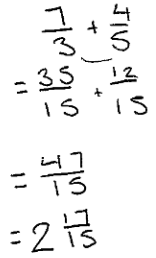
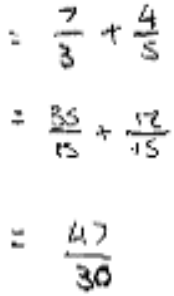
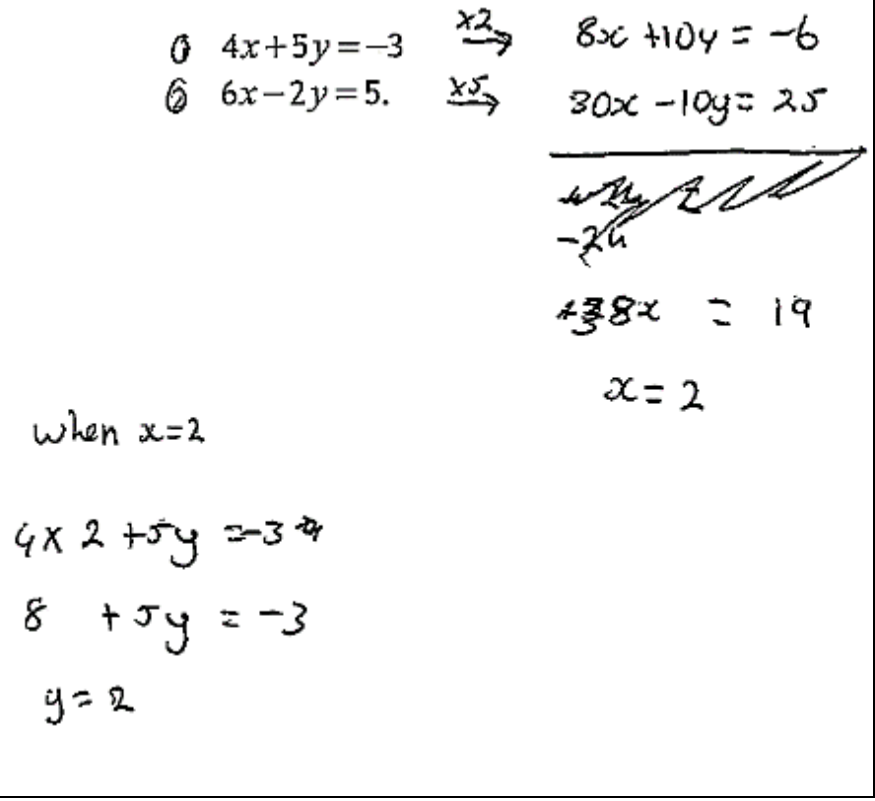
Commentary on paper 1 candidate evidence

The candidate evidence has achieved the following marks for each question of this course assessment component.

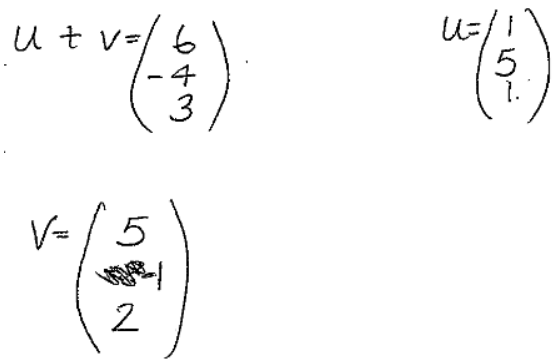
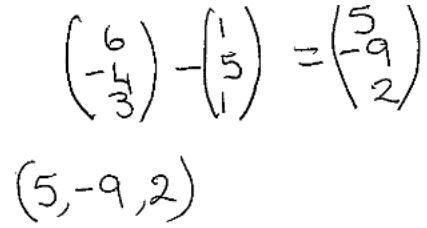
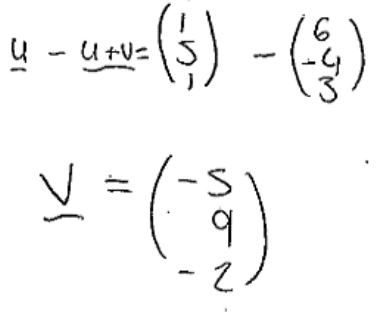
Question 1	Candidate response	Commentary
Response 1		**Mark: 2/2** The candidate was awarded 2 marks; see note 2 of the marking instructions. ✓●[1] correct identification of the common denominator ✓●[2] correct answer; do not penalise incorrect conversion to a mixed number
Response 2		**Mark: 1/2** The candidate was awarded 1 mark. ✓●[1] correct identification of the common denominator ×●[2] incorrect answer; denominators should not be added

Response 3	$\frac{7}{3_{\times 5}} + \frac{4}{5_{\times 3}}$ $\frac{21}{15} + \frac{12}{15}$ $\frac{33}{15} = \frac{11}{5}$ $\frac{21+}{12}$ 33	**Mark: 1/2** The candidate was awarded 1 mark. ✓●1 correct identification of the common denominator ×●2 incorrect calculation of first numerator
Question 2	**Candidate response**	**Commentary**
Response 1	$3x^2 - 3x + 1x - 1 + 2x^2 - 10$ $3x^2 + 2x^2 - 2x - 11$	**Mark: 2/3** The candidate was awarded 2 marks. ✓●1 correct expansion of $(3x+1)(x-1)$ ✓●2 complete expansion ×●3 incomplete collection of like terms
Response 2	$(3x+1)(x-1) + 2(x^2-5)$ $3x^2 - 3x + x - 1 + 2x^2 - 5$ $5x^2 - 2x - 6$	**Mark: 2/3** The candidate was awarded 2 marks. ✓●1 correct expansion of $(3x+1)(x-1)$ ×●2 incorrect expansion of $2(x^2-5)$ ✓●3 correct follow-through of collection of like terms

