4400 Paper 4H Mark Scheme

Except for questions 9, 11, 21 (where the marking scheme states otherwise), unless clearly obtained by an incorrect method, a correct answer should be taken to imply a correct method.

Trial and improvement methods for solving equations score no marks, even if they lead to correct answers.

Q	Working	Answer	Mark	Notes	
1	$^{2}/_{3} \times {}^{9}/_{5}$			M2	M1 for inverting 2nd fraction i.e. $^{9}/_{5}$
					or
	$^{6a}/_{9a}$ and $^{5a}/_{9a}$				M1 2 correct fractions with common denominators of a multiple of 9
	$^{6a}/_{9a} \div {}^{5a}/_{9a}$			M2	correct numerators and intention to divide
		$^{18}/_{15}$ or $^{6}/_{5}$	3	A1	any fraction equivalent to $1^{1}/_{5}$ Do not allow decimal conversions
					Total 3 marks

2	i	3x -15 = 39 or 3(*x* – 5) = 39 or x-5=39/3		B3	do not accept x-5 =13 B2 for 3*x* – 5 = 39 if x-5 seen otherwise B1 B1 for x-5 seen B0 for x= 39/3 +5 oe
	ii	3x = 54 or x - 5 = 13		M1	ft from any linear equation ax+b=c a>1 b,c ≠ 0 ax= c-b or x=c/a – b/a
			18	5 A1	**18 with no working for answer in i) or ii) gets M1 A1**
					Total 5 marks

3	6 × (-9 + 1) or -8 seen			M1	allow 6 x -9 + 1
	-48 or -54+6			M1	Accept $6/(-2)$ or $(3/8)$ x -8
		-3	3	A1	**Total 3 marks**

4	67 ÷ 2 or (67 +1) ÷ 2 oe			M1	attempt to find middle of cumulative frequency or listing of people.
		7	2	A1	cao look for mean (7.56..) rounded down (M0 A0)
					Total 2 marks

5	a	2 x π x 40 oe			M1
			251	2	A1 answer rounding to 251
	b	8 x 10 or 80			M1
		π x 3^2 (awrt 28.2 or 28.3)			M1
		"8x10" – "π x 3^2"			M1 dep on both M1's
			51.7	4	A1 answer rounding to 51.7
					Total 6 marks

6	a	1 – (0.3 + 0.1 + 0.4)			M1
			0.2oe	2	A1 Look for answer in table if missing from answer line
	b	0.3 + 0.4			M1
			0.7oe	2	A1
					Total 4 marks

7	a		Correct $\pm$ 2 mm	2	B2	B1 for any 2 vertices correct $\pm$ 2 mm or translation of correct image
	b		Translation $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$	2	B1 B1	translate or translated or -4 in *x* dir'n, or 4 to left or 4 west (not backwards or across) AND 5 in y dir'n or 5 up or 5 north (not (-4,5) or vectors without brackets) penalise contradictions
						Total 4 marks

8	a	$5.1^2 + 3.2^2$ (= 36.25) √"36.25"	6.02	3	M1 M1 A1	M2 for 5.1/cos(tan^{-1}(3.2/5.1)) or 3.2/sin(tan^{-1}(3.2/5.1)) Must be complete methods answer rounding to 6.02
	b	tan selected 6.5 x tan 32°	4.06	3	M1 M1 A1	sin 32° = "AB"/6.5/cos32 or "AB"/sin32 = 6.5/sin 58 (*AB* =) sin 32° × 6.5/cos32 or (AB=) sin 32 x 6.5 / sin 58 answer rounding to 4.06
						Total 6 marks

9	12 - *x* = 21 or 12-21=x or-x=21-12	-9	3	M2 A1	or [-*x*/3 = 7 - 12/3] or [12/3 - 7 = *x*/3] M1 for 12–x=3x7 **(Answer only gains no marks)**
					Total 3 marks

10	A product of 3 or more factors of which 2 are from 2,2,3,11 1,2,2,3,11 or 2,2,3,11	2 x 2 x 3 x 11	3	M1 M2 A1	M1 can be implied from a factor tree or repeated division M2 can be implied from a factor tree or repeated division product must be stated (not dots for product)
					Total 3 marks

11		$[^{80}/_{40}]$ or $[^{84}/_{42}]$ $\surd$36 or 6	12	3	B1 B1 B1	dep on both previous B1's (Accept 10 only if $^{80}/_{40}$, 6 used) **(Answer only gains no marks)**
						Total 3 marks

12	a	$^{v}/_{h}$ in a correct Δ	½ oe	2	M1 A1	M1 A0 for ½ x
	b		y = "½"x + 2 oe	2	B2	B1 for "½"x + 2 or L= "½"x + 2
	c		y = "½"x + c	1	B1	c any number $\neq 2$ or letter or y = "0.5"x or a line parallel to their b)
						Total 5 marks

13	a		60	1	B1	
	b	$^{y}/_{7.5} = {}^{4}/_{5}$ oe	6	2	M1 A1	correct ratios or correct use of sf (0.8 or 1.25 or 1.5 or 2/3)
	c	$[{}^{z}/_{5} = {}^{3}/_{4}]$ oe or $[{}^{z}/_{7.5} = {}^{3}/_{\text{"6"}}]$	3.75	2	M1 A1	allow ft on their "6" or correct use of sf (0.8 or 1.25 etc) cao
						Total 5 marks

