

Kpvtqfwevkqp"

 $30 \begin{tabular}{ll} 30 \begin{tabular}{ll} 30 \begin{tabular}{ll} Vjg" Crrnkecpv" ku" c" Ejknf" Rtqvgevkqp" Qhhkegt." yqtmkpi" ykvj" Wpkvgf" Pcvkqpu" Okuukqp" kp" Uqwvj" Uwfcp" *õWPOKUUö+." dcugf" kp" Dqt." Uqwvj" Uwfcp0" Ujg" ugtxgu" qp" c" hkzgf/vgt o "crrqkpv o gpv" *õHVCö+" cv" vjg" R/5" ngxgn0^3" \\ \end{tabular}$

 $Qp"47" Ugrvg o dgt"4242."vjg" Crrnkecpv"hkngf"cp"crrnkecvkqp"hqt"uwurgpukqp"qh"cevkqp" dghqtg"vjg" Wpkvgf" Pcvkqpu" Fkurwvg" Vtkdwpcn"kp" Pcktqdk0"Ujg"uggmu<"*k+"uwurgpukqp"qh"vjg"fgekukqp"fgp{kpi"jgt"vq"vgngeqoowvg"cpf"eqorgnnkpi"jgt"vq"tgvwtp"vq"vjg"fwv{"uvcvkqp"d{"3"Qevqdgt"4242"rgpfkpi"ocpcigogpv"gxcnwcvkqp="cpf"*kk+"c"Xknncoqtcp"uwurgpukqp"qh"vjg"eqpvguvgf"fgekukqp"rgpfkpi"vjg"ctv0"35"uwurgpukqp"qh"cevkqp"rtqeggfkpiu"rwtuwcpv"vq"ctvkengu"3;"cpf"58"qh"vjg"WPFV"Twngu"qh"Rtqegfwtg0"$

50Å Vjg"Tgurqpfgpv"hkngf"c"tgrn{"qp"4;"Ugrvgodgt"42420"""""

Hcevu"

 $60 \mbox{\normalfont\AA} \mbox{\normalfont Vjg"}$ Crrnkecpv" lqkpgf" WPOKUU" qp" 5" Qevqdgt" 4239" cu" c" Ejknf" Rtqvgevkqp" Qhhkegt 0^4 "

70Å $Kp"Qevqdgt"423;."vjg"Crrnkecpv"hgnn"knn"cpf"ujg"ycu"cfokvvgf"vq"WPOKUU"ngxgn" 4" jqurkvcn" hqt" ugxgtcn" fc{u0"}$

" Qp" 39" Qevqdgt" 423; ." vjg" Crrnkecpv" ygpv" vq" uggm" hwtvjgt" vtgcv o gpv"kp"vjg"Wpkvgf"Mkp i fq o 0^{6} ""

 $80 \label{eq:continuous} Dgv\,y\,ggp"6"Qevqdgt"423\,; "cpf"38"Crtkn"4242." vjg"Crrnkecpv"\,y\,cu"rncegf"qp"ukem"ngcxg0^7"$

³"Crrnkecvkqp."ugevkqp"X0"

^{4&}quot;Crrnkecvkqp."ugevkqp"XKK."rctc"440"

^{5&}quot;Crrnkecvkqp."cppgz"40"

^{6&}quot;Crrnkecvkqp."ugevkqp"XKK."rctc"470"

⁷"Kdkf."rctc"480"

 $Ecug"Pq \& "WPFV \\ \ PD \\ \& 14242 \\ \ 129 \\ \ :"$

 $Qtfgt"Pq \& "3::"*PD \verb"M14242+"$

" 90Á

$$\begin{split} &Ecug"Pq\&"WPFV|PD\&|4242|29:"\\ &Qtfgt"Pq\&"3::"*PD\&|4242+" \end{split}$$

