SIMPLIFYING AND PROVING ALGEBRICALLY

Pearson Edexcel – Monday 8 June 2020 - Paper 3 (Calculator) Higher Tier

1.

15	Proof	M1 A1	for $10x = 7.333\ldots$ $(7.\dot{3})$ and for finding difference that would lead to a terminating decimal for completing algebra to reach $\frac{11}{15}$	$100x$ and $1000x$, etc could also be used

Pearson Edexcel - Thursday 6 June 2019 - Paper 2 (Calculator) Higher Tier

2.

13	$\frac{7x-13}{x-2}$	B1 M1 M1 A1	for factorising eg $(x+5)(x-2)$ for a method to divide $(x+5)$ by the algebraic fraction eg $(x+5) \times \frac{(x-1)}{x^2+3x-10}$ for finding 2 fractions with a common denominator or a single fraction eg $\frac{6(x-2)}{x-2}+\frac{(x-1)}{x-2}$ **or** $\frac{6(x-2)+(x-1)}{x-2}$ **or** $\frac{6(x^2+3x-10)}{x^2+3x-10}+\frac{(x+5)(x-1)}{x^2+3x-10}$ **or** $\frac{6(x^2+3x-10)+(x+5)(x-1)}{x^2+3x-10}$ $\frac{7x-13}{x-2}$	Condone incorrect factorising Condone incorrect factorising

Pearson Edexcel - Tuesday 6 November 2018 - Paper 1 (Non-Calculator) Higher Tier

3.

16	Proof with $\frac{127}{495}$	M1 M1 C1	$0.25656\ldots$ **or** $0.2 + 0.05656\ldots$ or $(10 \times 0.2\dot{5}\dot{6} =)\ 2.\dot{5}\dot{6}$ or $2.5656\ldots$ or $(100 \times 0.2\dot{5}\dot{6} =)\ 25.\dot{6}\dot{5}$ or $25.6565\ldots$or $(1000 \times 0.2\dot{5}\dot{6} =)\ 256.\dot{5}\dot{6}$ or $256.5656\ldots$ for finding two correct recurring decimals that when subtracted would result in a terminating decimal or integer, eg. $256.5656\ldots - 2.5656\ldots$ or $25.6565\ldots - 0.25656\ldots$ or $256.\dot{5}\dot{6} - 2.\dot{5}\dot{6}$ or $25.\dot{6}\dot{5} - 0.2\dot{5}\dot{6}$ **or** for $\frac{254}{990}$ or $\frac{25.4}{99}$ full proof seen with $\frac{127}{495}$	

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4.

15	proof	C1	for writing an expression for an odd number, eg $2n + 1$ or $2n - 1$ (assuming n is any integer) **or** states n is even and eg $(n + 1)$ or $(n + 3)$ as odd numbers	
		C1	for a correct expression of the form $(2n + 1)^2 - (2n - 1)^2$ expanded eg $4n^2 + 12n + 9 - (4n^2 + 4n + 1)$ or $4n^2 + 4n + 1 - (4n^2 - 4n + 1)$ **or** $(2n + 1 + 2n - 1)(2n + 1 - (2n - 1))$ **or** when n is even and eg $(n^2 + 6n + 9) - (n^2 + 2n + 1)$ $(=4n + 8)$	Expansion of $(2n - 1)^2 - (2n + 1)^2$ oe is acceptable
		C1	for a correct simplified expression as a multiple of 8 eg $8n + 8$ or $8n$ **or** when n is even **and** eg $4n + 8$ **and** full explanation as to why $4(n+2)$ is always a multiple of 8	

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5.

15		Proof to reach $\frac{24}{55}$	M1	for $100x = 43.636\ldots$ $(43.\dot{6}\dot{3})$ **or** $10x = 4.3636\ldots$ $(4.3\dot{6})$ and $1000x = 436.36\ldots.(436.3\dot{6})$
			M1	(dep) for finding difference that would lead to a terminating decimal
			A1	for completing algebra to reach $\frac{24}{55}$

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6.

17		Completes proof	M1	Expands both expressions eg $\frac{1}{2}(n^2 + n + n^2 + n + 2n + 2)$ **or** $n^2 + n$ and $n^2 + n + 2n + 2$ **or** factorises $\frac{1}{2}(n+1)(n+n+2)$
			C1	Completes proof with explanation and reference to $(n+1)^2$

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7.

19		Proof (supported)	M1	starts process to find point of intersection by substituting, eg $(10 + 2y)^2 + y^2$ $(= 20)$
			M1	for expanding, eg $4y^2 + 20y + 20y + 100$ (3 out of 4 terms correct)
			M1	(dep M2) for 3-term quadratic equation ready for solving, eg $5y^2 + 40y + 80 = 0$
			M1	(dep on previous M1) for method to solve an equation of the form $ay^2 + by + c = 0$, eg by factorising or correct substitution into quadratic formula
			C1	fully correct method leading to $y = -4$ or $x = 2$ or $(y + 4)^2 = 0$ or $(x - 2)^2 = 0$ and statement, eg only one point of intersection so the line is a tangent to the circle

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8.

16			M1 M1	for the start of a method to convert 0.22.. to a fraction, eg $10y = 2.22..$ or $(y=)\ \frac{2}{9}$ for the start of a method to convert 0.13636... to a fraction, $10x = 1.3636..$ or $100x = 13.6363\ldots$ or $1000x = 136.3636..$ or $(x=)\ \frac{13.5}{99}$ or $(x=)\ \frac{135}{990}$
			C1	for correct arithmetic and concluding the proof OR
			M1 M1	for $0.1\dot{3}\dot{6} \times 0.\dot{2} = 0.\dot{0}\dot{3}$ $(= z)$ for complete method to find two appropriate recurring decimals the difference of which is a rational number, eg. $100z = 3.0303\ldots$, $(z =)\ 0.0303\ldots$ or $\frac{3}{99}$
			C1	for correct arithmetic and concluding the proof

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9.

4		$x^2 + 6x = 1$	M1	writes the area using algebraic terms e.g. $(x + 3) \times (x + 3)$ or at least two correct area expressions which may be written on the diagram or x given as $\sqrt{10} - 3$
			M1	expands and includes the given 10 e.g. $x^2 + 3x + 3x + 9 = 10$; condone one error in the four terms when expanding or $10 - 3\sqrt{10} - 3\sqrt{10} + 9 + 6\sqrt{10} - 18$ (=1) condone 1 error in the 6 terms
			A1	rearranges to give the given equation or shows surd expression simplifies to 1

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10.

16		$2(2n-3)$	C1	correct expansion of brackets to give at least 3 terms from $n^2-2n-2n+4$
		even	C1	arrives at n^2-2-n^2+4n-4 oe
			C1	reduces to $2(2n-3)$ or $4n - 6$
			C1	for conclusion e.g. $2(2n-3)$ always even, $4n - 6$ is always even since both are even numbers, they are multiples of 2.

