

GCSE

Edexcel GCSE

Mathematics A 1387

November 2006

Mark Scheme

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NOTES ON MARKING PRINCIPLES

- 1 Types of mark**
 - M marks: method marks
 - A marks: accuracy marks
 - B marks: unconditional accuracy marks (independent of M marks)

- 2 Abbreviations**

cao - correct answer only
ft - follow through
isw - ignore subsequent working
SC: special case
oe - or equivalent (and appropriate)
dep - dependent
indep - independent

- 3 No working**

If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

- 4 With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If it is clear from the working that the “correct” answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
If there is no answer on the answer line then check the working for an obvious answer.

- 5 Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

- 6 Ignoring subsequent work**
It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.
- 7 Probability**
Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.
- 8 Linear equations**
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.
- 9 Parts of questions**
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

No	Working	Answer	Mark	Notes
1		48	2	
(a)	16+32			B2 cao (B1 for 16 or 32 seen) B1 cao
(b)		4	1	
2		10 12 15 37 9 17 7 33 19 29 22 70	3	B3 all correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
(a)				
(b)		$\frac{19}{70}$	2	B2 for $\frac{19}{70}$, accept 0.27 (...)
				(B1 for $\frac{k}{70}$ with $0 < k < 70$ or for the correct probability incorrectly expressed, eg '19 out of 70')
3		6	1	B1 cao
(a)				
(b)		20	1	B1 cao
(c)		24	1	B1 cao
4	$(40 \div 10) \times (60 \div 20) \times (100 \div 10)$	120	3	M1 attempt one division (eg $40 \div 10$), may be implied by marks or number on one edge of diagram or by two of 4,3 and 10 seen M1 (dep) for $(“40 \div 10”) \times (“60 \div 20”) \times (“100 \div 10”)$ A1 cao OR M1 for $10 \times 20 \times 10$ or $40 \times 60 \times 100$ M1 (dep) for $“240000” \div “2000”$ A1 cao

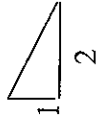
No	Working	Answer	Mark	Notes
5 (a)	<p>1076 807x 9146</p> <p>200 60 9 6000 1800 270 30 800 240 36 4</p> <p>6000+1800 +270+800+240+36=9146</p> <p>2.5 × 1000 or 2500</p>	91.46	3	<p>M1 for a complete method with relative place value correct, condone 1 multiplication error, addition not necessary A1 for 9146 A1 (dep on M1) for correct conversion of their total into £s OR M1 for a completed grid with not more than 1 multiplication error, addition not necessary A1 for 9146 A1 (dep on M1) for correct conversion of their total into £s OR M1 for sight of a complete partitioning method, condone 1 multiplication error, final addition not necessary A1 for 9146 A1 (dep on M1) for correct conversion of their total into £s</p>
(b)		5	3	<p>B1 for 2.5 × 1000 or 2500 M1 for weight ÷ 500 A1 cao</p>
6 (a)		(0)76	1	B1 for (0)76 (± 2°)
(b)			2	<p>B1 for a pt marked on a bearing of 155° (± 2°) from B or a line on a bearing of 155° ± 2° B1 for a point 5 cm (± 2 mm) from B or a line of length 5 cm (± 2 mm) from B</p>

No	Working	Answer	Mark	Notes
7		900 18 720 135	3	B3 all correct (B2 for 2 or 3 correct) (B1 for 1 correct).
8	$2 \times 3 = 6$	e.g. $2 \times 3 = 6$	2	B2 for a correct example (B1 for correctly multiplying any two prime numbers together or for $2 \times$ prime number not evaluated)
9			2	B2 for fully correct with 5 or more additional kites (B1 for a tessellation of 4 kites, 2 of which must be inverted, ignore remainder of diagram)
10 (a)		31	1	B1 for 31, accept 23, 27, 31
(b)		$4n - 1$		B2 for $4n - 1$ oe (B1 for $4n + k$, k any integer)
11 (a)	$r + 2r + 5 + 2r + 4r - 3$	$9r + 2$	2	M1 for intent to add the 4 terms, can be implied by sight of $9r$
(b)	$9r + 2 = 65$	7	2	A1 cao M1 ft for " $9r + 2$ " = 65 or for correct inverse operations A1 cao NB: algebra seen in (b) can attract marks in (a) if (a) left blank
12 (a)		negative	1	B1 cao
(b)		line of best fit	1	B1 straight line passing between ((4, 15) and (4, 20) and between (1, 40) and (1, 45)
(c)(i)		~ 22	2	B1 ft from single line segment with negative gradient ± 1 full (2mm) square
(ii)		~ 2.8		B1 ft from single line segment with negative gradient ± 1 full (2mm) square

