

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL General Certificate of Education Ordinary Level

MATHEMATICS

4004/1

PAPER I

JUNE 2020 SESSION

2 hours 30 minutes

Candidates answer on the question paper

Additional materials: Mathematical Instruments

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed. Time 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces at the top of this page. Write your centre and candidate number in the box on the top right corner of every page of this paper.

Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

Answer all questions.

Write your answers in the spaces provided on the question paper using **black** or **blue** pens. If working is needed for any question, it must be shown in the space below that question. Omission of essential working will result in loss of marks.

Decimal answers which are not exact should be given to three significant figures unless stated otherwise.

Mathematical tables, slide rules and calculators should **not** be brought into the examination room.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

This question paper consists of 20 printed pages.

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natua	ate Name	e	Centre Number	Candidate Number
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NB	EITHER	AI R MATHEMATICAL TA MAY BE	nswer all questions BLES NOR SLIDE RULI E USED IN THIS PAPER	ES NOR CALCULATORS
		Express 208,9		
	(a)	in standard form,		
			Answer	a) [1]
	(b)	correct to 3 significant fi	igures.	", """
			Answer (b	b) [1]
	(c)	correct to the nearest hur	ndred.	
			Answer (c	;) [1]
		Evaluate		
	(a)	-10°,		
			Answer (a) [1]
	(b)	$\left(\frac{4}{2}\right)^{\frac{3}{2}}$		
		(9)		

Answer (b) [2]



Candi	idate Nam	e	Centre Number	Candidate Number
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			3	
3			A B 16 9 6 16 9 8 4 7	
		The Venn diagram shows thr	ee sets A, B and C with their re	espective elements.
	(a)	List all elements of		
	(i)	А∩В,	Answer (a)(i)	[1]
	(ii)	(A∪B)'∩C.	Answer (a)(ii)	
	(b)	Find n (AUC).	Answer (b)	[1]
4	(a)	Solve the inequality $2 - y < $	< 3y - 10	

Answer (a) [2]

(b) The perfect square, y, satisfies both 2 - y < 3y - 10 and $y \le 9$ Find the possible values of y.

Answer (b) [1]

Candidate Name	Centre	Number	Candidate Nu	mber
\square				
	4			
5	Solve the simultaneous equations: 2x + y = 4 x - y = -2			
		Answer		[2]
6 (a)	Convert 3014 to a number in base 10.			
		Answer (a)		[1]
(b)	Evaluate			
(i)	$1101_2 + 111_2$, giving the answer in base	2,		
		Answer (b)(i)	
(ii)	$131_5 - 42_5$, giving the answer in base 5.			
		Answer (b)(i	i)	[1]
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	l	5	
-5.	he numbers are 4 and –	The mean of 3 numbers is 7. Two of Find the third number.	7
[3]	Answer		
		Given that $m = 1$ and $n = -2$, evaluat $\frac{1}{2}$	8
		m-n,	(a)
	Answer (a)		
		$\frac{m n}{m + n}.$	(b)
	Answer (b)		

Candidate Name	Centre Number Candidate Number
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	6
9	Express $\frac{2}{2 - 3n} - \frac{1}{n}$ as a single fraction in its simplest terms.
10	Answer [3] The matrix $(x+2)$ 4 is singular.
	$\begin{pmatrix} (x + 2) & 4 \\ 6 & x \end{pmatrix}$ Find the possible values of x .

Given that
$$f(x) = \frac{k+x}{3x-2}$$
 and that $f\left(-\frac{1}{3}\right) = \frac{1}{6}$ [3]

find the value of
$$k$$
.

Candidate Name		Centre Number	Candidate Number
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12	It is given that $\mathbf{p} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}, \mathbf{q} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$ Find	$\begin{pmatrix} -3\\2 \end{pmatrix}^{\text{and } \mathbf{r}} = \begin{pmatrix} x\\y \end{pmatrix}.$	
(a)	$\left p \right $, leaving the answer in surc	l form,	

Answer (a) [1]

(b) the value of \mathcal{X} and the value of \mathcal{Y} if $\mathbf{p} - \mathbf{q} = 2 \mathbf{r}$.

Answer (b) [2]

A salesman's total monthly salary consists of a basic salary of \$200 and a 2% commission on his monthly sales.
 In one month his total salary was \$560.
 Calculate

(a) his commission for that month,

Answer (a) [1]

	0
	8
(b)	the sales he made for that month.
	Answer (b) [2]
14	It is given that $Sin y = 5$ and that y is an acute angle.
	13
	Find as a common fraction,
(a)	$Cos \ (180^{\circ} - y^{\circ}).$
	Answer (a) [2]
(b)	Tan u°
(0)	Tun y.
	Answer (b)

GradeABCDEUFrequency52530292140

(a) Find the median grade.