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11.

22		Proof	B1	(indep) for stating $\cos 30 = \frac{\sqrt{3}}{2}$
			M1	for $PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ **or** $AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30$ $(=x^2(2-\sqrt{3}))$ oe
			M1	for $\cos PBQ = \frac{10^2 + 10^2 - PQ^2}{2 \times 10 \times 10}$ (implies previous M1)
	cos PBQ= $\frac{10^2 + 10^2 - x^2(2-\sqrt{3})}{200}$ $= \frac{200 - x^2(2-\sqrt{3})}{200}$		M1	for $\cos PBQ = \frac{10^2 + 10^2 - (x^2 + x^2 - 2 \times x \times x \times \cos 30)}{2 \times 10 \times 10}$
			A1	conclusion of proof with all working seen

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12.

17		proof	C1	starts proof eg $n(n+1)$ or $(n - 1) \times n$
			C1	$n(n+1) + n+1$ or $(n - 1) \times n + n$
			C1	for convincing proof including $(n+1)^2$ or n^2

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13.

19		proof leading to $\frac{7}{22}$	M1	for finding two correct recurring decimals that when subtracted would result in a terminating decimal or integer with intention to subtract eg $x = 0.31818...$, $100x = 31.81818...$
			A1	fully correct proof

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14.

20		proof (supported)	M1 M1 A1 C1	for any two consecutive integers expressed algebraically eg $n + 1$ and n (dep) for the difference between the squares of "two consecutive integers" expressed algebraically eg $(n + 1)^2 - n^2$ for correct expansion and simplification of difference of squares eg $2n + 1$ for showing statement is correct (with supportive evidence) eg $n + n + 1 = 2n + 1$ and $(n + 1)^2 - n^2 = 2n + 1$	for sight of $p^2 - q^2 = (p - q)(p + q)$ for deduction that $p - q = 1$ for linking these two statements eg substitution of 1 for $p - q$ for fully stated proof and deduction eg $p^2 - q^2 = 1 \times (p + q) = p + q$

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15.

13	$(3x - 1)(4x^2 + 20x - 3x - 15)$ $(x + 5)(12x^2 - 4x - 9x + 3)$ $(4x - 3)(3x^2 - x + 15x - 5)$	Fully correct algebra to show given result	M1 M1 A1	for method to find the product of any two linear expressions; eg. 3 correct terms or 4 terms ignoring signs (dep) for method of 6 products, 4 of which are correct (ft their first product) for fully accurate working to give the required result

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16.

24		Proof	C1 C1 C1 C1	for joining AO (extended to D) and considering angles in two triangles (algebraic notation may be used here) for using isosceles triangle properties to find angle BOD (eg. $x + x = 2x$) or angle COD (eg. $y + y = 2y$) for angle $BOC = 2x + 2y$ [= 2×angle BAO + 2×angle CAO] for completion of proof with all relevant reasons given, eg. base angles of isosceles triangle are equal and sum of angles at a point is 360^o

Pearson Edexcel - Sample Paper 2 - (Calculator) Higher Tier

17.

14	$(4n^2+2n+2n+1) - (2n+1) = 4n^2+4n+1-2n-1$ $= 4n^2 + 2n$ $= 2n(2n + 1)$	proof (supported)	M1 P1 C1	for 3 out of 4 terms correct in the expansion of $(2n + 1)^2$ **or** $(2n + 1)\{(2n + 1) - 1\}$ for $4n^2 + 2n$ or equivalent expression in factorised form for convincing statement using $2n(2n + 1)$ or $2(2n^2 + n)$ or $4n^2 + 2n$ to prove the result

Pearson Edexcel - Sample Paper 2 - (Calculator) Higher Tier

18.

15		$\frac{23}{90}$	M1 A1	For a fully complete method as far as finding two correct decimals that, when subtracted, give a terminating decimal (or integer) and showing intention to subtract eg $x = 0.2\dot{5}$ so $10x = 2.5\dot{5}$ then $9x = 2.3$ leading to… correct working to conclusion

Pearson Edexcel - Thursday 4 June 2015 - Paper 1 (Non-Calculator) Higher Tier

19.

21			Proof	3	M1 for $(x =)\ 0.04545(...)$ or $1000x = 45.4545(...)$, accept $1000x = 45.\dot{4}\dot{5}$ or $100x = 4.54545(...)$, accept $100x = 4.5\dot{4}$ or $10x = 0.4545(...)$,accept $10x = 0.\dot{4}\dot{5}$ M1 for finding the difference between two correct, relevant recurring decimals for which the answer is a terminating decimal A1 (dep on M2) for completing the proof by subtracting and cancelling to give a correct fraction eg $\frac{45}{990} = \frac{1}{22}$ or $\frac{4.5}{99} = \frac{1}{22}$

Pearson Edexcel - Monday 8 June 2015 - Paper 2 (Calculator) Higher Tier

20.

20			Shown	3	M1 for correct expansion of $(n+3)^2$ or $(n-3)^2$ eg $(n+3)^2 = n^2+6n+9$ or $(n-3)^2 = n^2-6n+9$ M1 for correct expansion of complete expression, eg $(n^2+6n+9) - (n^2-6n+9)$ A1 for $12n$ and conclusion OR M1 for $[n+3+n-3][n+3-(n-3)]$ M1 for $2n \times 6$ A1 for conclusion

Pearson Edexcel - Friday 13 June 2014 - Paper 2 (Calculator) Higher Tier

21.

21	(a)	$y^2 - 2y - 5y + 10$	$y^2 - 7y + 10$	2	M1 for all 4 terms correct (condone incorrect signs) or 3 out of 4 terms correct with correct signs A1 cao
	*(b)	$(4n^2 + 2n + 2n + 1) - (2n + 1)$ $= 4n^2 + 4n + 1 - 2n - 1$ $= 4n^2 + 2n$ $= 2n(2n + 1)$	Proof	3	M1 for 3 out of 4 terms correct in the expansion of $(2n + 1)^2$ or $(2n + 1)\{(2n+1) - 1\}$ A1 for $4n^2 + 2n$ or equivalent expression in factorised form C1 for convincing statement using $2n(2n + 1)$ or $2(2n^2 + n)$ or $4n^2 + 2n$ to prove the result

Pearson Edexcel - Thursday 28 February 2013 - Paper 1 (Non-Calculator) Higher Tier

22.