Paper 5523/03

No	Working	Answer	Mark	Notes
13	$12 \times 10 \div 2 = 60$ $5 \times 3 = 15$ $60 - 15 = 45$	45	3	M1 for $12 \times 10 \div 2$ or 60 seen M1 for 5×3 or 15 seen A1 cao SC: B2 for answer of 105
14 (a)	eg $10\% + 5\% + 2.5\% = £2 + £1 + £0.50$ $£20 + £3.50$	23.50	3	M1 for £2, £1 and £0.50 or £3.50 seen or $\frac{17.5}{100} \times 20.00$ M1 (dep) for “£3.50” + £20 A1 for 23.5 (0)
(b)	$75 \div (3+1+1) = 15$ $15 \times 3 = 45$	45	3	M1 for $75 \div (3+1+1)$ M1(dep) for “15” $\times 3$ A1 cao
(c)	0.8×200	160	2	M1 for 0.8×200 A1 for 160, accept 160 out of 200 SC: B1 for $\frac{160}{200}$ or 160 in 200
15		386 – 420	3	M1 for 2 of 20, 4, 0.2 A1 for $\frac{80}{0.2}$ or $\frac{84}{0.2}$ or 100×4 or 105×4 or 20×20 or 21×20 A1 for answer in range 386 – 420
16 (a)	2.3×20	46	2	M1 for 2.3×20 A1 cao
(b)	$480 \div 400$	1.2	2	M1 for $480 \div 400$ A1 for 1.2 or equivalent reduced fraction
17 (a)		20	1	B1 cao
(b)		$x(x+4)$	1	B1 cao
(c)(i)		$\frac{m^7}{t^4}$	2	B1 cao
(ii)				B1 cao
(d)	$x^2 + 5x + 3x + 15$	$x^2 + 8x + 15$	2	M1 for 3 of 4 terms $x^2 + 5x + 3x + 15$, signs not needed A1 for $x^2 + 8x + 15$

No	Working	Answer	Mark	Notes
18		Area Length None of these	3	B1 for Area only B1 for Length only B1 for None of these only
19 (a)		reflection line $y = x$	2	B1 for reflection
(b)	Triangle with vertices at $(-1, 3)$, $(-3, 3)$ and $(-3, 4)$		2	B1 for line $y = x$ (if B0 then B1 for line $y=x$ drawn on diagram) M1 for correct orientation or for a rotation of 90° clockwise about $(-1, 1)$ A1 cao
20 (a)		$-3, -2, -1, 0, 1$	2	B2 cao (-1 each error or omission)
(b)	$3x < -6$	$x < -2$	2	M1 for subtracting $2x$ from both sides, condone sign error in 6 and use of $=, >, \leq, \geq$ A1 for $x < -2$, accept $x < -\frac{6}{3}$




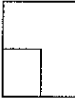
No	Working	Answer	Mark	Notes
21 (a)	$\frac{5}{15} + \frac{9}{15}$	$\frac{14}{15}$	2	M1 for suitable common denominator (multiple of 15), at least one of two fractions correct A1 for $\frac{14}{15}$ oe OR Attempt to use decimals, must use at least 2 dp M1 for 0.33 + 0.6 A1 for 0.93 (recurring)
(b)	$\frac{9}{4} \div \frac{3}{5}$ $\frac{9}{4} \times \frac{5}{3}$	$3\frac{3}{4}$	3	M1 for correctly decomposing $2\frac{1}{4}$ into non mixed number M1 for " $\frac{9}{4} \times \frac{5}{3}$ " A1 for $\frac{45}{12}$ oe single fraction or mixed number OR M1 for 2.25 ÷ 0.6 M1 for sight of decimal division method A1 for 3.75
22	Eg eqn(1) × 3 and eqn(2) × 4 then add leads to 17x = 51 Eqn (1) × 2 and eqn(2) × 3 then subtract leads to -17y = 17	x = 3, y = -1	4	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error A1 cao for non-eliminated variable M1 (dep on previous M mark) for correctly substituting their found value A1 cao (need both answers) SC: B1 for one correct answer only if Ms not awarded
23 (a)		0.00057	1	B1 cao
(b)		2.1×10^{10}	2	M1 for $7 \times 3 \times 10^{4+5}$ or better e.g 21×10^9 , 21 000000000 A1 cao

No	Working	Answer	Mark	Notes
24 (a)		14	1	B1 cao
(b)		8	1	B1 cao
(c)	$25/100 \times 300$	75	2	M1 for 25% of 300 or $300 \div 4$ or $\frac{1}{4} \times 300$ oe A1 cao
25 (a)		(5, 3½)	2	B1 for $x = 5$ B1 for $y = 3\frac{1}{2}$ B1 for $y = \frac{1}{2}x + k$, $k \neq 1$, oe B1 for $y = mx + 1$, $m \neq \frac{1}{2}$, oe or $x = 0$
(b)			1	
(c)			1	
26 (a)		70	2	M1 for $180 - (20+90)$ or angle $CDA = 90^\circ$ seen or marked on diagram A1 cao B1 cao
(b)		20	2	B1 for angles in the same segment (are equal) or angles subtended by same arc at circumference

