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VCDNG'QH'E QP VGP VU'

" " " " " " " " " " Rci g"
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Qxgtxkgy "/////////////////////////////////////"3"
 Rwr qug"/////////////////////////////////////"3"
 Vtcxgn'Ucwwu"/////////////////////////////////////"3"
 Qeew cvkqpcn'Hcwf "/////////////////////////////////////"3"
 Gzegr vkpu"/////////////////////////////////////"4"
 Go r m{ gg'Tgur qpuklksku"/////////////////////////////////////"5"
 Uwr gtxkuqtu'Tgur qpuklksku"/////////////////////////////////////"6"
 Ceeqwpvu' Rc { cdrg'Tgur qpuklksku"/////////////////////////////////////"6"/"7"
 Gki kdr'Gzr gpugu'Tgrv'gf 'vq'Vtcxgn'/////////////////////////////////////"7"
 Kgrki kdr'Gzr gpugu'Tgrv'gf 'vq'Vtcxgn'/////////////////////////////////////"8"
 Tgegr vu'/////////////////////////////////////"8"/"9"
 Ecuj 'Cf xcpegu'/////////////////////////////////////" : "
 Ckrkpg'Ugtxlegu'/////////////////////////////////////" : "
 Fgpkf 'Dqctf kpi 'Eqo r gpucvkpp'/////////////////////////////////////" : "
 Wpwugf IXqkf gf 'Vlengvu'/////////////////////////////////////" : "
 Ckrkpg'Rgpcn' 'Hctgu'/////////////////////////////////////" : "
 Hgs wgpv'Hn'gt'Rtqi tco 'Cy ctf u'/////////////////////////////////////" ; "
 Tgpvcn'Ectu'/////////////////////////////////////" ; "
 I tqwvf 'Vtcur qtvcvkpp'/////////////////////////////////////"32"
 Wug'qh'Rgtuqpcn'CWqo qdkg'/////////////////////////////////////"32"
 J qvgn'/////////////////////////////////////"32"

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G

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Vj g"Dqctf "qh"Vt wuygggu"cpf "yj g"Uwr gtlpvpgpf gpv"qh"Uej qqnu"qt "yj gkt"f guki pgggu"j cxg"

○ Qp"Hkg'y kj 'Ceeqpwu'Rc{cdrg'F gr ctwo gpv'cp'wr f cvgf "cwj qtk cvkqp"fk gev'f gr quk'kphq"

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Kpf kxf wcu" cwj qtk gf " vq" cr r tqxg" vtcxgn' qt" dwukpguu" gzi gpf kwtgu" qh' qvj gt" go r m{ ggu" uj cm'
cf o kprgt"yj gug"i wk gnpgu0"Gzr gpugu"yj cv'cr r gct"vq"dg"gzegulkxg"qt"wpwucn'kp"tgnvkqp"vq"yj g"
pcwtg"qh'vj g"dwukpguu"vtcxgn'uj cm'dg"kpuguki cvgf "r tkqt"vq"cr r tqxcr0"Gzr rpevkqp"qh'cp{ "uwej "
gzi gpf kwtg'o wuv'dg'kpenw gf "dghqtg'uwd0 kuukqp"vq'Ceeqpwu'Rc{cdrg0

"

Vj g'Ceeqpwu"Rc{cdrg"uchh"ku'tgur qpukdrg"hqf"tgxky kpi "cm'er r tqxgf "tcxgn/tgrvqf "tgs wguu"cpf "

Ect "tgpvcn'cpf "i cuqrlpg" hqt "tgpvcn'xgj kengu=" "o krci g'tgko dwtugf "y kj "c"tgpvcn'cu'o krgu"
ctg'htgg0'

"

I tqwpf "tcpur qtvcvkqp" kpenf kpi "vzk'cpf "r vdrk "tcpur qtvcvkqp" hctgu."o krci g'hqt "r gtuqpen"
xgj kengu."cpf "r ctntkpi "hgg0'

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O gcu'y j krg"qp" qhlekri "IRU" dwukpguu'y kj "qxgtpl j v'j qvgn'usc {0" "IRU" f qgu"pqv"tgko dwtug"
vzcdrg"o gcuô o gcu'hqt "f c{ "vtcxgr'qpn{0'

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Tgi kwtcvkqp"cpf "hggu'hqt" cwgpfcpeg"cv'cr r tqxgf "eqphgtgpegu"cpf "ugo kpcutu0'

