M1.

$\frac{x-1}{(x-2)(x-1)} - \frac{x-2}{(x-2)(x-1)}$

or $x - 1 - (x - 2)$
or $2(x - 2)(x - 1)$
or $x^2 - 2x - x + 2$

oe

M1

their $[\, x - 1 - (x - 2) \,] = 2(x - 1)(x - 2)$
or $x - 1 - x + 2$
or $2(x^2 - 2x - x + 2)$

oe

M1dep

$2x^2 - 6x + 3 \; (= 0)$

oe Must be three terms

A1

$\frac{--6 \pm \sqrt{(-6)^2 - (4 \times 2 \times 3)}}{2 \times 2}$

or $\frac{6 \pm \sqrt{12}}{4}$

oe
Allow one error, ft ***their*** *quadratic*

M1

$\frac{--6 \pm \sqrt{(-6)^2 - (4 \times 2 \times 3)}}{2 \times 2}$

or $\frac{6 \pm \sqrt{12}}{4}$

ft ***their*** *quadratic, fully correct*
oe
2.366(…) and 0.633(…)

A1ft

2.37 and 0.63

SC2 for one correct answer to 2 dp

SC1 for one correct answer to 3 dp or more

A1ft

Additional Guidance

T&I with two correct answers to 2 dp scores full marks
T&I with two correct answers to 3 dp or more loses final A mark
ft is from *their* quadratic (must have three terms)
One error is an incorrect substitution in one position or a short divisor line
A negative discriminant can score M1A1ftA0ft for an attempt at a solution

[6]

M2.

(a) $(ax + p)(bx + q)$

where $ab = 3$ *and* $pq = \pm 10$

or $aq + bp = -13$

M1

$(3x + 2)(x - 5)$

A1

(b) $3x(x - 5)$

M1

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

ft their answer to part (a) correctly simplified from common linear factors

A1ft

Additional Guidance

Do not allow further incorrect work

e.g. $\frac{3x}{3x + 2}$ incorrectly simplified to $\frac{1}{2}$

M1A0

[4]

M3.

(a) $5x^2 + 10xy - 2xy - 4y^2$

Allow one error in their four terms

M1

$5x^2 + 10xy - 2xy - 4y^2$

Fully correct

May be in a grid

A1

$5x^2 + 8xy - 4y^2$

ft their four terms

Do not ignore fw

A1ft

Alternative method 1

(b) $\frac{2 \pm \sqrt{(-2)^2 - (4 \times 1 \times -2)}}{2}$

oe

Allow one error

M1

$\frac{2 \pm \sqrt{(-2)^2 - (4 \times 1 \times -2)}}{2}$

or $\frac{2 \pm \sqrt{4 - -8}}{2}$

oe

Fully correct

A1

2.7 and -0.7

SC2 for either 2.7 or −0.7

A1

Alternative method 2

$(x - 1)^2 - 1 - 2 = 0$

oe

M1

$1 \pm \sqrt{3}$

oe
Fully correct
or 2.7(…) or − 0.7(…)

A1

2.7 and − 0.7
SC2 for either 2.7 or − 0.7

A1

Additional Guidance
− 0.73(…) or 2.73(…)

M1A1A0

-2^2 in the discriminant is one error unless recovered

(c) $(ax+b)(cx+d)$

or $(x + 2)(x - 2)$
where $ac = 3$ and $bd = -10$
or $ad + bc = -1$

M1

$(3x + 5)(x - 2)$

A1

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

Do not ignore fw

A1

Additional Guidance
$$\frac{(3x - 5)(x + 2)}{(x + 2)(x - 2)}$$

M1
A0

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

A0

[9]

M4. $(5x - 3)(x + 4)$

B1

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

B1

$\frac{5x - 3}{x - 4}$

Do not allow fw

B1dep

[3]

M5.

(a) $\frac{4c^5}{9d^3}$ or $\frac{4c^5d^{-3}}{9}$ or

$\frac{0.4c^5}{d^3}$ or $0.4c^5d^{-3}$

B2 Any two of these three components

- *numerator having c^5 (no c in denominator)*
- *denominator having d^3 (no d in numerator)*
  or numerator having d^{-3} (no d in denominator)
- *number $\frac{4}{9}$ or 0.4*

B1 Any one of these three components

- *numerator having c^5 (no c in denominator)*
- *denominator having d^3 (no d in numerator)*
  or numerator having d^{-3} (no d in denominator)
- *number $\frac{4}{9}$ or 0.4*

or

$\frac{40c^7d^3}{90d^6c^2}$ or $\frac{20c^7d^3}{45d^6c^2}$ or $\frac{8c^7d^3}{18d^6c^2}$

or $\frac{1.3c^7d^3}{3d^6c^2}$ or $\frac{\frac{4}{3}c^7d^3}{3d^6c^2}$

SC1 $\frac{9d^3}{4c^5}$ or $\frac{2.25d^3}{c^5}$

Always award SC1 if this is their final answer even if $\frac{4c^5}{9d^3}$ *seen in working*

