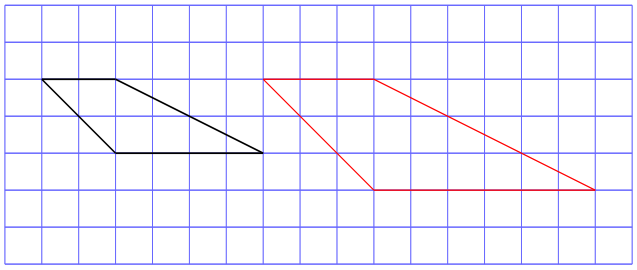
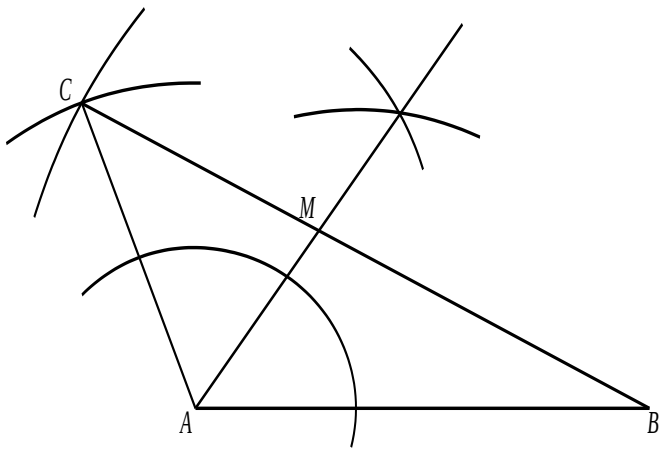
2023 E Math 4NA PRELIM Paper 1 Marking Scheme

Solutions			
1	$4(x-5)=3x+2$ $4x-20=3x+2$ $x=22$		
2	$8ab+10ay-12bx-15xy$ $=2a(4b+5y)-3x(4b+5y)$ $=(4b+5y)(2a-3x)$		
3	$\frac{34.5-6.3}{\sqrt{8.76}}=\frac{30-6}{\sqrt{9}}$ $=\frac{24}{3}$ $=8$		
4			
5a	$\frac{5^3\times5^4}{5^{-2}}=5^{3+4-(-2)}$ $=5^9$		
5b	$9^{\frac{1}{3}}=3^n$ $\left(3^2\right)^{\frac{1}{3}}=3^n$ $n=\frac{2}{3}$		
6a	$10x-3(7-4x)=10x-21+12x$ $=22x-21$		
6b	$h=k-2m$ $2m=k-h$ $m=\frac{k-h}{2}$ $OR\quad h-k=-2m$ $m=\frac{h-k}{-2}$		
7a	$p=60°$ alternate angles		

Solutions			
7b	$\angle ABC = 80°$ (adj $\angle$s on a straight line) $\neq 60°$ $\therefore \Delta ABC$ is not an equilateral triangle.		
8a	Modal age = 28 years		
8b	Median age $= \dfrac{32+34}{2}$ = 33 years		
8c	Probability $= \dfrac{22}{50}$ $= \dfrac{11}{25}$		
9	$x-4y=13 \quad -----(1)$ $7x+y=33 \quad -----(2)$ From (1), $x=4y+13 \quad -----(3)$ Subst (3) into (2), $7(4y+13)+y=33$ $28y+91+y=33$ $29y=-58$ $y=-2$ Subst $y = -2$ into (3), $x = 4(-2) + 13$ $= 5$		
10a	$y=\dfrac{k}{x^2}$, where k is a constant $45=\dfrac{k}{9}$ $k=405$ $y=\dfrac{405}{k^2}$		
10b	$y=\dfrac{405}{36}$ $=11.25 \quad$ or $\quad 11\dfrac{1}{4}$		
11a	$y=4x-3$ When $x = 2$, $y = 4(2) - 3$ $= 5 \quad \therefore$ (2, 5) lies on line l_1.		
11b	$y=4x+c$ Using (–1, 5), $5 = 4(–1) + c$ $c = 9$ $y = 4x + 9$		
12	Area $= \dfrac{160°}{360°}\times\pi(15^2)-\dfrac{1}{2}(15^2)\sin 160°$ = 276 cm^2 (3 s.f.)		

Solutions			
13	$2x = \dfrac{4}{x-5}$ $2x^2 - 10x = 4$ $x^2 - 5x - 2 = 0$ $x = \dfrac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-2)}}{2(1)}$ $= \dfrac{5 \pm \sqrt{33}}{2}$ $= 5.37$ or -0.372 (3 s.f.) (3 s.f.)		
14a	$x^2 + 10x - 9$ $= x^2 + 10x + 25 - 25 - 9$ or $(x+5)^2 - 5^2 - 9$ $= (x+5)^2 - 34$		
14b	$x^2 + 10x - 9 = 0$ $(x+5)^2 - 34 = 0$ $(x+5)^2 = 34$ $x + 5 = \pm\sqrt{34}$ $x = \pm\sqrt{34} - 5$ $= 0.83$ or -10.83 (2 d.p.) (2 d.p.)		
15	Int. $\angle$ for shape A = 60° Sum of int $\angle$ for shape B= *(n-2)* × 360° = *(10-2)* × 360° = 1440° Int. $\angle$ for shape $B = \dfrac{1440°}{10} = 144°$ Int. $\angle$ for shape C = 360° – 60° – 144° = 156° 1 ext. angle for C = 180- 156 = 24° Number of sides for C = $\dfrac{360°}{24°} = 15$		
16a	1 cm : 50 000 cm 1 cm : 0.5 km n = 0.5		
16b	Map distance = $\dfrac{10}{0.5}$ = 20 cm		
16c	1 cm^2 : 0.25 km^2 Actual area = 0.25 × 20 = 5 km^2		

Solutions			
17a	24, 29		
17b	$4+5(n-1)$ $=4+5n-5$ $=5n-1$		
17c	$5(15)-1 = 74$ lines		
17d	$5n-1=100$ $n=\frac{101}{5}$ is not an integer Not able to form a pattern with 100 lines		
18	Surface area = $2\pi(8)(15)+\pi(8^2)+2\pi(8^2)$ $= 240\pi + 64\pi + 128\pi$ $= 432\pi$ $= 1357.168$ $= 1360$ cm^2 (3 s.f.)		
19a	$QR = BC = 3$ cm Area of $\Delta PQR = \frac{1}{2}(3)(3.8)\sin 60°$ $= 4.94$ cm^2		
19b	$\frac{XY}{PQ}=\frac{YZ}{QR}$ $\frac{XY}{3.8}=\frac{4.5}{3}$ $XY=\frac{4.5}{3}\times 3.8$ $=5.7$ cm		
20a **20c**			
20b	$\angle BAC = 110°$ (± 2°)		
20d	BM = 4.9 cm (± 0.1 cm)		
21a	Particle is moving at a constant speed of 70 m/s.		

Solutions			
21b	Retardation = $\frac{70}{35}$ = 2 m/s^2		
21c	Total distance = $\frac{1}{2}(25+60)(70)$ = 2975 m OR can add up the 2 areas Area Rect + area triangle 1750+1225 = 2975 Average speed = $\frac{2975}{60}$ = 49.6 m/s or $49\frac{7}{12}$ m/s		