

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2021

## MATHEMATICS Compulsory Part PAPER 1

Question-Answer Book

 $8:30 \text{ am} - 10:45 \text{ am} (2\frac{1}{4} \text{ hours})$ This paper must be answered in English

## INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7, 9 and 11.
- (2) This paper consists of THREE sections, A(1), A(2) and B.
- (3) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (4) Graph paper and supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.
- (5) Unless otherwise specified, all working must be clearly shown.
- (6) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
- (7) The diagrams in this paper are not necessarily drawn to scale.
- (8) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

©香港考試及評核局 保留版權 Hong Kong Examinations and Assessment Authority All Rights Reserved 2021

Please stick the barcode label here.
Candidate Number



CTION A(1	) (35 marks)		
Simplify	$(\alpha \beta^3)(\alpha^{-2}\beta^4)^5$ and e	express your answer with positive indices.	(3 marks
Heliotopia politico			कोतं होते विश्ववत् विश्ववत् विश्ववत् वर्षा विश्ववत् वर्षा विश्ववत् विश्ववत् विश्ववत् विश्ववत् विश्ववत् विश्ववत
uppour min alborous	ini e ny mapaonjadan oradiselektrikista terpantajuan ny materia materia. Misintelektri		
well or events blisted on	krafterett jajaj til 1988 i stekna fæsta fragenaraparapi jalga tallitara i man papag.		Name of Market translated product the section of the
wpolodie i two patri	हार पुरस्का अर्थनिक स्थापित । साम वा प्रस्ता का प्रस्ता । साम स्थापित स्थापित । स्थापित । स्थापित । स्थापित । स		
	nna reini 1916 de 1919 i Algonio mento capito Britis i dal papor com alterna best		gaja paganga kala lidikuti dikeresepigan ja marama edi bili lidi referen maram
I PARCANTI I L'ANNOL (APPARAMENT I L'AN			માં આ તામ હતાના મુશ્કાન તામેનોના પશ્ચિમ કૃષ્ય પણ ભાગમાં ભાગ તામ તામ પ્રતિકર્ષિત છું કર્યું પણ કરવાના
विवरिक्त भी वर्ष कार्यव्यक्षिक कर स्था व	मभाग्रीकृति करम् विश्वासम् अञ्चलकारकारकृति स्त्री मे अध्यापाञ्चा प्रमाण स्त्रीकरण स्त्रीकरण स्त्रीकरण स्त्रीकर	11 Marquegas (gasarraiga a que e la salidificial di Nigeria e gaserra de adribed 1988) Primer (nyer da se seu escribe de la salida (Nigeria)	
raddill Flob four brown on creas	ura kala kal kal kal kal perjamangan menan kanan sebah sebah sebah pap pengan seperah kala kal		on orbida di Universi de ancione de Milita de Labora de Antol de Antol de Antol de Antol de Antol de Antol de A
Make a	the subject of the formu	$\frac{4-3a}{b}=5$	(3 mark
Make d	the subject of the formu	$\frac{4-3a}{b}=5.$	(3 mark
Make	the subject of the formu	$\frac{4-3a}{b}=5$	(3 mark
Make a	the subject of the formu	$\frac{4-3a}{b}=5.$	(3 mark
Make a	the subject of the formu	$\frac{4-3a}{b}=5$	(3 mark
Make (	the subject of the formu	$\frac{4-3a}{b}=5$	(3 mark
	the subject of the formulation of the subject of the formulation of the subject of the formulation of the subject of the subje	$\frac{4-3a}{b}=5$	
	the subject of the formulation of the subject of the s	$\frac{4-3\alpha}{b}=5$	
Make a suppose to construct the suppose to con	the subject of the formulation of the subject of the formulation of the subject of the formulation of the subject of the subje	$\frac{4-3a}{b}=5$	
		$\frac{4-3a}{b}=5$	

Please stick the barcode label here.

3.	Facto	orize	
	(a)	$6x^2 + xy - 2y^2 , \qquad .$	
	(b)	$8x - 4y - 6x^2 - xy + 2y^2$ . (3 ma)	ırks)
	ter makkajte vel 16a jezis		
	ad fal ann anns cans fass		laristini u mem
	AND AND THE STATE OF THE STATE		
	All chiese constinue or		Pilefelin samm
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		be recorded to record
	42 143 1200 1844 1840 1840 1840 1		
7	१४२-प्रसादनाचा च्यासम्बद्धाः		ad analyzysystifa
4.	Miles		ras, pro-gram skort sk
4.	(a)	Find the range of values of x which satisfy both $\frac{7(x-2)}{5} + 11 > 3(x-1)$ and $x+4 \ge 0$ .	
	(b)	How many positive integers satisfy both inequalities in (a)?  (4 ma	ırks)
	ha 12/11/710 1501/P11*		The second se
	the association of		To this likely ones
	:(446P))) B(d] *		II i stealait tales saits
	nada ene nilaz ene la		a) (r) = (a) (r) (r) (r)
	o papelana las constret		Antiferrational server
	District Petro		e111396/137991
	and announced particularly		I II let wedrej herlik
	err menn err melærjfel		erpenseurenkou

•	Ç
	Ç
	7
	marked
	Ų.
•	_
	9
	-
Ė	=
	the margins will not
	L.
	Ξ
	0.
	Ç
	Ξ
	4
7	÷
	Ξ
	TO THE
٠	Ξ
	۵
	V
	Wer
	B
	ť.

The number of stickers owned by a boy is 3 times that owned by a girl. If the boy gives 20 of stickers to the girl, then the number of stickers owned by the girl is 2 times that owned by the b Find the total number of stickers owned by the boy and the girl.  (4 mat
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
The marked price of a shirt is higher than its cost by \$80. The shirt is sold at a discount of 10% its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of shirt.  (4 marked price of a shirt is higher than its cost by \$80. The shirt is sold at a discount of 10% its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of shirt.
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of
its marked price. After selling the shirt, the percentage profit is 30%. Find the marked price of

Please stick the barcode label here.

