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PAPER 1F

No		Working	Answer	Mark	Notes
1	a		3018	1	B1 cao
	b		7900	1	B1 cao
	c		hundred, 100, 800	1	B1
	d		9, 57, 75, 98, 104	1	B1 cao
2	i		rectangle	3	B1
	ii		kite		B1
	iii		trapezium		B1
3	a		14, 17	1	B1 cao
	b		65	1	B1 cao
	c		89	1	B1 cao
	d		eg it goes even, odd, even, odd, …	1	B1
4	a		Hong Kong	1	B1
	b		100	1	B1 cao
	c		170-180	1	B1
	d		Korea	1	B1
5	a		$\frac{7}{10}$	1	B1
	b		$\frac{75}{100}$ or $\frac{3}{4}$ oe	1	B1
	c		$\frac{23}{100}$	1	B1
	d		15	1	B1 cao
	e		$\frac{5}{6}$	1	B1 cao
	f	3×72 (216) or $72\div8$ (9) or 0.375		2	M1
			27		A1 cao

No		Working	Answer	Mark	Notes	
6	a		metres, m	2	B1	
			kilograms, kg, kilos		B1	
	b		1500	1	B1	cao
7	a	$\frac{4\times36}{27}$ or $\frac{144}{27}$ or 5.33…		2	M1	
			5		A1	cao
	b	"144"−"5"×27		2	M1	
			9		A1	ft from "144" and "5"
8	a		2 lines of symmetry	2	B2	B1 for each correct line (- B1 for each incorrect line)
	b		pattern correct	2	B2	B1 for each correct quadrant
9	i		96	3	B1	Accept 95-97
	ii		28		B1	Accept 27-29
	iii		64		B1	Accept 63-65
10	i		G at ½	2	B1	Accept if intention clear
	ii		S at 1		B1	Accept if intention clear
11	a		52	1	B1	cao
	b		63	1	B1	cao
	c	180−"52"−"63"		2	M1	
			65		A1	ft from (a) and (b)
12	a		3.178049716…	2	B2	Accept 3 or more dp rounded or truncated (B1 for 10.1 seen)
	b		3.2	1	B1	ft from (a) if to 3 or more sf
13	a		$3pq$	1	B1	
	b		$3x-5$	2	B2	B1 for each term
	c	$4y=7+3$ or $4y=10$		2	M1	
			$2\frac{1}{2}$ oe		A1	

No		Working	Answer	Mark	Notes	
14	i		75, 105, 65, 80, 35	4	B2	B1 for 3 correct or $360 \div 72$
	ii		sectors correct		B1	ft from (i) if B1 awarded Allow $\pm 2°$
			labels		B1	(dep on 2 of previous 3 marks for correct labelling)
15	a		3	1	B1	cao
	b		**Q** correct	2	B2	B1 for one correct side
16		$\frac{2}{100} \times 69$ or 1.38		3	M1	or M2 for 69×1.02
		69 + "1.38"			M1	dep on 1st M1
			70.38		A1	Accept 70.4 Condone 70 380 000, 70 400 000
17	a		$6t + 3$	1	B1	cao
	b	$x^2 - 3x + 5x - 15$		2	M1	for 4 terms ignoring signs or 3 terms with correct signs
			$x^2 + 2x - 15$		A1	
	c		$5(2p - 3q)$	1	B1	
18	a	$\pi \times 4.7^2$		2	M1	
			69.4		A1	for 69.4 or better (69.39778…)
	b	Splits shape appropriately eg triangle & 2 rectangles, rectangle & trapezium		4	M1	
		eg $7 \times 2 + 6 \times 4$ or 14 + 24			M1	for area of at least one rectangle
		$\frac{1}{2} \times 3 \times 4$ or 6			M1	for area of triangle or trapezium
			44		A1	cao

No		Working	Answer	Mark	Notes	
19	a	$1-(0.35+0.16+0.27)$		2	M1	
			0.22		A1	oe
	b	$0.35+0.27$		2	M1	
			0.62		A1	oe
	c	0.16×75		2	M1	
			12		A1	cao
20	a		343	1	B1	cao
	bi		32	2	B1	cao
	ii		1125		B1	cao
	c	prime factors 2 & 5 seen		2	M1	
			$2\times 2\times 2\times 5\times 5$ or $2^3\times 5^2$		A1	
21	i		1, 3	3	B1	cao
	ii		1, 2, 3, 4, 5		B1	cao
	iii		"is a member of" oe		B1	
22	a		(5, 3)	2	B2	B1 for each coordinate
	b	$8-2=6$ & $5-1=4$		4	B1	
		6^2+4^2 or 36 + 16 or 52			M1	for squaring & adding
		$\sqrt{6^2+4^2}$ or $\sqrt{52}$ (7.2110…)			M1	(dep on 1st M1) for square root
						Either 6 or 4 must be correct for award of M marks
			7.21		A1	for 7.21 or better
23	i	$3x>-6$		4	M1	
			$x>-2$		A1	SC if M0, award B1 for −2
	ii		line to right of -2 indicated		B1	ft from (i) line must either have arrow or reach 4
			open circle at -2		B1	ft from (i)

No		Working	Answer	Mark	Notes	
24	a	$\frac{16+8}{150}$ or $\frac{24}{150}$ or 0.16		2	M1	
			16		A1	cao
	b	$34\times2.5+48\times7.5+26\times12.5$ $+18\times17.5+16\times22.5+8\times27.5$ or 85+360+325+315+360+220 or1665		4	M1	finds products $f\times x$ consistently within intervals (inc end points) and sums them
					M1	use of midpoints
		$\frac{"1665"}{150}$			M1	(dep on 1st M1) for division by 150
			11.1		A1	Accept 11 if $\frac{1665}{150}$ seen

No		Working	Answer	Mark	Notes	
1	a		1, 3, 5, 15	2	B2	B1 for 2 correct and none wrong
	b		16, 20, 24	2	B2	B1 for 2 correct and none wrong
	c		17, 19, 23	2	B2	B1 for 2 correct and none wrong
	d		36	1	B1	cao
2	a		7.7	1	B1	Allow $\pm$ 0.1
	bi		obtuse	2	B1	
	ii		143		B1	Allow $\pm$ 2
	ci		reflex	2	B1	
	ii		339		B1	Allow $\pm$ 2
3	a	$40\times3.5+20$		2	M1	
			160		A1	cao
	b	eg $40\times?+20=260$		2	M1	
			6		A1	cao
	c		$T=40W+20$ oe	2	B2	B1 for T = linear expression in W B1 for $40W+20$ oe
4	a		2.4	1	B1	cao
	b		2.68	1	B1	cao
	c		7	1	B1	cao
	d		0.07, 0.071, 0.7, 0.701, 0.71	1	B1	cao
	e		8.4	1	B1	cao
	f		$\frac{19}{100}$	1	B1	cao
5	i		diameter	3	B1	
	ii		arc		B1	
	iii		tangent		B1	

