Assessment schedule: practice paper 2026

AS 91261 Apply algebraic methods in solving problems · Vertex Academy practice paper, not an NZQA paper

QUESTION ONE

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	$(2x^3y^2)^3 = 8x^9y^6$ $8x^9y^6 \div 4x^5y$ $2x^4y^5$	Correctly simplified to $2x^4y^5$.		
(b)	$2x^2 + 7x - 15 = (2x - 3)(x + 5)$ $4x^2 - 9 = (2x - 3)(2x + 3)$ $\frac{x + 5}{2x + 3}$ $4(x + 5) = 3(2x + 3)$ $4x + 20 = 6x + 9$, so $2x = 11$ $x = \frac{11}{2}$	Numerator or denominator correctly factorised.	Correct simplification AND x = 11/2 found.	
(c)	$5000(1.0035)^n > 6500$ $1.0035^n > 1.3$ $n \log 1.0035 > \log 1.3$ $n > 75.09\ldots$ 76 months	Correct inequation or equation formed, or n = 75.09 found.	76 months, with the logs method shown and the whole number justified.	
(d)	$(8 + 2w)(5 + 2w) = 80$ $2w^2 + 13w - 20 = 0$ $w = \frac{-13 + \sqrt{329}}{4} = 1.28$ m $(L + 2w)(W + 2w) = 2LW$, so $4w^2 + 2(L + W)w - LW = 0$ $w = \frac{-2(L + W) \pm 2\sqrt{(L^2 + 6LW + W^2)}}{8}$ $w = \frac{-(L + W) + \sqrt{(L^2 + 6LW + W^2)}}{4}$ product of roots $= -\frac{LW}{4} < 0$, so exactly one positive root	Correct equation formed for the 8 m by 5 m pool.	w = 1.28 m found, with the negative root rejected.	General formula derived AND a valid reason given that there is exactly one positive solution for every pool (product of roots negative, or root compared with L + W).
(e)	$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{u - f}{uf}$ $v = \frac{uf}{u - f}$ $v = \frac{360}{18} = 20$ cm $v - f = \frac{uf - f(u - f)}{u - f} = \frac{f^2}{u - f}$ $f^2 > 0$ and $u - f > 0$, so $v > f$ $\frac{uf}{u - f} = u$ gives $u = 2f$	Correct first step of the rearrangement, or v = 20 cm found by substituting into the original formula.	v = uf/(u − f) AND v = 20 cm.	v − f shown to equal $f^2/(u - f)$ (or equivalent) with a clear argument that it is positive when u > f, AND u = 2f found.

QUESTION TWO

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	$a = 3, b = -5, c = -4$ $x = \frac{5 \pm \sqrt{(25 + 48)}}{6}$ $x = \frac{5 \pm \sqrt{73}}{6}$ $x = 2.26$ or $x = -0.59$	Both solutions correct.		
(b)	$b^2 - 4ac > 0$ $16 - 4k(k - 3) > 0$ $k^2 - 3k - 4 < 0$ $(k - 4)(k + 1) < 0$ $-1 < k < 4, k \neq 0$	Discriminant correctly expressed in terms of k, or the critical values −1 and 4 found.	$-1 < k < 4$ found from a correct inequation ($k \neq 0$ need not be stated).	
(c)	$2x + 2y = 13$ and $xy = 10$ $y = 6.5 - x$, so $x(6.5 - x) = 10$ $2x^2 - 13x + 20 = 0$ $(2x - 5)(x - 4) = 0$, so $x = 4$ or 2.5 4 m by 2.5 m	Both equations formed, or a correct quadratic in one variable.	Both dimensions found (4 m and 2.5 m).	
(d)	$\Delta = (k - 2)^2 - 4(1)(-2k)$ $\Delta = k^2 + 4k + 4 = (k + 2)^2$ $(k + 2)^2 \geq 0$, so the roots are always real $x = \frac{-(k - 2) \pm (k + 2)}{2} = 2$ or $-k$ $\Delta = 0$ when $k = -2$ $k = -2$, root $x = 2$	Discriminant expanded correctly to $k^2 + 4k + 4$.	$\Delta = (k + 2)^2$ shown AND $k = -2$ found.	Clear general reasoning that the roots are real for all k (square is never negative) and rational for rational k, AND the equal root $x = 2$ found.
(e)	$x^2 + 3 = kx - 1$, so $x^2 - kx + 4 = 0$ $k^2 - 16 = 0$ $k = 4$: $(x - 2)^2 = 0$, point (2, 7) $k = -4$: $(x + 2)^2 = 0$, point (−2, 7) $k^2 - 16 < 0$ $-4 < k < 4$	Correct quadratic $x^2 - kx + 4 = 0$ formed.	$k = \pm 4$ found using the discriminant.	Both points (2, 7) and (−2, 7) found AND $-4 < k < 4$ for no meeting points.

