

COMP-4476 - Assignment #1

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School assignment to encrypt and decrypt text using a Substitution Cipher and a Permutation Cipher written in Java.

Methods getSubstitutionKey, getEncryption and getDecryption keys in permutation class are for the sake of the assignment so you can see those values.

Substitution ciphers object receives a key space of letters, and a random permutation of the key space as a key.

Permutation cipher object receives an integer array and the size of the integer array.

The last section of the assignment is to attack the permutation cipher with a known plaintext and ciphertext attack.

The attacks first loop sets a potential size of the array (m). It then moves on to splitting the ciphertext and plaintext into a list of strings of size m. It then sorts each string in the list and loops through checking the hamming distance. If a loop makes it all the way through with a hamming distance of 0 then the size m is found and the loops are exited.

The next step checks the list of strings for any duplicate characters and attempts to find a string within the list of string with no duplicates.

The last step uses two for loops to place the matching letters into the proper positions in the array to find the decryption key.

Lastly, the attack uses an inverse permutation function using the decryption to find the encryption key.

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+ Assignment1 git:(master) x cd /Users/christophercampbell/Documents/School/2020-2021/COMP-4476/Assignment1 : /usr/bin/env /Library/Java/JavaVirtualMachines/adoptopenjdk-13.jdk/Contents
/Home/bin/java -Dfile.encoding=UTF-8 -cp "/Users/christophercampbell/Library/Application Support/Code/User/workspaceStorage/6c7ba255deac9c4d66eb91aa8ba8ce/redhat.java/jdt_ws/Assignment1
SUBSTITUTION_CIPHER
Key space: abcdefghijklmnopqrstuvwxyz ,.
Key: ewchp,maonkrub tvfjysidqdz.
Encryption: oxljxexfjloaxleupfoceljhpu cfexoclyxyfp,lxfowerlt roxocltfphexphlufxfyt,lxapla jxl ,lxaplettfbxocplpgtr oxphloxlx lxeaplaoujpr,l,f ulxaplmfppblf ulx lxaplaioxpla yjp,l
dpzxliapfjejl xjlfpcpbxltfjphobjlaespjppblix gocltexfojebjaotiejlwehl, fleupfocelzlfxfyfutehphloxpcpxferlx laojl ,ocp,laplaejlbpfpfj ymaxlx lftftfjpbxlapluen foxdl ,leupfoceljlia
lhohtb xls xpl, flauou,l,ecphlwdlebl yxt fyobml ,ltpecp,yrtft xpjxle,xplfxapkorrboml ,lmp fmp,l,r dhlzlaolobjxbocxliejlb xlx laperzlwylx lhptocxltoxljebl fmdl ,lr xomblehpr,xliobmislo
rphotexfl ,le,xexfpl ,lx kobm,l,coerlpxbjb b,lx nedzilill ,lxaplpnce fexlpwropspllxopl xepfljohpljlb xlnyxluojmyohphzlwylpsor ,lxaplu jxlapehltfobhoml,pxxyrpl ,lxapxfyutltfjpho
bcdoljlaolc bxpuxl ,fxaplxfyaxa leritt roxocobjltfpefocexplwyltaojlehuobjxfexo blaeglnosepufocelxpfexosp,l,ecxj ,lb xaobmlufxfyutljedlceblwpwropsphobcryhobmlaojlcrcoujlxaxl
ufwlohpblojic fxyt,laolcappfprehpfjloblxaplftpyrocebltfxdl,pprl wromphlx lhp,pbhlaoulrpfefhrpjjzlejlxapdlhohloblebloutpecaupblixaxexzwefl bpls xplzlobxler bmltfxdlrobbj,ltefxojebjaot
lehlrdobmlayhpfuobplb fujlehllobjxoxyo bj,lxaxluwedj ybhl,yjdxfyutls xpfjzle,xplerrzlrakpolaoljiorrombpjlx l , ,pbh,lwyxleupfoceljdjxpul ,lcapckjlehlwercbcpjljy,,pfj,lxaojltfjphobp
xlccrrjl, flaojl tt bpbjlx lwpr ckphlytlaplyjpllxaplhptefupbpl ,lnyxocplx lc bhyxclspbhpxxejlaplc uuyxpllxapljpbxpbcpjl ,lytt fxfpjl bcsoxphl ,ljpfou yjlcfoupjlaplmspjlaolj,euordlr