Response 3	$(3x+1)(x-1)$ $\quad 2(x^2-5)$ $= 3x^2-3+x-1$ $\quad = 2x^2-10$ $3x^2-3+x-1+2x^2-10$ $= 5x^2+x-14$	**Mark: 2/3** The candidate was awarded 2 marks. ✓●1 correct expansion of $2(x^2-5)$ ×●2 incorrect expansion of $(3x+1)(x-1)$ ✓●3 correct follow-through of collection of like terms
Response 4	$(3x+1)(x-1)+2(x^2-5)$ $\downarrow$ $2x^2-10$ $3x(x-1)+1(x-1)+2x^2-10$ $3x^3-3x+1x-1+2x^2-10$ ~~$3x^3-1x-1$~~ $\quad -1-10$ $+$ $3x^3+2x^2-2x+9$	**Mark: 1/3** The candidate was awarded 1 mark. ✓●1 correct expansion of $2(x^2-5)$ ×●2 incorrect expansion of $(3x+1)(x-1)$ ×●3 incorrect collection of constant terms

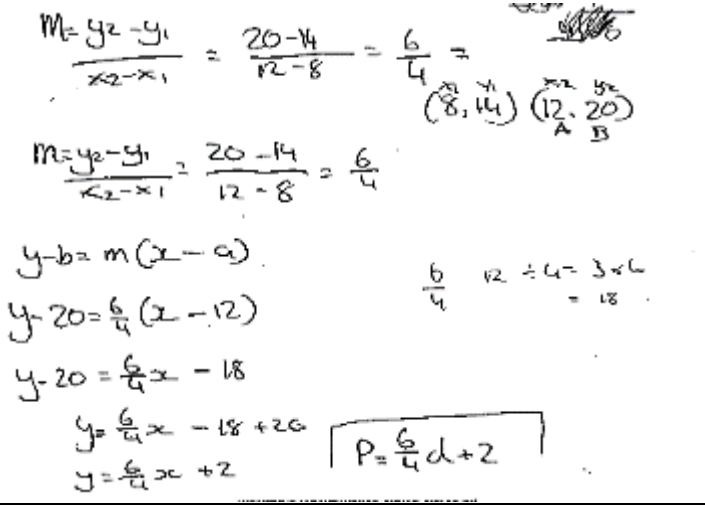
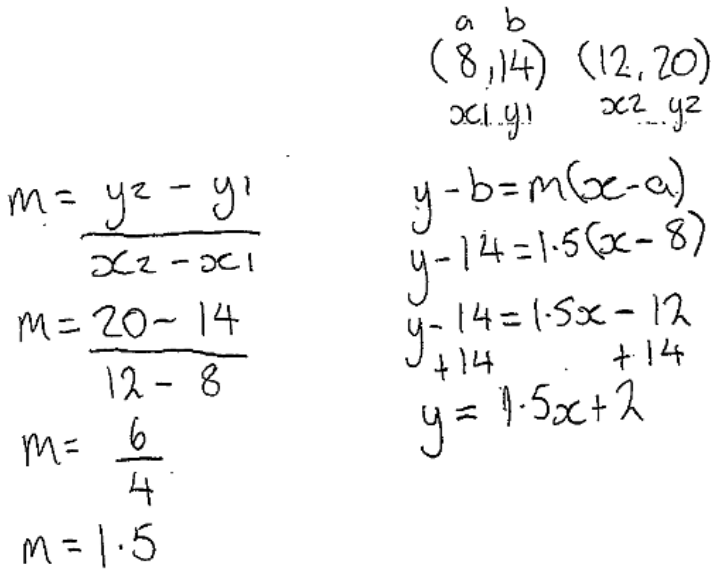
Question 3	Candidate response	Commentary
Response 1		**Mark: 2/3** The candidate was awarded 2 marks. ✓●[1] evidence of scaling ✓●[2] valid strategy followed through to produce values for *x* and *y* ×●[3] incorrect calculation of *x* leading to incorrect *y* value

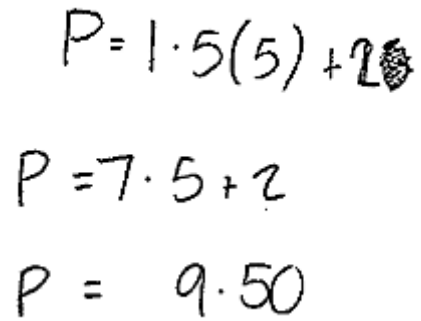
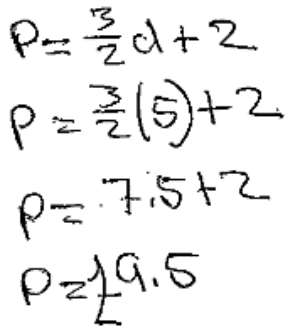
Response 2	$12x + 15y = -9$ subt. $12x - 4y = 10$ $19y = -19$ $y = \frac{-19}{19}$ $y = -1$	**Mark: 1/3** The candidate was awarded 1 mark. ✓●1 evidence of scaling ×●2 no attempt to calculate the value of *x* ×●3 no attempt to calculate the correct value of *x*
Question 4	**Candidate response**	**Commentary**
Response 1	$u = \begin{pmatrix} 1 \\ 5 \\ 1 \end{pmatrix} + \begin{pmatrix} 6 \\ -4 \\ 3 \end{pmatrix}$ $= \begin{pmatrix} 7 \\ 1 \\ 4 \end{pmatrix}$	**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 3 in the marking instructions. ×●1 incorrect strategy (addition) ✓●2 correct follow-through calculation

Response 2		**Mark: 1/2** The candidate was awarded 1 mark; see note 3 in the marking instructions. ✓●1 evidence of subtraction ×●2 incorrect calculation of *y* component
Response 3		**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 4 in the marking instructions. ✓●1 evidence of subtraction ×●2 final answer given in coordinate form; see note 2(b) of the marking instructions
Response 4		**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 2 of the marking instructions. ×●1 incorrect strategy (**u** – (**u** +**v**)) ✓●2 correct follow-through calculation

Question 5	Candidate response	Commentary
Response 1	$x^2 - 11x + 24 = 0$ $(x - 8)(x - 3)$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●1 correct factorisation ×●2 no attempt to solve for *x*
Response 2	$(x + 4)(x - 6)$: $x + 4 = 0$ $x - 6 = 0$ $x = -4$ $x = 6$ $(-4, 0)$ $(6, 0)$	**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 2 in the marking instructions. ×●1 incorrect factorisation ✓●2 correct follow-through solution for *x*
Response 3	$(x + 3)(x - 8) = 0$ $x = 3$ $x = 8$	**Mark: 0/2** The candidate was awarded 0 marks. ×●1 incorrect factorisation ×●2 incorrect follow-through solution from working is shown

