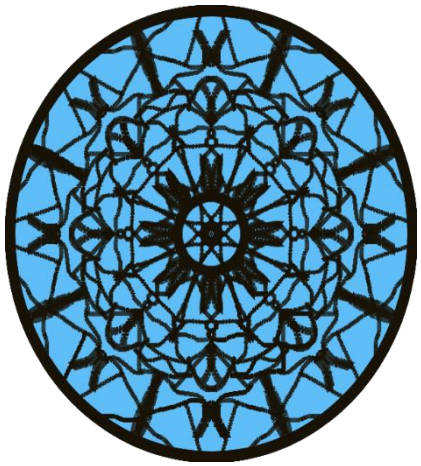


GCSE Mathematics

2019 Predicted Paper 1b (Non-Calculator)
1MA1
Higher Tier (Mark Scheme)

1MA1 2019 Predicted papers 1b: Paper 1H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
1				2	M1 for correct intersecting arcs A1 for correct angle bisector
2			Proof	4	M1 for setting up a correct equation in x, eg. $3x - 2 = x + 1$

1MA1 2019 Predicted papers 1b: Paper 1H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
					M1 (dep) for a fully correct method to solve their equation or for $x = 1.5$ M1 (dep) for ("1.5" + 1) × 4 or (3 × "1.5" – 2) × 4 or (3 × "1.5" – 2) × 2 + ("1.5"+ 1) × 2 C1 (dep on M3) for completing the proof resulting in a perimeter of 10 **OR** M1 for setting up a correct equation in x, eg. $2(3x – 2) + 2(x + 1) = 10$ M1 (dep) for a fully correct method to solve their equation or for $x = 1.5$ M1 (dep) for "1.5" + 1 and 3 × "1.5" – 2 C1 (dep on M3) for completing the proof resulting in a justification that the shape is a square

1MA1 2019 Predicted papers 1b: Paper 1H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
3			9	4	M1 for method to find area of one rectangle, eg 15 × 8 (=120) or 15 × 11 (=165) M1 (dep) for subtracting from/by given area, eg (138 – "120") (=18) or "165" – 138 (=27) M1 for final step from complete method shown, eg 15 − "18"÷ 3 or "27" ÷ 3 A1 cao **OR** M1 for a correct expression for the area of one rectangle, eg (8 + 3) × (15 − *x*) or 8 × *x* M1 (dep) for a correct equation eg (8 + 3) × (15 − *x*) + 8 × *x* = 138 M1 for correct method to isolate *x*, eg 3*x* = 27 A1 cao
4	(a)		3	1	B1 for 3 (accept ±3, but not –3 alone)
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ (= 0.5)

1MA1 2019 Predicted papers 1b: Paper 1H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
	(c)		4	1	B1 cao
	(d)		6	3	M1 for using $8 = 2^3$ M1 for deriving a correct equation in *m* A1 cao
5		240 ÷ 8 = 30 Ann = 30 x 3 = 90 Bob = 30 x 5 = 150 90 ÷ 2 + 150 ÷ 10 = 60 OR Ann = 3/8 Bob = 5/8 3/8 x ½ + 5/8 x 1/10 3/16 + 5/80 = 15/80 + 5/80	60/240 (= ¼)	4	M1 for 240 ÷ 8 = 30 M1 for 30 x 3 (= 90) or 30 x 5 (= 150) M1 for '90' ÷ 2 + '150' ÷ 10 A1 cao OR M1 for 3/8 or 5/8 M1 for 3/8 x ½ + 5/8 x 1/10 M1 for 3/16 + 5/80 A1 cao
6		Gradient of the line joining the two points $= \frac{-1-1}{4--2} = \frac{-2}{6} = -\frac{1}{3}$ and the midpoint of the line is $\left(\frac{4+-2}{2}, \frac{1+-1}{2}\right) = (1, 0)$. If the perpendicular bisector	$y = 3x - 3$.	5	Gradient of the line joining the two points $= \frac{-1-1}{4--2} = \frac{-2}{6} = -\frac{1}{3}$ and the midpoint of the line is $\left(\frac{4+-2}{2}, \frac{1+-1}{2}\right) = (1, 0)$. If the perpendicular bisector has a gradient of 3 and passes through (1, 0) then substituting $x = 1$ and $y = 0$ gives $0 = 3 \times 1 + c$ so $c = -3$.