Answer (a) [1]

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(b) Calculate the probability that two candidates chosen at random from the 150 obtained grade A or B.

Answer (b) [2] 16 (a) Point R(-3; -2) is mapped onto point R₁ by a transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. Find the coordinates of R₁

Answer (a) [1]

Candidate Name	Centre Number	Candidate Number	
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	10		

(b) In the diagram triangle P is the image of triangle Q under a certain transformation.

Describe fully the single transformation that maps triangle P onto triangle Q.



Answer (b) [2]

Candidate Name			Centre Number	Candidate Number
		1	1	
17	It is given that g_{0}	$c \frac{m}{2}$ and $g = 1$	when $m = 2$ and $r = 3$.	
	Find the	r		
(a)	formula connection	ng g, m and r,		

Answer (a) [2]

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(b) numerical value of g when m = 10 and r = 3.

Answer (b) [1]

Candidate Nar	ne	Centre Number	Candidate Number	
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		12		
18		O B 283 C		
		D		
			P	
	In the diagram A, B, O. PD is a tangent to the	C and D are points on the circur circle at D, $A\hat{D}B = 28^\circ$ and C	enference of a circle cen $(\hat{B}D) = 47^{\circ}.$	tre
	Calculate			
(a)	BÂD [,]			
		Answer (a)		[1]
(b)	CDP•			
		Answer (b)		[1]
(c)	$C\hat{A}B'$			
		Answer (c)		. [1]
(d)	$B\hat{C}D^{\cdot}$			
		Answer (d)		[1]

Candi	date Nar	ne	Centre Number	Candidate Number	
		13			
19	(a)	Simplify $4b - 3(4 - 2b)$.			
			Answer (a)	[2]	
	-34		Answer (a)	[2]	
	(b)	Factorise completely $x - y - xy + x^2$.			
			Answer (b)	[2]	
20	(a)	Name the regular polygon which has rotational symmetry of order 5.			
			Answer (a)		
	(b)	The sum of the interior angles of a he are 140°, 120° and 160°. The remaining angles are in the ratio Calculate the size of the largest of the	exagon is 720°. Three 2 : 3 : 5. e remaining angles.	of its interior angles	
			Answer (b)	[3]	

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21	It is given that $Log \ x = 6$ and $Log \ y = -2$. Evaluate
(a)	Log (xy).
	Answer (a) [2]
(b)	$Log\left(\frac{1}{\sqrt{x}}\right)$
	Answer (b) [2]
22	On a certain map, a length of 2cm represents a distance of 5km.
(a)	Express the scale of the map giving the answer in the form $1: n$.
	Answer (a) [2]
(b)	Calculate the area on the map in cm ² which represents an actual area of 4km ² .
	Answer (b) [2]



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Answer (b) [2]

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24 (a) A straight line has gradient -1 and passes through the point (3; 0). Find the equation of the line in the form y = mx + c.

Answer (a) [2]

(b) The solutions of a quadratic equation are x = -1 and x = 3. Write down the quadratic equation in the form $ax^2 + bx + c = 0$ where a, b and c are integers.

Answer (b) [3]



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The diagram shows triangle XYZ with XY = 6cm, XZ = 10cm and $Y\hat{X}Z$ = 30°. Use as much of the information given below as is necessary. [Sin 30° = 0, 50 : Cos 30° = 0, 87 : Tan 30° = 0, 58] Calculate the

6cm

(a) area of the triangle XYZ,

Answer (a) [2]

(b) length of YZ leaving the answer in surd form.



The diagram is a speed-time graph of an object which decelerates uniformly from a speed of 50 m/s to a speed of 30 m/s in 20 seconds. It further decelerates uniformly for 10 seconds until it comes to rest.

(a) Find the speed when t = 5 seconds.

Answer (a) [2]

(b) Calculate the

(i) acceleration of the object during the last 10 seconds.

Answer (b)(i) [2]

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(ii) distance travelled during the 30 seconds.



The diagram shows the cross-section of a concrete drinking trough which is 3m long. AB = 2,2m, BC = AG = 1m and CD = FG = 0,4m. DF the diameter of the drinking trough is 1,4m. Take π to be 22.

