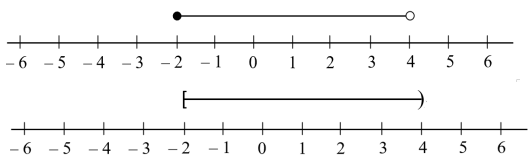
Q	Working	Answer	Mark	Notes

Q	Working	Answer	Mark	Notes
1 (a)		e^6	1	B1 cao
(b)	$x^2 - 3x + x - 3$		2	M1 for any 3 correct terms **or** for 4 out of 4 correct terms ignoring signs **or** for $x^2 - 2x \cdots$ **or** for $\ldots -2x - 3$
	Correct answer scores full marks (unless from obvious incorrect working)	$x^2 - 2x - 3$		A1
				Total 3 marks

Q	Working	Answer	Mark	Notes
2	$8 + 2 - p = 6$ oe eg $8 + 2 = 6 + p$ or $7^{8+2-p} = 7^6$ oe		2	M1 (or embedded eg $8 + 2 = 10$, $10 - 4 = 6$)
	Correct answer scores full marks (unless from obvious incorrect working)			A1 allow 7^4
				Total 4 marks

Q	Working	Answer	Mark	Notes
3 (a)		1	1	B1
(b)(i)	$(x \pm 4)(x \pm 9)(= 0)$		2	M1 or $(x + a)(x + b)$ where $ab = -36$ **or** $a + b = -5$
	Correct answer scores full marks (unless from obvious incorrect working)	$(x+4)(x-9)$		A1 (isw if they also solve the equation in this part)
(ii)	*Answers must ft from (b)(i)*	−4 and 9	1	B1 ft Answer **must** ft from their $(x + p)(x + q)$ in (b)(i) Award B0 for −4 and 9 if no marks scored in (i)
				Total 4 marks

Q	Working	Answer	Mark	Notes
4 (a)		$16p^6q^8$	2	B2 for all three correct terms (B1 for 2 correct terms in a product of 3 terms or for $(4p^3q^4)^2$ or $(4096p^{18}q^{24})^{\frac{1}{3}}$)
(b)	eg $\frac{2\times10}{3x\times10}+\frac{4\times6}{5x\times6}-\frac{9\times3}{10x\times3}$ $(=\frac{20}{30x}+\frac{24}{30x}-\frac{27}{30x})$		2	M1 for a common denominator for all 3 terms with at least 2 correct equivalent fractions (no need for signs) [NB: fraction can be done in 2 parts]
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{17}{30x}$		A1 or $\frac{17}{30}x^{-1}$
(c)	eg $4x(x-5)=4x^2-20x$ or $4x(2x+3)=8x^2+12x$ or $(x-5)(2x+3)=2x^2+3x-10x-15$ $=2x^2-7x-15$		3	M1 allow one error in the expansion of $4x(x-5)$ or $4x(2x+3)$ or $(x-5)(2x+3)$
	eg $(4x^2-20x)(2x+3)=8x^3+12x^2-40x^2-60x$ or $(8x^2+12x)(x-5)=8x^3+12x^2-40x^2-60x$ or $4x(2x^2+3x-10x-15)=8x^3+12x^2-40x^2-60x$ or $4x(2x^2-7x-15)=8x^3-28x^2-60x$			M1ft but dep on previous M1 for correctly expanding – allow one extra error or one omission.
	Working required	$8x^3-28x^2-60x$		A1 dep on M1 May be factorised if $8x^3-28x^2-60x$ seen
				Total 7 marks

Q	Working	Answer	Mark	Notes
5 (i)	$-7+3 \pounds 2x < 5+3$ oe or $\frac{-7}{2} \pounds x - \frac{3}{2} < \frac{5}{2}$ oe or $-7+3 \pounds 2x$ oe **and** $2x < 5+3$ oe or (x =) −2 or (x =) 4		3	M1 or one side of the inequality correct, i.e.. $x \geq -2$ oe or $x < 4$ Condone = rather than ≤ or < or any other sign for the M marks.
	$\frac{-7+3}{2} \pounds x < \frac{5+3}{2}$ or $\frac{-7}{2} + \frac{3}{2} \pounds x < \frac{5}{2} + \frac{3}{2}$ or $\frac{-7+3}{2} \pounds x$ oe **and** $x < \frac{5+3}{2}$ or (x =) −2 and (x =) 4			M1
	Correct answer scores full marks (unless from obvious incorrect working)	$-2 \pounds x < 4$		A1 allow $x \geq -2$ and $x < 4$ Allow [−2, 4)
(ii)			2	M1 ft for drawing a line from −2 to 4 or (indep) for a closed circle or [at −2 or (indep) for an open circle or) or [at 4 Only allow a follow through for a double ended inequality in (i)
		Correct diagram		A1 ft for correct diagram Only allow a follow through for a double ended inequality in (i)
				Total 5 marks