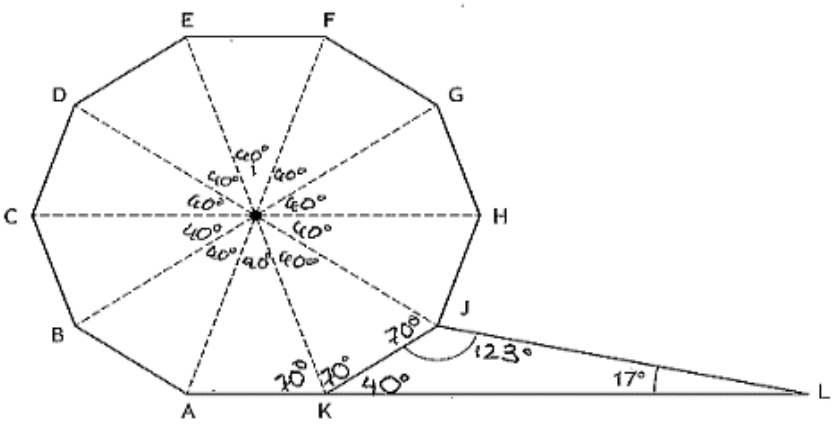
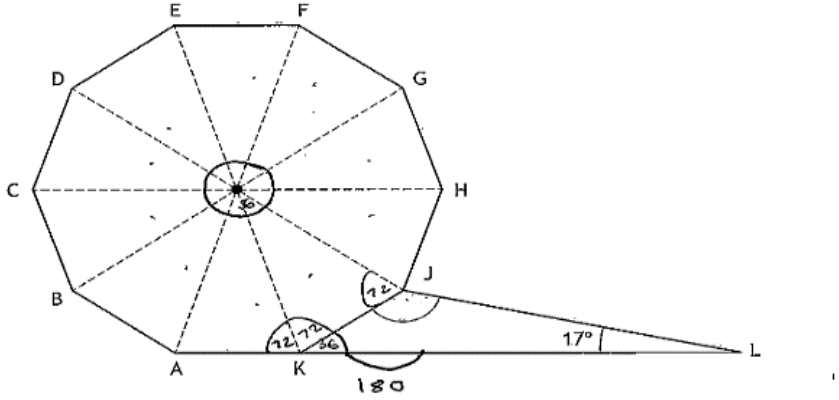
Response 4	$-b \pm \sqrt{b^2-4ac}$ $\frac{11 \pm \sqrt{25}}{2}$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●[1] correct use of quadratic formula; see note 4 of the marking instructions ×●[2] no attempt to solve for *x*
Question 6	**Candidate response**	**Commentary**
Response 1	$a = 5 \quad b = 2$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●[1] correct value of *a* stated ×●[2] incorrect value of *b* stated
Question 7(a)	**Candidate response**	**Commentary**
Response 1	$= \frac{p^2-p^1}{d^2-d^1}$ $= \frac{20-14}{12-8}$ $= \frac{6}{4} = 2.5$ $y = mx + c$ $p = 2.5d + C$ $14 = 2.5(8) + C$ $14 = 20 + C$ $14 = 20 - 6$ $p = 2.5d - 6$	**Mark: 2/3** The candidate was awarded 2 marks. ✓●[1] correct calculation of gradient ✓●[2] correct substitution of gradient and a point; see note 3 of the marking instructions ×●[3] incorrect simplification of straight line equation

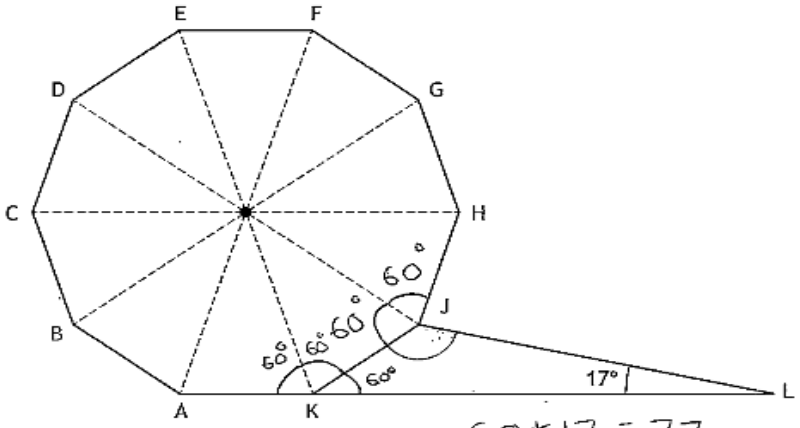
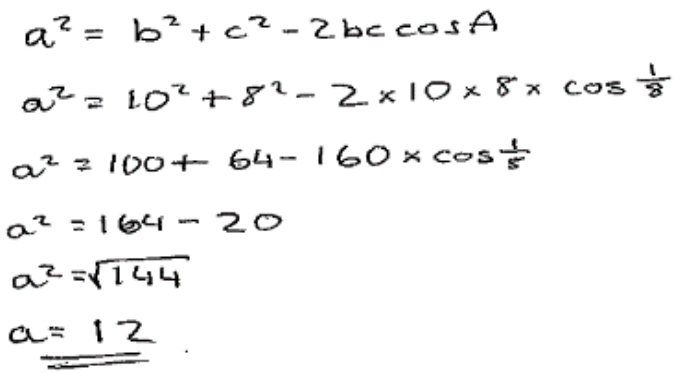
Response 2		**Mark: 2/3** The candidate was awarded 2 marks. ✓●[1] correct calculation of gradient ✓●[2] correct substitution of gradient and a point ×●[3] equation not stated in simplest form; see general marking principle (j)
Response 3		**Mark: 2/3:** The candidate was awarded 2 marks; see commonly observed response 1 in the marking instructions. ✓●[1] correct calculation of gradient ✓●[2] correct substitution of gradient and a point ×●[3] equation not given in terms of *P* and *d*

