Extended Mathematics
Topic :Algebra-2
Year :May 2013 -May 2023
Paper - 2
Answers

Question 1

$\frac{4}{y^2-8}$ oe final answer	**4**	**M1** first move completed correctly **M1** second move completed correctly **M1** third move completed correctly **M1** final move completed correctly on answer line

Question 2

$\frac{8x}{(x-3)(x+1)}$	**4**	**B1** for common denominator $(x-3)(x+1)$ seen **B1** for $(x+3)(x+1)-(x-1)(x-3)$ soi **B1** for $x^2+3x+x+3$ or $x^2-3x-x+3$ soi

Question 3

$n<9$	**2**	**M1** for $2n<18$ or $2n-18<0$ oe If 0 scored **SC1** for 9 with incorrect inequality.

Question 4

2500	**3**	**M1** for $m=kr^3$ **A1** for $k=20$

Question 5

–1 –2 –3 –4	**4**	**B3** for $x<-\frac{3}{5}$ and $x>-4.5$ oe or **B2** for $x<-\frac{3}{5}$ or $x>-4.5$ oe or **B1** for $5x<-3$ or $-9<2x$ oe Or mark on answer line –1 oe

Question 6

0.625 oe	**3**	**M1** for $y=\frac{k}{x^3}$ **A1** for $k=40$

Question 7

$\frac{5x+13}{(x+3)(x+2)}$ oe final answer	3	**B1** for common denominator $(x + 3)(x + 2)$ seen **M1** for $2(x + 2) + 3(x + 3)$ soi

Question 8

$\frac{6}{7}$ or 0.857[1…]	3	**M1** for $t = \frac{k}{\sqrt{u}}$ oe **A1** for $k = 6$

Question 9

$3x^4$	2	**B1** for kx^4 or $3x^k$

Question 10

$x \geq -\frac{3}{8}$ oe	2	**M1** for $-3 \leq 8x$ oe If 0 then **SC1** for $-\frac{3}{8}$ with incorrect inequality.

Question 11

(a) $8q^{-1}$ or $\frac{8}{q}$	2	**B1** for $8q^k$ or kq^{-1}
(b) 1/5 or 0.2	2	**M1** for $5^{-2}, \frac{1}{5^2}$ or [0].04 seen oe

Question 12

1.6 oe	3	**M1** for $m = kx^3$ **A1** for $k = 25$

Question 13

$x < 6.8$	4	**B3** for 6.8 with wrong inequality or equal as answer. Or **M1** for first move completed correctly and **M1** for second move completed correctly and **M1** for third move completed correctly

Question 14

120	3	**M1** for $v = \frac{k}{\sqrt{d}}$ **A1** for $k = 600$

Question 15

$[\pm]\sqrt{y-4}$ final answer	2	**M1** for first move completed correctly **M1** for second move completed correctly on answer line

Question 16

$\frac{2t-5}{t-1}$ final answer	**3**	**B1** for $\frac{3(t-1)}{t-1}$ or better **B1** for $3(t-1)-(t+2)$ oe or better

Question 17

(a) $\frac{5}{4}$ oe	**1**	
(b) $4y^6$	**2**	B1 for ky^6 or y^6 or $4y^k$ or 4 as final answer

Question 18

$[\pm]\sqrt{c^2-a^2}$ oe final answer	**3**	**M1** for correct square **M1** for correct re-arrangement **M1** for correct square root

Question 19

3.5	**3**	**M1** for $y = k\sqrt[3]{x+3}$ **A1** for $k = \frac{1}{2}$ Alternative method: **M2** for $\frac{y}{\sqrt[3]{340+3}} = \frac{1}{\sqrt[3]{5+3}}$ oe

Question 20

$t < -\frac{6}{7}$	**2**	**M1** for $5t + 2t < 17 - 23$ If zero scored **SC1** for $-\frac{6}{7}$ with incorrect inequality sign or equals sign

Question 21

$3x^6y^4$	**2**	**B1** for x^6 or y^4 in a product on answer line

Question 22

(a)	$5t^{25}$	**2**	**B1** for $5t^k$ or mt^{25} $(m \neq 0)$
(b)	–2	**1**	
(c)	64	**1**	

Question 23

1.6 oe	3	**M1** for $w = \frac{k}{\sqrt{x}}$ **A1** for $k = 8$ Alternative method: **M2** for $w\sqrt{25} = 4\sqrt{4}$ oe

Question 24

(a)	35	**1**	
(b)	$\frac{3V}{A}$ or $3VA^{-1}$	**2**	**M1** for multiplying by 3 or for dividing by $\frac{1}{3}$ or **M1** for dividing by A

Question 25

(a)	8	**2**	**B1** for 2^{12} or 4096
(b)	$2q^{\frac{3}{2}}$	**3**	**B2** for $kq^{\frac{3}{2}}$ as the answer or **B1** for $2q^2$ and **B1** for $q^{\frac{1}{2}}$ oe nfww

Question 26

[0], 1, 2, 3	**4**	**M1** for moving the 5 correctly **M1** for collecting *their* terms **A1** for a correct inequality for x eg $[0 \leq]\ x < 4$

Question 27

$\frac{2}{x(x+1)}$	**3**	**B1** for common denominator $x(x+1)$ seen **M1** for $2(x+1) - 2x$ oe or better

Question 28

$4 \pm \sqrt{y-6}$	**3**	**M1** for *their* 6 moved correctly **M1** for *their* $\sqrt{}$ taken correctly **M1** for *their* 4 moved correctly

Question 29

$\frac{16x^2 + 18x + 9}{6x}$ final answer	**4**	**M2** for 9 [+] $4x^2$ [+] $18x$ [+] $12x^2$ or better or **M1** for 2 of these and **M1FT** for adding their four 'numerators' together correctly and **B1** for denominator $6x$ to a maximum of **3** marks

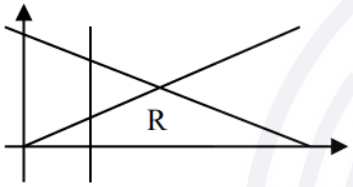
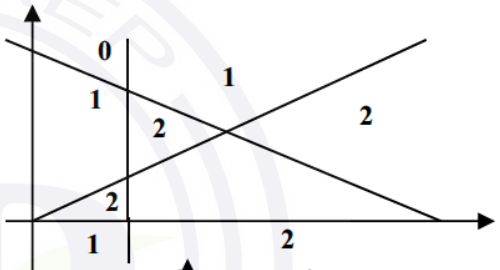
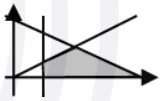
Question 30

4	**3**	**M2** for $6(3+5)=y(7+5)$ oe or **M1** for $y=\frac{k}{x+5}$ oe **A1** for $k=48$

