Ngee Ann Secondary School
Secondary 4&5 Elementary Mathematics-O
2026 Prelim paper 1
Marking Scheme

Qn No.	**Qn Part**	**Solutions**	**Marks (Remarks)**	**Total**
1		$(3x-2)(8x^2-5x+1)$ $= 24x^3-15x^2+3x-16x^2+10x-2$ $= 24x^3-31x^2+13x-2$	M1: Expansion (all terms must be correct) A1	[2]
2	**(a)**	50 mins	B1	[1]
	(b)	She is incorrect as the number of patients who have waiting time less than 43 minutes is **the same/equal** as the number of patients who have waiting time more than 66 minutes.	B1	[1]
3		$81 = 3^4$ $108 = 2^2 \times 3^3$ LCM: $2^2 \times 3^4 = 324$	M1: either prime factorisation A1 (to give 2 marks if no method)	[2]
4		$\frac{3(2k)}{4} = k - \frac{6(2k)-5}{5}$ $30k = 20k - 48k + 20$ $58k = 20$ $k = \frac{10}{29}$	M1: substitute x with $2k$ A1	[2]
5	**(a)**	2	B1	[1]
	(b)	9	B1	[1]
6	**(a)**	$15\pi - 24\pi b + 3\pi^2$ $= 3\pi(5 - 8b + \pi)$	B1	[1]
	(b)	$4x^2 + 9y^2 - 12xy - 64$ $= (2x-3y)^2 - 64$ $= (2x-3y-8)(2x-3y+8)$	M1: $(2x-3y)^2$ A1	[2]

7		$\frac{5x}{6}-\frac{3(x-1)}{4}+\frac{2x+7}{12}$ $=\frac{10x}{12}-\frac{9(x-1)}{12}+\frac{2x+7}{12}$ $=\frac{10x-9x+9+2x+7}{12}$ $=\frac{3x+16}{12}$	M1: common denominator (same form as here) A1	[2]
8	**(a)**	1.57 (3 sf)	B1	[1]
	(b)	11 and 12	B1, B1	[2]
9	**(a)**	547.39 billion $= 547.39 \times 10^9$ $= 5.4739 \times 10^{11}$	B1 3sf not accepted	[1]
	(b)	$\frac{5.4739\times10^{11}}{6.037\times10^{6}}$ = USD 90 672.52/90673/90700	M1 A1: accept 3sf, whole number or 2dp Don't accept standard form	[2]
10		$3x+5y=4$ $7x-4y=-22$ $12x+20y=16$ $35x-20y=-110$ $47x=-94$ $x=-2$ $y=2$	M1: Substitution/ Elimination (must show method) A1 A1	[3]
11	**(a)**	Angle OAB is 90° because tangent is perpendicular to the radius.	B1 (accept abbreviation)	[1]
	(b)	Area of quadrilateral – Area of sector $= 6\times11-\frac{126}{360}\times\pi(6)^2$ $= 26.4\ \text{cm}^2$	M1:either area A1	[2]

12	**(a)**	1 cm is to 60 km 24 cm is to 1440 km	B1	[1]
	(b)	1 cm^2 is to 3600 km^2 1574722 ÷ 3600 = 437.4227778 = 437 cm^2	M1: area scale A1	[2]

13	**(a)**	$BD^2 = 20^2 = 400$ $BC^2 + CD^2 = 12^2 + 16^2$ $= 400$ 4 **Since $BD^2 = BC^2 + CD^2$, by Converse of Pythagoras' Theorem,** it is a right angled triangle where *BD* is the hypotenuse. Hence *BC* is perpendicular to *CD*. OR $\cos BCD = \frac{12^2 + 16^2 - 20^2}{2(12)(16)}$ Angle BCD = 90° Hence *BC* is perpendicular to *CD*.	(must be 2 separate lines) B1 B1	[1]
	(b)	$\cos x + \sin x$ $= -\cos CDB + \sin CDB$ $= -\frac{16}{20} + \frac{12}{20}$ $= -\frac{1}{5}$	M1: either value A1	[2]
14		$\frac{3x^2 + 7x - 40}{18x^3 - 128x}$ $= \frac{(3x-8)(x+5)}{2x(9x^2-64)}$ $= \frac{(3x-8)(x+5)}{2x(3x-8)(3x+8)}$ $= \frac{x+5}{2x(3x+8)}$ or $\frac{x+5}{6x^2+16x}$	M1: factorise numerator M1: factorise denominator A1	[3]
15		Angle *CDA* = 132° ÷ 2 = 66° (angle at centre = 2 angles at circumference) Angle *CBA* = 180° - 66° = 114° (angles in opposite segment) Angle *CBP* = 180° - 114° = 66° (adjacent angles on a straight line)	B1 with reason B1 with reason B1: value of 66°	[3]