Calculate the

27

(a) perimeter of the cross-section,

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(b) area of the cross-section,

Answer (b) [3]

(c) volume of the concrete used to make the drinking trough.

Answer (c) [2]

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General Certificat	e of Education Ordin	ary Level	JUNCIL
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PAPER 2	E 2020 SESSION	2 hours	20 minutes
	12020 31/3/3IQI	Z nours	50 minutes
Candidates answer on the question pape	er		
Additional materials:			
Mathematical Instruments Mathematical Tables			
Non programmable Electronic Calculator Allow candidates 5 minutes to count pag This booklet should not be punched or s Time 2 hours 30 minutes	ges before the examin tapled and pages sho	ation. uld not be re	moved.
Non programmable Electronic Calculator Allow candidates 5 minutes to count page This booklet should not be punched or s Time 2 hours 30 minutes INSTRUCTIONS TO CANDIDATES Write your Name, Centre number and cand Write your Centre and Candidate number i this paper. Check that all the pages are in the booklet a are duplicate or missing pages. Answer all questions in Section A and any Write your answers in the spaces provided If working is needed for any question, it may Omission of essential working will result in Decimal answers which are not exact should unless stated otherwise. Decimal answers in degrees should be given Mathematical tables and Electronic calculate expressions.	ges before the examinatapled and pages show didate number in the span the box on the top right and ask the invigilator of four questions from on the question paper of ust be shown in the span of loss of marks. Id be given correct to the n correct to one decim- tors may be used to evan	ation. uld not be re- aces at the to ght corner of for a replacer Section B. using black of the below that hree significa al place. aluate explici	emoved. p of this page. every page of ment if there or blue pens. t question. Int figures it numerical
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Non programmable Electronic Calculator Allow candidates 5 minutes to count page This booklet should not be punched or s Time 2 hours 30 minutes INSTRUCTIONS TO CANDIDATES Write your Name, Centre number and cando Write your Centre and Candidate number if this paper. Check that all the pages are in the booklet are duplicate or missing pages. Answer all questions in Section A and any Write your answers in the spaces provided If working is needed for any question, it mo Omission of essential working will result in Decimal answers which are not exact should unless stated otherwise. Decimal answers in degrees should be given Mathematical tables and Electronic calculate expressions. INFORMATION FOR CANDIDATES The number of marks is given in brackets [ges before the examinate tapled and pages show didate number in the sp n the box on the top rig and ask the invigilator of four questions from on the question paper is ust be shown in the spa n loss of marks. Id be given correct to the n correct to one decimi- tors may be used to eval	ation. uld not be re- aces at the to ght corner of for a replacer Section B. using black on the below that mee signification al place. aluate explicion Destion or par	emoved. p of this page. every page of ment if there or blue pens. t question. Int figures it numerical t question.

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		SECTION	A (52 Marks)	
		Answer all quest	ions in this section	
I	(a)	The difference between two frac	tions is 2. The sma	aller fraction is
,	(**)		$3\frac{1}{3}$	$2{4}$
		Find the other fraction.		
			ŧű	
			Answer (a	ı) [2
		E state de la companya de la compa	· · · · · · · · · · · · · · · · · · ·	/ hetevitaattoitaattaattoittoittiittittäääännittiitt
	(b)	Express this population in stand	ard form.	
		٢		
		8		
			Answer (b) [2
	(c)	Increase \$40,00 in the ratio 8:5	i.	
			Answer (c	
	(4)	· · · · · · · · · · · · · · · · · · ·		
	(u)	Evaluate $(7\sqrt{5})$		
			Answer (d	£) [1

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	(e)	Simplify $11011_2 + 243_5$, giving the ans	wer in base five.	
				[a]
			Answer (e)	[3]
2	(a)	Two similar cups have diameters of 6 c	cm and 10 cm.	
	(i)	Write down the ratio of their volumes.		
				101
			Answer (a)(1)	[2]
	(ii)	Given that the volume of the smaller cu calculate the volume of the larger cup.	$1p \text{ is } 100 \text{ cm}^3$,	
			Answer (a)(ii)	[2]
	(b)	A wooden block is in the form of a pris with base 35 cm, perpendicular height 2 Calculate the	m whose cross-section 20 cm and length 1,2 r	n is a parallelogram n.
	(i)	surface area of the cross-section of the	block	

Answer(b)(i) [2]

