1. (a) Expand and simplify

$(x + y)^2$

....

(2)

(b) Hence or otherwise find the value of

$3.47^2 + 2 \times 3.47 \times 1.53 + 1.53^2$

....

(2)
(Total 4 marks)

2. (a) Show that $(2a - 1)^2 - (2b - 1)^2 = 4(a - b)(a + b - 1)$

(3)

(b) Prove that the difference between the squares of any two odd numbers is a multiple of 8.
(You may assume that any odd number can be written in the form $2r - 1$, where r is an integer).

(3)
(Total 6 marks)

3. (a) Factorise $x^2 - 3x$

....
(2)

(b) Simplify $k^5 \div k^2$

....
(1)

(c) Expand and simplify

(i) $4(x + 5) + 3(x - 7)$

....

(ii) $(x + 3y)(x + 2y)$

....
(4)

(d) Factorise $(p + q)^2 + 5(p + q)$

....

(1)
(Total 8 marks)

4. (a) Simplify $k^5 \div k^2$

....

(1)

(b) Expand and simplify

(i) $4(x + 5) + 3(x - 7)$

....

(ii) $(x + 3y)(x + 2y)$

....

(4)

(c) Factorise $(p + q)^2 + 5(p + q)$

....

(1)

(d) Simplify $(m^{-4})^{-2}$

....

(1)

(e) Simplify $2t^2 \times 3r^3t^4$

....

(2)

(Total 9 marks)

5. (a) Simplify

(i) $\dfrac{x^6}{x^2}$

....

(ii) $(y^4)^3$

....

(2)

(b) Expand and simplify $(t + 4)(t - 2)$

....

(2)

(c) Write down the integer values of x that satisfy the inequality

$$-2 \leq x < 4$$

....

(2)

(d) Find the value of

(i) $36^{-\frac{1}{2}}$

....

(ii) $27^{\frac{2}{3}}$

....

(2)

(Total 8 marks)

6. (a) Factorise $2x^2 - 7x + 6$

....

(2)

(b) (i) Factorise fully $(n^2 - a^2) - (n - a)^2$

....

n and a are integers.

(ii) Explain why $(n^2 - a^2) - (n - a)^2$ is always an even integer.

....

....

....

(4)
(Total 6 marks)

7. (a) Simplify

(i) $x^4 \times x^5$

....

(ii) $\frac{p^8}{p^3}$

....

(iii) $3s^2 t^3 \times 4s^4t^2$

....

(iv) $(q^3)^4$

....

(5)

(b) Expand $3(2g - 1)$

....

(1)

(c) Expand $2d(d + 3)$

....

(2)

(d) Expand and simplify $(x + 2)(x + 3)$

....
(2)
(Total 10 marks)

8. (a) Simplify fully $(3x^2y^4)^3$

....
(2)

(b) Expand and simplify $(2x + 5)(3x – 2)$

....
(2)

(c) Simplify fully $\dfrac{x^2 + 5x + 6}{x^2 + 2x}$

....
(2)
(Total 6 marks)

9. (a) Expand and simplify $(2x + 5)(3x – 2)$

....
(3)

(b) Given that $x^2 + 6x - 5 = (x + p)^2 + q$ for all values of x,

find the value of

(i) p,

(ii) q.

p = ...

q = ...

(3)

(Total 6 marks)

10. (a) Expand $x(3 - 2x^2)$

....

(2)

(b) Factorise completely $12xy + 4x^2$

....

(2)

(c) Simplify $\frac{20a^2}{4ab^2}$

.... **(2)**

(d) Simplify $\frac{x-3}{x^2-9}$

.... **(2)**

(Total 8 marks)

11. (i) Expand and simplify

$n^2 + (n + 1)^2$

....

n is a whole number.

(ii) Prove that $n^2 + (n + 1)^2$ is always an odd number.

(Total 4 marks)

12. For all values of x,

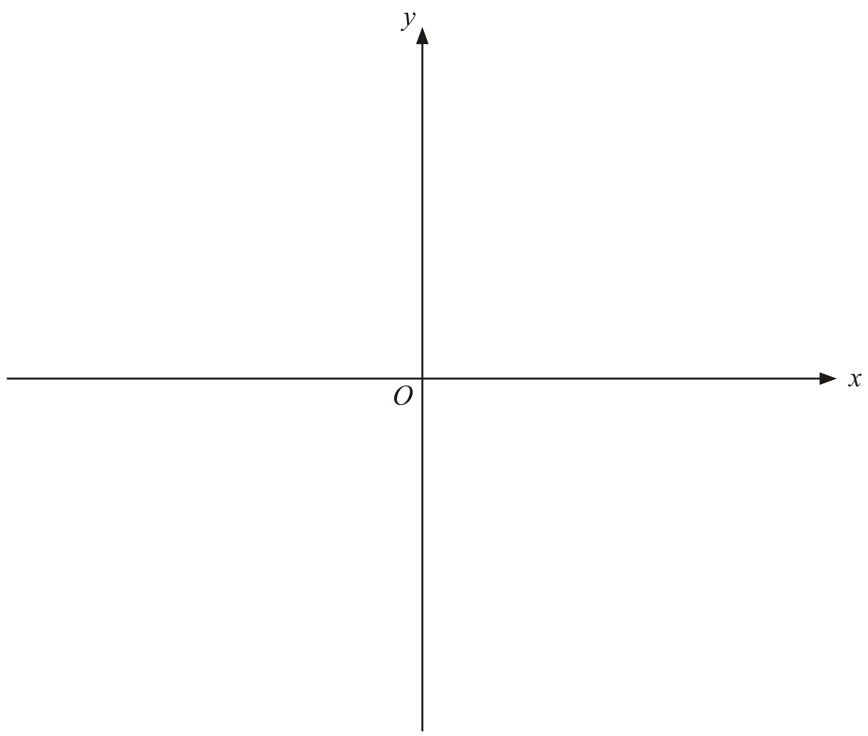
$$x^2 - 6x + 15 = (x - p)^2 + q$$

(a) Find the value of p and the value of q.

p = ... , q = ...

