



1		2.41	B1	c.a.o.	
					[1]
2	(a)	20	B1		
	(bi)	Number of scones with 700 ml of milk $= \frac{700}{150} \times 8 = 37 \frac{1}{3}$ Number of scones with 900 g of flour $= \frac{900}{275} \times 8 = 26 \frac{2}{11}$	M1		
		26 scones	A1		
	(bii)	Amount of butter $= \frac{60}{8} \times 26 = 195$	A1	FT from (b)(i)	
					[4]
3		Total interest earned $= 2.4\% \times \$5250 \times 4 = \504	M1	Calculate interest	
		Total after 4 years $\$5250 + \$504 = \$5754$	A1		
					[2]
4		Calculation B because <u>both the mass of gold and cost per gram of gold are rounded up.</u>	B1	Rounded up o.e.	
					[1]
5	(a)	$3c - 4 = 9c + 17$ $-6c = 21$ $c = -\frac{7}{2}$	M1	Isolate c	
			A1	o.e.	
	(b)	$8ab + 12a - 2b - 3$ $= 4a(2b + 3) - (2b - 3)$ $= (4a - 1)(2b + 3)$	M1	Grouping o.e.	
			A1		
	(c)	$(4x + 3y)(3x - 4y)$ $= 12x^2 + 9xy - 16xy - 12y^2$ $= 12x^2 - 7xy - 12y^2$	M1	Expand	
			A1		
					[6]



6	(a)	$-43 < 2(5x+3) - 14 \leq 42$ $-43 < 2(5x+3) - 14 \quad \text{and} \quad 2(5x+3) - 14 \leq 42$		Splitting	
		$-43 < 2(5x+3) - 14$ $-29 < 2(5x+3)$ $-\frac{29}{2} < 5x+3$ $-\frac{35}{2} < 5x$ $-\frac{7}{2} < x$	$2(5x+3) - 14 \leq 42$ $2(5x+3) \leq 56$ $5x+3 \leq 28$ $5x \leq 25$ $x \leq 5$	M2	M1 for each side solved correctly o.e.
		$-\frac{7}{2} < x \leq 5$	A1	o.e.	
	(b)		B1	Correct inequality FT from (a)	
					[4]
7	(a)	Correct perpendicular bisector with arcs	B1		
	(b)	Correct angle bisector with arcs	B1		
	(c)	Correct shaded area	B1		
					[3]



8	(a)	$(-3, 9)$	B1	c.a.o.	
	(b)	$ \overrightarrow{PQ} = \sqrt{(-7)^2 + 10^2}$	M1		
		$= 12.20655562 \text{ units}$ $= 12.2 \text{ units (3 s.f.)}$	A1		
					[3]
9		Let one side of the cube be x . $6x^2 = 125$ $x^2 = \frac{125}{6} \Rightarrow x = \sqrt{\frac{125}{6}}$	M1	Find one side of the cube s.o.i.	
		Volume of cube $= \left(\sqrt{\frac{125}{6}}\right)^3$ $= 95.09072179 \text{ cm}^3$ $= 95.1 \text{ cm}^3 \text{ (3 s.f.)}$	A1		
					[2]
10	(a)	$x = 2, y = 3$	B1		
	(b)	$k = 315$	B1		
					[2]
11	(a)	The increase in cost per litre of fuel from the end of May to the end of June may not be linear in nature, where the cost might have increased suddenly close to the end of June.	B1	The increase is non-linear o.e.	
	(b)	In between months, there may be drastic hikes in the cost of fuel per litre, which is not shown on the graph.	B1	Increases may not be shown o.e.	
	(ci)	The vertical axis does not start from zero.	B1	Does not start from zero o.e.	
	(cii)	A reader may think that the cost of fuel per litre at the end of June is about 8 times more of that at the end of January which is not true.	B1	Any comparison made o.e.	
					[4]