Question 32

$\frac{x+7}{(2x-1)(x+2)}$ Final answer	**3**	**B1** for $3(x+2)-1(2x-1)$ seen or better **B1** for denominator $(2x-1)(x+2)$ oe seen **SC2** for final answer $\frac{x+5}{(2x-1)(x+2)}$

Question 33

	**3**	 **SC1** for 

Question 34

97.2[0]	**3**	**M1** for $C=kr^2$ **A1** for $k=30$ or **M2** for $\frac{202.8}{2.6^2}=\frac{c}{1.8^2}$ oe

Question 35

v^3-p	**2**	**M1** for $v^3=p+r$

Question 36

(a) **(i)**	1	**1**	
(ii)	m^7	**1**	
(iii)	$2p^2$	**2**	**SC1** for $2p^k$ or kp^2 $k\neq 0$
(b)	$\frac{2}{5}$ or 0.4	**2**	**B1** for 3^5 or 3^{5x} or $243^{\frac{1}{5}}$ or $243^{\frac{2}{5}}$ seen

Question 37

12	3	**M1** for $x = k\sqrt[3]{y}$ oe **A1** for $k = 3$ or **M2** for $\frac{6}{\sqrt[3]{8}} = \frac{x}{\sqrt[3]{64}}$ oe

Question 38

(a)	$4x^9$ final answer	2	**B1** for answer kx^9 or $4x^k$ $(k \neq 0)$
(b)	$2y^{32}$ final answer	2	**B1** for answer ky^{32} or $2y^k$ $(k \neq 0)$

Question 39

$\frac{2x-23}{(x+2)(2x-5)}$ final answer	3	**B1** for a common denominator of $(x+2)(2x-5)$ **B1** for $3(2x-5)-4(x+2)$ or better or **SC2** for final answer $\frac{2x-7}{(x+2)(2x-5)}$ or **SC1** for numerator of $2x-7$ in final answer

Question 40

$\frac{1}{4}$ or 0.25	1	

Question 41

$y < 8$	1	
$y \geqslant 6-x$ oe **and** $y \geqslant x+2$ oe	3	**B2** for either $y \geqslant 6-x$ oe **or** $y \geqslant x+2$ oe or **SC2** for $y = 6-x$ oe **and** $y = x+2$ oe or **SC1** for $y > 6-x$ or $y = 6-x$ **or** $y > x+2$ or $y = x+2$

Question 42

18	3	**M2** for $2(2+4)^2 = p(-2+4)^2$ oe **M1** for $p = \frac{k}{(q+4)^2}$ **A1** for $k = 72$

Question 43

$\frac{18}{(x+2)^2}$ oe	**2**	**M1** for $y=\frac{k}{(x+2)^2}$ or better If zero scored **SC1** for final answer of $y=\frac{k}{(x+2)^2}$ where $k \neq 0$ or 18

Question 44

$\frac{x^{16}}{2y^4}$ final answer	**3**	**B2** for fraction as final answer with two of x^{16}, 2, y^4 correct and in correct position or **B1** for fraction as final answer with one of x^{16}, 2, y^4 correct and in correct position

Question 45

$\frac{2(s-ut)}{t^2}$ oe final answer	**3**	**M1** for correctly isolating term in a **M1** for correctly multiplying by 2 (or -2) **M1** for correctly dividing by t^2 (or $-t^2$)

Question 46

(a)	$\frac{3x}{2}$ oe final answer	**1**	
(b)	$\frac{x^2+2}{x}$ oe final answer	**1**	

Question 47

175	**3**	**M1** for $y=k(x-1)^2$ oe **A1** for $k=7$ or **M2** for $\frac{63}{(4-1)^2}=\frac{y}{(6-1)^2}$ oe

Question 48

$[\pm]\sqrt{\frac{y-b}{a}}$ oe final answer	**3**	**M1** for correctly subtracting to isolate term in x^2 **M1** for correct division **M1** for the final stage of correctly finding the square root

Question 49

81	**3**	**M1** for $V = k(r+1)^3$ and **A1** for $k = 3$ or **M2** for $\frac{V}{24} = \frac{3^3}{2^3}$ oe

Question 50

$y < 2$ oe and $x \geqslant -2$ oe	**2**	**B1** for either correct
$y \geqslant \frac{1}{2}x + 1$ oe and $y \leqslant -x + 3$ oe	**3**	**B2** for either $y \geqslant \frac{1}{2}x + 1$ oe or $y \leqslant -x + 3$ oe or **SC2** for $y = \frac{1}{2}x + 1$ oe **and** $y = -x + 3$ oe or **SC1** for $y = \frac{1}{2}x + 1$ oe **or** $y = -x + 3$ oe or **SC4** for $y \leqslant 2$ oe , $x > -2$ oe, $y > \frac{1}{2}x + 1$ oe and $y < -x + 3$ oe

Question 51

(a)	x^8y^7 final answer	**2**	**B1** for answer x^8y^k or x^ky^7 $(k \neq 0)$
(b)	$27p^6m^{15}$ final answer	**2**	**B1** for 2 correct of 27, p^6, m^{15} in a product as answer

Question 52

$n < 1.5$ oe final answer	**2**	**B1** for 1.5 oe in answer or **M1** for $3 > 8n - 6n$ oe

Question 53

$y < 4$ $y \geqslant 3$ $x \geqslant 2$ $y > x$	**4**	**B1** for each correct answer to a maximum of 3 marks. First two may be combined as a single inequality e.g. $3 \leqslant y < 4$ for **B2** After 0 scored **SC1** for use of = signs or incorrect inequality signs in all four equations

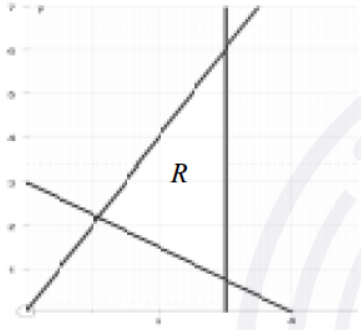
Question 54

90	**3**	**M1** for $y = k(x + 2)^2$ **A1** for $k = 2.5$ or **M2** for $\frac{(8+2)^2}{250} = \frac{(4+2)^2}{y}$ oe

Question 55

$8x^6$ final answer	**2**	**B1** for $8x^k$ or cx^6

Question 56

Correct shading with three ruled accurate solid boundary lines 	**5**	**B2** for $3x + 4y = 12$ line through (0, 3) and (4, 0) or **B1** for a diagonal line through one of these points **B1** for $y = 2x$ line through (0, 0) and (1, 2) or through (1, 2) and (3, 6) **B1** for $x = 3$ line

Question 57

$p = \frac{8r-5}{r-3}$ oe final answer	**3**	**M1** for correctly collecting terms in p on one side and terms not in p on the other side **M1** for correct factorising **M1** for correct division dependent on p appearing only once in a factorised expression Maximum M2 for an incorrect final answer