Question 7(b)	Candidate response	Commentary
Response 1		**Mark: 1/1** Assume that this follows on from a response of P = 1·5d + 2 in question 7(a). The candidate was awarded 1 mark; see note 2 of the marking instructions. ✓●[1] correct calculation of cost
Response 2		**Mark: 0/1** Assume that this follows on from a response of $P = \frac{3}{2}d + 2$ in question 7(a). The candidate was awarded 0 marks; see note 3 of the marking instructions. ×●[1] calculation of cost not given to two decimal places

Response 3	P = 3d + 5 P = 3(5) + 5 P = 15 + 5 P = 20 ∴ £20	**Mark 0/1:** Assume that this follows on from a response of P = 3d + 5 in question 7(a). The candidate was awarded 0 marks; see note 4 of the marking instructions. ×●1 follow-through calculation not awarded - eased calculation
Question 8	**Candidate response**	**Commentary**
Response 1	a=2 b=4 c=5 b^2-4ac $=4^2-4(2)(5)$ $16-40$ $=-24$, No real distinct roots because: $b^2-4ac<0$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●1 correct calculation of discriminant ×●2 incomplete statement for nature of roots; see note 3 of the marking instructions

Response 2	$f(2) = 2\times2^2 + 4\times2 + 5$ $= 8 + 8 + 5$ $= 21$ roots are real and distinct	**Mark: 0/2** The candidate was awarded 0 marks. ×●1 incorrect calculation of discriminant ×●2 incorrect statement for nature of roots; see note 4(a) of the marking instructions
Response 3	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $x = \frac{-4 \pm \sqrt{4^2-4\times2\times5}}{2\times2}$ $x = \frac{-4 \pm \sqrt{16-40}}{4}$ $x = \frac{-4 \pm \sqrt{-24}}{4}$	**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 1 in the marking instructions. ✓●1 correct calculation of discriminant ×●2 no attempt to state nature of roots

Question 9	Candidate response	Commentary
Response 1		**Mark: 1/2** The candidate was awarded 1 mark; see note 5 of the marking instructions. ×●1 incorrect calculation of interior angle ✓●2 correct follow-through calculation of angle KJL
Response 2		**Mark: 1/2** The candidate was awarded 1 mark. ✓●1 evidence of correct calculation of interior angle ×●2 no attempt to calculate angle KJL

Response 3		**Mark: 1/2** The candidate was awarded 1 mark. ×●1 incorrect calculation of interior angle ✓●2 correct follow-through calculation of angle KJL; see note 5 of the marking instructions
Question 10	**Candidate response**	**Commentary**
Response 1		**Mark: 2/3** The candidate was awarded 2 marks; see commonly observed response 1 in the marking instructions. ×●1 incorrect substitution into cosine rule ✓●2 correct calculation of XY^2 ✓●3 correct calculation of XY

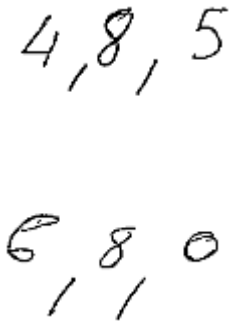
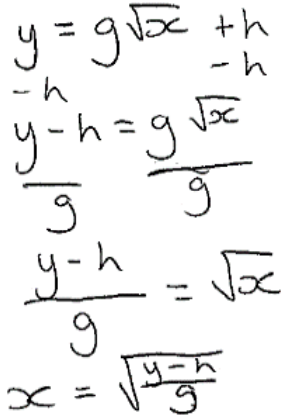
Response 2	$a^2 = b^2 + c^2 - 2bc\ \cos A$ $a^2 = 10^2 + 8^2 - 2 \times 10 \times 8 \times \frac{1}{8}$ $a^2 = 100 + 64 - 2 \times 10 \times 8 \times \frac{1}{8}$ $a^2 = 164 - 160 \times \frac{1}{8}$ $a^2 = 1312 - 1280 \times 1$ $a^2 = 32$ $a = \sqrt{32}$	**Mark: 1/3** The candidate was awarded 1 mark. ✓●1 correct substitution into cosine rule; see note 2 of the marking instructions ×●2 incorrect calculation of XY^2 ×●3 surd not simplified; see note 3(a) of the marking instructions
Response 3	$a^2 = b^2 + c^2 - 2bc\ \cos A$ $a^2 = 10^2 + 8^2 - 2 \times 10 \times 8 \times \frac{1}{8}$ $a = \sqrt{10^2 + 8^2 - 2 \times 10 \times 8 \times \frac{1}{8}}$ $a = \sqrt{100 + 64 - 160 \times \frac{1}{8}}$ $a = \sqrt{164 - 20}$ $a = \sqrt{144}$ $a = 12\text{ cm}$ $\frac{160}{1} \times \frac{1}{8}$ $\frac{160}{8}$ $= 20$	**Mark: 3/3** The candidate was awarded 3 marks. ✓●1 correct substitution into cosine rule; see note 2 of the marking instructions ✓●2 correct calculation of XY^2 ✓●3 correct calculation of XY

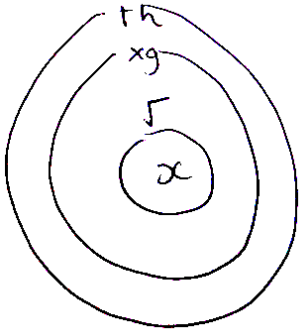
Response 4	$a^2 = b^2 + c^2 - 2bc\cos A$ $a^2 = 10^2 + 8^2 - 2 \times 10 \times 8 \times \frac{1}{8}$ $= 164 - 160 \times \frac{1}{8}$ $= 4 \times \frac{1}{8} 8$ $= \sqrt{32}$ $= \sqrt{16 \times 2}$ $= 4\sqrt{2}$.	**Mark: 2/3** The candidate was awarded 2 marks; see note 3(a) of the marking instructions. ✓●^{1} correct substitution into cosine rule ×●^{2} incorrect calculation of XY^2 ✓●^{3} correct follow-through simplified surd
Response 5	$c^2 = a^2 + b^2$ $c^2 = 10^2 + 8^2$ $c^2 = 100 + 64$ $c^2 = 164$ $c = \sqrt{164}$	**Mark: 0/3** The candidate was awarded 0 marks. ×●^{1} incorrect strategy ×●^{2} eased calculation of XY^2 ×●^{3} no attempt to simplify surd; see note 3(a) of the marking instructions