12		$8a - 4b + 7 = 6c$ $6c - 8a + 4b = 7$ $2(3c - 4a + 2b) = 7$ Since $2(3c - 4a + 2b)$ is always even for all integers a , b and c . However, if the result is 7, which is not even, then a , b and c cannot all be integers.	B1	Explain by contradiction if a , b and c are all integers.	
					[1]
13		Let angle $CAD = x$. Angle $ACD = \frac{180^\circ - x}{2}$. Also, angle $ACB = x + 42^\circ$.			
		$\frac{180 - x}{2} = x + 42$	M1	Form equation	
		$180 - x = 2x + 84$ $3x = 96$ $x = 32$	A1		
		Angle $ACD = 32^\circ + 42^\circ = 74^\circ$	A1		
					[3]
14		Let the GNI in 2018 be x .			
		GNI in 2019 = $1.0363x$ GNI in 2020 = $0.97868172x$	M1	Calculate GNI in 2020 s.o.i.	
		GNI in 2021 = $1.0924x$ Percentage increase = $\frac{1.0924x - 0.97868172x}{0.97868172x} \times 100\%$	M1	o.e.	
		$= 11.6195\%$ $= 11.6\% \text{ (3 s.f.)}$	A1		
					[3]
15	(a)	$y = (x - 2)(x - 8)$ $= x^2 - 2x - 8x + 16$ $= x^2 - 10x + 16$	M1	Form equation or M0	
		$b = -10$	A1	or B1	
		$c = 16$		or B1	
	(b)	$y = 2x^2 - 20x + 32$	B1	o.e.	
					[3]



16	(a)	The tangent TA is perpendicular to the radius of the circle OA . Hence, angle $OAT = 90^\circ$.	B1	Reason given	
	(b)	Angle $AOT = 180^\circ - 90^\circ - 42^\circ = 48^\circ$ (Angles sum of triangle)	M1	With reason given	
		Angle $ACB = \frac{48^\circ}{2} = 24^\circ$ (Angle at centre is twice the angle at centre)	A1	With reason given	
	(c)	Angle $AOC = 180^\circ - 2(23^\circ) = 134^\circ$ Reflex angle $AOC = 360^\circ - 134^\circ = 226^\circ$	M1	226° s.o.i.	
		Shaded area $= \frac{226^\circ}{360^\circ} \times \pi(8.7)^2$	M1		
		$= 149.2774873 \text{ cm}^2$ $= 149 \text{ cm}^2$ (3 s.f.)	A1		
					[6]
17		$(7^3)^4 = (7^2)^{-5y}$	M1	Change to base 7	
		$7^{12} = 7^{-10y}$ $12 = -10y$ $y = -\frac{6}{5}$	A1	o.e.	
					[2]
18		$\frac{a}{2a-3} = \frac{3c+d}{d}$ $ad = (3c+d)(2a-3)$	M1	Remove fraction s.o.i.	
		$ad = 6ac + 2ad - 9c - 3d$ $6ac + ad = 9c + 3d$	M1	Rearranging of terms o.e.	
		$a(6c+d) = 9c+3d$ $a = \frac{9c+3d}{6c+d}$	A1	o.e.	
					[3]
19		$y = x^2 + 6x + 11$ $y = (x+3)^2 - (3)^2 + 11$	M1	Attempt to complete the square o.e.	
		$y = (x+3)^2 + 2$	A1		
		Minimum point is $(-3, 2)$	A1		
					[3]