1MA1 2019 Predicted papers 1b: Paper 1H (Regular) mark scheme – Version 1.0					
Question		**Working**	**Answer**	**Mark**	**Notes**
		has a gradient of 3 and passes through (1, 0) then substituting $x = 1$ and $y = 0$ gives $0 = 3 \times 1 + c$ so $c = -3$.			The equation of the perpendicular bisector is $y = 3x - 3$.
7		$4x - 6y = 22$ $15x + 6y = 74$ $19x = 96$ $2 \times 4 - 3y = 11$	$x = 4$, $y = -1$	4	M1 for a correct process to eliminate either x or y (condone one arithmetic error) A1 for either $x = 4$ or $y = -1$ M1 (dep on 1st M1) for correct substitution of their found variable A1 for both $x = 4$ and $y = -1$

8		N boys 2N girls 3N/5 + 2N/10 = 4N/5 4N/5 ÷ 3N	4/15	4	M1 for 3N/5 or 2N/10 oe M1 for 3N/5 + 2N/10 oe M1 for '4N/5' ÷ 3N A1 for 4/15 oe

9(a)			2	1	B1 cao
9(b)			Negative	1	B1 cao
9(c)			2.6 to 2.9	2	B2 for answer in the range 2.6 to 2.9 [B1 for a line of best fit drawn if answer outside this range]
10(a)			Triangle at (0, -2), (3, -2), (0, -4)	2	B2 for a correct rotation [B1 for correct orientation or correct rotation 90° anticlockwise
10(b)			Enlargement, scale factor 3 about (0, 0)	3	B1 for enlargement B1 for scale factor of 3 B1 for centre (0, 0) oe

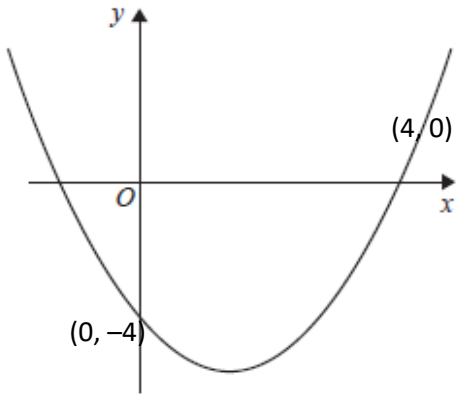
11a 11b		4 + 15/24 + 16/24 = 4 + 31/24 7/2 ÷ 14/5 = 7/2 x 5/14	$5\frac{7}{24}$ $1\frac{1}{4}$		M1 for 4 + 15/24 + 16/24 oe A1 cao M1 for 7/2 or 14/5 seen A1 cao

12(a)		x= 0.292929… 100*x* = 29.292929… 99*x* = 29	29/99	2	M1 for 0.292929… A1 for 29/99 oe
12(b)		*y* = 0.0x0x0x… 100*y* = *x*.0x0x0x… 99*y* = *x* so *y* = x/9	Proof	2	M1 for for sight of two recurring decimals whose difference is a rational number A1 for completion of proof

13		72	P1 P1 A1	for showing the process of 30 × 60 (=1800) or 20 × 54 (=1080) (dep P1) for showing the complete process e.g. (“1800” – “1080”) ÷ 10 concluding the answer is 72 (and not 66)

14		500	M1 A1	recognition of 1.2 or 120% oe eg 600 ÷ 1.2 oe or $x \times 1.2 = 600$ oe or 120%=600 cao
15		$x^3+6x^2+11x+6$	M1 M1 A1	for method to find the product of any two linear expressions (3 correct terms) e.g. $x^2+x+2x+2$ or $x^2+2x+3x+6$ or $x^2+x+3x+3$ for method of multiplying out remaining products, half of which are correct (ft their first product) e.g. $x^3+x^2+2x^2+3x^2+2x+3x+6x+6$ cao
16 (a)		$y=\frac{9}{x^2}$	M1 A1	begins to work with $y=\frac{k}{x^2}$ oe e.g. subs of a pair of numbers into $y=\frac{k}{x^2}$ or states k=9 for $y=\frac{9}{x^2}$ Accept $y = 9x^{-2}$
(b)		$\frac{3}{4}$	M1 A1	ft (dep on previous M1) subs y = 16 into proportional formula of the form $y=\frac{k}{x^2}$ oe oe

17(a)		Stars: 4/9 x 3/8 = 12/72 Hearts: 3/9 x 2/8 = 6/72 12/72 + 6/72 = 18/72	¼	3	M1 for 4/9 x 3/8 (= 12/72) or 3/9 x 2/8 (= 6/72) M1 for '12/72' + '6/72' A1 for ¼ oe
17(b)		1440 x 12/72 x 1.50 = 360 1440 x 6/72 x 2 = 240 1440 – 360 - 240	840	4	M1 for 1440 x 12/72 or 1440 x 6/72 M1 for 1440 x 12/72 x 1.50 (= 360) or 1440 x 6/72 x 2 (= 240) M1 for 1440 – '360' – '240' A1 cao
18(a)	$3((x-2)^2-4)$		C1	This mark is given for a first step to find gf(x)	
	$= 3(x^2 - 4x + 4 - 4)$ $= 3x^2 - 12x$ $= 3x(x-4)$		C1	This mark is given for a complete chain of reasoning	