yutn wjloblxaplaioxpla yjplehlapl , ,pfjl, fpmblm spfbupbjlt xpco bloblpcaebpl, fthbtl blefoser,lapleltfjphobpxlcejxjlh ywkl blxaplobxpmfoxdl ,lebpfcouo blnyxluwceyjlpxluomax
laprilaoulablaplybhpfuobjlxaplhpu cfceduplaejlyjl fblx lhp,pbh,ltefxojebjaotlehlrdobml,lybhojfuobpl rocd,lr klexic sohlll,lufxfyutlehlwercbcpjlwyploajlc ybxfduf ybhltejprl
l fmebjphltpit bjeblhloblfprrpcco bl blxaplweckl ,loxzlejlxaplrpcehpljaesp,lobjxephlapljelthpu cfexocm spfb fjejlfosejrl fljctepa exj,lapluayqqrphlehlwproxxrphleupfoceljl fhltcejj
lobjxoxyo bjzljyalcjlxaplcobxpjrl, flhojpejlc bxf rlehltpspbxo b,lejil l ,xpbzlapljbpfphehlxlcobcpzlobcryhobml spfluejkl,lebhzybwerplx ljpplwd bhlaojl ,lbfplprrcco bzlaplaelc bx
obyphlx luojlftfjpbxlaplpsobpxlxfyxalew ylxapltphopuoclehlloxlc bjpvyppbcpl,leupfocelajluebd,l,xapli frhlwpjxljcopbxojxj,loxlerj laejl bpl ,li frhlaoampajlc sohlll,exerodlfxpj,
lurfxfyutlaejlxfpexphleupfoceljerrorjloaxlxapljleupljuerlluobhpbj,j,terroebcpjluebmbo,dleupfocellob,rybcploblxapli frh,lxaplcrr jpxl bpjlfppl, fmpthyfobmliejflehhlz bcplybuehpzlebb xl
pejoridwlylwecwx mxapfllobltpecpoup,lapilc yxnfopjlxaxlaespl, ymaxler bmojleupfocelr kl blaolrpehpfjotzlxapdljxfymprlx lfpc mbojplxapltrecxapldlehuofr,lxaxluwexpfj,leupfocel
bjtefporewplw xals l spfllehlx lybhojpyxouxepxaplob,rybcpexapdlaesploblxapli frh,leupfocelbuorxefdlt jpfel bplcebb xlfebj, ful, fpmole ybxfopjzlejlxaplr bmlterjloble,meebojkebleb
lhofevlt sph,laxleupfocelbhojperjlferrdth lfpjsplejleblgeutrlx l xaplhpu cfecopjzeblhxl ltp trplia lroslpbljxexpljxaxltpfjacyxplxapoflcooxogbj,luflxfyutlxaoxkjloherjlepl, fljyckp
fj,lxaplm spfbupbjlx ,lcaobeblehllyjoelaespleriedljlpbblleupfocelbfapx folew yxl,fpph ulejldocberic spfl, ftxaplwrop,lxaxluomaxiojlfomax,lxfemomercrdlybhpflufxfyutlxapoflyjtoco bjla
esplwpllc b,ofuph,l, yflu fpldepfj ,lelaojx focerrdwehltpfjohpbxlrakpolfxfyutli yrhthpttblerrlxapjlaefujebhlu fp,loblllllleupfocelbl xpfjlohlb xlb ilia ulxapdlipflmpxobm,lb ilxa
pdth ,lxapdl yrhlwpls xobml, flhosajo blehlrdobm,lxapdl yrhlwplbhl fjoalmxapxfreutrbml ,lb fujlehlxapljafobkobml ,lbexo berlobjxoxyo bjlobx ltpfj berl,op,j,lxapdl yrhlwlyjapfobmo
blcroxuepcaebp,lxaxlxarpxbjlx l bldlhojxexblrebhlwyl,r fohexlsero, fboelebhleupfoceljapexfrehbl,lxapdl yrhlwpljomberrrobmlxaxlxaplcaceto bl ,l,fpph utehlhpu cfcedl, flerrlja yrhll
wplnyxleb xapflwonic ybxfduf fobmluoxmaxlef ybh,ltprrpcco bli yrhlyxlethpu cfexocjlpert blerrlxaplaefuflxfyutlaejl bp.
Decryption: it starts with americas democratic culture. tribal politics predated mr trump, the host of the apprentice exploited it to take himself from the green room to the white house.
yet, whereas most recent presidents have seen toxic partisanship as bad for america, mr trump made it central to his office. he has never sought to represent the majority of americans who
did not vote for him. faced by an outpouring of peaceful protest after the killing of george floyd, his instinct was not to heal, but to depict it as an orgy of looting and left wing vio
lencepart of a pattern of stoking racial tension. today, of the electorate believes the other side is not just misguided, but evil. the most head spinning feature of the trump preside