Paper 5523/04					
No	Working	Answer	Mark	Notes	
1		Correct shape	2	B2 (B1 for any one side correct, or all correct but scale factor other than 1 or 3) Tolerance: to within half square.	
2	$13 \times 5.5(0)$ or $71.5(0)$ $103 - 71.5(0)$ or $31.5(0)$ $31.5(0) \div 9$	3.50	4	M1 for $13 \times 5.5(0)$ or $71.5(0)$ seen M1 for $103 - "71.5(0)"$ or $31.5(0)$ seen M1 for $"31.5(0)" \div 9$ A1 for 3.50 Condone 3.5	
3		$5p + 2q$	2	B2 (B1 for $5p$ or $+2q$)	
		$y^2 - 5y$	1	B1	
	$6m + 8 + 3m - 15$	$9m - 7$	2	M1 for correct expansion of at least one bracket A1 for $9m - 7$	
4		30	2	M1 for $\frac{180 - 120}{2}$	
	$\angle ABD = 150^\circ$ seen	48	3	A1 for 30 cao M1 for $\angle ABD = 150^\circ$ seen or $180 - (a)$ (may be stated or shown on diagram) M1 for $360 - ("180-(a)" + 54 + 108)$ A1 for 48 ft from acute (a) OR: M1 for $54 + 120 (=174)$ M1 $360 - ("174" + "30" + 108)$ A1 for 48 ft from acute (a)	
5		Correct shape	2	B2 (B1 for one complete flag or two correct poles)	
6		$h = 70t + 80$	3	B1 for $h =$ linear expression in t B2 for $70t + 80$ (B1 for $70t$)	

Paper 5523/04

No	Working	Answer	Mark	Notes
7		0 12466 1 13355899 2 22455889 3 03 4 6 eg 1 3 represents 13	3	B1 for stem 0, 1, 2, 3, 4 or 0, 10, 20, 30, 40 B1 for accurate leaves – condone 1 error or omission (could be unordered)
8 (a)	$\frac{35}{1+4}$	7	2	M1 for $\frac{35}{1+4}$
(b)	4×18 or 72 or 5×18	90	2	A1 for 7 cao M1 for 4×18 or 72 or 5×18 A1 for 90 cao
9		Correct trapezium	3	B1 for accurately placed D B1 for accurately placed C B1 for two pairs of arcs at D and C, centred on base vertices
10 (a)	$\frac{216}{4.5}$	48 mph 0.8 m/min	4	M1 for $\frac{216}{\text{time}}$ eg time = 4h30, 4.5, 4.3, 270 B1 for the digits 45 seen A1 for 48 cao or 0.8 cao
(b)(i) (ii)		22.5 23.5	2	B1 (indep) for mph or m/h, m/min (must be consistent) B1 cao B1 23.5 or 23.49 or 23.49... or 23.4999(9...) oe
11	$6x - 2x = 9 + 5$ $4x = 14$	$3\frac{1}{2}$	3	M1 for correct rearrangement: $6x - 2x = 9 + 5$ or intent shown (correct signs) M1 $4x = 14$ A1 for $3\frac{1}{2}$ oe accept $\frac{14}{4}$

No	Working	Answer	Mark	Notes
12 (a)			2	B2 for elevation with correct orientation (B1 incorrect orientation)
(b)			2	B2 for correct plan; internal square can be in any corner. (B1 for 2 by 2 square with missing/extra internal lines)
13 (a)		-6, -16	2	B2 cao (B1 for one correct value)
(b)		$2(n-5)$	1	B1 oe eg $2n-10$; NB $n^{\text{th}} = B1, n = B0$
(c)	$"2(n-5)" = y \text{ or } \div 2 + 5$	$\frac{y+10}{2}$ or $\frac{y}{2} + 5$	2	M1 for " $2(n-5)" = y \text{ or } \div 2 + 5$ A1 for $\frac{y+10}{2}$ or $\frac{y}{2} + 5$ or $\frac{1}{2}(y+10)$ or $(y+10) \div 2$ (Sc B1 for ambiguous statements eg $y + 10 \div 2$)
14 (a)	$\frac{4}{100} \times 2664$	2770.56	3	M1 for $\frac{4}{100} \times 2664 (=106.56)$ M1 (dep) for "106.56" + 2664 A1 for 2770.56
(b)	$121.6(0) \times \frac{100}{4}$	3040	2	M1 for $121.6(0) \times \frac{100}{4}$ oe A1 cao
(c)	1.04 oe seen $2828.8 \div 1.04$	2720	3	B1 for 1.04 oe seen accept 104% M1 for $2828.8 \div 1.04$ oe A1 for 2720
15 (a)	$\frac{\sqrt{25.96}}{4.05} = \frac{5.09509...}{4.05}$	1.258048316	2	M1 for 5.09... or 4.05 or 25.96 seen A1 for at least 4 sf rounded or truncated: 1.258(048316...) or 1.26
(b)		1.26	1	B1 for 1.26 or ft from (a); 1.260 gets B0

Paper 5523/04

No	Working	Answer	Mark	Notes
16 (a)	prime factors 2 and 7 seen	$2 \times 2 \times 2 \times 7$	2	M1 for prime factors 2 and 7 seen
(b)		14	1	A1 for $2 \times 2 \times 2 \times 7$ or $2^3 \times 7$ B1 for 14 cao
17 (a)	$\frac{90}{240} \times 360$	135	2	M1 for $\frac{90}{240}$ A1 for 135
(b)		$15 \leq t < 20$	1	B1 for $15 \leq t < 20$ Accept 15-20
(c)		95 185 220 235 240	1	B1 for all correct
(d)		Points curve or line segment	2	B1 ft for at least 4 or 5 pts plotted correctly (± 1 sq) at ends of interval dep on sensible table (cf; no more than 1 error) B1(dep on previous B1) for pts joined by curve/line segments provided no gradient is negative (SC: B1 if 4 or 5 pts plotted not at ends but consistently within each interval and joined)
(e)		20.5-22.0	1	B1 ft from a cf graph using cf = 120 (.5)