(a) $\angle POQ$ , (b) $r$ , (c) the perimeter of $\triangle OPQ$ .		na, nga 12 an antan ant la stantan sa fibilita sa antan sa na stantan sa na		(4 m
		ng ngen sa mandan manda sanaran sandhibisa sa mansa sanaran sanaran sa		(4 m
(c) the perimeter of $\triangle OPQ$ .				(4 n
		apaga a mandal tara mandal bahar a manana bahar a		
		ng agai coma del nes mel las neservas del latino conservadora		<b>(</b> )
			enal Californi (et est lan 1889 habitat (et (1800)ar Contribut (et esser	ler lerteren i Missien lant 191 evel nevender får mendene heden
			had angalakat an ann an had an Mil-18014 i Urba Hatta i 1841	led reference reduction decreased as returns on the term she
	o un ad lei 14a Hot IAPI DI DI O I dekal bi seleki bi be 201		i Nivitii ku lii liiseal kaad maalad vanad miad	idal danda idi landi ka kalibiki 10 kalibiks Ole 1904 Pa 1994
	ertablasski ladi i lat läeläelä läät askii 14et laikeelä läätelle	11880404-cibilalkalidibilaha Bosh makanalihadba	een nggasan gagar namandh sadh eaddald (d) lifekid	अधारनाम् १५६६-१९५४ मधास्य व्यक्तिम् व्यक्ति
	IIIMAAMAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	ii Billi lai etak Alini ku keserbahann in indak milide sata		I MIONY 1480. NATION IN 10181 IZES SAVINGE
		n Jaysan ayay priyanen Wisholerkikira boshilal baresk jar	oth maddinasial ilisophicion like jevyhelek	kipiyanoq uquan ucun un upan u paan u paan ekibb bili
	आहेतात्रसम्बद्धाः स्थानम् । स्थानाः स्थानाः । स्थानाः । स्थानाः । स्थानाः ।	rajariji nam mrimraj manaya amezozana mmanorea	ers duerlerselun jes seks lis bed hil lebs 1911 rhvels99 fal 10110	https://orienterialdisciin.ushidabited.orien.usi.elinin.pun
	allesa astrologorogorogorogorogorog	CHRONI PROGRESSION STORY S	Sould telegraphy on our necessary person represent to compare	aanamanna anan ana anaarara
	ATTENDIA DEL TATORO DE LO CONTRA DE LA CONTRA DEL CONTRA DE LA CONTRA DEL CONTRA DE LA CONTRA DEL CONTRA DE LA CONTRA DE L	and the second of the second o	energy generation on an one of the law of the label the label	CHRO SHIGH BURNER COOL PROPERTY FROM
	arraman araman alta (Apertia) (Arib) (Arib) (Arib)		i sakkaarististististista kallastaan allateen on sa misan	and database begalerated to the Mether Mether
	11699600 Lee hebt Spillad informitti 21160-val invelo in	jjeggimenti m i jlemaliment m m diesvods	al addaly hidded as sender reach (brieftser 64949) 1964)	Millio ditelli meldeli in manishin pidemerima
	जिल्ह्या का जात्र स्थापन का आरम्भ का अपने स्थापन क स्थापन के स्थापन के	। संस्थान (स्तान्त्रस्य) का प्रसायना न्यान्त्री व्यवस्थान क्रिक्ता व्यवस्थान	onse gygg ogsørgeg puggel og pare fransællet let sel sel lik i att fill st	भ १ १ १ १ १ १ १ १ १ १ १ १ १ १ १ १ १ १ १
		reprintmental manatal manatal mental men	Mainadolamolamina de mario de mario	
				1
	per supere digg see l'enclar les eaus med dendes hel l'obres finbe	. Вальна венет польств в септемвин польсо септем се	भाग ।रस्य प्राप्तक । स्थायन प्रभावता हम न्यान्त ।या न्याने वयः वयः न्यां न्यां वर्षाः वन्त	. orderse for paper or ray persons bed held filled fill field filled at the la
		elikisti tehtalisedeb ceededi (edus eedadetad lacisalad lastika (lacis	n program gyranaer ny nysadselmildon on ao lochâl lâe	- (отоги гронгическа сампинова съце
	DISCRETARIO PROPERTO PER DE LA LOTO PA	HEROLITARIA ATLEBIA IOLITATI PERINTI PERINTI PERINTI PERINTI	agegabet gegennen i en para fagenne professoren en en de na familie	The latest contains the section in the section of t

(5 marks)

In Figure 1, AB produced and CD produced meet at the point E. It is given that  $\angle CAE = \angle BDE$ . 8.

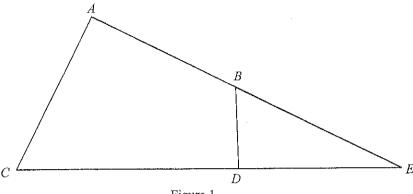
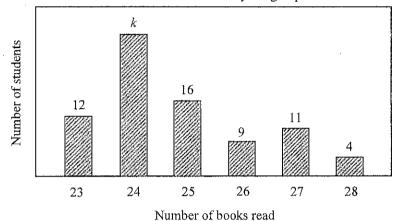


Figure 1

- Prove that  $\triangle ACE \sim \triangle DBE$ . (a)
- It is given that AC = 25 cm, AE = 60 cm, CE = 65 cm and BD = 15 cm. (b)
  - Is  $\triangle ACE$  a right-angled triangle? Explain your answer.
  - Find the area of  $\triangle BDE$ . (ii)

Distribution of the numbers of books read by the group of students in the year



If a student is randomly selected from the group, then the probability that the selected student reads fewer than 26 books in the year is  $\frac{7}{10}$ .