*21		$(n+1)^2 - n^2$ $= n^2 + 2n + 1 - n^2 = 2n + 1$ $(n+1) + n = 2n + 1$ OR $(n+1)^2 - n^2$ $= (n + 1 + n)(n + 1 - n)$ $= (2n + 1)(1) = 2n + 1$ $(n+1) + n = 2n + 1$ OR $n^2 - (n+1)^2 = n^2 - (n^2 + 2n + 1) =$ $-2n - 1 = -(2n + 1)$ Difference is $2n + 1$ $(n+1) + n = 2n + 1$	proof	4	M1 for any two consecutive integers expressed algebraically eg n and $n+1$ M1(dep on M1) for the difference between the squares of 'two consecutive integers' expressed algebraically eg $(n+1)^2 - n^2$ A1 for correct expansion and simplification of difference of squares, eg $2n + 1$ C1 (dep on M2A1) for showing statement is correct, eg $n + n + 1 = 2n + 1$ and $(n+1)^2 - n^2 = 2n + 1$ from correct supporting algebra

Pearson Edexcel - Thursday 8 November 2012 - Paper 2 (Calculator) Higher Tier

23.

25		$A = \frac{1}{2} \times x \times 2x \times \sin 30^\circ$ $A = \frac{1}{2} \times 2x^2 \times 0.5$ **OR** Height $= 2x \sin 30^\circ = x$ $A = \frac{x \times x}{2} = \frac{x^2}{2}$ **OR** Height $= x \sin 30 = \frac{x}{2}$ $A = \frac{1}{2} \times 2x \times \frac{x}{2} = \frac{x^2}{2}$	$x = \sqrt{2A}$ shown	3	M1 $(A =) \frac{1}{2} \times x \times 2x \times \sin 30^\circ$ A1 $A = x^2 \times 0.5$ **or** $A = \frac{x^2}{2}$ C1 for completion with all steps shown **OR** M1 height $= 2x \sin 30$ $(= x)$ A1 $A = x^2 \times 0.5$ **or** $A = \frac{x^2}{2}$ C1 for completion with all steps shown **OR** M1 for height $= x \sin 30$ $(= \frac{x}{2})$ A1 $A = x^2 \times 0.5$ **or** $A = \frac{x^2}{2}$ C1 for completion with all steps shown

Pearson Edexcel - Wednesday 13 June 2012 - Paper 2 (Calculator) Higher Tier

24.

21		$4n^2 + 12n + 3^2 - (4n^2 - 12n + 3^2)$ $= 4n^2 + 12n + 9 - 4n^2 + 12n - 9$ $= 24n$ $= 8 \times 3n$	Proof	3	M1 for 3 out of 4 terms correct in expansion of either $(2n + 3)^2$ or $(2n - 3)^2$ **or** $((2n + 3) - (2n - 3))((2n + 3) + (2n - 3))$ A1 for $24n$ from correct expansion of both brackets A1 (dep on A1) for $24n$ is a multiple of 8 or $24n = 8 \times 3n$ or $24n \div 8 = 3n$

Pearson Edexcel - Thursday 5 November 2009 - Paper 3 (Non-Calculator) Higher Tier

25.

23		$x = 0.363636\ldots$ $100x = 36.363636\ldots$ $99x = 36$ $x = \frac{36}{99} = \frac{4}{11}$ or $10000x = 3636.36\ldots$ $9999x = 3636$ $x = \frac{3636}{9999} = \frac{4}{11}$ or $9900x = 3600$ etc	Proof	3	M1 for $100x = 36.363636\ldots$ or $10000x = 3636.3636..$ M1 (dep) for subtraction of both sides A1 for $\frac{36}{99} = \frac{4}{11}$ from correct proof. OR M1 starts long/short division of 11 into 4, set out correctly, with 0.36 seen on the top of the bus stop (oe) with a remainder of 7 M1(dep) Remainder of 4 after the remainder of 7 seen in correct place A1 At least 2 remainders of 4 and one of 7 seen in the correct place and with a statement that the decimal will recur with a cycle length 2 because the remainders have a cycle length 2.

Pearson Edexcel - Thursday 5 November 2009 - Paper 3 (Non-Calculator) Higher Tier

26.

25		Let n be any integer Then a pair of consecutive integers are n and $n + 1$ Their sum = $2n + 1$ Since n is an integer $2n$ is even so $2n + 1$ is odd	Proof	3	M1 Sight n and $n+1$ or $n - 1$ and n M1 sight of $2n+1$ oe A1 explanation of $2n+1$ eg 'it's odd' 'it's one more than an even number' (n must have been defined as an integer to earn the A1)

OCR GSCE – Thursday 5 November 2020 – Paper 5 (Non-Calculator) Higher Tier

27.

14	**(a)**		$12a^{\frac{5}{2}}$ **oe** final answer	**2**	**B1** for $ka^{\frac{5}{2}}$ **oe** or $12a^k$ $(k \neq 0)$	For B1 accept $12a$
14	**(b)**		$8a^{15}$ final answer	**3**	**B2** for $8a^5$ or $\frac{8a^6}{a^{-9}}$ or ka^{15} $(k \neq 0)$ or **B1** for ka^5 or $\frac{ka^6}{a^{-9}}$ or 8 **seen** $(k \neq 0)$	

OCR GSCE – Tuesday 5 November 2019 – Paper 4 (Calculator) Higher Tier

28.

5			$4x^2 - 11xy - 3y^2$ final answer	**3**	**M2** for three correct terms from $4x^2 - 12xy + [1]xy - 3y^2$ oe or **M1** for two correct terms in the expansion above	**M1** implied by two correct terms in answer

OCR GSCE – Thursday 7 November 2019 – Paper 5 (Non-Calculator) Higher Tier

29.

3	**(a)**		She added the terms **oe** $2a^3$	**1** **1**		In all 3 parts any incorrect statement treat as choice Allow correct descriptions of what Martina should have done in each part See AG
3	**(b)**		She divided the powers **oe** x^8	**1** **1**		See AG
3	**(c)**		She squared (½ × 6 × 5) **oe** 75	**1** **1**		See AG

OCR GSCE – Thursday 6 June 2019 – Paper 5 (Non-Calculator) Higher Tier

30.

2	**(a)**		$6a^{11}$	**3**	**B2** for answer ka^{11} or $\frac{6a^{13}}{a^2}$ or $6 \times a^6 \times a^5$ or $6 \times a^8 \times a^3$ shown in working OR **B1** for answer $6a^k$ or ka^{13} or for $3a^8 \times 2a^3$ or $3a^6 \times 2a^5$ shown in working	
	(b)		2.5 or $2\frac{1}{2}$ or $\frac{5}{2}$	**3**	**M1** for correct first step e.g. $6x - 10 = 5$ **M1** for $6x = 5 + 10$ FT *their* first step or for FT *their* $ax = b$ to $x = \frac{b}{a}$	Do not accept $\frac{15}{6}$ as final answer but allow to imply M1M1 Embedded answer scores M2 max where $\frac{b}{a}$ is a simplified fraction (improper or mixed number) or an integer e.g. M1 for $6x = 1$ leading to $x = \frac{1}{6}$

OCR GSCE – Thursday 6 June 2019 – Paper 5 (Non-Calculator) Higher Tier

31.