330Å Vjg" Crrnkecpv" eqpvgpfu" vjcv" vjg" eqpvguvgf" fgekukqp" ku" wpncyhwn0³⁵" Ujg" ockpvckpu" vjcv" cnvjqwij" itcpvkpi" c" vgngeq o o wvkpi" tgswguv" ku" fkuetgvkqpct{." uwej" crrtqxcn" ujqwnf" pqv" dg" ykvjjgnf" wptgcuqpcdn{0" Vjg" Crrnkecpv" tgnkgu" qp" WP OKUU" Dtqcfecuv"kuuwgf"qp"49" Oc{"4242"cpf"vqyp"jcnn" oggvkpiu"jgnf"qp"3:"Lwpg"4242"cpf" 45"Ugrvg o dgt"4242." yjgtg"kv" ycu"eq o o wpkecvgf."coqpi"qvjgtu."vjcv"c"tgvwtp"vq"vjg"

$$\begin{split} &Ecug"Pq\&"WPFV1PD\&14242129:"\\ &Qtfgt"Pq\&"3::"*PD\&14242+" \end{split}$$

 $eqpvkpwgf"vtgcvogpv"cpf"tgxkgyu"d\{"jgt"fqevqtu."c"ogfkecn"tgrqtv"ycu"kuuwgf"qp"46"\\ Ugrvgodgt"4242"tgeqoogpfkpi"vjcv"ujg"ujqwnf"yqtm"htqo"jqog0"Qp"vjg"ucog"fc\{."vjg"Crrnkecpv"uwdokvvgf"vjg"ogfkecn"tgrqtv"vq"vjg"WPOKUU"ogfkecn"vgco"cpf"c"tgswguv"vq"vgngeqoowvg0"Jgt"tgswguv"ycu"cnuq"fgenkpgf"qp"vjg"ucog"fc\{"cpf"ujg"hkngf"vjku"crrnkecvkqp"qp"47"Ugrvgodgt"42420"$

Kttgrctcdng" jcto"

 Vjg" Crrnkecpvøu" cdwug" qh" cwvjqtkv{" encko" ku" pqv" tgegkxcdng" dgecwug" ujg" fkf" pqv" gzjcwuv"kpvgtpcn"tgogfkgu."cu"tgswktgf0"

 $3: \emptyset \land Qp"vjg" ogtkvu."vjg"Tgurqpfgpv"uwdokvu"vjcv"vjg"Crrnkecpv"jcu"pqv"ucvkuhkgf"vjg" vjtgg" rtgtgswkukvgu"hqt"uwurgpukqp"qh"korngogpvcvkqp"qh"vjg"fgekukqp0"Vjg"eqpvguvgf" fgekukqp"ku"ncyhwn"dgecwug"vjg"Crrnkecpv"jcu"pq"tkijv"vq"vgngeqoowvg"cpf"vjg"ocpcigt"jcu"vjg"fkuetgvkqp"vq"itcpv"vjg"Crrnkecpv%u"tgswguv"hqt"cp"ceeqooqfcvkqp"vq"yqtm"tgoqvgn<math>\{0"Vjg"Ejkgh."Ejknf"Rtqvgevkqp"Wpkv"tgcuqpcdn\{"eqpenwfgf"vjcv"vjg"Crrnkecpv"ku"tgswktgf"vq"tgrqtv"qp"ukvg"dgecwug"jgt"rqukvkqp"tgswktgu"jgt"rtgugpeg"qp"vjg"itqwpf0"Ujg"jcu"dggp"cdugpv"htqo"vjg"okuukqp"ctgc"yqtmkpi"tgoqvgn{"hqt"oqtg"vjcp"vjg"cnnqycdng"ukz"oqpvju0"Vjg"Tgurqpfgpv"ockpvckpu"vjcv"ukpeg"WPOKUU"Ogfkecn"hqwpf"vjg"Crrnkecpv"hkv"vq"yqtm"kp"vjg"okuukqp"ctgc"cpf"engctgf"vq"vtcxgn."vjgtg"ctg"pq"itqwpfu"vjg"gvgvgpf"jgt"vgngeqoowvkqp"tggvqdgt"42420"$

