

Suggested Marking Scheme 4NA Prelim P1 2023

1	$\frac{3}{5}(x+2) = -(x-1)$ $3x + 6 = -5x + 5$ $8x = -1$ $x = -\frac{1}{8}$																										
2	12 units \rightarrow 1200cm 3 units \rightarrow 300cm																										
3	$1 - y < -10$ $-y < -11$ $y > 11$ Smallest prime = 13																										
4	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Red box</th> <th style="text-align: center;">Blue box</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1</td><td style="text-align: center;"><i>A</i></td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;"><i>B</i></td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;"><i>C</i></td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;"><i>D</i></td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;"><i>A</i></td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;"><i>B</i></td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;"><i>C</i></td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;"><i>D</i></td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;"><i>A</i></td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;"><i>B</i></td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;"><i>C</i></td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;"><i>D</i></td></tr> </tbody> </table>	Red box	Blue box	1	<i>A</i>	1	<i>B</i>	1	<i>C</i>	1	<i>D</i>	2	<i>A</i>	2	<i>B</i>	2	<i>C</i>	2	<i>D</i>	3	<i>A</i>	3	<i>B</i>	3	<i>C</i>	3	<i>D</i>
Red box	Blue box																										
1	<i>A</i>																										
1	<i>B</i>																										
1	<i>C</i>																										
1	<i>D</i>																										
2	<i>A</i>																										
2	<i>B</i>																										
2	<i>C</i>																										
2	<i>D</i>																										
3	<i>A</i>																										
3	<i>B</i>																										
3	<i>C</i>																										
3	<i>D</i>																										

5		<p>The diagram consists of two parts. On the left, there is a large L-shaped polygon drawn with black lines on a grid. It has a vertical column of 5 squares and a horizontal row of 4 squares, with a corner square at the top-left of the column. On the right, there is a smaller L-shaped figure drawn with red lines on the same grid. It has a vertical column of 2 squares and a horizontal row of 1 square, with a corner square at the top-left of the column.</p>
6		<p>5 seconds → 15 characters 60 seconds → 180 characters</p>
7		$y = (x+1)(x-5)$ $y = x^2 - 4x - 5$ $b = -4, c = -5$
8	(a)	$h = \frac{k}{r^2}$ $8 = \frac{k}{(10)^2}$ $k = 800$ $h = \frac{800}{r^2}$ $h = \frac{800}{(4)^2}$ $h = 50$
	(b)	<p>A Cartesian coordinate system is shown with a horizontal x-axis and a vertical y-axis. A straight line is plotted that passes through the origin (0,0) and extends upwards and to the right, representing a direct proportionality between x and y.</p>
9	(a)	$a = 4$
	(b)	$5^3 = 125$

10	(a)	$x^2 + 4x - 9$ $= (x+2)^2 - 9 - 4$ $h = 2, k = -13$
	(b)	-13
11	(a)	$x^{-2} \times x^{\frac{1}{3}} = x^n$ $x^{-\frac{5}{3}} = x^n$ $n = -\frac{5}{3}$
	(b)	$\sqrt{\frac{y^8}{y^2}}$ $= \sqrt{y^6}$ $= y^3$
12		$\angle AED = 48^\circ$ (base angle of isosc. Δ) $\angle DEF = 48^\circ$ (congruent) $x^\circ = 48^\circ + 48^\circ$ (alt. \angle s) $x = 96$
13	(a)	6n-23
	(b)	$6n - 23 > 50$ $6n > 73$ $n > 12.2$ $k = 13$
14		$\tan \angle DCA = \frac{2.6}{3}$ $\angle DCA = \tan^{-1}\left(\frac{2.6}{3}\right)$ $\angle CAB = \angle DCA$ (alt. \angle s) $\text{Obtuse } \angle EAB = 180^\circ - \tan^{-1}\left(\frac{2.6}{3}\right)$ $= 139.1^\circ$