11	**(a)**		$10\sqrt{2}$ final answer	**2**	**B1** for $2\sqrt{50}$ or $5\sqrt{8}$ or for correct answer seen then spoiled	
	(b)		2	**1**		

OCR GSCE – Tuesday 2 November 2017 – Paper 4 (Calculator) Higher Tier

32.

2	**(a)**	**(i)**	a^4	**1**		
		(ii)	b^{15}	**1**		
	(b)		$x(6 - x)$	**1**		

OCR GSCE – Tuesday 2 November 2017 – Paper 4 (Calculator) Higher Tier

33.

13	**(a)**		4 5	**4**	**B2** for one correct solution OR **B1** for $x^2 - 9x + 20 = 0$ **M2** for $(x - 4)(x - 5) = 0$ or use of the formula with at most one error or **M1** for two factors which when expanded give two terms correctly or use of the formula with at most two errors if **0** scored **SC1** for correctly factorising *their* quadratic expression	
	(b)		$6x^3 + 23x^2 - 33x + 10$	**4**	**M3** for a fully correct method with at most one error e.g. $(2x^2 + 9x - 5)(3x - 2) = 6x^3 + 27x^2 - 15x - 4x^2 - 18x + 10$ or better or **M2** for a correct method to multiply two brackets e.g. $2x^2 + 10x - x - 5$ or $3x^2 + 15x - 2x - 10$ or better or **M1** for a correct method with at most two errors or a correct method to multiply two brackets with at most one error	

OCR GSCE – Tuesday 6 November 2017 – Paper 5 (Non - Calculator) Higher Tier

34.

18			$(x + 1)^2 - x^2$ **oe**	**M2**	**M1** for x and $x + 1$ shown **oe**	For M2 or M1 Condone any two consecutive expressions written algebraically and condone reversal
			Expands all brackets correctly for their expression eg $x^2 + 2x + 1 - x^2$	**M1**		If reversed then brackets needed or all signs need to be correct
			$2x + 1$ is always odd **oe**	**A1**	With no errors seen and brackets expanded for their expressions If 0 scored, **SC1** for 2 correct numeric examples or correct reasoning with consecutive odds and evens	Condone $-2x - 1$ for reversal FT from *their* correct consecutive square expressions eg square numbers 1, 4, 9, 16, go odd, even, odd etc, odd – even = odd, even – odd = odd

OCR GSCE – Thursday 8 June 2017 – Paper 5 (Non - Calculator) Higher Tier

35.

15	**(a)**	**(i)**	$6\sqrt{2}$ final answer	**2**	**M1** for $\sqrt{25 \times 2}$ or better seen	
		(ii)	$\frac{5\sqrt{6}}{3}$ final answer	**2**	**M1** for $\frac{10}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$ oe	For 2 marks accept $1\frac{2}{3}\sqrt{6}$

	(b)		Identifies both errors **and** explains the correct steps e.g. Square not multiply by 2 oe negative power does not make answer negative it should be the reciprocal oe $\frac{1}{16}$	**2** **1**	**B1** for each with no incorrect statement for either	Accept implication of error by a description of correct step e.g. should be squared should be reciprocal, should be $1/n$, should be 1/64 Descriptions must be in words do not accept numeric examples alone SEE APPENDIX isw attempt to convert to decimal

OCR GSCE – Tuesday 13 June 2017 – Paper 6 (Calculator) Higher Tier

36.

16	**a**		$3y^7$	**1** **1 AO1.3a**		
	b		$\frac{7x+2}{(x-1)(x+2)}$ or $\frac{7x+2}{x^2+x-2}$ as final answer	**3** **3 AO1.3b**	**B1** for $(x-1)(x+2)$ or x^2+x-2 seen as a denominator **M1** for $3(x+2)+4(x-1)$ or $3x+6+4x-4$ soi	Condone missing final bracket. Accept not in fraction or seen in separate fractions

OCR GSCE – Sample Papers – Paper 4 (Calculator) Higher Tier

37.

20	**(a)**		$\frac{n-m}{n(n+1)}$	**2** **2 AO1.3b**	**M1** for $\frac{n(m+1)-m(n+1)}{n(n+1)}$	
	(b)		$m<n \Rightarrow n-m>0$ $\Rightarrow \frac{n-m}{n(n+1)}>0$ $\Rightarrow \frac{m+1}{n+1}-\frac{m}{n}>0$	**2** **2 AO2.4b**	**M1** for *their* '$\frac{n-m}{n(n+1)}$' >0	

AQA GSCE – Tuesday 19 May 2020 – Paper 1 (Non - Calculator) Higher Tier

38.

13(a)	$(x+8)(x-5)$ or $(k=)\ 3$ or $(x+5)(x-8)$ or $(k=)\ -3$ or $(x+10)(x-4)$ or $(k=)\ 6$ or $(x+4)(x-10)$ or $(k=)\ -6$ or $(x+20)(x-2)$ or $(k=)\ 18$ or $(x+2)(x-20)$ or $(k=)\ -18$ or $(x+40)(x-1)$ or $(k=)\ 39$ or $(x+1)(x-40)$ or $(k=)\ -39$ or $s=8$ and $t=5$ or $8-5$	M1	oe correct factorisation
	3	A1	condone embedded answer $x^2+3x-40$
	Additional Guidance		
	$x^2+sx-tx-st$ with no further working		M0A0
	Ignore incorrect factorisations in working		

13(b)	Valid reason	B1	eg it should be -2 or 4×-5 isn't 0 or $(2+2)(2-7) = -20$ or $2+2=4$ or $2+2 \neq 0$

Additional Guidance	
'He didn't change the sign on the left'	B1
'If you substitute 2 it does not give 0'	B1
$x = 2$ is wrong	B1
$x = -2$ (and $x = 7$)	B1
$x = -2$ and $x = -7$	B0
'One solution is wrong' or 'Only one answer is correct'	B0
$x = 2$	B0
Ignore statements which do not contradict a correct answer	

AQA GSCE – Thursday 8 June 2020 – Paper 3 (Calculator) Higher Tier

39.