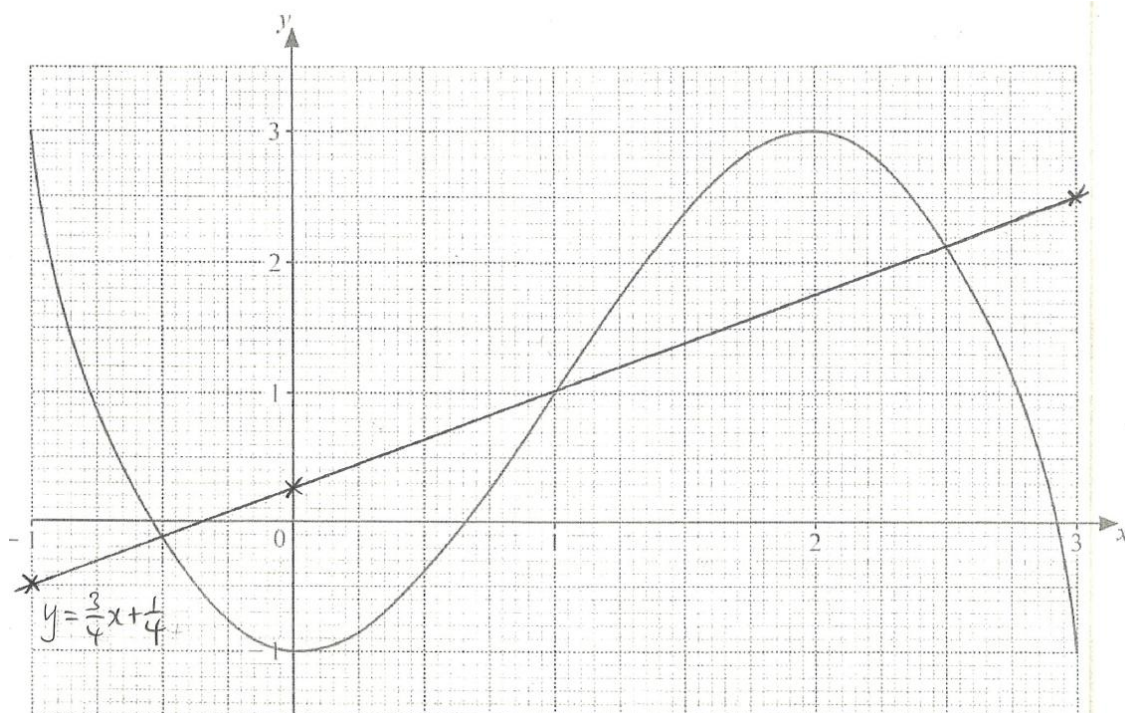
20	(a)	Let angle $APS = x$ Angle $BPQ = 180^\circ - 90^\circ - x = 90^\circ - x$ (Adjacent angles on a straight line) Angle $BPQ = 180^\circ - 90^\circ - (90^\circ - x) = x = \text{Angle } APS$ (Angles sum of triangle)	M1	Prove angle APS and angle BPQ are equal o.e.	
		$PS = QP$ (Sides of a square are equal) Angle $PAS = \text{Angle } QBP = 90^\circ$ (Interior angles of a square)	M1		
		Hence, Triangles APS and BQP are congruent. (AAS Congruency Test)	A1	Must state AAS	
	(b)	Let point X lie on BC and is vertically below point S. By Pythagoras' Theorem, $QS^2 = 25^2 + 25^2 = 1250$	M1	Find QS o.e.	
		$QX = \sqrt{1250 - 31^2} = 17 \text{ cm}$	M1		
		$2PB = 31 - 17 = 14$ $PB = 7 \text{ cm}$ $AP = 24 \text{ cm}$	A1	A1 for both	
					[6]
21	(a)	$\frac{\pi r^2(78)}{\pi^2 h} = \frac{13}{20}$	M1	Form equation o.e.	
		$\frac{h}{78} = \frac{20}{13}$ $h = 120$			
		120 cm	A1		
	(b)	$\left(\frac{h}{78}\right)^3 = \frac{20}{13}$	M1	Form equation o.e.	
		$\frac{h}{78} = \sqrt[3]{\frac{20}{13}}$ $h = 78 \times \sqrt[3]{\frac{20}{13}}$	M1	o.e.	
		$h = 90.04442251$ $h = 90.0 \text{ (3 s.f.)}$	A1	c.a.o.	
					[5]