ncy is his contempt for the truth. all politicians prevaricate, but his administration has given america alternative facts. nothing mr trump says can be believedincluding his claims that
mr biden is corrupt. his cheerleaders in the republican party feel obliged to defend him regardless, as they did in an impeachment that, bar one vote, went along party lines. partisanship
and lying undermine norms and institutions. that may sound fussytrump voters, after all, like his willingness to offend, but americas system of checks and balances suffers. this presiden
t calls for his opponents to be locked up he uses the department of justice to conduct vendettas he commutes the sentences of supporters convicted of serious crimes he gives his family pl
um jobs in the white house and he offers foreign governments protection in exchange for dirt on a rival. when a president casts doubt on the integrity of an election just because it might
help him win, he undermines the democracy he has sworn to defend. partisanship and lying also undermine policy. look at covid . mr trump had a chance to unite his country around a well
organised responseand win re election on the back of it, as other leaders have. instead he saw democratic governors as rivals or scapegoats. he muzzled and belittled americas world class
institutions, such as the centres for disease control and prevention. as so often, he sneered at science, including over masks, and, unable to see beyond his own re election, he has cont
inued to misrepresent the evident truth about the epidemic and its consequences. america has many of the worlds best scientists. it also has one of worlds highest covid fatality rates.
mr trump has treated americas allies with the same small mindedness. alliances magnify americas influence in the world. the closest ones were forged during wars and, once unmade, cannot
easily be put back together in peacetime. when countries that have fought alongside america look on his leadership, they struggle to recognise the place they admire. that matters. america
ns are liable both to over and to underestimate the influence they have in the world. america military power alone cannot transform foreign countries, as the long wars in afghanistan an
d iraq proved. yet american ideals really do serve as an example to other democracies, and to people who live in states that persecute their citizens. mr trump thinks ideals are for sucke
rs. the governments of china and russia have always seen american rhetoric about freedom as cynical cover for the belief that might is right. tragically, under mr trump their suspicions h
ave been confirmed. four more years of a historically bad president like mr trump would deepen all these harmsand more. in american voters did not know whom they were getting. now th
ey do. they would be voting for division and lying. they would be endorsing the trampling of norms and the shrinking of national institutions into personal fiefs. they would be ushering i
n climate change that threatens not only distant lands but florida, california and americas heartlands. they would be signalling that the champion of freedom and democracy for all should
be just another big country throwing its weight around. re election would put a democratic seal on all the harm mr trump has done.
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PERMUTATION CIPHER