Question 58

$x > -9$	**2**	**M1** for $\frac{x}{3} > 2 - 5$ oe or $\left(\frac{x}{3} + 5\right) \times 3 > 2 \times 3$ oe

Question 59

$\frac{1}{8}x^2$ or $0.125x^2$ final answer	**2**	**B1** for answer $\frac{1}{8}x^k$ or nx^2

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Question 60

2	**3**	**M1** for $y = k\sqrt{x}$ **A1** for $k = 4$ or **M2** for $\frac{\sqrt{9}}{12} = \frac{\sqrt{1/4}}{y}$ oe

Question 61

$2p^4$ final answer	**2**	**B1** for kp^4 or $2p^k$ as answer

Question 62

$n > 3.75$	**2**	**M1** for $7 + 8 < 5n - n$ oe

Question 63

$\frac{py}{q}$ final answer	**2**	**M1** for one correct step

Question 64

$y \leqslant -\frac{3}{5}x + 6$ oe $x \geqslant 2$ oe $y > x$ oe final answers	**5**	**SC4** for $y < -\frac{3}{5}x + 6, x > 2, y \geqslant x$ oe or **B3** for $y \leqslant -\frac{3}{5}x + 6$ oe or **B2** for $y = -\frac{3}{5}x + 6$ oe or **B1** for gradient $= -\frac{3}{5}$ oe soi and **B2** for $x \geqslant 2$ and $y > x$ oe or **B1** for either $x \geqslant 2$ or $y > x$ oe or for $x = 2$ and $y = x$ with incorrect inequalities

Question 65

1.25	**3**	**M1** for $d = \frac{k}{(w+1)^2}$ or better **M1** for $[d=]\ \frac{their\ k}{(7+1)^2}$ or **M2** for $3.2(4 + 1)^2 = d(7 + 1)^2$ oe

Question 66

n^7 final answer	**1**	

Question 67

1, 2, 3	**3**	**B2** for $t < 4$ or **M1** for $2 + 6 > 3t - t$ oe or better If zero scored, **SC1** for answer 0, 1, 2, 3 or 1, 2, 3, 4

Question 68

$9y^3$ final answer	**2**	**B1** for $9y^k$, $9 \times y^3$ or ky^3 $(k \neq 0)$ as final answer

Question 69

$y \geqslant 0$ and $x \geqslant 1$ oe and $x + y \leqslant 4$ oe	**4**	**SC3** for $y > 0$, $x > 1$ and $x + y < 4$ oe or **B1** for $y \geqslant 0$ **B1** for $x \geqslant 1$ oe and **B2** for $x + y \leqslant 4$ oe or **M1** for grad = –1 soi If **B0** scored for first two **B** marks, **SC1** for $y = 0$ and $x = 1$ or with incorrect inequality sign

Question 70

(a)	4	**2**	**B1** for 25 or –21
(b)	$\sqrt{y - qr}$ oe final answer	**2**	**M1** for $y - qr = p^2$ or **M1** for correctly square rooting *their* function of y, q and r

Question 71

$6\frac{2}{3}$ oe	**3**	**M1** for $y = k\sqrt{x+2}$ oe or better e.g. $2 = k\sqrt{7+2}$ **M1** for [y =] their $k \times \sqrt{98+2}$ or **M2** for $\frac{y}{2} = \frac{\sqrt{98+2}}{\sqrt{7+2}}$

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Question 72

$\frac{pt-2t-3p}{pt}$ final answer	**2**	**B1** for $pt-2t-3p$ or $1-\frac{2t+3p}{pt}$

Question 73

$6x^8$ final answer	**2**	**B1** for $6x^k$, $6\times x^8$ or $kx^8\ (k\neq 0)$ as final answer

Question 74

(a)	t^{20} final answer	**1**	
(b)	x^{10} final answer	**1**	
(c)	$27m^6$ final answer	**2**	**B1** for $27m^k$ or km^6 as final answer

Question 75

4	**3**	**M1** for $y=\frac{k}{x^2}$ **M1** for $y=\frac{their\ k}{10^2}$ or **M2** for $5^2\times 16=10^2\times y$ oe

Question 76

)(a)	6	**1**	
)(b)	$2x^3$ final answer	**1**	
)(c)	$15y^4$ final answer	**2**	**B1** for $15y^k$ or ky^4 as final answer $(k\neq 0)$

Question 77

)(a)	$x \leqslant 3$ final answer	**2**	**M1** for $13-7\geqslant 3x-x$ oe
)(b)	1, 2, 3	**1FT**	correct answer or **FT** their answer to **(a)**

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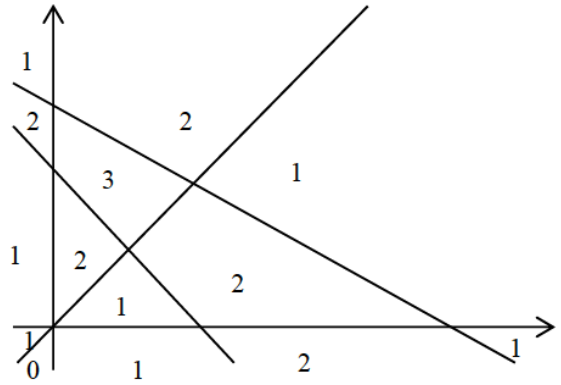
Question 78

Correct region	3	 **SC1** for R not marked and reverse shading

Question 79

$\frac{32}{x^2}$ or $32x^{-2}$ final answer	2	**M1** for $y=\frac{k}{x^2}$ oe or $[k=]\ 32$

Question 80

$\frac{2}{a^4}$ or $2a^{-4}$ final answer	2	**B1** for $\frac{2}{a^k}$ oe or $\frac{k}{a^4}$ oe $(k\neq 0)$ final answer

Question 81

$(x-y)^2$ oe final answer	2	**M1** for $x-y=\sqrt{a}$ or *their* $(x-y)$ squared

Question 82

(a)	$8x^{12}$ final answer	2	**B1** for $8x^k$ or kx^{12} in final answer $k\neq 0$
(b)	9	2	**M1** for $27^{\frac{2}{3}}$ or 3^k or $p^{\frac{1}{2}}=3$ or $p^3=729$

Question 83

1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$	3	**M1** for $\frac{k}{\sqrt{1+x}}$ **M1** for $y=\frac{\textit{their } k}{\sqrt{1+15}}$ or **M2** for $\frac{2}{\sqrt{1+15}}=\frac{y}{\sqrt{1+8}}$

