

A U`]a Vi` <]`` `GYb[[] [] Gi bgYh
J]Yk dc]bh]b`@ca Vc_

J c`gh`bX][Yf`F Y]gYZ\`fYf`ni a`A U`]a Vi` <]``ž`Y]bYa`XYf`
VYghYb`5i gg]W`hgd i b_hY`VY]`GcbbYbi bhYf[Ub[`]b`XYf`B`À`Y`
j cb`GYb[[] []`Ui Z`XYf`ϕ`gY``@ca Vc_`"A U`]a Vi` <]``]gh`Y]b`
5i gg]W`hgd i b_h`Ub`XYf`?`ØghYbgd]hnY`]b`@ca Vc_`ž`XYf`U`g`
Y]bYf`XYf`VYghYb`C`fhY`Z`Øf`GYb[[] []!`GcbbYbi bhYf[`Àb[Y`
VY`Ub`bh]`gh``8`Yf`<`Ui`dh`\`Ø[Y``]gh`Y]bY`[fUgVYk U`W`gYbY`
@]W`hi b[`a`]hj`YfY]bnY`hYb`DU`a`Yb`i`bX`ØVYfV`]W`h`XYb`
C`nY`Ub`]b`F`]W`hi b[`XYf`;`]!]`ϕ`gY`b``5`b`ZU`\`fh`ni a`A U`]a Vi` <]``
f`bi`_]h`A U`]a Vi` Ł`K`Ybb`G]Y`[Y`Z`FU[h`k`Yf`XYb`ž`k`c`XYf`VYghY`
5i gg]W`hgd i b_h`Ui Z`XYb`GcbbYbi bhYf[Ub[`]j`cb`GYb[[] []]`ghž`
Yf`\`U`hYb`G]Y`\`Ài`Z[`X]Y`5`bhk`cfh`A U`]a Vi` <]``5i Z`XYb`
YfghYb`6`]W`_`VY];`cc[`Y`g]b`X`G]Y`Y`Xc`W`a`Ò[`]W`Yfk`Y]gY`
Yhk`Ug`j`Yfk`]ffhž`k`c`g]W`XYf`hUhg`À`W`]W`Y`/`Ua`d`Λ`Y``]d`/`

J c`gh`bX][Yf`F Y]gYZ\`fYf`ni a`A U`]a Vi` <]``ž`Y]bYa`XYf`VYghYb`
5i gg]W`hgd i b_hY`VY]`GcbbYbi bhYf[Ub[`]b`XYf`B`À`Y`j`cb`GYb[[] []`
Ui Z`XYf`ϕ`gY``@ca Vc_`"

A U`]a Vi` <]``]gh`Y]b`5i gg]W`hgd i b_h`Ub`XYf`?`ØghYbgd]hnY`]b`
@ca Vc_`ž`XYf`U`g`Y]bYf`XYf`VYghYb`C`fhY`Z`Øf`GYb[[] []!`
GcbbYbi bhYf[`Àb[Y`VY`Ub`bh]`gh``8`Yf`<`Ui`dh`\`Ø[Y``]gh`Y]bY`
[fUgVYk U`W`gYbY`@]W`hi b[`a`]hj`YfY]bnY`hYb`DU`a`Yb`i`bX`
ØVYfV`]W`h`XYb`C`nY`Ub`]b`F`]W`hi b[`XYf`;`]!]`ϕ`gY`b``"

5 bZU`\fh`ni a`A U`]a Vi` <]``f`bi`_]h`A U`]a Vi` Ł

K`Ybb`G]Y`[Y`Z`FU[h`k`Yf`XYb`ž`k`c`XYf`VYghY`5i gg]W`hgd i b_h`Ui Z`XYb`
GcbbYbi bhYf[Ub[`]j`cb`GYb[[] []]`ghž`Yf`\`U`hYb`G]Y`\`Ài`Z[`X]Y`
5`bhk`cfh`A U`]a Vi` <]``5i Z`XYb`YfghYb`6`]W`_`VY];`cc[`Y`g]b`X`G]Y`
Y`Xc`W`a`Ò[`]W`Yfk`Y]gY`Yhk`Ug`j`Yfk`]ffhž`k`c`g]W`XYf`hUhg`À`W`]W`Y`

GhUbXcfh'VYZ]bXYh"

