (= $4y$) or $3x - 2y = 3(\frac{3y}{2}) - 2y$ (= $2\frac{1}{2}y$)	M1	(2 × 3 + 2) : (3 × 3 − 2 × 2) oe using any values of x and y in the ratio 3 : 2
	8 : 5	A1	
4	$ADB = 180 - 90 - (90 - 2x)$ (= $2x$)	B1	Angle sum of triangle
	DAC = their $2x - x$	B1	Exterior angle = sum of interior opposite angles
	DAC (= x) = ACB	B1	Must have all reasons for full marks
	Alternative method 1		
	$ADC = 90 + 90 - 2x$ (= $180 - 2x$)	B1	Exterior angle = sum of interior opposite angles
	$DAC = 180$ – their $(180 - 2x) - x$	B1	Angle sum of triangle
	DAC (= x) = ACB	B1	Must have all reasons for full marks
	Alternative method 2		
	$DAC = 180 - 90 - (90 - 2x) - x$	B2	Angle sum of triangle
	DAC (= x) = ACB	B1	Must have all reasons for full marks
	Alternative method 3		
	$BAC = 180 - 90 - x$ (= $90 - x$)	B1	Angle sum of triangle
	DAC = their $(90 - x) - (90 - 2x)$ (= x)	B1	
	DAC (= x) = ACB	B1	Must have all reasons for full marks

Q	Answer	Mark	Comments
5	$10x$ or $6x^2$	B1	
	their $6x^2 =$ their $10x$	M1	oe
	$2x(3x - 5) = 0$ or $3x = 5$	M1	oe ft if a quadratic equation
	$x = \frac{5}{3}$	A1	oe
6	$\frac{6x^5 - 15x^2}{x^2}$	M1	
	$6x^3 - 15$	A1	
	$18x^2$	A1 ft	ft from a two-term polynomial
7	$\frac{2k - 3h}{hk}$ or $2k - 3h = 4hk$	M1	or $\frac{2}{h} = 4 + \frac{3}{k}$
	$2k = 4hk + 3h$	M1	or $\frac{2}{h} = \frac{4k+3}{k}$
	$2k = h(4k + 3)$ **and** $h = \frac{2k}{4k+3}$	A1	$\frac{h}{2} = \frac{k}{4k+3}$ **and** $h = \frac{2k}{4k+3}$
8	$(y =)\ 3x^2 + 2x - 8$	B1	
	$\frac{dy}{dx} = 6x + 2$	B1 ft	ft if 3 terms for their $y =$ ......
	14	B1 ft	

Q	Answer	Mark	Comments
9	$4x + 5x = 180$ or $9x = 180$	M1	Opposite angles in cyclic quadrilateral are supplementary
	$x = 20$	A1	
	$2y + 2 \times$ (their 20) $+ 5y = 180$	M1	Opposite angles in cyclic quadrilateral are supplementary
	$y = 20$ (so $x = y$)	A1	Must state a reason for full marks
	Alternative method		
	$4x + 5x = 180$ or $9x = 180$	M1	Opposite angles in cyclic quadrilateral are supplementary
	$2x + 7y = 180$	M1	Opposite angles in cyclic quadrilateral are supplementary
	$4x + 5x = 2x + 7y$	M1	
	$7x = 7y$ (so $x = y$)	A1	Must state a reason for full marks

Q	Answer	Mark	Comments
10	$\frac{dy}{dx} = -8 - 3x^2$	M1	
	$x^2 \geq 0$ for all values of x so $-8 - 3x^2 < 0$ for all values of x	A1	oe
	Gradient is always negative so y is a decreasing function for all values of x	A1	Must make connection between $\frac{dy}{dx}$ and gradient / decreasing function

Q	Answer	Mark	Comments
11	$p^2 = m^2 + (3m)^2 - 2 \times m \times 3m \times \cos 60$	M1	oe
	$p^2 = m^2 + (3m)^2 - 3m^2$	A1	
	$p^2 = 7m^2$ so $p = m\sqrt{7}$	A1	