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(ii)	volume of the block,				
			Answer (b)	(ii)	[2]
(iii)	mass of the block if 3 cm	³ of the block	weigh 2,5 g.		
			Answer (b)	(iii)	[2]
3 (a)	Find the value of \mathcal{Y} for wh	iich ((-2)	0)	
		(y 4)	$\begin{pmatrix} 3 \end{pmatrix} = (\cdot)$	-2)	

Answer (a) [2]

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andidate Nat	me	Centre Number	Candidate Number
(b)	5 Find the matrix P such that $P\begin{pmatrix}3\\2\end{pmatrix}$	$\begin{pmatrix} -4 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	
		Answer (b)	[3]
(c)	The equation of a straight line is y - Find the	+3x = -4	
(i)	coordinates of the point where the li	ne crosses the y-axis,	
	<u>.</u>		
(ii)	gradient of the line,	Answer (c)(i)	[2]
(iii)	equation of a line parallel to the line	Answer (c)(ii) y + 3x = -4 and part	[1] ssing through the
	μοπτ (σ, σ).		
		Answer (c)(iii)	[2]

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4 Answer the whole of this question on the blank space below.

Use ruler and compasses only for all constructions and show clearly all construction lines and arcs.

All constructions should be done on a single diagram.

(a) Construct

- (i) triangle ABC in which AB = 7 cm, $B\hat{A}C = 45^\circ$, BC = 8 cm, Answer (a)(i) on the diagram [4]
- (ii) the locus of points equidistant from B and C, Answer (a)(ii) on the diagram [2]

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	(iii)	the locus of points 5 cm from C.	Answer (a)(iii) on the dia	gram [1]
	(b)	A point R in triangle ABC is such the from C. Show by shading, the region in which	hat it is nearer B than C and ch R must lie.	l is less than 5 cm
			Answer (b) on the diagram	n [2]
	(c)	Measure and write down the size of	\hat{ABC} · Answer (c)	[1]
5	(a)	Show that the equation $x - 3 = \frac{5}{3x}$ Answer (a).	reduces to $3x^2 - 9x - 5$	i = 0.
	(b)	Solve the equation $3r^2 - 9r - 5$	- n .	[2]
		Give the answers correct to 2 decima	al places.	
			Answer (b)	[5]
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In the diagram, ABCD is a cyclic quadrilateral with centre O. AB is produced to M. $M\hat{B}C = 70^{\circ}$ and $B\hat{D}C = 40^{\circ}$.

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Find

(i)
$$B\hat{C}D^{\flat}$$

Answer (c)(i) [1]

(ii) $A\hat{B}D$,

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 [2]

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(iii) ADO-			
		Answer (c)(iii)	[2]

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SECTION B (48 Marks)

Answer any four questions from this section.

Each question carries 12 marks



In the diagram, ABO is a triangle in which M is the mid-point of OB and N lies on AB such that $AN = \frac{1}{5}AB$ ON and AM intersect at X. $\vec{OA} = a$ and $\vec{OB} = b$.

$$OA = OB = O$$

(a) Express, in terms of
$$a$$
 and/or b

(i) $O\vec{X}$,

Answer (a)(i) [1]

(ii) \vec{AN} ,

Answer (a)(ii) [1]

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Answer (c) [1]

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	1	2		
(d)	Use the results of (b) and (c) to fi	nd the numerical valu	es of h and k .	

Answer (d)	\$*************************************	
****		[3]

(e) Hence, or otherwise find the ratio of area of triangle OAX to area of triangle OAM.

Answer (e) [1]



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7	Answer the whole of this question			
7	unit on both axes.	on t	ne grid below. Use a scal	e of 2 cm to 1
				ով։ - Գիլիայիս հավորվում է Գիլիս ու ֆիլիսիս է սինելու է։ - Գիլիսիս հայտնելու է հայտնելու է հայտնելու է հայտնելու է։ - Գիլիսիսիսիս հայտնելու է հայտնելու է հայտնելու է հայտնելու է։

(a) Triangle PQR has vertices at P(1; 3), Q(2; 1) and R(4; 3). Draw and label triangle PQR.