6	a		48	1	B1	cao
	b	$\frac{52}{100}\times 450$ oe		2	M1	
			234		A1	cao
7	a		2	1	B1	cao
	b	1 2 2 2 3 5 5 4 8		2	M1	
			3		A1	
	c		7	2	B2	B1 for 1-8 oe
8	a		$4pq$	1	B1	Accept $4qp$. Not $pq4$
	b		9	1	B1	cao
	c	$19 = 3y - 2\times 7$		3	M1	
		$3y = 19 + 14$			M1	
			11		A1	cao
9	ai		6	2	B1	cao
	ii		8		B1	cao
	b	$5\times 3\times 8$		2	M1	
			120		A1	cao
10	a		4 35	1	B1	cao
	b		1815	1	B1	Accept 6 15pm
	c		1550	1	B1	Accept 3 50pm
	d	100 : 80 oe		2	M1	eg 1.25:1
			5 : 4		A1	4:5 SC B1
11	a		$\frac{8}{15}$ oe	2	B2	B1 for fraction <1 with numerator 8 or denominator 15
	b		$\frac{3}{14}$ oe	2	B2	B1 for fraction <1 with numerator 3 or denominator 14

No		Working	Answer	Mark	Notes	
12	a	1200×11.85	2	M1		
			14 220		A1	cao
	b	$1659 \div 11.85$		2	M1	
			140		A1	cao
13		$10 - 3 \times 2.7$		2	M1	
			1.9		A1	cao
14		$\frac{9.5}{3.8}$		2	M1	for 9.5 or 3.8 seen
			2.5		A1	cao
15		4.5 oe seen		3	B1	
		$\frac{117}{\text{"4.5"}}$			M1	for $\frac{117}{\text{time}}$ eg $\frac{117}{4.3(0)}$
			26		A1	cao
16	a		632	1	B1	cao
	b	5 x 156 or 780			M1	
		"780"–"632"			M1	(dep M1)
			148		A1	cao
17	a		40	2	B1	cao
			80		B1	cao
	b		75	1	B1	cao
18	a		Rotation	3	B1	not "turn"
			90°		B1	If 2 transfs given, B0B0B0
			(0, 0) or origin		B1	
	b		Correct image	2	B2	(B1 for 2 vertices correct)

No	Working	Answer	Mark	Notes
19		10 & 0.8 or 9.8 & 1 or 10 & 1	2	B2 B1 for 9.8 & 0.8
20 a		n^4	1	B1 cao
b		p^7	1	B1 cao
c		q^4	1	B1 cao
21	$\frac{12}{5}\times\frac{15}{8}$ $\frac{180}{40}$ or simpler inc $\frac{9}{2}$	 $4\frac{1}{2}$	3	M1 Not 2.4 x 1.875 A1 Not 4.5 A1 cao
22	$4x-12=7x-10$ $-12+10=7x-4x$ or $-2=3x$	 $-\frac{2}{3}$ oe	3	B1 for $4x-12$ seen M1 A1
23 a	$\sin\angle PQR=\frac{4.7}{7.6}=0.6184...$	 38.2	3	M1 for sin & $\frac{4.7}{7.6}$ or 0.6184… M1 $\sin^{-1}(0.6184..)$ May be implied A1 for 38.2 or better
bi		7.65	2	B1 Accept $7.64\dot{9}$
ii		7.55		B1 cao
24	$a+5+3a-7+2a-1=24$ $6a-3=24$	 4.5 oe	3	M1 M1 A1

No		Working	Answer	Mark	Notes
25	ai		$\frac{1}{3}$	1	B1
	ii		$\frac{2}{3}$	1	B1
	iii		0	1	B1 Accept $\frac{0}{3}$
	b	$\frac{1}{3}\times\frac{1}{3}$ or all 9 combinations shown eg 2 way table or list		2	M1
			$\frac{1}{9}$		A1

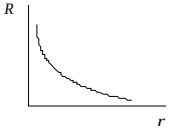
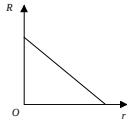
No		Working	Answer	Mark	Notes	
1		$\frac{2}{100}\times 69$ or 1.38 69 + "1.38"	 70.38	3	M1 M1 A1	or M2 for 69×1.02 dep on 1st M1 Accept 70.4 Condone 70 380 000, 70 400 000
2	a		$6t + 3$	1	B1	cao
	b	$x^2 - 3x + 5x - 15$		2	M1	for 4 terms ignoring signs or 3 terms with correct signs
	c		$x^2 + 2x - 15$		A1	
			$5(2p - 3q)$	1	B1	
	d		$n(n + 4)$	1	B1	
3	a	$\pi \times 4.7^2$		2	M1	
			69.4		A1	for 69.4 or better (69.39778…)
	b	Splits shape appropriately eg triangle & 2 rectangles, rectangle & trapezium eg $7\times 2 + 6\times 4$ or 14 + 24 $\frac{1}{2}\times 3\times 4$ or 6		4	M1 M1 M1	 for area of at least one rectangle for area of triangle or trapezium
			44		A1	cao
4	ai	$1 - (0.35 + 0.16 + 0.27)$		4	M1	
			0.22		A1	oe
	ii	0.35 + 0.27			M1	
			0.62		A1	oe
	b	0.16×75		2	M1	
			12		A1	cao

No		Working	Answer	Mark	Notes	
5	a	prime factors 2 & 5 seen		2	M1	
			$2\times2\times2\times5\times5$ or $2^3\times5^2$		A1	
	b	$2\times2\times2\times3\times5\times5$		2	M1	for $2\times2\times2\times3\times5\times5$ or for lists of multiples with at least 3 correct in each list
			600		A1	cao
6	a		(5, 3)	2	B2	B1 for each coordinate
	b	$8-2=6$ & $5-1=4$		4	B1	
		6^2+4^2 or 36 + 16 or 52			M1	for squaring & adding
		$\sqrt{6^2+4^2}$ or $\sqrt{52}$ (7.2110…)			M1	(dep on 1st M1) for square root
			7.21		A1	for 7.21 or better
7	i		1, 3	3	B1	Condone repetition
	ii		1, 2, 3, 4, 5		B1	Condone repetition
	iii		"is a member of" oe		B1	
8	i	$3x>-6$		4	M1	SC if M0, award B1 for −2
			$x>-2$		A1	
	ii		line to right of -2 indicated		B1	ft from (i) line must either have arrow or reach 4
			open circle at -2		B1	ft from (i)