Question 11	Candidate response	Commentary
Response 1	$\frac{9}{\sqrt{6}} = \frac{9}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{9\sqrt{6}}{6} = \frac{3\sqrt{6}}{2}$ $\frac{3\times\sqrt{2}\sqrt{3}}{2} = \frac{3\times2\sqrt{3}}{2} = \frac{6\sqrt{3}}{2} = \frac{3\sqrt{3}}{1}$ $= 3\sqrt{3}$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●[1] correct expression of equivalent fraction with rational denominator ×●[2] correct answer given followed by subsequent incorrect working; see note 3 of the marking instructions

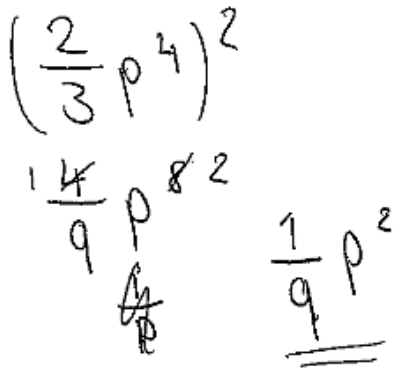
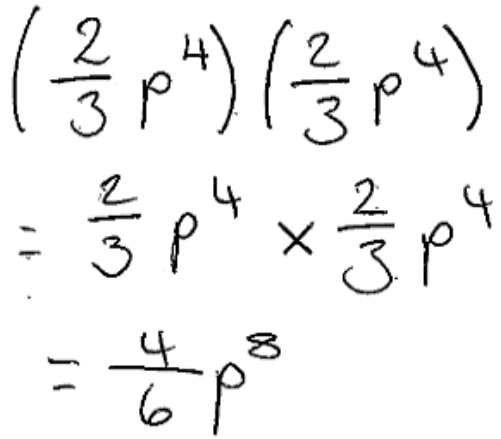
Question 12	Candidate response	Commentary
Response 1	12. Given that $\cos 60° = 0{\cdot}5$, state the value of $\cos 240°$. $\frac{\cos 240}{60} = 4$ $0{\cdot}5\times4=2$ $\cos 240 = 2.0$	**Mark: 0/1** The candidate was awarded 0 marks. ×●[1] incorrect value stated

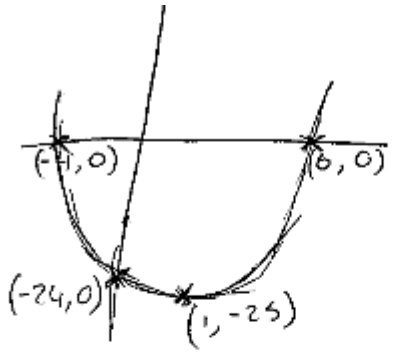
Question 13	Candidate response	Commentary
Response 1	Write down the coordinates of B and C. B = (2, 8, 5) C = (4, 8, 0)	**Mark: 1/2** The candidate was awarded 1 mark. ×●1 incorrect coordinates of B ✓●2 correct follow-through coordinates of C; see note 4 of the marking instructions
Response 2	B = (2, 8, 5) C = (6, 8, 0)	**Mark: 1/2** The candidate was awarded 1 mark. ×●1 incorrect coordinates of B ✓●2 correct coordinates of C
Response 3	(4, 8, 5) (6, 8, 0)	**Mark: 2/2** The candidate was awarded 2 marks; see note 2(a) of the marking instructions. ✓●1 correct coordinates of B ✓●2 correct coordinates of C

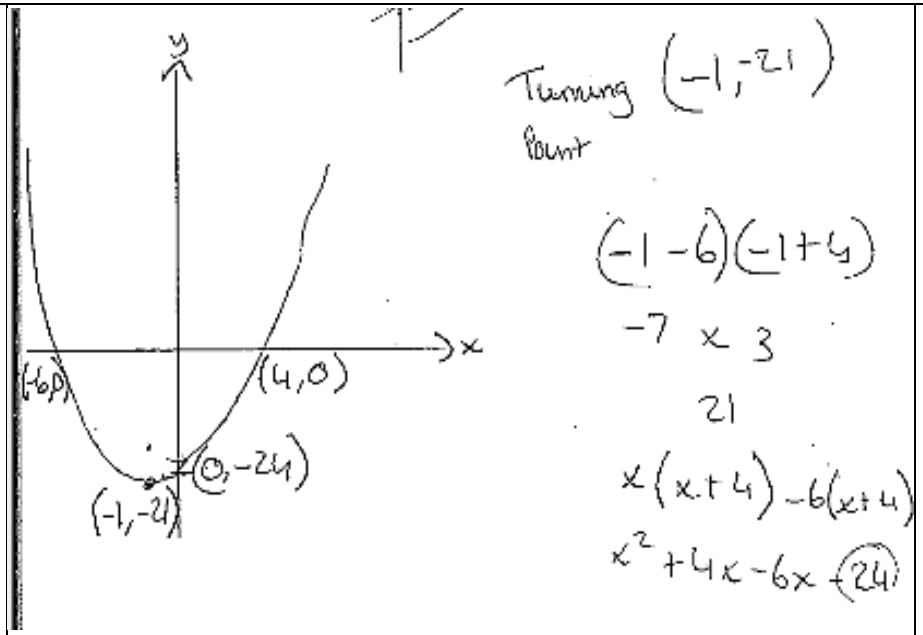
Response 4		Mark 2/2 or 1/2 depending on whether the candidate was already penalised in question 4 for omission of brackets. The candidate was awarded 2 marks if the omission of brackets was already penalised in question 4; see note 1(a) of the marking instructions. ✓●1 correct coordinates of B ✓●2 correct coordinates of C The candidate was awarded 1 mark if the omission of brackets was **not** penalised in question 4; see note 1(a) of the marking instructions. ×●1 correct coordinates of B stated without brackets ✓●2 correct coordinates of C
Question 14	**Candidate response**	**Commentary**
Response 1		**Mark: 2/3** The candidate was awarded 2 marks. ✓●1 correct subtraction of *h* ✓●2 correct division by *g* ×●3 incorrect strategy (square root instead of square of right hand side)

