2022 MYE Math S4E5N P1 Marking Scheme

Question	Answer	Marks	Guidance
1a	$5x = 12 + \frac{x}{3}$ $5x - \frac{x}{3} = 12$ $\frac{14}{3}x = 12$ $x = \frac{18}{7}$ or $2\frac{4}{7}$	 A1	 A1 for correct working and answer. Answer corrected to 3 significant figures is not accepted.
1b	$7m - 2n - 3(n - 2m)$ $= 7m - 2n - 3n + 6m$ $= 13m - 5n$	M1 A1	M1 for expanding $-3(n - 2m)$.

Question	Answer	Marks	Guidance
2	$\frac{3}{2}x - \frac{5(x-3)}{6} = \frac{9x - 5(x-3)}{6}$ $= \frac{9x - 5x + 15}{6}$ $= \frac{4x + 15}{6}$	M1 A1	For combining fractions into single fraction with common denominator correctly

Question	Answer	Marks	Guidance
3	$10x^2 - y + 5xy - 2x$ $= 10x^2 + 5xy - 2x - y$ $= 5x(2x + y) - (2x + y)$ $= (2x + y)(5x - 1)$	 M1 A1	Other accepted answer: $(-2x - 2y)(1 - 5x)$

Question	Answer	Marks	Guidance
4	$6x^2 - 11x - 10 = 0$ $(2x-5)(3x+2) = 0$ $x = -\frac{2}{3}$ or $\frac{5}{2}$	M2 A1	M1 for each factor. A1 for both answers. Answer corrected to 3 significant figures is not accepted. No mark if student did not use factorisation method.

Question	Answer	Marks	Guidance
5a	300 children – 360° $x = \frac{360}{300} \times 60$ $= 72$	B1	
5b	Sector angle for mangoes $= 360° - 84° - 102° - 72°$ $= 102°$ The number of children who like rambutans to those who like mangoes = 72 : 102 = 12 : 17	M1 A1	
5c	Percentage of children who like durians $= \frac{102}{360} \times 100\%$ = 28.3%	 A1	A1 for correct working with percentage symbol and answer in decimal.

Question	Answer	Marks	Guidance
6a	$198 = 2 \times 3^2 \times 11$	B1	
6b	HCF = $2 \times 3^2 = 18$	B1	

Question	Answer	Marks	Guidance
7	$p = 1$ $q = 400$	 B2	Must correct for both p and q to get B2.
Question	**Answer**	**Marks**	**Guidance**
8	Let the monthly payment be $\$x$.	 M1	

	$20\% \times 1455 + 12x = 1587$ $291 + 12x = 1587$ $x = 108$ The monthly payment is \$108.	A1	M1 for finding the deposit $20\% \times 1455 = \$291$

Question	Answer	Marks	Guidance
9a	$k = 3$ $m = 5$	B1 B1	
9b	1	B1	

Question	Answer	Marks	Guidance
10	Price of cap without use of voucher discount = 15+7 = \$22 Original price $= 22 \div \frac{100-12}{100}$ $= 22 \div 0.88$ = \$25	M1 A1	No A1 if student show this working: $\frac{22}{88} \times 100\% = 25$

Question	Answer	Marks	Guidance
11a	$F = ma$ $= 5 \times 20$ $= 100\text{N}$	A1	A1 for working and answer. 5.00×20.00 is not accepted
11b	Evidence: 5.27 and 24.92 are rounded to 1 significant figure. Concept: Both numbers are rounded down to smaller values for estimation. Conclusion: Hence, the estimated force is underestimated.	B1	B1 for concept and conclusion.

