EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

MATHEMATICS **6880/03**

Paper 3 Calculator Structured Questions (Core and Extended) **October/November 2020**

2 hours 30 minutes

Candidates answer on the Question Paper
Additional Materials: Electronic calculator
Geometrical instruments
Mathematical tables (optional)
Tracing paper (optional)

Confidential

MARK SCHEME

{6880/03}

MARKS: 100

This document consists of **11** printed pages.

 [Turn over

GENERALL INSTRUCTIONS

Administration

1. Arrival of Scripts

(i) Please use scissors to open plastic envelopes.

(ii) Check scripts **on arrival** against attendance registers **and** mark sheet.
If you have any paper 3 scripts which do not appear to be for you, please contact either Principal examiner or your Team leader. They should be able to send them directly to the correct examiner.

If they are SGCSE scripts but papers 1 or 2 then it may be possible to send them directly to the correct examiner by contacting the principal Examiner of that paper. Otherwise, you return them to Examination Council.

(iii) Please refer to instructions for Examiners for other aspects of administration.

2. Co-ordinations

(i) Examiners should answer the question paper before the coordination meeting so that they have a full understanding of what is expected.

(ii) Throughout your marking you must explain marks for work which is partially correct. This is usually done with the normal prefixes e.g. M, A, SC, B etc.

(iii) All provisionally (dummies) marked scripts must be reviewed in the light of any amendments to mark scheme made at the coordination meeting and any subsequent comments from team leader.

(iv) Before you proceed with your marking, check all comments and amendments made during coordination. Scripts should be marked in the order of your apportionment sheet, if possible.

(v) As soon as possible after the meeting you should provisionally mark about 10 scripts for the team leader to ascertain if you are marking according to the scheme agreed upon.

3. Batch

Your team leader will sample every batch that you mark. The team leader will sample the first 10 scripts from the first batch you mark to ascertain if your marking is consistent with what has been agreed on coordination. Feedback will be given immediately for you to make changes. Where the mark scheme has not been adhered to, you are expected to go through the whole batch before continuing to the next batch and before entering the marks onto the mark sheets.

4. Examiners' Report

You are expected to complete an examiner's report form, which will be later used to compile a paper report. You should include overall comments, comments on certain individual questions and details of any problems with individual centres.

5. Mark Sheets and Checking

The scripts should show ringed totals for each question and these ringed totals will check the sub-totals. There should also be final total at the top of the front sheet, which should be ringed on checking. Please be careful to check the mark sheets, especially that the 100 box is completed for candidates scoring at least 100.

These sheets should be signed by your checker.

Marking

1. Procedure

(i) Mark in RED – ink or ballpoint.

(ii) Marks should be written in the right-hand margin (or right-hand side if no margin exists!). there may be some scripts where the outside margins are easier to work with. Do not enter marks in the body of scripts.

(iii) Sub-totals should add up to a ringed total for each question. A full total should then appear on the first page and is to be ringed on checking. Full details of marks given are necessary e.g. partial credit by M marks, ticking, crossing underlining, ringing candidates' work. The sub-totals should agree to those beside the relevant question parts.

(iv) Indicate where errors are first made and how any follow-throughs have been checked.

(v) Normally arithmetic answers are marked where first seen, before rounding.

(vi) If a candidate re-starts a question please use clear arrows to show the end of the first attempt and the start of the second attempt. Make sure you only have one ringed total in this situation.

(vii) In the case of graph questions when all parts are to be done on graph paper, please write all marks on one side of the graph paper, even if some work has been done elsewhere.

(viii) In many cases a correct final answer will receive full marks. In some cases a method is required and here you should use Ms in your marking. Whenever final answers are incorrect you must look for method, transcription errors, mis-reads, follow-throughs and indicate any reason for any marks you have awarded.

2. Deleted Work

This is marked if it is legible and if it has not been replaced.

3. Types of Mark

(i) M – for a correct method applied to appropriate numbers.

(ii) A – for accuracy and depend on M marks. Hence MOA1 is not possible

(iii) B – independent accuracy marks. A fully correct final answer may receive full marks without the need to check for method. These cases would score, for example B2 and only when incorrect answers are seen is the M looked for. Please refer to mark scheme to see which questions can be marked in this way.

(iv) S, P and C marks are given in graph questions for scale, plotting and curve quality.

(v) R and E marks are given for reasoning or explanations.

(vi) SC marks are given in special cases only when mentioned in the mark scheme.

(vii) ft or hooked tic (√ will indicate the award of follow-through marks when the mark scheme allows it.
A further error in a follow-through would lose such marks and can be indicated by a note or by a hooked tick crossed out.

4. Mis-reads
These happen the first time a candidate copies a number from the question paper and must be consistent throughout the question. One A mark or one B mark is deducted. M marks are still awarded. Indicate by MR -1.