No	Working	Answer	Mark	Notes
18 (a)	3.1 68.2(31) 3.2 73.7(28) 3.3 79.4(97) 3.4 85.5(44) 3.5 91.8(75) 3.6 98.4(96) 3.7 105.4(13) 3.65 101.9(1725)	3.6	4	B2 for trial $3.1 \leq x \leq 3.7$ evaluated (B1 for trial $3 < x < 4$ evaluated) B1 for different trial $3.615 \leq x \leq 3.65$ evaluated B1 for 3.6, (dep on at least one of 2 previous Bs) or anything that rounds to 3.6 Values evaluated can be rounded or truncated, but to at least 1 d.p.
(b)(i)		$x^2(x+4) = 100$	2	B1 for $x^2(x+4)$ seen or $x \times x \times x + 4$ OR “3.6” ³ + 4 × “3.6” ² ≈ 100 (dep on 3.6 ≤ (a) ≤ 3.7); (46.656 + 4 × 51.84) B1 ft from “3.6” ie “3.6” + 4
19	$168^2 + 157^2 = 28\,224 + 24\,649$ $= 52\,873$ $\sqrt{28224 + 24649}$	7.6 229.9 - 230	3	M1 for $168^2 + 157^2$ M1 $\sqrt{168^2 + 157^2}$ or $\sqrt{28224 + 24649}$ or $\sqrt{52873}$ ie not doubling A1 for 229.9-230
20	$\frac{8}{25} \times 1750$ or 0.32×1750 or 8×70	560	3	M1 for $\frac{8}{25}$ oe seen or $\frac{1750}{25}$ oe seen or 0.32 or 70 seen M1 for $\frac{8}{25} \times 1750$ oe A1 for 560

No	Working	Answer	Mark	Notes
21	$\cos x = \frac{3.9}{4.7} = 0.8297 \dots$	33.9	3	M1 for $\cos = \frac{3.9}{4.7}$ (= 0.8297...) M1 for $\cos^{-1} \frac{3.9}{4.7}$ or $\cos^{-1} \frac{4.7}{3.9}$ A1 for 33.9 – 33.93 SC B2 for 0.592(069...) or 37.6(923...) or 37.7
22 (a)	$\frac{12}{6.02 \times 10^{23}}$	1.99×10^{-23}	2	M1 for $\frac{12}{6.02 \times 10^{23}}$ A1 for 1.99×10^{-23} or better (1.99335...)
(b)	$\frac{100}{12} \times 6.02 \times 10^{23}$	5.02×10^{24}	2	M1 for $\frac{100}{12} \times 6.02 \times 10^{23}$ or $100 \div (a)$ A1 for 5.02×10^{24} or 5.03×10^{24} or better (5.0166...) ft from (a)
23	$\left(\frac{1}{2} \times \pi \times 30^2 + 60 \times 45\right) \times 90$ $(1/2 \times 2827.43 + 2700) \times 90$ $(1413.7.. + 2700) \times 90$ $4113.7.. \times 90 = 370234.5 \dots$	370 000	4	Cross-section approach: M1 for $(\frac{1}{2} \times \pi \times 30^2$ (=2827.4 or 1413.7) or 60×45 (=2700)) M1 for “ $(\frac{1}{2} \times \pi \times 30^2$ ” + 60×45 (complete method) M1 for “ <i>any</i> area” $\times 90$ or 4110–4115 A1 for 370 000 to 370300 Volume approach: M1 for $(\frac{1}{2} \times \pi \times 30^2$ or 60×45 M1 for “ $(\frac{1}{2} \times \pi \times 30^2$ ” $\times 90$ (=127234 or 254468) or $60 \times 45 \times 90$ (=243000) M1 for addition of two volumes A1 for 370 000 to 370300 (370 235)

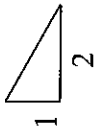
Paper 5523/04

No	Working	Answer	Mark	Notes
24 (i) (ii) (iii)		E A I	3	B1 for E cao B1 for A cao B1 for I cao
25 (a)	$\sqrt{75}$	8.66 or $5\sqrt{3}$	2	M1 for $\frac{3 \times 50}{2}$ or 75 A1 for 8.66 or better (8.6602..., $5\sqrt{3}$)
(b)	$d^2 = \frac{3h}{2}$	$\frac{2d^2}{3}$	2	M1 for squaring each side A1 for $\frac{2d^2}{3}$ oe

