Answer Scheme
Sec 4E/5N Mathematics Preliminary Examination Paper 1, 2024

Qn	Answer	Marks	Remarks
1a	3.58	B1	
2a	$12x^2y^5$	B1	
2b	$6x-8$	B1	$3(2x-4)$ not accepted
3	$2x^3-13x^2+6x$ $=x(2x^2-13x+6)$ $=x(2x-1)(x-6)$	B1, B1	Fact. x or quadratic expression B1, B1
4	36.9° or 143.1°	B1, B1	
5a	7.75	B1	

Qn	Answer	Marks	Remarks
5b	$\frac{(12\times 8)+(3+6+7+8+9+9+10+10)}{20}$ $=\frac{96+(62)}{20}$ $=\frac{158}{20}$ $=7.9$	M1 A1	
6a	$12\,250\times\frac{p}{q}$ $12250=2\times5^3\times7^2$ $p=7 \quad q=2$	 B1 B1, B1	
6b	$12250=2\times5^3\times 7^2$ $x=2\times5^3 \quad \times 3$ – – – – – – – – – – – – – – – – HCF $=250=2\times5^3$ $\therefore x=750$	 B1	
7	$81^{2x}\times9^x=27$ $(3^4)^{2x}\times(3^2)^x=3^3$ $8x+2x=3$ $x=\frac{3}{10}/0.3$ or $9^{4x}\times9^x=9^{1.5}$ $5x=1.5$ $x=0.3$ $x=\frac{3}{10}/0.3$	 M1 A1	 See base 3 or base 9

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th><th>Remarks</th></tr>
<tr><td>8</td><td>
<u>Top</u>
Perimeter = 20
length + breadth = 10

<table>
<tr><td>Paired No.</td><td>Area of top</td><td>Height</td></tr>
<tr><td>1, 9</td><td>Reject < 3</td><td></td></tr>
<tr><td>2, 8</td><td>Reject < 3</td><td></td></tr>
<tr><td>3, 7</td><td>Reject ≤ 3</td><td></td></tr>
<tr><td>4, 6</td><td>$4 \times 6 = 24$</td><td>$Height = \frac{120}{24} = 5$</td></tr>
<tr><td>5, 5</td><td>Reject, cannot be same length = cube</td><td></td></tr>
</table>
Or

$120 = 2 \times 2 \times 2 \times 3 \times 5$
By trial and error,
Height = 5 cm
</td><td>M1

A1

M1

A1</td><td>Prime factors</td></tr>
<tr><td>9</td><td>
$T = 2\pi\sqrt{\frac{L}{g}}$
$\frac{T}{2\pi} = \sqrt{\frac{L}{g}}$
$\frac{L}{g} = \frac{T^2}{(2\pi)^2}$
$g = \frac{4\pi^2 L}{T^2}$
</td><td>M1

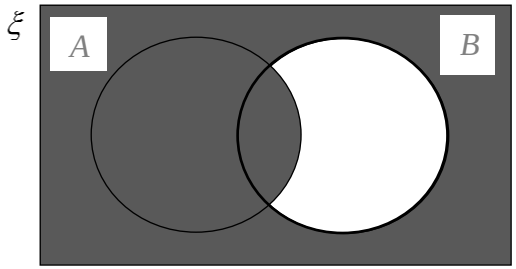
M1

A1</td><td>Divide 2π

Square both sides</td></tr>
</table>

Qn	Answer	Marks	Remarks
10a	$310° \pm 1°$ (309 °– 311°)	B1	
10b	See behind (Construct 5 cm radius) $4 / 4.5 / 5$ *km* (Convert to km)	M1 A1	
11ai	$Mean = \frac{282}{50}$ $= 5.64$	B1	
11aii	- There is no exact data of each child's time spent on playing online games - The average for time spent on playing games is used in the calculation - The time spent is given as a range of values - The mid value average is used when calculating the mean	B1	
11b	$SD = \sqrt{\frac{1906}{50} - \left(\frac{282}{50}\right)^2}$ $= 2.51$	M1 (ecf mean) A1	Show correct substitution of each value in formula

Qn	Answer	Marks	Remarks
12	$\frac{x}{4}-\frac{y}{2}=2$ ---------- (1) $3x=19+4y$ --------- (2) $(1)\times 4$ $x-2y=8$ $x=8+2y$ --------- (3) sub (3) into (2) $3(8+2y)=19+4y$ $24+6y=19+4y$ $y=-2.5$ $x=8+2(-2.5)$ $x=3$	 M1 A1 A1	
13a	$5y(x-4)$	B1	
13bi	$A\cap B'$ $A'\cap B'$ $B'\cap(A\cup B)$	B1	

Qn	Answer	Marks	Remarks
13bii		B1	
14a	$1-\frac{5}{9}-\frac{2}{15}$ $=\frac{14}{45}$	B1	