- (a) Find k.
- (b) Write down the range, the inter-quartile range and the standard deviation of the distribution. (5 marks)

EC	TION	A(2) (35 marks)	
0.		given that $f(x)$ is partly constant and partly varies as $(x+4)^2$ . Suppose that $f(2) = 105$ .	f(-3) = 0
	(a)	Find $f(0)$ .	(3 marks)
	(b)	Denote the graph of $y = f(x) + 3$ by $G$ .	
		(i) Write down the y-intercept of $G$ .	
		. (ii) Find the x-intercept(s) of G.	(3 marks)
	edda o o or ee edd		
	AND COMMITTEE OF THE		nzargumaklumin 1933(604)) (-) izginjir naman
	n menebbli Heldzo		
	MAC 1981.77 197191 (*		
	skied erise ja en		(C101821/10129) [15] or Holgody r 1490/
	no see taalaalaat II		raframmunishur mesti (1954)BAND-11944
			ggygg pagang manan merana nereta antiti (1 Disa sedi
	leeser on Iraid/Isl		tral believen va kenson i provide i for illi pirto disclosivo to
	. at . at like least t		
	manta (dell'el		N Daniel Invited propriet prop
	BOM HI HEAVY		(O1000014(O0)[10]   Irsheller medablebree (O
	esal Hal Jel Hal Jel		D Celebra III II 1994 (b) voj gravnogovalno vrlvo i
	erandi lin laktri		ary a much of recording federally (O) 1884 (A) (A) 1897 (A)
	hal man validam ada 19		aanstanadan arat katta ahal 141 01040 t
	proceed subbacket		(O talli in I binder en restensjen ppyrjeje jegnycje j
	pp parameteless		er og mytyvet men fet sån kryvenen i krype sen.

	Please	stick	the	barcode	label	here
--	--------	-------	-----	---------	-------	------

	Nun	nber of tokens got	1 1	2	3	4	5	6	7
	Nu	mber of children	15	9	2	5	4	2	5
(a)	Find t	the mean of the distr	ibution.						
(b)	Are tl	ne median and the m	ode of th	e distrib	ution equ	al? Expl	lain your	answer.	
(c)	If n	more children play t	he game	and each	of them	gets 5 t	okens, w	rite down	l
	(i)	the value of $n$ such	h that the	e mean o	f the dist	ribution	is increas	ed by 1;	•
	(ii)	the least value of	n such th	nat the m	edian of	the distri	bution is	increased	l by 2;
	(iii)	the greatest value	of n suc	h that the	e mode o	f the dist	ribution r	emains u	nchange
independent of the	010./10101WWW.WHELF	मुद्देश्वसूत्रम् कृत्वस्य स्थार संस्थाः सः स्थान् स्थानित स्थानित स्थानित स्थानित स्थानित स्थानित स्थानित स्था		Printerior de l'action de la company de l'action de l'action de l'action de l'action de l'action de l'action de		on carlifer of all labely fol establishes o	aal curaras makka arrekitaacastak	omenum oranomen ma	
matter/abl landered	lesi Dibiot Aldi ibi (Abiot	st littilitetstättetti mediamikkalan alpapan komanepuon sappippe s	The most result of management	MI BOULD PORTE PURE BUILD OF	live landstown on below and out out of en one		ann ar ean ann ann ar earl de far la bhai	BIORIBI/APIRDIAIA/PIA) ***	teran delikarikan an ikatarian
могу прецен	I MONTH of the feet money	in zamo za unigin ja ndi uli la kanin kradali ukkribilan k Geldel Meseb (GIII)	) भग्नान्त्रसम्बद्धासम्बद्धाः सम्बद्धाः	· · · · · · · · · · · · · · · · · · ·	gagagas krasas jājarikkam rasas	al sal tilerdas i Granilaria) ikiakkur laur	s and Deall ad Disclob (Olstick) of the	. July 1000 (1938) 181 (3930) 18 (1819) 18	(a) (manala) (m. 100-10) (m. 100-10)
speks out teachted tacking									
	Hali Holan Glorian 41%	rite del com (kisanisad i sali i de cur un cur un un ununita le un unite persentas) quipas (quipa)	ALDERINI BUNGHOLOROR				naran maaray een nas generij men on menne bila		
Name of the last	2001 [11] [11] [11] [11] [11] [11] [11] [	nd tolladi) silland britetal britetal britania bit dangdali jargana parangfag.			15141 191511 1914 (BERTHALINE) 1811 (ASTA	al tard tal med at the ladarited list out to side		aria ha Diria ketaburi ngari teresi Shiri Birar saiki teraka bahat 1986	intal fersædni inteles kalantskrædi far Til ferskræder for færling far malfædene
v an arr mean la l				HOLIOLAGISH BEALER ISA		NECONORISATENNOS ESTANDOS ESTA	SILOOOSI LEGISTA (GASIA) SARA	aria (a) 10 (a) (0 (a)	
	red lafe (in the CHA) (in the C								
Mind to the part of									

