1. (a) Solve $4(x + 3) = 6$

x = ………………….
(3)

(b) Make t the subject of the formula $v = u + 5t$

t = ………………….
(2)
(Total 5 marks)

2. Make t the subject of the formula $v = u + 5t$

t = ………………..
(Total 2 marks)

3. (a) Expand and simplify

$(x - y)^2$

....
(2)

(b) Rearrange $a(q - c) = d$ to make q the subject.

q = ...
(3)
(Total 5 marks)

4. The cost of hiring a car can be worked out using this rule.

Cost = £90 + 50p per mile

Bill hires a car and drives 80 miles.

(a) Work out the cost.

£ ....

(2)

The cost of hiring a car and driving *m* miles is *C* pounds.

(b) Complete the formula for *C* in terms of *m*.

C = ...

(2)

Zara hired a car.

The cost is £240

(c) How many miles did Zara drive?

.... miles

(3)

(Total 7 marks)

5. (a) Factorise $x^2 - 5x$

....
(2)

(b) Factorise completely $3a^2 - 6a$

....
(2)

(c) Make q the subject of the formula $P = 2q + 10$

q = ...
(2)

(d) Expand and simplify $(y + 3)(y - 4)$

....
(2)
(Total 8 marks)

6. The cost of hiring a car can be worked out using this rule.

Cost = £ 90 + 50p per mile

The cost of hiring a car and driving m miles is C pounds.

(a) Complete the formula for C in terms of m.

C = ...
(2)

Zara hired a car.

The cost is £240

(b) How many miles did Zara drive?

.... miles

(3)

(Total 5 marks)

7. This rule is used to work out the total cost, in pounds, of hiring a carpet cleaner.

Multiply the number of days' hire by 4

Add 6 to your answer

Peter hires a carpet cleaner.
The total cost is £18

(a) Work out for how many days he hires the carpet cleaner.

.... days

(2)

(b) Write down an expression, in terms of n, for the total cost, in pounds, of hiring a carpet cleaner for n days.

....

(2)
(Total 4 marks)

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

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

(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)

9. Make c the subject of the formula $a = 3c - 4$

$c =$ ....

(Total 2 marks)

10. Make t the subject of the formula $v = 5t + u$.

$t =$ ....

(Total 2 marks)

11. Make y the subject of the formula

$$x = 3y + 2$$

....
(Total 2 marks)

12. Make t the subject of the formula

$$u = 7t + 30$$

t = ...
(Total 2 marks)

13. The number of diagonals, D, of a polygon with n sides is given by the formula

$$D = \frac{n^2 - 3n}{2}$$

A polygon has 20 sides.
Work out the number of diagonals of this polygon.

....
(Total 2 marks)

14. Make p the subject of the formula $m = 3n + 2p$

p = ...
(Total 2 marks)

15. Make a the subject of the formula $s = \frac{a}{4} + 8u$

a = ...
(Total 2 marks)

16. Make c the subject of the formula $f = 3c - 4$

c = ...

(Total 2 marks)

17. Make b the subject of the formula $P = 2a + 2b$

b = ...

(Total 2 marks)

18.

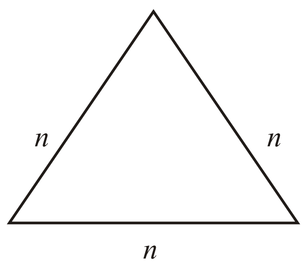

Diagram **NOT** accurately drawn

The perimeter of this equilateral triangle is P cm.
Each side of the triangle has a length of n cm.

(a) Write down a formula for P in terms of n.