 $3; \emptyset \land Y \&vj" tgictf" vq" wtigpe \{."vjg" Tgurqpfgpv" uwdo &vu" vjcv" vjg" Crrnkecpv" jcu" pqv" fgo qpuvtcvgf" uwurgpukqp" qh" vjg" eqpvguvgf" fgekukqp" ku" wtigpv0" Ukpeg" 33" Ugrvgo dgt" 4242."vjg" Crrnkecpv" ycu"kphqtogf"vjcv"ghhgevkxg"3" Qevqdgt"ujg" yqwnf"jcxg"vq"tgvwtp" vq" jgt" fwv{"uvcvkqp0" Jqygxgt."ujg" yckvgf" wpvkn" 47" Ugrvgodgt"4242."oqtg" vjcp" vyq" yggmu"ncvgt"vq"hkng"vjg"crrnkecvkqp0"Cp{"wtigpe{"ku"ugnh/etgcvgf0"}}$

 $420 \begin{tabular}{ll} 420 \begin{tabular}{ll} 420$

 $\label{eq:control_problem} 430 \mbox{\'A} \qquad \mbox{Vjg"Tgurqpfgpv"vjgtghqtg."tgswguvu"vjg"Vtkdwpcn"vq"tglgev"vjg"crrnkecvkqp0"}$

Eqpuk fgt cvkqpu"

440Å Vjg" crrnkecvkqp" ku" tgegkxcdng0" Vjg" kuuwg" ku" cdqwv" oqfcnkv{" qh" yqtm" htqo" qwvukfg"vjg" fwv{"uvcvkqp." yjkej "pqy."kp"vjg"gtc"qh" EQXKF/3;."jcu"dggp" ocfg" ykfgn{" cxckncdng" vq" uvchh" ogodgtu" qp" vjg" dcuku" qh" ugxgtcn" rqnke{" fqew ogpvu" etgcvkpi" cp" cf'' jqe'' pqt ocvkxg" htcogyqtm" hqt" yqtmkpi" cttcpig ogpvu0" "C" tghwucn" vq" i tcpv" rgt okuukqp"

$$\begin{split} &Ecug"Pq\&"WPFV1PD\&14242129:"\\ &Qtfgt"Pq\&"3::"*PD\&14242+" \end{split}$$

450Á Cu" eqpegtpu" vjg" Tgurqpfgpvøu" ctiwogpv" tgncvgf" vq" õgzjcwuvkpi" qvjgt" tgogfkguö."vjg"Vtkdwpcn"tgecnnu"vjcv"vjg"eqorgvgpeg"qh"vjg"Vtkdwpcn"ku"fgvgtokpgf"d{" vjg" WPFV" Uvcvwvg" cnqpg" cpf" vjku" eqorgvgpeg" fqgu" pqv" hcmn" vq" dg" oqfkhkgf" d{" cfokpkuvtcvkxg" kuuwcpegu=" nkmgykug." vjg" ncvvgt" owuv" pqv" dg" cvvtkdwvgf" ngicn" ghhgev" kpeqpukuvgpv" ykvj"vjg"Uvcvwvg0"Coqpi"qvjgtu."ctv0"4"qh"vjg"WPFV"Uvcvwvg"fgvgtokpgu" gzrtguun{" cpf" gzjcwuvkxgn{" vjg" korcev" qh" cfokpkuvtcvkxg" rtqeggf

Ecug"Pq & "WPFV1PD & 14242129:"

 $Qtfgt"Pq \& "3::"*PD \verb"M14242+"$

Rcig": "qh"32"

 $490 \text{\'A} \qquad \text{Kp"uw\,o\,o\,kp\,i\,"wr."vj\,g"Tgurqpfgpv@u"ct\,i\,w\,o\,gpv"ku"gpvktgn\{\,\text{"}\,o\,kurnceg\,f0", \, \text{1.00} \text{$1.$

Ogtkvu"

4;0\(\hat{\text{M}}\) Vjku"Vtkdwpcn"citggu"ykvj"vjg"Tgurqpfgpv"vjcv"vjg"tgswktgogpv"qh"rtkoc"hcekg" wpncyhwnpguu"ycu"pqv"ocfg"qwv0"Vjg"Crrnkecpv"jcu"pq"tkijv"vq"vgngeqoowvg="vjg"ocvvgt"dgnqpiu"kp"vjg"ctgc"qh"dtqcf"ocpcigtkcn"fkuetgvkqp0"Yjgtgcu"kpfkxkfwcn"pggfu"qh"uvchh"ogodgtu."cpf"jgcnvj"korgfkogpvu"coqpi"vjgo."ctg"korqtvcpv"eqpukfgtcvkqpu"tgeqipk|gf"kp"vjg"tgngxcpv"rqnke{"fqewogpvu."cp{"fgekukqp"qp"vjg"encko"vq"dg"ceeqooqfcvgf"hqt"rgtuqpcn"tgcuqpu"owuv"cnuq"vcmg"kpvq"ceeqwpv"vjg"pgeguukv{"vq"ockpvckp"rtqrgt"qrgtcvkqp"qh"vjg"Qticpk|cvkqp0"Vjg"swguvkqp"ku"vjwu"cdqwv"dcncpekpi"eqorgvkpi"pggfu0"

