

# **CRIM1010**

7 f]a ]bc`c[ m˙5b˙±bffcXi W•]cb

HYfa "C bY" ## "&\$&\$

# 7ci fgY<sup>.</sup>Cj Yfj ]Yk

## 7ci fgY 8YHJ] g

7 fYX]hDc]bhg\*\*

## Gi a a UfmcZh\Y 7ci fgY

Gi VYWi5fYU. '7 f]a ]bc`c[ mi+blfcXi Wyg'h\Y'\_YmWcbWydhg'UbX'WyffYbhXYVUhyg']b'Wf]a ]bc`c[ mi'7 cj Yfg'VUg]W ]ggi Yg'gi W'Ug'h\Y'XYZ]b]h]cbz'a YUgi fYa YbhUbX'Yl d`UbUh]cbg'cZWf]a Yz'gcWJYhU`'fYUWf]cbg'hc'Wf]a Yz'Wf]a ]bc`c[ ]WU`'h\Ycf]Ygz'h\Y'fc`Y'cZfYgYUfW\'UbX'h\Y']bZi YbW''cZWf]a ]bc`c[ mcb'di V`]Wdc`]Wh'

#### 7 ci fgY @YUfb]b[ Ci hWca Yg

- %" Cih]bY:h\Y:gWcdYž:U]a g:UbX:dfUWfWyg:cZ7f]a ]bc:c[mUg:U:X]gWd:]bY/
- &" ⇒XYbhZm\_Ymd`UmYfgžh\Ya Yg`UbX`XYVUhYg`UVci hWf]a Y
- ' " 8 Ya cbglfUlY 'Ub'i bXYfglUbX]b[ 'cZ\_YmWf]a ]bc'c[ ]WJ`'l\Ycf]Yg'UbX'WcbWYdlg'l\fci [ \`Wf]h]WJ` Yb[ U[ Ya Ybhk ]h\``]hYfUli fYž'bYk g'UbX'ch\Yf'a YX]U
- ("8YgWf)VY'U'j Uf)YhmcZk Umg'hc'XYZ|bYža YUgi fY'UbX'YI d'U]b'Wf]a Y
- )" I bXYfgHJbX`JbX`i gY`VJg]WhYfa ]bc`c[mWca a cb'hc'h\Y'Wf]a ]bc`c[]WJ``Z]Y`X
- \*" H\]b\_'Wf]h]WU``m'UVci h'Wf]a Y'UbX']hg'WUi gYg
- +" 5bU`mgY`Wf]a Y`dfcV`Ya g`i g]b[`VUg]WWf]a ]bc`c[]WU``dYfgdYWfj Yg

## HYUWX]b[ GhfUhY[]Yg

H\]g`Wci fgY`fYei ]fYg`bc`df]cf`\_bck `YX[Y`]b`7 f]a ]bc`c[m" & `UVWcfXUbW' k ]h\ I BGK `@YUfb]b[ 'UbX HYUW\]b[; i ]XY`]bYg`k Y`YI dYWhc Yb[ U[ Y`mci ']b``YUfb]b[ 'h\fci [\'U`Wca V]bUh]cb`cZ`YWh fYgž'h hcf]U`gž ]bX]j ]Xi U``fYUX]b[ 'UbX`gh Xmž[i ]XYX`h ]h]cb`Zca '[i Ygh`YWh fYfg`UbX`UWUXYa ]Wg`k \c`UfY`UWhj Y fYgYUfW\Yfg`]b`h\Y`Z]Y`Xž'a YUb]b[ Z``ZYYXVUW\_`cb`k f]hhYb`k cf\_`UbX`h hcf]U``dUfh]W]dUh]cbž'UbX`ghi Wh fYX UWhj ]h]Yg`h\UhYbWci fU[ Y`]bXYdYbXYbhh\]b\_]b[ 'UbX`h\Y`XYj Y`cda YbhcZX]gW]d`]bUfm\_bck`YX[ Y`UbX UWUXYa ]Wg\_]``g"

K Y'gYY'I BGK 'ghi XYbh`YUfbYfg'Ug'UWhjj Y'dUfhjWjdUbhg']b'h\Y'dfcXi Whjcb'cZ\_bck `YX[Y"'H\]g'Wci fgYdf]cf]hjgYg'`YUfb]b[!Vm!Xc]b['UbX'U]a g'hc'ZcghYf'U'gd]f]hcZWf]hjWU`'h\ci [\h'UbX'UWhjj Y'Ybei ]fm]b'U`''ghi XYbh `YUfbYfg"'#i]g'YggYbhjU`'h\Uh'mci 'hU\_Y'ck bYfg\]d'cZmci f'ghi X]Yg'UbX'k cf\_'cb'XYj Y`cd]b['mci f'g\_]``g'Ug'Ub ]bXYdYbXYbh`YUfbYf.