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Question 84

$\frac{2x^2+x-7}{3(x+1)}$ or $\frac{2x^2+x-7}{3x+3}$ final answer	**3**	**M1** for $(2x-1)(x+1)-2\times 3$ oe with an attempt to expand the brackets **B1** for $3(x+1)$ or $3x+3$ for denominator

Question 85

$[\pm]\sqrt{\frac{p}{2}}$ oe	**2**	**M1** for $\frac{p}{2}=q^2$ or $\sqrt{p}=\sqrt{2}\,q$ or $[q=]\sqrt{their\ \frac{p}{2}}$ or $[q=]\frac{\sqrt{p}}{their\sqrt{2}}$

Question 86

(a)	25	**1**	
(b)	9	**1**	

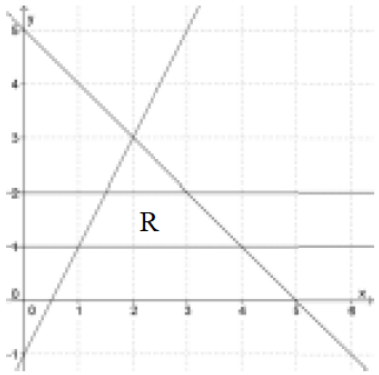
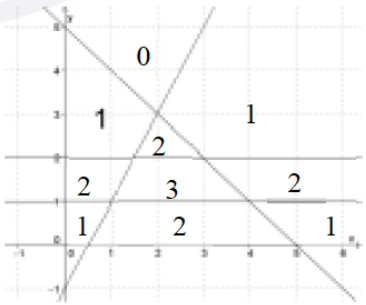
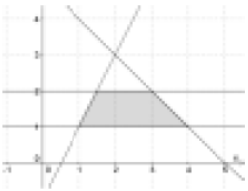
Question 87

$n < 3.5$ oe final answer	**2**	**M1** for $18-11>5n-3n$ oe

Question 88

(a)	$\frac{x}{x+3}$ final answer	**3**	**B1** for $x(x-3)$ **B1** for $(x-3)(x+3)$
(b)	$\frac{8x+7}{(x-4)(2x+5)}$ final answer	**3**	**B1** for common denominator of $(x-4)(2x+5)$ oe **M1** for $3(2x+5)+2(x-4)$ oe with an attempt to expand the brackets

Question 89

Correct region identified 	**3**	 **SC1** for 

Question 90

7.65	**3**	**M1** for $h = k\sqrt{p}$ oe **M1** for $h =$ *their* $k\sqrt{p}$ or **M2** for $\frac{5.4}{\sqrt{1.44}} = \frac{h}{\sqrt{2.89}}$ oe

Question 91

(a)	-4	**1**	
(b)	$\frac{1}{5}$ or 0.2	**1**	

Question 92

x^2 final answer	**1**	

Question 93

$\frac{y^2}{2}$ or $0.5y^2$ final answer	**2**	**M1** for $\left(\frac{y^6}{8}\right)^{\frac{1}{3}}$ or $\left(\frac{2}{y^2}\right)^{-1}$ or better or **SC1** for answer $\frac{y^2}{c}$ or $\frac{y^k}{2}$ or $\frac{2}{y^2}$

Question 94

$[\pm]\sqrt{y^2-1}$ final answer	**3**	**M1** for correct squaring **M1** for correct rearranging for x or x^2 term **M1** for correct square root

Question 95

$\frac{y+x}{xy}$ final answer	**3**	**B1** for $y(x+1)-x(y-1)$ **B1** for common denominator xy or **SC2** for $\frac{y-x}{xy}$ final answer

Question 96

$-1, 0, 1, 2, 3$	**3**	**B2** for $-2 < n \leqslant 3$ or list with one error or omission or **M1** for $-5 + 1 < 2n$ or $2n \leqslant 5 + 1$ or a list with 3 correct and no more than 1 incorrect or if zero scored, **SC1** for $5, 3, 1, -1, -3$

Question 97

(a)	$x + y \leqslant 16$ oe $x \geqslant 4$ oe	**2**	**B1** for each mark final answers If zero scored, **SC1** for $x + y < 16$ **and** $x > 4$
(b)	Correct shading	**3**	**M2** for lines at $x = 4$ **and** $x + y = 16$ or for correct shading of $x < 4$ or $x + y > 16$ or **M1** for line at $x = 4$ or *their* $x = 4$ or for line at $x + y = 16$ or *their* $x + y = 16$
(c)	144	**2**	**M1** for (8, 8) selected or for $10 \times x + 8 \times y$ for any numerical point which is inside or on the boundary of *their* unshaded region

Question 98

$\frac{x^2 + 20x + 31}{2(x-3)(x+7)}$ final answer	**4**	**B1** for a common denominator of $[2](x - 3)(x + 7)$ seen isw **M1** for $2\times5\times(x + 7) + 2\times3\times(x - 3) + (x - 3)(x + 7)$ oe **and** must have attempted to expand all the brackets in the numerator **M1** for $10x + 70 + 6x - 18$ **or** $x^2 - 3x + 7x - 21$ **or** $[2](5x + 35 + 3x - 9)$ or better

Question 99

'(a)	$(y =) \frac{72}{(x+1)^2}$ oe	**2**	**M1** for $y = \frac{k}{(x+1)^2}$
'(b)	32	**1FT**	**FT** correct evaluation from *their* equation in **(a)** using 0.5

Question 100

(a)	m^{10} final answer	**1**	
(b)	$20x^5y^2$ final answer	**2**	**B1** for 2 out of 3 elements correct in final answer or correct answer spoiled

Question 101

12	3	**M2** for $9 \times 8 = 6y$ oe OR **M1** for $y = \frac{k}{x}$ oe **M1** for $[y =]$ *their* $\frac{k}{6}$

Question 102

-12	2	**B1** for 2^3, 2^{-3}, 2^{12} or 2^{-12}

Question 103

$\frac{1}{y(y-1)}$ or $\frac{1}{y^2-y}$ final answer	3	**B1** for common denominator of $y(y-1)$ or y^2-y **B1** for $y-(y-1)$ or $y-y+1$

Question 104

150	3	**M1** for $y = k(x-1)^2$ **M1** for $[y =]$ *their* $k \times (6-1)^2$ oe OR **M2** for $\frac{y}{24} = \frac{(6-1)^2}{(3-1)^2}$

Question 105

(a)	27	1	
(b)	$3t^9$ final answer	2	**B1** for kt^9 or for $3t^k$ $(k \neq 0)$

Question 106

$[\pm]\sqrt{\frac{A}{2\pi+y}}$ final answer	2	**M1** for $\frac{A}{2\pi+y} = x^2$ **M1** for correctly square rooting their expression in x^2 If zero scored **SC1** for $\frac{[\pm\ ]\sqrt{A}}{2\pi+y}$

