

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

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

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

4	$67 \div 2$ or $(67 + 1) \div 2$ 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	$2 \times \pi \times 40$ oe			M1	
			251	2	A1	answer rounding to 251
	b	$8 \times 10$ or 80 $\pi \times 3^2$ (awrt 28.2 or 28.3) "8x10" - " $\pi \times 3^2$ "			M1	
			51.7	4	M1 M1 A1	dep on both M1's 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	$5.1^2 + 3.2^2 (= 36.25)$ $\sqrt{36.25}$	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 $6.5 \times \tan 32^\circ$	4.06	3	M1 M1 A1	$\sin 32^\circ = \frac{AB}{6.5/\cos 32}$ or $AB/\sin 32 = 6.5/\sin 58$ $(AB =) \sin 32^\circ \times 6.5/\cos 32$ or $(AB =) \sin 32 \times 6.5 / \sin 58$ 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 $12 - x = 3 \times 7$  (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	$2 \times 2 \times 3 \times 11$	3	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	$[\frac{80}{40}]$ or $[\frac{84}{42}]$ $\sqrt{36}$ or 6	12	3	B1 B1 B1	dep on both previous B1's (Accept 10 only if $\frac{80}{40}$ , 6 used) (Answer only gains no marks)
<b>Total 3 marks</b>					

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

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

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

15	a		$3c^7d^5$	2	B2	B1 for $c^7$ or $d^5$ Accept $3 \times c^7 \times d^5$
	b		$16x^{12}y^4$	2	B2	B1 for 16 or $x^{12}$ or $y^4$ Accept $16 \times x^{12} \times y^4$
	c	$\frac{2(x-3)}{x(x-3)}$	$\frac{2}{x}$	2	M1 A1	either factorisation correct. Accept $(x \neq 0)$ $(2 \neq 0)$ Accept $\frac{2 \neq 0}{x \neq 0}$ 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 <sup>d</sup> 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	$2x + 3 = 0$ $x = -\frac{3}{2}$	$(-\frac{3}{2}, -\frac{9}{4})$ oe	3	M1 A1 A1	only ft their $\frac{dy}{dx}$ , 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=) " $x+y$ " + $y - \frac{1}{2}x$ or (PA=) $\frac{1}{2}x - y - "x - y"$	$-0.5x - 2y$	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	$\frac{80}{150} \times 15$ or $4 \times 2$ (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) $\frac{1}{2} \times (\text{freq 4-5} + \text{freq 5-6})$ or $(\frac{1}{2} \times \text{freq 4-5} + \frac{1}{8} \times \text{freq 5-9})$	9	3	M1 M1 A1	12 & 6 seen or 12 & 24 or 60 & 30 (small squares) dep e.g. $(0.5 \times 12) + (0.5 \times 6)$ or $(0.5 \times 12) + (\frac{1}{8} \times 24)$ or $\frac{1}{10} \times 90$
						<b>Total 5 marks</b>

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 $\sqrt{3}/4$	4	M1 M1 A1	(dependent on 1 line of Pythagoras or sine rule)
	b	$(\sqrt{3}/2)^2 + (1/2)^2$ = $3/4 + 1/4$ oe		2	M1 A1	$(\sqrt{3}/2)^2$ Must be seen allow $0.75 + 0.25$ if M1 gained
						<b>Total 6 marks</b>

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	$\frac{2(x+1)-x}{x(x+1)} = 1$ $2(x+1)-x = x(x+1)$ $x^2 - 2 = 0 \text{ oe}$	$\pm\sqrt{2}$ or $\pm 1.41\dots$	4	M1 M1 M1 A1	$\frac{2(x+1)}{x} - 1 = x+1 \text{ or } 2 - \frac{x}{x+1} = x$ removal of denominator  correct gathering of terms  answer rounding to $\pm 1.41$ (answer only gains no marks)
Total 7 marks						

22	a	$x \times 10^5 + 0.1y \times 10^5 = z \times 10^5$	$x + 0.1y \text{ oe}$	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