(2)

(b) On the axes, draw a sketch of the graph $y = x^2 - 6x + 15$



(2)
(Total 4 marks)

13. (a) Expand and simplify $(x + 3)(x - 4)$

....

(2)

(b) Expand and simplify $(2x + 5)(3x - 4)$

....

(2)

(c) Factorise $x^2 + 7x + 10$

....

(2)

(d) Simplify fully $3p^5q \times 4p^3q^2$

....

(2)

(e) $p = 3t + 4(q - t)$

Find the value of q when $p = 6$ and $t = 5$

q = ...

(3)

(Total 11 marks)

14. (a) Factorise completely $3a^2 - 6a$

....

(2)

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

q = ...

(2)

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

....

(2)

(d) Factorise $4p^2 - 9q^2$

....

(2)
(Total 8 marks)

15. (a) Factorise fully $6x^2 + 9xy$

....

(2)

(b) Expand and simplify $(2x + 5)(x - 2)$

....

(2)
(Total 4 marks)

16. (a) Expand and simplify

$(x - 6)(x + 4)$

....

(2)

(b) Factorise completely

$12x^2 - 18xy$

....

(2)

(Total 4 marks)

17. (a) Simplify $k^5 \div k^2$

....

(1)

(b) Expand and simplify $4(x + 5) + 3(x - 7)$

....

(2)

(Total 3 marks)

18. (a) Expand and simplify $(3x + 2)(4x + 1)$

....

(2)

(b) Factorise completely $3x^2 + 6xy$

....
(2)
(Total 4 marks)

19. (a) Simplify

(i) $x^4 \times x^5$

……………………

(ii) $\frac{p^8}{p^3}$

……………………

(iii) $3s^2t^3 \times 4s^4t^2$

……………………

(iv) $(q^3)^4$

……………………
(5)

(b) Expand $2d(d + 3)$

……………………
(2)
(Total 7 marks)

20. Expand and simplify $(2x + 5)(3x - 2)$

……………………

(Total 2 marks)

l À**21.** (a) Simplify $4e \times 3f$

....

(1)

(b) Factorise $5x + 15$

....

(1)

(c) Simplify $2(r + 3) + 3(2r + 1)$

....

(2)

(Total 4 marks)

22. Expand and simplify $(3x - 5)(x + 1)$

....

(Total 2 marks)

23. (a) Factorise $8p - 6$

....

(1)

(b) Factorise completely $y^3 - y^2$

....

(2)

(c) Expand and simplify $(e + 3)(e + 4)$

....

(2)
(Total 5 marks)

24. Prove that $(n + 2)^2 – (n – 2)^2 = 8n$ for all values of n.

(Total 2 marks)

25. (a) Expand $3(5p – 2)$

....

(1)

(b) Expand and simplify $3(2x + 1) + 2(3x - 1)$

....

(2)

(c) Factorise $a^2 - 16a + 64$

....

(2)
(Total 5 marks)

26. (a) Expand $3(x + 2)$

....

(1)

(b) Factorise $5t + 20$

....

(1)
(Total 2 marks)

27. Expand and simplify $3(2x + 5) + 4(3x + 1)$

....

(Total 2 marks)

28. Expand and simplify $(3x + 4)(5x - 1)$

....

(Total 2 marks)

29. Expand and simplify

$$(x + 3y)(x - 4y)$$

$x^2 + xy - 7y^2$	$x^2 - xy - 12y^2$	$x + xy - 12y$	$x^2 + xy - 12y^2$	$x^2 - 7xy - 12y^2$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

30. Expand $(2x + 5y)(3x - 2y)$

$5x^2 + 8xy - 7y^2$	$6x^2 + 12xy - 10y^2$	$5x^2 + 4xy - 7y^2$	$6x^2 - 4xy - 10y^2$	$6x^2 + 11xy - 10y^2$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

31. Expand and simplify $(3x - 2y)^2$

A	B	C	D	E
$9x^2 - 4y^2$	$9x^2 + 4y^2$	$9x^2 - 12xy + 4y$	$9x^2 + 12xy - 4y^2$	$9x^2 - 12xy + 4y^2$

(Total 1 mark)

32. $(2x + 1)(x - 3) =$

A	B	C	D	E
$2x^2 + 5x - 3$	$2x^2 - 2x - 3$	$2x^2 + 2x - 3$	$2x^2 - 5x - 3$	$2x^2 - 5x + 3$

(Total 1 mark)

33. $(2x+y)(3x-2y) =$

A	B	C	D	E
$6x^2+xy-2y^2$	$6x^2-xy-2y$	$6x^2-xy-2y^2$	$6x-xy-2y^2$	$6x^2+7x-2y^2$

(Total 1 mark)

34. Expand and simplify $(2e - 5f)^2$

A	B	C	D	E
$4e^2-25f^2$	$4e^2-10ef+25f^2$	$4e^2+25f^2$	$4e^2-20ef-25f^2$	$4e^2-20ef+25f^2$

(Total 1 mark)

35. Expand and simplify $(2x - 1)(5x + 3)$

....

(Total 3 marks)

36. (a) Expand and simplify $2(x + 3) + 3(x + 6)$

....

(2)

(b) Factorise completely $3y^2 - 12y$

....

(2)

(c) Factorise $t^2 - 16$

....

(1)
(Total 5 marks)

37. $(2x - 7)(x - 3) =$

$2x^2 - 13x + 21$	$2x^2 + 21$	$2x^2 - 21$	$2x^2 + 13x + 21$	$2x^2 + 4x + 21$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

38. Expand and simplify $(2x - 5)^2$

$100x^2$	$4x^2 - 25$	$4x^2 + 25$	$4x^2 - 20 + 25$	$4x^2 + 20x + 25$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

39. (a) Expand and simplify $(y + 2)(y + 3)$

....

(2)

(b) Simplify $\dfrac{3(x-2)}{x^2-7x+10}$

....