8Yf'cZZ]n]Y`Y'A U`]a Vi '<]'`]gh'XYf'\ØW ghY'Di b_h'XYf'@UbXni b[Y
Ui ZXYf'GØXgY]hY'XYg'A U`]a Vi '6YUW`"9g]gh'Ui Z; cc[`Y'A Udg'U`g
6i_]h'A U`]a Vi 'a Uf_]Yfhž'k Ug'Y][Ybh]W`X]fY_h' A U`]a Vi '<]'`
VYXYi hYh'"8]Yg']gh'Y]b'VfY]hYf'DUf_d`Uhm']b'XYf'?i fj Y'a]h'6`]W`Ui Z
XUg'A Yf'i bX'XYb'GhfUbX'j cb'A U`]a Vi "

5i ZXYf'UbXYfYb'GY]hY'XYg'A U`]a Vi '6YUW`VYZ]bXYh'g]W`YXcW`
Y]b'k Y]hYfYf'5i gg]W`hgd i b_hž'XYf'gck c\`U`g'A U`]a Vi '7`]ZZ'U`g
Ui W`U`g'A U`U`U`<]'`VY`Ubbh']gh" 'A Y]bYf'A Y]bi b['bUW`']gh'X]YgYf
<Ø[Y`ž'cV k c\`Yf'b]W`h'gc`cW`']gh'k]Y'X]Y'gØX`]W`Yž'cZZ]n]Y`Y
GY]hYž'Y]b'bcW`'VYggYfYf'5i gg]W`hgd i b_hž'XU`G]Y`Ui Z'XYb
[fUgVYk UW`gYbYbž'dU`a YbVYk UW`gYbYb'<Ø[Y`\]bUi g[Y\Yb
_ØbbYbž'i a `XYb'GcbbYbi bhYf[Ub['ni `VYcVUW`hYb"

⇒W` \UVY'VY]XY'GYb[[]!GcbbYbi bhYf[Ub[g!5i gg]W`hgd i b_hY'Ui Z
XYf'?UfhY'i bhYb'a Uf_]Yfhž'XUa]h'G]Y'g]Y`Y]W`hYf'Z]bXYb'_ØbbYb"
9g'gc`hY'i b[YZ\`f%) 'A]bi hYb'XUi Yfbž'i a `j cb'GYb[[][\]Yf\Yf
ni `ZU\FYbž'k Ybb'G]Y'X]Y`_i fj YbfY]W`Y'?ØghYbghfU» Y'bUW`'BcfXYb
bY\`a Yb"

K Ybb'G]Y`_Y]b'A chcffUX`\UVYbž'UVYf'hfchnXYa `XYb
i b[`Ui V`]W`Yb'5i gg]W`hgd i b_h'GYb[[][\]VY]'GcbbYbi bhYf[Ub[
Yf'YVYb'a ØW`hYbž'_ØbbYb'G]Y`Y]bY`@CA 6C?!HCI F': , F'I BH9F`" ,
I G8`Vi W`Ybž'X]Y`Ua `A U`]a Vi '<]'`ni a `GcbbYbi bhYf[Ub[`YbXYh"

A 9<F`@CA 6C?!F 9-69-899B.`J C@@GHÿ B 8 ÷ 9F
F I 7?G57?@9#; 589B`': , F`@CA 6C?

5i gg]W`hgd i b_h'A U`]a Vi '<]'`

GcVU`X`G]Y`Ub[Y_ca a Yb'g]bX'i bX'⇒f'A chcffUX`cXYf'5i hc
[YdUf_h`\UVYbž'_ØbbYb'G]Y`Ui Z'XYb'VYhcb]YfhYb'K Y[
\]bUi g[Y\Ybž'i a `Y]bYb'k Y]hYb'6`]W`Ui ZXUg'A Yf'i bX'XYb
GhfUbX'j cb'A U`]a Vi 'ni `[Yb]Y» Yb"

8U`X]Yg`X]Y`\ØW`ghY'@UbXni b[Y`Ub'XYf'GYb[[]!?'ØghY']ghž']gh'Yg

Y]b`dYfZY_hYf`Cfhž`i a`X]Y`j`cfVY][`Y]hYbXYb`6cchY`ni`VYcVUW`hYb
i bX`ni`VYcVUW`hYbž`k]Y`X]Y`GcbbY`\]bhYf`XYa`<cf]ncbh
j`YfgW`k]bXYh"

5i » YfXYa`YVh`\]Yf`]b`6i`_]h`A`U`]a`Vi`Y]bY`5ZYbZUa`]]Y`"G]Y
Z]bXYb`g]Y`cZ]j`ca`5i`gg]W`hgd`i`b`_h`U`i`g`]b`XYb`DU`a`Yb`Ua`F`UbX
XYf`?`]ddY"