%" +b 'fh ]g 'Wci fgY ']h ]g 'Yl dYWYX 'fh Uhmci 'k ] `` 'UhnYbX 'Uh `YUgh, \$i 'cZh\Y'hi hcf]U`g" 'Mci 'bYYX 'hc dUfh]W]dUfY ']b 'Vch\ ``YWi fYg 'UbX'hi hcf]U`g" '5 `` 'ci f``YWi fYg 'UbX'hi hcf]U`g 'UfY ']bhYfUW]j Y" 'DfYdUfUh]cbž `]ghYb]b[ 'UbX'Wf]h]WU` 'Yb[ U[ Ya Ybhk ]h\ 'Wci fgY'a UhYf]U`ž`YUfb]b[ 'Zfca 'mci f'hYUW\Yfg'Vi h'U`gc'mci f dYYfg'UfY 'YggYbh]U` ']b[ fYX]Ybhg'Zcf'U'gi WWfggZ ``Wca d'Yh]cb'cZh\]g 'Wci fgY"

&" Mci 'bYYX'hc'd'Ub'WUfYZ ``m'UbX'i gY'mci f'h]a Y'dfcXi Wh] Y`m']Zmci 'k ]g\'hc'UW\]Yj Y'[ccX'fYgi `hg']b h\]g'Wci fgY"'5```UggYgga Ybh'HUg\_g'g\ci `X'VY'fYgYUfW\YX'UbX'XfUZhYX'k Y```]b'UXj UbW''cZ qi Va ]qq]cb"

' " Mci 'UfY'fYgdcbg]V`Y'Zcf'mci f'ck b``YUfb]b[ /k cf\_'hc'XYj Y`cd'g\_]``g'h\Uhk ]```YbUV`Y'mci 'hc'Yb[ U[ Y Wf]h]WU``mUbX'UbU'mf]WU``mk ]h\`'UWUXYa ]W`]hYfUhi fYž'bYk g'fYdcfh]b[ 'UbX'dc`]WmXcW a Ybhg"'H\Y'[ cU` cZh\]g'Wci fgY']g'bchhc'VY'UV`Y'hc'fYdfcXi WY'h\Y'WcbhYbh]b''U'XYgWf]dh]j Y'a UbbYf/k Y'k ]```Ugg]gh mci 'hc'VYWca Y'`]hYfUhY']b''UWUXYa ]WfYgYUfW\'g\_]``g'k ]h\'h\]g'Wci fgY'Ug'h\Y'Z[fghighYdd]b[!ghcbY]b

# 5ggYgga Ybh

8 YHJ] YX 'UggYgga Ybh']bglfi Wfjcbg'UbX'a Uf\_]b['fi Vf]Vg'k] ``VY'a UXY'Uj U] `UV'Y'rc'ghi XYbhg'Uhi\Y'VY[]bb]b[cZgYa YghYf'cb'A ccX'Y"'K Y'k] ``\Uj Y'h]a Y']b'h\Y'h rcf]U'g'rc'X]gW gg'h\Y'Yl dYWfUh]cbg'Zcf'YUWX UggYgga Ybh'HUg\_"'\D 'UXX]h]cbz'A ccX'Y'X]gW gg]cb'VcUfXg'k] ``VY'gYhi d'Zcf'YUWX 'UggYgga Ybh'HUg\_'UbX ghi XYbhg'UfY'ghfcb[`mYbWci fU[YX'rc'j]g]hh\YgY'fY[i `Uf'mUbX'i gY'h\Y'VcUfXg'rc'Ug\_'ei Ygh]cbg'UVci hh\Y HUg\_g"'H\ci [\acksir achei Ygh]cbg'k] ``VY'Wcj YfYX'Xi f]b['h rcf]U`gz'h rcfg'Xc'\Uj Y'Ub'UXX]h]cbU``Wcbgi `HUh]cbha Y]b'h\Y'k YY\_VZcfY'YUWX'UggYgga Ybh''9a U]`'rc'cf[Ub]gY'h\]g"

## 5ggYgga Ybh'HUg\_g'

5ggYgga Ybh'hJg_	K Y][ \h	8i Y'8UHY	Gh XYbh@YUfb]b[ Ci hWca Ygʻ5ggYggYX
5bbchJhYX'V]V']c[fUd\mi	(\$1	&+#\$' #&\$&\$`%\$.\$\$`DA	' ž) ž*
6f]YZ]b[ 'dUdYf'	*\$1	\$, #\$) #&\$&\$`%\$.\$\$`DA	%ž&Ž ž( ž) ž+

## 5ggYgga Ybh'8YHJ]`g

5ggYgga Ybh% 5bbcHJhYX V]V`]c[fUd\m

GhUfh XUhY.