(2)
(Total 4 marks)

40. $(x + 3)^2 =$

$x^2 + 9$	$x^2 + 6x + 9$	$2x + 6$	$x^2 + 3x + 9$	$x^2 + 6x + 6$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

41. Expand and simplify $(3x + 2y)(4x - 5y)$

$7x^2 - 7xy - 10y^2$	$7x^2 - 7xy - 10y$	$12x^2 - 7xy - 10y$	$12x^2 - 7xy - 10y^2$	$12x^2 + 7xy - 10y^2$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

42. $(2x - 3y)(3x + 2y) =$

$6x^2 - 6y^2$	$6x^2 - 5xy - 6y^2$	$6x^2 - xy - 6y$	$6x^2 - 5xy - 6y$	$6x^2 + xy - 5y^2$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

43. $(2x + 3)^2 - (2x + 3)(x - 1) =$

$(2x + 3)(x + 2)$	$x + 6$	$2x^2 + x + 6$	$2x^2 - x + 12$	$(2x + 3)(x + 4)$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

1. $x^2 + 2xy + y^2$ 2

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

M1 for at least 3 of the 4 terms correct
A1 cao

25 2

M1 for recognising 3.47 + 1.53 (= 5)
A1 cao

[4]

2. (a) AG 3

$4a^2 - 4a + 1 - (4b^2 - 4b + 1) =$
$4(a^2 - b^2) - 4(a - b)$
$4(a - b)(a + b - 1)$

OR
$((2a - 1) - (2b - 1))((2a - 1) + (2b - 1))$
$(2a - 2b)(2a + 2b - 2)$

Expansion Method
M1 for a correct expansion of any one of the three terms
M1(dep) on an attempt to expand all 3 terms and show LHS = RHS
A1 fully correct algebra
RHS exp is $4(a^2 + ab - a - ba - b^2 + b)$

OR Factorisation Method
M1 for attempt to use difference of 2 squares on LHS
M1 for one bracket correctly simplified
A1 fully correct

(b) 3

Any 2 odd square numbers have the above form

If a and b are both even or odd then $a - b$ is even,
so $4(a - b)$ is a multiple of 8
If one of a,b is odd, then $a + b - 1$ is even,
so $4(a + b - 1)$ is a multiple of 8

B1 'any 2 square nos have the above form' (may be implied by sight of $(2a - 1)^2 - (2b - 1)^2$ in part (b))
B1 first reason
B1 second reason

SC B1 for $(2r + 1)^2 - (2r - 1)^2$
B1 for 8r

[6]

3. (a) $x(x - 3)$ 2

B2 for $x(x - 3)$
(B1 for x (…….))

(b) k^3. 1

B1 for k^3.

(c) (i) $7x - 1$ 4

$4x + 20 + 3x - 21$

*M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better)*
A1 for $7x - 1$

(ii) $x^2 + 5xy + 6y^2$

$x^2 + 3xy + 2xy + 6y^2$

*M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$*
A1 for $x^2 + 5xy\ 6y^2$

(d) $(p + q)(p + q + 5)$ 1

B1 for $(p + q)(p + q + 5)$

[8]

4. (a) k^3. 1

B1 for k^3.

(b) (i) $7x - 1$ 4

$4x + 20 + 3x - 21$

*M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better)*

A1 for $7x - 1$

(ii) $x^2 + 5xy + 6y^2$

$x^2 + 3xy + 2xy + 6y^2$

*M1 for **three** of 4 terms $x^2 + 3xy + 2xy + 6y^2$*

A1 for $x^2 + 5xy + 6y^2$

(c) $(p + q)(p + q + 5)$ 1

B1 for $(p + q)(p + q + 5)$

(d) m^8 1

B1 for m^8.

(e) $6r^3t^6$ 2

B2 for $6r^3t^6$

(B1 for .....r^3t^6 or for 6...t^6)

[9]

5. (a) (i) x^4 1

B1 cao

(ii) y^{12} 1

B1 cao

(b) $t^2 + 2t - 8$ 2

B2 for fully correct

(B1 for 3 out of 4 terms from $t^2 + 4t - 2t - 8$)

(c) $-2, -1, 0, 1, 2, 3$ 2

B2 for fully correct

(B1 for $-2, -1, 0, 1, 2, 3$ with either -2 omitted or 4 included, or both, or any five integers correct only and no incorrect integers)

(d) (i) $\frac{1}{6}$ 1

B1 cao accept $\pm\frac{1}{6}$ or $-\frac{1}{6}$

(ii) 9 1

$27^{\frac{2}{3}} = (3)^2$

B1 cao

[8]

6. (a) $(2x - 3)(x - 2)$ 2

B2 cao

B1 $(2x - a)(x - b)$, where $ab = 6$

(b) (i) $(n - a)(n + a - (n - a))$

or

$n^2 - a^2 - (n^2 - 2an + a^2)$

$2a(n - a)$ 2

M1 for $(n - a)(n + a)$ seen

A1 cao

or M1 for $n^2 - 2an + a^2$ seen

A1 cao

(ii) a and $n - a$ are integers
$2 \times n \times (n - a)$ is even — 2

M1 dep for identifying n – a as an integer or multiplying by 2 gives an even number or
M1 dep for identifying an or a^2 as an integer, or for the difference of two even numbers is an even number
A1 correct proof

[6]

7. (a) (i) x^9 — 1

B1 cao

(ii) p^5 — 1

B1 cao

(iii) $12\, s^6\, t^5$ — 2

B2 cao
(B1 for two of 12, s^6, t^5 in a product)

(iv) q^{12} — 1

B1 cao

(b) $6g - 3$ — 1

B1 cao

(c) $2d^2 + 6d$ — 2

B2 cao (B1 for $2d^2$ or 6d)

(d) $x^2 + 3x + 2x + 6$ — 2
$x^2 + 5x + 6$

B2 for $x^2 + 5x + 6$
(B1 for 3 out of 4 parts correct in working)

[10]

8. (a) $27x^6y^{12}$
$27x^6y^{12}$ — 2

B2 for fully correct
B1 for 2 of 27, x^6, y^{12} correct in a 3 term product

(b) $6x^2 + 15x - 4x - 10$
$6x^2 + 11x - 10$ 2
B2 for fully correct
(B1 for 3 out of 4 terms correct in working including signs or 4 terms correct, incorrect signs)