- `U`h1` G9B; ; ÷ ÷5I`GG=7`<HGDI`B?H9`A`5@A`6I`A`5@5?`5
2
- `U`h1` A`5@A`6I`!5: : 9B`B`@CA`6C?`2

GI`7<9B`G`9`8`9B`5: : 9BK`5@8`J`C`B`@CA`6C?`3`@9G9B`G`9`<`9F
8`9B`J`C`@@GH`B`8 ÷ 9B`6@C;`!DC`GH"

A`U`]a`Vi`7`]ZZ`5i`gg]W`hgd`i`b`_`h

5b`XYf`B`cfX`gY]hY`XYg`A`U`]a`Vi`6YUW`VYZ]bXYh`g]W`X]Y`A`U`]a`Vi
7`]ZZ`8]Y`a`Y]ghYb`A`YbgW`Yb`VYn]Y`Yb`g]W`Y`X`c`W`h`Uhg`A`W`]W`U`i`Z
X]YgYb`5i`gg]W`hgd`i`b`_hž`k`Y`bb`g]Y`A`U`]a`Vi`<`]Y`fk`À`b`Yb`"A`Y]bYf
A`Y]b`i`b[`b`UW`]gh`X]Yg`XYf`VYggYfY`5i`gg]W`hgd`i`b`_h`i`b`X
k`U`f`g`W`Y]b`]W`a`Y]b`@]YV`]b[`gc`fh`ZØf`XYb`GcbbYb`i`bhYf[`Ub[`]b
GYb[[]]"

9g[]Vh`Ui`gfY]W`YbX`D`Uhn`ni`a`Duf`_Yb`gck`c`\`Y]bYg`5i`hc`g`U`g
Ui`W`Y]bYg`A`c`h`c`f`f`U`X`g"K`Y`bb`G]Y`k`À`f`Y`b`X`XYg
GcbbYb`i`bhYf[`Ub[`g`ni`6Ygi`W`_`ca`a`Ybž`a`ØggYb`G]Y`&\$\$\$`8F
VYnU`Ybž`i`a`Δ`f: U`f`f`U`X`U`V`ni`ghY`Yb"

5i`Z`XYf`]b`_Yb`GY]hY`gY`Yb`G]Y`A`U`]a`Vi`6YUW`i`b`X`XYb
5i`gg]W`hgd`i`b`_h`A`U`]a`Vi`"5i`Z`XYf`Ub`XYfYb`GY]hY`\`UVYb`G]Y`Y]bYb
6`]W`_`Ui`Z`XYb`gdY`_h`U`_i`À`f`Y`b`B]d`U`\`6YUW`i`b`X`X]Y`;]]!`b`gY`bž`X]Y
Ua`<cf]ncbh`Ui`Zh`Ui`W`Y`b"

GI`7<9B`G`9`B`57<`8`9B`6`9GH9B`GHF`Y`B`8`9B`B`G9B; ; ÷ ÷3`@9G9B
G`9`8`9B`J`C`@@GH`B`8 ÷ 9B`6@C;`!DC`GH"

6YghY`@U[Y`VY]`GcbbYb`i`bhYf[Ub[`]b`GYb[[]]"

DU`a `HfYY`<]`

: Øf`X]Y`VYghY`5i gg]W`h`Ui Z`XYb`GcbbYbi bhYf[Ub[` [Y\Yb`G]Y`Ub
XYb`J`Yf`_Ui Zggh`ÅbXYb`j`cfVY]`Ui Z`XYb`[fUgVYk UW`gYbYb`< Ø[Y`
a`]hgY`hgUa` [YgdfYb`_Y`hYb`DU`a` Yb`"8]YgYf`5VgW`b]h`h`XYg
A`U`a` Vi` `<`≡`]gh`[fØ`»`hYbhY]`g`[Yf`Åi` a` hi` bX`V]YhYh`Y]bYb`k`Y]hYb
6`]W`_Ui Z`XUg`A`YYf`"8]Yg`]gh`Ui W`Y]b`[fc`»`Ufh][Yf`C`fhž`i` a`Y]b][Y
]_cb]gW`Y`GYb[[]] !GcbbYbi bhYf[Ub[gZ`hc`g`ni`a` UW`Yb`"

K`Ybb`G]Y`ni` a`F`UbX`XYf`?`]ddY`\]bi bhYf[Y\Ybž`[]Vh`Yg`Y]bYb
DZUXž`XYf`Yhk`Ug`k`Y]hYf`bUW`i`bhYb`ZØ`fhž`k`c`G]Y`≠`fYb`Y][YbYb
UV[Y`Y[YbYb`6YfY]W`Z]bXYbž`i` a`XYb`GcbbYbi bhYf[Ub[`ni
VYcVUW`hYb`"