14	a		$^{1}/_{4}$ binary tree structure all probs & labels correct	3	B1 B1 B1	P(tail) on Ist throw
	b	"$^{1}/_{4}$" x "$^{1}/_{4}$"	$^{1}/_{16}$ or 0.0625	2	M1 A1	ft their 2 tail branches cao
						Total 5 marks

15	a		$3c^7d^5$	2	B2	B1 for c^7 or d^5 Accept 3 x c^7 xd^5
	b		$16x^{12}y^4$	2	B2	B1 for 16 or x^{12} or y^4 Accept 16 x x^{12} x y^4
	c	$^{2(x-3)}/_{x(x-3)}$	$^{2}/_{x}$	2	M1 A1	either factorisation correct. Accept (x±0) (2±0) Accept $^{2\pm0}/_{x\pm0}$ **Look for incorrect algebra**
						Total 6 marks

16	a		$(2x - 3)(x + 1)$	2	B2	B1 for one correct factor or $(2x + 3)(x - 1)$ (integers only)
	b		"1.5" and "-1"	1	B1	both req^d ft (a) if 2 linear factors
						Total 3 marks

17	a		$2x + 3$	2	B2	B1 each term (accept $3x^0$)
	b		"-5"	1	B1	ft their $ax + b$ $(a, b \neq 0)$
	c	"$2x + 3$" = 0 $x = -^3/_2$	$(-^3/_2, -^9/_4)$ oe	3	M1 A1 A1	only ft their $^{dy}/_{dx}$, if $ax + b$ $(a, b \neq 0)$ cao dependent on 2x+3=0 cao Answer dependent on 2x +3 =0 seen
						Total 6 marks

18	a		-**x** oe	1	B1	can be unsimplified
	b		**x** + **y** oe	1	B1	can be unsimplified
	c	Unsimplified expression in terms of *x* and **y** for PA or AP (either correct or ft from b) e.g.(AP=) "**x**+**y**"+**y**-½**x** or (PA=) ½**x**-**y**-"**x**-**y**"	-0.5**x**-2**y**	3	B2 B1	B1 Correct vector statement with at least 3 terms including AP or PA e.g.PA = PC + CA or AP = AC + CP can include x and/or y cao
						Total 5 marks

19	a	$^{80}/_{150}$ x 15 or 4 x 2 (small squares) (freq den)	8	2	M1 A1	M1 for any fd value in correct position and no errors or 1 large square=2.5 leaves or 1 small square=1/10 (leaf) oe
	b	Freq 4-5 = 12 and (freq 5-6 = 6 or freq 5-9=24) ½ ×(freq 4-5 + freq 5-6) or (½ x freq 4-5 + 1/8 x freq 5-9)	9	3	M1 M1 A1	12 & 6 seen or 12 & 24 or 60 & 30 (small squares) dep e.g. (0.5 x 12) +(0.5 x 6) or (0.5 x12)+(1/8 x 24) or 1/10 x 90
						Total 5 marks

20	ai	*BM* = 1 or CM =1			B1	(can be marked on diagram) allow cosine rule method
	ii	$(AM^2 =) 2^2 - 1^2$ (= 3) $(AM =) \sqrt{(2^2 - 1^2)}$ (= $\sqrt{3}$)	$^{\sqrt{3}}/_2$ or $\sqrt{¾}$	4	M1 M1 A1	(dependent on 1 line of Pythagoras or sine rule)
	b	$(^{\sqrt{3}}/_2)^2 + (^1/_2)^2$ = ¾ + ¼ oe		2	M1 A1	$(^{\sqrt{3}}/_2)^2$ Must be seen allow 0.75 + 0.25 if M1 gained
						Total 6 marks

21	a	$\frac{-3 \pm \sqrt{3^2 - 4 \times 2 \times (-1)}}{2 \times 2}$ $\frac{-3 \pm \sqrt{17}}{4}$	0.281 and -1.78	3	M1 M1 A1	allow one sign error both answers rounding to 0.281 & -1.78 **(answer only gains no marks)**
	b	$\frac{2(x+1)-x}{x(x+1)} = 1$ $2(x+1)-x = x(x+1)$ $x^2 - 2 = 0$ oe	$\pm\sqrt{2}$ or ±1.41...	4	M1 M1 M1 A1	$\frac{2(x+1)}{x} - 1 = x + 1$ or $2 - \frac{x}{x+1} = x$ removal of denominator correct gathering of terms answer rounding to ±1.41 **(answer only gains no marks)**
						Total 7 marks

22	a	$x \times 10^5 + 0.1y \times 10^5 = z \times 10^5$	$x + 0.1y$ oe	2	M1 A1	M1 for $0.1y$ or $(10^x \times 10^4 + y \times 10^4 = 10z \times 10^4)$ or $(10x + y = 10z)$
	bi		7.5	1	B1	
	ii	$0.75 \times 10^{n-m}$ (= $a \times 10^p$)	$n - m - 1$	2	M1 A1	0.75 and n-m seen (even in part i))
						Total 5 marks

Total 100 marks