15		$AF = \sqrt{15^2 - 9^2}$ $= 12$ $\frac{DE}{5} = \frac{22.5}{15}$ $DE = 7.5$ $\frac{AG}{12} = \frac{22.5}{15}$ $AG = 18$ <p>Area of triangle ADE</p> $= \frac{1}{2}(7.5)(18)$ $= 67.5 \text{ cm}^2$				
16	(a)	$(2x-3)^2 = 4x^2 - 12x + 9$				
	(b)	$1 - \frac{2x}{2x-3}$ $= \frac{2x-3-2x}{2x-3}$ $= \frac{-3}{2x-3}$ $= \frac{-3(2x-3)}{(2x-3)^2}$ $= \frac{-6x+9}{(2x-3)^2}$ $a = -6, b = 9$				
17		$2x + 5y = x + 4y + 7$ $x + y = 7$ $x + 1 = 3y$ $3y - 1 + y = 7$ $y = 2$ $x = 5$ <p>Length = 20</p> <p>Breadth = 6</p> $BD = \sqrt{20^2 + 6^2} = 20.9$				
18	(a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Time (h hours)</th> <th style="text-align: center; padding: 5px;">Mid-value x</th> <th style="text-align: center; padding: 5px;">Frequency f</th> <th style="text-align: center; padding: 5px;">fx</th> </tr> </thead> </table>	Time (h hours)	Mid-value x	Frequency f	fx
Time (h hours)	Mid-value x	Frequency f	fx			

$0 < h \leq 2$	1	0	0
$2 < h \leq 4$	3	1	3
$4 < h \leq 6$	5	4	20
$6 < h \leq 8$	7	8	56
$8 < h \leq 10$	9	9	81
$10 < h \leq 12$	11	2	22
$12 < h \leq 14$	13	1	13
Total		25	195

$$\text{Estimated mean} = \frac{195}{25} = 7.8$$

(b)

The time is given in a range and we are not able to determine the exact amount of time spent studying for each student.

19

i

$$L = \frac{110^\circ}{360^\circ} \times 2\pi(80)$$

$$L = 153.5889\dots$$

$$L = 154\text{cm}$$

ii

$$\text{Area of big sector} = L = \frac{110^\circ}{360^\circ} \times \pi(80)^2$$

$$\text{Area of small sector} = L = \frac{110^\circ}{360^\circ} \times \pi(45)^2$$

$$\begin{aligned}\text{Area of display} &= \frac{110^\circ}{360^\circ} \times \pi(80)^2 - \frac{110^\circ}{360^\circ} \times \pi(45)^2 \\ &= 4199.698513 \\ &= 4200 \text{ cm}^2\end{aligned}$$

20		$m_{AB} = m_{AC}$ $\frac{2m - (-5)}{-m - 4} = \frac{5 - (-5)}{-16 - 4}$ $\frac{2m + 5}{-m - 4} = -\frac{1}{2}$ $2(2m + 5) = -1(-m - 4)$ $4m + 10 = m + 4$ $3m = -6$ $m = -2$
21	(a)	$\pi(10)(15) - \pi(3)(4.5)$ $= 429 \text{ cm}^2$
	(b)	$\frac{1}{3}\pi r^2 h = \frac{4}{3}\pi r^3$ $h = 4r$
22	(a)	<p>Construct triangle: $\angle CAB = 98^\circ$ $BC = 9.8 \text{ cm}$ (with construction arc)</p>
	(b)	Construct angle bisector for $\angle CAB$
	(c)	Construct arc 2 cm from A Shade correct region
23	(a)	<p>Total Cost $= 2(\\$34.20) + 2(\\$20.70)$ $= \\$109.80$</p>
	(b)	<p>Total cost (before Wildpass discount) $= 2(\\$43.20) + (\\$20.00)$ $= \\$106.40$ Total cost he pays $= \frac{80}{100} \times \\106.40 $= \\$85.12$</p>
	(c)	<p>Percentage increase $= \frac{43.20 - 34.20}{34.20} \times 100$ $= 26.3\%$</p>