Qn	Answer	Marks	Remarks
14b	$3\ parts --> 10+8\ balls$ $1\ part --> 6\ balls$ $2\ parts --> 12 balls$ $n = 12 - 7$ $n = 5\ balls$ **OR** $\frac{7+n}{10+7+8+n} = \frac{2}{5}$ $3n = 15$ $n = 5$ **OR** P(pick red and blue balls) $= \frac{3}{5}$ $3\ parts --> 10+8\ balls$ $1\ part --> 6\ balls$ $2\ parts --> 12 balls$ $n = 12 - 7$ $n = 5\ balls$	M1 A1	
15	$\frac{3}{5+3} \times 100\%$ $= 37.5\%$	M1 A1	

Qn	Answer	Marks	Remarks
16	**Method 1** $x = \frac{k}{y^2}$ $x_1 = \frac{k}{(5y)^2}$ $x_1 = \frac{k}{25y^2}$ $Percentaage\ change = \frac{\frac{k}{y^2} - \frac{k}{25y^2}}{\frac{k}{y^2}} \times 100\%$ $= \frac{1 - 0.04}{1} \times 100\%$ $= 96\ \%$	M1 M1 A1	

Qn	Answer	Marks	Remarks
	Method 2 $k = xy^2$ $x_1 = \frac{xy^2}{(5y)^2}$ $x_1 = \frac{x}{25}$ $Percentaage\ change = \frac{x - \frac{x}{25}}{x} \times 100\%$ $= 96\ \%$	M1 M1 A1	
17a	90	B1	
17b	$L_n = (n-1) + (n-1) + 10 + n + 10$ $= 3n + 18$	B1 (See 3n) B1 (See 18)	
17c	$L_n = 3n + 18$ $= 3(n + 6)$ *shown*	B1 (no ecf)	
18a	$\tan \angle ABC = \frac{8.4}{5}$ $\angle ABC = 59.2°$ OR $AB = 9.77548$ $\angle ABC = \sin^{-1}(\frac{8.4}{9.77548})$ $\angle ABC = 59.2°$	M1 A1	

Qn	Answer	Marks	Remarks
18b	$\sin 48° = \frac{8.4}{AD}$ $AD = 11.3$	M1 A1	
19	$x^2 + 5x - 16 = 0$ $(x + 2.5)^2 - (2.5)^2 = 16$ $(x + 2.5)^2 = 6.25 + 16$ $(x + 2.5)^2 = 22.25$ $x + 2.5 = \pm\sqrt{22.25}$ $x = -2.5 \pm \sqrt{22.25}$ $x = 2.22 \quad or \quad -7.22$	M1 M1 A1, A1	See completing the sq Sq rt
20a	$\sin \angle AXC = \frac{3}{5}$ $BX = 4$ $\tan \angle AXB = \frac{3}{4}$	M1 A1	
20b	$\tan \angle ACB = \frac{3}{4+2}$ $= \frac{1}{2}$	M1 A1	

Qn	Answer	Marks	Remarks
21	Polygon Q interior $\angle(Q) = 180° - 18°$ $= 162°$ sum of interior $\angle$ hexagon (P) $= (6-2) \times 180°$ $= 720°$ $162° + 162 + a + b + c + d + e + f + 720° = 360° \times 6$ $a + b + c + d + e + f + 1044° = 2160°$ $a + b + c + d + e + f = 1116°$	M1 M1 M1 A1	Int. angle for Q Int. angle for P
22a	Reflex $\angle AOC = 360° - 4x°$ (Angles at a point) $\angle ABC = \frac{360° - 4x°}{2}$ (Angle at centre = twice angle at circum) $= 180° - 2x°$	M1 A1	
22b	$\angle BAC = 180 - x° - (180° - 2x°)$ (Sum of angles in a tri.) $= x°$ $\angle BAE = 90° - (90° - 2x°) - x°$ (rad $\perp$ tan) $= x°$	M1 A1	
23a	$N = v \times 0.9^{2t}$ $81\,000 = v \times 0.9^2$ $v = 100\,000$	B1	

Qn	Answer	Marks	Remarks
23b	$N = v \times 0.9^{2t}$ $N = v \times 0.81^{t}$ $N = kv$ $k = \frac{N}{v}$ *or* $k = 100\,000k$	B1	
23c	At t = 2 hours $N = 100\,000 \times 0.9^{2(2)}$ $N = 65\,610$ Percentage decrease $= \frac{100\,000 - 65610}{100\,000} \times 100\%$ $= 34.39\%$	M1 A1	ecf 100 000
23d	Diagram **4**	B1	
24a	$\frac{1}{b} : \frac{1}{a}$ and $3a : 3b$	-1 (1 incorrect) -2 (2 or more incorrect)	