Go on to the next page

	7
	ď
	_
	marke
	-
ı	2
	-
	đ
	. Č
	2
	+
	-
	-
	- 5
	-
	U
ŀ	- 5
ı	
ĺ	5
	- 2
	7
	Q.
	بخ
	4
	2.
	. *
	•
	ō
ļ	Ť
l	- 5
ı	- 6
ı	C
1	ř
ı	ä
ı	
ı	1
۱	Ę
	•

the r	emainder are $2x^2-37$ and $cx+c-1$ respectively, where c is a constant.	quotient an
(a)	Find $c$ .	(3 marks
(b)	Prove that $x+3$ is a factor of $p(x)$ .	(1 mark
(c)	Someone claims that all the roots of the equation $p(x) = 0$ are real numbers, correct? Explain your answer.	Is the claim (3 marks
interior constitution of the factor constitution		bi kinkeliti bishmennesiyingi n ja menjeligishi ililik intahusaa
modér mari 0		ssec arcticisti O atticisti (acist; tre censpla) elje
rim antrodobel		Mikrorrandi elderren faq racaspigna
erfändlin i skenn er		ades (4) property to the SM 14) ton SAT the contribution
al lie on skillbroad		renggarinaanin obern del B. (171-180-180)
adell-Holline		
. (01-31 (01 bo) (11 b		anisch (visite) des Sistem für Lipsten unger
MINI O IRONO		The IA Little Order of Delivery and the Control of
d 2040 (41 (41 (41 (41 (41 (41 (41 (41 (41 (41		
man randrak		egypty protestallownia a to all strike PAFPA
ongran las pengsals		Assessed to the second
- PARTIES PART		
amara (gal andra)		: 1984(4) 1810(4) (1944)(5) (5) (5) (5) (5) (5) (5) (5) (5) (5)
alenter (Piper)		
-arrium ed		

Please stick the barcode label here.

