Anglo-Chinese School
(Barker Road)

Marking Scheme
Secondary 3 Express
Mathematics 4052
End-of-Year Examination Paper 1 2023

1	(a)	$(2x-3y)^2=(2x)^2-2(2x)(3y)+(3y)^2$ $=4x^2-12xy+9y^2$
2	(a)	$6+(n-1)(4)$ or $4n+2$
	(b)	$T_{11}=4(11)+2=46$
	©	The *n*th term is $2(2n+1)$, hence the value should always be an even number.
3	(a)	15.99 million = $15.99\times10^6=1.599\times10^7$
	(b)	$\frac{15.99\times10^6}{390745}=40.921\approx41$
4	(a)	$540=2^2\times3^3\times5$
	(b)	$\frac{2^2\times3^3\times5\times p}{q}$ $\therefore p=2,q=5$
5	(a)	$t=\frac{k}{w}$ $\therefore$ time = 10 hours
	(b)	$y=kx^3$ $y=k(3x)^3=k(27x^3)$ $\frac{27y-y}{y}\times100\%=2600\%$
6		$2^x\div8^{x-2}\times4^{2x+3}=\frac{1}{16}$ $2^x\div2^{3(x-2)}\times2^{2(2x+3)}=2^{-4}$ $2^{x-3x+6+4x+6}=2^{-4}$ $2x=-16$ $x=-8$
7	(a)	$(x-3)^2-5$
	(b)	Minimum point: $(3,-5)$
8		$128°-95°=33°$ (alternate $\angle$s, $VW \parallel UX$)

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		$180° - 33° = 147°$ (interior $\angle$s, $ST \parallel UX$)
9	(a)	$x = 0.5$
	(bi)	$-x^2 + 2x + 4 = 0$ $-x^2 + x + 6 = -x + 2$ $\therefore$ Equation of straight line: $y = -x + 2$
	(bii)	
		Line drawn $x = 3.2$ or -1.2 (allow for ± 0.1 for both answers)
10	(a)	$np = \sqrt{h^2 - 4k^2}$ $n^2 p^2 = h^2 - 4k^2$ $k^2 = \dfrac{h^2 - n^2 p^2}{4}$ $k = \pm\sqrt{\dfrac{h^2 - n^2 p^2}{4}}$ or $\pm\dfrac{1}{2}\sqrt{h^2 - n^2 p^2}$
	(b)	$k = \pm\dfrac{1}{2}\sqrt{9^2 - 2^2(-1)^2} = 4.39$ or -4.39
11		Interior angle of $B = \dfrac{(5-2)\times 180}{5} = 108°$ $360 = 108 + 90 + \dfrac{(n-2)\times 180}{n}$ $162 = \dfrac{(n-2)\times 180}{n}$ $162n = 180n - 360$ $n = 20$
12	(a)	The bars do not start from zero, making the proportion of number of students in Aesthetics Club seems double of those in Debate Club.
	(b)	It will be easier to show the exact numbers of private buses using a line graph than a pictogram.

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13	(a)	$\frac{5(3n-4.5)}{3}+\frac{(2n+9)}{2}=\frac{10(3n-4.5)+3(2n+9)}{6}$ $=\frac{30n-45+6n+27}{6}$ $=\frac{36n-18}{6}=6n-3$
	(b)	Since $\frac{5(3n-4.5)}{3}+\frac{(2n+9)}{2}=6n-3=3(2n-1)$, it will always be a multiple of 3.
14	(a)	$AD^2+BD^2=8^2+15^2=289=17^2$ $AB^2=17^2$ Since $AD^2+BD^2=AB^2$, by the Converse of Pythagora's Theorem, angle *ADB* is a right angle.
	(b)	*AC* = 10 cm $\cos\angle ACB=-\cos\angle ACD=-\frac{3}{5}$
	(c)	Largest angle = angle *ACB* = 126.9°

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15	(a)	$P(\text{value chosen is median}=16)=\frac{3}{20}$
	(bi)	$21(15)=4+5+6+7+9+10+13+14+15$ $+3(16)+17+19+2(20)+2(21)+2(22)+x$ $x=22$
	(bii)	$20\le x\le 22$
16	(a)	$4ax-3ay-8bx+6by$ $=a(4x-3y)-2b(4x-3y)=(4x-3y)(a-2b)$
	(b)	$\frac{16x^2-9}{4x^2-9x-9}=\frac{(4x-3)(4x+3)}{(4x+3)(x-3)}$ $=\frac{4x-3}{x-3}$
17	1^{st} equation: $x+y=343$	
	2^{nd} equation: $(0.10)x+(0.18)y=42.7$	
	Show elimination or substitution method.	
	Number of small boxes = 238 Number of big boxes = 105	
18	(a)	Total S.A $=2\pi r^2+\pi(2r)(r+5)+\pi r^2$ $=3\pi r^2+2\pi r^2+10\pi r$ $=5\pi r^2+10\pi r$
	(b)