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Answer (a) on diagram [1]

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Candidate Name	Centre Number Candidate Number
(b)	Triangle $P_1Q_1R_1$ is the image of triangle PQR under a reflection in the line y = -x
(i)	Draw the line $y = -x_{\rm eff}$
	Answer (b)(i) on diagram [1]
(ii)	Draw and label triangle $P_1Q_1R_1$.
	Answer (b)(ii) on diagram [3]
(iii)	A transformation, G, maps triangle PQR onto triangle $P_2Q_2R_2$ with vertices at P_2 (1; -6), Q_2 (2; -2) and R_2 (4; -6).
	Draw and label triangle $P_2Q_2R_2$. Answer(b)(iii) on diagram [1]
(iv)	Describe fully the single transformation, G, which maps triangle PQR onto triangle $P_2Q_2R_2$.
	Answer(b)(iv)
(c)	The point R_3 (-1; 2) is the image of R under a translation.
(i)	Find the translation vector.
	Answer (c)(i) [1]

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	(ii)	Write down the coordinates or respectively, under the same t	f P_3 and Q_3 the images of ranslation.	P and Q
			Answer (c)(ii)	[2]

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m

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(a) Find the value of $m_{\rm eff}$

y

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Answer (a) [1]

-4

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Answer this part of the question on the grid below. Use a scale of 2 cm to 1 unit on the x axis and 2 cm to 5 units on the y axis.

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		╡╗╡╅╗╬╶╏╌╦╴╞╤╝╱┫╗╡╱┫╴┝╍┝┙╊╌╗╌┥╡┑┥╼┥┥┥╸┥╌╗╼╞╼╞╸╡╶┥┯┿╌╊╼╢┥┥╸╝┥╝╺┿╴╝┥╉╸╴╡╶╏╴╸
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╶╴┠╬╌╬╌╬╌╬┾╬┿╬╧╢┝╍┝╣╍┾╬╬╝╬┊╔╠┢╔╬╡╬╬┿╸╽╔╝╎┝╴┉╺	ᆃ᠁ᡵᢤ᠊ᢩᠳ᠆ᡱᢣᢟᡭᠯᠴᡛ᠊᠋ᢢ᠆ᡩᠵᡛᡊᠯᠬᡇᡊᡛ᠇ᢩᡡ᠖ᡃᠲᡊ᠅ᠺᡀ᠅ᠴᡘᠴᢢ᠈ᡧᠴᢥ᠆ᠰᠴᢢ᠆ᢜ᠆ᠯ	- 눈에 가지는 것 같은 것 같이 다니는 눈이 것 같이 다시는 같이 가지 않는 것 이 말했다. 한 것 같은 것 같은 것 같은 것 같은 것 같이 않는 것 같이 않는 것 같이 많이 했다. 한 것 같이 나는 것
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(b) Draw the graph of
$$y = x^3 - 3x^2 =$$

Answer (b) on the diagram [4]

4004/2 J2020



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Candidate Name		Centre Number	Candidate Number
а (с) U	Jse the graph to find an estimate the		
(i) g	gradient of the curve at the point when	x = 3,	
(ii) a	rea bounded by the curve, the $\mathcal Y$ -axis	Answer (c)(i) and the line $\mathcal{Y} = -12$.	[2]
		Answer (c)(ii)	[2]
(d) W na	Vrite down, from the graph, the range egative gradient.	of values of x when the	e curve has a
		Answer (d)	[1]
(e) Us	se the graph to solve the equation x^3	$-3x^2 = 2$, for po	sitive values of x
		Answer (e)	[2]
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Candid	ate Name		Centre Number	Candidate Number	
\square					
			18		
9	(a)	Factorise completely			
	(i)	$x^2 - 4$			
			Answer (a)(i)	[2]
	(ii)	$x^2 - 5x + 6$			
			Answer (a)(ii)	[2]
	(iii)	Hence or otherwise find the Hig $x^2 - 5x + 6$.	ghest Common Factor ((H.C.F.) of $x^2 - 4$	and
			Answer (a)(ii	i)	[1]
	(b)	It is given that $S = \frac{a}{1 - r}$	- 19 -		
	(i)	Find the value of S when $\alpha = 8$	1 and $r = \frac{1}{2}$		
			ð		

Answer (b)(i) [2]

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Candidate Name	Centre Number	Candidate Number
	19	

(ii) Make r the subject of the formula.

Answer (b)(ii) [3]

From a group of 30 people at a party, it was observed that 17 people ate beef, 16 people ate pork, x people ate both beef and pork and 6 people ate neither (c) beef nor pork.

Calculate x, the number of people who ate both beef and pork.

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Answer (c) [2]

[Turn over





In the diagram KLNG is a trapezium in which LMN is a straight line and $KLM = M\hat{N}G = 90^{\circ}$. MK = 7 cm, MG = 5 cm, $L\hat{M}K \equiv 60^{\circ}$ and $N\hat{M}G = 35^{\circ}$. Calculate the

(a) length of NG.