Paper 5525/05

No	Working	Answer	Mark	Notes
1 (a)	$75 \div (3+1+1) = 15$ $15 \times 3 = 45$	45	3	M1 for $75 \div (3+1+1)$ M1(dep) for "15" $\times 3$ A1 cao
(b)	0.8×200	160	2	M1 for 0.8×200 A1 for 160, accept 160 out of 200 SC: B1 for $\frac{160}{200}$ or 160 in 200
2 (a)		$4n - 1$	2	B2 for $4n - 1$ (B1 for $4n + k$ or $kn - 1$, k any integer)
(b)		Yes	2	M1 for " $4n - 1$ " = 319 A1 for $n = 80$ accept: $4(80) - 1 = 319$; 320 is a multiple of 4, subtract 1 gives 319; if you add 1 and divide by 4 you get a whole number; yes it's the 80 th term.
3 (a)	2.3×20	46	2	M1 for 2.3×20 A1 cao
(b)	$480 \div 400$	1.2	2	M1 for $480 \div 400$ A1 for 1.2 or equivalent reduced fraction
4		386 - 420	3	M1 for 2 of 20, 4, 0.2 A1 for $\frac{80}{0.2}$ or $\frac{84}{0.2}$ or 100×4 or 105×4 or 20×20 or 21×20 A1 for answer in range 386 - 420

Paper 5525/05

No	Working	Answer	Mark	Notes
5	$3x - 12 = x + 24$ $2x = 36$	18	3	M1 for $3 \times (x - 4) = x + 24$ or $\frac{3(x-4)}{3} = \frac{x+24}{3}$ M1 for $3x - x = 24 + 12$ or $x - \frac{x}{3} = \frac{24}{3} + 4$ oe A1 cao B2 cao
(b)		$16x^{12}y^4$	2	
6		reflection line $y = x$	2	(B1 for $2^4 x^{3 \times 4} y^4$, with one error allowed in powers) B1 for reflection B1 for line $y = x$ (if B0 then B1 for line $y=x$ drawn on diagram) M1 for correct orientation or for a rotation of 90° clockwise about $(-1,1)$ A1 cao
(b)	Triangle with vertices at $(-1, 3)$, $(-3, 3)$ and $(-3,4)$		2	
7		$-3, -2, -1, 0, 1$		B2 cao (-1 each error or omission)
(b)	$3x < -6$	$x < -2$		M1 for subtracting $2x$ from both sides, condone sign error in 6 and use of $=, >, \leq, \geq$ A1 for $x < -2$, accept $x < -\frac{6}{3}$

Paper 5525/05

No	Working	Answer	Mark	Notes
8	$\frac{17}{5} - \frac{7}{4}$ or $3 - 1$ and $\frac{2}{5} - \frac{3}{4}$ oe $\frac{68}{20} - \frac{35}{20}$ or $\frac{8}{20} - \frac{15}{20}$ or $2 \frac{29}{20} - \frac{15}{20}$	$1 \frac{13}{20}$	3	M1 for correctly decomposing into non mixed numbers M1 for correct method to write all fractions to a common denominator A1 for $\frac{33}{20}$ oe single fraction or mixed number ALT: B1 for 3.4 and 1.75 M1 for attempt to subtract 2 decimal (condone one error) A1 for 1.65 cao
9		Area Length None of these	3	B1 for Area only B1 for Length only B1 for None of these only
10 (a)		0.00057	1	B1 cao
(b)		2.1×10^{10}	2	M1 for $(7 \times 3) \times 10^{4+5}$ or better, eg 21×10^9 , 21 000 000 000 A1 cao
11	Eg eqn(1) $\times 3$ and eqn(2) $\times 4$ then add leads to $17x = 51$ Eqn (1) $\times 2$ and eqn(2) $\times 3$ then subtract leads to $-17y = 17$	$x = 3, y = -1$	4	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error A1 cao for non-eliminated variable M1 (dep on previous M mark) for correctly substituting their found value A1 cao (need both answers) SC: B1 for one correct answer only if Ms not awarded

No	Working	Answer	Mark	Notes
12 (a)		14	1	B1 cao
(b)		8	1	B1 cao
(c)	$25/100 \times 300$	75	2	M1 for 25% of 300 or $300 \div 4$ or $\frac{1}{4} \times 300$ oe A1 cao
13 (a)		70	2	M1 for $180 - (20+90)$ or angle CDA = 90° seen A1 cao
(b)		20	2	B1 cao B1 for angles in the same segment (are equal) or angles subtended by same arc at circumference
14 (a)		0.6 0.6, 0.4, 0.6	2	B1 for LHS: (0.4), 0.6 B1 for RHS: (0.4), 0.6, 0.4, 0.6
(b)	$0.4 \times 0.4 = 0.16$	0.16	2	M1 for 0.4×0.4 or $\frac{4}{10} \times \frac{4}{10}$ oe A1 for 0.16 or $\frac{4}{25}$ or $\frac{16}{100}$
15 (a)	$n^{\text{th}} \text{ row} = n^2 - (n-1)(n+1)$	$n^2 - (n+1)(n-1)$	1	B1 for $n^2 - (n-1)(n+1)$ oe (condone $n^2 - (n+1)(n-1)$)
(b)	$n^2 - (n-1)(n+1) = n^2 - (n^2 - 1) = 1$	1	2	M1 for $(n-1)(n+1) = n^2 - 1$ A1 cao (SC: B1 for 1 on answer line without working)