(c) $\frac{(x+2)(x+3)}{x(x+2)}$
$\frac{x+3}{x}$ 2
B2 for $\frac{x+3}{x}$
(B1 for x(x + 2) or (x + 2)(x + 3) seen)

[6]

9. (a) $6x^2 - 4x + 15x - 10$ 3
$= 6x^2 + 11x - 10$
M2 for 3 of 4 terms $6x^z - 4x + 15x - 10$ *correct*
(M1 for 2 terms correct)
A1 for $6x^2 + 11x - 10$

(b) (i) $(x + 3)^2 - 3^2 - 5$ 3
$p = 3$
B1 for p = 3
M1 for an attempt to factorise, eg $(x \pm 3)^2 \pm 3^3$

(ii) $(x + 3)^2 - 14$
$q = -14$
A1 for q = –14

[6]

10. (a) $x \times 3 - x \times 2x$
$= 3x - 2x^3$ 2
B2 cao
(B1 for a two term expression with either 3x or $2x^3$*)*

(b) $4x(3y + x)$ 2
M1 for taking out a factor of x, 2x, 2, 4 or 4x
A1 cao

(c) $\frac{5a}{b^2}$ 2

B2 for $\frac{5a}{b^2}$ *or* $5ab^{-2}$ *(accept* $\frac{5a}{1b^2}$*)*

(B1 for either dealing with the numbers or dealing with the powers of a)

(d) $\frac{\cancel{x-3}}{\cancel{(x+3)}\,(x+3)}$

$\frac{1}{x+3}$ 2

M1 for (x – 3)(x + 3)

A1 cao

[8]

11. (i) $n^2 + (n + 1)^2 = 2(n^2 + n) + 1$

$2n^2 + 2n + 1$

M1 for at least 3 terms correct from $n^2 + n + n + 1$

A1 for $2(n^2 + n) + 1$ *oe*

(ii) $2(n^2 + n)$ is always even so $2(n^2 + n) + 1$ is always odd

M1 for recognizing $2n^2$ *is always even*

A1ft complete proof for their quadratic

Alternative method

M1 for recognizing that if n^2 *is odd then* $(n + 1)^2$ *is even or vice versa*

A1 for complete proof

[4]

12. (a) $(x + 3)^2 - 3^2 + 15$

$p = 3, q = 6$ 2

B2 for p = 3 and q = 6

(B1 for p = 3 OR q = 6)

SC: award B2 for $(x + 3)^{2+}$ *6 if p <u>and</u> q are not identified*

(b) Sketch 2

B1 for U shaped curve

B1 ft for TP in first quadrant (ft if TP not in first quadrant)

[4]

13. (a) $x^2 - 4x + 3x - 12$

$= x^2 - x - 12$

$x^2 - x - 12$ 2

M1 for exactly 4 terms correct ignoring signs (x^2, 4x, 3x, 12)

or 3 out of 4 terms with correct signs (x^2, –4x, +3x, –12)

A1 cao

(b) $6x^2 - 8x + 15x - 20 = 6x^2 + 7x - 20$

$6x^2 + 7x - 20$ 2

M1 for exactly 4 terms correct ignoring signs ($6x^2$, 8x, 15x, 20)

or 3 out of 4 terms with correct signs ($6x^2$, –8x, +15x, –20)

A1 cao

(c) $(x + 2)(x + 5)$ 2

B2 cao

(B1 for exactly one of (x + 2), (x+ 5))

(d) $12p^8q^3$ 2

B2 cao

(B1 for any 2 out of 3 terms correct in a product

or 3 terms correct in a sum or part product)

(e) $6 = 15 + 4(q-5)$

$6 = 15 + 4q - 20$

$11 = 4q$

$= 2\frac{3}{4}$ 3

M1 for correct substitution of p and t.

M1 for correct expansion of 4(q – t) oe (eg 4q – 20, 4q – 4t)

A1 11/4 or 2 ¾ or 2.75

or

M1 for correct substitution of p and t.

M1 for $\frac{p-3t}{4} = q - t$ *oe*

A1 11/4 or 2 ¾ or 2.75

[11]

14.	(a)	$3a(a - 2)$	2	
		B2 for 3a(a – 2) *(B1 for $3(a^2 - 2a)$ or a(3a – 6) or 3a(linear expression in terms of a))*		
	(b)	½ $(P - 10)$	2	
		M1 for correctly isolating 2q or –2q correctly dividing both sides by 2 or for a correct second step which may follow an incorrect first step *A1 for ½ (P – 10) oe*		
	(c)	$y^2 + 3y - 4y - 12 = y^2 - y - 12$	2	
		B2 for $y^2 - y - 12$ *(B1 for 3 out of 4 terms in $y^2 + 3y - 4y - 12$)*		
	(d)	$(2p + 3q)(2p - 3q)$	2	
		M1 for $(2p \pm 3q)(2p \pm 3q)$ or $(2p)^2 - (3q)^2$ *A1 for (2p + 3q)(2p – 3q)*		
				[8]

15.	(a)	$3x(2x + 3y)$	2	
		B2 for fully correct (accept (3x – 0)(2x + 3y) *(B1 for x(6x + 9y) or $3(2x^2 + 3xy)$ or 3x(a linear expression in x and y)*		
	(b)	$2x^2 - 4x + 5x - 10$		
		$2x^2 + x - 10$	2	
		B2 for $2x^2 + x - 10$ *(B1 for 3 out of 4 terms correct, with correct signs, or the 4 terms $2x^2$, 4x, 5x and 10 seen, ignoring signs)*		
				[4]

16. (a) $x^2 - 2x - 24$ 2

$x^2 - 6x + 4x - 24$

M1 for any 3 terms correct
A1 cao

(b) $6x(2x - 3y)$ 2

B2 for 6x(2x – 3y)
(B1 for either x(12x – 18y) ***OR***
2x(6x – 9y) ***OR*** *3x(4x – 6y)*
OR *6x(ax – by) where either a ≠ 2 or b ≠ 3*