"

Vczgu'cuuqekcvf "y kj "tcpur qtvcvkqp." hqi kpi "cpf "o gcu"qpn{0'

"

Vtcxgr'vq"cpf "htqo "ckr qtvecrwrwvf "cv'y g'tcvgr gt"o krg"guwcdkuj gf "d{ "y g'F gr v'qh" Hkpcpeg"

Y j gtg"vj g"go r m{ gg"ku'tgs wktgf "vq"i q"cf c{ "gctn{ "vq"s wcrk{ "hqt"cmj /r tkegf "r gpcn{ "ckhctg."vj g"
ucv'g'y knr c{ "vj g'cf f kkpncn'nf i kpi "cpf "o gcn'gZR gpugu'pqv'vq'gzeggf "vj g'co qwpv'qh'ucxkpi u'kp"vj g"
ckhctg0

"

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Cp{ "dapwu"qt "r tqo qvqpcn'i tcwkv{ "tgegkxgf "cu"ci tcwkv{ "cu"ci "tguwn'qh'qh'heknLRU"vcxgn'uj cni'dg"
wugf "vq"qh'ugv'qt "t gf weg'vj g'equv'qh'uwdugs wgpv'qh'heknLRU"vcxgn0" Wpf gt "pq'ektewo ucpegu"ecp"vj g"
vcxgrgt"nggr "c" dapwu"qt "qvj gt" r tqo qvqpcn'i tcwkv{ "uq" gctpgf "hqt" j ku" qy p" r gtuqpcn'wug0" Cu"
uwh'hekgpv'o krci g."gctpgf "cu"ci "tguwn'qh'ucv'g/r ckl "vcxgn"ku'ceewo wrcv'g. "ht gg"v'kengv'eqwr qpu'y kn'
dg"cr r rkgf "hqt"cpf "wugf "vq"qh'ugv'qh'heknLRU"vcxgn'equu0"

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Vj g" F kurtlev"j cu"gpvgtgf "kpvc"ceqvtcev'y kj "Gpvtr tkug" T gpvcn0Rtkqt "vq"tgpvki "c"xgj keng."r rgcug"
ecni" Ceeqwpw" Rc{ cdrg" Vtcxgn' Cpcn{ uv" cv" 823/; 82/: : ; ; "qt" 823/; 82/: 9: 5" CR" Uwr gtxkuqt" hqt"
cuukucpeg0Vj g" F kurtlev'y kn'tgko dwtug"vcxgrgtu'hqt"vj g'equv'qh'tgpvki "c"o kf/uk' g."kpvto gf kv'g"qt"
eqo rcev" ect" y kj " rtkqt" crrtqxcn0 Vj g" Ucv'g" qh' O U" j cu" f kucqwpv' tcv'gu" cxckrdrg"
*y y y (f h c 0 u c v g 0 u 0 u l r w e j c u k p i h t c x g n 0 0 krci g"ku"pqv'tgko dwtugf "hqt"tgpvcn'xgj keng."cnj qwi j "
vj g'equv'qh'i cuqkpg'o c{ "dg"t'gko dwtugf 0

"

Vtcxgrgtu'uj qwf "tgpv'ect"vq"vj gkt "f gukpcv'kpv'y j gp"ftkxkpi "ku"o qtg'equv'gh'ge'v'xg'vj cp"qvj gt"
o gcpu'qh'v'cpur qt'v'kpv0

"

Y j gp" r kenkpi "w" "c" tgpvcn' ect." vtcxgrgt" uj qwf "ej gen' y kj " tgpvcn' ect" ci gpv' hqt" cp{ "
r tqo qvqpcn'tcv'gu. "rcuv/o kpv'g"ur geknu. "qt"ht gg"wr i tcf gu0

"

Vj g'r j { ulecn'eqpf kkp'qh'vj g'tgpvcn'xgj keng'uj qwf "dg"kpur gev'g'f "r tkqt"vq"rgcxkpi "vj g'tgpvcn'
m'0" Cp{ "f co ci g" hqwpf "uj qwf "dg"tgr qt'v'g' "vq"vj g"ect"tgpvcn'ci gpe{ "dghqtg"vj g'xgj keng"ku"
ceegr v'g'0" F co ci g"uj qwf "dg"fqewo gpv'g' "qp"vj g"ect"tgpvcn'ci tggg gpv'vq"cxqkf "r quukdr"
f kur wg'qxgt" f co ci gu'hqt"y j kej "vj g'eqo r cp{ "ku"pqv'tgur qpukdr0