Q	Working	Answer	Mark	Notes
6 (a)		(12), 36, 64, 76, 86, 90	1	B1
(b)			2	M1 ft from table for at least 5 points plotted correctly (± 0.5 squares) at end of interval **or** ft from (CF) table for all 6 points plotted consistently (± 0.5 squares) within each interval in the **freq table** at the correct height
		Correct cf diagram		A1 accept curve or line segments accept graph that is not joined to (25, 0)
(c)	E.g. reading at 42 minutes and reading at 52 minutes		2	M1 for correct use of 42 and 52, ft from a cum freq graph provided method is shown – e.g. a line vertically drawn to the graph from readings of 42 and 52 on the Time axis to meet the graph and then a horizontal line to the CF axis (even if wrongly read scale) or clear marks on the graph and CF axis that correspond to the correct readings or correct values from the CF axis
	Correct answer scores full marks (unless from obvious incorrect working)	25 – 29		A1 ft Accept a single value in range 25 to 29 or ft from their cumulative frequency graph provided method is shown
				Total 5 marks

Q	Working	Answer	Mark	Notes
7	*BOC*(*BOD*) = 180 – 48 – 90 (= 42) oe **or** *EOC* = 180 – (90 – 48) or 90 + 48 (= 138) oe		3	M1 for method to find angle *BOC* or *EOC* (may be shown in the correct place on the diagram)
	$\frac{180-'42'}{2}$ oe **or** '138' ÷ 2 oe			M1 a fully correct method to find angle *DFE*
	Correct answer scores full marks (unless from obvious incorrect working)	69		A1
				Total 3 marks

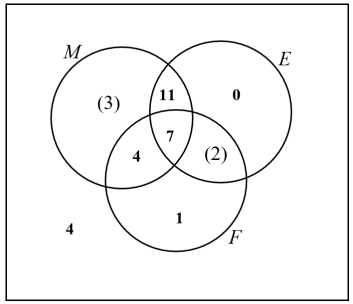
8	(a)	$\frac{2x-3}{3(2x-3)+1}$		2	M1 for substituting f(x) into g(x) Allow $\frac{f}{3f+1}$
		Correct answer scores full marks (unless from obvious incorrect working)	$\frac{2x-3}{6x-8}$		A1 oe (do not isw incorrect cancelling)
	(b)	$y(3x+1) = x$ and $3xy + y = x$ or $x(3y+1) = y$ and $3xy + x = y$		3	M1 for moving the denominator to the other side of the equation and expanding correctly
		$x(1-3y) = y$ or $x(3y-1) = -y$ or $y(1-3x) = x$ or $y(3x-1) = -x$			M1 for collecting and factorising the variable on one side in a correct equation
		Correct answer scores full marks (unless from obvious incorrect working)	$\frac{x}{1-3x}$		A1 oe eg $-\frac{x}{3x-1}$ or $\frac{-x}{-1+3x}$ oe
					Total 6 marks

Q	Working	Answer	Mark	Notes
9 (a)	$6y(y-1)+5(y-1)$ or $y(6y+5)-1(6y+5)$		2	M1 for $(6y \pm 5)(y \pm 1)$ or $(6y \pm 1)(y \pm 5)$ or $(ay+5)(by-1)$ where $ab=6$ or $5b-a=-1$ or $(6y+p)(y+q)$ where $pq=-5$ or $6q+p=-1$ Condone use of a different letter to y
	Correct answer scores full marks (unless from obvious incorrect working)	$(6y+5)(y-1)$		A1 oe
(b)	$8w-fw=2f+3$ oe		3	M1 for multiplying by denominator and expanding in a correct equation
	$8w-3=2f+fw$ oe or $-2f-fw=3-8w$ oe			M1 for gathering terms in f on one side and other terms the other side in a correct equation ft their equation dep on 2 terms in f and two other terms
	Correct answer scores full marks (unless from obvious incorrect working)	$f=\frac{8w-3}{2+w}$		A1 oe accept $f=\frac{3-8w}{-2-w}$ oe
(c)	$4(x^2-2x)+7$ or $4\left(x^2-2x+\frac{7}{4}\right)$ oe		3	M1
	$4\left[(x-1)^2-1^2\right]+7$ oe or $4\left[(x-1)^2-1^2+\frac{7}{4}\right]$ oe			M1 for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	$4(x-1)^2+3$		A1 allow $a=4$, $b=-1$ and $c=3$
				Total 8 marks

