ADDITONAL	MA	THEMATICS 2
0575		

	General Certificate of Education Examination	
(2 marks)	Edukamer ORDINARY LEVEL	1)
JUNE 2021	EQUKAINEL ORDINARY LEVEL	
Subject Title	Additional Mathematics	
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(4 marks	Two and a half hours $(2 - 2)$ if Two and a half hours $(1 - 2)$	i)
nswer ALL Q ECTION B or IARKS.	JESTIONS IN SECTION A and ANY TWO QUESTIONS FROM EITHER SECTION C. IN SECTIONS B AND C, ALL QUESTIONS CARRY EQUAL	T T
	Month Monthly Monthly salary (M) to solar chamican add avail, arrive	
ut NOT a comb	contraction of Section A and Section B OR Section A and S ination of all three orking must be shown. No marks will be awarded for answers without brief sta answers have been obtained.	
ectronic calcula dente () here necessary to	(.) the salary for the sizth month.	
ormulae Booklets	may be used.	(i) .
	The binary operation $*$ is defined over the set, $S = \{L, 2, 3, 4\}$ as $x * y = x^{y}$ modulo (a) Copy and complete the operation table below for $(S, *)$.	
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(3 marks	Edukamer	
(3 marks	(b) Give a reason why (5, *) does not form a group! [Assume associativity] Given a matrix, $M = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$	5- 106 . 11)
(3 marks) (1 marks)	(b) Give a reason why (5, *) does not form a group! [Assume associativity] Given a matrix, $M = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$, and the inverse of M .	
(3 marks) (1 marks) (3 marks)	(b) Give a reason why $(5, *)$ does not form a group! [Assume associativity] (b) Give a reason why $(5, *)$ does not form a group! [Assume associativity] (c) Given a matrix, $M = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$, and the inverse of M	ng ion . 11 (3 milek (Dipatk

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for more past questrions, corrections and notes, download the app "kawlo" on playstore or visit http://www.gce

SECTION A: PURE MATHEMATICS THIS SECTION IS COMPULSORY TO ALL CANDIDATES (ANSWER ALL QUESTIONS)

(a) Find the value of k, (b) Show that $f(x) = (x + 2)(x^2 + x + 3)$. (c) Show that $f(x) = (x + 2)(x^2 + x + 3)$. (c) Show that $f(x) = (x + 2)(x^2 + x + 3)$. (c) Show that $f(x) = (x + 2)(x^2 + x - 3)$. (d) find the values of $\alpha + \beta$ and $\alpha\beta$. (e) Show that $f(x) = (x + 2)(x^2 + x - 3)$. (f) Given that α and β are the roots of $2x^2 + x - 3$. (g) find the values of $\alpha + \beta$ and $\alpha\beta$. (g) marks (hence, (h) write down another quadratic equation with integral coefficients whose roots are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$. (c) marks (i) Find the number of ways of selecting a class prefect boy and a class prefect girl from a class of 4 boys and 5 girls. (ii) Write down the first three terms of the binomial expansion of $(1 - 2x)^{-1}$ in ascending powers of x , simplifying your answer as far as possible. (iii) Write down the first three terms of the binomial expansion of $(1 - 2x)^{-1}$ in ascending powers of x , simplifying your answer as far as possible. (iii) Write down the first three terms of the binomial expansion of $(1 - 2x)^{-1}$ in ascending powers of x , simplifying your answer as far as possible. (iii) The basic salary of a teacher in a school is 100,000 FCFA and his salary is increased monthly by 10%. The table below shows his salary for the first 3 months. (iii) Increment (1) $1 t_1 = 0 M_1 = 100,000$ $2 t_2 = 1,000 M_2 = 110,000$ (a) Show that $\frac{M_3}{M_2} = \frac{M_3}{M_1}$. (c) marks (i) The binary operation $*$ is defined over the set, $S = \{1, 2, 3, 4\}$ as $x * y = x^y$ modulo 5. (a) Copy and complete the operation table below for $(5, *)$. (b) Give a reason why $(5, *)$ does not form a group. [Assume associativity] (i) Given a matrix, $M = (\frac{-1}{2}, \frac{-1}{2})$. (a) Find the inverse of M . Hence or otherwise, (b) Find the point whose image is $(5, -1)$ under the transformation represented by the matrix M					(ALL Q	UESTIONS)	
(b) Show that $f(x) = (x + 2)(x^2 + x + 3)$. (2 marks (i) Given that α and β are the roots of $2x^2 + x - 3$, (a) find the values of $\alpha + \beta$ and $\alpha\beta$. (2 marks Hence, (b) write down another quadratic equation with integral coefficients whose roots are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$. (2 marks (i) Find the number of ways of selecting a class prefect boy and a class prefect girl from a class of 4 boys and 5 girls. (4 marks (ii) Write down the first three terms of the binomial expansion of $(1 - 2x)^{-1}$ in ascending powers of x, simplifying your answer as far as possible. (4 marks (iii) Write down the first three terms of the binomial expansion of $(1 - 2x)^{-1}$ in ascending powers of x, simplifying your answer as far as possible. (4 marks (iii) Month Monthly Monthly salary (M) 1 trable below shows his salary for the first 3 months. Month Monthly Monthly salary (M) 1 $1_{x} = 0$ $M_1 = 100,000$ 2 $1_{x} = 1,100$ $M_{3} = 121,000$ (a) Show that $\frac{M_3}{M_2} = \frac{M_3}{M_1}$. (2 marks Hence or otherwise, find: (b) the salary for the sixth month, (c) the total salary carned by the teacher within the first 6 months. (c) The binary operation $*$ is defined over the set, $S = \{1, 2, 3, 4\}$ as $x * y = x^y$ modulo 5. (a) Copy and complete the operation table below for $(S, *)$. (b) Give a reason why $(S, *)$ does not form a group. [Assume associativity] (1 mark) (ii) Given a matrix, $M = (\frac{2}{-1} - \frac{1}{2})$. (a) Find the inverse of M . Hence or otherwise, (b) Find the inverse of M . (b) Find the point whose image is $(5, -1)$ under the transformation represented by the matrix, M	1.	(i)	(a) Fir	nd the value of k .	factor of $f(x)$, where $f(x)$	$x) = x^3 + 3x^2 + kx + 6.$	(2 marks)
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(a) Copy and complete the operation table below for $(S, *)$. (3 mark $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	•	(i)	The bi	nary operation * is	s defined over the set, S	$= \{1, 2, 3, 4\}$ as $x * y = r^{y}$	modulo 5
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matrix M						with a two of the state	
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							(2 marks)