16		Size of interior angle : (360° – 60°)÷ 2 = 150° Size of exterior angle: 180° – 150° = 30° Number of sides: 360° ÷ 30° = 12 sides	M1: interior angle M1: exterior angle A1	[3]
17	**(a)**	The **principal value increases every month**, hence the appreciation value is not 1.2% of $56700.	B1 (must see the word 'principal')	[1]
	(b)	$58900\left(1+\frac{0.1}{100}\right)^{36}$ = $61057.93/61058/61100	M1 A1	[2]
18		Let x be the cash price of the sofa bed. Total amount: $0.25x + 26\times 88$ Interest: $(0.75x)(0.08)(26/12)$ $= 0.13x$ $1.13x = 0.25x + 2288$ $0.88x = 2288$ $x = \$2600$	 M1: Interest M1: correct equation A1	[3]
19	**(a)**	1 cupboard : 96 man- hours 96 ÷ (3× 4) = 8 days 8 – 2 = 6 days	 M1: total number of days A1	[2]
	(b)	$y^3 = \frac{k}{x^2}$ where k is a constant $k\left(\frac{1}{4^2}-\frac{1}{8^2}\right)=3$ $k\left(\frac{1}{16}-\frac{1}{64}\right)=3$ $\frac{3}{64}k=3$ $k = 64$ $x = 8$ or -8	 M1 M1: Find k A1	[3]

		Generally quite well done if they managed to get the first equation. Some mistakes include not having a constant (k) in the equation. If there are 2 sets of workings, we will pick the one that results in lower marks and there would be no marks if there is no *k*.		
20	**(a)(i)**	$\sqrt[3]{\dfrac{x^3+2y}{y}}=2x$ $\dfrac{x^3+2y}{y}=(2x)^3$ $x^3+2y=8x^3y$ $x^3=8x^3y-2y$ $x^3=y(8x^3-2)$ $y=\dfrac{x^3}{8x^3-2}$	M1: Cube on both sides M1: Terms with *y* on one side and factorise A1	[3]
		Generally well done and most can get the first method mark. However, many did not know how to make y the subject.		
	(a)(ii)	$y=\dfrac{(-2)^3}{8(-2)^3-2}$ $y=\dfrac{4}{33}$	B1	[1]
	(b)	$p=\dfrac{3}{q}+2$ $pq=3+2q$ $q(p-2)=3$ $q=\dfrac{3}{p-2}$ It is inaccurate as ***q* is undefined only when p = 2**. OR	B1: Make *q* the subject B1 B1: Substitute p =3	[2]

		When p =3 , 3= $\frac{3}{q}$ + 2 1= $\frac{3}{q}$ Thus q=3 instead of undefined when p =3.	B1	
		Well done with most using the alternative method.		
21	**(a)**	58 – 30 = 28	M1: either value A1	[2]
	(b)	$\frac{7}{12} \times 120 = 70$ Score: 50	B1: 70 B1 [Allow B2]	[2]
		Well done. Some makes the mistake of read off from 50 instead.		
22	**(a)(i)**	$-\frac{12}{13}$	B1	[1]
	(a)(ii)	$\frac{5}{12}$	B1	[1]
	(b)	$\frac{1}{2}(5)(b) = 50$ b = 20 20 – 3 = 17 R (17, 0)	M1 [Shoelace will not be given if there is any error] A1	[2]
23	**(a)**	Since **$(x - h)^2$ is always positive or zero for all values** of x, the **maximum value** of y occurs when $(x - h)^2$ =0. Hence, the maximum value happens when $x - h = 0$ or $x = h$.	B1	[1]
	(b)	$41 - 12x - x^2 = 0$ $x^2 + 12x - 41 = 0$ $(x+6)^2 - 36 - 41 = 0$ $(x+6)^2 = 77$ $(x+6) = \pm\sqrt{77}$	M1	