QUESTION THREE

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	$2x - 1 = 3^4$ $2x - 1 = 81$ $x = 41$	$x = 41$.		

(b)	let $n = 3^x$, so $3^{2x} = n^2$ $2n^2 - 7n + 3 = 0$ $(2n - 1)(n - 3) = 0$, so $n = \frac{1}{2}$ or 3 $3^x = 3$ gives $x = 1$ $3^x = \frac{1}{2}$ gives $x = \log 0.5 \div \log 3$ $x = 1$ or $x = -0.631$	Rewrites as a quadratic in $n = 3^x$.	Both values of n found AND both values of x found.	
(c)	$32\,000b^2 = 23\,120$ $b^2 = 0.7225$, so $b = 0.85$ $0.85^t < 0.3125$ $t > \log 0.3125 \div \log 0.85 = 7.157\ldots$ After 7.16 years (during the 8th year)	$b = 0.85$ found.	b interpreted in context AND $t = 7.16$ years (or the 8th year) found with logs.	
(d)	$x = 2^y = (2^2)^{\wedge}(\frac{y}{2}) = 4^{\wedge}(\frac{y}{2})$, so $\log_4 x = \frac{y}{2}$ $x = (2^3)^{\wedge}(\frac{y}{3}) = 8^{\wedge}(\frac{y}{3})$, so $\log_8 x = \frac{y}{3}$ $x = a^y = (a^n)^{\wedge}(\frac{y}{n})$ $(1 + \frac{1}{2} + \frac{1}{3}) \log_2 x = 11$, so $\log_2 x = 6$ $x = 64$ $(\frac{1}{2}) \log_3 x = (\frac{1}{2}) \log_3 5$ $x = 5$	$\log_4 x = y/2$ or $\log_8 x = y/3$ shown, or one correct solution from a valid method.	$x = 64$ found with all terms changed to base 2.	General result proved using index laws AND $x = 5$ found from it.
(e)	$12\,000(1.03)^t > 18\,000(0.985)^t$ $(\frac{1.03}{0.985})^t > 1.5$ $t > \log 1.5 \div \log(\frac{1.03}{0.985}) = 9.08\ldots$ 10 years $P a^t > Q b^t$, so $(\frac{a}{b})^t > \frac{Q}{P}$ $t > \log(\frac{Q}{P}) \div \log(\frac{a}{b})$ Only the ratio $\frac{Q}{P}$ appears, so only the ratio matters	Correct expression for either town after t years, or a correct inequation or equation formed.	$t = 9.08$ found with logs, and 10 years given.	General result derived with the sign of $\log(a/b)$ justified AND explanation that only the ratio Q/P matters.

Judgement for each question

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question.	1u	2u	3u	1r	2r	1t	2t

Grade score out of 24 (each question's grade: N0 = 0 to E8 = 8): Not Achieved 0 to 7, Achieved 8 to 13, Merit 14 to 19, Excellence 20 to 24 (the 2025 exam's cut scores).