B3

(b) $(m + 1)(m – 4)$ or $m^2 - 3m - 4$ seen as a common denominator

oe

B1

$5(m - 4) + 6(m + 1)$

Allow one error in expansion if not showing brackets

e.g. Allow 5m – 20 + m + 6

M1

$$\frac{5m - 20 + 6m + 6}{\text{their common denominator}}$$

or

$$\frac{5m - 20}{\text{their common denominator}} + \frac{6m + 6}{\text{their common denominator}}$$

Allow one error in expansion of numerator(s)

their common denominator must be a quadratic

M1

$\frac{11m - 14}{(m + 1)(m - 4)}$ or $\frac{11m - 14}{m^2 - 3m - 4}$

A1

[7]

M6. $x(x – 2)$ or $x^2 - 2x$

oe

any correct common denominator seen

M1

$4x - 3(x - 2)$ or $4x - 3x + 6$

oe

correct numerator seen for their denominator, may be written as separate fractions

M1dep

$\frac{x+6}{x(x-2)}$ or $\frac{x+6}{x^2-2x}$

oe

Strand (ii)

correct answer with no errors in working

Q1

[3]

M7.

$(ax + b)(cx + d)$

Where $ac = 4$ and $bd = \pm 5$ or $ad + bc = \pm 19$

M1

$(4x - 1)(x + 5)$

A1

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

B1

their $\frac{(4x-1)(x+5)}{(3x-4)(3x+4)} \times \frac{(3x-4)}{(x+5)}$

Inverting the 2nd fraction and multiplying

Must have attempted to factorise both expressions (allow max one error in each)

M1

$\frac{4x-1}{3x-4}$

A1

[5]

M8.

(a) $\frac{4(x-1)+2x}{x(x-1)}$

oe e.g. two separate fractions
Condone absence of brackets only if recovered

M1

$\frac{4(x-1)+2x}{x(x-1)} \quad (=\frac{6x-4}{x(x-1)})$

Do not condone absence of brackets even if recovered

A1

(b) $6x - 4 = 3x(x - 1)$

oe e.g. 4(x − 1) + 2x = 3x (x − 1)

M1

$3x^2 - 9x + 4 \ (= 0)$

−3x² + 9x − 4 (= 0)

A1

$\frac{--9 \pm \sqrt{(-9)^2 - 4 \times 3 \times 4}}{2 \times 3}$

$(\frac{9 \pm \sqrt{33}}{6})$

Correct use of formula for their quadratic
M1 Allow one sign error (must have square root and numerator all over 2a)
Allow M2 for correct factorisation of their quadratic

M2 $(x-\frac{3}{2})^2 = \frac{9}{4} - \frac{4}{3}$ *oe*

M1 $(x-\frac{3}{2})^2 = \frac{9}{4} + \frac{4}{3} = 0$ *oe*

M2

2.46 **and** 0.543

Must both be to 3 significant figures

A1

[7]

M9. $\frac{n(n-1)+n(n+1)}{2}$

*This mark is for combining fractions **or** if fractions dealt with separately, for combining n^2 terms correctly*

$\frac{n^2-n+n^2+n}{4}$ *is B0 as incorrect combining of fractions*

B1

$\frac{n^2-n+n^2+n}{2} = \frac{2n^2}{2}$

This mark is for eliminating −n and n either by showing by crossing or writing on same line and writing next line without them

$\frac{n^2}{2} - \frac{n}{2} + \frac{n^2}{2} + \frac{n}{2}$

B1

$\frac{2n^2}{2} = n^2$

This mark is for cancelling 2 top and bottom

$\frac{n^2}{2} + \frac{n^2}{2} = n^2$

B1

Alternative Method

$\frac{n}{2}((n-1)+(n+1))$

This mark is for factorising out a common factor.

$\frac{n}{4}(n-1+n+1)$ *is B0 as incorrect factorisation*

B1

$\frac{n}{2}(2n)$

This mark is for combining terms inside bracket correctly

B1

)

n^2

$1n^2$ is OK

B1

[3]

M10. $5(x + 1)$ or $4(x + 2)$

or $(x + 2)(x + 1)$

or $2(x + 2)(x + 1)$

oe

M1

$5x + 5 + 4x + 8$

or $x^2 + 2x + x + 2$

or $x^2 + 3x + 2$

or $2x^2 + 4x + 2x + 4$

or $2x^2 + 6x + 4$

Allow 1 error

M1dep

their $5x + 5 + 4x + 8 = 2(x + 2)(x + 1)$

oe

M1dep

$2x^2 - 3x - 9 = 0$

or $2x^2 - 3x = 9$

or $2x^2 = 3x + 9$

Correctly simplified to three terms

A1

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

Attempt to factorise their quadratic or uses quadratic formula with at most one error

i.e. $(mx + a)(nx + b)$ where mn = their 2 and ab = ± their 9

M1

$x = -\frac{3}{2}$ and $x = 3$

A1

[6]