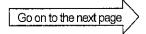
retadilin menen hajabakuranan menten proprinsentat prinsentat internatione	रो मंत्रिक त्रोक्षीवी विकास वो उन्हों स्पृताता काम व्यक्तित व्यक्ति है	nz neferl helsen erstada fril all til Resejlerst udla til blikt i fölsti.	व्यक्तिकाचा चात्रकाका (काश्रम) विकास विकास । या १२४१ मा १८५४। का	भित्ति कल्ली जो इतिहासी सरिवास सा उठकुली व कल्कर सरवस्त्र इन्द्रकृत्य सा उठकुरसाहुर ह
terralahrassas grassalla sesalla sècis belikibi terasi in 1000 (9) rejes	r ng r ograffinging na sir nityping sin francosk to assock bold likker behad beljahold klebalski	lag i meneri mi mening mi mineri in i meneri erakeni mi kemel hil likkel li likelike	Blasticount tale Montro Milital in the analysis of the section	and receive an incomment receive property received by temperal activated by the first best for the characters.
	el les ladord actin les fabres es ladras pipes popp per per per per per per per per per p	. Drevi (Ord relator de del GEET), (Ordered 1-1800-) (PED) (-17-)	let mat 1911 bit het het 1911 betom en vate fan sade maamen en meer en sacrad mas sacr	ser et englesper presi je j prima, deldellen likali lister i nivere en laren en lideller in sen
angangungun ngu nu ngguni ng mgan na mu lai pandardét né néh lat habish 19464914	Barelliki ki elike var aleski kale ta ra ar da radi tad sari raquear pap uprasupar raj si er	ne meen var velerin en verval 1124 Hilland Die Stift Paritificial III	g pri mana spipa sajaspag pija na manan keresanerbena mandelped (NAM)	Tild belind Ded hall ded refer for an overall dischar an one hall an ondere variety of our conservation for the
sagarra neperal masso nij promonsko omretsvo dorbi no dal trza bilakti 1841.	aj jesjesji ju je sest jesjusetri sprenji gompu er er en di lie od fermink Offellaritelek eller	Halladia le fale de le la	og var progreg s zzwe weg var ong vije omnowen older ong van beks veloklock ols veloklock (di bet	ellel lettella let Mel I M seved Malaci al al mobile manscrif ma primagiosar papa.
				•
Marie or companied blood by Local III I MITPLE HERE I MITE II HERE I MITE II HERE I MITE II HERE I MITE II HERE	स्तितिक व्यक्तिक विकास विकास । व्यवकारी व्यक्ति विकास वि	i valeti o valital lateratali socio en valifera moci na munera i cate	a को कि जो तम विकास का स्थान कि अपने का कि की मान हो।	न्यु । जोक्या वर्ष प्रदान प्रदानकृत का जन्मी स्थित किल्डी की किल्डी की नवस्थ वर्ष
pering yras gray neruggan nd moan nerung ad nerbal (d nët jal lid) er let 1990et t	is in the second section of the second second second second second section second section second section section second section	। (All leal कर के क्षेत्र की शिक्त हो (ची निविध्यक्त क्षेत्र की को विश्वविद्या है।	o ni luglieją lidujui moėtu rajoši novetų delelle (elveli) (OPP	Mid Other Article International necessitation and concensional processing processing the processing of
lei ef Ni ban bler 1-const reits fin efn he confinition. In 111 mean 1911 papara	THE STATE OF THE STATE OF STAT			
	ii isti 141 koot AN kilah kababa temitor muror permorpi moorpi pepertoppiya.	न्या भारतस्य स्थानः । ।।।। हन्या स्थानं प्रकार प्रकार वा व व्याप्तिकार वा व्याप्त	स्थापन्यकृतके केन्द्रसम्बद्धास्य कार्यसम्बद्धाः	सिर सरक्तान पर सम्बन्ध में 11 साम होते । सार 1-स्तिन्ध मेर्स स्थापन स्थापन स्थापन स्थापन स्थापन स्थापन स्थापन
aj popuj popujuju momentu mosovu i mendravi ligendi idriki 1111 U lielil 1424-bil 11	pappy magam mpupa ramawa) masa lalema lalashishishishi ili lalet ta tsala	al 1911 a Nel selfalbect a Halvina al acasay com acpeny quip	is disclinical and the second sector of the second sector of the sector	का मोजन विविद्यात्ता क्रिक्ता राज्यात्र राज्यात्र विविद्यात् विविद्यात् विविद्यात् विविद्यात् विविद्यात् विविद
हामुम्बन्दरम्भावत् वर वर वर्षः वर वर वर वरण्या हो । वर्षण्यो किसी विदर्भन विश्वविद्या (४२१९८८) छ। । सम्बन्ध वर	त्र प्रमुख्य स्वर्थन स्वर्थन व्यवस्था । स्वर्धामा १८ साम्याच्या १८८० स्वर्थन १८८० स्वर्थन स्वर्थन स्वर्थन स्वर	of a field of 1995 service and fact of manufacture and account of manufactu	त्ति । विद्यानम् विद्याप्ति । व्यक्ति । । । । । । । । । । । । । । । । । । ।	. pp. no.   anni brown richwell (Class to Lynn) (Class) (Class) (Class) (Class) (Class)
				er fal Modde fel estar en sacon en entendigen popul principal fel pentrologistik as ker
rm on 12 MgG 11 9884 Nest at the Become Deck following beauty on a second	-bergjejes jege ji jaji 1919 1911 1980 (1918) bi da akad ta Manazarana na lajan i ja daja s	त्रमं वर्णकां को विशेषां को वर्णकां किस्ति किस्ति । एक्स्ट्रिक्स्पुर्व   एस्स्ति । वर्णकां वर्णकां	ja mugumalsalsa mukammako musedjurki la 614/0401010	१९५८)   विद्यालया क्षेत्रका क्षेत्रका क्षेत्रका क्षेत्रका क्षेत्रका क्षेत्रका क्षेत्रका क्षेत्रका क्ष
risona i spesja je mogogi momoniu merer zakobil Malbekol lakbil i Heldri	ः विस्तित्व प्रितिवृद्धित विद्वारा भूति एक भूति प्रित्याच्या व्यवस्थान विद्वारा विद्वारा विद्वारा विद्वारा स्थ -	her beselved to Daharel feedled Libraried per militar complete spring med tol sta		Set to the first for the construction on a paper (4) Part (4) 1961-10 Part Alberta
e Oktobarno go ngalan ya nya anga Materia Pilitsiya Malei lah anta nat anta	Huboni masayashin ay ma masasi qa Higi paya 1964 Hasin ki tase Hibba	Lebi indefect for a felt and indiffer any and method on exclusion company on pass many	PT   Comment   2014   1906   1.40   1907   140   140   140   140   140   140   140   140   140   140   140   1	Opmotion model syllated Heavily Beats (1-) city (1-) city (1-) city
l III saa lal hoon hal mynystysy pastel y pastel 1445 akt - 1441 60 talliul (sei 1811).	pj gajjas gajjja nj pre jagon me ja oras dala bet a logist (Allaki) ilik alisi MAPI.	d NHM BHOTTO missississississississississississississ	भीता व्यक्ता प्रकृति (संस्थात ()) (स्थात ()) (भाषा (व) सिर्धार (ये स्वयंत्रास्य	भी ता एक्टन क्रियों न तम् दुरम्पर प्रिन्नकृति हम् विक्रियों क्रियों क्षित विक्रियों क्षित विक्रियों क्षित विक्र
				•
al total Del Colore de l'apparente mercano especiale de la lata del 10 biblio de l'Este de l'Artico de	। हा । 1881 N. 18-180 (स. 1802) )   सन्दर्भात   स्वतान   स्वतान   स्वतान   स्वतान   स्वतान   स्वतान   स्वतान	privation conserve at six of six (six i) but he private property many		bild inne theil ne come pe pol er prespiration proposer per per per per bild the affilie bis i
1864 to lectural to an appearance property (41944) 1-1141 b) 1418 (111964	तं स्वतिकी व्यक्तिका विवस्तिको विवस्तिका विवस्तिका स्वतः स्वतामा स्वतः व्यक्तिवानकारकार्या । स्वतःस्व	var variotty id irrivated prot talla in madeline addal final	el legad pad 15. Millia selver en en europi eus hadde legische (e. ledischiel) en	This litter is the second and the large parties by the special interval institute rate for
nnan a seljeste jih jil jajaji jir jajanah ja aspanan lansan lansan ja assa	or peppi - 1949) i - 1918 (1914 diffrant) edin ordin ordin i la fadava que assaça basa	er un lascer lancad au ancaegus al lei Leel all 1944 (e-1944) (1949-1400) et de	ter for lift halfal folded fell fold liften bell feat foat one earlier medievent ans on process	का विकास समित । ॥ स्थापन विकास कार्यक विकास कार्यक स्थापन । ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥ ॥
				•
sadelilet all belle tableat 1910 (1910) (1911) person (proposition mones esta de la Del morbo (	na pering proposas para da ina mandra da pering da	art terranda laman rechibo de la hid 101 island di 100 island i 100 island di 100 isla		क्यों हे र क्षिति है। क्षित्र कि विकास क्षित्र में क्षित्र क्षित्र क्षित्र क्षित्र क्षित्र क्षित्र क्षित्र क्ष -
Priorital following special resources are several special special 1999 of British	Stadiil in labali terbéhah bashiri an lama adpar an papar anga anganggapa	त स्व प्रकारको व्यवस्था रूपको व्यवस्था व्यवस्था एक । यह । यह व्यवस्था एक । यह व्यवस्था व्यवस्था व्यवस्था व्यवस्थ	, par no mano nesegna collector politico (estac) (41000011011111111111111111111111111111	gan mage on conformity or locks the last self-self-self-self-self-self-self-self-
•				
agences man of all light fields for the light SHAPES (SHAPESHAPE) (1916)	ali fishikati lefali teriza indekati kuranjan sanjan tengalah majam majam ya pajayiyi jajaj jaj jaj jaj jaj ja	N 101011411601914741551141162mm meh myden er egjesep jær	lavan Maria izi aktor Grafe (M. 19) pog paragasan ng muu pa un ug parawa parawa	e ur ur eeu beske een ja
Meet fall fel ad Beval faller on ad an far far Lancauvay and separal payors property payons	Application to the control of the co	NAV DECIDE DEL PRESENDE DE DECIDE DE PRESENDE ANT AUTO ANT AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUT	Callad additional to two leterary test the addition by the property of	i har hat has tod on hor suchers proceedings oppositely on the propositive has have bedit had had not come.