Q	Answer	Mark	Comments
12	$\dfrac{480 - -180}{-260 - 620}$	M1	
	$-\dfrac{3}{4}$	A1	
	$480 = \text{their } -\dfrac{3}{4} \times (-260) + c$ or $-180 = \text{their } -\dfrac{3}{4} \times (620) + c$	M1	oe
	$B = (0, 285)$	A1	
	$0 = \text{their } -\dfrac{3}{4}x + 285$	M1	oe
	$C = (380, 0)$	A1	
13	(5, 9)	B1	Centre of circle
	D (1, 9) or B (9, 9)	B1	
	Midpoint of a side of the square eg midpoint of AB $\dfrac{(5 + \text{their } 9)}{2}, \dfrac{(13 + \text{their } 9)}{2}$ or (7, 11)	M1	$BC \rightarrow$ (7, 7) $CD \rightarrow$ (3, 7) $DA \rightarrow$ (3, 11)
	$\text{radius}^2 = (\text{their } 7 - \text{their } 5)^2 + (\text{their } 11 - \text{their } 9)^2$ or 8	M1	oe
	$(x - 5)^2 + (y - 9)^2 = 8$	A1	oe
	Alternative method 1		
	(5, 9)	B1	Centre of circle
	$\cos 45 = \dfrac{r}{4}$ or $\cos 45 = \dfrac{AB}{8}$	M1	oe
	$r = 4 \times \dfrac{1}{\sqrt{2}}$ or $AB = 8 \times \dfrac{1}{\sqrt{2}}$	M1	oe
	$r^2 = \dfrac{16}{2}$ or 8	M1	
	$(x - 5)^2 + (y - 9)^2 = 8$	A1	Oe

Q	Answer	Mark	Comments
	Alternative method 2		
	(5, 9)	B1	Centre of circle
	Distance $AO = 4$	B1	oe
	$AM = r$ and $OM = r$	M1	where M is the midpoint of AB and O is the centre of the circle r is the radius of the circle oe
	$r^2 + r^2 = 4^2$ or $2r^2 = 16$ or $r^2 = 8$	M1	
	$(x-5)^2 + (y-9)^2 = 8$	A1	oe
14(a)	$(2)^3 + 8(2)^2 + (2) - 42$	M1	
	$8 + 32 + 2 - 42 = 0$	A1	
14(b)	$(x^3 + 8x^2 + x - 42 =)$ $(x-2)(x^2 + nx + 21)$	M1	oe or Substitutes another value into the expression and tests for '= 0' or Long division of polynomials getting as far as $x^2 + 10x$ ...
	$(x-2)(x^2 + 10x + 21)$	A1	$(x + 3)$ is a factor
	$(x-2)(x+3)(x+7)$	A1	$(x + 7)$ is a factor
	2, −3 and −7	A1	

Q	Answer	Mark	Comments
15	$\dfrac{(5\sqrt{5}-2)(2\sqrt{5}+3)}{(2\sqrt{5}-3)(2\sqrt{5}+3)}$	M1	
	$50-4\sqrt{5}+15\sqrt{5}-6$ **or** $20-9$	M1	oe allow one error
	$50-4\sqrt{5}+15\sqrt{5}-6$ **and** $20-9$	A1	oe
	$4+\sqrt{5}$	A1	
16	$2(x^2-4x)\ (+9)$ or $2(x^2-4x+\frac{9}{2})$	M1	
	Sight of $(x-2)^2$	M1	
	$2[(x-2)^2-4]+9$ or $2[(x-2)^2-4+\frac{9}{2}]$	A1	
	$2(x-2)^2+1$	A1	
	Squared terms are always ≥ 0 so the expression is always ≥ 1 or > 0	A1	oe
	Alternative method		
	$\frac{dy}{dx}=4x-8x$	M1	Starting with $y=2x^2-8x+9$
	Stationary point when $x=2$	M1	
	$\frac{dy}{dx}=-4$ when $x=1$ **and** $\frac{dy}{dx}=4$ when $x=3$ ... hence minimum point when $x=2$	A1	
	$y=1$ (when $x=2$)	A1	
	Minimum point at (2, 1) hence expression must be > 0 for all values of x	A1	oe

Q	Answer	Mark	Comments
17	$2a + ab = -1$	B1	Allow one error in these two steps
	$a - 3b = 2$	B1	
	$2a + \frac{a(a-2)}{3} = -1$	M1	$(3b + 2)(2 + b) = -1$
	$a^2 + 4a + 3 = 0$	A1	$3b^2 + 8b + 5 = 0$
	$(a + 1)(a + 3)(= 0)$	M1	$(3b + 5)(b + 1)(= 0)$
	$a = -1$, $b = -1$ and $a = -3$, $b = -\frac{5}{3}$	A1	