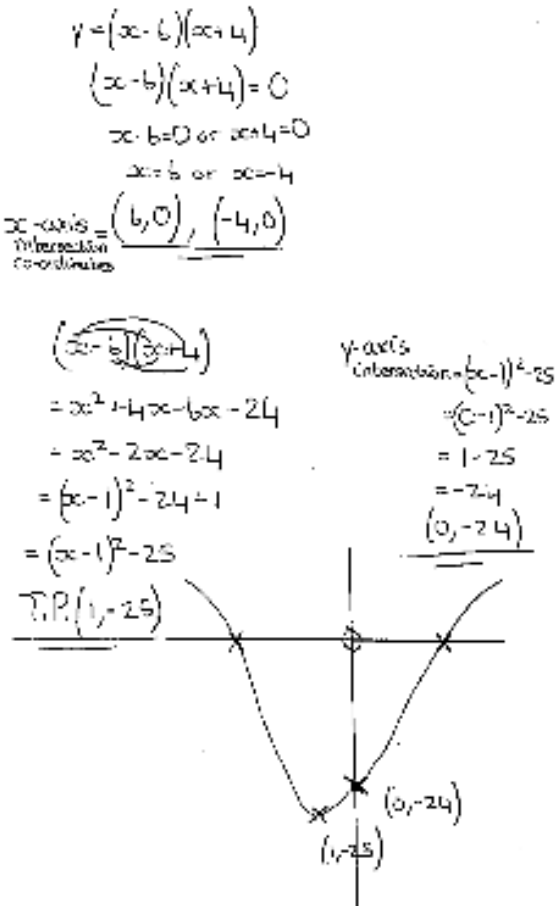
Response 2	(x) $y = g\sqrt{x} + h$ $g\sqrt{x} + h = y$ $g\sqrt{x} = y - h$ $g^2x = y - h$ $x = \frac{y-h}{g^2}$	**Mark: 2/3** The candidate was awarded 2 marks. ✓●1 correct subtraction of *h* ✓●2 correct division by g^2 in final line of working ×●3 incorrect squaring
Response 3	$y = g\sqrt{x} + h$ $x = \left(\frac{y-h}{g}\right)^2$ 	**Mark: 3/3** The candidate was awarded 3 marks. ✓●1 correct subtraction of *h* ✓●2 correct division by *g* ✓●3 correct square of right hand side

Response 4	$y = g\sqrt{x} + h$ $g\sqrt{x} + h = y$ $\sqrt{x} + h = \frac{y}{g}$ $\sqrt{x} = \frac{y-h}{g}$ $x = \left(\frac{y-h}{g}\right)^2$	**Mark: 0/3** The candidate was awarded 0 marks. ×●1 incorrect subtraction of *h* ×●2 incorrect division by *g* ×●3 incorrect squaring
Question 15	**Candidate response**	**Commentary**
Response 1	$\left(\frac{2}{3}p^4\right)\left(\frac{2}{3}p^4\right)$ $\frac{4}{9}p^8$ $= \frac{2}{3}p^8$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●1 correct start of process ×●2 correct completion of process with subsequent incorrect working; see note 2 of the marking instructions

Response 2		**Mark: 1/2** The candidate was awarded 1 mark. ✓●[1] correct start of process ×●[2] correct completion of process with subsequent incorrect working; see note 2 of the marking instructions
Response 3		**Mark: 1/2** The candidate was awarded 1 mark. ✓●[1] correct start of process ×●[2] incorrect completion of process

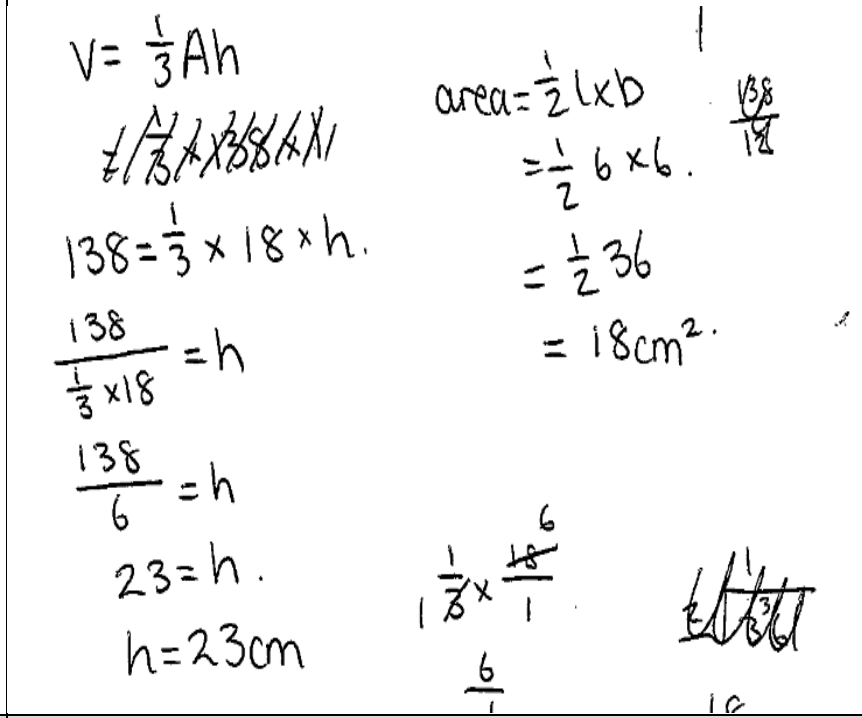
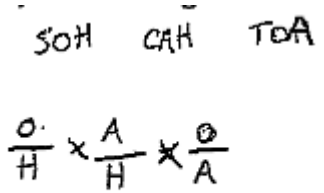
Question 16	Candidate response	Commentary
Response 1	 y intercept = 0 $y = x^2 - 6x + 4x - 24$ $x^2 - 2x - 24 = 0$ $(x-6) = 0 \quad x = 6$ $(x+4) = 0 \quad x = -4$ $x = 0$ $= 0^2 - 2(0) - 24$ $= -24$ $1^2 - 2(1) - 24$ $= 1 - 2 - 24$ $= -25$	**Mark: 3/3** The candidate was awarded 3 marks. ✓●1 correct identification of roots ✓●2 correct identification of turning point ✓●3 correct identification of *y*-intercept and consistently annotated parabola drawn; see note 2 of the marking instructions