(a)	Find OG.	(2 marks)
(b)	Does $O$ lie inside $C$ ? Explain your answer.	(1 mark)
(c)	Let $P$ be a moving point in the rectangular coordinate plane such that $OP = GP$ , the locus of $P$ by $\Gamma$ . Suppose that $\Gamma$ cuts $C$ at the points $M$ and $N$ . Find the	. Denote
h Hallifer (Frense)		(e14)))(eldalvalvalvalvalvalvalvalvalvalvalvalvalva
departs one		
ndersalvel (del de , , , shand ner terorne		destatations trader (News) i esta
(goog of project		n kaandele kultusel (d. 1804/1919) see 1905 – Alexandria (d. 1804/1919) see kultusel (d. 1804/1919) see kultusel (d. 1804/1919) see kultusel (d. 1804/1919)
H See Life on the con-		
' las Hild (A) de Henri		
ų melymod leon		NE PPOSION I ASIAN AFRICAN INTO AN
<u></u>		ज १६५५ व्यवस्था १४४ स्था १४ । १४ ज्यार म वर वर
randi dal las barbar		
n slånsælen		

	neware written in the margine will not be marked	
٠	Ļ	
	ξ	
	_	
ř	Ė	
•	5	
	_	
	۲	
,	F	
	Ģ	Ų
	λ	į
	Ċ	
	<b>-</b>	
	ď	)
7	÷	
	·	
•	Ħ	
	untiten	
	ņ	
	ā	
	-	
	ű	,
	Ç	

circ volu The	base radius of the solid right circular cylinder $X$ and the base radius of the solid right ular cone $Y$ are equal. The heights of $X$ and $Y$ are 20 cm and 24 cm respectively. The time of the solid right circular cone $Z$ is equal to the sum of the volume of $X$ and the volume of $Y$ base radius of $Z$ is equal to the base diameter of $X$ . A craftsman finds that the volume of $X$ and $X$ is equal to the base diameter of $X$ .
(a)	Find the base radius of $Y$ . (2 marks
(b)	Are Y and Z similar? Explain your answer. (3 marks
(c)	The craftsman claims that the sum of the curved surface area of $X$ and the curved surface area of $Y$ is greater than the curved surface area of $Z$ . Do you agree? Explain your answer.  (3 marks
an neesan lale	
1014 (MHO) 14	
MAINIMA	
(510H910H	
HINDON ALI	
int the street on	
daligididd o	
er betreef ook	
stationismi	
manada	

payment in the distribution of the international manuscript or international manuscript in the
powerdown (Market Dispersion of the Control of the
•



	_
- 6.	
100	

CTION	B (35 marks)	
A qu	eue is randomly formed by 7 teachers and 3 students.	
(a)	How many different queues can be formed?	(1 mark)
(b)	Find the probability that no students are next to each other in the queue.	(3 marks)
1141 451 171 15515441		San men कि विदेशी कि करिन है कि जिल्ली पि के स्टिन्स् (विद्युक्त कुल का का समस्य
et tattiditet teriarita		
II let - let las les les le		AT THE STATE OF TH
n tannal rafter on ra		
allandininini		
-15111911-11919949		
numuunoo		
la lako (Greco)		etana et labalettiikii (ettiisii ii ii isteeri ja ja ettiena ja lab
l selfestasi (0) (0) (0)		Noveld II Skitting area in separative protection in lebelebble
10100101111111		
151 1950 11 141 150 151 1		
regisalita letiti la		Trivillat Monet Mc1810 (A) Shell Hilling Property Springers and
11 ad to 14100149 1		ANGERT ENERS ENERGIE GEBEN BANKE ENERGEN SERVEN
II SAPPI IPI (Dodrey) I		DAGANG NATURUH III AR TA DAGAR MAR SARAH II AR AN TARAK TARAK
.a.iniaran.		
ned overlett bet 1940-		alati i i i alia i i i i i i i i i i i i i i
nas lannas erlaks		
readt is learnings		naga aqaan aasa aqaa adaas ah dad Nee Dhee
Field of law or		(alielo (treŝta frient a ce juniste (subsigni)e artașia

(	

<i>(</i> .)	Pind A(I)	() marka
(a)	Find $A(1)$ .	(2 marks)
(b)	Suppose that $\log_2 G(n) = A(n)$ for any positive integer $n$ .	
	Find the greatest value of $k$ such that $\log_8(G(1)G(2)G(3)\cdots G(k)) < 999$ .	(5 marks)
Ann met on hel hel net or		person raj pomodral mili sul l'anceles sal nellés (1817)
		r nga marangambana na marangan sa aranga da Pel de
		n men met moode te vojtes (j) joeg vijdore
saj n padroro n metad		et en en bas-linkliteklijk operan ist maret mare
		larik i ni riski ili begi ni tama ran malil muo
eff left askers de serve		
110111111111111111111111111111111111111		
E LANGE OF THE PARTY.		Ar 1900-1 (All Isla) d'Arman i bit aman arman papi N
440		to construction of property of the second second
		. Diller i v illerdruktikrikri ryken i nee je beld ed 
al leadh-odeldenn raes		
141 - 111 141 141 141 141 141 141 141 14		nd he annowhere he little det skyl (4 papers name
-1416-111141-141		header for her in transcent and gapet 181 type 141 at the
A Debided tell felicion di		Hipopopous moneon mente le 18s 1946 lis
i-Marini istoricio		izgjeji) danski men insentrugj
H DELPT (40		ar neer on compression on the contract cold bridged II have
landile (de la lege		De fiel Di Information aktorem com sappiges
eellali Diali-1911		I MATERIA I DERENI DE DESENTE CONTRACTOR DE
urten lide lide utenderlad		or the state of th
the floring of charles on		agan an angerana ya masan and sala felabbiel (1901)
alal makiri kiri Pira		na mananananan in mengelah menananan in
vrander blandti		permany maganizacanje turi al alabid II Distr
hjøjgen i Fransis sel		hjippe jeri jerne me rendim me lære libensstræn Dirklishida

