TANGLIN SECONDARY SCHOOL
MATHS PAPER 2
PRELIMINARY EXAMINATION 2020
SECONDARY 4 EXPRESS MARKERS' REPORT

Qn		Workings	Marks	Remarks
1	(a)	$3x+2=20$ $x=6$	M1 A1	
	(b)	$(x+1)(x-3)=6$ $x^2-2x-9=0$ $x=\frac{-(-2)\pm\sqrt{(-2)^2-4(1)(-9)}}{2}$ $=\frac{2\pm\sqrt{40}}{2}$ $=4.16$ or -2.16	M1 M1 M1 A1	
	(ci)	$\frac{75x^3}{16y^2}\times\frac{(2xy^2)^3}{25x^5y^3}$ $=\frac{3xy}{2}$	M1 A1	
	(cii)	$\frac{2}{(x+2)(x-1)}+\frac{1}{x-1}$ $=\frac{2}{(x+2)(x-1)}+\frac{x+2}{(x+2)(x-1)}$ $=\frac{x+4}{(x+2)(x-1)}$	M1 M1 A1	

2	**(ai)**	$x = 3$ $y = 11$ $z = 15$	B1 B2	If 1 wrong If all correct
	(aii)	$T_n = 3 + 4(n - 1)$ $= 4n - 1$	M1 A1	
	(aiii)	435	B1	
	(bi)	5	B1	
	(bii)	15		
	(biii)	$n-1$	B1	
	(biv)	$\frac{n(n-1)}{2} = \frac{256\times255}{2} = 32640$	B1	
	(bv)	Because the only factorisation for 71 is 1 × 71 and 2×71 can never be a product of consecutive integers (i.e. $n(n-1)$)	B1	
3	**(a)**	$\frac{2720}{85}\times100$ $= \$3200$	M1 A1	
	(b)	2720×0.85 $= \$2312$	M1 A1	
	(ci)	2312 − 120 = 2192 ($)	B1	
	(cii)	3200 − 2192 = 1008($)	M1 A1	
	(d)	Amount after processing fee = 2192 × 1.04 = $2279.68 Amount to be paid over 24 months $= \frac{2279.68\times5\times2}{100} + 2279.68$ $= \$2507.648$ Amount to be paid a month	M1 M1	

		$= \$2507.648 \div 24$ $= \$104.49$	A1	
4	**(a)**	$\frac{400}{x}$	B1	
	(b)	$\frac{400}{x-20}$	B1	
	(c)	$\frac{400}{x}+\frac{400}{x-20}=9$ $\frac{400(x-20)+400x}{x(x-20)}=9$ $800x-8000=9x^2-180x$ $9x^2-980x+8000=0$	M1 M1 A1	
	(d)	$x=\frac{-(-980)\pm\sqrt{(-980)^2-4(9)(8000)}}{2(9)}$ $=\frac{980\pm\sqrt{672400}}{18}$ $=100$ or $8\frac{8}{9}$ $8\frac{8}{9}$ should be rejected as the speed of return journey would be negative.	M1 M1 A1 B1	
	(e)	$88\frac{8}{9}$ km/h	B1	
5	**(a)**	$700 < t \leq 800$	B1	

	(b)	750.5 hours	B1	
	(c)	$\text{SD} = \sqrt{\frac{115440000}{200} - \left(\frac{150100}{200}\right)^2}$ $= 118$	M1 A1	
	(d)	P(getting a light bulb with lifetime of at most 700 hours) $= \frac{25+40}{200}$ $= \frac{13}{40}$ or 0.325	 M1 A1	
	(ei)	P(getting two light bulbs that can last more than 900 hours) $= \frac{24}{200} \times \frac{23}{199}$ $= \frac{69}{4975}$	 M1 A1	
	(eii)	The mean life time of light bulbs made by brand A is longer.	B1	
6	**(a)**	$4\mathbf{A} = \begin{pmatrix} 2 & 6 \\ 8 & 4 \end{pmatrix}$ $\mathbf{A} = \begin{pmatrix} \frac{1}{2} & \frac{3}{2} \\ 2 & 1 \end{pmatrix}$	M1 A1	

	(b)	$2\begin{pmatrix}3 & -4\\0 & 2\end{pmatrix}+\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}-3\begin{pmatrix}-2 & -1\\1 & 4\end{pmatrix}$ $=\begin{pmatrix}6 & -8\\0 & 4\end{pmatrix}+\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}-\begin{pmatrix}-6 & -3\\3 & 12\end{pmatrix}$ $=\begin{pmatrix}13 & -5\\-3 & -7\end{pmatrix}$	M1 M1 A1	
	(ci)	$\mathbf{C}=\begin{pmatrix}18 & 9 & 10\\15 & 7 & 24\end{pmatrix}$	B1	
	(cii)	$\mathbf{S}=\begin{pmatrix}18 & 9 & 10\\15 & 7 & 24\end{pmatrix}\begin{pmatrix}1\\1\\1\end{pmatrix}$ $=\begin{pmatrix}37\\46\end{pmatrix}$	 B1	
	(ciii)	37 and 46 represents total cups of coffee sold at café A and B respectively.	B1	
	(civ)	$\mathbf{P}=\begin{pmatrix}8\\6\\7\end{pmatrix}$	B1	