Either 6 or 4 must be correct for award of M marks

No		Working	Answer	Mark	Notes	
9	a	$\frac{16+8}{150}$ or $\frac{24}{150}$ or 0.16		2	M1	
			16		A1	cao
	b	$34\times2.5+48\times7.5+26\times12.5$ $+18\times17.5+16\times22.5+8\times27.5$ or 85+360+325+315+360+220 or1665		4	M1	finds products $f\times x$ consistently within intervals (inc end points) and sums them
					M1	use of midpoints
		$\frac{"1665"}{150}$			M1	(dep on 1st M1) for division by 150
			11.1		A1	Accept 11 if $\frac{1665}{150}$ seen
	c		34, 82, 108, 126, 142, 150	1	B1	cao
	d		Points	2	B1	$\pm$ ½ square ft from sensible table
			Curve		B1	or line segments (dep on 5 pts correct or ft correctly or 5 ordinates from (c) plotted correctly and consistently within intervals but not above end points)
	e	cf of 75 (or 75½) used		2	M1	
			~ 9		A1	ft from sensible graph
10		$\pi\times12$ or 37.6991…		4	M1	
		$\div4$			M1	(dep) SC B2 for 3π or 9.4247… seen
		$+2\times6$ or +12			B1	(indep)
			21.4		A1	for 21.4 or better (21.4247…)

No		Working	Answer	Mark	Notes	
11	a		1.5×10^8	1	B1	cao
	b		4.5×10^9	2	M1	4.5×10^n for integer $n > 0$
					A1	for $n = 9$
						SC B1 for 4.5^{09}
12	a	$4y = 3x - 15$		3	M1	
		$y = \frac{3}{4}x - \frac{15}{4}$			M1	for $\frac{"3x-15"}{4}$
			$\frac{3}{4}$		A1	ft from $\frac{"3x-15"}{4}$
	b	eg Eqn (A)×3 or Eqn(B)×2 or Eqn(A)×5 or Eqn(B)×3		4	M1	for clear attempt at first step in correct process to eliminate either or y
		eg Eqn (A)×3 + Eqn(B)×2 or Eqn(A)×5 - Eqn(B)×3			M1	Completes correct process to eliminate either x or y (Condone one error)
		eg $x = 3$			A1	cao for non-eliminated one
			$(3,-1\frac{1}{2})$		A1	cao
13	a		$3t^2 + 8t - 5$	2	B2	(B1 for 2 terms correct)
	b	$6t + 8$		2	M1	for $6t + 8$ or d(a)/dt if at least B1 scored
			20		A1	ft
14	ai		bar correct	3	B1	$28 \pm ½$ sq
	ii		130, 120		B2	B1 cao for each value
	b	$\Sigma f = 480, \quad \frac{3}{4}\times480 = 360$		2	M1	
			2500		A1	ft from "480" ie Σf

No		Working	Answer	Mark	Notes	
15	a	6.805×4		2	M1	
			27.22		A1	cao
	b	$6.815 \times 4 = 27.26$		2	M1	
			27		A1	cao
16		$(2x+5)(x-4)$		3	M1	
		$(x+4)(x-4)$			M1	
			$\frac{2x+5}{x+4}$		A1	cao
17	ai	$R = \frac{k}{r^2}$		4	M1	
			$R = \frac{3.6}{r^2}$		A1	
	ii				B2	B1 for graph with negative gradient (increasing or constant) even if it touches of crosses one or both axes eg 
	b		0.4	1	B1	ft from *k*

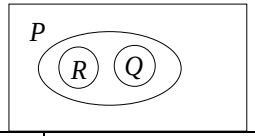
No		Working	Answer	Mark	Notes	
18	a	$3.6 \times 2.8 = 2.4 \times BE$		3	M1	Accept $AE \times CE = BE \times ED$
		$\frac{3.6 \times 2.8}{2.4}$			M1	
			4.2		A1	cao
	b	$\frac{3.6^2 + 2.4^2 - 4.9^2}{2 \times 3.6 \times 2.4}$		3	M1	
		-0.3061			A1	at least 3 sf
			108		A1	for 108 or better (107.826…)
19	ai		5	2	B1	cao
	ii		0		B1	cao
	b	eg $\begin{matrix} \times 2 \rightarrow -1 \\ \div 3 \leftarrow +1 \end{matrix}$ or attempt to make x the subject of $y = 2x - 1$		2	M1	
			$\frac{x+1}{2}$ oe		A1	
	ci		$\frac{3}{2x-1}$	2	B1	
	ii		$\frac{1}{2}$		B1	

No	Working	Answer	Mark	Notes	
20	$\angle RST = 108°$		5	B1	
	opposite angles of a cyclic quadrilateral			B1	or exterior angle = opposite interior angle Accept *cyclic quadrilateral*
	$\angle SRT = 28°$			B1	
	angle between chord & tangent = angle in alternate segment			B1	Accept *alternate segment* or *chord & tangent*
		28		B1	
	or				
	$\angle RST = 108°$		5	B1	
	opposite angles of a cyclic quadrilateral			B1	or exterior angle = opposite interior angle Accept *cyclic quadrilateral*
	$\angle PTR = 108°$			B1	
	angle between chord & tangent = angle in alternate segment			B1	Accept *alternate segment* or *chord & tangent*
		28		B1	
	or				
	$\angle UTR = 72°$		5	B2	
	angle between chord & tangent = angle in alternate segment			B1	Accept *alternate segment* or *chord & tangent*
		28		B2	B1 for 72 − 44

No		Working	Answer	Mark	Notes	
1		$\frac{9.5}{3.8}$	2.5	2	M1 A1	for 9.5 or 3.8 seen cao
2		4.5 oe seen $\frac{117}{"4.5"}$	26	3	B1 M1 A1	 for $\frac{117}{\text{time}}$ eg $\frac{117}{270}$ cao
3			$T = 40W + 20$ oe	2	B2	B1 for T = linear expression in W B1 for $40W + 20$ oe
4	a		632	1	B1	cao
	b	5 x 156 or 780 "780"–"632"	 148		M1 M1 A1	 (dep M1) cao
5	a		40 80	2	B1 B1	cao cao
	b		75	1	B1	cao
6	a		Rotation 90° (0, 0) or origin	3	B1 B1 B1	not “turn” If 2 transfs given, B0B0B0
	b		Correct image	2	B2	(B1 for 2 vertices correct)