"

Qt ki kpcn'tgpvcn'tgegr w"cpf "cp{ "cuuqekcv'g'f i cuqkpg'tgegr w'o wuv'dg'uwdo kv'g'f "y kj "vcxgn'
t'gko dwtugo gpv'tgs wgu0

"

Go r m{ gg" y kn' pqv' dg" t'gko dwtugf "hqt" v'ch'le" ekc'v'kpu" vj g{ "tgegkxg" y j krg" qp" F kurtlev"
dwukpu0

"

Vtcxgrgtu'ctg'tgur qpukdr'hqt"ecpegrkpi "tgpvcn'ect"t'gugtxcv'kpu"kh'vcxgn'r n'pu'ej cpi g0

"

Qpn{ "LRU"go r m{ ggu'ctg"cmjy gf "vq"tkf g"cu"ci r cuugpi gt "cpf lqt"ftkxg'vj g'ug'f kurtlev'tgpvcn0

"

"

"

Vczk'dwu.'lwdy c{.'qt'uj wwrng'htgu'y kn'dg'tgko dwtugf 'cv'cewcn'equv'y kj 'qtki kpcn't gegkr u0'T gegkr u"
uj qwf "kpenmf g"eqo r cp{ "pco g.'f cvg.'f gukpcv'kp"cpf "co qwp0"Go r m{ ggu'vcxgn'kpi "v'j g"uco g"
mcecv'kp'uj qwf 'uj ctg'i tqw'f 't'cpur qt'cv'kp"v'j"cpf 'htqo 'v'j g'ckr qt'v'y j gpgxgt'r quukdrg0'

"

Nqecr'lect'ugt'xlegu'o c{ 'dg'wugf 'kh'k'ku'v'j g'o quv'geqpqo kecn'htqo 'qh't'cpur qt'cv'kp0'

"

Nko qwukpg'qt'ect'ugt'xlegu'uj qwf 'dg'wugf "qpn{ 'y j gp"clwukh'kcdrg.'xcrkf "dwukpguu'tgcuqpu'r tgenmf g"
v'j g'wug'qh'o qtg'geqpqo kecn'o qf g'qh't'cpur qt'cv'kp0'

"

Ceeqwpw'Rc{ cdrng'y kn't'gugtxg'Uj wwrng'Ugt'xlegu'v'j"cpf 'htqo 'v'j g'ckr qt'v'y j gp'tgs wgu0'

"

"

C'r tkxcvgn{ "qy pgf "xgj leng"o c{ "dg'wugf "hqt'dwukpguu'vcxgn'r tqxkf gf "v'j g'xgj leng'ku'kpuwtgf "d{ "v'j g"
r tkxcv'g'qy pgt'cpf "v'j g'kpf kxf wcn'wukpi 'uwej "c'xgj leng'j cu'c'xcrkf "qr gtcvqt'w'ht'egpug0'k'ku'gzr tguun{ "
w'pf gtuv'qf "v'j cv'y j krg'wukpi "c'r tkxcvgn{ "qy pgf "xgj leng.'v'j g'qr gtcvqt'cuuwo gu'cm't'gur qpukdkv{ 'hqt"
ceekf gpw'v'j g'gzv'p'qh'v'j g'qr gtcvqt'w'kpuwt'cpeg"eqxgtci g0'

"

Vj g'F kwt'lev'y kn'r c{ "c'uc'p'f ctf 'tcv'g'r gt"o krg'hqt'qh'lekcn'vcxgn'd{ 'r tkxcv'g'cwqo qdkrg'dcugf "qp'v'j g"
cewcn' _____ " " W'p'f gt" p'qto cn'
ektewo ucpegu."o krgci g'ku'eqo r wgf "htqo "v'j g"vcxgn'gt'w'p'qto cn'y qtmukg"v'j g'f gukpcv'kp"cpf "
tgwtp"v'j g'vcxgn'gt'w'p'qto cn'y qtmukg"*gzemf kpi 'y gng'p'f "vcxgn0'

"