[4]

17. (a) k^3 1

B1 for k^3

(b) $7x - 1$ 2

$4x + 20 + 3x - 21$

M1 for ***three*** *of 4 terms 4x + 20 + 3x − 21 (or better)*
A1 for 7x − 1

[3]

18. (a) $12x^2 + 11x + 2$ 2

$12x^2 + 8x + 3x + 2$

M1 for expansion (condone one error)
A1 cao

(b) $3x(x + 2y)$ 2

B2 cao
(B1 for 3x(   ) or __(x + 2y) or $3(x^2 + 2xy)$ *or x(3x + 6y))*

[4]

19. (a) (i) x^9 1

B1 cao

(ii) p^5 1

B1 cao

(iii) $12\,s^6\,t^5$ 2

B2 cao
(B1 for two of 12, s^6, t^5 *in a product)*

(iv) q^{12} 1

B1 cao

(b) $2d^2 + 6d$ *2*

B2 cao

(B1 for $2d^2$ or 6d)

[7]

20. $6x^2 - 4x + 15x - 10$

$6x^2 + 11x - 10$ 2

B2 for fully correct

(B1 for 3 out of 4 terms correct in working, including signs or 4 terms correct, incorrect signs)

[2]

21. (a) $12ef$ 1

B1 cao

(b) $5(x + 3)$ 1

B1 cao

(c) $8r + 9$ 2

M1 for 2r + 6 + 6r + 3 ***or*** *8r* ***or*** *9*

A1 cao

[4]

22. $3x^2 + 3x - 5x - 5$ 2

$3x^2 - 2x - 5$

B2 cao

(B1 for 4 correct terms or 3 of 4 terms correct condoning incorrect signs)

[2]

23. (a) $2(4p - 3)$ 1

B1 cao

(b) $y^2(y - 1)$ 2

B2 for $y^2(y - 1)$ or $(y^2 + 0)(y - 1)$

(B1 for $y(y^2 - y)$ or $(y + 0)(y^2 - y)$)

SC: Award B1 for $y^2(y - 0)$ or $y^2(y + 1)$

(c) $e^2 + 7e + 12$ 2

M1 for 3 out of the 4 terms e^2, 4e, 3e, 12 correct or $e^2 + 7e + k$

A1 cao

[5]

24. $n^2 + 4n + 4 - (n^2 - 4n + 4)$ 2

$= n^2 + 4n + 4 - n^2 + 4n - 4$

$= 8n$

M1 for either $n^2 + 2n + 2n + 4$ or $n^2 - 2n - 2n + 4$ oe

A1 for showing that terms reduce to 8n

[2]

25. (a) $15p - 6$ 1

B1 for $15p - 6$

(b) $6x + 3 + 6x - 2$

$= 12x + 1$ 2

B2 for $12x + 1$

(B1 for 12x or + 1 or $6x + 3$ or $6x - 2$)

(c) $(a - 8)(a - 8)$ 2

B2 for $(a - 8)(a - 8)$ or $(a - 8)^2$

(B1 for a in both brackets and two numbers multiplying to 64 or –64)

Condone the missing trailing bracket.

26. (a) $3x + 6$ 1

B1 for $3x + 6$ oe

(b) $5(t + 4)$ 1

B1 for $5(t + 4)$ oe

[2]

27. $6x + 15 + 12x + 4$ 2
$= 18x + 19$

M1 for 6x + 15 or 12x + 4 seen
A1 for 18x + 19 oe (eg. 19 + 18x, 18 × x + 19)

[2]

28. $15x^2 - 3x + 20x - 4$ 2

	$3x$	4
$5x$	$15x^2$	$20x$
-1	$-3x$	-4

$15x^2 + 17x - 4$

B2 cao
(B1 for 4 correct terms with or without signs, or 3 out of no more than 4 terms, with correct signs. The terms may be in an expression or in a table, etc.)

M1 can be awarded for all 4 of $15x^2$, 20x, 3x and 4 seen irrespective of sign.
M1 can be awarded for any 3 of $15x^2$, 20x, –3x and –4 seen.
Note: 20x implies +20x

[2]

29. B

[1]

30. E

[1]

31. E

[1]

32. D

[1]

33. C

[1]

34. E

[1]

35. $2x(5x + 3) - (5x + 3) = 10x^2 + 6x - 5x - 3$

Or

×	$2x$	-1
$5x$	$10x^2$	$-5x$
$+3$	$6x$	-3

$10x^2 + x - 3$ 3

M1 for $2x(5x + 3) - (5x + 3)$ or $2x \times 5x + 2x \times 3 -1 \times 5x + -1 \times 3$

A1 for exactly 4 terms correct ignoring signs (eg $10x^2$, $6x$, $5x$, 3) or 3 correct terms out of no more than 4 terms with correct signs (ie 3 out of $10x^2$, $+6x$, $-5x$, -3)

A1 cao

[3]

36. (a) $2x + 6 + 3x + 18$

$5x + 24$ 2

M1 for $2 \times x + 2 \times 3$ or for $3 \times x + 3 \times 6$

A1 for $5x + 24$ cao

(b) $3y(y - 4)$ 2

M1 for $3y(ay - b)$ or for $3(ay^2 - by)$ or for $y(3y - 12)$

A1 for $3y(y - 4)$ cao

(c) $(t - 4)(t + 4)$ 1

B1 for $(t - 4)(t + 4)$ oe

[5]

37. A

[1]

38. D

[1]

39. (a) $y^2 + 3y + 2y + 6$

$y^2 + 5y + 6$ 2

M1 for 3 terms out of y^2, $3y$, $2y$, 6
or $y^2 + 5y$ (+ c) or (dy^2 +)$5y + 6$
A1 for $y^2 + 5y + 6$

(b) $\frac{3(x-2)}{(x-2)(x-5)}$

$\frac{3}{x-5}$ 2

M1 for $(x \pm 2)(x \pm 5)$
A1 cao

[4]

40. B

[1]

41. D

[1]

42. B

[1]

43. E

[1]

1. Paper 3

It is disappointing that so few candidates were able to make a reasonable attempt at the expansion of the brackets. Predictably $x^2 + y^2$ was the most common (incorrect) answer seen. No candidates appeared to make the connection between the two parts. Instead there were many long attempts at quite complex long multiplication solutions, most unsuccessful.