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that tofthc ost	- She n - The o	han has x cups of beans and y cups of corn to prepare corn chaff. Given that: nust use at least 2 cups of beans and at least 4 cups of corn quantity of corn she uses must be greater than or equal to the quantity of beans. quantity of bean and corn that she has to prepare the corn chaff is 20 cups,	(ii)
narks)	(a) Wr	ite down four inequalities in terms of x and y that satisfy these conditions. Atome and the	(3 marks)
(zarks)	(b) Sha	ade so as to leave unshaded, the region represented by these inequalities. add (d)	(3 marks)
ocities N	(c) Fin	ven that a cup of beans costs 100 francs and a cup of corn cost 50 francs, d the maximum expenditure that can be incurred by the woman. To the selecting ow the selection of the	(2 marks)
6.		blve for θ , in the range, $0^{\circ} \le \theta \le 360^{\circ}$, the equation $\sin 2\theta - \cos \theta = 0$.	(3 marks)
tarks) narks)	n 1.) (a	 (a) the velocity of 1 after collision. (b) the velocity of 1 after collision. (c) the lass in kinetic energy after collision. 	(3 marks)
		$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(i) _0]
	. 11-3	S at the field of 3 2 3 6 6 3 6 3 6 7 $f(x)$ 1.7 1.7 1 -1 -1.7 -1.7 -1 0 1.7	(1) .01
iarks) j narks)	a o)	$(3\ell + 5I)$ respectively. Find the position vector of the centre of gravity of these taree particles. In	(1 mark)
kg7 arks) narks)	(a) W wl An	oints P and Q have position vectors $3i - 2j$ and $2i + 3j$ respectively. rite down the vector equation of the line l_1 passing through P and Q in the form $r = a + tb$, here t is a scalar. nother line, l_2 has vector equation, $l_2: r = 2i + 3j + s(5i + j)$, where, s is also a scalar.	(1) (2 marks)
: narks)	(b) the	e position vector of the point of intersection of the lines l_1 and l_2 .	(4 marks) (2 marks)
8.	(i) 111	(a) Find the power generated by the engine of the car. Coven that the power generated and the resistance remain unchangod> $x, x^2 x^{-1}$, (a) Find the acceleration of the car on a level road at the instan $0 \le x, x^2, x^{-2}$, $x \ge x, x^2 x^{-1}$.	
narks)	15)	(a) Define in a similar manner, the gradient function of $f'(x)$ (b) Evaluate $f'(-2)$	(2 marks) (2 marks)
	(ii)	Evaluate $\int_0^{\frac{\pi}{4}} (2x + \sin 2x) dx$.	(4 marks)
9.	(i)	SECTION B: MECHANICS IF THIS SECTION IS CHOSEN, THEN SECTION C MAY NOT BE CHOSEN (ANSWER ANY TWO QUESTIONS) A particle moves from rest in a straight line from a fixed point O, and after t seconds of its r	notion ,
		the displacement from O is $x = (t^3 + 4t^2 + 6)m$.	

