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Quality Management

Please provide us with your feedback regarding the Informatik 1 lecture!

<https://qmsl.uzh.ch/de/XELN4> (DE)

<https://qmsl.uzh.ch/en/XELN4> (EN)

The links are also provided in the OLAT forum in the post “Course Evaluation”.



Informatik I HS 18

“Live Coding”

Fallout 3 Word Puzzle

Carol Alexandru

Institut für Informatik

<http://www.ifi.uzh.ch/seal/teaching/courses/info1.html>



Quest

HARD LUCK BLUES



Demo

<http://mitchellthompson.net/demos/terminal/>

ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

```
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * .
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = & _
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #  0x5B7A $ . - : | ? . : ( | ; |
0x342  % ! " # $ % & ' ( ) *  0x166C + - * / & # $ % & ' ( ) *
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /  0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMB0IL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <      0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

What's the puzzle? - Understanding functionality



Fallout 3 Word Puzzle: Basic Features

1. Display n possible passwords

```
2 ATTEMPT(S) LEFT: █ █
0x758A / ^ | | # * $ , . RED    0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -    0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % : 0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL    0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : & 0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _ 0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN    0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - # 0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $ 0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /    0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? / 0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . " 0x1C86 * % . & % @ - $ : = = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,    0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & " 0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G 0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <    0x26E4 MBING ' : ^ @ ? [ & > MANIKIN █
0x08F5 ; ? : - = | > $ : . _ . 0x16FD $ & * ! - ] $ " : . $ _
```


Fallout 3 Word Puzzle: Basic Features

1. Display n possible passwords
2. Allow the user to enter a password

```
2 ATTEMPT(S) LEFT: ■ ■
0x758A / ^ | | # * $ , . RED    0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -    0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % : 0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL    0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : & 0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _ 0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN      0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - # 0x587A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $ 0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /      0x550A ? SCANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? / 0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . " 0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,      0x778C GUMBOIL ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & " 0x0C7B & | ; ' [ ! * ' ' @ ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G 0x88BD / & . ! , * ; - " * L | > 3/7 correct.
0x62B7 AMBLES ? " | / | <     0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ . 0x16FD $ & * ! - ] $ " : . $ _
```

Fallout 3 Word Puzzle: Basic Features

- 1. Display *n* possible passwords
- 2. Allow the user to enter a password
- 3. Process the user-provided password and give feedback:
 - Access granted or denied

```
2 ATTEMPT(S) LEFT: ■ ■
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _   0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x0421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' : /    0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "    0x1C80 * % . & % @ - $ : = = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,         0x778C GUMBOIL ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "    0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G    0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <        0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .    0x16FD $ & * ! - ] $ " : . $ _
```

Fallout 3 Word Puzzle: Basic Features

- 1. Display *n* possible passwords
- 2. Allow the user to enter a password
- 3. Process the user-provided password and give feedback:
 - Access granted or denied
 - How many letters of the password match the correct password? (e.g. 2/5)

```
2 ATTEMPT(S) LEFT: ■ ■
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x0421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' : /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , ] / & " / | ' . "    0x1C80 * % . & % @ - $ : = = , > 1/7 correct.
0x7AFC ^ BUMPKIN | , ' , /      0x778C GUMBOIL : ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | , ' [ ! * ' ! @ , | > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * L I > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
```

Fallout 3 Word Puzzle: Basic Features

1. Display n possible passwords
2. Allow the user to enter a password
3. Process the user-provided password and give feedback:
 - Access granted or denied
 - How many letters of the password match the correct password? (e.g. 2/5)
4. End the program if
 - No more tries left
 - Correct password found ✓

```
2 ATTEMPT(S) LEFT: ■ ■
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

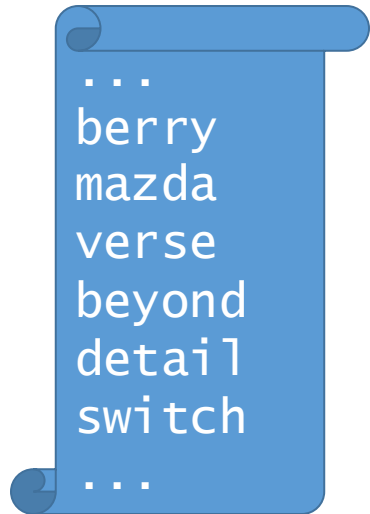
Fallout 3 Word Puzzle: Basic Features

1. Display n possible passwords
2. Allow the user to enter a password
3. Process the user-provided password and give feedback:
 - Access granted or denied
 - How many letters of the password match the correct password? (e.g. 2/5)
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```