Ewt'g'p'w'f.'t'gko dwtugo gpv'ht'k'p/f kwt'lev'vcxgn'ku'cv'v'j g'tcv'g'qh'089'egpu'r gt'o krg'cu'qh'42460"Qw
qh'v'qy p'vcxgn'ku't'gko dwtugf 'cv'v'j g'tcv'g'qh'043'egp'v'gtu'r gt'o krg'cu'qh'42460"Vj gug'tcv'gu'y kn'cf lwu'
cu'v'j g'hgf gtcn'i qxgtpo gpv'cf lwu'ku'tcv'g.'v'j r kecn'f 'v'j g'ht'uv'qh'v'j g'ecrg'p'f ct" { gct0'

"

Y j gp"y q"qt"o qtg'LRU"go r m{ ggu'vcxgn'k'p"qpg'r tkxcv'g'xgj leng."qpn{ "qpg"vcxgn'gzr gpug"cv'v'j g"
cwj qtk gf "t'gko dwtugo gpv'tcv'g'r gt"o krg'uj cn'dg'cm'y gf 0"Vj g'r gtu'p'erc'ko kpi "t'gko dwtugo gpv'
uj cm't'gr qt'v'y j g'pco gu'qh'q'v'j gt'LRU"go r m{ gg'r cuugpi gtu0'

"

Go r m{ ggu'o c{ "pqv'tgs wgu't'gko dwtugo gpv'ht'i cu'rk'p'g'cu'v'j ku'ku'eqxgtgf "d{ "v'j g'o krgci g'tcv'g0'

"

Vtcxgn'gtu'wukpi "c'r tkxcvgn{ "qy pgf "xgj leng"v'j"vcxgn'q'w'qh'ucv'g'qp"qh'lekcn'LRU'dwukpguu'y kn'dg"
t'gko dwtugf "o krgci g'cv'v'j g'o quv'geqpqo kecn'o qf g'qh't'cpur qt'cv'kp"/'p'qto cm{ "v'j g'm'y guv'ck'ht'g0"
C'er t

"

Go r m{ ggu'uj qwf "cny c{ u'ugrgev'c"j qvgn'vj cv'ku'vj g'o quv'geqpqo kcn'hqt "vj gkt "dwukpguu'tkr "kh'k'ku" pqv'qpg'qh'vj g'r tghgtgf "j qvgnu0

"

Y j gp "tcxgnkpi "vq" c" eqphgtgpeg" qt "ugo kpct. "k'ku" cr r tqr tkcvg" vq" uc{ "cv'vj g"j qvgn'j quv'kpi "vj g" eqphgtgpeg" qt "ugo kpct. "cuuwo kpi "vj cv'vj g'f ckn{ "tcvg'ku'p'qv'wpt gcuqpcdn{ "g'zr gpuk'g't'gr'v'k'g" vq" q'vj gt " cngtpe'v'k'gu0

"

Qt "kh'cp" go r m{ gg"ej qug"vq"uc{ "y kj "t'gr'v'k'gu. "j g'qt "uj g'y km'dg" t'gko dwtugf "hqt" o gcn' dw" o wuv" j cxg' r tkqt "cr r tqxch'htqo "uwr gtxkuqt "cpf "cwcej "c" eqr { "vq" tcxgn' t'gko dwtugo gpv' t'gs v'gu0

"

Cm' h'f i kpi "t'gegkr v'ctg" t'gs vktgf "r tkqt "vq" t'gko dwtugo gpv' dgkpi "r tqeguugf 0" O gcn' cpf "kpek' gpvcn' qp' h'f i kpi "t'gegkr v' b wuv' dg' kgo k' gf "ugr ctcvgn{ 0" C' h'f i kpi "t'gegkr v' b wuv' k'penw' g' cm' qh' v'j g' h'q' m' y kpi " k'phqto cvkqp<

"

P co g' cpf "h'ecv'k'qp" qh' v'j g' h'f i kpi "guv' d' r' k' u' j o gpv' F cvgu' qh' uc{ " Kgo k' gf "ej cti gu' h'qt" h'f i kpi . "o gcn. "v'gr' j qpg" ecm. "k'p/ tqo "o q'x' k' u. "gve0

"

