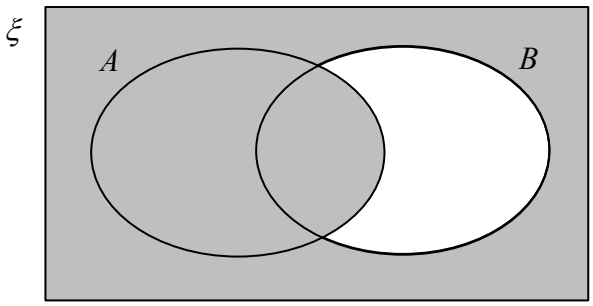
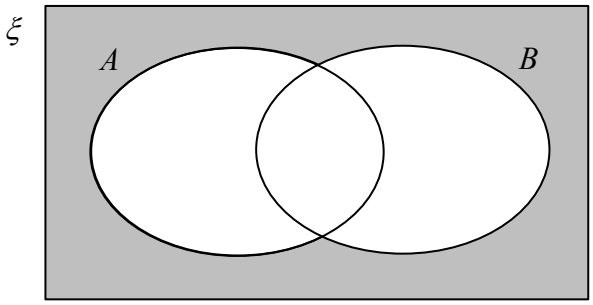
General Certificate of Education Ordinary Level 2016
Mathematics 4048/01
Syllabus 4048 Paper 1
SUGGESTED Solutions & Marking Scheme Mark Allocation
Prepared by: Jordan Tew (*@math_stuff_here*)

1	(a)	$6x-2$	B1		
	(b)	$6x(1+3y)$	B1		
					[2]
2		$4ax-16ay+12by-3bx$ $=4a(x-4y)-3b(x-4y)$	M1	Grouping or M0	
		$=(4a-3b)(x-4y)$	A1	or B1 per bracket	
					[2]
3	(a)		B1		
	(b)		B1		
					[2]
4		$(5n+1)^2-(5n-1)^2$ $=25n^2+10n+1-\left(25n^2-10n+1\right)$	M1	Either expansion correct s.o.i.	
		$=25n^2+10n+1-25n^2+10n-1$ $=20n$	A1		
		Since 20 is a factor of the expression, it is a multiple of 20 for all positive integers n.	AG	Must conclude	
					[2]

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5		Perimeter $= 22$ cm Length + Breadth $= 11$ cm (May be implied through guess and check, or other methods e.g. prime factorisation)	M1	Find possible combinations of Lenth + Breadth s.o.i.	
		6 cm	A1		
					[2]
6		$\frac{1}{2}(18.7)(12.8)\sin\angle ABC = 58.6$ $\sin\angle ABC = \frac{1465}{2992}$	M1	Use of area of triangle s.o.i.	
		$\angle ABC = 29.31685932°$ or $150.6831407°$ $= 29.3°$ or $150.7°$ (1 d.p.)	A1		
					[2]
7		$\left(\frac{h}{30}\right)^3 = \frac{1}{2}$	M1	Form equation	
		$\frac{h}{30} = \sqrt[3]{\frac{1}{2}} \Rightarrow h = 30\times\sqrt[3]{\frac{1}{2}} = 23.81101578 = 23.8$ (3 s.f.)	A1		
					[2]
8		The widths of the flames are inconsistent / not constant.	B1	Feature	
		This may lead a reader to think that the gas bill in 2015 is twice the gas bill in 2012.	B1	Comparison made	
					[2]
9		$\frac{3}{(x-4)^2} + \frac{1}{(x-4)}$ $= \frac{3+x-4}{(x-4)^2}$	M1	Join fraction	
		$= \frac{x-1}{(x-4)^2}$	A1		
					[2]