No	Working	Answer	Mark	Notes
16 (a)		$y = \frac{1}{2}x + k$	1	B1 for $y = \frac{1}{2}x + k$, $k \neq 1$
(b)		$y = mx + 1$	1	B1 for $y = mx + 1$, $m \neq \frac{1}{2}$, or $x = 0$
(c)		$y = -2x + 26$	3	M1 for $m = -\frac{1}{1} - \frac{1}{2}m = -1$ ($\frac{1}{2}$)
17 (a)		390		M1 for substituting (10,6) into $y=mx+c$ oe A1 for $y = -2x + 26$ oe
(b)		400		B1cao
		Correct bar		B1cao B1 for correct bar
18	$\frac{60}{360} \times 2 \times \pi \times 12$	4π	3	M2 for $\frac{60}{360} \times 2 \times \pi \times 12$, accept numerical π (M1 for $\frac{60}{360} \times k$, where k in terms of π , or $n \times 2 \times \pi \times 12$, $n < 1$) A1 for 4π or $\frac{a\pi}{b}$ cao, where a and b are correct integers
19 (a)(i)		$1/2$	2	B1cao oe
(ii)		$-1/2$		B1cao oe
(b)(i)	Draws horizontal line $y = -0.4$	114 and 246	4	M1 for use of $y = -0.4$ (may be implied by one correct solution)
(ii)	Draws horizontal line $y = 0.75$	36 and 324		A1 for both 114 ± 6 and 246 ± 6 M1 for use of $y = 0.75$ (may be implied by one correct solution)
				A1 for both 36 ± 6 and 324 ± 6

No	Working	Answer	Mark	Notes
20 (a)	$6x^2 - 4x + 15x - 10$	$6x^2 + 11x - 10$	3	M2 for 3 of 4 terms $6x^2 - 4x + 15x - 10$ correct (M1 for 2 terms correct) A1 for $6x^2 + 11x - 10$ B1 for $p = 3$
(b)(i)	$(x + 3)^2 - 3^2 - 5$	$p = 3$	3	M1 for an attempt to factorise, eg $(x \pm 3)^2 \pm 3^3$ A1 for $q = -14$
(ii)	$(x + 3)^2 - 14$	$q = -14$		
21 (a)		8	1	B1 cao
(b)	$\sqrt{8} = \sqrt{4 \times 2} = 2\sqrt{2}$	$2\sqrt{2}$	2	B2 cao
(c)	$\sqrt{25 \times 2} = \sqrt{25} \sqrt{2} = 5\sqrt{2}$	$5\sqrt{2}$	2	(B1 for $\sqrt{4 \times 2}$ or $\sqrt{4} \sqrt{2}$ or $\sqrt{2} \sqrt{2} \sqrt{2}$ or $\sqrt{2^3}$) (Accept 2 on answer line if $2\sqrt{2}$ seen) B2 cao
(d)	$\frac{1 + \sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}(1 + \sqrt{2})}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{2} + \sqrt{2}\sqrt{2}}{2} =$ $\frac{\sqrt{2} + 2}{2}$	$\frac{\sqrt{2} + 2}{2}$	2	(B1 for $\sqrt{25 \times 2}$ or $\sqrt{25} \sqrt{2}$ or $\sqrt{5} \sqrt{5} \sqrt{2}$) (Accept 5 on answer line if $5\sqrt{2}$ seen) M1 for $\times \sqrt{2}$ top and bottom A1 cao oe

No	Working	Answer	Mark	Notes
22				
(a)(i)		$-3a + b$	4	B1 for $-3a + b$ accept $-2a - a + b$ oe B1 for $-2a + 2b$ accept $-2a + b + b$ oe
(ii)		$-2a + 2b$		
(iii)	$\vec{PQ} = \vec{PA} + \frac{1}{2}\vec{AB}$ $= a + \frac{1}{2}(-3a + b)$	$\vec{PQ} = \vec{PO} + \vec{OB} + \frac{1}{2}\vec{BA}$ $= -2a + b + \frac{1}{2}(3a - b)$		M1 for $(\vec{PQ} =) \vec{PA} + \frac{1}{2}\vec{AB}$ or $(\vec{PQ} =) \vec{PO} + \vec{OB} \pm \frac{1}{2}\vec{AB}$
(b)	$\vec{PR} = 4\vec{PQ}$ so PR is 'parallel' to PQ so PQR is a straight line	$\vec{PR} = 4\vec{PQ}$	2	A1 for $-\frac{1}{2}a + \frac{1}{2}b$, accept $a + \frac{b-3a}{2}$ oe M1 for $PR = 4PQ$ oe or comparing $2(-a + b)$ with $\frac{1}{2}(-a + b)$ A1 for a fully correct proof
(c)		12	1	B1 cao
23	$y^2 = (x-7)^2$ $x^2 + x^2 - 14x + 49 = 25$ $2x^2 - 14x + 49 = 25$ $2x^2 - 14x + 24 = 0$ $2(x^2 - 7x + 12) = 0$ $2(x-4)(x-3) = 0$	$x = 3$ $y = -4$ $x = 4$ $y = -3$	6	M1 $y^2 = (x-7)^2$ seen or implied M1 for $x^2 + x^2 +/- 14x + 49 = 25$ (oe expanded form) M1 for correct attempt to solve 3 term quadratic A1 for $x = 3, x = 4$ cao M1 (dep. on previous Ms) for sub. one value of x into either equation A1 for $x = 3, y = -4$ and $x = 4, y = -3$ SC: B2 for (4, -3) and (3, -4) if M's not awarded B1 for (4, -3) or for (3, -4) if M's not awarded