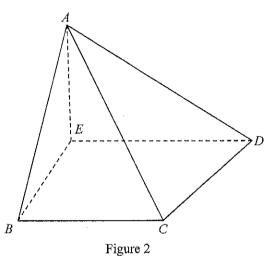
Г	· · · · · · · · · · · · · · · · · · ·	
		1
- 1		1
Ì		ł
		İ
		ļ
		1
	· ·	
		İ
		1
		}
		Ι.
렸ㅣ		l S
žI		무존
15		пa
=		e r
ĕ		قب ا
힐		. ] 💆
31		1
₹		1;₹
2		S
剧		.思
밁		Answers written in the margins will not be marked.
Answers written in the margins will not be marked		H
ايو		l e
₽		#2
≊		□.□
&		E
Ħ١		1.E
≩		3
2		S
<u></u> [ 🧟		Ş
2		Su
71		A
İ		
		1
- 1		
1		
Ì		
	443 BO (1816) Physique in the company of the company of the BO (1816) is the body of the compan	
ļ		
ļ		
-		1
l		
		1
		,

18.

Answers written in the margins will not be marked.

(a)

(2 marks)



A thin metal sheet ABCD is in the shape of a trapezium, where  $AD/\!/BC$ . It is given

that AB = 45 cm,  $\angle ADC = 70^{\circ}$  and  $\angle BAD = 50^{\circ}$ . Find CD.

- (i) Find  $\angle CAD$ .
- (ii) Does the angle between the plane ACD and the plane BCDE exceed 30°? Explain your answer. (5 marks)

· referendelses les l	la confirm an les and Males while are malarers of bade	teal Hit sail to Habbelt of 1-2000 Hoteland	entiminaraniananananana	erinoerinaloerri-enenaloen	name and an annual establishment libits	пи чиниментичната	DI INI INII II HAINAI Ies Os Oliveridi Me	ell elablic camellal on all ellobors	al lararaniahan an arrah		ana ana ana ana ana ana ana ana ana ana	lan Harran
	al las selements on servas met land for 14% on landarous	allin becheldelin Ladde wit Adlin an	MINISTER DE LE TOMONIONE	ALIGNATIOS SONS TATIBLISMA INC.	Actal lability are as as as appropriate	inclusion distributes estimated in		el ivel labori (49 delevius (4) laboris	all-transferabli francientel Di a	edd fall lâdad Ferladi yn lâler	retteleteldad harliffbanal is illetta is	de Pirent Labbles
			,									
*********	el all lecon les leurs burdando l'un la cel alem						antelledratumtrana anar	A			.,	
- let les					P   P   WOOD   WOOD   W   W   WOOD   WOOD		hil I Develop of culture value I nev	er brond lei brohn unversat or b		arable and to access to be		Livraiteli la
						The state of the s						
	I PP I de la la la la la la la la la la la la la	THE RESIDENT PRINCIPAL PRI		Hellstotistellellellerteralle				en en en en en en en en en en en	P. 181 (49-91-7 11-15)		44 (54) 144 (54) 141 (54) 144 (54)	
111-141-1-1-1	The safetill illinise teacher include in the	Halamin lai tamis Miller in Israelis	Widowoodalidiraliania idilalia i	lancamited Linius (Asiantes) in Reidi	II Halveltal excessival area as as	rad reladificación in an arrena currena		en lej chede en ad en en les les en	arian manadamadan ja m	and the second second second	actorise po cornect comment to	erelaki evel
41-110HFBA	101P1010101010101411411411411414141	:	ski inditioni internati iPtPritth obsei sol i	Ivani-meni i mumeri di di Hili i deliposi	At North Claff In correction and accord	artuil lalu la menean er con lécter			<i></i>			
1511/151814	lat lat Mi tatasi ori shi tat con etabon laccore br	everal test use us while use used broket is	della dell'electrolici della d	Minimum minimum	d to a fel on announce on and an one on and							
III ALOINI	altelul alvenramerta arvalut literen	ade hel cole are liftlette i nel lanced) lifelare ne	reddunde farlen i versteldi III (dilde) (	the label Plantare land de la label de label	half als like on the cole on an array and	er rel menetere de labeler rebend reb like m			**************************************	lered trailed of dishiptores	s los 1886o al Metheroldi lal lal	114114411
			eratemen una puncial un lin las erationts	ter bereat leebebelle on lees leed bed	frakad haddal ar aan ee pel to let lêry	e para lacco (della lacca can serprare cel s			marrigi un miratrada las rec	efelfa cael las las lal lei lei si Po	12:11:0:10:11:11:11:01:01:11:11:01:01:11	1011011
,per (*********)	lat ret addarvetind on nertice but on our deaded	had best and time the consentions of a brought or			*,**,*********************************					real las Habbert About hat the Hotel	this in the second of the second	1001011
										-		
- PHP-PHNI	istatisistateeta estastestatistatee	-enteriori-mante-ortenioria	anama tamas en anterior	let lancks had flows observe several	ann leise or lan modern state of	arlummer) kan kumanan kecali	al mid al inimanales mana	film the anjetter of an analysis	ring property and account	nes as and loved neservoluses	averlettiel (vi liitvel II leieliirvet)	- Indoor o
. Lead broad arms	we refer the enthropments the saturd to be		n an againment y al la conserval herbi	daş lan herbi val sel da İve lanı ladın com		erver erve verke od od hel helv med hel l	Halvaklas ası lar harin; sapasasını svarı	m on corner commercialistic abli	al las lables by lift on an labiter	nalisi kanana kilanasi na	tores a mesentere d	
Parla at di ca	o note to the nation of the first of the first in the	ылишинаянальная	noralonalone-vaner-	-Helen almannistrator			-	ш-ш-шиманивнечен-	-12401411210141141141141141141		Milderstram avenam	
referencement	version dem medeldnehmel miser in mise	culvelescal It had dal Itelael ad alebe	risti ida am ilikosri dolbini idi idila	Marcell (Celler Irl MISSIO) III MI	Bakallie-Haddallid II da Bala ibid	erdfillill i Dillotol Distolariola	ALIM Halles vetalliki alimbirel labim	H lardal fal 1015021 dEld off ID la	H474-11/13/11/11/11/11/11/17/-H	MENORY CHESTOR	teritore lei idi biliribidi biloride.	
	ntarezan mailan arsan basalan apren		n lan annum oo o le la diil la rannan o	or her life loss of all accounts lables	erant of the an lawron an atelia terron	ng herbil irothi erbi bi na lamoval evej		al ival laboratorje: I ratar alamosta ar	merelinesides areas de altreb			1491 1441
		- 101 - 100 - 101 -	***************************************	hi sa ai idini ai isini bi isin	***************************************	15.101 m. ad (n. 1016) (n. n. 1101 (1516))		11111 M 10111 M 1011 M 1011 M 1011 M 1011			pr (vinjun 1870m) nr 11 mm//m	ter-tet-
भागमगामा		inentalis ini ini ini ana ini ana	गच्याक्तस्याकासायापयागया	in antarest taribum artis	91919218118188888181249218288	***************************************	and the contract of the contra		Mail in in in Mila de lavariar	ansar lan an al aladarla as	shifteeped to other otter toponome.	
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ter let on fervertembrer obt on letter) et let	the construction of the second	Armizandeilah Helefalvierani	,,,,		( (		er i rekiteriler investifikanerensi rei		lad Norablemon and defeat		-
				41411444114114141414141444444				************************		ranner; on tel terrorarite to te	rantestratic Mathematica	
enoume	BIOMPINIPPOPINITPPOPINI	and the according to the first of the first	iteliki lehtte ill talmaterbita	velver and takken their tal elektrick tacket in	hetatoriotalinitet helmanetik	om lei hevervei einem bisi has malik	n in hi mredelardiferter illi aki m	ard threshold relateds develop in	anial ivel and at anoman an	m on hoursagel on on sel some life	lal fal labilibl succellabratal second of	Devel I Iel
										٠		
	DDI minimore libeliari (I 100 l'Artecolet (Artecolet	a di di di di di di di di di di di di di	Markapitani ilinisilini shi ilinishi ori ilinishi	al laboratori del laboratori del del del del	101016/1011/11/11/11/11/11/11/11/11/11/11/11/1			ootsaaneen oo saasa te	man in month mineral	-	ga anno anno ang mga mara ga san ta	
Marin									INIAI MININIAI MARTINIAI M			
												, (21
***************************************	HAN BESTEROUS IN BUILD HURST COME	natural and and an institution in	TO SERVICE CONTRACTOR DE COMP	erm men oranimaski pjemi zalimi	akad astilassa palsateleasta talla	with airmach attavancea		nominanonamentie uu	ddderdd f fe laesw fal hel he fai h	al Hal I den om Jad Lennald bren om r	4	nel lawrodl
	and openings of arms as done arms		er pensoner en slant er electorité las latté	0.101010r.ar.atom.co.0010		.01 to 1 MI Distribution for the literary like i	lder om lablaklabiti ittelgal om overvan		ng an int jeran an insarran in	and for children's descent he ha	nare ad adu le camerabadhi Dubari	