No		Working	Answer	Mark	Notes	
7		$\frac{12}{5}\times\frac{15}{8}$ $\frac{180}{40}$ or simpler inc $\frac{9}{2}$	 $4\frac{1}{2}$	3	M1 A1 A1	Not 2.4 x 1.875 Not 4..5 cao
8	a		10 & 0.8 or 9.8 & 1 or 10 & 1	2	B2	B1 for 9.8 & 0.8
	b	$v^2 = 2gh$	 $\frac{v^2}{2g}$ oe	2	M1 A1	
9	a		n^4	1	B1	cao
	b		p^7	1	B1	cao
	c		q^4	1	B1	cao
	d		t^3	1	B1	cao
10	a	$\sin\angle PQR = \frac{4.7}{7.6} = 0.6184...$	 38.2	3	M1 M1 A1	for sin & $\frac{4.7}{7.6}$ or 0.6184… $\sin^{-1}$(0.6184..) May be implied for 38.2 or better
	bi		7.65 7.55	2	B1 B1	Accept $7.64\dot{9}$ cao
11		$4x - 12 = 7x - 10$ $-12 + 10 = 7x - 4x$ or $-2 = 3x$	 $-\frac{2}{3}$ oe	3	B1 M1 A1	for $4x - 12$ seen

No		Working	Answer	Mark	Notes
12	a	$\frac{12}{8}$ or 1.5 oe seen		2	M1
			7.5 oe		A1
	b	$15\times\frac{2}{3}$		2	M1
			10		A1 cao
	c	$\left(\frac{3}{2}\right)^2$ or $\frac{9}{4}$ or 2.25 oe		2	M1
			135		A1 cao
13		$a+5+3a-7+2a-1=24$		3	M1
		6a-3=24			M1
			4.5 oe		A1
14	a	$\frac{1}{3}\times\frac{1}{3}$ or all 9 combinations shown eg 2 way table or list		2	M1
			$\frac{1}{9}$		A1
	bi	$\frac{2}{3}$ on bottom LH branch		9	B1
		rest of probabilities correct			B1
		EOE, EOO, OEE, OEO, OOE, OOO			B1
	ii	$\frac{2}{3}\times\frac{2}{3}\times\frac{2}{3}$			M1
			$\frac{8}{27}$ oe		A1 ft if 0 < probs <1
	iii	$\frac{1}{3}\times\frac{2}{3}\times\frac{2}{3}$ in any order or $\frac{4}{27}$			M1
		3 correct paths identified			B1 may be implied by next M1
		"$\frac{4}{27}$"×3			M1 or add 3 correct paths
			$\frac{4}{9}$ oe		A1 ft if 0 < probs <1

No	Working	Answer	Mark	Notes
15	0.88 seen $\frac{726}{0.88}$	 825	3	B1 M1 A1 cao
16			3	B3 B1 for each condition satisfied
17	$10x = 3.222...$	$\frac{29}{90}$	2	M1 A1 cao
18 a		$-18,(-2),2,0,-2,2,18$	2	B2 for all correct (B1 for 4 or 5 correct)
b		Points plotted Curve	2	B1 $\pm$ ½ sq ft if at least B1 in (a) B1 ft if awarded B1 for points
ci		$-0.7,1,2.7$	4	B2 ft if awarded $\geq$ B1 in (b) (B1 for 2 correct)
ii	indication that $y = 6$ used or $x^3-3x^2+2 = 6$ or $y = 6$ seen	 3.4		M1 eg line, mark on graph A1 ft if awarded $\geq$ B1 in (b)
19 a	$6p^2+15pq-4pq-10q^2$	 $6p^2+11pq-10q^2$	2	M1 for 3 terms correct A1 cao
b		$8x^6y^{12}$	2	B2 (B1 for 2 of 3 parts correct)
c		$a^{-8}b^6$	2	B2 (B1 for one part correct) Accept $\frac{1}{a^8b^{-6}}$
d		$3p^2$	2	B2 (B1 for one part correct)

No	Working	Answer	Mark	Notes
20 a	$\pi\times3.7^2+\pi\times3.7\times8.3$		2	M1
		139 to 140		A1
b	$8.3^2-3.7^2$ or 55.2		4	M1
	$\sqrt{"55.2"}$ or 7.4296…			M1 dep on 1st M1
	$\frac{1}{3}\pi\times3.7^2\times"7.43"$			M1
		107		A1 for 107 or better (106.512…)
21	$y=6-2x$		7	M1 for making y (or x) the subject
	$x^2+(6-2x)^2=20$			M1 for substitution
	$x^2+36-24x+4x^2=20$			M1 for correct expansion
	$5x^2-24x+16=0$			A1
	$(5x-4)(x-4)=0$			M1
		$x=4$ and $x=\frac{4}{5}$ oe		A1 cao
		$x=\frac{4}{5}, y=4\frac{2}{5}$ oe		
		and $x=4, y=-2$		A1 Must be in pairs One pair only, by trial & improvement, or without working, M0A0
22 ai		$\mathbf{a}+\frac{1}{2}\mathbf{b}$ oe	3	B1
ii		$\frac{1}{2}\mathbf{a}+\mathbf{b}$ oe		B1
iii		$\mathbf{b}-\mathbf{a}$ oe		B1
b	$\frac{1}{2}\mathbf{a}+\mathbf{b}-\mathbf{a}-\frac{1}{2}\mathbf{b}$		2	B1
	or $\frac{1}{2}\mathbf{b}-\frac{1}{2}\mathbf{a}$			
		$\overrightarrow{XY}=\frac{1}{2}\overrightarrow{QS}$		B1 Or equivalent. Must use vector not'n dep on 1st B1

MATHEMATICS 4400, CHIEF EXAMINER'S REPORT

General Comments

All four papers proved to be accessible and gave candidates the opportunity to demonstrate positive achievement. The vast majority of candidates were entered at an appropriate tier and, at both tiers but particularly at the Higher tier, many able, well prepared candidates scored high marks.

PAPER 1F

This paper gave most candidates the chance to show what they knew and no questions were inaccessible. The marks of a number of candidates were in the 90s, suggesting that, had they been entered for the Higher tier, they might have achieved a higher grade. Candidates generally presented their answers clearly and showed necessary steps in their working.

Question 1

In part (b), the number was sometimes written to the nearest thousand and, in part (c), "hundredth" appeared often enough to be noticeable but many candidates scored full marks.

Question 2

Overall, this was well answered. Few lost the first mark, although "square" was seen occasionally. Rather more common were "rhombus" instead of "kite" and "parallelogram" instead of "trapezium".

Question 3

The majority of candidates scored the first 3 marks but the explanation proved more of a challenge. Nevertheless, many scored the mark with answers such as "Odd numbered terms are even", "It goes even, odd, even, odd…" and "10th, 20th, 30th… terms are odd, as they end in 9". Common explanations which received no credit included "An odd number is being added each time" and "100 is an even number".