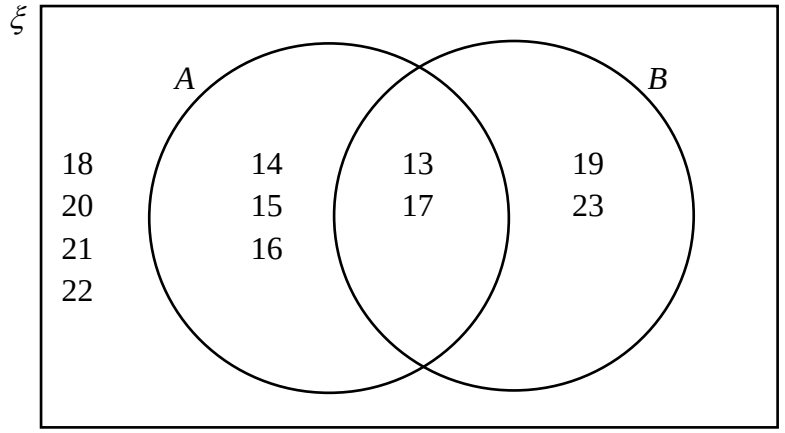
Question	Answer	Marks	Guidance

12	$\left(\frac{4\sqrt[3]{x^5}}{x}\right)^{\frac{3}{2}} = \left(\frac{4x^{\frac{5}{3}}}{x}\right)^{\frac{3}{2}}$ $= \frac{4^{\frac{3}{2}}x^{\frac{5}{3}\times\frac{3}{2}}}{x^{\frac{3}{2}}}$ $= \frac{8x^{\frac{5}{2}}}{x^{\frac{3}{2}}}$ $= 8x$	M1 M1 A1	Write $\sqrt[3]{x^5}$ in index form. Simplify coefficient in the numerator and simplifying power of x in the numerator.

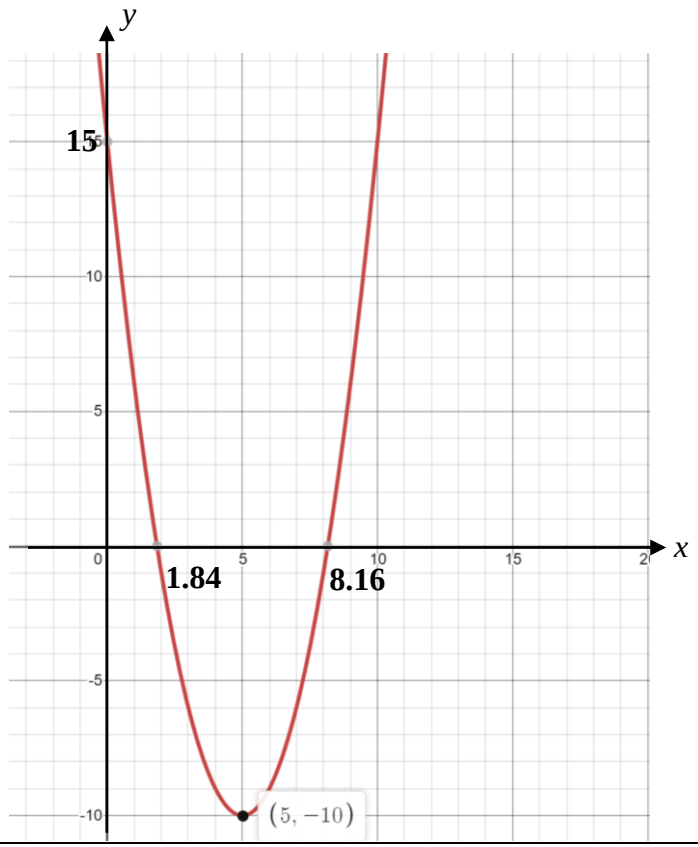
Question	Answer	Marks	Guidance
13a	Let n be the number of sides of regular polygon P. $2n$ be the number of sides of regular polygon Q. Interior angle of polygon $P = \frac{180\times(n-2)}{n}$ Interior angle of polygon $Q = \frac{180\times(2n-2)}{2n}$ $\frac{\frac{180\times(n-2)}{n}}{\frac{180\times(2n-2)}{2n}} = \frac{7}{8}$ $\frac{180\times(n-2)}{n} \div \frac{180\times(2n-2)}{2n} = \frac{7}{8}$ $\frac{180\times(n-2)}{n} \times \frac{2n}{180\times(2n-2)} = \frac{7}{8}$ $\frac{(n-2)}{1} \times \frac{2}{(2n-2)} = \frac{7}{8}$ $\frac{(n-2)}{1} \times \frac{2}{2(n-1)} = \frac{7}{8}$ $\frac{(n-2)}{(n-1)} = \frac{7}{8}$ $7(n-1) = 8(n-2)$ $7n-7 = 8n-16$ $n = 9$ Polygon P is 9-sided.	M1 M1 A1	Able to apply ratio equivalence by forming an equation. Simplifying the equation to algebraic fractions. Guess and check is not accepted.
13b	Interior angle of polygon $Q = \frac{180(18-2)}{18}$ $= 160°$ Exterior angle of polygon $Q = 180°-160°$ $= 20°$	M1 A1	Or Exterior angle of polygon $Q = \frac{360}{2\times 9}$