5. Choice
If two answers are given and they are not the same then mark the worst.

6. Notation
Allow any sensible notation. Watch out for commas being used for decimal points and dots used for products!!!! Brackets may be seen to represent inequalities.

7. Abbreviations
In addition to those already seen the following may crop up.

cao – correct answer only
ww – without working
www – without wrong working
oe – or equivalent
soi – seen or implied
bod – benefit of doubt
art – answer rounding to
isw – ignore subsequent working
ft – follow through
oor – out of range
mog – marks on graph
cso – correct solution only
t& I –trial and improvement
t& e – trial and error

8. Equivalent Methods
In general, equivalent methods are accepted. However, scale drawings are not accepted in place of calculations.

9. Accuracy
(i) If a question asks for a particular level of accuracy then the mark scheme will include specific details.

(ii) In other cases, the following apply:

- **(a)** More than 3 sf in the answer but correct (either rounded or truncated at fourth figure)- allow full marks.
- **(b)** Less than 3 sf in answer but correct 3 or more sf seen in the working – allow full marks even if rounded incorrectly.
- **(c)** 3 sf incorrect in the answer but 3 sf or more correct seen in the working – allow full marks.
- **(d)** Absence of final zero in 3 sf answer – e.g. 26 for 26.0 – usually condone unless wrong working seen.

(iii) Some situations can be complicated. In most numerical answers, we mark at the most accurate, which is usually where the answer is first seen.

(a) If it is incorrect then it scores zero, even if it has been correctly rounded into a correct answer.

(b) If the answer is being then used in another part of the question then unless some special circumstances are given, then any M marks are available.

(c) If an accuracy ft is also available in the new part, then give the ft mark for a correct follow through from a value which has lost the accuracy mark in the first part.

(d) However a correct value from the first part may have been given the accuracy mark but then has been rounded incorrectly and this has been condoned. If the wrongly rounded value is used in the second part and leads to an incorrect answer, even if correctly followed through, then this should not receive the accuracy mark here and **should not** be treated as a ft case.

Some examples on accuracy

1. Suppose a calculator display correctly gives 6.32455532 and the general rubric on the front cover of the paper applies and the mark scheme applies the usual rules about 3 sf or more. The following answers, usual where first seen, would achieve the given score out of A1.

6.3 A0, 6.32 A1, 6.33 A0, 6.324 A1, 6.325 A1, 6.3246 A1, 6.4 A0 etc.

2. Suppose the mark scheme to a question is

(a) $\frac{4}{3}\pi 3.5^3$ M1

(b) "their (a)" × 5.6 M1

(c) 1005 to 1006 or 1008 or 1010 A1 ft

Candidate A (a) 179.59 M1A1 (www2)

(b) 179.59 × 5.6=1005.7=1000 M1A1 (marked at most accurate)

Candidate B (a) 179.59 M1A1

(b) 180 × 5.6 = 1008 M1A1

Candidate C (a) 179.59 = 179 M1A1 (ignore the 179)

(b) 179 × 5.6 = 1002.4 M1A0 (not treated as ft)

Candidate D (a) $\frac{4}{3}\pi 3.5^3$ = 179.48 = 179.5 M1A0 (marked at most accurate)

(b) 179.5× 5.6 = 1005 M1A1

Candidate E (a) $\frac{4}{3}\pi 3.5^3$ = 179.48 = 179 M1A0

(b) 179 × 5.6 = 1002.4 M1A1 ft

10. Transcription Error

If it is clear that an incorrect final answer is a transcription error then allow full marks.

11. Trigonometrical Expressions

(i) If the sine rule is used with sin 90° then treat the sin 90° as1.

e.g. x/sin 90° = 12/sin 34° is marked as x = 12/sin 34°.

(ii) If cos 90° is used in the cosine rule, then it must be

reduced to zero before credit is gained.

12. Method Marks

(i) Complete correct methods receive M marks when arithmetic errors or incomplete solutions occur. If a correct method is followed by a further incorrect method step then the M mark will probably be lost.

(ii) Some questions may require a method to be seen, even when a final answer is correct.

(iii) If two different methods are used then the final answer can imply which one was used. If there is no final answer or other evidence then mark the worst method.