Question 107

$y > 2$ oe final answer $y \geqslant 3 - x$ oe final answer	**3**	**B1** for $y > 2$ oe final answer **B2** for $y \geqslant 3 - x$ oe final answer or **B1** for $y = 3 - x$ oe soi or **SC2** for $y \geqslant 2$ oe **and** $y > 3 - x$ oe final answer

Question 108

$y \geqslant 1.5$ oe $y \geqslant \frac{3}{4}x$ oe $y < -\frac{1}{2}x + 3$ oe	**4**	**SC3** for $y > 1.5$ oe and $y > \frac{3}{4}x$ oe and $y \leqslant -\frac{1}{2}x + 3$ oe or **B3** for any two correct inequalities or **B1** for $y \geqslant 1.5$ oe and **B2** for $y \geqslant \frac{3}{4}x$ oe **or** $y < -\frac{1}{2}x + 3$ oe or $y = \frac{3}{4}x$ oe **and** $y = -\frac{1}{2}x + 3$ oe or with incorrect inequality signs or **B1** for $y = \frac{3}{4}x$ oe OR $y = -\frac{1}{2}x + 3$ oe or with incorrect inequality signs

Question 109

9	**3**	**M1** for $y = k(x-1)^2$ **M1** for $[y =]$*their* $k(7-1)^2$ OR **M2** for $\frac{4}{(5-1)^2} = \frac{y}{(7-1)^2}$ oe

Question 110

$n < -4.4$ or $n < -4\frac{2}{5}$ final answer	2	**M1** for $8n - 3n < -5 - 17$ or better or $3n - 8n > 17 + 5$ or better

Question 111

-7	2	**B1** for 3^{-3} or 3^4 or 3^7 or 3^{-7} seen or **SC1** for final answer 7

Question 112

$\frac{1}{x(x+1)}$ oe final answer nfww	3	**B1** for common denominator $x(x+1)$ oe **M1** for $x + 1 - x$

Question 113

10	3	**M1** for $y = k\sqrt{x}$ **M1** for $y =$ *their* $k \times \sqrt{25}$ OR **M2** for $\frac{y}{6} = \sqrt{\frac{25}{9}}$

Question 114

(a)	$\frac{1}{w}$ or w^{-1}	1	
(b)	$27w^9$ final answer	2	**B1** for kw^9 or $27w^k$

Question 115

$\frac{A - \pi r^2}{\pi r}$ or $\frac{A}{\pi r} - r$ oe final answer	2	**M1** for $A - \pi r^2 = \pi rl$ or $\pi r^2 - A = -\pi rl$ or $\frac{A}{\pi r} = l + r$

Question 116

$\frac{2x}{3+x}$ oe final answer	4	**M1** for correctly clearing the denominator and expanding bracket **M1** for correctly collecting terms in m on one side and terms not in m on the other **M1** for correct factorising **M1** for correct division dependent on m appearing only once in a factorised expression

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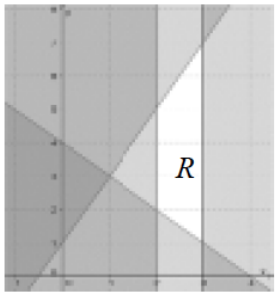
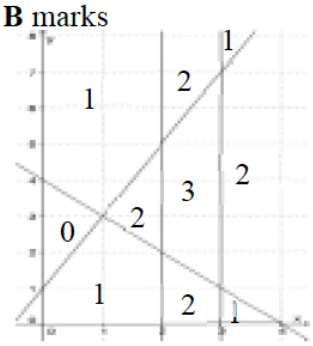
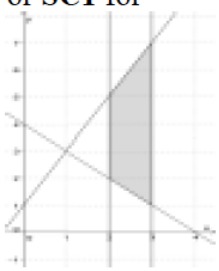
Question 117

Correct region identified 	**3**	**B** marks  or **SC1** for 

Question 118

$m \geqslant 3$ final answer	**2**	**M1** for correct first step e.g. $7m \geqslant 19 + 2$

Question 119

7(a)	8	**1**	
'(b)(i)	$\frac{x^2}{16}$ final answer	**1**	
(b)(ii)	$a^{-3}b^5$ or $\frac{b^5}{a^3}$ final answer	**2**	**B1** for $a^{-3}b^k$ or a^kb^5

Question 120

$\frac{x^2-3x+8}{3(x+2)}$ or $\frac{x^2-3x+8}{3x+6}$ final answer	**3**	**B1** for common denominator $3(x + 2)$ **M1** for $(x-5)(x+2)+3\times6$

Question 121

4, 5, 6	**3**	**B2** for 1 error or 1 omission or **M2** for $3.75 \leqslant n < 7$ oe or **M1** for $3.75 \leqslant n$ or $n < 7$ or better

Question 122

$\frac{4}{x^3}$ oe final answer	**2**	**M1** for $y = \frac{k}{x^3}$ oe

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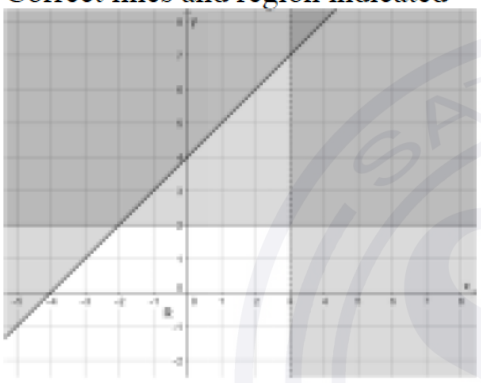
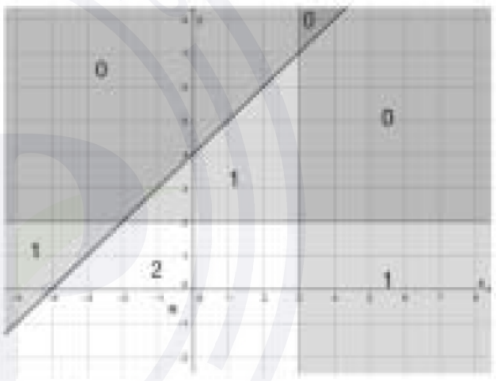
Question 123

(a)	-3	**1**	
(b)	$\frac{m}{4}$ or $0.25m$ final answer	**2**	**B1** for $\frac{1}{4}$ or 0.25 or 4^{-1} or m correct in final answer

Question 124

$[y =]\frac{1}{4}(x-4)$ oe final answer	**2**	**M1** for $y = k(x-4)$

Question 125

Correct lines and region indicated 	**5**	**B1** for $y = 2$ solid line **B1** for $x = 3$ dashed line **B1** for $y = x + 4$ solid line **B2, B1 or B0** for region 

