



*For Performance Measurement*

**ORDINARY LEVEL**

**MATHEMATICS**

**4004/01**

**NOVEMBER 2022**

**EXAMINER REPORT**

## **Introduction**

The stakeholder report is for Ordinary Level Mathematics paper one (400401) for the November 2022 session.

The report captures the following:

- General performance of candidates
- Question-by-question analysis
- Highlights on expected solution(s) and method(s) to get the solution.
- Common errors or misconceptions by candidates.

The report ends with a conclusion.

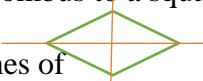
### The general performance of the candidates

Very few candidates performed exceptionally well. The majority performance range was from poor to mediocre, showing the barest mathematical skills.

The report will use the following abbreviation: **cwa** for: common wrong answer.

Question	Expected answer	Comments and the method
1(a)	1000001	This was done well. No working was needed
(b)	42 hours	This was done well except those who used 12 hours instead of 24 hours. Expected method was $24 + \frac{3}{4} \times 24$
(c)	$11^0 36'$ or 11degrees 36minutes	Most candidates could not change the decimal part to minutes. They would separate degrees and minutes by a comma. Expected method was $11^0$ and $\frac{6}{10} \times 60$ minutes
2 (a)	29	Expected method was $\frac{377}{13}$
(b)	$\begin{pmatrix} 2 \\ -4 \end{pmatrix}$	Expected method was $\begin{pmatrix} 5 \\ 0 \end{pmatrix} - \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ Some candidates subtracted $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$ from $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ resulting in <b>CWA</b> of $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$ ,
(c)	16	Expected list of square numbers 1;4;9;16 Some candidates confused the concept of square numbers and even numbers resulting in <b>CWA</b> of 4 and 18.
3 (a)	$045^0$	The <b>CWA</b> was $45^0$ or $45^0 NE$ . Only three figures should have been used. The correct solution involved $\frac{90}{2}$ and had to convert it to a three-figure bearing
(b)	1;3;5	The expected list of odd numbers was 1;3;5;7. Candidates were expected to choose the first three. The <b>CWA</b> was 1;2;3. The odd number is a basic maths concept that should not be mistaken for a prime number.
(c)	0,05	Candidates were to look at the second significant figure (5)

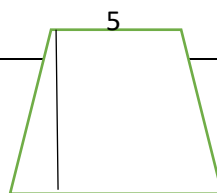
		The <b>CWA</b> was 0.0500. The concept was poorly applied.
4 (a)	$\frac{8}{7}$	Some candidates failed to effect the division of a whole number by a fraction. The expected method was $\frac{1}{\frac{7}{8}} = 1 \times \frac{8}{7}$ The CWA was $\frac{7}{8}$ .
(b)	1	The expected method was $\log_5 \frac{80}{16} = \log_5 5$ Most candidates would divide $\log_5 80$ by $\log_5 16$ resulting in the CWA was 5
5 (a)	$\frac{1}{3}$	Some candidates obtained the correct answer from the wrong working. Expected method was $\frac{1(2x+3y)}{3(2x+3y)}$
(b)	$\frac{7}{3}$	The expected method was $\sqrt{\frac{49}{9}}$ after converting to improper fractions The <b>CWA</b> was $\pm \frac{7}{3}$ . Candidates were expected to note that the square root was given as positive.
6	3 or $\frac{-2}{4}$	The expected method was: factorise and solve $(2x + 1)(x - 3) = 0$ or $x = \frac{5 \pm 7}{4}$ (use of the quadratic formula) The <b>CWAs</b> were 1 and $-1\frac{1}{2}$
7 (a)	0	They were expected to substitute 3 in the function to get $f(3) = 3^2 - 3 \times 3$
(b)	-2 or 5	They were expected to form the equation, $d^2 - 3d = 10$ and solve $(d-5)(d+2) = 0$ or $d = \frac{3 \pm 7}{2}$ (use of the quadratic formula) Most candidates failed to form the required quadratic equation
8	n=13, m=2	Expected method was: Add the 2 equations, remain with $5m=10$ or $-5n=-65$ . Solve and substitute or use the matrix method $\begin{pmatrix} m \\ n \end{pmatrix} = \frac{1}{5} \begin{pmatrix} 1 & 1 \\ -2 & 3 \end{pmatrix} \begin{pmatrix} -7 \\ 17 \end{pmatrix}$ or any other correct method of solving simultaneous equations
9 (a)	53	Most candidates were not familiar with the concept of prime numbers. Expected list was 47;53;59. Only 53 belongs to the range The <b>CWA</b> were 51 and 57.