Question	Answer	Marks	Guidance
14	Volume of cone B $= \frac{1}{3}\pi(1.5r)^2(6h)$ $= \frac{1}{3}\pi r^2 h \times (1.5)^2(6)$ $= \frac{1}{3}\pi r^2 h \times \frac{27}{2}$ $= 4 \times \frac{27}{2}$ $= 54\ \text{cm}^3$	M1 A1	

Question	Answer	Marks	Guidance
15	$V = kr^2$ where k – constant When $r_2 = 1.2r$ $V_2 = kr_2^2$ $= k(1.2r)^2$ $= 1.44kr^2$ Percentage increase in volume $= \frac{V_2 - V_1}{V_1} \times 100\%$ $= \frac{1.44kr^2 - kr^2}{kr^2} \times 100\%$ $= 44\%$	M1 A1	For $k(1.2r)^2$ No A1 if student shows this working: $\frac{1.44kr^2 - kr^2}{kr^2} \times 100 = 44\%$ Finding the answer by substituting values is not accepted

Question	Answer	Marks	Guidance
16a		B1 B1 B1	For elements in set $A \cap B'$ = {14, 15, 16}. For elements in set $(A \cup B)'$ = {18, 20, 21, 22}. For elements in set $(A \cap B)$ = {13, 17} and $A' \cap B$ = {19, 23}.
16b	$A' \cap B'$ = {18, 20, 21, 22}	√A1	With curly brackets.
16c	$(A \cap B') \cup (A' \cap B)$ = {14, 15, 16, 19, 23} = 5	√A1	

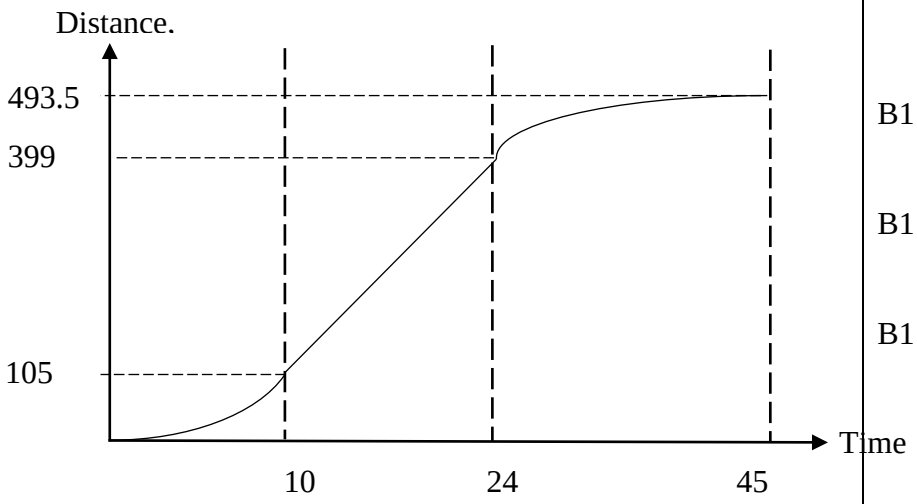
Question	Answer	Marks	Guidance
17a	Height P to $QR = \sqrt{k^2 - 4^2}$ cm $\sin \angle PRQ = \frac{\sqrt{k^2 - 16}}{k}$	M1 A1	Must show $QR = \sqrt{k^2 - 4^2}$ (need not state Pythagoras Theorem)
17b	Let h cm be the height of the triangles. Area of $\Delta PRQ = \frac{1}{2}kh$ cm^2 Area of $\Delta QSP = \frac{1}{2}(0.75k)h$ $30 = 0.75\frac{1}{2}kh$ $0.75\frac{1}{2}kh = 30$ $\frac{1}{2}kh = \frac{30}{0.75}$ Area of $\Delta PRQ = \frac{1}{2}kh = 40$ cm^2	 M1 A1	