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No	Working	Answer	Mark	Notes
1		1.258048316	2	M1 for 5.09... or 4.05 or 25.96 seen A1 for at least 4 sf rounded or truncated: 1.258(048316...) or 1.26
	$\frac{\sqrt{25.96}}{4.05} = \frac{5.09509...}{4.05}$	1.26	1	B1 for 1.26 or ft from (a); 1.260 gets B0
2		p^9	1	B1cao
		q^5	1	B1cao
		r^{12}	1	B1cao
	$6m + 8 + 3m - 15$	$9m - 7$	2	M1 for correct expansion of at least one term A1 for $9m - 7$
3		229.9 - 230	3	M1 for $168^2 + 157^2$ M1 $\sqrt{168^2 + 157^2}$ or $\sqrt{28224 + 24649}$ or $\sqrt{52873}$ ie not doubling A1 for 229.9-230
	$168^2 + 157^2 = 28\,224 + 24\,649$ $= 52\,873$	560	3	M1 for $\frac{8}{25}$ oe seen or $\frac{1750}{25}$ oe seen or 0.32 or 70 seen M1 for $\frac{8}{25} \times 1750$ oe A1 for 560
	$\sqrt{28224 + 24649}$			
4				
	$\frac{8}{25} \times 1750$ or 0.32×1750 or 8×70			

No	Working	Answer	Mark	Notes
5	3.1 68.2(31) 3.2 73.7(28) 3.3 79.4(97) 3.4 85.5(44) 3.5 91.8(75) 3.6 98.4(96) 3.7 105.4(13) 3.65 101.9(1725)	3.6	4	B2 for trial $3.1 \leq x \leq 3.7$ evaluated (B1 for trial $3 < x < 4$ evaluated) B1 for different trial $3.615 \leq x \leq 3.65$ evaluated B1 for 3.6, (dep on at least one of 2 previous Bs) or anything that rounds to 3.6 Values evaluated can be rounded or truncated, but to at least 1 d.p.
(b)(i)		$x^2(x+4) = 100$	2	B1 for $x^2(x+4)$ seen or $x \times x \times x + 4$ <i>OR</i> “3.6” ³ +4×”3.6” ² ≈ 100 (dep on $3.6 \leq (a) \leq 3.7$); (46.656+4×51.84) B1 ft from “3.6” ie “3.6” + 4
(ii)		7.6		
6	(a) $121.6(0) \times \frac{100}{4}$ (b) 1.04 oe seen 2828.8 ÷ 1.04	3040 2720	2 3	M1 for $121.6(0) \times \frac{100}{4}$ A1 cao B1 for 1.04 oe seen M1 for $2828.8 \div 1.04$ oe A1 for 2720
7		95 185 220 235 240 Points curve or line segment	1 2 1	B1 for all correct B1 ft for at least 4 or 5 pts plotted correctly (± 1 sq) at ends of interval dep on sensible table (cf; no more than 1 error) B1 ft (dep on previous B1) for pts joined by curve/line segments provided no gradient is negative (SC: B1 if 4 or 5 pts plotted not at ends but consistently within each interval and joined) B1 ft from a cf graph using cf = 120 (.5)

No	Working	Answer	Mark	Notes
8		perp bisector	2	B1 appropriate arcs B1 if within guidelines
		Angle bisector	2	B1 appropriate arcs B1 if within guidelines
9		1.12×10^2	2	M1 for $12\,600$ or 1.26×10^4 A1 for $1.12 \times 10^2 - 1.123 \times 10^2$ oe
		$d^2 = \frac{3h}{2}$	2	M1 for squaring each side A1 for $\frac{2d^2}{3}$ oe
10		33.9	3	M1 for $\cos = \frac{3.9}{4.7}$ (= 0.8297...) M1 (dep) for \cos^{-1} A1 for 33.9 – 33.93 SC B2 for 0.592(069...) or 37.6(923...) or 37.7
11		R shaded	4	B4(dep on well defined border) correct region labelled R. If not labelled, dep on all inequalities being clearly shaded (B3 corrected region with incorrectly marked boundaries) (B2 2 out of 3 correct regions, consistently shaded or all 3 lines drawn to form a triangle) (B1 any one region correctly shaded either side or any two correct lines drawn)