		$x=-6\pm\sqrt{77}$ $x=2.77$ or -14.77	A1, A1	[3]
		Not as well done as many made mistake when forming perfect squares and others left their answers in 3 sf or did double rounding off.		
24	**(a)**	$T_n=2^{n-1}+(3n-1)+(n+1)^2$	B1: all 3 terms correct B1: Any correct term In the given space.	[2]
	(b)(ii)	$T_n - T_{n-1}$ $=2^{n-1}+(3n-1)+(n+1)^2-[2^{n-2}+(3(n-1)-1)+(n)^2]$ $=2^{n-1}+3n-1+n^2+2n+1-2^{n-2}-3n+4-n^2$ $=\ 2^{n-1}+2n-2^{n-2}+4$ $=\ 2^{n-2}(2-1)+2n+4$ $=\ 2^{n-2}+2n+4$	M1:Replace n by $n-1$ M1: expansion M1	[3]
	(c)	Since the difference of the consecutive terms could be expressed as $2(2^{n-3}+n+2)$ **and *n* must be a natural number/ positive integer**, the difference is always an even number. This is a hence question. There is a condition that n >2 missing.	B1: must take out factor of 2	[1]
25	**(a)**	Let r be the radius of the cylinder. $24=2\pi r$ $r=\dfrac{12}{\pi}$ Volume: $\pi\left(\dfrac{12}{\pi}\right)^2(17)$ $=\dfrac{2448}{\pi}$ cm^3	M1: length = circumference A1	[2]
		Not well done. Some assumed 17 cm to be the circumference, and others did not understand what it meant by leaving your answer in pi.		

	(b)	Let the radius of circle be l and radius of the cone be r. Arc length FH: $\frac{1}{4}(2\pi l)$ $\frac{1}{4}(2\pi l) = 2\pi r$ $r = \frac{1}{4}l$ Curved surface area: $\pi\left(\frac{1}{4}l\right)l = 72\frac{1}{4}$ $l = 17$ Volume of cone: $\frac{1}{3}\pi\left(\frac{1}{4}l\right)^2\sqrt{289 - \frac{289}{16}}$ = 311.34438 cm^3 = 311 cm^3	M1: arc length = circumference M1: Find l (Equate curved surface area to area of quadrant) M1: height of cone A1	[4]
		Not well done. Many did not able to draw the relations that arc length of the quadrant would be the circumference of the cone and the curved surface area is the area of the quadrant. Others are not able to identify the slang height of the cone is the radius of the quadrant.		
26	**(a)**	$\overrightarrow{BD} = \overrightarrow{BA} + \overrightarrow{AD}$ = 8**b** – 4**a** $\overrightarrow{BE} = \frac{3}{4}$(8**b** – 4**a**) = 6**b** – 3**a**	M1: Find $\overrightarrow{BD}$ (even without the tilde) A1	[2]
	(b)	$\overrightarrow{BF} = \overrightarrow{BE} + \overrightarrow{EF}$ = – 3**a** + 6**b** + 2**a** – 2**b** = 4**b** – **a** $\overrightarrow{BC}$ = 2 (4**b** – **a**) = 8**b** – 2**a**	M1: Find $\overrightarrow{BF}$ (even without the tilde) A1	[2]

	(c)	$\overrightarrow{DC} = \overrightarrow{DB} + \overrightarrow{BC}$ $= 4\mathbf{a} - 8\mathbf{b} + 8\mathbf{b} - 2\mathbf{a}$ $= 2\mathbf{a}$ Since $\overrightarrow{AB} = 2\overrightarrow{DC}$, AB is parallel to DC. ABCD is a **trapezium** because it **has only one pair of parallel lines.**	M1: Find $\overrightarrow{DC}$ M1 A1	[3]
		Well done but the students need to learn that they need to express vector as a scalar multiplication of another vector to draw that the 2 vectors are parallel. To gather that it has only one pair of parallel lines, they can compare the other 2 vectors or they can highlight that the parallel lines have different lengths.		