Question	Answer	Marks	Guidance
18a	$x^2-10x+15$ $= x^2-10x+\left(\frac{10}{2}\right)^2-\left(\frac{10}{2}\right)^2+15$ $= x^2-10x+5^2-25+15$ $=(x-5)^2-10$	 M1 A1	
18b	$(x-5)^2-10=0$ $(x-5)^2=10$ $x-5=\pm\sqrt{10}$ x = 1.8837722 or 8.16227766 = 1.84 or 8.16	 M1 A1	 A1 for both correct answers.
18c		B1 B1 B1	Correct shape and symmetrical. Correct intercepts indicated. (must be intercept values, not coordinates) Correct turning point indicated. (can be coordinates or indicate the axis values)

Question	Answer	Marks	Guidance
19a	$P = \begin{pmatrix} 5 & 4 & 2 & 3 \\ 2 & 5 & 1 & 5 \\ 0 & 2 & x & 2 \end{pmatrix} \begin{pmatrix} 2 \\ 5 \\ 10 \\ 50 \end{pmatrix}$ $= \begin{pmatrix} 200 \\ 289 \\ 110+10x \end{pmatrix}$	B1 B1	For first two elements. For the third elements in terms of x.
19b	Amount of money Patrick, Quincy and Rachel save, respectively.	B1	
19c	$110+10x = 200$ $x = 9$	B1	
19d	Total amount that Patrick, Quincy and Rachel save in total $= \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 200 \\ 289 \\ 200 \end{pmatrix}$ $= \begin{pmatrix} 689 \end{pmatrix}$ **Or** Total amount that Patrick, Quincy and Rachel save in total $= \begin{pmatrix} 7 & 11 & 12 & 10 \end{pmatrix} \begin{pmatrix} 2 \\ 5 \\ 10 \\ 50 \end{pmatrix}$ $= \begin{pmatrix} 689 \end{pmatrix}$	M1 A1	

Question	Answer	Marks	Guidance
20a	P ($p \in T'$) = $\frac{3}{9} = \frac{1}{3}$	√B1	
20b	Second number / First number 13: 18, 20, 24, 26 11: 16, 18, 22, 24 7: 12, 14, 18, 20 5: 10, 12, 16, 18 5, 7, 11, 13 P (sum of the two numbers is more than 20) = $\frac{4}{16}$ = $\frac{1}{4}$ OR P (sum of the two numbers is more than 20) = $\frac{2}{4} \times \frac{2}{4}$ = $\frac{1}{4}$ OR P (sum of the two numbers is more than 20) = $\left(\frac{1}{4} \times \frac{1}{4}\right) \times \left(\frac{1}{4} \times \frac{1}{4}\right) \times \left(\frac{1}{4} \times \frac{1}{4}\right) \times \left(\frac{1}{4} \times \frac{1}{4}\right)$ = $\frac{1}{4}$	M1 A1	Or equivalent tree diagram showing the sum of the values working.