Question 126

0.14 oe	**3**	**M1** for $y = \frac{k}{(x+1)^2}$ **M1** for $y = \frac{\text{their } k}{(4+1)^2}$ OR **M2** for $\frac{0.875(1+1)^2}{(4+1)^2}$ or **M1** for $y(4+1)^2 = 0.875(1+1)^2$

Question 127

$2m + 1$	**2**	**B1** for $2m + c$ or $km + 1$ $(k \neq 0)$

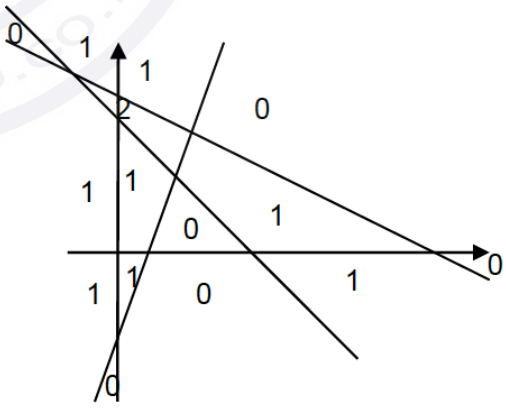
Question 128

$m = \frac{k}{P-1}$ final answer	**4**	**B3** for final answer $\frac{k}{P-1}$ OR **M1** for multiplying or dividing by m correctly **M1** for term(s) in m on one side correctly and terms not in m on the other side correctly **M1** for correctly factorising m with a 2-term bracket oe **M1** for correct division by *their* 2-term bracket with m as the subject To a maximum of **M3** for an incorrect answer

Question 129

$\frac{3x^2-4x+9}{(x+3)(x-5)}$ final answer	**3**	**B1** for common denominator $(x+3)(x-5)$ oe isw **M1** for $2x(x-5)+(x+3)(x+3)$ or better

Question 130

(a)	R identified correctly	**2**	**B** marks 
(b)	7	**1**	

Question 131

(a)	$10m^5$ final answer	**2**	**B1** for $10m^k$ or km^5 as final answer
(b)	x^{24} final answer	**1**	

Question 132

$\frac{x-5}{(x+2)(3x-1)}$ final answer	**3**	**B1** for common denominator isw expansion **M1** for $3x-1-2(x+2)$ or better

Question 133

(a)	$27y^{12}$ final answer	**2**	**B1** for ky^{12} or $27y^k$ in final answer
(b)	$\frac{3}{2}$ oe	**1**	

Question 134

[±] 0.6 oe	**3**	**M1** for $y = \frac{k}{\sqrt{x+1}}$ **M1** for $y = \frac{their k}{\sqrt{99+1}}$ OR **M2** for $\frac{2\sqrt{8+1}}{\sqrt{99+1}}$ or **M1** for $2\sqrt{8+1} = y\sqrt{99+1}$

Question 135

(a)	t^{14} final answer	**1**	
(b)	u^{25} final answer	**1**	

Question 136

(a)	$\frac{45}{(x+1)^2}$ final answer	**2**	**M1** for $t = \frac{k}{(x+1)^2}$
(b)	4	**2**	**M1** for $1.8 \times (x+1)^2 =$ *their* 45 or better

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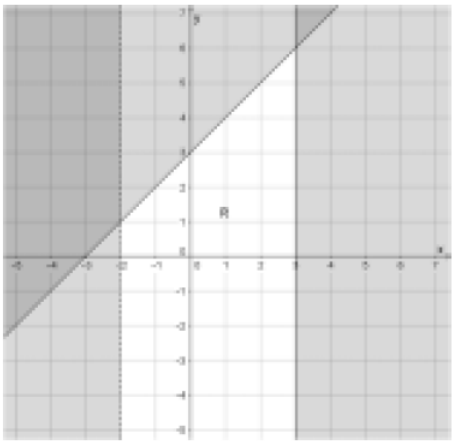
Question 137



4	**B1** for $x = -2$ dashed ruled line and $x = 3$ solid ruled line **B1** for $y = x + 3$ solid ruled line **B2** for indication of correct region or **B1** for shading that satisfies two of the inequalities, e.g. two of $x > -2$, $x \leqslant 3$ and $y \leqslant x + 3$

Question 138

1(a)	6	2	**B1** for 3^4 or 3^{x-2} or **M1** for $3^x = 81 \times 3^2$ or better
1(b)	8	3	**M2** for $x^{\frac{5}{3}} = 32$ or better or **M1** for $\frac{1}{x^{\frac{1}{3}}} = \frac{32}{x^2}$ or better or $x^{\frac{1}{3}--2} = 32$ or better

Question 139

$y = 5$ ruled $y = x + 1$ ruled Correct region indicated	4	**B2** for two correct lines or **B1** for one correct line **B2** for indication of correct region or **B1** for shading that satisfies two of the inequalities

Question 140

$x < -10$ final answer	2	**M1** for $-12 - 13 > 3x - \frac{x}{2}$ oe

Question 141

$\frac{x^2 - 3x - 8}{2(x+1)}$ or $\frac{x^2 - 3x - 8}{2x+2}$ final answer	3	**B1** for common denominator $2(x+1)$ or $2x+2$ **M1** for $x(x+1) - 2(2x+4)$ or better

Question 142

128	3	**M1** for $y = \frac{k}{x^2}$ **M1** for $y = \frac{their\ k}{\left(\frac{1}{2}\right)^2}$ OR **M2** for $\frac{2 \times 4^2}{\left(\frac{1}{2}\right)^2}$ or **M1** for $2 \times 4^2 = y \times \left(\frac{1}{2}\right)^2$

Question 143

$\frac{P}{2+\pi}$	2	**M1** for $P = r(2+\pi)$

Question 144

$\frac{16}{x^4}$ or $16x^{-4}$	2	**M1** for $\left(\frac{x}{2}\right)^{-4}$ or $\left(\frac{8}{x^3}\right)^{\frac{4}{3}}$ or $\left(\frac{x^{12}}{4096}\right)^{-\frac{1}{3}}$ or better or **B1** for $\frac{16}{x^k}$ or $16x^k$ or $\frac{k}{x^4}$ or kx^{-4} final answer

Question 145

$6x^5$ final answer	2	**B1** for kx^5 or $6x^k$

Question 146

[y =] 1	3	**M1** for $y = k \times \sqrt[3]{x+3}$ **M1** for $y = their\ k \times \sqrt[3]{24+3}$ OR **M2** for $\frac{y}{\sqrt[3]{24+3}} = \frac{2}{3} \times \frac{1}{\sqrt[3]{5+3}}$ oe