Encryption Key: [6, 4, 3, 1, 0, 2, 5]
Decryption Key: [4, 3, 5, 2, 1, 6, 0]

rtsti ahiwst tcrea mimd 'asectacorirtlc uubrt.e iiopla lr sitcp etdeadmrtm u ht.p ef tohsaoah" t inepprtpe ec"x etolidtotti mh kaeir feslf htmo ernerge t oomoiw htehsobet u,e,y.e tarew he so smt neercteisrpedvh tnsa ee esnpctotx nsiratas phsiao db afiem rar m ac,mpartu i daetlrtnash t oleiio fca e .hhvve snetgus ohpr t oe neerstjm hteaoytroi iem farh sacmndi od eov to ti rf ohearf,m cn y dbaupio uof glnofcap eetrplo ota sett htre egliklknog o feof gresh dy,ntsi ni zwic s t ontob,leha dottu itcpei n s taaoygo r ioo flt nagn di-telfwllvgn oo-eneepa foitr rttp aet f nosrgnkoi tlacal,oiinesn,adt oyf w4 00l et hetrocetaele ebiet evsh eho trs eisdii tn oigints s deuid,ie ubtv ht.l ee tomshnpsda-ie glnfoertau teh ft r pumpcedseini s yi heno scitr pmtor et htl .tuhatto lpi nacisiavrpber,eact ihu ssnidaminirtaoi sh aqea evnma alrc"tnrtieacf vieao .st"mgnghti pur rtmcys a bebna dveleiedlci-nush nigisiac lmat h ndi rberc i soh.turp ehcsi erdalreeh n sitbpe erupnailc e yratfibile l t egdo needfgr ihmeseiradsh s ,at idye dinani mcapmehat neth ab,t rtv noeotew,e n noa lglytapr p.snie nsiratan phsiagi y dnmedu nrnn nieo nasu dntnist snito.a thtanduo ysn-ssf uyvpmrtu srtoe,arefat kl ll,iwsi eh nnillg t seso.nefodm tb uasacrei'mtss yeec o fhda kcsncalb anfusse fh .restsrpsi ectndie o slatfosi rh tengpone o stbdkcl oee iu phtseu s aedeh p netratuiffo s t cietudocncndv eee ,patshmmac ou htse ecetesnnsfose eropuptvocsr nodedit ore fsmircsu i h seyhseigv lafsi mmlpyl uisbi o weh nt o eihthn ysueaf e dhoo seffrgfingeri enrvuomop tnsinitetcoce i nxefagahn tidro rra o n w.lvua pa ehv ndiersessa tct bud ot htmo eigenitratfoyt tel nessi oinuuce tbanties e t giqh ihpl ne ,iwnhmedu nrh snietcme edoe yarchw sh as t rono.needfstrp ai inhaspil nadyolagn smedu nrhp nieoo .ciylctako 9-dvoilir r .mtdh mupanhca auotec i einthtuo scnurayr oe adn wa roll grdeins enosepsi da-nwl-e nre oicetn htmo ef kabcos ,i ta eho trsedelar evh a.detnisaws h earomd eco ctaiagsonevrrvr a si o lasroepcsage .tashezmm ulbnd da ettleillem daro sac'wac-lrd ltniss snittiuhous,s cet a shetnc erdro sf sasieelrtocnor da npotnveeissa.n ntf ooen e ,hsadeeer nic tseci ec,n niuldga rvoem .kssabnu,d asotel oeebe y ihdn s-r woneotcleiieheh,n tocs a ntndenu esi onrtesrpnev et hetndie b hurtaet uothmdie pe naci dnc tisoceuesnea se.ma aircn na smy htfo esdlowr'stseb e stnicel i st.ta olashoen so dro fwlhihs' gvc setof9ldi- ylltaat.e tr asut m rr ahm sdtartecreca mila 'astlv eisisheh ht as maemdinl-n.sedensilla lagm eesam yinfasacrel'elil nu i cnenrv htebet dl.hssoc le en toso eewrfu dgrede glrmw,nasr duoco n edma, onacnt liaesy uepb to kabct ehegtreepni a eteii.o nhwecsrnutehtat h uf vaeooa hgtl digneseiirnaecokol o lsi nh hreaedset pi,hgrt ysu t lgeoiqoerch htes etecipa ma ehvdyh .rietanta tm .re sasacreiini ea rlo ebalbootht n-evran o duisseedrth eamtufn eilh enecteahye vet i nh.lrw odcrea miilma lo yatppoa ewrlacen nrrtto afmrfo giroenitnocur a se,snl hteo ra qwshfani gnts naiar da niwrpqa oty de.ecrea miadina elersl asodyl s erevaae a nxo epmlt eho tracoedma,sice potdn weloep eiloh vas i ntat etshere tpsh eucttic ieri snzie.mrtm ukih ptnled siafer sa k usro ch .restrvo ege tmnesnhco irdn aa haisus wa vaelas yaseiem narer acnhaciotr r tobufamoeed cny scieocla vtro rf iebeh lthtfe a hgm ithirsi ggrr.t a,llicay edu nrmrtm ureh pticps y ia soinhnebeve erfnc oio .emefomru r ray esi afo hairtsocob llyadsep rikl netir r entuw muppeddl e lane ltheshe n-srama.ro dmeiz i noiem garty acnodd resin tn okmhwwo oywet h tg reen.gi tn yhtwo eh .d otlowe uo e dbvo gitrfsvi rrida oimn,nil ygywet h e duolbsode nret nightmat rp o nigrasmonr htdn einihsrknfogn lnotaititti ni notuise onitp ansrol sfife-o yntew b ludenr esuhil n giccetiaa tegahn rt ahtn neaetsio ontnasi yddtalt nftu sb ,diolraolic afn anriaiem dare sac'hdalratnyht,s e luw odhiseb g nilalgh thtaph ecm o oimfderfeeo da ndyaroemcl rf oa loh lsuu e dbjtnats ogb ehrrnuc otwrh ytosi nigttgiw ehduoa rnl-e .re oicetnplowu e atu diaronct ae csl lano lrh htear r mmtsh mupaxend o.