Question 4

This was probably the best answered question on the paper and errors were rare.

Question 5

This was another very well answered question and there were no common mistakes.

Question 6

"Pounds" appeared sometimes in part (a), instead of "kilograms". In part (b), both 0.0015 $(1.5 \div 1000)$ and 150 (1.5×100) were regular wrong answers.

Question 7

This question posed few problems and many candidates gained full marks.

Question 8

Only stronger candidates answered both parts correctly and the success rates on each part were similar. In the first part, some candidates drew only one diagonal, scoring 1 mark, while other drew both diagonals and both mediators, scoring no marks.

Question 9

Reading from the conversion graph proved straightforward. Almost all candidates gained at least 2 marks and many answered all three parts correctly.

Question 10

Full marks were common. G was almost always marked correctly but S was occasionally marked at 0.

Question 11

This was another very well answered question. Even candidates who made an error in the first two parts could still score both marks in the last part, if they showed in their working how they had used their values of w and x to obtain the value of y.

Question 12

Part (a) was usually correct but 3.18 (the value correct to 2 decimal places) was a popular wrong answer to part (b).

Question 13

The greatest number of errors were probably made in the first part, with pq^3 and $p^3 + q^3$ both appearing regularly. In the second part, 1 – 6 caused some problems, although there were many correct answers, while the majority of candidates were able to solve the equation in the final part.

Question 14

This was very well answered. Most candidates calculated the angles correctly, drew an accurate pie chart and labelled its sectors.

Question 15

The majority of candidates found the scale factor and completed the enlarged shape correctly.

Question 16

This question had a high success rate. A few candidates calculated 2% of 69 million but failed to add this to 69 million.

Question 17

The overall standard of algebraic manipulation was good, although answers such as $6t + 1$ and $5t + 3$ were given to part (a) and sign errors were not uncommon in part (b).

Question 18

The area of the circle was usually correct but a truncated answer (69.3) with no working scored no marks. In the second part, a substantial number of candidates used an incorrect length when finding the area of a trapezium, 11 cm instead of 9 cm for the base or 6 cm instead of 8 cm for the top. The small minority who did not draw lines on the diagram to show how the shape was split up almost invariably got the answer wrong. A small minority tried to find the perimeter, instead of the area.

Question 19

This was well answered by candidates of all abilities.

Question 20

Part (b) was extremely well answered and part (a) somewhat less so. Part (c) proved more demanding but, even here, 1 mark was awarded for identifying 2 and 5 as the prime factors.

Question 21

Candidates varied in their familiarity with the symbols appearing in this question. The answers to (i) and (ii) in the first part were occasionally reversed and often wrong. Popular answers to the second part included “subset” and “universal set”.

Question 22

(6, 4) appeared regularly as the answer to the first part. In the second part, many candidates gave evidence of knowledge of Pythagoras’ theorem but, to receive any credit, at least one of the lengths had to be correct. Candidates who drew a diagram were more likely to achieve some success than those who did not.

Question 23

Only the ablest candidates scored full marks. If just one mark were lost, it was often through failure to draw an open circle at –2 on the number line.

Question 24

Part (a) was quite well answered but 36 $\left(\frac{24}{100}\times 150\right)$ and 84 $\left(\frac{126}{150}\times 100\right)$ (the percentage that travel *less* than 20 km) both occurred regularly.

For part (b), many candidates clearly knew that, to find the mean, they had to do some adding and then divide but did not know what to add or what to divide by. This led to a wide range of methods such as dividing the sum of the numbers in the frequency column by 6 (the number of intervals) and dividing the sum of the upper limits of the intervals by 150. Those who had some familiarity with the correct method often used upper limits or 3, 8, 13 etc instead of the mid-interval values.

PAPER 2F

All candidates found plenty of opportunity to show their understanding and there were very few low marks. At the other end of the scale, there were not many candidates who did so well as to suggest that they might have benefited from entering at Higher Level. Where there was weakness, it tended to be in algebraic topics and in knowledge of mathematical vocabulary more than in other areas. Candidates generally showed a good understanding of probability (except multiplication) and arithmetic (except fractions). Many candidates lost marks through premature rounding or through giving answers to only one significant figure.

Question 1

(a) Very many candidates omitted 15. Many omitted 1.
(b) A few candidates gave 4, 5 and 6 as the answer.
(c) Some candidates listed the odd numbers.
(d) Answers of 6 and 6^2 were fairly frequent, but did not score the mark. Some candidates gave an answer of 27 or 26.

Question 2

(a) Many candidates gave the measurement correct to the nearest centimetre. Others gave 7.2. A few gave 77, presumably in millimetres, but without stating their units.
(b)(c) Angle measurement was generally quite good, although some candidates found the associated acute angle in each case. The descriptions were less good. Some candidates stated “acute” and “obtuse” even though their two angles were obtuse and reflex. Their was much invention, such as “interior”, “outside”, rombus”, “ososeles”,

Question 3

(a)(b) These questions were generally answered correctly.
(c) Most candidates answered this correctly. Some left “kg” in their formula, thus losing a mark. A few candidates attempted W in terms of T, either instead of, or as well as, the required answer.

Question 4

(a)(b) These parts were generally answered correctly.
(c) Some candidates rounded to one decimal place.
(d) A frequent error was to place 0.71 before 0.701.
(f) An answer of 1/9 or 1/19 was not uncommon.

Question 5

This question was poorly answered on the whole. Part (i) was more often correct than the others. “Arc” was sometimes seen, but more often in (iii) (wrongly) than in (ii) (correctly). Part (iii) was sometimes correct, but part (ii) hardly ever. “Sector”, “segment”, “radius” and “chord” were common answers to (ii). There was much evidence of creativity rather than knowledge, eg “intersection”, “outside line” “length”, “section”, “radius”, “circumference”, “interceptor” and “base”.

Question 6

Both parts were generally answered correctly.

Question 7

(a)(b) These were often correct, although the mean was sometimes found instead of either mode or median.
(c) Some candidates gave the pair of values 8 and 1 in some form, without subtracting. Many candidates calculated the mean instead of the range.

Question 8

This question was well answered.
(a) Common answers which did not gain the mark were pq x 4 and $pq4$.
(b) A few candidates gave the answer $x = 3$.
(c) A few candidates substituted correctly, but then made a sign error. A few substituted $y = 19$ or $n = 19$.

Question 9

(a) Most candidates answered part (i) correctly, but in (ii) the most common answers were 4 and 12. Perhaps the word "vertices" was not understood.
(b) This was usually correctly answered, although a few calculated surface area or
(3 x 8) x (5 x 8).