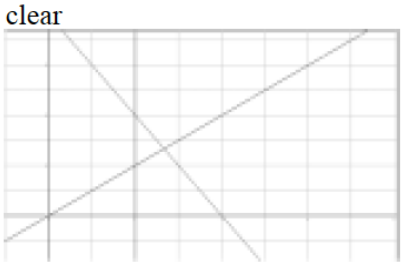
Question 147

(a)	p^6	**1**	
(b)	m^{10}	**1**	
(c)	k^{15}	**1**	

Question 148

4		**2**	**M1** for $y^{\frac{2}{3}} = x^{\frac{1}{6}}$ or $y^2 = \sqrt{x}$ or $y^4 = x$

Question 149

(a)	Correct lines and correct region clear 	**5**	**B2** for $2x + y = 8$ correctly ruled or **B1** for ruled line with negative gradient **B1** for $y = x$ correctly ruled **B1** for $x = 2$ correctly ruled
(b)	6	**1**	

Question 150

16		**3**	**M1** for $p = k(q+2)^2$ **M1** for $p = (their\ k)(10+2)^2$ OR **M2** for $\frac{p}{(10+2)^2} = \frac{1}{(1+2)^2}$ oe

Question 151

(a)	$125x^{12}$	**2**	**B1** for $125x^k$ or kx^{12}
(b)	$8x^{96}$	**2**	**B1** for $8x^k$ or kx^{96}

Question 152

$2t^4$		**2**	**B1** for $2t^n$ or kt^4 $(n,k \neq 0)$

Question 153

1.8 or $1\frac{4}{5}$		**3**	**M2** for $m = \frac{k}{(p-1)^2}$ or **M1** for $m = \frac{theirk}{(6-1)^2}$ OR **M2** for $5(4-1)^2 = m(6-1)^2$ oe

Question 154

$y = \frac{10.5}{\sqrt{x}}$ oe final answer	**2**	**M1** for $y = \frac{k}{\sqrt{x}}$

Question 155

(a)	$64x^3y^6$ final answer	**2**	**B1** for kx^3y^6 or $64x^ky^6$ or $64x^3y^k$ final answer or correct answer then spoilt
(b)	$\frac{2}{3}$	**1**	

Question 156

$y = \frac{10.5}{\sqrt{x}}$ oe final answer	**2**	**M1** for $y = \frac{k}{\sqrt{x}}$

Question 157

(a)	$64x^3y^6$ final answer	**2**	**B1** for kx^3y^6 or $64x^ky^6$ or $64x^3y^k$ final answer or correct answer then spoilt
(b)	$\frac{2}{3}$	**1**	

Question 158

a^{-4} or $\frac{1}{a^4}$ final answer	**1**	

Question 159

$10x^7$ final answer	**2**	**B1** for kx^7 or $10x^k$ final answer or for correct answer then spoilt

Question 160

$49x^6$ final answer	**2**	**B1** for $49x^k$ or nx^6 as final answer

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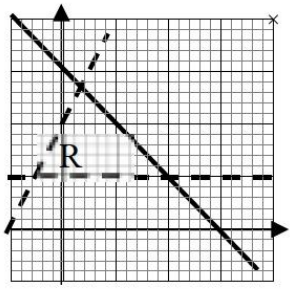
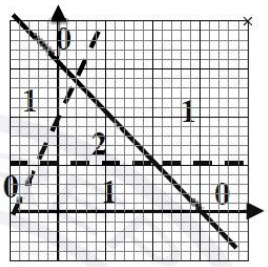
Question 161

3 correct ruled lines and R clearly indicated 	5	**B1** for each line $y = 1$ dashed $y = 2x + 2$ dashed $x + y = 3$ solid **B2** for correct region or **B1** for region satisfying 2 inequalities  or **SC1** for shading of the **wanted** region only

Question 162

$\frac{81}{(y-2)^2}$ final answer	2	**M1** for $z = \frac{k}{(y-2)^2}$ oe or better

Question 163

–1, 0, 1 final answer	2	**B1** for $-1 \leqslant x < 2$ or two correct answers and no extras or three correct answers and one extra/wrong

Question 164

$12x^7$ final answer	2	**B1** for $12x^j$ or kx^7 $(j, k \neq 0)$ as final answer

Question 165

(a)	$[F =]\frac{108}{d^2}$ final answer	2	**M1** for $F = \frac{k}{d^2}$ oe or better
(b)	$[n =]\frac{1}{4}$ or 0.25	1	

Question 166

24	3	**M1** for $y = k\sqrt{x-3}$ oe **M1** for $y =$ *their* $k\sqrt{39-3}$ oe

Question 167

(a)	$256a^4b^{20}$ final answer	**2**	**B1** for two correct elements in final answer
(b)	27	**1**	
(c)	6	**2**	**M1** for $3^k \div 3^t = 3^2$ or $3^8 \div 3^t = 3^k$ oe or better or $3^t = 729$ oe

Question 168

$27y^6$ final answer	**2**	**B1** for ky^6 or $27y^k$ as final answer or correct answer seen and spoilt

Question 169

$8g^{28}$ final answer	**2**	**B1** for kg^{28} or $8g^k$ as final answer or correct answer seen and spoilt

Question 170

(a)	3^{6n+5} final answer	**2**	**B1** for 3^5 or $(3^3)^{2n}$ or better or answer $6n + 5$
(b)	$2^3 \times 3^5 \times p^6$ final answer	**2**	**B1** for two parts correct or $2 \times 3 \times 2 \times 3^2 \times p^3 \times 2 \times 3^2 \times p^3$ or $1944p^6$ or $k^2 = 2^2 \times 3^4 \times p^6$

Question 171

(a)	x^{-2} or $\frac{1}{x^2}$ final answer	**1**	
(b)	$\frac{2}{3}$	**1**	
(c)	1 nfww	**3**	**M1** for $3^{-2(4-3x)}$ oe or better or $9^{\frac{3x}{2}} \times 9^{-(4-3x)} = 9^{\frac{1}{2}}$ oe or better **M1** for $3x + (their - 2) \times (4 - 3x) = 1$ oe or better or $their\frac{3x}{2} - (4-3x) = their\frac{1}{2}$ oe or better

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Question 172

38	**3**	**M2** for $12\times\sqrt{4.25-2}=3\times\sqrt{x-2}$ OR **M1** for $y=\frac{k}{\sqrt{x-2}}$ oe **M1** for $3=\frac{their\ k}{\sqrt{x-2}}$ oe

Question 173

$\frac{2}{3}$ oe	**3**	**M1** for $y=\frac{k}{\sqrt{x+4}}$ **M1** for $y=\frac{their k}{\sqrt{77+4}}$

Question 174

A correct equation leading to 41	**3**	**M2** for $4x=164$ or **M1** for $x+2(x-24)+x-16=100$ oe or **M1** for correctly simplifying *their* equation to the form $kx = c$ provided at least one part correct from $[2](x-24)$ oe or $x-16$ or **B1** for answer 41 without an equation in x shown