....
(2)

(b) Work out the value of P when $n = 6$

P = ...
(2)
(Total 4 marks)

19. Make t the subject of the formula

$2(t - 5) = y$

t = ...
(Total 3 marks)

1. (a) -1.5 3

$4x + 12 = 6$
$4x = -6$

B1 for $4x + 12$ *or* $x + 3 = \frac{6}{4}$
M1 for a correct re-arrangement of their 3 terms to isolate 4x or x
A1 for –1.5 oe

(b) $\frac{v-u}{5}$ 2

$v - u = 5t$

M1 for isolating ± 5t or ± t or for dividing through by 5
A1 oe

[5]

2. $\frac{v-u}{5}$ 2

$v - u = 5t$

M1 for isolating ± 5t or ± t or for dividing through by 5
A1 oe

[2]

3. (a) $x^2 - xy - xy + y^2$

$x^2 - 2xy + y^2$ 2

M1 for 3 terms correct with sign, or 4 terms correct ignoring signs, or $x^2 - 2xy - y^2$
A1 cao

(b) $aq - ac = d$

$aq = ac + d$

$\frac{ac+d}{a}$ 3

B1 aq – ac
M1 for +ac or ÷ a both sides
A1 oe
OR
B2 $q - c = \frac{d}{a}$
B1 $q = \frac{d}{a} + c$, $q = d + a + c$ *oe*

[5]

4. (a) 90 + 80 × 0.50

90 + 40 = £130 2

M1 for 90 + 80 × 0.50 or 9000 + 80 × 50 or 90 + 80 × 50
A1 for 130
SC: B1 for 94 or 490 or 4090 or 13000 seen

	(b)	$90 + 0.5m$	2
		B1 for 0.5 m *B1 for 90 + "0.5m"* *NB: Ignore any £ signs*	
	(c)	$240 = 90 + 0.5m$	
		$150 = 0.5m$	3
		$= 300$	
		M1 for 240 = "90 + 0.5m" *M1 for "0.5m"= 150* *A1 for 300* ***Alternative*** *M1 for 240 – 90 or 150 seen* *M1 for "150" × 2 oe* *A1 for 300*	

[7]

5.	(a)	$x(x - 5)$	2
		B2 for x(x – 5) *(B1 for (linear expression in x))*	
	(b)	$3a(a - 2)$	2
		B2 for 3a(a – 2) *(B1 for 3($a^2 - 2a$) or a(3a – 6) or 3a(linear expression in a))*	
	(c)	$2q = P - 10$	2
		$= 1/2\ (P - 10)$	
		M1 for correctly isolating 2q or – 2q or for correctly dividing both sides by 2 or for a correct step which may follow an incorrect first step *A1 for ½ (P – 10) oe*	
	(d)	$y^2 - y - 12$	2
		B2 for $y^2 - y - 12$ *(B1 for 3 out of 4 terms in $y^2 + 3y - 4y - 12$)*	

[8]

6.	(a)	$90 + 0.5m$	2
		B1 for 0.5 m *B1 for 90 + '0.5m'* *(NB: ignore any £ signs)*	

(b) $240 = 90 + 0.5m$ 3

$150 = 0.5m$

$= 300$

M1 for 240 = ‘90 + 0.5m’
M1 for ‘0.5m’ = 150
A1 for 300
Alternative
M1 for 240 – 90 or 150 seen
M1 for ‘150’ × 2 oe
A1 for 300

[5]

7. (a) $(18 – 6) \div 4 = 3$

2

M1 for 18 – 6 or 12 or 3 × 4 + 6 or 4n + 6 = 18 or 10, 14, 18 seen
A1 for 3 cao

(b) $4n + 6$ 2

B2 for 4n + 6 or (cost =) 4n + 6
(B1 for 4n + a or bn + 6, where a and b are numbers (b ≠ 0) or n = 4n + 6 or 4n + 6 = 18 or £ 4n + 6 or 4x + 6)

[4]

8. (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* $\frac{v^2}{2a} = \frac{u}{2a} + s$ *oe)*

Examples:

$s = \frac{v^2 - u^2}{2} \div a$ *gets B2* $\quad$ $s = \frac{v^2 + u^2}{2a}$ *gets B1*

$s = v^2 - u^2 - 2a$ *without the intermediate* $2as = v^2 - u^2$ *gets B0*

[5]