Find:

(3 marks) the velocity of the particle when t = 2. (a) (3 marks)

the acceleration of the particle when t = 2. (b)

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clus of com to prepare com chaff. Given that A particle P, of mass 3kg lies at rest on a smooth plane, inclined at 30° to the horizontal. Given that (ii) the particle, P is attached to an inelastic string which passes over a smooth fixed pulley at the top of the plane, to another particle, Q of mass 6kg hanging freely. Given that the system is released from rest with the string taut, find: a sould dema. Add a bas who emer of contrating and most second and 13 marks) the common acceleration of the particles, a stiru 2 rol and grades appropriate a nO (a) (4 marks) the tension in the string of a battreeton removed by the grind of an or observed (b) (2 marks) up or borns costs 160 hones and a cap of com cost 30 frase. Two particles S and T of masses 2kg and 3kg respectively are moving in a straight line with velocities (iii) marks) 12 ms⁻¹ and 6 ms⁻¹ respectively. S collides with T and after collision S moves with a velocity of $6 \, m s^{-1}$. Solve for θ_{i} in the range, $0^{\circ} \leq \theta \leq 360^{\circ}$, the equation sin $2\theta = \cos \theta = 0$. Find: The function $f(x) = \sqrt{3} \cos x + \sin x$, where $0 \le 1$ (a) the velocity of T after collision. (2 marks) (a) Copy and complete the table. (b) the loss in kinetic energy after collision. (3 marks) 10. (i) The rate of change of the radius of a circle is $2cms^{-1}$ at the instant when the radius is 2cm. Find: (a) the rate of change of the area of the circle, (3 marks) (b) orb the rate of change of the circumference of the circle. turn in interaction of the circumference of the circle. The interaction of the circumference of the circle. The area bounded by the curve $y^2 = x^2 + 1$, the x-axis and the ordinates x = 1 and x = 3 is rotated ztunan (ii) completely about the x-axis. Find the volume of the solid generated. (6 marks) The position vectors of three particles of masses 2kg, 5kg and 9kg are (-2i + 3j), (4i - 3j) and (iii) mark) (3i + 5j) respectively. Find the position vector of the centre of gravity of these three particles. (6 marks) 11. The forces $F_1 = (pi + j)N$, $F_2 = (2qi + 3pj)N$ and $F_3 = (i + qj)N$ act on a particle of mass 2kg. (i) -rt Find the resultant of the three forces in terms of p and q. (a) (3 marks) Given that a fourth force, $F_4 = (6i)N$ is added to the system and the system is at equilibrium. Find, the values of p and q. (b) (5 marks) A car of mass 2000kg has a maximum speed of 10 ms⁻¹ up a slope inclined at an angle θ to the (ii) marked horizontal, where, $\sin \theta = 0.4$, against a constant resistance of 2000 N. (2 marks) (a) Find the power generated by the engine of the car. (4 marks) Given that the power generated and the resistance remain unchanged, Find the acceleration of the car on a level road at the instant when the speed is $20 m s^{-1}$. (b) (5 marks) (ii) Evaluate $\int_{0}^{1} f(2x + \sin 2x) dx$ SECTION BEMECHANICS RUTHIS SECTION IS CHOSEN, THEN SECTION C MAY NOT BE CHOSEN A particle moves fournest in a straight fine from a fixed point O, and after r scenaris of its motion ,

(b) (he acceleration of the particle when t = 2.1 strong when t

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SECTION C: STATISTICS AND PROBABILITY IF THIS SECTION IS CHOSEN, THEN SECTION B MAY NOT BE CHOSEN (ANSWER ANY TWO OUESTIONS)

(ANSWER ANY TWO QUESTIONS)											
12. The marks scored by 100 students in an examination are distributed as follows:											
		Marks (x)	1 - 5	6 - 10	11-15	16-20	21-25	26-30	31-35	36 - 40	
		Number of						10	0		
		students (f)	8	10	12	20	23	12	9	6	
	 (a) Draw a cumulative frequency graph of the distribution. From your graph, estimate: 									(5 marks)	
	(b) the median,								(3 marks)		
	(c) the semi-interquartile range.								(4 marks)		
	• • •	Find the mean	•	-	on.						(5 marks)
13.	(i) A discrete random variable, X has probability mass function, p defined by $p(x) = \begin{cases} \frac{(x+1)}{k}, & \text{for } x = 0, 1, 2, 3, 4 \\ 0, & \text{elsewhere} \end{cases}$										
					lere						
		where, k , is a			he distrib	ution tabl	e.				(2 marks)
		(a) Copy x P(X = x) Find :	$\frac{1}{k}$	$\frac{1}{\frac{3}{k}}$	2 3	4					
			alue of t	he const	tant <i>k</i> .						(2 marks)
											(5 marks)
	(ii)										
	()	Find:	,				2*				
			mean an	d the sta	ndard de	viation of	the distri	bution.			(3 marks)
		(b) <i>P(X</i>	< 2)								(3 marks)
		(c) $P(X)$	≥2)								(2 marks)
14.	(i)	Two events A Find:	A and B	are inde	pendent s	such that a	$P(A) = \frac{1}{5}$	and P(B	$)=\frac{3}{20}.$		
		(a) $P(A)$	$\cap B$),								(2 marks)
		(b) $P(A)$									(3 marks)
			∩ <i>B</i>).								(3 marks)
	(b) X is a girl or offers the sciences. (3)										
		(c) X is a	a boy gi	ven that	ne offers	the scien	ices.				(2)

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