Question 175

(a)	h^7 final answer	**1**	
(b)	$\frac{x^3}{343}$ final answer	**1**	
(c)	6	**1**	

Question 176

$n > -1$ oe	**1**	

Question 177

81	**3**	**M2** for $m^{\frac{3}{4}} = 27$ or better or **M1** for $\frac{1}{m^{\frac{1}{4}}} = \frac{27}{m}$ or better or $m^{-\frac{1}{4}--1} = 27$ If **0** scored **SC1** for answer $\frac{1}{81}$

Question 178

2.8	**3**	**M1** for $y = \frac{k}{(x-1)^3}$ **M1** for $y = \frac{their\ k}{(4-1)^3}$ OR **M2** for $y(4-1)^3 = 9.45(3-1)^3$

Question 179

(a)	y^{-2} or $\frac{1}{y^2}$ final answer	**1**	
(b)	7	**1**	

Question 180

(a)	2.5	**3**	**M1** for $y = k \times \sqrt[3]{x+1}$ **M1** for $y = their k \times \sqrt[3]{124+1}$
(b)	multiplied by 4 oe	**1**	

Question 181

24	**1**	

Question 182

$\frac{16}{\sqrt{x}}$ oe final answer	**3**	**M2** for $w = \frac{k}{\sqrt{x}}$ oe OR **M1** for $w = j\sqrt{y}$ **M1** for $y = \frac{c}{x}$

Question 183

(a)	$[p =]\ 4$ $[q =]\ -6$	**2**	**B1** for one correct or $(x+4)^2 - 6$ or $x^2 + px + px + p^2$ $[+ q]$
(b)	–10 and 2	**2**	**M1** for $(x+4)^2 = 36$ or $(x + their 4)^2 = 30 - their(-6)$ or for correct method to solve quadratic e.g. $(x+10)(x-2)$

Question 184

$36y^{144}$ final answer	**2**	**B1** for ky^{144} or $36y^k$ final answer $k \neq 0$ or correct answer seen and spoilt

Question 185

–3	**1**	

Question 186

$\frac{2}{x}$ final answer	**4**	**M1** for $\left[\frac{4}{2x-3}\right] \times \frac{2x^2+11x-21}{2x^2+14x}$ oe soi **B1** for $(x + 7)(2x - 3)$ oe factorised **B1** for $2x(x + 7)$ oe factorised

Question 187

8	**3**	

Question 188

$[0 =]\ 6x^2 - 19x + 3$	**B5**	**B4** for $8x - 20 + 2x + 2 = 6x^2 + 6x - 15x - 15$ or better OR **M2** for $4(2x - 5) + 2(x + 1) = 3(x + 1)(2x - 5)$ oe or **M1** for $4(2x - 5) + 2(x + 1)$ or better or common denominator $(x + 1)(2x - 5)$ or better **B1** for $2x^2 + 2x - 5x - 5$ or better seen **M1** for correctly simplifying *their* quadratic to the form $[0 =]\ ax^2 + bx + c$
Correct method to solve *their* three term quadratic	**M1**	e.g. $(6x - 1)(x - 3)$ $\frac{-(-19) \pm \sqrt{(-19)^2 - 4 \times 6 \times 3}}{2 \times 6}$
$x = 3,\ x = \frac{1}{6}$ oe	**B1**	

Question 189

(a)	$27x^{12}$ final answer	**2**	**B1** for kx^{12} or $27x^c$ final answer or for $27x^{12}$ then spoilt
(b)	$[\pm]\ y$	**1**	

Question 190

$\frac{144}{w}$ oe	**3**	**M2** for $y = \frac{k}{w}$ oe or **M1** for $x = cw^2$ or for $y = \frac{j}{\sqrt{x}}$ oe

Question 191

$5x^{625}$ final answer	**2**	**B1** for final answer kx^{625} or $5x^k$ or correct answer spoiled

Question 192

$2x^9$ final answer	**2**	**B1** for kx^9 or $2x^k$ as final answer or $2x^9$ spoiled

Question 193

$\frac{5x-4}{x+3}$ final answer	4	**B2** for $(5x-4)(x-3)$ or **B1** for $(5x+a)(x+b)$ with $ab = 12$ or $a + 5b = -19$ or for $5x(x-3)-4(x-3)$ or $x(5x-4)-3(5x-4)$ **B1** for $(x+3)(x-3)$

Question 194

4.5 oe	3	**M2** for $2^2 \times y = 3^2 \times 2$ OR **M1** for $y = \frac{k}{x^2}$ **M1** for $y = \frac{theirk}{2^2}$

Question 195

$5w^{625}$ final answer	2	**B1** for kw^{625} or $5w^k$ final answer or for $5w^{625}$ then spoiled

Question 196

$\frac{x+4}{2x+3}$ final answer	4	**B1** for $(2x-3)(2x+3)$ **B2** for $(2x-3)(x+4)$ or **B1** for $(2x + a)(x + b)$ where $ab = -12$ or $a + 2b = 5$ or $x(2x-3)+4(2x-3)$ or $2x(x+4)-3(x+4)$

Question 197

8	3	**M1** for $y = \frac{k}{\sqrt[3]{x+5}}$ oe **M1** for substituting *their k* into $y = \frac{k}{\sqrt[3]{22+5}}$ oe OR **M2** for $12\sqrt[3]{3+5} = y\sqrt[3]{22+5}$ oe

Question 198

$m=\frac{2k}{(2-R)}$ or $m=\frac{-2k}{(R-2)}$ final answer	**4**	**M1** for clearing fractions **M1** for expanding brackets (or ÷ 2) **M1** for collecting terms in m on one side and terms not in m on the other **M1** for dividing by a bracket maximum of **3** if final answer incorrect

Question 199

$\frac{22x+3}{(3x+2)(2x-1)}$ final answer	**3**	**B1** for a common denominator $(3x + 2)(2x – 1)$ oe isw **B1** for $5(2x – 1) + 4(3x + 2)$ oe isw

Question 200

0.16 oe	**3**	**M1** for $m=\frac{k}{(t+2)^2}$ oe **M1** for substituting *their k* into $m=\frac{their\ k}{(8+2)^2}$ OR **M2** for $0.64 \times (3 + 2)^2 = m(8 + 2)^2$ oe

Question 201

$\frac{5c}{2c-3}$ oe final answer	**4**	**M1** for correctly clearing the denominator **and** expanding bracket or correctly clearing the denominator **and** dividing by c **M1** for correctly collecting terms in x on one side and terms not in x on the other **M1** for correct factorising **M1** for correct division dependent on x appearing only once in a factorised expression Maximum 3 marks for an incorrect answer

Question 202

3.2 oe	**3**	**M1** for $y = k(x+3)^2$ oe or better **M1** for substituting *their* k into $y = k(1+3)^2$

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