18(b)	$g^{-1}(x) = \frac{x}{3} + 4$	M1	This mark is given for a process to find an expression for $g^{-1}(x)$
	$3 + 4 = 7$	A1	This mark is given for the correct answer only
19  When $x = 0$ and $y = –4$, $–4 = 0^2 + (a \times 0) + b$ $b = –4$	P1	This mark is given for a process to substitute to find the value of b
When $x = 4$ and $y = 0$, $0 = 4^2 + 4a – 4$ $a = –3$	P1	This mark is given for a process to substitute to find the value of a
$y = x^2 – 3x – 4 = (x + 1)(x – 4)$ Thus the other intercept is at $(–1, 0)$	P1	This mark is given for a complete process to find the turning point

Midpoint x-coordinate is 1.5 When $x = 1.5$, y-coordinate is –6.25 Turning point is (1.5, –6.25)		A1	This mark is given for the correct answer only
20	Let x be the number of orange marbles in the bag The probability of taking two orange marbles is $\frac{x}{2x+3} \times \frac{x-1}{2x+2}$ The probability of taking two purple marbles is $\frac{x+3}{2x+3} \times \frac{x+2}{2x+2}$	P1	This mark is given for a process to find the probability of taking two orange marbles or the probability of taking two purple marbles
	The probability of taking two marbles of the same colour is $\frac{x}{2x+3} \times \frac{x-1}{2x+2} + \frac{x+3}{2x+3} \times \frac{x+2}{2x+2} = \frac{43}{88}$	P1	This mark is given for forming an equation for the probability Roxanne takes two marbles of the same colour
	$88(x(x-1) + (x+3)(x+2))$ $= 43(2x+3)(2x+2)$	P1	This mark is given for a process to eliminate fractions from the algebraic expression
	$88(2x^2 + 4x + 6) = 43(4x^2 + 10x + 6)$	P1	This mark is given for reducing the expression to a quadratic equation

	$176x^2 + 352x + 528 = 172x^2 + 430x + 258$ $4x^2 - 78x + 270 = 0$				
	$(2x - 30)(2x - 9) = 0$		P1	This mark is given for finding a method to solve the quadratic equation	
	15		A1	This mark is given for the correct answer only	
21			$3x$	M1	Factorising numerator and denominator of first fraction $\frac{3(x+2)}{(x-5)(x+2)}$ $\left(=\frac{3}{(x-5)}\right)$ M1 Factorising denominator of second fraction $\frac{x+5}{x(x+5)(x-5)}$ $\left(=\frac{1}{x(x-5)}\right)$ M1 Multiplication by reciprocal $\frac{3(x+2)}{(x-5)(x+2)} \times \frac{x(x+5)(x-5)}{(x+5)}$ A1 Completing algebra to reach $3x$
22			$x < -3, x > 6$	M1	Rearrange to $x^2 - 3x - 18 > 0$
				M1	Correct method to solve $x^2 - 3x - 18 = 0$
				M1	Establish critical values -3 and 6
				A1	$x < -3, x > 6$
23			60	P1	process to start problem eg draw diagram and find gradient of OA (= 3)

				P1	process to find equation of tangent with $m = -1/'3'$
				P1	process to find x-axis intercept of tangent
				P1	process to find area of triangle
				A1	cao

24	(a)	$\sqrt{9\times5}$ **and** $\sqrt{4\times5}$		2	M1	**or** for 45 = 3 × 3 × 5 **and** 20 = 2 × 2 × 5
			$5\sqrt{5}$ shown		A1	dep on M1 cao with sight of $3\sqrt{5}+2\sqrt{5}$ but we must see where these come from
	(b)	$\frac{2}{\sqrt{3}-1}\times\frac{\sqrt{3}+1}{\sqrt{3}+1}$ or $\frac{2(\sqrt{3}+1)}{3-1}$ or $\frac{2\sqrt{3}+2}{2}$		2	M1	Rationalise denominator – award for seeing multiplication by $\frac{\sqrt{3}+1}{\sqrt{3}+1}$ or $\frac{-\sqrt{3}-1}{-\sqrt{3}-1}$
			$1+\sqrt{3}$		A1	dep on M1
	(c)	$(x+3\sqrt{2})^2-(3\sqrt{2})^2-1$		2	M1	or $(x+3\sqrt{2})^2-18-1$ **or** for $a=3\sqrt{2}$ **or** $b=-19$
			$(x+3\sqrt{2})^2-19$		A1	

20		Proof	B1	for using any correct trig value for 30°, e.g. sin 30 = 0.5, cos 30 = $\frac{\sqrt{3}}{2}$ or tan 30 = $\frac{1}{\sqrt{3}}$
			M1	for hypotenuse of small triangle = 2*y* or hypotenuse of large triangle = 2*n*
			A1	for method to find the hypotenuse of middle triangle, e.g. $\sqrt{(2n)^2-n^2}$ $(=\sqrt{3}n)$
			A1	for a correct equation linking *y* and *n* and correct working leading to the given result