22		Distance travelled by $A = \frac{1}{2}(20 + v)(60) + 40v$	M1	s.o.i.	
		Distance travelled by $B = 100(v + 3)$	M1	s.o.i.	
		$100(v + 3) = 75 + \frac{1}{2}(v + 20)(60) + 40v$	M1	Form equation	
		$100(v + 3) = 75 + 30(v + 20) + 40v$ $100v + 300 = 75 + 30v + 600 + 40v$ $30v = 375$ $v = 12.5$	A1		
					[4]
23		$\frac{2x}{x+4} + \frac{5}{3x-5} = 3$ $\frac{2x(3x-5) + 5(x+4)}{(x+4)(3x-5)} = 3$	M1	Join fraction	
		$6x^2 - 10x + 5x + 20 = 3(x+4)(3x-5)$	M1	Remove fraction	
		$6x^2 - 5x + 20 = 3(3x^2 + 12x - 5x - 20)$	M1	Expand $(x+4)(3x-5)$	
		$6x^2 - 5x + 20 = 9x^2 + 21x - 60$ $3x^2 + 26x - 80 = 0$ $x = \frac{-(26) \pm \sqrt{(26)^2 - 4(3)(-80)}}{2(3)}$	M1	Quadratic formula o.e.	
		$x = 2.407916139$ or $x = -11.07458281$ $x = 2.41$ or $x = -11.07$ (2 d.p.)	A1	Both seen	
					[5]
24		$\left(\frac{16}{81a^4c^{12}}\right)^{\frac{3}{4}} = \left(\frac{81a^4c^{12}}{16}\right)^{\frac{3}{4}}$	M1	Flip fraction or M0	
		$= \frac{27}{8}a^3c^9$	A1	c.a.o. or B1 for $\frac{27}{8}$ or B1 for a^3c^9	
					[2]



25	(ai)	Mean = 77.0625 g	B1	c.a.o. since exact	
	(aii)	Standard deviation = 3.38 g	B1	c.a.o.	
	(b)	1. On average, the masses of the kiwi fruits are higher as the mean of 77.0625 g is larger than 65.5 g of the plums.	B1	Must state figures	
		1. The distribution of the masses of the kiwi fruits are more consistent as the standard deviation of 3.38 g is lower than 3.83 g of the plums.	B1	Must state figures	
					[4]
26		$4x^3 - 12x^2 + 3x + 5 < 0$ $x^3 - 3x^2 + \frac{3}{4}x + \frac{5}{4} < 0$ $-x^3 + 3x^2 - \frac{3}{4}x - \frac{5}{4} > 0$	M1	Divide by (-4) throughout the inequality s.o.i.	
		$-x^3 + 3x^2 - 1 > \frac{3}{4}x + \frac{1}{4}$ Equation of line is $y = \frac{3}{4}x + \frac{1}{4}$.			
		Drawing of line with two points plotted	M1	s.o.i.	
		$x < -0.5$ or $1 < x < 2.5$	A2	A1 for each inequality o.e.	
					[4]





27	(a)	$1 - x$	B1	c.a.o.	
	(b)	$P(Y \text{ lands on an odd number}) = \frac{3}{20x}$	M1	s.o.i.	
		$P(X \text{ lands on even and } Y \text{ lands on odd}) = \frac{9}{20}$ $(1 - x) \left(\frac{3}{20x} \right) = \frac{9}{20}$ $3(1 - x) = 9x$ $3 - 3x = 9x$ $x = \frac{1}{4}$	M1	Find x o.e.	
		$P(\text{both } X \text{ and } Y \text{ land on even})$ $= \left(1 - \frac{1}{4} \right) \left(1 - \frac{3}{20(0.25)} \right) = \frac{3}{10}$	A1	o.e.	
					[4]

END OF MARKING SCHEME



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