U`h1` GC`BB`9BI`BH9F;`5B;`GG`=7`<`HGDI`B`?`H`G9B;` ;`÷`=`2`

GYb[[] [] `I` bhYf`_i` bZhgzØ\ fYf

I`bhYf`_i`bZh`]b`GYb[[] []

A`9`B`9`I`BH9F`?`I`B: `H`B`G9B;` ;`÷`≡`C`M`C`*`(`)` ;`fYYb`5gf]`b
GYb[[] []`ØVYfbUW`hYhY`]W`]b`X]YgYa`_`Y]bYb`<`chY`a`]h`Dcc`ž
f]Yg][Ya`6UXYn]a`a`Yf`i`bX`:`YfbgY\Yf`ZØf`bi`f`-`8`c`Uf`d`fc`B`UW`h`
≠W`V]b`a`]f`b]W`h`g]W`Yfž`c`V`Yg`g]W`i`a`Y]b`GcbXYfUb[YV`ch]b`XYf
B`YVYbgU]gcb`\UbXY`hYž`UVYf`Yg`]gh`XYZ]b]h]j`XUg`VYghY`DfY]g!
@Y]ghi`b[g]J`Yf`\`À`hb]g`]b`GYb[[] []`ZØf`X]YgYb`DfY]g`"9g`]gh`Y]b`k`Yb][
UVgY]hg`XYg`<`Ui`d`hgW`U[gž`UVYf`Yg`c`\bh`g]W`Ui`Z`Y`XYb`:`U`"
K`Ybb`G]Y`\]Yf`Vi`W`Ybž`j`YfdUggYb`G]Y`b]W`h`<`Yb`fmž`XYb
GhfU»`Yb`\`ÅbX`Yf`i`a`X]Y`9W`Y`"9f`a`UW`h`Y]b][Y`XYf`VYghYb
;`Yk`Øfn`_UZZYgž`X]Y`]W`Y`d`fc`V]Yfh`\UVYž`i`bX`V]YhYh`A`U`\`nY]hYb
XYf`<`chY`_`UggY`ZØf`%`&`\$\$\$`≠`F`Ub`"

U`h1` ;`F`_`B`9G`5GF`≠`@`CA`6C`?`2`

GHF`5B`86`@`=7`?`5I` :`8`9B`GC`BB`9BI`BH9F;`5B;`5I` :`8`9F`?`@`DD9
:`,`F`I`BH9F`(`\$`~`DUg]Z]W6YUW`7`chhU[Yg`K`Ybb`]W`]b`GYb[[] []
Y]b`\`Ø`YfYg`6i`X[Yh`\`À`hYž`k`ÅfY`X]Yg`XYf`C`fhž`XYb`]W`[YVi`W`h
\`À`hY`"9g`]Y[h`Ub`XYf`?`ØghY`]b`XYf`B`Å`Y`j`cb`GYb[[] []`6YUW`ž`k`c
G]Y`j`cb`≠`fYa`6U`_cb`cXYf`XYa`Dcc`Ui`g`X]Y`5i`gg]W`h`[Yb]Y»`Yb
_ØbbYb`"≠`6Yni`[`Ui`Z`XYb`K`Yfh]gh`X]Yg`gc`[i`hž`k`]Y`G]Y`Yg`

j]Y`Y]W\h]b [Ubni@ca Vc_`Z]bXYb`k YfXYb"

`U`h1 D5G≐ ⇒ `657< `7C HH5; 9G`@CA 6C? `B8CB9G⇒B
I BH9F?I B: H 2

U`h1 A 5@A 6I `< @G9B; ; ≐ =

GCBB9BI BH9F; 5B; GG⇒< HGDI B?H 2

U`h1 ?@DD9`JCB`A 5@A 6I ž'8 ⇒`GHF 5B8`JCB`A 5@A 6I
6@⇒?H 2

U`h1 A 5@A 6I `< @G9B; ; ≐ =

GCBB9BI BH9F; 5B; GG⇒< HGDI B?H 2

U`h1 A 5@A 6I `< @G9B; ; ≐ =

GCBB9BI BH9F; 5B; GG⇒< HGDI B?H 2

`U`h1 A U`ja Vi !<Ø[Y`!@ca Vc_` 2

"

8YhU]`g

6Ygi W\Yb`G]Y`i bg`Ui Z. `Y]bY!fY]gY"XY