(b)	57	Multiples of 19 are 38; 57;76. Only 57 belongs to the range
(c)	49	Expected list of square numbers was 16;25;36;49;64. Only 49 belongs to the range.
10 (a)	21;28	Analysis of the sequence was required. The difference between two adjacent numbers was increasing by 1
(b)	$\frac{1}{16}; \frac{1}{64}$	Analysis of the sequence was required. Candidates were expected to divide the number on the left by 4. The <b>CWA</b> were $\frac{1}{8}$ and $\frac{1}{32}$ .
11 (a)	8	Most candidates could not expand correctly. Expected expansion was $1 \times a^1 + 1 \times a^0 = 9$ $a + 1 = 9$ The <b>CWA</b> was 10.
(b)	$400_5$	Most candidates did not complete the required steps. They were expected to convert to base 10 by use of place value: $2 \times 7^2 + 0 \times 7^1 + 2 \times 7^0 = 100$ Then convert 100 to base 5 by division and writing the remainders The <b>CWA</b> was $100_5$ . When they had not converted to base 5
12 (a)	$\frac{49}{144}$	Candidates should have added the numerators before squaring. Expected method was $\left(\frac{4+3}{12}\right)^2 = \left(\frac{7}{12}\right)^2$ The <b>CWA</b> was $\frac{25}{144}$ . When they applied the square without first adding the numerators
(b)	$\frac{5}{6}$	Expected working was $\frac{5}{4} \times \frac{2}{3}$
13 (a)	2	Candidates mistook the rhombus to a square. The correct diagram was  Where the red lines are lines of Symmetry. The <b>CWA</b> was 4.
(b)	$36cm^2$	Expected method was $48 - \left(\frac{1}{2}\right)^2 \times 48$ The <b>CWA</b> was 24. Candidates did not realise that they were to use the concept of area of similar figures where the scale factor is squared.

14 (a)	$4(3p^2 - q)(3p^2 + q)$	Expected method was $4(9p^4 - q^2)$ then factorise using the difference of two squares Most candidate failed to identify the need to use the difference of two squares.
(b)	$(2m+3n)(5y+3)$	Candidates were familiar with the factorisation by grouping Expected method was $5y(2m + 3n) + 3(2m + 3n)$ or $2m(5y + 3) + 3m(5y + 3)$
15 (a)	36km/h	Expected method was $\frac{\frac{10}{1000}}{\frac{1}{60 \times 60}}$ The <b>CWA</b> was 0,01km/h when most candidates would just convert metres to km.
( b)	6 and -6	The question required two values as a solution. Expected method was $m \times 2m - 6 \times 12 = 0$ $m^2 - 36 = 0$ Some did not see that it is a quadratic equation hence it needs two solutions by factorisation
16(a)	$y > \frac{1}{3}x$	Some gave the inequality $y > \frac{1}{3}$ leaving out the $x$ .
(b)	$400 \leq 2x + 2y < 560$ or equivalent when dividing by common factor	. Candidates were required to find the perimeter in terms of $x$ and $y$ . The <b>CWA</b> was $400 \leq p < 560$
17(a)	12	Most candidates only solved the inequality. Some failed to interpret. $n > 11$ The <b>CWA</b> were 11 but the inequality does not have equality
(b)	7cm	Candidates could have done well had they drawn a rough sketch. Expected method was the use of the Cosine formula $x^2 = 3^2 + 5^2 - 2 \times 3 \times 5 \times \cos 120^\circ$ $x^2 = 3^2 + 5^2 - 2 \times 3 \times 5 \times \left(-\frac{1}{2}\right)$ $x = \sqrt{49}$