Question 10

(a) This was generally answered correctly.
(b) The calculation was usually correct, but a few candidates gave 6:15 without pm. These did not score.
(c) The calculation was often incorrect. 16:30 was common. A few gave the answer 3:50 without pm. These did not score.
(d) Not many correct solutions were seen. A common error was 140:80. Some candidates gave the correct ratio but could not simplify it correctly. Answers involving fractions rather than ratios were not accepted.

Question 11

This question was usually answered correctly. Some candidates went into decimals, sometimes leading to errors. In (b) a few candidates gave answers of 7/14 or 3/15. A small minority of candidates showed no understanding of probability, giving answers greater than 1.

Question 12

This question was answered correctly by almost all candidates. A very few were unsure whether to multiply or divide.

Question 13

Most candidates answered this question successfully. A few subtracted before multiplying. Others omitted the "3".

Question 14

Calculator work was not strong in this question. Few candidates performed the calculation in one step, although most achieved the correct answer. Some wrote an incorrect middle step such as 9.5/7.6 or 9.5/4.8.

Question 15

Many candidates took the time to be 4.3 hours. Some candidates correctly changed to minutes (or even seconds!), but most of these either could not interpret their decimal answer or simply did not convert back to km/h. A few candidates divided the wrong way round.

Question 16

This was generally answered correctly.
(a) A few candidates worked out 158/4
(b) Common incorrect methods were (632 + 156)/5, 156/5 and (156 x 5) / 5.

Question 17

This question was also answered well.
(a) A few candidates multiplied 120 by 1 and by 2.
(b) 25 x 2 = 50 was seen on a few scripts as was 1/3 x 25 = 8.33.

Question 18

(a) Many candidates did not appear to know the vocabulary of transformations, using language such as “move”, “flip”, “turn”, “up” and “to the right”. Some gave the coordinates of the starting and finishing positions. Others described rotating and then translating, ignoring the phrase “single transformation” in the question.. The rotation was sometimes given as 90^o clockwise or as 180^o. An incorrect centre, or no centre, was sometimes given. Some candidates described the rotation as 90^o “in the x axis” or “on the x axis” or “where $y = x$”.
(b) Some candidates rotated Q about (2,2) through 180^o or 90^o. The latter gave two correct vertices and scored 1 mark. A few candidates reflected P instead of Q in $y = x$, or perhaps they reflected Q in the y axis. Others reflected Q in $x = 1.5$.

Question 19

Many correct answers were seen, although a few candidates showed no understanding of the concept of approximating. Only partial credit was given for 9.8 and 0.8.

Question 20

(a) This was usually correct, but a few candidates gave $4n$ as the answer.
(b) Some candidates gave the answer p^{10}.
(c) $q^{2.3}$, q^{10} and q^3 were frequently seen.

Question 21

Many candidates converted to decimals. An answer of 4.5 scored no marks unless 9/2 or $4^1/_2$ was also seen. Another error was to leave the answer as 9/2, which scored 2 marks.

Some candidates tried to deal with the integer parts of the numbers separately from the fractional parts. Some found a common denominator. Many others tried some form of "cross-multiplying". A few candidates thought that $2^2/_5 = {}^4/_5$ and $1^7/_8 = {}^7/_8$, presumably multiplying the numerator by the integer part. A few candidates achieved $4^1/_2$ but went on to "simplify" their answer to $2^1/_4$ and then $1^1/_8$.

Question 22

Most candidates multiplied out the bracket correctly (although a few wrote $4x - 7$). Most, however, made one or more sign errors afterwards. Those who did achieve $-2 = 3x$ correctly, sometimes gave wrong answers such as –0.66, 0.667 or -1.5. A few left their answer in the (unfinished) form of 2/-3. Decimals were unnecessary in this question, although many candidates chose to express their answer in this form. Some seemed unaware of the notation for recurring decimals. A few candidates tried trial and improvement, but these generally failed to achieve the correct answer and therefore scored no marks.

Question 23

(a) A minority of candidates were successful in this part. Some of these rounded prematurely, losing accuracy. A few used the wrong trig function. Many, however, did not use trigonometry, but attempted to use Pythagoras' theorem alone to find the angle.
(b) Not many candidates understood the concept of bounds. Of those who did, many gave the upper bound as 7.64. More commonly there were combinations such as
7.64 and 7.56; 7.61 and 7.59; 7.7 and 7.5; 8 and 7; 8 and 7.1; 8 and 7.5; 8.6 and 6.6; 7.67 and 7.64 as well as pairs which seemed to bear no relation at all to 7.6.

Question 24

This question was fairly well answered. A few candidates wrote x instead of +, but could proceed no further. A few candidates tried to add the a terms and the constant terms separately, rather than to form an equation. Generally they made an error such as $24 - 3$ instead of $24 + 3$. Those who formed the equation correctly sometimes made the same error, or made a different error when rearranging the equation. A few candidates used trial and improvement; these only scored marks if they reached the correct answer.

Question 25

(a) Many candidates obtained all three correct answers, including some candidates who scored poorly elsewhere in the second half of the paper.

A good number of candidates seemed reluctant to leave their answers as fractions. Having identified the correct numerator and denominator they went on to divide or to convert to a percentage. This is unnecessary and opens the door for mistakes such as incorrect rounding. Where the value of a probability is easily identifiable as a fraction, then the fraction is the best form for the answer. However, correct decimal and percentage equivalents are accepted.

A small number of candidates used a "ratio" form, such as 1:3 instead of 1/3. This is incorrect. Betting odds (eg 1/3 = 1:2) were not accepted.

(b) Very few candidates understood that multiplication was required. 1/3 + 1/3 and 1/3 x 2 were common. Those who used decimals usually lost a mark for accuracy eg, 0.33 x 0.33 = 0.1089.

PAPER 3H

The majority of questions were well answered. A high proportion of answers to many questions gained full marks, especially those to Questions 1-6, 9 and 11. Only part (b) of Question 14 (Histogram) and part (b) of Question 15 (Bounds) caused widespread difficulty.

Working was usually clearly shown and easy to follow.

Question 1

A multiplier of 1.2 was occasionally used but, overall, this proved to be a very straightforward start to the paper.

Question 2

Full marks were common on this routine algebra question.

Question 3

The area of the circle was usually correct but, in the second part, a substantial number of candidates used an incorrect length when finding the area of a trapezium, 11 cm instead of 9 cm for the base or 6 cm instead of 8 cm for the top. The small minority who did not draw lines on the diagram to show how the shape was split up almost invariably got the answer wrong.