Paper 5

Many candidates were able to correctly expand the double brackets but some then had problems simplifying the 'middle two' terms. Only a minority saw the connection between the two parts and frequently embarked on three long multiplications with very little success. Some of those who spotted the connection unfortunately made a subsequent basic error and wrote "$(3.47 + 1.53)^2 = 6^2 = 36$."

2. Part (a) once again exposed weaknesses in algebra. There were first of all the candidates who thought that expanding the square meant just squaring the first term and then squaring the second term. Further, the square of $2a$ is $2a^2$ and the expansion of the left-hand side yields $4a^2 - 4a + 1 - 4b^2 - 4b + 1$.
Candidates also found difficulty with the right hand side. Some could not deal with the 4 correctly, but the major error from those that knew something, was to get the sign of the *b* term wrong.
A few candidates saw the connection between this part and part (b). Only the very best were able to reason why the expression on the right hand side should be a multiple of 8, but many managed to get partial credit by arguing that it was a multiple of 4. An interesting approach, which appeared on occasions, was to consider the difference between consecutive odd squares. This also gained partial credit as by arguing that any two odd squares are connected by a sequence of consecutive odd square numbers, a candidate could have obtained full marks.
It was disappointing to see so many candidates writing $(2r - 1)^2 - (2r - 1)^2$ where clearly they had not understood the basic rule of algebra, that the same letter in an algebraic expression always carries the same value.

3. Only about one quarter of the candidates factorised $x^2 - 3x$ correctly in part (a). Many candidates did not seem to know what was required and few of those not gaining both marks recognised that *x* was a common factor. Candidates were more successful in part (b) but there were a surprising number who did not know what to do and both $k3$ and $k^{2.5}$ were common incorrect answers. In part (c) many candidates correctly expanded the brackets in (i) to produce three or four correct terms but the resulting expression was often simplified incorrectly. A common mistake was for +20 –21 to become +41. Fewer correct answers were seen in (ii) and a common incorrect answer to this part was $2x+5y$. Many of the candidates who knew what to do obtained three correct terms and gave the fourth term as $6y$ or $5y^2$. When three or four terms were obtained there was a good success rate with collecting like terms. Correct answers to part (d) were extremely rare. Some of those who appeared to know how to factorise the expression failed to use brackets correctly and wrote $p + q(p + q +5)$.

4. Mathematics A Paper 7

In this algebraic expressions question the vast majority of candidates obtained the correct answer to part (a), the method marks in part (b) and, less so, a mark in part (e). The common errors were writing “$6y$” instead of “$6y^2$” in the expansion in part (b)(ii), expanding everything in (c) and then ‘moving on’, writing m^{-6} as the wrong answer to part (d) and failing to simplify “2 × 3” as “6” in the final part.
In part (c), which was answered badly, some of the better attempts failed to gain the mark because the brackets were missing around the common factor with answers being left as “$p+q(p+q+5)$”

Mathematics B Paper 18

Part (a) was answered correctly by the vast majority of candidates. Part (bi) was mostly answered correctly. In (bii) $3y \times 2y$ was frequently evaluated as $6y$ rather than $6y^2$. Parts (c) and (d) were poorly done; only a very few correct answers were seen. In part (e), the common error was to leave the answer as $2t^6 \times 3r^3$. Some candidates erroneously introduced an addition sign into the expression.

5. This was a straightforward question that tested candidates knowledge of a range of algebraic topics. About 70% of candidates were able to cope correctly with the powers in part (a) and 75% were able to correctly multiply out a pair of brackets in part (b) whilst nearly 80% were able to list the correct integers in a combined inequality in part (c). Candidates were not so successful in dealing with negative and fractional indices with 50% success in raising 36 to the power of – ½ and 55% in identifying 9 as 27 to the power two thirds.

6. About half the candidates were able to gain at least one mark for part (a).
A common mistake here was $(2x–1)(x–6)$.
Only the best candidates were able to make any progress with part (b). Some could expand $(n–a)^2$ correctly, but a significant number gave the answer as $n^2–2na–a^2$ or $n^2–2na–a$or $n^2 –2na–2a$.
In context, few candidates could expand $–(n–a)^2$. The alternative approach of factorising $n2 –a^2$ was seen rarely. Only the very best could give a complete explanation of why the expression was an even integer, but many commented that a number multiplied by 2 must be even.

7. This was a question which tested basic algebraic techniques and as such was answered very well by the vast majority of candidates. In 6(a) parts (i) and (ii) were very well answered. The most common error on part (i ii) was to add the 4 and 3 to give an answer of $7s^6t^5$. Part (iv) was also well answered, although incorrect attempts such as q^7or $4q^{12}$ were often seen.
Part (b) was very well answered, as was part (c).
Part (d) was well answered, with only a very few students unable to access the question.

8. All 3 parts were straightforward tests of algebraic manipulation. All parts were answered correctly by many candidates. In part (a) the main error was with the 3 where answers of $3x^6y^{12}$ and $9x^6y^{12}$ were common. On part (c) some candidates simplified correctly to $\frac{x+3}{x}$ but then went on to 'simplify' to 3.

9. Many candidates were able to score full marks for the expansion of the brackets in part (a). Errors in signs were less common than working out the product of $2x$ and $3x$ as $5x^2$ or $6x$.In part (b), some candidates were able to score 1 mark for $p = 3$, but only the best candidates were able to complete the square successfully to find the value of q. Many expanded the brackets, but did not go on to equate coefficients and solve the resulting simultaneous equations.