2 ATTEMPT(S) LEFT: ■ ■
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
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0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI > 3/7 correct.
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0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
    
```

Fallout 3 Word Puzzle: Ingredients



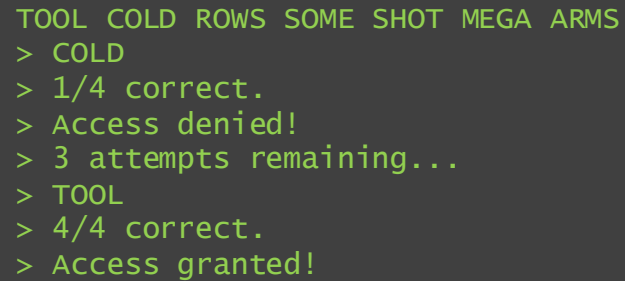
Word list
from
Internet

Fallout 3 Word Puzzle: Ingredients



...
berry
mazda
verse
beyond
detail
switch
...

Word list
from
Internet



```
TOOL COLD ROWS SOME SHOT MEGA ARMS  
> COLD  
> 1/4 correct.  
> Access denied!  
> 3 attempts remaining...  
> TOOL  
> 4/4 correct.  
> Access granted!
```

Game logic
Processing input and giving feedback
Exiting the program eventually

Fallout 3 Word Puzzle: Ingredients

...
berry
mazda
verse
beyond
detail
switch
...

Word list
from
Internet

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```

Game logic
Processing input and giving feedback
Exiting the program eventually

T	O	O	L
↕	↕	↕	↕
C	O	L	D

Comparing
characters of
the solution

Fallout 3 Word Puzzle: Ingredients

...
berry
mazda
verse
beyond
detail
switch
...

```
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> COLD  
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T	O	O	L
↕	↕	↕	↕
C	O	L	D

Word list
from
Internet

Game logic
Processing input and giving feedback
Exiting the program eventually

Comparing
characters of
the solution

Functionality

Fallout 3 Word Puzzle: Ingredients

...
berry
mazda
verse
beyond
detail
switch
...

Word list
from
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```
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Game logic
Processing input and giving feedback
Exiting the program eventually