e marked.	
not b	
will not	
margins	
the.	
2	
withen	
newhere	

	(a)	Using	g the method of completing the square, express, in terms of $k$ , the coordinates of $Q$ .
	` /		(2 mar)
	(b)	Write	e down, in terms of $k$ , the coordinates of $R$ . (1 ma
(c) The coordinates of the point $S$ are $(7, 4-3k)$ . Denote the inscribed circle of			
		(i)	Express, in terms of $k$ , the equation of the straight line which passes through $Q$ and $S$
		(ii)	Express, in terms of $k$ , the equation of $C$ .
		(iii)	Suppose that $QS$ is the tangent to $C$ at the point $T$ . Let $U$ be the centre of $C$ . It given that the coordinates of the point $V$ are $(-29, -14)$ . Is it possible that $STUV$ is rectangle? Explain your answer.
			(9 mar
	m certain terretera	and to the control to the control	
	was labereted Pully IN	m shi erfare sarva i i masaas ia	
	an n cana la filosof qu'Al	Bales to Bridge to the London	
	-141		
	postpore over MI to III	ener entant teathersen	
	con mal the left todated to a	diffel fold-that have been seen to	
		evenega ny ami	
	en paragaga da est		
	po secono nel lantas terb	i nai kaldal koomen kerkesken	
-	Marakiman		
	Habbadi d rabi advant	arms je lerked tel Hel kel	t.
	nun met en skinetredel e	MINISTER	THE COLOR OF THE C
	n merudiarishishishi	livete teet labour . sabodal rec	
	ann pad off helbet (+140)	ahlahan mulafi lan lurara	

ł		
- 1		
Ì		
-		
ļ		
1		
-		
- [		
- 1		
- 1		
٠,		
3		
Answers written in the margins will not be marked		
ĔΙ		
ည		
=	•	
2		
Ħ١		
3		
S		
<u>Ε</u> 0		
<u>a</u>		
Ħ		
Š		
s۱		
♬┃		
¥1		
[₹		
S		
<u>5</u>		
2		
2		
1		•
ļ		
1		
1		
-		
	•	
-		
Į		
ĺ		
ļ		
- {		

END OF PAPER