Answer (a) [2]

(b) size of $\hat{KM} G$,

Answer (b) [1]



	Candidate Na	me	<u></u>	Centre Number	Candidate Number
	(c)	area of triangle KMG,	21	1	
	(d)	length of KG,		Answer (c)	
	(e)	size of $M\hat{K}G$		Answer (d)	[4]
				Answer (e)	[3]
- vera			4004/2 J2020		[Turn over

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Candidate Name	C	entre Number	Candidate Number	
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	22			
11	A group of youths wishes to make Let x be the number of chairs and	e and paint chairs and y the number of ta	d tables for sale. bles to be produced.	
(a)	The group wishes to produce at le Write down two inequalities, one conditions.	ast 5 chairs and not 1 in x and the other in	less than 5 tables. In $\mathcal Y$, that satisfy these	
		Answer (a)	[2	2]
(b)	The group has 48 hours to make the first takes 4 hours to make a chain inequality in x and y that satisfies	ne chairs and tables. and 3 hours to make as this condition.	a table, write down on	

Answer (b) [1]

(c) The group hired a compressor for 14 hours to paint the chairs and tables. Given that it takes 1 hour to paint a chair and 1 hour to paint a table, form an inequality in x and y that satisfies this condition.

Answer (c) [1]



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Candida	te Name			Centre N	umber	Candidate N	lumber
				24			
	(ii)	The profit on a Use the graph 1	chair is \$10 a to find the gre	nd the profit atest possible	on a table is S e profit that ca	520. n be made.	
					Answer (d)(ii	i)	[2]
12		The table below	v shows the h	eights, <i>h</i> cm,	of a group of	200 children.	
		Height (hcm)	50 < h ≤ 60	60 < h ≤ 70	$70 < h \le 75$. 75 ≤ h ≤ 80	$80 \le h \le 100$
		Frequency	24	38	53	45	40
		Density	2,4	3,8	10,6	<i>p</i>	<u>q</u>
	(a)	Find the value	of				
	(i)	р					
			3				
			÷		Answer (a)(i)	*****	[1]
	(ii)	q					
					Answer (a)(ii)	[1]
	(b)	Calculate an es	timate of the 1	mean height o	of the children	ι.	

Answer (a)(iii) [3]



Candidate Name	Centre Number	Candidate Number
	25	

- 25
- (c) Draw a histogram to show the information in the table.
 Use a scale of 2 cm to represent 10 units on the h axis and 2 cm to represent 2 units on the Frequency Density axis.



Answer (b) on the graph

[5]

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Candidate Name	Centre	Number	Candidate	Number	
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	26				

(d) Two children are chosen at random from the group. Find the probability that each has a height which is greater than 75 cm.

Answer (c) [2]





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ZIMBABWE SCHOOL EXAMINATIONS COUNCIL General Certificate of Education Ordinary Level

MATHEMATICS PAPER 2

4004/2

NOVEMBER 2020 SESSION

2 hours 30 minutes

Additional materials: Mathematical Instruments Mathematical Tables Non programmable Electronic Calculator Plain Paper (1 sheet) Graph paper (4 sheets)

Time 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces provided on the answer paper/answer booklet.

Answer all questions in Section A and any four questions from Section B.

Write your answered on the separate answer paper provided. If you use more than one sheet of paper, fasten the sheets together.

All working must be clearly shown on the same sheet as the rest of the answer. Omission of essential working will result in loss of marks.

If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given correct to three significant figures. Answers in degrees should be given correct to one decimal place.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question. Mathematical tables and Non-programmable electronic calculators may be used to evaluate explicit numerical expressions.

> This question paper consists of 10 printed pages and 2 blank pages. Copyright: Zimbabwe School Examinations Council, N2020.

SECTION A (52 Marks)

Answer all questions in this section

		Evaluate $90 = 20 \div 5 \pm 3 \times 2$	[2]
1	(a)	Evaluate $20 - 20 \pm 0 \pm 5 \times 2$.	

(b) Simplify
$$(\sqrt{10} - \sqrt{5})^2$$
 leaving the answer in surd form. [2]

A			
14 520	В		
23 490	8 970	С	
33 260	18 740		D

(i)	Write down the distance from A to D, giving the answer in standard form.	[1]
<i>(</i> 1 •)		

(b) A three-digit number in base *n* is given as 147_n .

(i) Write down the least possible value of
$$n$$
. [1]

(ii) If
$$147_n = 324_6$$
, find the possible value of *n*. [4]

3

 (ii) Find the number of sides of a polygon whose interior angles add up to 4 complete revolutions. [3]

Write down the number of degrees in 4 complete revolutions.