9. $c = \frac{a + 4}{3}$ — 2

$a + 4 = 3c$

M1 for $a + 4 = 3c$ *OR* $\frac{a}{3} = c - \frac{4}{3}$

A1 for $c = \frac{a + 4}{3}$ *oe*

[2]

10. $\frac{v - u}{5}$ oe — 2

$v - u = 5t$

M1 for $v - u = 5t$ *or* $u - v = -5t$

A1 for $\frac{v - u}{5}$ *oe*

[2]

11. $y = \frac{x-2}{3}$ 2

$x - 2 = 3y$

M1 for a correct operation to isolate y
A1

[2]

12. $t = \frac{u-30}{7}$ 2

$7t = u - 30$

B2 for $t = \frac{(u-30)}{7}$ *oe*

(B1 for 7t = u – 30 or $\frac{u}{7} = t + \frac{30}{7}$ *or for the correct application of one of the two algebraic steps)*

[2]

13. 170 2

$\frac{20^2 \quad 3 \times 20}{2}$

M1 for sub into formula
A1 cao

[2]

14. $\frac{1}{2}(m - 3n)$ oe 2

$m - 3n = 2p$
OR
$\frac{m}{2} = \frac{3n}{2} + p$

M1 for m – 3n = 2p ***or*** *m/2 =* $\frac{3n}{2} + p$

A1 for $\frac{1}{2}(m - 3n)$ *oe*

[2]

15. $4(s - 8u) = a$ 2

$s - 8u = a/4$

M1 for $s - 8u = \frac{a}{4}$ ***OR*** $4s = a + 32u$

A1

[2]

16. $f + 4 = 3c$ or $\frac{f}{3} = c - \frac{4}{3}$

$\frac{f+4}{3}$ 2

M1 for a correct process at either stage

A1 for $\frac{f+4}{3}$ *oe*

[2]

17. $P - 2a = 2b$

Or $\frac{P}{2} = a + b$

$\frac{P-2a}{2}$ oe 2

M1 for a correct algebraic step to isolate b
A1

[2]

18. (a) $P = 3n$ 2

B2 for P = 3n oe
(B1 for P = kn oe) or 3n (oe) seen)
Note *n + 3; P + n + n + n oe gets B0*

(b) 18 2

M1 for correct substitution in their formula
A1 cao

[4]

19. $2t - 10 = y$ 3

$2t = y + 10$

$t = \dfrac{y+10}{2}$ oe

or

$t - 5 = \dfrac{y}{2}$

$t = \dfrac{y}{2} + 5$

M1 for expanding bracket 2t – 10

M1 for + 10 to both sides

A1 for $t = \dfrac{y+10}{2}$

OR

M1 for dividing both sides by 2 eg. $\dfrac{2(t-5)}{2} = \dfrac{y}{2}$ *or* $t - 5 = \dfrac{y}{2}$

M1 for +5 to both sides

A1 for $t = \dfrac{y+10}{2}$ *or* $t = \dfrac{y}{2} + 5$ *oe*

[3]

1. Over 40% of candidates obtained the correct solution to the equation in part (a) with the better candidates using an algebraic approach. Many candidates were able to multiply out the bracket correctly to give $4x + 12$ although some obtained $4x + 3$. Some did not know how to proceed beyond this first step and those that did frequently made mistakes when attempting to isolate $4x$. A significant number of candidates attempted to solve the equation by substitution and many of these attempts were unsuccessful. Part (b) was not answered well and many candidates had little idea how to change the subject of the formula. Terms were moved from one side to the other regardless of order and a surprising number of attempts involved addition or multiplication rather than the inverse operations. Some of those candidates who scored no marks might have gained one mark if they had shown two distinct stages rather than trying to do the complete re-arrangement in one step.

2. **Specification A**

Candidates generally were able to carry out the rearrangement correctly. Many wrote down the correct answer without any intermediate step. Of those candidates who scored one of the two marks, the majority approach was to carry out the division first to get $\dfrac{v}{5} = u + t$ followed by $t = \dfrac{v}{5} - u$.