**@Yb[h**\."\\\$\\$"k cfXg"Y| \\M X]b["fYZYfYb\\Yg"

**‰** igY

±bglfi Wf]cbg'UfY'dfcj]XYX'cb'AccX'Y"

 $\label{thm:continuous} \begin{tabular}{ll} Hi fb]h]b"gYh]b"[."H\]g"Ugg][ba Ybh]g"gi Va]hhYX"h\fci [\Thi fb]h]b"UbX"ghi XYbhg"WUb"gYY"Hi fb]h]b"g]a]"Uf]hm fYdcfhg" \end{tabular}$ 

#### 5 hmy b X Ub WY F Yei ] f Ya Yb hg

#b 'h\]g'Wci fgY']h]g'Yl dYWhYX'h\Uhmci 'k]```UlhYbX'Uh`YUgh, \$\land \czh\Y'hi hcf]U'g']b'dYfgcb'fmci 'WUb'a ]gg'bc a cfY'h\Ub'&'hi hcf]U`g\!"H\YfY']g'gca Y'ZYl ]V]`]mm'c 'UlhYbX'U'X]ZZYfYbhhi hcf]U`hc'h\Y'cbY'U``cWUhYX'cb'Ub cWWUg]cbU``VUg]g'hc'Wcj Yf']`bYgg# bYl dYWhYX'Yj Ybhg"'`5hhYbXUbW']b'dYfgcb'Uh'@YWhi fYg']g'bchfYei ]fYX\ck Yj Yf'mci 'UfY'Yl dYWhYX'hc'UWWygg'h\Y'fYWcfX]b['cb`]bY']Zbch']b!dYfgcb"'H\Y'a U'cf]hmcZghi XYbhg'Xc UhYbX'h\Y'`YWhi fY']b'dYfgcb'Ug']h\Y`dg'a U\_Y'gYbgY'cZh\Y'k YY\_`mhcd]W'

# 7ci fgY GWX YXi `Y

J]Yk WUgg'ha YHUV'Y

H]a YtUV`Y

8UhY	HmdY	7 cbhYbh
K YY_'%''%+'': YVfi Ufm!''&% : YVfi Ufm	Hcd]W	±blfcXi Whjcb. WcbWhdhg cZWhja Y7 XYj ]UbWh
K YY_'&.'&(		<b>%</b> %

F Ygci fWYg

DfYgWf]VYX F Ygci fWYg

Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

Hi fb]h]b Gi Va ]gg]cb

\_Zmci YbWci bhYf'U'dfcV`Ya 'k \Yb'UhYa dhJb[ 'hc'gi Va ]hmci f'Ugg][ ba Ybhh\fci [ \ 'Hi fb]hJbž'd`YUgY
hY`Yd\cbY'9| hYfbU``Gi ddcfhcb'-', ) '' ' ' %cf'Ya U]`'h\Ya 'cb'Y! hYfbU`hY`hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY\_XUmg'UbX'-.\$\$Ua '-') .\$\$da 'cb'k YY\_YbXg'fl \*) 'XUmg'U'mYUft'' =Zmci
UfY'i bUV`Y'hc'gi Va ]hmci f'Ugg][ ba YbhXi Y'hc'U'ZUi 'hk ]h\'Hi fb]hJb'mci 'a Um'Udd'mZcf'Ub'Y! hYbg]cbžVi hmci
a i ghfYhU]b'mci f'hJW\_Yhbi a VYf'Zfca '9! hYfbU``Gi ddcfhfU'cb[ 'k ]h\'Ubmch\Yf'fY`Yj UbhXcW a Ybhgt'hc
]bWi XY'Ug'Yj ]XYbW'hc'gi ddcfhmci f'Y! hYbg]cb'Udd`]WUhJcb'' =Zmci 'Ya U]`'9! hYfbU``Gi ddcfhmci 'k ]``

# $5\,WUXYa\,W< cbYghmUbXDU[\,Uf]ga$

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i=iWUbiHU\_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW\_bck iYX[Ya Ybh'i

- i bXYfgHUbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'gh XYbhUhI BGK
   VY'Uk UfY'cZd`U[]Uf]ga ž'Wcdmf][\hz'I BGK 'Gh XYbh7cXY'cZ7cbXi WhUbX'5VWWdhUV`Y'I gY'cZ IBGK =7 HF Ygci fWrg Dc`]Wh

# 5 WUXYa ]W±bZcfa Uhjcb

: cf`YggYbhJU``gh XYbh]bZcfa UhJcb`fY`UhJb[ 'hc.

- fYei YghgʻZcfʻYl hYbg]cb/`UhYʻgi Va ]gg]cbgʻ[i ]XY`]bYg/
- fYj ]Yk 'cZa Uf\_g/
- I BGK < YU`h\ UbX GUZYmdc`]W]Yg/
- YI Ua ]bUh]cb dfcWXi fYg/