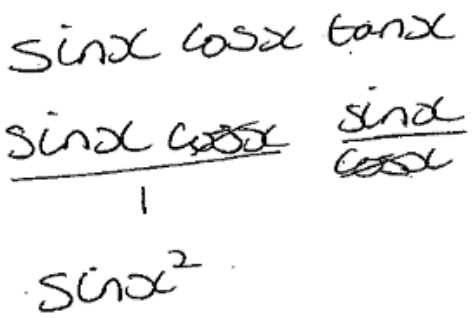
Response 2		**Mark: 1/3** The candidate was awarded 1 mark. ×●¹ incorrect identification of roots ✓●² correct identification of *y*-intercept ×●³ mark unavailable - does not lead to a parabola; see note 3 of the marking instructions

Response 3		**Mark: 2/3** The candidate was awarded 2 marks. ✓●[1] correct identification of roots ✓●[2] correct identification of turning point ×●[3] correct identification of the y-intercept but the parabola not fully annotated

Question 17	Candidate response	Commentary
Response 1	$V = \frac{1}{3}Ah = V$ $Ah = 3V$ $h = \frac{3V}{A}$ $h = \frac{3 \times 138}{36}$ $h = 11.2$ cm	**Mark: 2/3** The candidate was awarded 2 marks. ✓●1 correct change of subject to *h* ✓●2 correct substitution into formula ×●3 incorrect calculation of height
Response 2	$V = \frac{1}{3}Ah$ $138 = \frac{1}{3} \times 6 \times h$ $138 = 2 \times h$ $138 \div 2 = h$ 69 2)138 $h = 69$	**Mark: 1/3** The candidate was awarded 1 mark; see commonly observed response 4(a) in the marking instructions. ✓●1 correct substitution of volume into formula ×●2 incorrect substitution of base into formula ×●3 eased calculation; see note 5 of the marking instructions

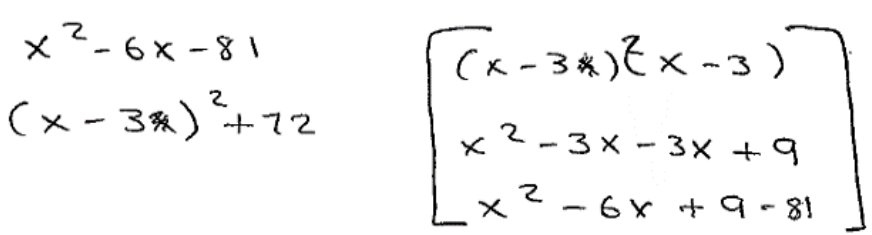
Response 3	$V=\frac{1}{3}Ah$ $138=\frac{1}{3}(6\times 6)h$ $138=\frac{1}{3}(36)h$ $138=12h$ $h=$ [redacted] $\frac{138}{12}$ $=\frac{23}{2}$ cm	**Mark: 3/3** The candidate was awarded 3 marks. ✓●1 correct change of subject to *h* ✓●2 correct substitution into formula ✓●3 correct calculation of height; see note 3 of the marking instructions

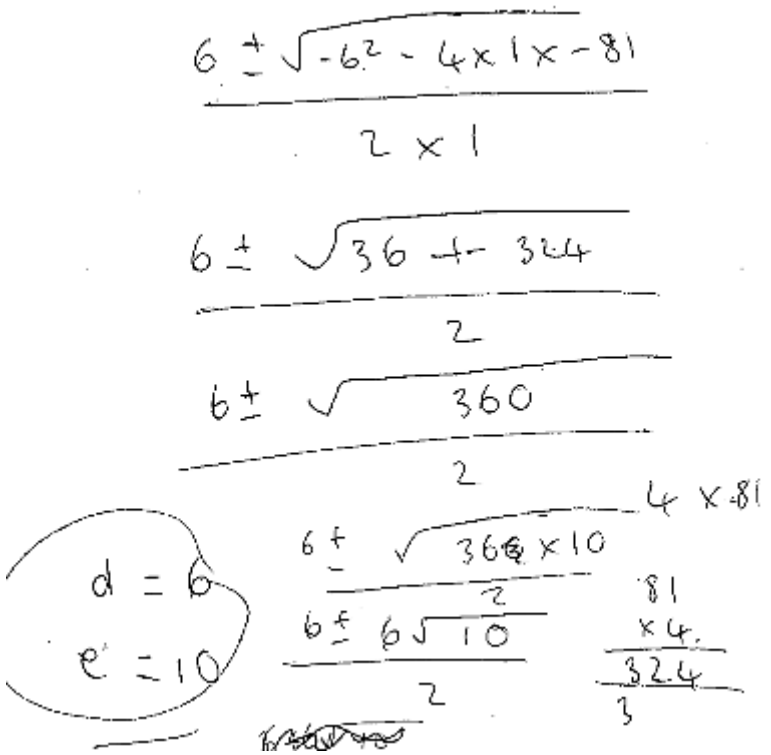
Response 4		**Mark: 1/3** The candidate was awarded 1 mark; see commonly observed response 2 in the marking instructions. ✓●¹ correct substitution of volume into formula ×●² incorrect substitution of base into formula ×●³ eased calculation; see note 5 of the marking instructions
Question 18	**Candidate response**	**Commentary**
Response 1		**Mark: 1/2** The candidate was awarded 1 mark. ✓●¹ correct substitution into expression; see note 7 of the marking instructions ×●² no attempt to express in simplest form

Response 2		**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 1 in the marking instructions. ✓●^{1} correct substitution into expression ×●^{2} incorrect simplification; see note 3 of the marking instructions