T O O L
↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓
C O L D

Comparing
characters of
the solution

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL  
ENTER PASSWORD NOW  
  
2 ATTEMPT(S) LEFT: █ █  
  
0x758A /^| |#*$. -RED 0x1204 /@/:&-#GAMB  
0x2593 $KIN/*$:/"+- 0x795B LED;&*!./!@%  
0x7C26 @(/:/%@"):%: 0x7AF8 #-#?:*,$!=@^  
0x265D ^&#^*_LAZUL 0x0438 #.&;|RAHEKI  
0x461E IS--^*&"#%:& 0x32C7 N-*.%|^$*.  
0x1F50 .";@!"$$^!:_ 0x352D '= -@;?,$+=^&  
0x23C5 %;;-/MANIKIN 0x75D8 -^-LANDMAN.  
0x0D1A .@;"^"+%[-# 0x5B7A $.-:|?.:(|;  
0x8421 &%!,]"#|/./$ 0x766C &+$)!.#?@|-/  
0x5DD0 ,*=LANOLIN;/ 0x550A ?&CANIKIN/!| >GAMBLED  
0x565E $-|@|!#{,'?/ 0x29AD =.|_&-!/;&* >Entry denied  
0x0731 |,},&"/|'." 0x1C86 *%._&%@-$;==, >1/7 correct.  
0x7AFC ^BUMPKIN|'!' 0x778C GUMBOIL+?&+. >REDSKIN  
0x6131 :?!.?#=-./&" 0x0C7B &|;'!*'@,> >Entry denied  
0x2FD4 .':,&+._.$_%G 0x88BD /&.!,*;- '*LI >3/7 correct.  
0x62B7 AMBLES?"|/|< 0x26E4 MBING':^@?|& >MANIKIN█  
0x08F5 ;?:-|=|>$:._. 0x16FD $&*!-|]$":.$_
```

Decorative components
Random characters
History formatting

Functionality

Fallout 3 Word Puzzle: Ingredients

...
berry
mazda
verse
beyond
detail
switch
...

Word list
from
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Game logic
Processing input and giving feedback
Exiting the program eventually

T O O L
↑ ↓ ↑ ↓ ↑ ↓ ↑ ↓
C O L D

Comparing
characters of
the solution

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: █ █

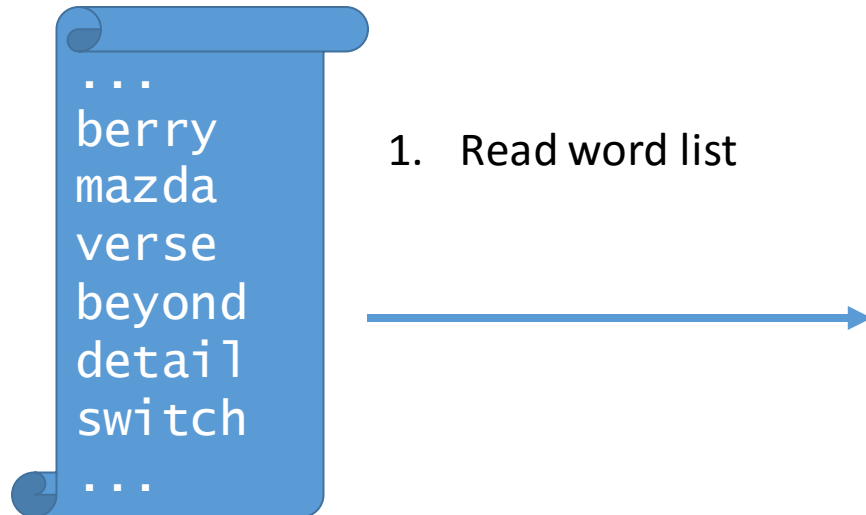
0x758A /^| |#*$. -RED 0x1204 /@/:&-#GAMB
0x2593 $KIN/*$:/"+- 0x795B LED;&*!./!@%
0x7C26 @(/:/%@"):%: 0x7AF8 #-#?:*,$!=@^
0x265D ^&#^*_LAZUL 0x0438 #.&:;|RAHEKI
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0x1F50 .";@!"$$^!:_ 0x352D '= -@;?,$+=^&
0x23C5 %; -/MANIKIN 0x75D8 -^-LANDMAN.
0x0D1A .@;"^"+%[-# 0x5B7A $.-:|?.:(|;|
0x8421 &%!;]"#|/./$ 0x766C &+$)!.#?@|-/
0x5DD0 ,*=LANOLIN;/ 0x550A ?&CANIKIN/!| >GAMBLED
0x565E $-|@|!#{,'?/ 0x29AD =.|_&-!/;&* * >Entry denied
0x0731 |,},&"/|'." 0x1C86 *%.&%@-$;=, >1/7 correct.
0x7AFC ^BUMPKIN|'.' 0x778C GUMBOIL+?&+. >REDSKIN
0x6131 :?!.?#=-./&" 0x0C7B &|;|!*'@,] >Entry denied
0x2FD4 .':,&+._.$_%G 0x88BD /&.!,*;- '*LI >3/7 correct.
0x62B7 AMBLES?"|/|< 0x26E4 MBING':^@?|& >MANIKIN█
0x08F5 ;?:- =|>$:._. 0x16FD $&*!-]|$":.$_
```