	Alternative method 1 Working with 3.47…..		
26	$10x = 34.7\ldots$ or $100x = 347.7\ldots$	M1	oe multiplication by a power of 10 eg $1000x = 3477.7\ldots$ any letter
	$10x - x = 34.7\ldots - 3.47\ldots$ or $9x = 31.3$ with $10x = 34.7\ldots$seen or $100x - 10x = 347.7\ldots - 34.7\ldots$ or $90x = 313$ with $100x = 347.7\ldots$ and $10x = 34.7\ldots$ seen or $100x - x = 347.7\ldots - 3.47\ldots$ or $99x = 344.3$ with $100x = 347.7\ldots$ seen	M1dep	oe subtraction to eliminate recurring digits eg $1000x - 10x = 3477.7\ldots - 34.7\ldots$ or $990x = 3443$ with $1000x = 3477.7\ldots$ and $10x = 34.7\ldots$ seen numbers must all be correct
	$x = 3.47\ldots$ stated and M2 scored and $9x = 31.3$ and $(x =) \frac{31.3}{9}$ and $\frac{313}{90}$ or $x = 3.47\ldots$ stated and M2 scored and $90x = 313$ and $(x =) \frac{313}{90}$ or $x = 3.47\ldots$ stated and M2 scored and $99x = 344.3$ and $(x =) \frac{344.3}{99}$ and $\frac{313}{90}$	A1	oe eg $x = 3.47\ldots$ stated and M2 scored and $990x = 3443$ and $(x =) \frac{3443}{990}$ and $\frac{313}{90}$

Mark scheme continues on the next three pages

26 cont	**Alternative method 2 Working with 0.47…..**		
	$10x = 4.7\ldots$ or $100x = 47.7\ldots$	M1	oe multiplication by a power of 10 eg $1000x = 477.7\ldots$ any letter
	$10x - x = 4.7\ldots - 0.47\ldots$ or $9x = 4.3$ with $10x = 4.7\ldots$ seen or $100x - 10x = 47.7\ldots - 4.7\ldots$ or $90x = 43$ with $100x = 47.7\ldots$ and $10x = 4.7\ldots$ seen or $100x - x = 47.7\ldots - 0.47\ldots$ or $99x = 47.3$ with $100x = 47.7\ldots$ seen	M1dep	oe subtraction to eliminate recurring digits eg $1000x - 10x = 477.7\ldots - 4.7\ldots$ or $990x = 473$ with $1000x = 477.7\ldots$ and $10x = 4.7\ldots$ seen numbers must all be correct
	$x = 0.47\ldots$ stated and M2 scored and $9x = 4.3$ and $(x =) \frac{4.3}{9}$ and $3\frac{4.3}{9}$ and $\frac{313}{90}$ or $x = 0.47\ldots$ stated and M2 scored and $90x = 43$ and $(x =) \frac{43}{90}$ and $3\frac{43}{90}$ and $\frac{313}{90}$ or $x = 0.47\ldots$ stated and M2 scored and $99x = 47.3$ and $(x =) \frac{47.3}{99}$ and $3\frac{47.3}{99}$ and $\frac{313}{90}$	A1	oe eg $x = 0.47\ldots$ stated and M2 scored and $990x = 473$ and $(x =) \frac{473}{990}$ and $3\frac{473}{990}$ and $\frac{313}{90}$

Mark scheme continues on the next page

26 cont	**Alternative method 3 Working with 0.07…..**		
	$10x = 0.7\ldots$ or $100x = 7.7\ldots$	M1	oe multiplication by a power of 10 eg $1000x = 77.7\ldots$ any letter
	$10x - x = 0.7\ldots - 0.07\ldots$ or $9x = 0.7$ with $10x = 0.7\ldots$ seen or $100x - 10x = 7.7\ldots - 0.7\ldots$ or $90x = 7$ with $100x = 7.7\ldots$ and $10x = 0.7\ldots$ seen or $100x - x = 7.7\ldots - 0.07\ldots$ or $99x = 7.7$ with $100x = 7.7\ldots$ seen	M1dep	oe subtraction to eliminate recurring digits eg $1000x - 10x = 77.7\ldots - 0.7\ldots$ or $990x = 77$ with $1000x = 77.7\ldots$ and $10x = 0.7\ldots$ seen numbers must all be correct
	$x = 0.07\ldots$ stated and M2 scored and $9x = 0.7$ and $(x =) \frac{0.7}{9}$ and $3.4 + \frac{0.7}{9}$ and $\frac{313}{90}$ or $x = 0.07\ldots$ stated and M2 scored and $90x = 7$ and $(x =) \frac{7}{90}$ and $3.4 + \frac{7}{90}$ and $\frac{313}{90}$ or $x = 0.07\ldots$ stated and M2 scored and $99x = 7.7$ and $(x =) \frac{7.7}{99}$ and $3.4 + \frac{7.7}{99}$ and $\frac{313}{90}$	A1	oe eg $x = 0.07\ldots$ stated and M2 scored and $990x = 77$ and $(x =) \frac{77}{990}$ and $3.4 + \frac{77}{990}$ and $\frac{313}{90}$

Additional guidance continues on the next page

26 cont	**Additional Guidance**	
	$313 \div 90 = 3.47\ldots$	M0M0A0
	Alt 1 M1dep oe subtraction to eliminate recurring decimals includes $100x - 10x = 313$ with $100x = 347.7\ldots$ and $10x = 34.7\ldots$ seen or $90x = 347.7\ldots - 34.7\ldots$ with $100x = 347.7\ldots$ and $10x = 34.7\ldots$ seen (apply same principle in Alt 2 and Alt 3)	
	Alt 2 equivalents for final part of A1 eg For $3\frac{43}{90}$ and $\frac{313}{90}$ allow $3 + \frac{43}{90}$ and $\frac{313}{90}$	
	Alt 3 equivalents for final part of A1 eg For $3.4 + \frac{7}{90}$ and $\frac{313}{90}$ allow $3 + \frac{4}{10} + \frac{7}{90}$ and $\frac{313}{90}$	

AQA GSCE – Tuesday 21 May 2019 – Paper 1 (Non - Calculator) Higher Tier

40.

16	Correct factorisation of numerator $2(2x - 4x^2)$ or $4(x - 2x^2)$ or $x(4 - 8x)$ or $2x(2 - 4x)$ or $4x(1 - 2x)$ or correct factorisation of denominator $2(6x - 3)$ or $3(4x - 2)$ or $6(2x - 1)$ or correct cancelling by 2 throughout $\frac{2x - 4x^2}{6x - 3}$	M1	oe with negative coefficients
	Correct fraction with numerator $4x(1 - 2x)$ or $-4x(2x - 1)$ and denominator $6(2x - 1)$ or $-6(1 - 2x)$ or $-\frac{4x}{6}$ or $\frac{-4x}{6}$ or $\frac{4x}{-6}$ or $\frac{2x(2-4x)}{-3(2-4x)}$ or $\frac{2x(2-4x)}{3(4x-2)}$	M1dep	oe with cancelling of 2 throughout eg $\frac{2x(1-2x)}{3(2x-1)}$ or $\frac{2x(1-2x)}{-3(1-2x)}$
	$-\frac{2x}{3}$ or $-\frac{2}{3}x$	A1	allow $\frac{-2x}{3}$ or $\frac{2x}{-3}$
	Additional Guidance		
	Allow multiplication signs up to M1M1		
	Allow -0.6 for $-\frac{2}{3}$		
	Do not allow $-0.66...$ for $-\frac{2}{3}$		
	For the first M1 only, allow any correct factorisation seen within multiple attempts		

AQA GSCE – Tuesday 11 June 2019 – Paper 3 (Calculator) Higher Tier

41.