Question 4

In part (b), the product of 0.35 and 0.27 was occasionally found but, in general, this was another very well answered question.

Question 5

The success rate was very high for the first part but noticeably lower for the second part, for which 25 and, to a lesser extent, 5 were popular wrong answers.

Question 6

(6, 4) appeared regularly as the answer to part (a) but many candidates scored full marks for the whole question.

Question 7

Candidates varied in their familiarity with the symbols appearing in this question. The answers to (i) and (ii) in the first part were occasionally reversed and “subset” was sometimes given as the answer to the second part but there were many completely correct answers.

Question 8

Most candidates gained 3 or 4 marks on this question. If a mark were lost, it was often through failure to draw an open circle at –2 on the number line.

Question 9

Many candidates scored full marks. Occasionally, values other than mid-interval values were used in part (b) or a cumulative frequency of 80 used in part (e) but such errors were rare.

Question 10

This question was well answered, although a significant minority failed to include the two radii in the perimeter.

Question 11

The vast majority of candidates answered both parts correctly. Numerically correct answers, eg 15×10^7 for part (a), which were not in standard form received no credit.

Question 12

This was well answered. In part (a), those candidates with some understanding, albeit imperfect, of $y = mx + c$ gave 3 as the gradient.

Question 13

The success rate was high but there was some evidence of unfamiliarity with calculus. Division by t, instead of differentiation, was not uncommon in the first part and, in the second part, $t = 2$ was sometimes substituted into the expression for the velocity.

Question 14

Few failed to score at least the mark for 130 in part (a) and many gained full marks, although 80 appeared regularly as the second entry in the frequency table. Correct answers to part (b) were rare. ¾ of 4000 was found as often as ¾ of 480 and even those who found ¾ of 480 were likely to give $2000 \leq n \leq 2500$ as the estimate for the upper quartile, instead of 2500.

Question 15

The first part was quite well answered but 6.805 was a common wrong answer and a lower limit for the area of the square was occasionally calculated. The second part was seldom answered correctly. Even when the upper bound was evaluated, the final answer was usually wrong, generally either 27.2 or 27.24 (the mean of the bounds).

Question 16

This question was routine for candidates well practised in the simplification of algebraic fractions but others attempted to cancel terms or “solve” the fraction in ways that showed no understanding of what was required.

Question 17

Most candidates gained at least 3 marks. If marks were lost, it was most likely to be on the sketch graph.

Question 18

There was a fair success rate for both parts but only the ablest candidates answered both parts completely correctly. In part (a), *AE* + *EC* = *BE* + *ED* was sometimes used, resulting in an answer of 4 cm, and answers of 3.09 cm $\left(3.6\times\frac{2.4}{2.8}\right)$ also appeared regularly. Part (b) was often answered correctly but errors in rearranging the Cosine rule were not uncommon.

Question 19

Those candidates who were familiar with functions gained most, if not all, the marks for this question. $\frac{3}{11}$ or 0.27 [gf(6)] was sometimes found instead of fg(6) in part (a)(ii).

Question 20

Attempts ranged from the concise and correct to the rambling and wrong. False assumptions were often made, particularly that *TS* was parallel to *QR*. No credit was given if incorrect working led to a correct answer and appropriate terminology was expected in the reasons, although some latitude was given. Thus, for example, markers accepted “cyclical” but “cynical” was less deserving of reward.

PAPER 4H

The response to this paper was generally very good indeed. A few candidates scored 100% and a significant number gained marks in the 90s. Low marks were rare and there was very little evidence of candidates having been entered for Higher level when Foundation would have been more appropriate. Most candidates showed good facility with the relevant techniques in all aspects of the syllabus - number, algebra, shape and space and handling data. The first 15 questions were particularly well answered and for these questions, the errors identified in the comments below were very much the exception rather than the rule. Some candidates lost marks through premature rounding.

Question 1

This was almost invariably correct, with most candidates not needing to write down an intermediate answer. A very few made a sign error.

Question 2

The most common error (though even this was relatively rare) was to take the time to be 4.3 hours. Some candidates correctly changed to minutes (or even seconds!), but most of these either could not interpret their decimal answer or simply did not convert back to km/h. A few candidates divided the wrong way round.

Question 3

Some candidates gave W in terms of T as well as T in terms of W. If both were correct, no credit was lost. Others only gave W in terms of T . These scored one of the two marks, so long as their formula was correct. A small number of candidates gave a muddled answer such as $W = 40/T - 20$. Some candidates left "W kg" in their formula, thereby losing one mark.

Question 4

(a) A few candidates worked out 158/4
(b) Common incorrect methods were (632 + 156)/5, 156/5 and (156 x 5) / 5.

Question 5

(a) A few candidates multiplied 120 by 1 and by 2.
(b) 25 x 2 = 50 was seen on a few scripts as was 1/3 x 25 = 8.33.

Question 6

(a) A sequence of two or more transformations scored no marks. The rotation was sometimes given as 90^o clockwise or as 180^o. An incorrect centre was occasionally given. Some candidates described the rotation as 90^o "in the x axis" or "on the x axis" or "where $y = x$".
(b) A few candidates reflected P instead of Q in $y = x$, or perhaps they reflected Q in the y axis. Others reflected Q in $x = 1.5$. Some rotated Q about (2,2).

Question 7

One error was to leave the answer as 9/2, which scored 2 marks. An answer of 4.5 scored no marks unless 9/2 or $4^1/_2$ was also seen. Some candidates tried to deal with the integer parts of the numbers separately from the fractional parts. Some found a common denominator. A few candidates thought that $2^2/_5 = {}^4/_5$ and $1^7/_8 = {}^7/_8$, presumably multiplying the numerator by the integer part. A significant number of candidates achieved $4^1/_2$ but went on to "simplify" their answer to $2^1/_4$ and then $1^1/_8$.

Question 8

(a) Only partial credit was given for 9.8 and 0.8.
(b) Incorrect algebra was not uncommon, eg $2g/V^2$ or $V^2 2g$ or $V^2 - 2g$ or $\sqrt{}(2g)$ $/V$ or $V/\sqrt{}2g$. Candidates who attempted a reverse flow chart method generally failed.

Question 9

(a) Very few errors were seen.
(b)(c)(d) In these parts a very few candidates multiplied or divided powers instead of adding or subtracting them.
(b) An occasional candidate gave the answer p^{10}.
(c) q^{10} was occasionally seen.
(d) A few candidates stopped at t^{11}/t^8. Others stated $t^{28}/t^8 = t^{20}$.