Q	Working	Answer	Mark	Notes
9 (c) **ALT**	$ax^2 + 2bax + b^2a + c$		3	M1 for correctly expanding $a(x+b)^2 + c$ to give $ax^2 + 2bax + b^2a + c$
	$2ba = -8$ and $b^2a + c = 7$			M1 for a complete method (equating coefficients)
	Correct answer scores full marks (unless from obvious incorrect working)	$4(x-1)^2+3$		A1 allow $a = 4$, $b = -1$ and $c = 3$
10	$\left(\frac{8}{\sqrt{5}-1}\right)\times\frac{\sqrt{5}+1}{\sqrt{5}+1}$ **or** $\frac{8\left(\sqrt{5}+1\right)}{4}$ **or** $\frac{8\sqrt{5}+8}{4}$ oe		3	M1 for rationalising the denominator – award for seeing intention to multiply by $\frac{\sqrt{5}+1}{\sqrt{5}+1}$ **or** $\frac{-\sqrt{5}-1}{-\sqrt{5}-1}$
	Working required	$2\sqrt{5}+2$		A1 from correct working
		$\sqrt{20}+2$		B1ft for $k\sqrt{5}+c=\sqrt{5k^2}+c$ where $5k^2$ is a single integer Accept $a = 20$ and $b = 2$
				Total 3 marks

Q	Working		Answer	Mark	Notes
11	$y = x - 3$	$x = y + 3$		6	B1 for correct rearrangement of linear equation
	eg $3x^2 - (x-3)^2 + x(x-3) = 9$	eg $3(3+y)^2 - y^2 + y(3+y) = 9$			M1 substitution of their linear equation into quadratic in x or y alone(even if B0 scored)
	eg $3x^2 + 3x - 18\ (= 0)$ **or** $x^2 + x - 6\ (= 0)$	eg $3y^2 + 21y + 18\ (= 0)$ **or** $y^2 + 7y + 6\ (= 0)$			M1ft from their substitution (dep on previous M1) for a complete correct method to get a 3-term or 2-term quadratic expression in the form $ax^2 + bx\ (+ c)\ (= 0)$ [allow $ax^2 + bx = c$]
	eg $(x-2)(x+3)\ (= 0)$ $x = \frac{-1 \pm \sqrt{1^2 - 4\times1\times-6}}{2\times1}$ eg $\left(x - \frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = 6$	eg $(y+1)(y+6)\ (= 0)$ $y = \frac{-7 \pm \sqrt{7^2 - 4\times1\times6}}{2\times1}$ eg $\left(y - \frac{7}{2}\right)^2 - \left(\frac{7}{2}\right)^2 = -6$			M1 (dep on M1) for a complete method to solve their 3-term or 2- term quadratic equation ($ax^2 + bx\ (+ c) = 0$) – correct factorisation or substitution into formula or completing square (allow one sign error and some simplification – allow as far as $\frac{-1 \pm \sqrt{1+24}}{2}$ or $\frac{-7 \pm \sqrt{49-24}}{2}$) or for seeing $x = 2, x = -3$ **or** $y = -1, y = -6$
	$x = -3, x = 2$ **and** $y = -1,\ y = -6$ or one correct midpoint coordinate ie $x = -\frac{1}{2}$ **or** $y = -\frac{7}{2}$				A1 (dep on M2) for $x = 2, x = -3$ **and** $y = -1, y = -6$ **or** one correct midpoint ie $x = -\frac{1}{2}$ or $y = -\frac{7}{2}$
	Working required		$\left(-\frac{1}{2}, -\frac{7}{2}\right)$		A1 (dep on M2) oe
					Total 6 marks