Go r m{ ggu'ctg" gpeqwtci gf "vq" wug" vj gkt "qy p" egn' r' j qpgu' h'qt "cm' ecm0" Vtcxgn' tu" ctg" f' k'ueqwtci gf " htqo "wukpi "r' j qpgu' k'p" vj gkt "j qvgn' tqo u. "gzegr v' k'p" ecugu' qh' go gti gpe{ 0" "Cf o k'p' k'ut' cv'qtu" y j q' ctg"

f lgo 'f gr gpf u'qp'vj g'mecvkp'qh'vj g'vcxgr0'Vj g'F kwtlev'dcugu'vj gk'cmjy cdng'r gt'f lgo 'tcvg'
qp'vj g'tcvg'ugv'd{ 'vj g'F gr v0qh'Hkpcpeg'cpf 'Cf o kpkwtcvkqp'cpf 'Hgf gten'Tgi kxgt0

"

"

Go r m{ ggu'ctg"

0"C'vcxgrgt"o c{ 'pqv'uwdo kv'c'r gt"

f lgo 'tgs wguv'ht'c'o gcn'kh'j kulj gt'o gcn'y cu'kpenwf gf 'kp'c'i tqwr 'dkn'r ckf "d{ 'cpqj gt'ci gpe{0""

"

I tcwklgu"

Ki'vj gtg"ctg"cp{ "s wgu'kqpu"cu"vq"y j gvj gt"cp"gzr gpug"ku"cr r tqr tkvg."kps wkt g"dghqtg"vj g"gxgpv'tcyj gt"
vj cp"chgt0'

"

"

"

P qp/vtcxgrntgrv'gf "gzr gpugu'kpewttgf "f wtkpi "vtcxgrny kn'pqv'dg'tgko dwtugf "d{ 'vj g'F kutle'0'

"

Tgvcknr' wtej cugu'qh'lw r rkgu."dqqm."gve0'

Gzr gpugu'kpewttgf "qp'dgi ch'qh'qyj gtu0'

"

"

"

Ki'qwj cxg'vtcxgrntgrv'gf "s wgu'kqpu."{qw'b c{ 'eqpcev'r gtuqpu'kugf "dgrqy "f wtkpi 'pqto cr'ndwukpguu"
j qwtu<'

Ceeqwpw'Rc{ cdng'uvch'o go dgt"

Gzgewkxg'F ktgev't'qh'Hkpcpeg"

Ej kgh'Qr gtcv'kpi "Qhleg"

"

Vtcxgrnt'uj qwf "dg'r tgr ctgf "vq"j cpf ng"cp{ "go gti gpekgu'qeewttkpi "y j kg'vtcxgrkpi "chgt"vj g'pqto cr'
LRU'y qtnj qwtu0'P qv'h{ 'vj g'Ceeqwpw'Rc{ cdng'uvch'vj g'pgz v'dwukpguu'f c{ 'hqt'cuukvcpeg'k'p'tguqkpi "
LRU'vtcxgr'n #

50 VtcxgrIT gko dwtugo gpv'Tgs wguv'ó'wugf "vq'tgs wguvt'gko dwtugo gpvhqt 'vtcxgn'tgrcvgf 'gZR gpugu"
chgt'eqo r ngvqp'qh'vkr 0'

60 Kp/F kxtlev'O krci g"ó'wugf "vq'tgs wguv'o krci g'tgko dwtugo gpv'hqt 'vtcxgn'y kj kp'y g'o gvtq"
ctgc'y j gp'wulpi "c'r gtuqpcn'xgj kerg0'

"

6+ K'vcxgn'cttcpi go gpa'ctg'ej cpi gf "dgecwug'qh'c"pqp/F kutlev'tgrvgf "gxgpv."y g'vcxgrgt'y km'dg"
tgr qpukdg" hqt" tgo dwtukpi " yj g" F kutlev' hqt" cp{ " equv' cpf " hggv" cuqekcygf " y kj " yj gkt"
rtgr c{o gpa0"Cp{ "ej cpi gu"yj cv'tguwv"kp"cf fkkqpcn'hggv"o wuv'dg"cr r tqxgf "d{ "yj g"hwf kpi "
uqwtg"cpf "yj g"vcxgrgtai"uwrtxluqt0" Y j gp" yj g" f kutlevai"ecpegrv'kqp" r tgeguugu"ctg"pqv"
hqmqy gf ."yj gp"cp{ "equv'kpewtgf "dgeqo gu'vj g'tgr qpukdkv{ "qh'vj g'vcxgrgt0'

7+