	Alternative method 1 – answer written as a fraction		
	a^2 on numerator	B1	a correctly simplified
	b^3 on denominator or b^{-3} on numerator	B1	b correctly simplified
	c cancelled and d on denominator or d^{-1} on numerator	B1	d correctly simplified
	Alternative method 2 – answer written only as a product		
	a^2	B1	a correctly simplified
	b^{-3}	B1	b correctly simplified
	d^{-1} and c cancelled	B1	d correctly simplified
	Additional Guidance		
15	If answer line is blank, marks can be awarded in the working		
	Do not award any marks if addition or subtraction is seen in their best attempt		
	Condone use of capital letters		
	Penalise use of × sign by one mark only if full marks would have been awarded eg $a^2 \times b^{-3} \times d^{-1}$		B1B1
	$\frac{a^2}{db^3}$ or $\frac{a^2d^{-1}}{b^3}$ or $\frac{a^2b^{-3}}{d}$ or $a^2b^{-3}d^{-1}$		B1B1B1
	$\frac{a^2b^2}{db^5}$ or $\frac{a^2b^2d^{-1}}{b^5}$ or $a^2b^2d^{-1}b^{-5}$		B1B0B1
	$\frac{a^3}{dab^3}$		B0B1B1
	$\frac{a^2c}{cdb^3}$		B1B1B0
	$\frac{a}{d} \times b^3$ use of × sign not penalised as full marks would not be awarded		B0B0B1
	$a^2 + b^{-3} - d^{-1}$		B0B0B0

AQA GSCE – Tuesday 6 November 2018 – Paper 1 (Non - Calculator) Higher Tier

42.

3	$22a$	B1	

AQA GSCE – Thursday 8 November 2018 – Paper 2 (Calculator) Higher Tier

43.

20	$\frac{6n^2}{n} + 2n^3$ or $6n + 2n^3$ or $6n^3 - 6n$	M1	expands one bracket correctly allow $3 \times 2n$ for $\frac{6n^2}{n}$
	$\frac{6n^2}{n} + 2n^3 + 6n^3 - 6n$ or $6n + 2n^3 + 6n^3 - 6n$	M1dep	fully correct expansion allow $3 \times 2n$ for $\frac{6n^2}{n}$
	$8n^3$ and $(2n)^3$	A1	must have seen M1M1 oe eg $8n^3$ and $2n \times 2n \times 2n$ or $8n^3$ and $\sqrt[3]{8n^3} = 2n$ condone $8n^3$ and 2^3n^3
	Additional Guidance		
	Do not allow $\frac{2n^2 \times 3}{n}$ for $\frac{6n^2}{n}$		

AQA GSCE – Thursday 8 November 2018 – Paper 2 (Calculator) Higher Tier

44.

22	$3(x-2)$ or $x^3(x^2-4)$ or $x^2(x^3-4x)$ or $x(x^4-4x^2)$ or $(x^4+2x^3)(x-2)$ or $x^3(x+2)(x-2)$ or $x^2(x^2+2x)(x-2)$ or $x(x^3+2x^2)(x-2)$	M1	numerator or denominator factorised oe eg $x^2(x+2)(x^2-2x)$
	$3(x-2)$ and $x^3(x+2)(x-2)$ or $3(x-2)$ and $(x^4+2x^3)(x-2)$ or $3(x-2)$ and $x^2(x^2+2x)(x-2)$ or $3(x-2)$ and $x(x^3+2x^2)(x-2)$	A1	numerator and denominator factorised each with factor $(x-2)$
	$\frac{x^3(x+2)}{3}$ or $\frac{x^2(x^2+2x)}{3}$ or $\frac{x(x^3+2x^2)}{3}$ or $\frac{x^4+2x^3}{3}$	A1	oe fully simplified expression eg $\frac{1}{3}x^3(x+2)$ or $\frac{x^4}{3}+\frac{2x^3}{3}$
	Additional Guidance		
	$\frac{x^3(x+2)}{3}$ followed by further incorrect work		M1A1A0
	$\frac{x^3\times(x+2)}{3}$ or $\frac{1}{3}\times x^3(x+2)$		M1A1A0
	$3\times(x-2)$ and $x^3\times(x+2)\times(x-2)$		M1A1
	$3\times(x-2)$ or $x^3\times(x^2-4)$		M1
	$1(3x-6)$ or $-1(6-3x)$		M0
	$-3(2-x)$		M1
	$-3(2-x)$ and $-x^3(x+2)(2-x)$		M1A1

AQA GSCE – Monday 24 May 2018 – Paper 1 (Non - Calculator) Higher Tier

45.

3	$5a-4a^2$	B1	

AQA GSCE – Thursday 7 June 2018 – Paper 2 (Calculator) Higher Tier

46.

13	**Alternative method 1**		
	Any correct factorisation of the numerator or the denominator	M1	eg $8(x^2 - 1)$ or $4(x + 1)$ or $2(4x^2 - 4)$ or $2(2x + 2)$ or $4(2x^2 - 2)$ or $(4x + 4)(2x - 2)$ or $(4x - 4)(2x + 2)$ or $(8x + 8)(x - 1)$ or $(8x - 8)(x + 1)$ or $-2(-4x^2 + 4)$ does not need to be seen in a fraction may be implied eg $\frac{2x^2 - 2}{x + 1}$ or $\frac{4x^2 - 4}{2x + 2}$
	Correct fraction with a common algebraic factor in the numerator and the denominator	A1	eg $\frac{8(x+1)(x-1)}{4(x+1)}$ or $\frac{2(2x+2)(2x-2)}{2(2x+2)}$ or $\frac{2(x+1)(x-1)}{(x+1)}$ or $\frac{4(x+1)(2x-2)}{4(x+1)}$ or $\frac{(4x+4)(2x-2)}{4x+4}$
	$2x - 2$ or $a = 2$ and $b = -2$ with M1A1 scored	A1	

Mark scheme and additional guidance continues on the next page

13 cont	**Alternative method 2**		
	$4ax^2 + 4ax + 4bx + 4b$	M1	oe expands $(ax + b)(4x + 4)$ to 4 terms with at least 3 terms correct
	Any 2 of $4a = 8$ $4b = -8$ $4a + 4b = 0$	A1	
	$a = 2$ and $b = -2$ and shows that third equation is satisfied with M1A1 scored	A1	
	Additional Guidance		
	M1 is implied by the first A1 eg $\frac{8(x+1)(x-1)}{4(x+1)}$		M1A1
	$1(8x^2 - 8)$ or $-1(8 - 8x^2)$ etc		M0
	$2x - 2$ without M1A1 scored		M0A0A0
	M1A1 scored and $2x - 2$ followed by attempt to solve $2x - 2 = 0$		M1A1A1
	M1A1 scored and $2x - 2$ followed by $2(x - 1)$		M1A1A1
	M1A1 scored followed by $2(x - 1)$ but $2x - 2$ not seen		M1A1A0

AQA GSCE – Thursday 7 June 2018 – Paper 2 (Calculator) Higher Tier

47.