Q	Working	Answer	Mark	Notes
12 (a)(i)		**b** – **a**	1	B1 oe
(ii)	E.g. (*KI* = *KJ* + *JI* =) 2(**b** – **a)** + 2**b** oe		2	M1ft (i) for any valid correct path (oe) in capitals or lower case letters
	Correct answer scores full marks (unless from obvious incorrect working)	4**b** – 2**a**		A1 oe simplified
(iii)	E.g. (*LD* = *LF* + *FE* + *ED* =) (**b** – **a)** + (**b** – **a)** – **a** oe		2	M1ft (i) for any valid correct path (oe) in capitals or lower case letters
	Correct answer scores full marks (unless from obvious incorrect working)	2**b** – 3**a**		A1 oe simplified
(b)	(*GHIJKL* =) $6 \times 5 \times 2^2$ (= 120) or (*GABH* =) $5 \times 2^2 - 5$ (= 15) or 3×5 (= 15) or (Number of triangles in shaded region =) $(6 \times 4) - 6$ (= 18)		3	M1
	"120" – (6×5) or $6 \times$ "15" or "18" × 5			M1
	Correct answer scores full marks (unless from obvious incorrect working)	90		A1
				Total 8 marks

Q	Working	Answer	Mark	Notes
13 (a)	$(11 - x) + (x) + (18 - x) + 3 = 25$ oe or $(11 - x) + (x) + (18 - x) + 3 + 7 = 25 + 7$ oe or $x + y + z = 25 - 3$ and $x + z = 11$ and $x + y = 18$ oe where $y = M \cap E \cap F'$ and $z = M \cap F \cap E'$		2	M1 for setting up a correct equation
	Correct answer scores full marks (unless from obvious incorrect working)	7		A1 (allow 7 in the Venn diagram if no answer is given in (a))
(b)			2	B2 ft for $18 - x$, x and $11 - x$ dep on M1 in part (a) and ($x < 12$) (NB 0, 1 and 4 are fixed) for 6 correct remaining values (B1 ft for 4 or 5 correct remaining values) Allow just E to be blank if other sections are populated with a number
(c)	$\frac{3 + \text{"11"}}{25}$ or $\frac{3 + (18 - \text{"7"})}{25}$ or 0.56 oe	$\frac{14}{25}$	1	B1ft for $18 - x$, x and $11 - x$ oe
				Total 5 marks

Q	Working	Answer	Mark	Notes
14	$\left(\frac{6+5}{2}, \frac{2+3}{2}\right) = \left(\frac{1}{2}, \frac{5}{2}\right)$ oe		7	M1 for finding the midpoint of AB
	$\frac{2-3}{-6-5}\left(=\frac{-1}{-11}=\frac{1}{11}\right)$ oe			M1 for finding the gradient of AB
	$\frac{1}{11} = -1$ **or** $(m =) -11$			M1ft their gradient of AB (indep) for the correct use of $m_1 \times m_2 = -1$
	$"\frac{5}{2}" = "-11"\left("-\frac{1}{2}"\right) + c$ oe **or** $y - "\frac{5}{2}" = "-11"\left(x - "-\frac{1}{2}"\right)$ **and** $(y =) "-11"(-1) - 3 (= 8)$ **or** $(y =) "-11"\left(-1 - "-\frac{1}{2}"\right) + "\frac{5}{2}" (= 8)$			M1 for an expression that gives the y value at C
See alt methods	(Perp =) $\sqrt{\left(2 - \frac{5}{2}\right)^2 + \left(1 - -\frac{1}{2}\right)^2}$ $\frac{\sqrt{122}}{2}$ **and** $(AB =) \sqrt{(3 - 2)^2 + (5 - -6)^2}$ $(= \sqrt{122})$			M1
	(Area of triangle =) $\frac{1}{2} \times \sqrt{122} \times \frac{\sqrt{122}}{2}$			M1 for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	30.5		A1 oe Allow answers in the range 30.4 – 30.5
				Total 7 marks

Q	Working	Answer	Mark	Notes
15	E.g. $y = 0.4x....$ **and** $10y = 4.x....$ $(10y - y = 4.x - 0.4$ oe) **or** $10y = 4.x....$ **and** $100y = 4x.x....$ $(100y - 10y = 4x - 4$ oe) **or** $100y = 4x.x....$ **and** $1000y = 4xx.x....$ $(1000y - 100y = 4xx - 4x$ oe)		3	M1 for selecting 2 correct recurring decimal expressions and then a demonstration to subtract (If recurring dots not shown then allow each expression to 1 dp e.g. $y = 0.4x....$ **and** $100y = 4x.x....$ as a pair **and** $100y - y$ or $4x.x.... - 0.4x....$) or an answer of $y = \frac{4x - 4}{90}$ oe
	E.g. $9y = 4\frac{x}{10} - \frac{4}{10} = \frac{40 + x - 4}{10}$ oe or $90y = 40 + x - 4$ oe or $900y = 400 + 10x + x - 40 - x$ oe			M1 for a correct subtraction with correct expressions simplified
	Working required	$\frac{36 + x}{90}$		A1 dep on M2 oe
				Total 3 marks