	(cv)	$\mathbf{T} = \begin{pmatrix} 18 & 9 & 10 \\ 15 & 7 & 24 \end{pmatrix} \begin{pmatrix} 8 \\ 6 \\ 7 \end{pmatrix}$ $= \begin{pmatrix} 268 \\ 330 \end{pmatrix}$	M1 A1	
7	**(a)**	$CF = \sqrt{10^2 - 8^2}$ $= 6$ cm	M1 A1	
	(b)	$V = \frac{1}{2}(8)(6) \times 20$ $= 480$ cm^3	M1 A1	
	(c)	Area of triangular cross section faces $= 2 \times \frac{1}{2}(8)(6)$ $= 48$ cm^2 Area of rectangular faces $= 20(10) + 20(6) + 20(8)$ or $20(10 + 6 + 8)$ $= 480$ cm^2 Total Surface Area $= 528$ cm^2	M1 M1 A1	
	(d)	$BD = \sqrt{464} = 21.54065923$ cm $\tan DBE = \frac{6}{\sqrt{464}}$ Angle $DBE = 15.6^{\circ}$ (to 1 d.p.)	M1 M1 A1	
8	**(ai)**	-4	B1	

	(aii)	$y=-4x+c$ $3=-4(2)+c$ $c=11$ $y=-4x+11$	 M1 A1	
	(aiii)	$L=\sqrt{(5+2)^2+(-9-5)^2}$ $=15.7 \text{ unit}^2$	 M1 A1	
	(bi)	$y=7-2x$ --- (1) $3y=2x-5$ --- (2) Sub equation (1) into equation (2) $3(7-2x)=2x-5$ $21-6x=2x-5$ $8x=26$ $x=3\frac{1}{4}$ $y=\frac{1}{2}$ Coordinates of C is $\left(3\frac{1}{4},\frac{1}{2}\right)$ or $\left(\frac{13}{4},\frac{1}{2}\right)$	 M1 M1 A1	 For correct x coordinates
	(bii)	Area of triangle	 M1 A1	

		$=\frac{1}{2}\left(\frac{13}{4}\right)\left(7+\frac{5}{3}\right)$ $=14\frac{1}{12}$ unit^2		
9	**(a)**	Distance between ship A and pier P $D^2=3^2+4.8^2-2(3)(4.8)\cos 120^\circ$ $D=\sqrt{3^2+4.8^2-2(3)(4.8)\cos 120^\circ}$ $=6.27694=6.28$ km	M1 M1 A1	
	(b)	$A=\frac{1}{2}(3)(4.8)\sin 120^\circ$ $=6.24$ km^2	M1 A1	
	(c)	$\frac{\sin BPA}{3}=\frac{\sin 120^\circ}{6.27694}$ Angle $BPA=24.5^\circ$ Bearing = 324.5°	M1 A1	
	(d)	$AL=3$ $h=3\tan 3.5^\circ$ $=183.48786$ m Let the angle of elevation of top of light house from P be x $\tan x=\frac{183.48786}{7800}$ $x=1.3^\circ$	M1 M1 A1	

10	**(a)**	Amount he has to pay over 15 years $= 50000 + \frac{50000 \times 3 \times 15}{100}$ $= \$72500$	 M1 A1	
	(b)	Amount in his savings plan after 15 years $= 27500\left(1 + \frac{5.6}{100}\right)^{15}$ $= \$62271.81$	 B1	
	(c)	<u>Duration the savings plan can pay the premium</u> $62271.81 – 4750 – 5(5000) – 5(5250) – 5500 = 771.81$ Means can pay until 70 years old with a remaining amount of $771.81 (Student assumes Mr Tan will live till 81 years old) Remaining amount of premium to be paid till Mr Tan dies at 81 years old = 4(5500) + 5(5750) + 2(6000) = $62750 Amount he needs to invest in the foreign government bond = $62750 – $771.81 = $61978.19 $P(1+0.02)^{20} = 61978.19$ $P = \$41709.55$ Total amount of money invested in insurance savings plan and foreign bonds = $27500 + $41709.55 = $69209.55	M1 A1 B1 B1 B1 B1 B1	Show reasonable calculation why it can pay till 72 years old

		He should go for insurance savings plan since he pays less than life insurance.		