(b) Two similar containers are of capacities 1,728 l and 5,832 l respectively.
 If the surface area of the bigger container is 153 cm², find the surface area of the smaller container.

[3]

[1]

- Triangle ABC has sides AB = 6.5 cm, BC = 7.8 cm and AC = 9.1 cm, measured to the nearest mm.
- (i) Express the length of side AB as a range, in the form $\dots \le AB < \dots$ [2]
- (ii) Calculate the least possible perimeter of the triangle. [2]

It is given that matrix $A = \begin{pmatrix} 2 & x \\ 4 & 3 \end{pmatrix}$ and matrix $B = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$.

(a) Simplify leaving the answers in terms of x,

(c)

4

(i) A^2 , [2]

(b) If matrix A is singular, find the value of
$$x$$
. [2]

(c) A primary school decided to send all their Grade 3 learners on a trip. The learners were asked to indicate the places they would like to visit, choosing from Birchenough Bridge, Great Zimbabwe Monuments and Matopo Monuments.

The following statistics were gathered.

39 wanted to visit the Great Zimbabwe Monuments.

31 wanted to visit the Birchenough Bridge.

30 wanted to visit the Matopo Monuments.

10 wanted to visit all the three places.

6 were not keen to visit any one of the three places.

19 wanted to visit both the Great Zimbabwe Monuments and Birchenough Bridge.

15 wanted to visit both the Great Zimbabwe Monuments and the Matopo Monuments.

17 wanted to visit the Birchenough Bridge and the Matopo Monuments.

(i) Using the given information, copy and complete the Venn diagram shown where

 ξ is the set of all Grade 3 pupils in that school

Z is the set of learners who chose Great Zimbabwe Monuments,

B is the set of learners who chose Birchenough Bridge and

M is the set of learners who chose Matopo Monuments.



[4]

(ii) Write down the total number of the Grade 3 learners. [1]

		Use ruler and compasses only for all constructions and show clea all construction lines and arcs. All constructions should be done on a single diagram.	.rly
(a)	(İ)	Construct a triangle PQR such that $QR = 7,5cm, PQR = 90^{\circ} and QRP = 30^{\circ}$.	[5]
	(ii)	Construct the locus of points equidistant from P and R.	[2]
	(iii)	Construct the locus of points that are 3 cm from Q.	[1]
(D)		Mark and label the points D_1 and D_2 that are equidistant from points P and R and are 3 cm from Q.	[2]
(c)		A point X , inside the triangle is such that it is nearer P than R and more than 3 cm from Q. Shade the region in which X must lie.	[2]
(d)		Measure and write down the length of PR.	[1]

5

Answer the whole of this question on a sheet of plain paper.

5

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SECTION B (48 Marks)

6

Answer any four questions from this section

Each question carries 12 marks

6	(a)		Mrs Chuhwa invested a certain amount of money with a bank that offered 4,5% p.a. simple interest.	
			After 8 months her money amounted to \$504,70 before any bank charges were deducted.	
			Calculate the amount of money that Mrs Chuhwa had initially invested.	[3]
	(b)	(i)	Mrs Bande bought a set of sofas for \$368 cash, including 15% VAT. Calculate the price of the sofas excluding VAT.	[2]
		(ii)	Mr Ndloru decided to buy a similar set of sofas on laybye terms. He paid a deposit of \$150 plus three equal monthly instalments of \$87 including VAT	
			Calculate the difference in the amounts of money the two customers paid.	[3]
	(c)		The average expenditure E of a family over a certain period of time is partly constant and partly varies as the number, n of people in the family.	
		(i)	Find a relationship between E and n using constants h and k .	[1]
		(ii)	The expenditure for 5 people is \$55 and for 3 people is \$45. Find the value of h and the value of k .	[3]
7	(2)		A rectangle with a width of $(x + 2)$ cm has a perimeter of $(8x + 2)$ cm.	
			Find an expression for the length of the rectangle.	[2]
	(b)		Given that the area of the rectangle is 16 cm^2 , form an equation in x and show that it reduces to $3x^2 + 5x - 18 = 0$.	[3]
	(c)		Solve the equation $3x^2 + 5x - 18 = 0$, giving the answers correct to three significant figures.	[5]
	(d)		Hence, find the perimeter of the rectangle.	[2]

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A particle is thrown vertically upwards and its height, h metres above the ground after t seconds, is given by the equation

7

 $h = 10 + 25t - 5t^2$. The following is an incomplete table of values for $h = 10 + 25t - 5t^2$.