	Alternative method 1 Working with 2.75…..		
	$10x = 27.5\ldots$ or $100x = 275.5\ldots$	M1	oe multiplication by a power of 10 eg $1000x = 2755.5\ldots$ any letter
	$10x - x = 27.5\ldots - 2.75\ldots$ or $9x = 24.8$ with $10x = 27.5\ldots$ seen or $100x - 10x = 275.5\ldots - 27.5\ldots$ or $90x = 248$ with $100x = 275.5\ldots$ and $10x = 27.5\ldots$ seen or $100x - x = 275.5\ldots - 2.75\ldots$ or $99x = 272.8$ with $100x = 275.5\ldots$ seen	M1dep	oe subtraction to eliminate recurring digits eg $1000x - 10x = 2755.5\ldots - 27.5\ldots$ or $990x = 2728$ with $1000x = 2755.5\ldots$ and $10x = 27.5\ldots$ seen numbers must all be correct
27	$x = 2.75\ldots$ stated and M2 scored and $9x = 24.8$ and $x = \frac{24.8}{9} = \frac{124}{45}$ or $x = 2.75\ldots$ stated and M2 scored and $90x = 248$ and $x = \frac{248}{90} = \frac{124}{45}$ or $x = 2.75\ldots$ stated and M2 scored and $99x = 272.8$ and $x = \frac{272.8}{99} = \frac{124}{45}$	A1	oe eg $x = 2.75\ldots$ stated and M2 scored and $990x = 2728$ and $x = \frac{2728}{990} = \frac{124}{45}$

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27 cont	**Alternative method 2 Working with 0.75…..**		
	$10x = 7.5\ldots$ or $100x = 75.5\ldots$	M1	oe multiplication by a power of 10 eg $1000x = 755.5\ldots$ any letter
	$10x - x = 7.5\ldots - 0.75\ldots$ or $9x = 6.8$ with $10x = 7.5\ldots$ seen or $100x - 10x = 75.5\ldots - 7.5\ldots$ or $90x = 68$ with $100x = 75.5\ldots$ and $10x = 7.5\ldots$ seen or $100x - x = 75.5\ldots - 0.75\ldots$ or $99x = 74.8$ with $100x = 75.5\ldots$ seen	M1dep	oe subtraction to eliminate recurring digits eg $1000x - 10x = 755.5\ldots - 7.5\ldots$ or $990x = 748$ with $1000x = 755.5\ldots$ and $10x = 7.5\ldots$ seen numbers must all be correct
	$x = 0.75\ldots$ stated and M2 scored and $9x = 6.8$ and $x = \frac{6.8}{9}$ and $2\frac{6.8}{9} = \frac{124}{45}$ or $x = 0.75\ldots$ stated and M2 scored and $90x = 68$ and $x = \frac{68}{90}$ and $2\frac{68}{90} = \frac{124}{45}$ or $x = 0.75\ldots$ stated and M2 scored and $99x = 74.8$ and $x = \frac{74.8}{99}$ and $2\frac{74.8}{99} = \frac{124}{45}$	A1	oe eg $x = 0.75\ldots$ stated and M2 scored and $990x = 748$ and $x = \frac{748}{990}$ and $2\frac{748}{990} = \frac{124}{45}$

Mark scheme continues on the next page

27 cont	**Alternative method 3 Working with 0.05…..**		
	$10x = 0.5\ldots$ or $100x = 5.5\ldots$	M1	oe multiplication by a power of 10 eg $1000x = 55.55\ldots$ any letter
	$10x - x = 0.5\ldots - 0.05\ldots$ or $9x = 0.5$ with $10x = 0.5\ldots$ seen or $100x - 10x = 5.5\ldots - 0.5\ldots$ or $90x = 5$ with $100x = 5.5\ldots$ and $10x = 0.5\ldots$ seen or $100x - x = 5.5\ldots - 0.05\ldots$ or $99x = 5.5$ with $100x = 5.5\ldots$ seen	M1dep	oe subtraction to eliminate recurring digits eg $1000x - 10x = 55.5\ldots - 0.5\ldots$ or $990x = 55$ with $1000x = 55.5\ldots$ and $10x = 0.5\ldots$ seen numbers must all be correct
	$x = 0.05\ldots$ stated and M2 scored and $9x = 0.5$ and $x = \frac{0.5}{9}$ and $2.7 + \frac{0.5}{9} = \frac{124}{45}$ or $x = 0.05\ldots$ stated and M2 scored and $90x = 5$ and $x = \frac{5}{90}$ and $2.7 + \frac{5}{90} = \frac{124}{45}$ or $x = 0.05\ldots$ stated and M2 scored and $99x = 5.5$ and $x = \frac{5.5}{99}$ and $2.7 + \frac{5.5}{99} = \frac{124}{45}$	A1	oe eg $x = 0.05\ldots$ stated and M2 scored and $990x = 55$ and $x = \frac{55}{990}$ and $2.7 + \frac{55}{990} = \frac{124}{45}$

Additional guidance continues on the next page

	Additional Guidance	
27 cont	124 ÷ 45 = 2.75…	M0M0A0
	Alt 1 M1dep oe subtraction to eliminate recurring decimals includes $100x - 10x = 248$ with $100x = 275.5\ldots$ and $10x = 27.5\ldots$ seen or $90x = 275.5\ldots - 27.5\ldots$ with $100x = 275.5\ldots$ and $10x = 27.5\ldots$ seen (apply same principle in Alts 2 and 3)	
	Alt 2 equivalents for final part of A1 eg For $2\frac{68}{90} = \frac{124}{45}$ allow $2 + \frac{68}{90} = \frac{124}{45}$	
	Alt 3 equivalents for final part of A1 eg For $2.7 + \frac{5}{90} = \frac{124}{45}$ allow $2 + \frac{7}{10} + \frac{5}{90} = \frac{124}{45}$	

AQA GSCE – Tuesday 12 June 2018 – Paper 3 (Calculator) Higher Tier

48.