10	(a)	$\frac{3x°}{2}$ or $(175-2x)°$	B1	o.e.	
	(b)	If angle $ADC = \frac{3x°}{2}$, $\frac{3x}{2}+2x+5=180$ / If angle $ADC=(175-2x)°$, $3x=2(175-2x)$	M1	Form equation with either angle	
		$\frac{7}{2}x=175$, $x=50$ / $3x=350-4x$, $7x=350$, $x=50$	A1		
					[3]
11	(a)	$9+(x-4)^2-(4)^2$	M1	Complete the square s.o.i.	
		$=-7+(x-4)^2$	A1	c.a.o.	
	(b)	$(4,-7)$	B1	FT from (a)	
					[3]
12		**In the US:** Cost of diesel per litre $=\frac{4.48}{3.785}=\frac{896}{757}$ US Dollars	M1	Cost per litre s.o.i.	
		Cost of diesel per litre in SGD $=\frac{896}{757}\times 1.242=1.47005582$ Singapore Dollars	M1		
		Hawaii	A1	M0A0	
					[3]
13	(a)	2520 m	B1		
	(b)	Let the heights of the planes be h_1 and h_2.			
		$21-\frac{h_1}{120}-\left(21-\frac{h_2}{120}\right)=25$	M1	Difference s.o.i.	
		$\frac{h_2}{120}-\frac{h_1}{120}=25$, $\Rightarrow h_2-h_1=3000$	A1		
					[3]

14		(27, 22)	B2	B1 for each correct coordinate	
					[2]
15	(a)	Angle $AED = 180° - 45° = 135°$ (Adjacent angles on a straight line)	M1	If any/all reason(s) is/are missing, or unacceptable short forms are used*, deduct **only** M1 from total in this part. A1 is still given if correct.	
		Angle $DAE = 180° - 135° - 22° = 23°$ (Angles sum of triangle)	M1		
		Angle $ABC = 180° - 23° - 34° = 123°$ (Interior angles, BC is parallel to AD)	M1		
		Refle angle $ABC = 360° - 123° = 237°$ (Angles at a point)	A1		
		<u>Do Not Accept the use of the following short forms:</u> • '$\angle$' to denote 'angle' • 'Δ' to denote 'triangle' • '//' to denote 'parallel'		*Unacceptable short forms to look out for	
	(b)	Angle $ACD = 180° - 45° - 38° = 97° \neq 90°$ (Angles sum of triangle)		Must state reason	
		Since angle $ACD \neq 90°$, by right-angle in semicircle property, a semicircle with AD as its diameter does not pass through C	B1	Must state circle property	
					[5]
16	(a)	Circumference $= 2\pi(10)$	M1	Radius $= 10$ cm s.o.i.	
		$= 62.83185307 = 62.8$ cm (3 s.f.)	A1		
	(b)	By Pythagoras' Theorem, Length of rectangle $= \sqrt{20^2 - 13^2} = \sqrt{231}$ cm	M1		
		Area $= 13\sqrt{231} = 197.582894 = 198$ cm^2 (3 s.f.)	A1		
					[4]
17	(a)	$k = 4$	B1		
		$a = 5$	B1		
	(b)	Gradient $= \dfrac{100 - 4}{-2 - 0} = -48$	M1		
		$y = -48x + 4$	A1		
					[4]

18	(a)	Use of ladder method or tree method to prime factorise	M1	or B0	
		$2^4 \times 7^2$	A1	or B1 per factor	
	(b)	Since the powers of the prime factors are all even / are all multiples of 2 / are all divisible by 2, 784 is a perfect square.	B1		
	(c)	$m = 7$ and $n = 2$	B1		
					[4]
19	(a)	Litres of petrol used $= \frac{6.7}{100} \times 19629 = 1315.143$	M1		
		Total paid $= \$2.42 \times 1315.143$ $= \$3182.64606 = \$3182.65$ (2 d.p.)	A1		
	(b)	Total distance travelled in 2024 $= \frac{100}{135} \times 19629$	M1		
		$= 14540$ km	A1		
					[4]
20	(a)	1 : 2 500 000 1 cm : 25 km	M1	Conversion to km s.o.i.	
		Actual length $= 25 \times 49.3 = 1232.5$ km	A1		
	(b)	1 cm : 25 km 1 cm^2 : 625 km^2	M1	Square map scale s.o.i.	
		Area of Switzerland $= \frac{41285}{625} = 66.056$ cm^2	A1	c.a.o.	
					[4]
21	(a)	$\frac{200-84}{200}$	M1	84 s.o.i.	
		$= \frac{29}{50}$	A1	o.e.	
	(b)	$90\% \times 300 = 270$ $90\% \times 300 = 330$	M1	Find the bounds s.o.i.	
		Number of students $= 100 - 64 = 36$	A1		
					[4]