Time (t) seconds	0	1	2	3	4	5	6
Height (h) metres	10	30	m	40	30	10	-20

(a)		Find the value of m .	[1]
(b)		Answer the whole of this part of the question on sheet of graph paper. Use a scale of 2cm to 1 unit on the f axis and 2cm to 10 units on the h axis.	
	(i)	Draw the graph of $h = 10 + 25t - 5t^2$.	[4]
	(ii)	Write down the distance between the initial and final positions of the particle.	; [1]
(c)		Use the graph to answer the following questions.	
	(i)	Find the greatest height reached by the particle.	[2]
	(ii)	Estimate the velocity of the particle when $t = 5$.	[2]
	(iii)	Find the times when the particle is 21 m above the ground.	[2]

9

(a)



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In this question, take π to be 3,142.

In this diagram, sector OAB is the cross-section of a solid prism that is 50cm long.

The radius of the sector is 6 cm and $A\hat{O}B = 80^{\circ}$.

Calculate the

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length of arc AB, (i)

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. 1

[2]

(ii) total surface area of the prism.



In the diagram, ABC is a triangle in which AB = 7 cm, AC = 9 cm and $Sin B\hat{A}C = 2$, where is $B\hat{A}C$ acute. 3

Find the

- [3] Cos BÂC, **(i)**
- length of BC. (ii)

0 - 1 - 20

....

10

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(b)

An Agriculture class studied the effect of a certain chemical on the growth rate of 30 Moringa seedlings. The heights of the Moringa seedlings are shown in the frequency table.

Height h (cm)	$10 \le h \le 20$	$20 \le h \le 25$	$25 \le h \le 35$	35 < h ≤ 40
Frequency	5	6	10	9

(h) If this information is represented on a histogram, write down the	Write down the modal class.	[1]
frequency densities of the following classes.	If this information is represented on a histogram, write down the frequency densities of the following classes.	

(i)
$$10 < h \le 20.$$
 [2]

(ii)
$$35 < h \le 40$$
. [1]

(c) Calculate the size of the angle that would represent the class
$$35 < h \le 40$$
 on a pie chart. [2]

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[3]

[4]

P21

	9	
(d)	Calculate an estimate of the mean height of the seedlings.	[3]
(e)	If 2 seedlings are picked at random, find the probability that one is at most 20 cm tall and the other is more than 35 cm tall.	[3]
	Answer the whole of this question on a sheet of graph paper Use a scale of 2 cm to 2 units on both axes for $-10 \le x \le 8$ and $-4 \le y \le 8$.	
(2)	Triangle ABC has vertices at $A(2; -2)$, $B(4; 2)$ and $C(6; 2)$. Draw and label triangle ABC.	[1]
(b)	Triangle $A_1B_1C_1$ has vertices at A_1 (-2; 2), B_1 (0; 6) and C_1 (2; 6). Draw and label triangle $A_1B_1C_1$.	[1]
(c)	Describe fully the single transformation which maps, triangle ABC onto triangle $A_{t}B_{1}C_{1}$.	[2]
(đ)	Triangle ABC is mapped onto triangle $A_2B_2C_2$ by a reflection in the x -axis. Draw and label triangle $A_2B_2C_2$.	[2]
(e)	Draw and label triangle $A_3B_3C_3$, the enlargement of triangle ABC about centre (-4; 2) and scale factor of $-\frac{1}{2}$.	[3]
(f)	Transformation V is defined by the matrix $\begin{pmatrix} 1-2\\ 0 & 1 \end{pmatrix}$.	
	Draw and label triangle $A_4B_4C_4$, the image of triangle ABC under transformation V.	[3]



The diagram is a star made up of a regular hexagon ABCDEF, centre X, surrounded by 6 equilateral triangles AOB, BPC, CQD, DRE, ESF and $FTA.\overline{OA} = a$ and $\overline{OB} = b$.

(a) Write down the following vectors in terms of a and/or b giving the answers in their simplest form.

(i)	\vec{OS}	1	η	

- (ii) \vec{AB} . [1]
- (iii) \vec{OR} (2)

$$(iv) \quad CF \quad [2]$$

(b) The length of line OA= 5 cm. Find

(i) $|\boldsymbol{a}-\boldsymbol{b}|,$ [2]

(ii)	the perimeter of triangle OQS,	[3]

(iii) the area of triangle OAB. [2]