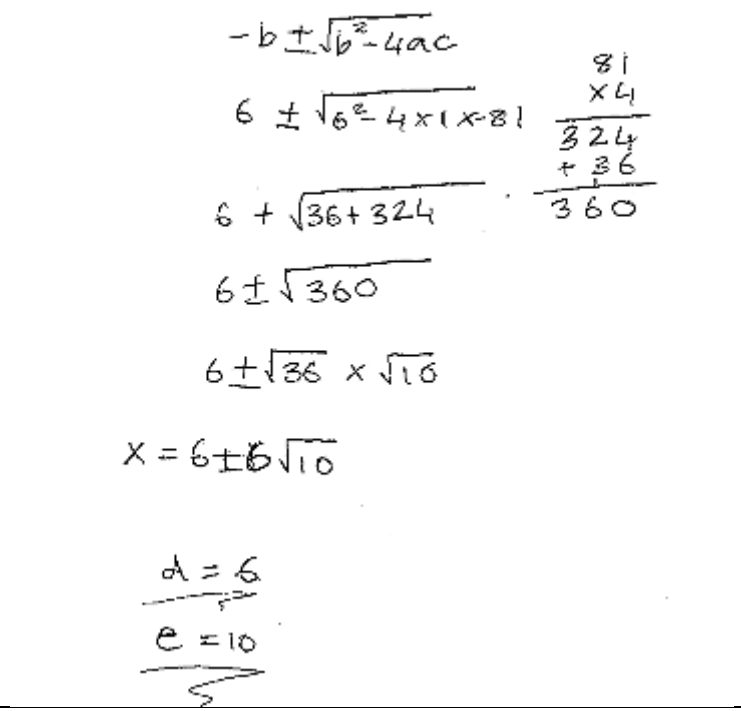
Response 3	$\sin x \times \cos x \times \tan x$ $\sin x \times \cos x \times \left(\frac{\sin x}{\cos x}\right)$ $\sin x \times \sin x$ $= \sin(x)^2$ $= \sin^2 x$ $= (\sin x)^2$ $= 2\sin x^\circ$	**Mark: 1/2** The candidate was awarded 1 mark. ✓●1 correct substitution into expression ×●2 invalid subsequent working; see note 6 of the marking instructions
Question 19(a)	**Candidate response**	**Commentary**
Response 1	**(i)** $(x+3)^2 - 9 - 81$ $(x+3)^2 - 90$	**Mark: 1/2** The candidate was awarded 1 mark. ×●1 incorrect bracket ✓●2 correct completion of process

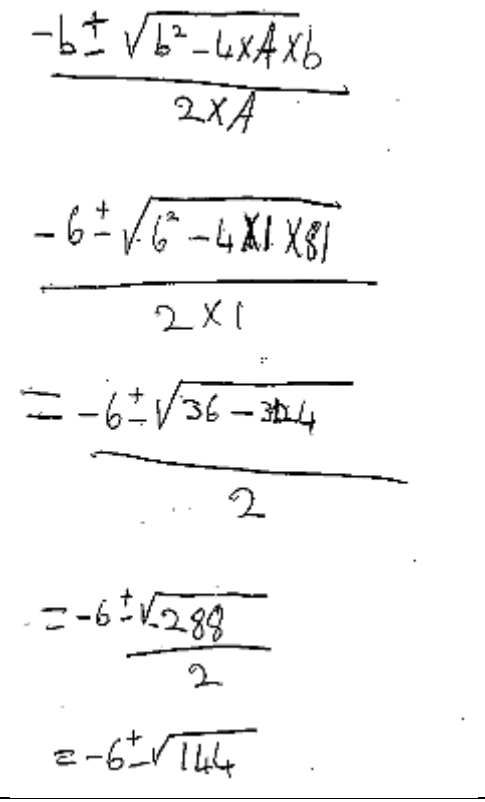
	(ii) $x = -3$	**Mark: 1/1** The candidate was awarded 1 mark; see note 2 of the marking instructions. ✓●[1] correct follow-through equation of axis of symmetry
Response 2	**(i)** $(x^2 - 6x) - 81$ $(x^2 - 6x + 36) - 36 - 81$ $(x-6)(x-6)$ $(x-6)^2 - 117$. **(ii)** $x = 3$	**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 3(a) in the marking instructions. ×●[1] incorrect bracket ✓●[2] correct follow-through completion of process **Mark: 0/1** The candidate was awarded 0 marks; see note 2 of the marking instructions. ×●[1] equation of axis of symmetry is inconsistent with the solution to part (i)

Response 3	**(i)**  **(ii)** axis of symmety = 3	**Mark: 1/2** The candidate was awarded 1 mark; see commonly observed response 3(a) in the marking instructions. ✓●[1] correct bracket with square ×●[2] incorrect completion of process **Mark: 0/1** The candidate was awarded 0 marks; see note 1 of the marking instructions. ×●[1] incomplete equation of axis of symmetry

Question 19(b)	Candidate response	Commentary
Response 1		Mark 3/4: The candidate was awarded 3 marks. ✓●[1] correct substitution into quadratic formula ✓●[2] correct evaluation of discriminant ✓●[3] correct simplification of surd ×●[4] incorrect completion of process

Response 2	$\frac{-b \pm \sqrt{(b^2-4ac)}}{2a}$ $= \frac{-b \pm \sqrt{-b^2-4(i)(-81)}}{2}$ $= \frac{-b \pm \sqrt{36+324}}{2}$ $\frac{-b \pm \sqrt{360}}{2}$	**Mark: 1/4** The candidate was awarded 1 mark. ×●1 incorrect substitution into quadratic formula ✓●2 correct evaluation of discriminant ×●3 no attempt to simplify surd ×●4 no attempt to complete process

Response 3		**Mark: 2/4** The candidate was awarded 2 marks; see commonly observed response 8 in the marking instructions. × ●1 incomplete substitution into quadratic formula ✓●2 correct evaluation of discriminant ✓●3 correct simplification of surd ×●4 incorrect completion of process

Response 4		**Mark: 0/4** The candidate was awarded 0 marks; see commonly observed response 5 in the marking instructions. ×●[1] incorrect substitution into quadratic formula ×●[2] incorrect evaluation of discriminant; see note 2 of the marking instructions ×●[3] mark unavailable as calculated discriminant is less than zero; see note 3 of the marking instructions ×●[4] mark unavailable as calculated discriminant is less than zero; see note 3 of the marking instructions