		The <b>CWA</b> was 19. Most candidates used $\frac{1}{2}$ for the value of $\cos 120^\circ$ .
18(a)	-4 and 4	The formulation of an equation was necessary. Expected method was $x^2 + 3^2 = 5^2$
(b)(i)	1;4;9	Most candidates had 4 and 9 skipping 1. Candidates did not realise that 1 is a perfect square.
(b)(ii)	4	Candidates could not list the factors of 8 Expected factors of 8 were 1;2;4;8 The cwa was the inclusion of 3
(b)(iii)	$B \subset A$ or $A \supset B$	Candidates were not familiar with set notation
19(a)	$18^\circ\text{C}$	Wrong units were used Candidates were expected to select the number with highest frequency Some gave the $18^\circ$ without the C.
(b)	$21^\circ\text{C}$	Expected method was $\frac{20+22}{2}$ for the median
(c)	$11^\circ\text{C}$	The concept of range was not well understood by candidates. Expected method was 28-17
(d)	$21,2^\circ\text{C}$	Some candidates failed to add all the numbers given.  Expected method was $\frac{18+20+22+23+26+28+22+18+18+17}{10} = \frac{212}{10}$ or any other correct method
20 (a)(i)	$2d^\circ$ or $180-4d^\circ$	The cwa was $45^\circ$ . The answer should have been in terms of d. Candidates could have used either alternate angles or sum of opposite interior angles equal to exterior angle in a triangle.
(a)(ii)	$30^\circ$	Candidates were required to form the correct equation. Expected equation was $4d + 2d = 180$ or $180 - 4d + d = 3d$ or $d + 180 - 3d = 4d$ then solve to find the value of d

(b)(i)	$38^0$	Expected method was $180^0 - 142^0$ ( triangle OBA is an isosceles triangle) Some candidates failed to identify the theorem to apply
(b)(ii)	$76^0$	Expected method was $2 \times 38^0$ ( $B\hat{O}C$ is twice $C\hat{A}F$ ) Most candidates failed to identify the correct theorem to apply
21 (a)( i)	$12^0$	Expected method was $13x + 2x = 180$ The <b>CWA</b> was 24. Some candidates equated the equation to $360^0$ instead of $180^0$ .
(a)(ii)	15	Expected method was $\frac{360^0}{2 \times 12^0}$ or $\frac{360^0}{180^0 - 13 \times 12^0}$ The <b>CWA</b> was 30. Most candidates divided $360^0$ by 12 instead of $24^0$ .
21(b)	$\frac{178}{400}$	. Expected method was with replacement $\frac{3}{20} \times \frac{3}{20} + \frac{5}{20} \times \frac{5}{20} + \frac{12}{20} \times \frac{12}{20}$ The question was not answered by many. Most of those who attempted it worked without replacement
22 (a)( i)	8m/s	Substitution was familiar to candidates. Expected method was $v = 5 + 4 \times 3 - 3^2$
(a)( ii)	5	Only the positive was the expected answer since time is positive Expected method was: factorise and solve $(5 - t)(1 + t) = 0$ or $t = \frac{-4 \pm 6}{-2}$ (use of the quadratic formula) Some included the negative value of time in the final answer when they were expected to use the positive only
(b)	$h = \frac{A - 2\pi r^2}{2\pi r}$	Expected method was $2\pi r h = A - 2\pi r^2$ . Some few candidates could not isolate h.
23 (a)	8cm	Candidates were expected to equate the equal sides to x; $5+x+17+x=42$ . $X=10$ . The equal sides are 10 cm long.



		$\begin{array}{ccc} 10 & h & 10 \\ & 17 & \end{array}$ <p>Using Pythagoras theorem; <math>h^2 = 10^2 - 6^2</math>. <math>\therefore h = 8</math>  The <b>CWA</b> was 10 just copying one of the sides. Most candidates could not proceed to find the height.</p>
(b)	$88cm^2$	<p>Expected method was <math>\frac{1}{2}(5 + 17)8</math> or the isosceles trapezium could be divided into parts.  The <b>CWA</b> was 110. Candidates used 10 as the height</p>
24 (a)	\$150	<p>Expected method was <math>\frac{100}{120} \times 180</math>.  The <b>CWA</b> was \$144, 00. Most candidates subtracted 20% of \$180 from \$180.</p>
(b)	\$120	<p>Expected method was <math>\frac{80}{100} \times 150</math> or <math>\frac{80}{120} \times 180</math> or <math>150 - \frac{20}{100} \times 150</math>  The <b>CWA</b> was \$115, 20. Most candidates subtracted 20% of \$144 from \$144.</p>

## Conclusion

The report highlighted the performance of the candidates in the component.

Question by question analysis shows that the following topics need attention by Teachers in preparing Candidates for future examinations:

Bearing

Theory of logarithms

Functional notation



Sequences

Number bases

Area of similar shapes

Units of measurement

Inequalities

Cosine rule,

Range

Exterior angles

Probability

Profit and loss