	Alternative method 1		
18	$\frac{2(x+4)}{6x}$ or $(-)\frac{15}{6x}$ or $\frac{2x+8}{6x}$ or $(-)\frac{15}{6x}$ or $\frac{2x(x+4)}{6x^2}$ or $(-)\frac{15x}{6x^2}$ or $\frac{2x^2+8x}{6x^2}$ or $(-)\frac{15x}{6x^2}$	M1	oe A correct fraction using a common denominator for one of the given fractions Accept for this mark only eg $2(3x)$ for $6x$ $3(5)$ for 15 $(2x)(3x)$ for $6x^2$ First fraction can be written as separate fractions eg $\frac{2x}{2(3x)} + \frac{8}{2(3x)}$
	$\frac{2(x+4)}{6x}$ and $(-)\frac{15}{6x}$ or $\frac{2x+8}{6x}$ and $(-)\frac{15}{6x}$ or $\frac{2x(x+4)}{6x^2}$ and $(-)\frac{15x}{6x^2}$ or $\frac{2x^2+8x}{6x^2}$ and $(-)\frac{15x}{6x^2}$	A1	oe A correct fraction using a common denominator for both of the given fractions First fraction can be written as separate fractions eg $\frac{2x}{6x} + \frac{8}{6x}$
	$\frac{2x-7}{6x}$ or $\frac{2kx-7k}{6kx}$, where k is a constant value	A1	Accept eg $\frac{2x+-7}{6x}$ Do not ignore further working

18 cont	**Alternative method 2**		
	$\frac{2(x+4)}{6x}$ or $(-)\frac{15}{6x}$ or $\frac{2x+8}{6x}$ or $(-)\frac{15}{6x}$ or $\frac{2x(x+4)}{6x^2}$ or $(-)\frac{15x}{6x^2}$ or $\frac{2x^2+8x}{6x^2}$ or $(-)\frac{15x}{6x^2}$	M1	oe A correct fraction using a common denominator for one of the given fractions Accept for this mark only eg $2(3x)$ for $6x$ $3(5)$ for 15 $(2x)(3x)$ for $6x^2$ First fraction can be written as separate fractions eg $\frac{2x}{2(3x)} + \frac{8}{2(3x)}$
	$\frac{2x+8-15}{6x}$ or $\frac{2x-7}{6x}$ or $\frac{2kx-7k}{6kx}$, where k is a constant value	A1	Allow one error in numerator Accept eg $\frac{2x+-7}{6x}$ Must be $6x$ or a multiple of $6x$
	$\frac{2x-7}{6x}$ or $\frac{2kx-7k}{6kx}$, where k is a constant value	A1	Accept eg $\frac{2x+-7}{6x}$ Do not ignore further working
	Additional Guidance		
	Use the method that gives the greater mark		
	$\frac{2x^2-7x}{6x^2}$		M1A1
	$\frac{2x-7}{6x} = \frac{-5}{6x}$		M1A1A0
	$\frac{15x}{6x^2} - \frac{2x^2+8x}{6x^2}$ (order of fractions reversed)		M1A0A0

AQA GSCE – Thursday 6 November 2017 – Paper 2 (Calculator) Higher Tier

49.

11	$\frac{x^2}{2x^2+1}$	B1	
	Additional Guidance		

AQA GSCE – Wednesday 8 November 2017 – Paper 3 (Calculator) Higher Tier

50.

5	$x^2 - 8x - 8x + 64$	M1	allow one error or omission terms may be seen in a grid
	$x^2 - 16x + 64$	A1	Ignore fw eg if attempting to solve Do not ignore fw if attempting to simplify
	Additional Guidance		
	$x^2 - 16x$ (+ k) $k \neq 64$		M1A0
	$x^2 - 8x + 64$		M1A0
	$x^2 - 16x + 64 = -15x^3 + 64$		M1A0
	$x^2 - 8x + 8x + 64$ (one error)		M1A0
	$x^2 + 8x + 8x + 64$ (one error)		M1A0
	$x^2 - 6x + 8x + 64$ (two errors)		M0A0
	$x^2 + 64$ (two errors)		M0A0

AQA GSCE – Wednesday 25 May 2017 – Paper 1 (Non - Calculator) Higher Tier

51.

1	2^8	B1	

AQA GSCE – Tuesday 13 June 2017 – Paper 3 (Calculator) Higher Tier

52.

27	**Alternative method 1** – completing the square		
	$(x+\frac{1}{2})^2 + ...$	M1	
	$(x+\frac{1}{2})^2 - (\frac{1}{2})^2 + 1$ or $(x+\frac{1}{2})^2 - \frac{1}{4} + 1$ or $(x+\frac{1}{2})^2 + \frac{3}{4}$	A1	oe
	$(x+\frac{1}{2})^2 \geq 0$ and $\frac{3}{4} > 0$ and always positive	A1	oe
	Alternative method 2 – real roots		
	$\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times 1}}{2 \times 1}$ or a correct sketch showing a quadratic curve with turning point above the x-axis	M1	oe
	States no values on x-axis	A1	oe
	States no values on x-axis and (minimum value =) $\frac{3}{4}$	A1	oe
	Alternative method 3 – Calculus		
	$2x + 1 = 0$	M1	
	$x = -\frac{1}{2}$	A1	
	(minimum value =) $\frac{3}{4}$	A1	

27 cont	**Alternative method 4** – Explanation method		
	If $x \geq 0$, $x^2 \geq 0$ and $x \geq 0$ $(1 > 0)$ so $x^2 + x + 1 > 0$ and If $-1 < x < 0$ $x^2 > 0$ and $x + 1 > 0$ so $x^2 + x + 1 > 0$ and If $x \leq -1$ $x^2 > x$ and $x^2 + x > 0$ so $x^2 + x + 1 > 0$	B3	Accept $x > 0$ for $x \geq 0$ B2 for two correct statements B1 for one correct statement
	Additional Guidance		
	Calculating pairs of coordinates alone		M0A0A0

AQA GSCE – Sample Paper 1 (Non - Calculator) Higher Tier

53.

26	$\frac{10}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ or $\frac{10\sqrt{5}}{15}$ $\frac{10}{3\sqrt{5}} \times \frac{3\sqrt{5}}{3\sqrt{5}}$ or $\frac{30\sqrt{5}}{45}$ or $\frac{\sqrt{20}}{3}$	M1	oe Must multiply numerator and denominator eg $\frac{10}{\sqrt{45}}$ is M0 $\frac{10}{\sqrt{45}} \times \frac{\sqrt{45}}{\sqrt{45}}$ is M1
	$\frac{2\sqrt{5}}{3}$	A1	

AQA GSCE – Sample Paper 2 (Calculator) Higher Tier

54.

3	$a + 20a^2$	B1	