Q1. $P = 3a + 2b^2$

(a) Find the value of P when $a = 5$ and $b = -4$

.....

(2)

(b) Make a the subject of the formula.

.....

(2)
(Total 4 marks)

Q2. (a) Simplify $4a + 3c - 2a + c$

.....

(1)

(b) $S = \frac{1}{2}at^2$

Find the value of S when $t = 3$ and $a = \frac{1}{4}$

S = ...

(2)

(c) Factorise $x^2 - 5x$

.....

(2)

(d) Expand and simplify $(x + 3)(x + 4)$

.....

(2)

(e) Factorise $y^2 + 8y + 15$

.....

(2)

(Total 9 marks)

Q3. $v^2 = u^2 + 2as$

$u = 6$
$a = 2.5$
$s = 9$

(a) Work out a value of v.

$v =$ .....

(3)

(b) Make s the subject of the formula $v^2 = u^2 + 2as$

$s =$ .....

(2)
(Total 5 marks)

Q4. $P = 4k - 10$

$P = 50$

(a) Work out the value of k.

.....

(2)

$y = 4n - 3d$

$n = 2$
$d = 5$

(b) Work out the value of y.

.....

(2)
(Total 4 marks)

Q5. $F = 1.8C + 32$

(a) Work out the value of F when $C = -8$

.....

(2)

(b) Work out the value of C when $F = 68$

.....

(2)

(Total 4 marks)

M1.

	Working	Answer	Mark	Additional Guidance
(a)	$3 \times 5 + 2 \times (-4)^2$ $15 + 2 \times 16$ $15 + 32$	47	2	**M1** for $3 \times 5 + 2 \times (-4)^2$ **A1** for 47
(b)	$P - 2b^2 = 3a$ $a = (P - 2b^2) \div 3$	$a = \frac{P - 2b^2}{3}$	2	**M1** for $P - 2b^2 = 3a$ **A1** cao
				Total for Question: 4 marks

M2.

	Working	Answer	Mark	Additional Guidance
(a)		$2a + 4c$	1	**B1** $2a + 4c$ or $2(a + 2c)$
(b)	$\frac{1}{2}x \times \frac{1}{4} \times (3)^2 =$ $\frac{1}{2} \times \frac{1}{4} \times 9 = 1.125$	1.125	2	**M1** for substitution: $\frac{1}{2} \times \frac{1}{4} \times 3^2$ oe **A1** 1.125, $1\frac{1}{8}$, $\frac{9}{8}$ oe
(c)		$x(x - 5)$	2	**B2** , accept $x(x + -5)$ (**B1** for x(linear expression in x) or $x - 5$ seen)
(d)	$x^2 + 3x + 4x + 12$	$x^2 + 7x + 12$	2	**B2** for fully correct (**B1** for 3 out of 4 terms correct in working including signs, **OR** 4 terms correct, with incorrect signs).
(e)		$(y + 3) \times (y + 5)$	2	**B2** for fully correct (**B1** for $(y + a)(y + b)$ with one of $ab = 15$, $a + b = 8$)

	Total for Question: 9 marks

M3.

	Working	Answer	Mark	Additional Guidance
(a)	$v^2 = 6^2 + 2 \times 2.5 \times 9$	9	3	**M1** for correct substitution giving $6^2 + 2 \times 2.5 \times 9$ or better **M1** (dep) for $\sqrt{"81"}$ **A1** cao accept ±9 [SC: **B1** for answer of 81 if M0 scored]
(b)	$v^2 - u^2 = 2as$ **OR** $\frac{v^2}{2a} = \frac{u^2}{2a} + s$	$\frac{v^2 - u^2}{2a}$ oe	2	**B2** for $\frac{v^2 - u^2}{2a}$ oe (**B1** for $v^2 - u^2 = 2as$ oe or $\frac{v^2}{2a} = \frac{u^2}{2a} + s$ oe) Examples: $s = \frac{v^2 - u^2}{2}$ ÷ a gets **B2** $s = \frac{v^2 + u^2}{2a}$ gets **B1** $s = v^2 - u^2 - 2a$ without the intermediate $2as = v^2 - u^2$ gets B0
				Total for Question: 5 marks

M4.

	Working	Answer	Mark	Additional Guidance

(a)	$50 = 4k - 10$ $4k = 60$	15	2	**M1**for $50 = 4k - 10$ oe **A1** cao
(b)	$y = 4 \times 2 - 3 \times 5$	–7	2	**M1** for $4 \times 2 - 3 \times 5$ oe **A1** cao
				Total for Question: 4 marks

M5.