Qn	Answer	Marks	Remarks
24b	$J : S$ $6 : 2$ (multiple 7) $42 : 14$ $J : S$ $2 : 5$ (multiple 8) $16 : 40$ Difference in John's units $= 42 - 16$ $= 26$ $26\ units ----> \$13$ $1\ unit ----> \$0.5$ $16\ units ----> 16 \times \$0.5 = \$8$ OR $\frac{6x-13}{2x+13} = \frac{2}{5}$ $x = 3.5$ $6x - 13$ $= 6(3.5) - 13$ $= 8$	M1 M1 M1 A1	

Qn	Answer	Marks	Remarks
25a	**Method 1** $\angle DEF = \angle FEC = x°$ (FE bisects $\angle DEC$) $\angle DEF = \angle EFC = x°$ (Alt $\angle$, DE // BC) $\angle ECF = 180° - x° - x°$ (Angles in a str. line) $= 180° - 2x°$	M1 A1	State angle EFC = x
	Method 2 $\angle DEF = \angle FEC = x°$ (FE bisects $\angle DEC$) $\angle ECF = 180° - 2x°$ (int. $\angle$, DE //BC)	M1 A1	State angle EFC = x
25b	$\angle DAE = \angle FEC = x°$ (Corresp. $\angle$, FE//DA) $\angle ABF = \angle ADE = \angle EFC = x°$ (Corresponding angle) $\angle AED = \angle ECF = 180° - 2x°$ (interior angle) Triangle $\angle AED$ is similar triangle $\angle ECF$ (AA similarity test)	M1, M1, A1	Any two reason stated State sim. test
	Additional Working $\angle AED = 180° - 2x°$ (Angles in a str. line) $\angle DEF = \angle DBF = x°$ (Opp. $\angle$,in a parallelogram) $\angle DBF = \angle ADE = x°$ (Corresp. $\angle$,DE//BF) $\angle DAE = \angle FEC = x°$ (Corresp. $\angle$,FE//DA)		
25c	**ACB**	B1	
26a	$\mathbf{F} = \begin{pmatrix} 30 \\ 40 \\ 50 \end{pmatrix}$	B1	

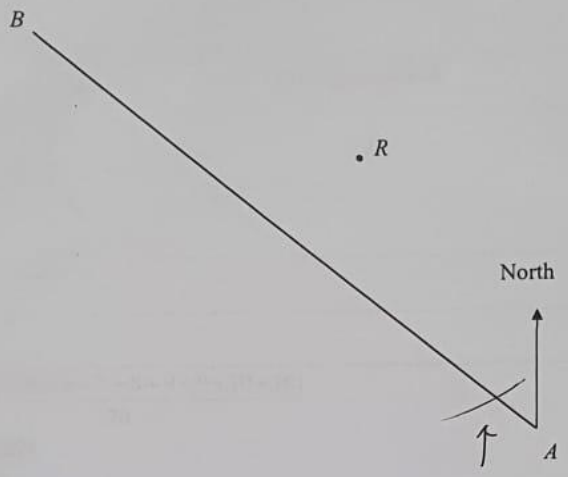
Qn	Answer	Marks	Remarks
26b	$C = \begin{pmatrix} 22 & 20 & 9 \\ 8 & 10 & 11 \end{pmatrix} \begin{pmatrix} 30 \\ 40 \\ 50 \end{pmatrix}$ $C = \begin{pmatrix} 1910 \\ 1190 \end{pmatrix}$	B1, B1	B1 for 1 correct element
26c	- **1910** represents the **total fees** for beginner, intermediate and advanced classes on **weekdays**. - **1190** represents the **total fees** for beginner, intermediate and advanced classes on **weekends**.	B1	
26d	Participants in September $Beginner = (22+8) \times 0.8 = 24$ $Intermediate = (20+10) \times 1.1 = 33$ $Advanced = (20) \times 3 = 60$ $Total\ \ fees\ \ for\ September = (24 \times 30) + (33 \times 40) + (60 \times 50)$ $= 5040$ $Perecentage\ increase = \frac{5040 - 3100}{3100} \times 100\%$ $= 62.6\% \quad or \quad 62\frac{18}{31}\%$	M1 M1 A1	See total fees for Sept
	Total	**90**	

8

ANNEX

10

Scale: 1 cm to 5 km



B1

In the scale drawing, R is the centre of a rock bed, A is a ship and B is a port.
The line AB shows the ship's course.

(a) Measure the bearing of B from A.

Answer .....° [1]

(b) The rock bed covers a 25 km radius.

If the ship were to stay on course, state the distance at which the ship will first hit the rock bed.

B1

Answer 4 – 5 km. [2]

4, 4.5, 5

[Turn over