it starts with america's democratic culture. tribal politics predated mr trump. the host of "the apprentice" exploited it to take himself from the green room to the white house. yet, wher eas most recent presidents have seen toxic partisanship as bad for america, mr trump made it central to his office. he has never sought to represent the majority of americans who did not vote for him. faced by an outpouring of peaceful protest after the killing of george floyd, his instinct was not to heal, but to depict it as an orgy of looting and left-wing violence-par t of a pattern of stoking racial tension. today, 40% of the electorate believes the other side is not just misguided, but evil. the most head-spinning feature of the trump presidency is h is contempt for the truth. all politicians prevaricate, but his administration has given america "alternative facts". nothing mr trump says can be believed—including his claims that mr bi den is corrupt. his cheerleaders in the republican party feel obliged to defend him regardless, as they did in an impeachment that, bar one vote, went along party lines. partisanship and lying undermine norms and institutions. that may sound fussy-trump voters, after all, like his willingness to offend. but america's system of checks and balances suffers. this president c alls for his opponents to be locked up; he uses the department of justice to conduct vendettas; he commutes the sentences of supporters convicted of serious crimes; he gives his family pl um jobs in the white house; and he offers foreign governments protection in exchange for dirt on a rival. when a president casts doubt on the integrity of an election just because it migh t help him win, he undermines the democracy he has sworn to defend. partisanship and lying also undermine policy. look at covid-19. mr trump had a chance to unite his country around a wel l organised response-and win re-election on the back of it, as other leaders have. instead he saw democratic governors as rivals or scapegoats. he muzzled and belittled america's world-cl ass institutions, such as the centres for disease control and prevention. as so often, he sneered at science, including over masks. and, unable to see beyond his own re-election, he has c ontinued to misrepresent the evident truth about the epidemic and its consequences. america has many of the world's best scientists. it also has one of world's highest covid-19 fatality r ates. mr trump has treated america's allies with the same small-mindedness. alliances magnify america's influence in the world. the closest ones were forged during wars and, once unmade, cannot easily be put back together in peacetime. when countries that have fought alongside america look on his leadership, they struggle to recognise the place they admire. that matters. americans are liable both to over- and to underestimate the influence they have in the world. american military power alone cannot transform foreign countries, as the long wars in afghani stan and iraq proved. yet american ideals really do serve as an example to other democracies, and to people who live in states that persecute their citizens. mr trump thinks ideals are fo r suckers. the governments of china and russia have always seen american rhetoric about freedom as cynical cover for the belief that might is right. tragically, under mr trump their suspi cions have been confirmed. four more years of a historically bad president like mr trump would deepen all these harms-and more. in 2016 american voters did not know whom they were getting . now they do. they would be voting for division and lying. they would be endorsing the trampling of norms and the shrinking of national institutions into personal fiefs; they would be us hering in climate change that threatens not only distant lands but florida, california and america's heartlands. they would be signalling that the champion of freedom and democracy for al l should be just another big country throwing its weight around. re-election would put a democratic seal on all the harm mr trump has done.x

PERMUTATION ATTACK

Value of # = 7
Encryption Key: [6, 4, 3, 1, 0, 2, 5]
Decryption Key: [4, 3, 5, 2, 1, 6, 0]

+ Assignment1 git:(master) x []