	Working	Answer	Mark	Additional Guidance
(a)	$1.8 \times -8 + 32$	17.6	2	**M1** for 1.8×-8 or –14.4 or $\frac{-72}{5}$ seen or $32 - $ '1.8×8' or $1.8 \times -8 + 32$ seen **A1** for 17.6 or $\frac{88}{5}$ or 17.60 oe
(b)	$68 = 1.8C + 32$ $1.8C = 68 - 32$ $C = 36 - 1.8$	20	2	**M1** for $68 - 32$ or 36 or $68 = 1.8C + 32$ seen; condone replacement of C by another letter. **A1** for 20 cao NB Trial and improvement score 0 or 2
				Total for Question: 4 marks

E2. This question gave students the opportunity to display their skills of algebraic manipulation and of algebraic substitution.
Usually candidates were successful on part (a), although there were many wrong answers, mainly from a misunderstanding of the relationship of the sign in a term with the term it acted on.

Part (b) had many cases of poor substitution, where, for example, $\frac{1}{4} \times 3^2$ was evaluated as $\left(\frac{1}{4} \times 3^2\right)$

Parts (c), (d) and (e) were all well done. The most common error in (c) was the difference of 2 squares misunderstanding as $(x - 5)(x + 5)$ or $(x - 2.5)(x + 25)$. The clumsy, but correct was awarded both marks.

On (d), the characteristic $x^2 + 7x + 7$ was occasionally seen and on (e) the 'factorisation' $y(y + 8) + 15$

E3. Substitution of the values of the three variables was usually good in part (a) but subsequent calculation was not. 6^2 was often seen evaluated as 12, $2 \times 2.5 \times 9$ seen was often followed by 5×18. Another very common mistake was to work out $2 \times (2.5 + 9)$.

On the occasions when the arithmetic was more accurate, some candidates failed to realise the need to find the square root, giving 81 as their answer, and some simply divided 81 by 2 as their attempt to solve $v^2 = 81$

Many candidates, in part (b), failed to understand the demand of the question and used information from part (a) to attempt a solution.

Those candidates using 'input' and 'output' machines often made errors either when dealing with the coefficient of s; separating the 2 and a incorrectly, or in the order of operations.

E4. Although part (a) was well attempted the correct answer of 15 was perhaps not as

common as might have been expected. Many of those who did not work out the correct answer gained one mark for substituting the value of P to get $50 = 4k - 10$ but then incorrectly manipulated the terms to get $4k = 50 - 10$. Thus 10 was the most common incorrect answer. Many candidates who gave an answer of 10 were unable to gain the first mark because they did not show the substitution. Some of those with a correct method failed to divide 60 by 4 correctly. In part (b) most candidates correctly substituted the given values. The majority went on to give the correct answer but some who wrote 8 – 15 gave the answer as 7 rather than –7.

E5. Specification A

Foundation

Many candidates struggled with the algebra in this question. Many attempts at substitution were spoilt by incorrect use of operations (eg 1.8 + –8 in part (a)) or incorrect transcribing of negative values. In part (b) few gained a mark for substitution by not writing the full equation; though some got as far as stating the 36. Many answers showed no working in either part.

Higher

Substitution of values into the formula was generally correct.

Subsequent errors with evaluation usually involved the -8 term where candidates often added 1.8 and -8 rather that multiplying them to give –6.2 and a final answer of 25.8 or ignored the negative sign to evaluate –8 × 1.8 as +14.4 and get 46.4 Often the operations were incorrectly ordered to give 1.8 × (–8 + 32) = 43.2 and the decimal point in 1.8 was sometimes omitted. In part (b) as in part (a) correct substitutions were often seen although some candidates missed the mark available for this by going straight to an incorrect attempt to solve. Where errors occurred in subsequent algebraic manipulation, some went on to add 32 to 68 getting 100, which they then divided by 1.8 to get 55.5555…. Others divided 68 by 1.8 before subtracting 32.

The decimal point in 1.8 was again sometimes omitted giving 2 as a final answer after 36 = 18C. Another common error was to substitute 68 for C rather than F giving F = 1.8 × 68 + 32.

Specification B

Foundation

Using the temperature conversion formula proved to be somewhat challenging, especially as the value given for *C* was negative with over 60% of the candidates scoring no marks in both parts. The starting point of replacing *C* in the formula was rewarded but a misunderstanding crept in when it came to evaluating it. From 1.8 × –8 it was not unusual to see this given as –6.2, thus ignoring the fact that the two numbers needed to be multiplied together not subtracted. For part (b) the formula needed to be rearranged using the given value of *F* to find *C*. Those who managed to deal with this produced some elegant lines of working but the majority struggled to make any headway.

Higher

This formula involving negative numbers and decimals proved a challenge for many candidates. The main issue appeared with the interpretation of the expression obtained when –8 was substituted for C and then the expression written and interpreted as 1.8 – 8 + 32 = 25.8. It is probably no accident that those candidates who wrote 1.8 × –8 + 32 tended to show more success.

Part (b) also caused problems with the order of operations required to find the value of C. However many candidates did work out 68 – 32 rather than go for the division and so picked up the method mark and then the accuracy mark.