10. Part (a) was done well. Most candidates were able to obtain the $3x$ term, but errors in obtaining the $2x^3$ term were frequent- typically this term was written as $3x$, $3x^2$, $2x^2$ or $6x^2$. Some candidates knew the method for expanding brackets but were unable to complete the algebra, thus leaving their final answer as $x \times 3 - x \times 2x^2$

A small number of candidates expanded the brackets correctly but then went on to 'simplify' their expression further. Common incorrect final answers here were x^2, $-x^2$, x^3, $-x^3$, $1x^{-2}$

Most candidates were able to score at least 1 mark in part (b). The requirement to use brackets was understood and if not fully factorised many were able to extract at least one common factor, usually $4(3xy + x^2)$ or $x(12y + 4x)$.

Those candidates that chose to show their working in part (c) were often able to gain a mark for either simplifying the numbers or simplifying the terms in a, but many candidates went straight to the answer, typically writing $5ab^2$. Another popular error was to cancel the square from the a with the square from the b, i.e. going from $5a^2/ab^2$ to $5a/ab$. A significant number of candidates showed separately that $20/5 = 4$ and $a^2/a = a$ but then wrote their final answer as $5ab^2$

In part (d), only the best candidates were able to score full marks on this question. A surprising number of candidates, having correctly factorised the denominator and correctly cancelled the common factor from both, the numerator and the denominator, and then went on to give their final answer as $x + 3$. By far the most common method was to cancel like terms from both the numerator and the denominator to achieve variations of $\frac{\not{x} - \not{3}}{x^2 - \not{9}^3} = \frac{1}{x-3}$

11. Part (i) was done well by many candidates, though the expansion of $(n + 1)^2$ and/or the subsequent simplification of the expression proved difficult for some. A common error here was to expand $(n + 1)^2$ as $(n + 1) + (n + 1)$, or as $n^2 + 1$, or as $n^2 + n + n + 2$. It was not uncommon to see $n^2 + n^2$ simplified as n^4.

In part (ii), many candidates were able to use the simplified expression in part (i), or the original expression from the question, to give a detailed argument of why it was always odd; but, as with an earlier question, the difference between 'show' and 'prove' was not clear to some candidates. It was common to see substitutions for an even value of *n,* and then an odd value of *n,* followed by a comment that hence it must be true. Other incorrect answers included the popular misconception that 'the value of n^2 is always even (or odd)' and that 'adding 1 to any number makes it odd'.

12. Only the best candidates were able to gain any marks in part (a) of this question. A significant number of those candidates who, having correctly completed the square as $(x – 3)^2 + 6$, gave their final answer as $p = −3$, $q = 6$.

In part (b), many candidates were able to score at least 1 mark for drawing a U shaped curve (usually symmetrically in the *y*-axis). Few candidates appreciated the connection between parts (a) and (b), and simply calculated and then plotted the coordinates of points on the curve. Common errors here were to sketch an n shaped curve, a straight line or a cubic curve.

13. Parts (a) to (d) were straightforward tests of algebraic manipulation. Generally, these were carried out well, with few errors. There were some difficulties with part (d) with answers such as pq$(3p^4 \times 5p^2q)$, $7p^8q^3$ and $12p^8 + q^3$.

Part (e) proved more of a challenge for weaker candidates. There are essentially two approaches; the first approach involves rearranging the algebra to $q = \frac{p - 3t + 4t}{4}$ and then substituting for *p* and *t.* This gives the value of *q* directly. The second approach is to substitute for *p* and *t* first and then to solve the resulting equation. The second approach proved to be more popular and was generally successful. However, many candidates made a BIDMAS error of $6 = 15 + 4(q – 5) \Rightarrow 6 = 19(q – 5)$.

14. Part (a) was answered well by about half the candidates, and many were able to achieve a mark for partially factorising either the 3 or the *a*. Common errors were $3a(a – 3)$ and $3a(a + 2)$

Part (b) was done well by many candidates. Candidates should be encouraged to show all stages in an algebraic manipulation. A significant number of candidates simply wrote down their final answer (often incorrectly) without showing any working. Many candidates were confused about the order of operations and/or the nature of the operations. Typical first line errors were $\frac{P}{2} = q + 10$ $2q = P + 10$ and $q = 2P + 10$.

Part (c) was done well by the majority of candidates. Most candidates were able to expand the brackets with obtain at least three of four correct terms. Common errors were $-4y + 3y = -7y$, $y \times y = 2y$ and $(y + 3)(y - 4) = y^2 + 3y - 4y - 1$

In part (d), only the best candidates were able to achieve both marks for factorising the expression. Common errors amongst those candidates who showed some understanding of what was required were $(2p - 3q)(2p - 3q)$and $(2p)^2 - (3q)^2$.

15. Many candidates failed to factorise the given expression fully and answers of $3(2x^2 + 3xy)$, and $x(6x + 9y)$ were common. Some candidates, understanding something of the concept of factorisation, took 6 or 6x as a common factor giving answers of $6x(x + 1.5y)$ or $6x(x + 9y)$ These gained no marks.

In part (b), sign errors often resulted in candidates losing one of the two marks. The most common incorrect answers were $2x^2 + 9x \pm 10$ and $2x^2 + x \pm 7$ (or ±3), usually after one mark had been awarded. A significant number of candidates had no idea how to expand the brackets giving answers of for example, $2x^2 \pm 10$

16. This question was not well answered. A number of candidates scored 1 mark in part (a) for 3 correct terms only, usually giving the numerical term as –2 or + 24. Mistakes at the simplification stage were commonplace where candidates combined terms that should have been separate. The requirements of factorisation is not understood by many candidates as part (b) was seldom done correctly. This part was very centre dependant and even then partial factorisation, earning 1 mark, was seen more than the complete answer.

17. 57% gained the mark in part (a). In part (b) the expansion of brackets was accurately done by over 60% of the candidates (condoning one error); however $4x + 20 + 3x - 21$ often led to $7x + 41$, $7x - 41$, $x - 1$, $x + 1$ or $7x + 1$ only one third correctly simplifying to $7x - 1$.