Question 10

(a) A long but correct method, using Pythagoras' theorem and cosine or tangent, was used by a few candidates. Others rounded prematurely and lost the accuracy mark. Some gave the answer to the nearest integer, also losing the accuracy mark. A few used the wrong trig function.
(b) The upper bound was frequently given as 7.64 or 7.6499… Some candidates gave pairs which suggested little understanding of bounds, eg 7.61 and 7.59; 8 and 7;
8 and 7.1; 8 and 7.5; 8.6 and 6.6; 7.67 and 7.64. A few candidates used the lengths of *QR* and *RP* as the bounds.

Question 11

Many candidates achieved $–2 = 3x$ correctly and then gave wrong answers such as –0.66, 0.667 or -1.5. A few left their answer in the (unfinished) form of 2/-3. Decimals were unnecessary in this question, although many candidates chose to express their answer in this form. Some seemed unaware of the notation for recurring decimals. A few candidates gave $4x - 7 = 7x – 10$ as the first step.

Question 12

(a)(b) These parts were almost always answered correctly. A tiny minority used addition and subtraction rather than multiplication and division (eg (a) 12 – 8 = 4, $x = 5 + 4 = 9$).
(c) 60 x 1.5 or 60 x 4 was sometimes seen. A few candidates used $(15/12)^2 = 1.25^2$ as the area scale factor.

Question 13

A few candidates tried to do this question by adding the *a* terms and the constant terms separately, rather than by forming an equation. Generally they made an error such as 24 – 3 instead of 24 + 3. Those who formed the equation correctly sometimes made the same error, or made a different error when rearranging the equation. A few candidates used trial and improvement; these only scored marks if they reached the correct answer.

Question 14

(a) The correct fraction 1/3 was doubled instead of squared by some candidates. An answer of 1/3 or 2/6 was seen occasionally, sometimes unsupported and at other times accompanied by 1/3 + 1/3 = 2/6 or even 1/3 x 1/3 = 2/6.
(b) A very few candidates gave non-complementary pairs of probabilities on the tree. In (iii) some candidates used only one or two routes rather than the three needed.

Question 15

The expected incorrect solution, using 12% of £726, was sometimes given.

Question 16

The most common wrong answer had *Q* correctly placed, but *R* placed partly outside *P*. Some candidates overlapped *Q* and R or drew *R* inside *Q*. A few did not draw a separate shape for each of *Q* and *R*.

Question 17

Many candidates ignored the dot. Others read the decimal as having dots over both the 3 and the 2. Some gave the answer as 1611/5000. Some candidates tried a "quick" method, although most of these used a denominator of 99 rather than 90. Some candidates gave the correct answer without working - perhaps using 3/10 + 2/90, although this method was not seen explicitly. The majority tried the standard method using $10x - x$ but some could not handle either the subtraction or the consequent simplification. Some tried $100x - x$ which can provide a valid method, but the subsequent steps usually proved too awkward. A few succeeded in using the more elegant method of $100x - 10x$.

Question 18

(a) A disappointing number of incorrect values were seen, often following from sign errors.
(b) Plotting was generally reasonably good. There were a few scale errors plus the usual collection of wobbly, feathery, thick, multiple or inaccurate curves.
(c) Surprisingly, there was a significant minority of candidates who did not attempt to use the graph but attempted all sorts of incorrect algebraic methods. A few differentiated.
(i) Reading from the graph was generally good, although many candidates gave only two of the three answers.
(ii) Not many candidates knew that the equation of a straight line needed to be found by rearranging the equation. Of those who did know this, some found incorrect lines such as $y = -6$ or $y = -4$. A few candidates started from scratch, by drawing
$y = x^3 - 3x^2 - 4$, and thereby wasting much valuable time. Where an answer was given with no evidence of method (perhaps by using a graphical calculator?), credit was only given if the answer was consistent with the candidate's graph from part (b).
To ensure marks are scored in questions of this type, candidates should show clearly the relevant straight line on their graph.

Question 19

(a) Incorrect expansions were not uncommon, involving a sign error or terms of the wrong degree or only two terms.
(b)(c)(d) In all these parts, the powers were frequently added or subtracted instead of multiplied or divided, (the opposite error to that seen in qu 9).
(b) A common error was failure to cube the 2. Answers of $2x^2y^{12}$ and $2x^6y^{12}$ were frequent.
(c) a^2b^5 was often seen.
(d) Most candidates achieved p^2, but few could evaluate $27^{1/3}$, often giving $9p^2$.

Question 20

(a) Many candidates found only the curved surface area. A few used $2\pi r$ for the area of the base.
(b) Most candidates used the correct formula, but some took the height to be 8.3. Others used Pythagoras' theorem wrongly. Many candidates rounded the height prematurely to 7.4 and consequently achieved an inaccurate answer of 106.

Question 21

There were a good number of completely correct solutions to this question. A few candidates gave correct working but rejected the non-integer value of x. There was some incorrect arithmetic and some candidates failed to give the final answers as pairs of values of x and y. Some candidates substituted correctly but made errors in the expansion of $(6 - 2x)^2$.

However, a substantial number of candidates showed no familiarity with the substitution method, but tried to use an elimination method instead. Some multiplied the first equation by x and managed, by devious incorrect operations, to achieve a single equation in x only. Others "squared" the first equation, giving $4x^2 + y^2 = 36$, or "rooted" the second equation, giving $x + y = 4.47$. A few "differentiated" the second equation to obtain a second linear equation: $2x + 2y = 0$.

Some candidates found the solution $x = 4$, $y = -2$ by trial and error. This scored no marks at all.

Question 22

A small minority of candidates did not attempt this question. Perhaps they failed to turn over the last page of the paper.
(a) This part was generally answered correctly, with just a few wrong signs appearing occasionally.
(b) Many candidates stated that $XY = \frac{1}{2}(\mathbf{b} - \mathbf{a})$ but gave inadequate explanations. It was unclear whether the statement was just derived from the result which they were asked to prove. Methods involving similarity, without use of vectors, scored no marks.

To gain the first mark, candidates had to derive $\overrightarrow{XY} = \frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{a}$ from the diagram. To gain the second mark, the first mark had to have been gained already and then candidates had to make the statement $XY = \frac{1}{2}QS$, or $\frac{1}{2}\overrightarrow{\mathbf{b}} - \frac{1}{2}\overrightarrow{\mathbf{a}} = \frac{1}{2}(\mathbf{b} - \mathbf{a})$**,** or an equivalent statement expressed in vector notation. $XY = \frac{1}{2}QS$ was not sufficient.

MATHEMATICS 4400, GRADE BOUNDARIES

Grade	A*	A	B	C	D	E	F	G
Foundation				**74**	**58**	**42**	**26**	**10**
Higher	**80**	**63**	**46**	**29**	**15**	**8**		

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demands of the question paper.

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