Question	Answer	Marks	Guidance
21a	$\angle ABP = \angle CDP$ ($\angle$s in the same segment) or ($\angle$ at centre = $\angle$at circumf) Or $\angle PAB = \angle PCD$ ($\angle$s in the same segment) or ($\angle$ at centre = $\angle$at circumf) $\angle APB = \angle CPD$ (vert. opp. $\angle$s) By AA (or AAA) similarity test, triangles *PAB* and *PDC* are similar	M1 A1	M1 for the two reasons.
21b	$PA = \frac{6.9}{8.9} PC$ $PA = \frac{6.9}{8.9}(10.6 - PB)$ $\angle PAB = \frac{132°}{2} = 66°$ Using Cosine Rule, $PB = 6.3239 = 6.3$ cm	M1 A1	

Question	Answer	Marks	Guidance
22a	Total distance for the whole journey $= \frac{1}{2}(24+14)(21)+21^2-\frac{1}{4}\left(\frac{22}{7}\right)(21^2)$ = 399 + 441 – 346.5 = 399 + 94.5 = 493.5 m	M1 A1	M1 for area under the curve $21^2-\frac{1}{4}\left(\frac{22}{7}\right)(21^2)$
22b		B1 B1 B1	B1 for 0s to 10s with distance travelled indicated **correctly**. B1 for 10s to 24s with distance travelled indicated **correctly**. B1 for 24s to 45s with distance travelled indicated **correctly**. **No mark awarded if the distance specified is incorrect.**

Question	Answer	Marks	Guidance
23a	**Evidence:** Length $ST = (12 - 2a)$ cm. **Concept:** By Pythagoras Theorem, in triangle *EST*, $ST^2 = ES^2 + ET^2 = a^2 + a^2 = 2a^2$. **Conclusion:** Hence, $(12 - 2a)^2 = 2a^2$.	M1 A1	For clearly stating the evidence. For stating the concept clearly and making the conclusion. **Marks awarded only if candidates can communicate proficiently without letting the marker guess/infer/.** **Must have the conclusion to be awarded the full two marks.**
23b	$(12 - 2a)^2 = 2a^2$ $144 - 48a + 4a^2 = 2a^2$ $2a^2 - 48a + 144 = 0$ $a^2 - 24a + 72 = 0$ (Shown)	B1	Correct expansion.
23c	$a = \dfrac{-(-24) \pm \sqrt{(-24)^2 - 4(1)(72)}}{2(1)}$ $= \dfrac{24 \pm \sqrt{288}}{2}$ $= 20.485$ or 3.5147 $= 20.5$ or 3.51	M1 A2	Show substitution.
23d	Perimeter = 3.5147×16 $= 56.2$ cm	A1	

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Where solutions in addition to those given in the mark scheme are possible, full marks will be given for a correct result from any correct method, with equivalentsub-marks for equivalent stages. (This does not however apply if candidates are directed in the question to answer a question by a particular method.)

1 Marks are of the following three types.

M Method mark, awarded for a valid method applied to the problem. Method marks are not lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea mustbe applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula.
A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method markis earned (or implied).
B Mark for a correct result or statement independent of Method marks.

The marks indicated in the scheme may not be subdivided. Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored.

2 When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation DM or DB (or dep *) is used to indicate that a particular M or B mark is dependent on an earlier M or B mark in the scheme. Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from thereon is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are run together by the candidate, the earlier marks areimplied and full credit is given.

3 FT implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are givenfor correct work only — differences in notation are of course permitted. A and B marks are not given for 'correct' answers or results obtained from incorrectworking. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable.

4 The following abbreviations may be used in a mark scheme.

AEF Any Equivalent Form (of answer or result is equally acceptable).
AG Answer Given on the question paper (so extra care is needed in checking that the detailed working leading to the result is valid).CAO Correct Answer Only (emphasising that no 'follow through' from a previous error is allowed).
ISW Ignore Subsequent Working.
OE Or Equivalent
SR Special Ruling (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the lightof a particular circumstance).