Specification B

The general level of algebra was very disappointing. Only about 40% of candidates were able to score full marks. This should have been a routine question for higher level candidates. Many candidates were able to answer it correctly but many others were unable to cope with the necessary two operations. These were often carried incorrectly leading to the common incorrect answers of $t = \frac{v+u}{5}$ or $t = \frac{v}{5} - u$.

3. **Intermediate Tier**

This question was not well attempted. In part (a) candidates jumped all too readily into the misconception that the answer was merely the square of the two terms: $x^2 - y^2$. Few even attempted to derive the four necessary terms.
In part (b) it was disappointing to find so many candidates incorrectly multiplying out the bracket on the left hand side, giving the result as $aq - c$. Even the ablest candidates were unable to perform manipulation of individual terms, with minus signs commonly misplaced. Algebraic manipulation is a significant weakness.

Higher Tier

In part (a) most candidates scored at least one mark. The most common errors were $x^2 - y^2$ and $x^2 - 2xy - y^2$ with $x^2 + y^2$ also being popular.
In part (b) the most common correct approach seen was to divide both sides by a first and then add c to both sides. This was seen many times. The candidates who expanded the brackets first seemed to be less successful in carrying on scoring full marks. Some candidates carried out the operations in the wrong order, adding c to both sides and then dividing by a to get $q = \frac{d+c}{a}$

4. In part (a) most candidates realised that they needed to multiply 50p by 80 and add the result to £90. Many, though, made errors in the multiplication or in the conversion to pounds and some did not attempt to convert pence into pounds. Therefore 94, 490 and 4090 were common incorrect answers. A small number of candidates multiplied 90 by 80 as well. Disappointingly, very few candidates obtained the correct formula in part (b) as most were unable to deal with the different units. Many gave an answer of $90 + 50m$. Others ignored the 50p and gave $90 + m$. It was common for candidates to include the £ sign in their formula and some included "p" as well. Some also included words, e.g. "*m* per mile". In part (c) hardly any candidates used their equation from part (b) and the majority began by subtracting 90 from 240. The second stage in the calculation defeated most and a very common error was to ignore the different units and divide 150 by 50. An answer, however unreasonable, of 3 miles was quite common. Those who appreciated that 50p is £0.50 often divided 150 by 2.

5. As might be expected, part (a) was answered with the most success. Many candidates, though, did not understand the meaning of 'factorise'. Some of those who did identify x as the common factor gave an incorrect expression, often $x - 5x$, inside the bracket. In part (b), partially factorised expressions, i.e. $3(a^2 - 2)$ or more often $a(3a - 6)$, were almost as common as the correct answer. Part (c) was answered very poorly and provided little evidence that candidates were able to set out simple algebraic methods. Some candidates simply interchanged P and q in the formula and many gave incorrect answers such as $P - 10/2$, $P/2 - 10$ or $P - 5$ without any working. Since candidates had to perform two steps to rearrange the formula, a correct step, if seen, would have gained one mark. Part (d) was better attempted than part (c). More than a quarter of the candidates gained one mark but relatively few achieved both marks either through making a sign error in the multiplication or an error in collecting the y terms. Many candidates showed no understanding of what was required and added the two expressions or introduced an equals sign.

6. In part (a), less than half the candidates were able to write down the correct formula for C in terms of m. Common incorrect answers were $C = 90 + 50m$, $m\ (90 + 0.5)$ and $90 + m$. In part (b), most candidates were able to score at least one mark for a correct start, such as 240 – 90 (common) or 240 = 90 + '$0.5m$', but inaccurate calculations frequently marred good performance, e.g. 240 – 90 = 130 and $\frac{150}{0.5} = 75$.