No	Working	Answer	Mark	Notes
12	$\left(\frac{1}{2} \times \pi \times 30^2 + 60 \times 45\right) \times 90$ $(1/2 \times 2827.43 + 2700) \times 90$ $(1413.7.. + 2700) \times 90$ $4113.7.. \times 90 = 370234.5...$	370 000	5	<p>Cross-section approach: M1 for $(\frac{1}{2} \times) \pi \times 30^2$ (=2827.4 or 1413.7) or 60×45 (=2700) M1 for "$(\frac{1}{2} \times) \pi \times 30^2$" + 60×45 (complete method) M1 for "any area" $\times 90$ or 4110–4115 A1 for 370 000 to 370300 B1 correct units</p> <p>Volume approach: M1 for $(\frac{1}{2} \times) \pi \times 30^2$ or 60×45 M1 for "$(\frac{1}{2} \times) \pi \times 30^2$" $\times 90$ (=127234 or 254468) or $60 \times 45 \times 90$ (=243000) M1 for addition of two volumes A1 for 370 000 to 370300 (370 235) B1 correct units</p>
13		E A I	3	
14	$60 \times 40 \times 2$ 4800 <p>"4800" = $\pi \times 4^2 \times h$ "4800" "50.265..."</p>	95.5	5	<p>B1 for E cao B1 for A cao B1 for I cao</p> <p>M1 $60 \times 40 \times 2$ A1 for 4800</p> <p>M1 for $\pi \times 4^2$ or 50.265... M1 for "4800" \div "$\pi \times 4^2$" A1 95.49 - 95.5</p>
15	$\frac{x}{450} \times 70$ $7, 18.8, 15.2, 28.9$	7, 19, 15, 29		<p>M1 valid method A2 all correct (A1 2 or 3 correct) SC unrounded: M1 A1 A0</p>

No	Working	Answer	Mark	Notes
16				
(a)	$d = kt^2$	$d = 5t^2$	3	M1 for $d = kt^2$ (accept any $k \neq 0, 1$) M1(dep) for $20 = k \times 2^2$ A1 for $d = 5t^2$ B1 for 45 cao
(b)	$20 = k \times 2^2$	45	1	
(c)	$605 = 5t^2$	11	3	M1 for $605 = 5t^2$ ("5" $\neq 1$) M1 for $\sqrt{\frac{605}{5}}$ A1 for 11 cao
17	$\text{eg } 0.91^8 = 0.4702\dots$	8	3	B1 for 0.91 seen oe M1 for 0.91^2 (0.8281) or higher power evaluated A1 for 8 – 8.01
18				
(a)	$2x + 2y = 10$		1	B1 for $2x + 2y = 10$ oe
(b)	$x^2 + y^2 = 16$ $x^2 + (5 - x)^2 = 16$		3	B1 for $x^2 + y^2 = 4^2$ oe M1 for rearranging first equation and substituting into second
(c)	$x = \frac{10 \pm \sqrt{(-10)^2 - 4 \times 2 \times 9}}{2 \times 2}$ $\frac{10 \pm \sqrt{28}}{4}$		3	A1 for sight of $25 - 10x + x^2$ and correct simplification to the given equation M1 for correct substitution into quadratic formula (allow sign errors) A1 for correct simplification
		3.82; 1.18		A1 for 3.82 – 3.823, 1.177 – 1.18

No	Working	Answer	Mark	Notes
19	$qx = p(x + c)$ $qx = px + pc$ $qx - px = pc$ $x(q - p) = pc$	$\frac{pc}{q - p}$	4	M1 for $qx = p(x + c)$ oe M1 for $qx = px + pc$ oe M1 for $x(q - p) = pc$ oe A1 for $\frac{pc}{q - p}$ oe
20 (a)	eg $\frac{4.2^2 + 5.3^2 - 7.6^2}{2 \times 4.2 \times 5.3}$ $\frac{-12.03}{44.52}$ or $-0.2702\dots$	105.7	3	M1 for correct substitution into cosine rule to find any angle M1(dep) for correct order of evaluation of their cosine rule to get to $\cos X = \frac{p}{q}$ where p and q are numbers A1 105.67 – 105.7
(b)	eg $\frac{1}{2} \times 4.2 \times 5.3 \times \sin 105.67^\circ$	10.7	3	M2 for substitution of lengths of 2 sides and their included angle into $\frac{1}{2} ab \sin C$ (M1 if it is their angle but not the included one) A1 for 10.7 – 10.72
21 (a)(i)	$\frac{4.75}{5.35}$ $\frac{4.85}{5.25}$	0.887850467	3	B3 LB = 0.8878-0.888 and UB = 0.9238 - 0.924 (B2 one of LB or UB correct) (B1 sight of one of 4.75, 5.35, 4.85, 5.25) SC: B2 correct answers in wrong order
(ii)		0.923809523		
(b)		0.9 Bounds agree to 1 dp	2	B1 dep on two correct bounds for gradient B1 dep on two correct bounds for gradient

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No	Working	Answer	Mark	Notes
22	0.62×0.38 or 0.2356 $\times 2$ oe	0.4712	4	B1 for 0.38 seen M1 for $0.62 \times (1-0.62)$ or 0.2356 M1(dep) for $\times 2$ oe A1 for 0.47, 0.471, 0.4712 oe
23	$\frac{49152}{12000}$ or 4.096 $\sqrt[3]{4.096}$ or 1.6 "1.6" ² or 2.56	3800	4	M1 for $\frac{49152}{12000}$ or 4.096 oe M1 for $\sqrt[3]{4.096}$ or 1.6 oe M1 for "1.6" ² or 2.56 oe A1 for 3800 cao

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