18. Factorisation (part (b)) was much better understood than the expanding of brackets. In part (a) common errors were $4x \times 3x = 12x$ (leading to an answer of $23x + 2$) and $2 \times 1 = 3$. Many candidates merely added all the terms to get $7x + 3$. In part (b) incomplete factorisation was not uncommon and some candidates believed that they had to simplify the expression and gave $9x^3y$ as their answer.

19. Approximately 85% of candidates were able to answer all of part (a) correctly. In part (b) only about three quarters of candidates were able to expand the bracket correctly.

20. This question was answered correctly by approximately 60% of candidates. The most common error when expanding the brackets was to give $2x \times 3x$ as $6x$ rather than $6x^2$. There were some errors in arithmetic seen after a correct expansion with $-4x + 15x$ simplified to $-19x$ rather than $-11x$ being the most common.

21. This question was very well understood with 80% achieving success with part (a) 65% with the factorising in part (b) and 60% getting part (c) fully correct with a further 20% gaining partial success for $8r$ or 9

22. This question well understood with 60% of candidates able to gain at least one mark for partial expansion of the two brackets and 40% able to fully expand and simplify their answer.

23. Factorising '$8p - 6$' in part (a) provided a reasonable introduction to this algebra question with just over half the candidates writing correct responses. Less confident attempts might have been helped by breaking down the expression into component parts like '$(4)(2)p - (3)(2)$' which allows the '2' to be seen as the common factor.

Part (b) was rather more troublesome with many gaining just part marks for writing '$y(y^2 - y)$' instead of the full factorisation leading to '$y^2(y - 1)$'. It was not unusual to find that further simplification was attempted turning a correct final answer into one that was incorrect. It is important that candidates know when to stop in algebra questions as subsequent working is taken into account when assessing the award of marks. The mean mark of 0.52 for this question may well have been higher as a result.

Part (c) required the expansion of two brackets by multiplication. It was encouraging to find that a method was being applied to successfully achieve the multiplication of the brackets. Less impressive was the number of numerical errors being made with '$4 \times 3 = 7$' high on the list. It was disappointing to find once more that, having arrived at the correct expression of '$e^2 = 7e + 12$', there was the desire to combine terms together and thus forfeit the answer mark. The mean mark for this part of the question was 1.17.

24. A variety of methods were used in this question, some of which were more convincing than others. Many tried to prove the result using a numerical method which was really no more than substituting values into the left hand side to show that it did indeed produce the right hand side. Since it worked for one or two or three values they erroneously concluded that it must work for all values. This being very clearly an algebra question any numerical approach was not rewarded. For those who approached it algebraically, errors in expanding the brackets '$(n + 2)^2$' and '$(n - 2)^2$' did not help. A further difficulty arose in dealing with the negative sign between the two brackets as those who disregarded it managed to simplify the left hand side to '8' rather than '$8n$'. In spite of this there were some very elegant solutions, from a minority, who set out their solution in a developing way to show the stages in achieving a proof. Most clearly struggled with this type of question with the mean mark being only 0.13 even though a mark could have been scored merely by expanding one of the brackets correctly.

25. ¾ of the candidates were able to expand $3(5p - 2)$ correctly in part (a). In part (b) most candidates scored at least one of the two available marks by either expanding one of the brackets correctly, (generally the first), or correctly adding each of the $6x$ terms from their attempt at the expansion of the two brackets. The mean mark for this part of the question was 1.17.

The mean mark of 0.57 in (c) indicates that not many of the candidates were able to factorise $a^2 - 16a + 64$ correctly. Many candidates did, however, manage to score 1 of the 2 available marks by getting the correct expressions in each of the brackets but getting one or both of the signs incorrect. A few scored 1 mark for a in both brackets with two numbers whose product was 64 or −64.

26. Both parts of this question were usually well done but the answers of , $3x + 2$, $9x$ and $5x$ were not uncommon in part (a) while $25t$ and $5(t + 20)$ were common errors in part (b).

27. Although the correct answer of $18x + 19$ was the modal response, it was disappointing to see many candidates struggle with this question. The expansion of each of the brackets was often poor with answers of $6x + 5$ and $12x + 1$ common. In adding together $6x$ and $12x$, many gave $18x^2$ as their answer. A significant number of candidates followed their attempts at expanding each of the brackets by then finding the product of their expansions.

Weaker candidates expanded the brackets as $3 \times 7x$ and $4 \times 4x$ to give an answer of $37x$ $(21x + 16x)$

28. This expansion was not done well, particularly when finding the product of $3x$ and $5x$; $15x$ being the most common answer. An answer of $32x – 4$ was therefore not uncommon. Careless errors with signs prevented many candidates gaining full marks.

Weaker candidates, of which there was much evidence, gave $7x + 4$ or similar as their answer, as a result of trying to add the brackets.

29. No Report available for this question.

30. No Report available for this question.

31. No Report available for this question.

32. No Report available for this question.

33. No Report available for this question.

34. No Report available for this question.

35. Most candidates knew to apply their taught method for expanding the product of a pair of bracketed linear expressions, however a surprising number failed to correctly work out the product of $2x$ and $5x$; $10x$ or $7x$ being the most common errors. In addition, many made sign errors when collecting terms for the final answer.

36. This question was poorly answered overall. Part (a) was the most successful with almost all candidates gaining at least one mark for multiplying out one of the brackets. About a third of the candidates gained a mark in (b) for a partial factorisation of the expression but fully correct solutions were rare. In part (c) only about 10% of candidates gave the correct answer for the factorisation of the difference of two squares.

37. No Report available for this question.

38. No Report available for this question.

39. A variety of methods were used by candidates when answering the first part of the question. Almost 80% of answers seen gained at least one mark for writing down 3 or more correct terms in the expansion. A common error from those who did not score full marks for this part of the question was to add rather than multiply the constant terms. In part (b) partial credit was given to candidates who made a good attempt at factorising the denominator of the fraction. Some candidates multiplied out the numerator and tried to factorise the denominator (sometimes successfully) and hence failed to simplify the fraction. Clearly, for some candidates this material was unfamiliar territory. About one quarter of candidates completed this part successfully.

40. No Report available for this question.

41. No Report available for this question.

42. No Report available for this question.

43. No Report available for this question.