22	(a)	312°	B1	c.a.o.	
	(b)	Distance within shaded area on map $= 5.1$ cm	M1		
		Distance within shaded area in km $= 5.1 \times 10 = 51$ km	M1		
		Time taken $= \frac{51}{35} = 1$ hour 27 minutes	A1		
					[4]
23	(a)	17 units	B1		
	(b)	$\overrightarrow{DC} = \overrightarrow{OC} - \overrightarrow{OD}$ $\overrightarrow{OD} = \overrightarrow{OC} - \overrightarrow{DC}$ $= \begin{pmatrix} 4 \\ 20 \end{pmatrix} - \begin{pmatrix} -16 \\ 30 \end{pmatrix}$	M1	Splitting of vectors s.o.i. or M0	
		D (20, –10)	A1	or B1 for each coordinate	
	(c)	Trapezium	B1		
					[4]
24		By Pythagoras' Theorem, Radii of quadrant $= \sqrt{r^2 + r^2} = \sqrt{2r^2} = \sqrt{2}r$	M1	s.o.i.	
		Unshaded area $= r^2 + \frac{\pi\left(\sqrt{2}r\right)^2}{4} + r(2r) - \frac{\pi r^2}{2}$ (1) (2) (3)	M3	M1 for triangles *CGH* and *DEH* (1) M1 for quadrant *GEH* (2) M1 for difference to find *AEF* and *BGF* (3)	
		$= 3r^2$			
		Fraction $= \frac{3r^2}{(2r)^2} = \frac{3r^2}{4r^2} = \frac{3}{4}$	A1	c.a.o as the question asks for a **fraction**	
					[5]

25	(ai)	$\overrightarrow{AC} = 5\mathbf{c} - 5\mathbf{a}$	$\overrightarrow{CA} = 5\mathbf{a} - 5\mathbf{c}$	M1	s.o.i.	
		$\overrightarrow{AP} = \frac{4}{5}(5\mathbf{c} - 5\mathbf{a}) = 4\mathbf{c} - 4\mathbf{a}$ $\overrightarrow{OP} = 5\mathbf{a} + 4\mathbf{c} - 4\mathbf{a} = \mathbf{a} + 4\mathbf{c}$	$\overrightarrow{CP} = \frac{1}{5}(5\mathbf{a} - 5\mathbf{c}) = \mathbf{a} - \mathbf{c}$ $\overrightarrow{OP} = 5\mathbf{c} + \mathbf{a} - \mathbf{c} = \mathbf{a} + 4\mathbf{c}$	A1		
	(aii)	$\overrightarrow{PA} = 4\mathbf{a} - 4\mathbf{c}$		M1	s.o.i.	
		$\overrightarrow{PQ} = 4\mathbf{a} - 4\mathbf{c} + 4\mathbf{a} + 8\mathbf{c} = 8\mathbf{a} + 4\mathbf{c}$		A1		
	(b)	Since $\overrightarrow{CB} = \frac{5}{4}\overrightarrow{PQ}$, $\overrightarrow{PQ}$ is a scalar multiple of $\overrightarrow{CB}$ and hence PQ is parallel to CB.		B1	Find a relationship between $\overrightarrow{PQ}$ and $\overrightarrow{CB}$	
	(c)	5 : 4		B1	c.a.o.	
						[6]

END OF MARKING SCHEME

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