7. This question was done well by most of the candidates. In part (a), the vast majority of candidates were able to find the number of days hire of the carpet cleaner. Usually by the reverse process 18 – 6 = 12 and then dividing this by 4, but some by setting up and solving the equation $4n + 6 = 18$. In part (b), most of the candidates were able to write down a suitable expression for the total cost of hire for n days, but some wrote this incorrectly as $n = 4n + 6$ or in the rearranged form as $n = (C - 6)/4$.

8. 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 × 2.5 × 9 seen was often followed by 5 × 18. Another very common mistake was to work out 2 × (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.

9. This question was very poorly done. It was rare to see an interim statement of $3c = a + 4$ and the correct answer was even more scarce. There were many attempts to move terms, but usually with a complete disregard for sign; $3c = a - 4$ occurred frequently. Sometimes this was followed by a correct division by 3, but the method mark had already been lost.
A number of weaker candidates tried to find a numerical value for *c*.

10. This was well answered by the majority of candidates. Common errors were to subtract 5 rather than divide by 5 in the final step or to confuse the signs.

11. The majority of candidates scored the available method mark even though for many it was for a follow through step in isolating y after an error of the type $3y = 2 - x$.

12. **Higher Tier**

The vast majority of candidates were able to gain some credit in this question. The most common error seen was to reverse the operations in the wrong order leading to an incorrect answer of $t = \frac{u}{7} - 30$.

Intermediate Tier

$t = 7u \pm 30$ appeared regularly, either as a first step or as an answer. Those who had some understanding of transformation of formulae often gave answers of $t = \frac{u}{7} - 30$ or $t = u - 30 \div 7$, while 37 or $37u$ were popular answers from those who had little idea. A significant number of candidates having found a correct or near correct answer then continued their algebraic manipulation to give answers such as $-23u$ and $-\frac{30u}{7}$; subsequent incorrect algebra loses previously gained marks.

13. Many candidates gained one mark for a correct substitution but then failed to get the correct answer through inaccuracies in squaring 20; 40 and 200 being the most common incorrect responses. 320 was often seen instead of 3×20 and poor arithmetic skills accounted for many errors.

14. Candidates at this level continue to be poor at rearranging formulae. Operation machines often failed through a failure to invert the order of the operations and failure to interpret 3n correctly. Common responses were to replace *p* with *m* to give $p = 3n + 2m$ and $p = m/5n$ (from $m = 5np$)

15. A quarter of candidates were unable to gain any marks on this question and only 30% of candidates gained full marks. The most common error made was to fail to multiply all terms by 4 when dealing with the fraction. The most common incorrect answer seen was $a = 4s - 8u$.

16. The majority of candidates answered this question correctly. The most common error seen came from those candidates who started by dividing by 3; in this method, just f was frequently divided by 3 and not the 4.

17. Many correct solutions were seen to this question. The most common error occurred in the first line of working when candidates, in an attempt to subtract $2a$ from P wrote $2a - P$. A minority of candidates lost the final accuracy for omitting brackets and writing their final answer as $b = P - 2a \div 2$, this error was avoided by most candidates by using fraction notation and giving their final answer as $b = \frac{P - 2a}{2}$. Some candidates achieved the correct answer but then went on to spoil their answer by incorrectly cancelling the 2s.

18. There were many and varied responses to this question. Only 29% obtained a fully correct solution to part (a) with $P = n^3$ or $n \times n \times n$ being a common incorrect response. It was also common to $P + n + n + n$ which obtained no marks as it was not a formula though if $n + n + n$ was seen on its own one mark was awarded. In part (b) candidates were more successful with 57% obtaining both marks and a further 11% gaining 1 mark for using their formula correctly.

19. Those candidates applying the rules of BIDMAS and initially expanding the bracketed term, gained one mark for a correct expansion. In many cases this was the only mark awarded as poor algebraic manipulation often followed.

$t = 25+y$was a common error by candidates transforming the formula in their heads and usually showing no working at all. Many candidates correctly wrote $2t = y + 10$ after correctly expanding the brackets but then went on to make errors with their simplification.