Q	Working	Answer	Mark	Notes
16	E.g. $x + y + x + y + x = 100$ oe or $3x + 2y = 100$ oe $y = \frac{100 - 3x}{2}$		3	M1 for a correct equation for the perimeter of the shape **or** for a correct expression for the area of triangle *CED*
	E.g. $\frac{1}{2} \times x \times x \times \sin 60$ $= \frac{1}{2} \times x \times x \times \frac{\sqrt{3}}{2}$ $= \frac{x^2\sqrt{3}}{4}$ E.g. $x^2 = \frac{x^2}{2} + h^2$ **and** $= \frac{1}{2} \times x \times \frac{x\sqrt{3}}{2} = \frac{x^2\sqrt{3}}{4}$			
	$x \text{"}\frac{100 - 3x}{2}\text{"} + \text{"}\frac{x^2\sqrt{3}}{4}\text{"}$ oe			M1 for the area of the shape in terms of x only
	E.g. $x\frac{200 - 6x}{4} + \frac{x^2\sqrt{3}}{4}$ or $\frac{x}{4}(200 - 6x + x\sqrt{3})$ or $\frac{200x - 6x^2}{4} + \frac{x^2\sqrt{3}}{4}$ or $\frac{x}{4}(200x - 6x^2 + x^2\sqrt{3})$	Shown		A1 for the area given in correct form with full working shown (at least one intermediate step before the answer)

17	(a)		$(-2, 9)$	1	B1
	(b)		$(y =)\ 9 - 3(x - 4 + 2)^2$	1	B1 oe eg $(y =) -3x^2 + 12x - 3$ accept f$(x - 4)$
	(c)		Reflection in the line $y = 0$ or x-axis	1	B1 with no mention of another transformation

Q	Working	Answer	Mark	Notes

				Edexcel averages: scores of candidates who achieved grade:								
Qn	Mean score	Max score	Mean %	ALL	9	8	7	6	5	4	3	U
1	2.73	3	91	2.73	2.98	2.95	2.91	2.83	2.67	2.32	1.61	0.66
2	1.68	2	84	1.68	1.95	1.88	1.84	1.62	1.53	1.22	0.87	0.22
3	3.02	4	76	3.02	3.96	3.69	3.45	2.87	2.22	1.34	0.65	0.15
4	4.96	7	71	4.96	6.58	5.95	5.21	4.56	3.84	2.62	1.38	0.82
5	3.12	5	62	3.12	4.64	4.03	3.46	2.67	1.74	0.84	0.18	0.00
6	3.27	5	65	3.27	4.47	3.88	3.37	2.89	2.52	1.76	0.88	0.34
7	1.73	3	58	1.73	2.74	2.23	1.92	1.32	0.80	0.42	0.13	0.00
8	2.34	5	47	2.34	4.51	3.18	2.21	1.11	0.39	0.21	0.09	0.00
9	3.57	8	45	3.57	6.89	4.51	3.12	2.02	0.94	0.48	0.16	0.06
10	1.16	3	39	1.16	2.42	1.46	0.91	0.49	0.23	0.09	0.02	0.00
11	1.98	6	33	1.98	4.61	2.18	1.42	0.52	0.22	0.11	0.07	0.00
12	2.53	8	32	2.53	5.40	2.78	1.82	1.23	0.65	0.34	0.25	0.00
13	1.57	5	31	1.57	3.74	1.84	0.86	0.42	0.14	0.07	0.09	0.02
14	1.74	7	25	1.74	4.21	1.73	1.03	0.55	0.29	0.13	0.03	0.00
15	0.38	3	13	0.38	0.92	0.43	0.24	0.13	0.03	0.01	0.00	0.00
16	0.50	3	17	0.50	1.41	0.45	0.17	0.06	0.01	0.00	0.00	0.00
17	0.58	3	58	0.58	1.68	0.48	0.16	0.03	0.00	0.03	0.00	0.00
	36.86	**80**	**46**	**36.86**	**63.11**	**43.65**	**34.10**	**25.32**	**18.22**	**11.99**	**6.41**	**2.27**

Suggested grade boundaries

Grade	9	8	7	6	5	4	3
Mark	53	39	30	22	15	10	4