Question	Answers	Marks	Notes
1 (a)	$102000 \times \frac{100}{12}$ oe (E) 850 000	M1 A1	
(b)	777 017.40	B3 **[5]**	B2 for 712 860 or M2 for $600\,000 \times 1.09^3$ B1 for 654000
2(a)	-5	B3	M2 for $16x^2+48x+27$
(b)(i)	$2(4x^2 - 9) + 3$ $8x^2 - 15$	M1 A1	M1 for $4(2x+3)^2 - 9$
(ii)	$\frac{(2x+3)(2x-3)}{2x+3}$ $2x - 3$	M1 A1	
(c)	$4x^2 - 2x - 12 = 0$ oe $(2x + 3)(x - 2) = 0$ $x = \frac{-3}{2}$ oe, $x = 2$	B1 M1 A1 A1 **[11]**	
3 (a)	$d = 5$ $e = 4$ $f = 7$	B1 B1 B1	
(b)(i)	6	B1	
(ii)	15 + 8 + 5 28	M1 A1	
(c) (i)	$\frac{23}{54}$	B2	M1 for $\frac{15}{54} \times \frac{6}{53}$ *or* $\frac{6}{54} \times \frac{15}{53}$
(ii)	$\frac{15}{54} \times \frac{6}{53} + \frac{6}{54} \times \frac{15}{53}$ $\frac{10}{159}$	M2 A1 **[11]**	M1 for $\frac{15}{54} \times \frac{6}{53}$
4(a)	$x(y + 2) - 7(y + 2)$ or $y(x - 7) + 2(x - 7)$ $(y + 2)(x - 7)$	M1 A1	
(b)	for $\frac{p \pm \sqrt{q}}{r}$ where $p = -2$ and $r = 6$ $q = 88$ 3 s.f answers arising from –1.8968 , 1.2301 or better	B1 B1 B1, B1 **[6]**	

5(a)(i)	$-4\mathbf{b} + 12\mathbf{a}$	B2	B1 for $8\mathbf{a}$ seen
(ii)	$-\mathbf{a} + 3\mathbf{b}$	B2	B1 for $-\mathbf{b} + 3\mathbf{a}$ seen or $\frac{1}{4}their(a)(i)$
(b)	$\overrightarrow{AY} = -4\mathbf{a} + 12\mathbf{b}$ $= 4(-\mathbf{a} + 3\mathbf{b})$ $= 4\overrightarrow{AZ}$	M1 M1 A1 **[7]**	accept vectors leading to $\overrightarrow{ZY} = 3\overrightarrow{AZ}$
6(a)	$\sin B = \frac{125\sin 25}{61}$ $\sin^{-1}\left(\frac{125\sin 25}{61}\right)$ $120.0^{(o)}$	M1 M1 A1	
(b)	$61^2 + 55^2 \pm 2\times 61\times 55\cos 115$ $6746 - 6710\cos 115$ $\sqrt{9581.768}$ 97.8865	M1 M1 M1 A1	
(c)	$\frac{1}{2}\times 61\times 55\sin 115$ 1520.33	M1 A1 **[9]**	
7 (a)	$60x + 80y \leq 24000$	B1	
(b)	$y \geq 50 \quad and \quad x > y$	B1 B1	
(c)	solid line through (0,50) and (400,50) solid line through (0,300) and (400,0) broken line through (0,0) and (300, 300) correct region shaded	L1 L1 L1 R1	
(d)	150	B1 **[8]**	
8 (a)	$7.50 \leq x < 9.0$	B**1**	
(b)	$\frac{\sum midvalues \times frequency}{200}$ 6.6	M2 A1	M1 for numerator with 1 or 2 wrong products OR M1 for dividing by 200
(c)	116 , 176	B1 B1	

(d)	all 8 points correctly plotted smooth to give shape through at least 6 correct points	P2 C1	P1 for 6 to 7 correctly plotted
(e)(i)	4.2 to 4.6	B2	M1 for 20% of 200
(ii)	2.8 to 3.4	B2	M1 for UQ 8.1 to 8.4 or LQ 5.0 to 5.3
		[13]	
9(a)(i)	Correct triangle	B1	
(ii)	Enlargement, centre (0,0) S.F. -2	B1 B1B1	
(iii)	b = -2	B1	
(b)	triangle (1,1) , (1,3) and (2,1)	B2	
(c)(i)	triangle (3,1) ,(5,1) and (5,2)	B1	
(ii)	shear, x-axis invariant, SF 2	B1 B1B1	B1 for 2 correct coordinates
		[11]	
10(a)	straight lines from (0,0) to (10,20) to (20,20) to (25,0)	B2	B1 for two correct lines
(b)	6	B1	
(c)	$\frac{1}{2}(25+10)\times 20$ 350	M1 A1	
(d)	-4	B2	B1 for 4
		[7]	
11 (a)	$p^2 + r = 9p^2$ $r = 8p^2$ $\frac{r}{8} = p^2$ $p = (\pm)\sqrt{\frac{r}{8}}$	M1 M1 M1 A1	
(b)	$x = 3$ and $y = 2$	B4	M1 for det =-11 or $3x + 2y = 13$ $4x - y = 10$ M1 for $\frac{-1}{11}\begin{pmatrix}-1 & -2\\ -4 & 3\end{pmatrix}\begin{pmatrix}13\\ 10\end{pmatrix}$ or correct attempt to eliminate 1 variable

(c)(i)	$p = 7r^3$	B2	B1 for $p = kr^3$
(ii)	5	B2 **[12]**	B1 for $\frac{448}{7}$