520\(\delta\) Kv" ku" wpfkurwvgf" \(\delta\)" o qtgqxgt" swkvg" qdxkqwu" /" vjcv" vjg" rqukvkqp" qh" Rtqvgevkqp" Qhhkegt"cv"vjg"Ejknf"Rtqvgevkqp"Wpkv"tgswktgu"c"rtgugpeg"qp"vjg" i tqwpf0""Vjg"Crrnkecpv" jcu" dggp" rj {ukecnn {"cdugpv"htqo"vjg" Okuukqp"hqt"c" {gct"pqy."cu"chvgt" jgt"ukem"ngcxg" ujg" ycu" rgt okvvgf" vq" yqtm" htqo" jqog" hqt" ugxgtcn" oqpvju0" Uwej" c" nqpi" cdugpeg" kpgxkvcdn {"rwv"c"dwtfgp"qp"vjg"Wpkv0"Vjg"Vtkdwpcn"cnuq"gpfqtugu"vjg"ctiwogpv"vjcv"kp" uq"hct"cu"vjg"encko"ku"dcugf"qp"vjg"Crrnkecpvøu"eqpfkvkqp"cpf"vjg"rcpfgoke."vjgtg"ku"pq" rquukdknkv{"vq" rtgfkev"vjcv"cp{"qh"vjgug"gngogpvu" yknn"dg"cnngxkcvgf"kp"vjg"hqtguggcdng" hwvwtg0"Rgtrgvwcvkpi"vjg"ukvwcvkqp"vjwu"dgiu"vjg"swguvkqp"qh"vjg"Crrnkecpvøu"hqt" yqtm0"Kp"vjg"ncvvgt"tgurgev."kp"Cwiwuv"4242"vjg"Crrnkecpvøu"eqp

$$\begin{split} &Ecug"Pq0\ensuremath{\mbox{\sc FV1}}\mbox{PD\ensuremath{\mbox{\sc I}}\mbox{4242129:"}}\\ &Qtfgt"Pq0\ensuremath{\mbox{\sc I}}\mbox{"}3::\ensuremath{\mbox{\sc I}}\mbox{"}\mbox{PD\ensuremath{\mbox{\sc I}}\mbox{4242+"}} \end{split}$$

530Å Cnvqigvjgt" vjg" korwipgf" fgekukqp" fqgu" pqv" fkuenqug" wptgcuqpcdngpguu" qt" fkurtqrqtvkqpcnkv{." cu" uwej " kv" ku" pqv" rtkoc"hcekg" wpnc y hwn0" Vjku" gpvcknu" tghwucn" qh" vjg" crrnkecvkqp" hqt" uwurgpukqp" qh" cevkqp0" Vjg" Vtkdwpcn" pggfu" pqv" cfftguu" vjg" tgockpkpi" kuuwgu0""

QTFGT"

 $540 \text{\AA} \qquad Vjg"crrnkecvkqp"ku"tghwugf0"$

 $\label{eq:continuous} $$ $^*Ukipgf^{+"}$ Lwfig^*Cipkgu|mc"Mnqpqykgemc/Oknctv" Fcvgf"vjku"4; $^{vj''}fc{"qh"Ugrvgodgt"4242"}$

 $Gpvgtgf"kp"vjg"Tgikuvgt"qp"vjku"4;^{vj}"fc\{"qh"Ugrvgodgt"4242"$

 $\label{eq:continuity} $$ $^*Ukipgf^*$ $$ Cdgpc$ $Mycm{g/Dgtmq."Tgikuvtct."Pcktqdk"} $$$