Decorative components
Random characters
History formatting

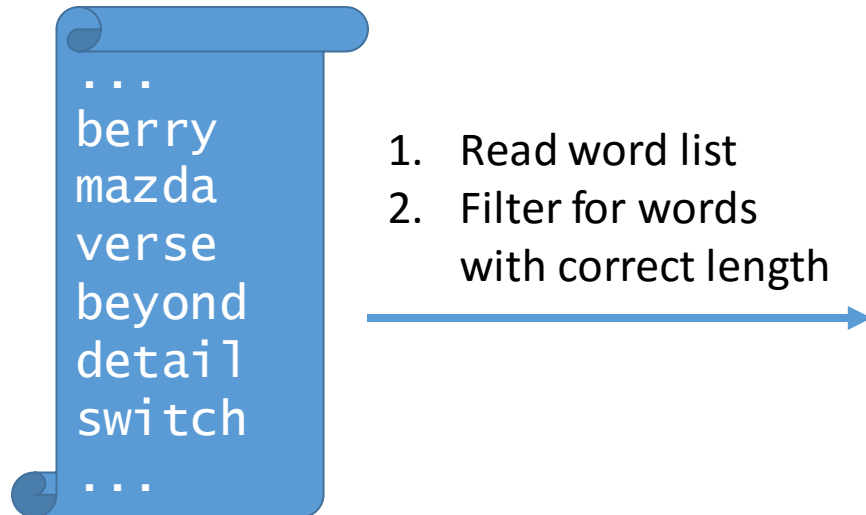
Functionality

User Interface

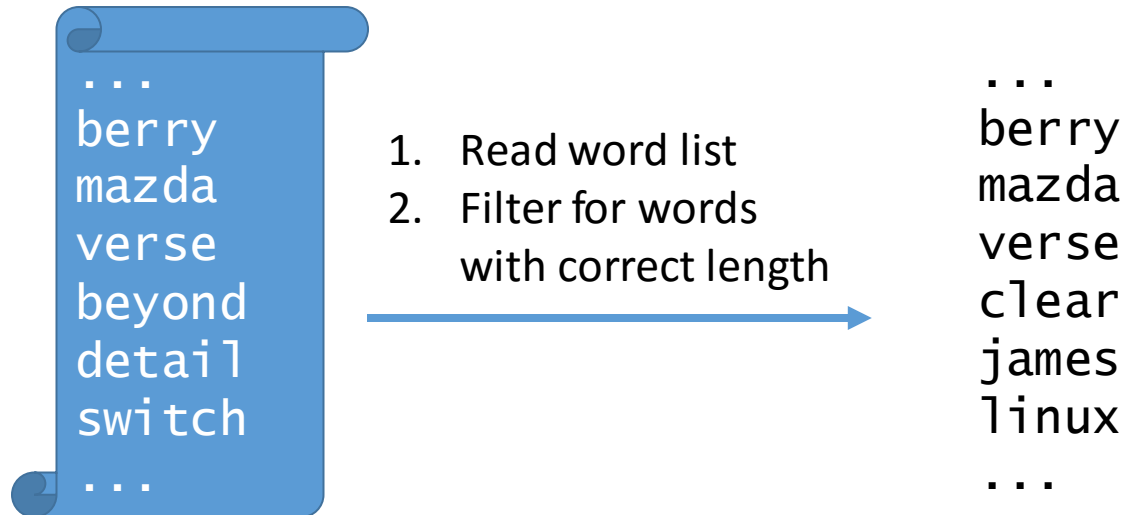
Functionality, Part 1: Getting the words



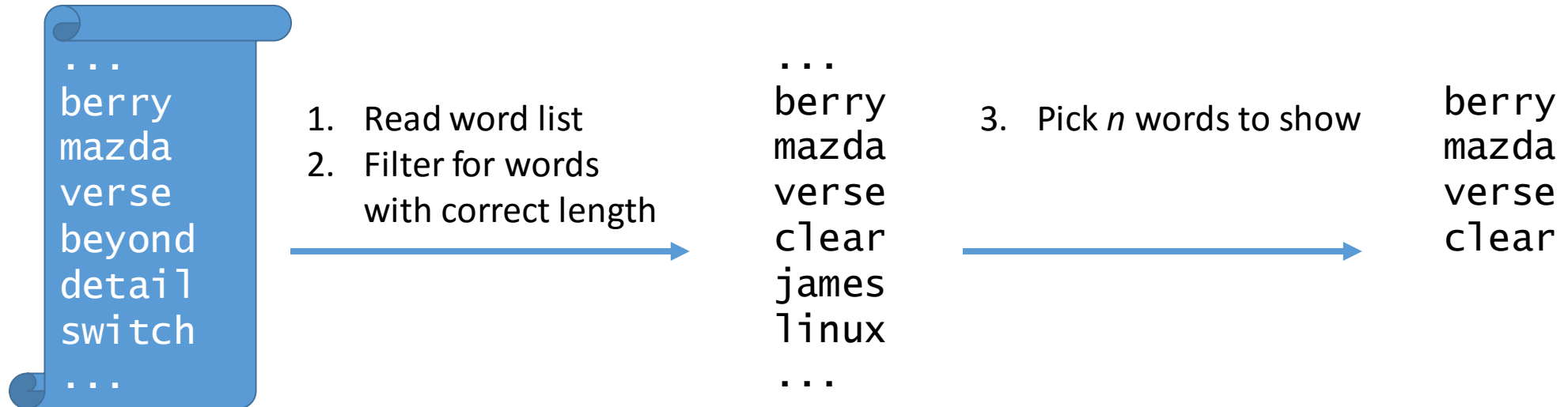
Functionality, Part 1: Getting the words



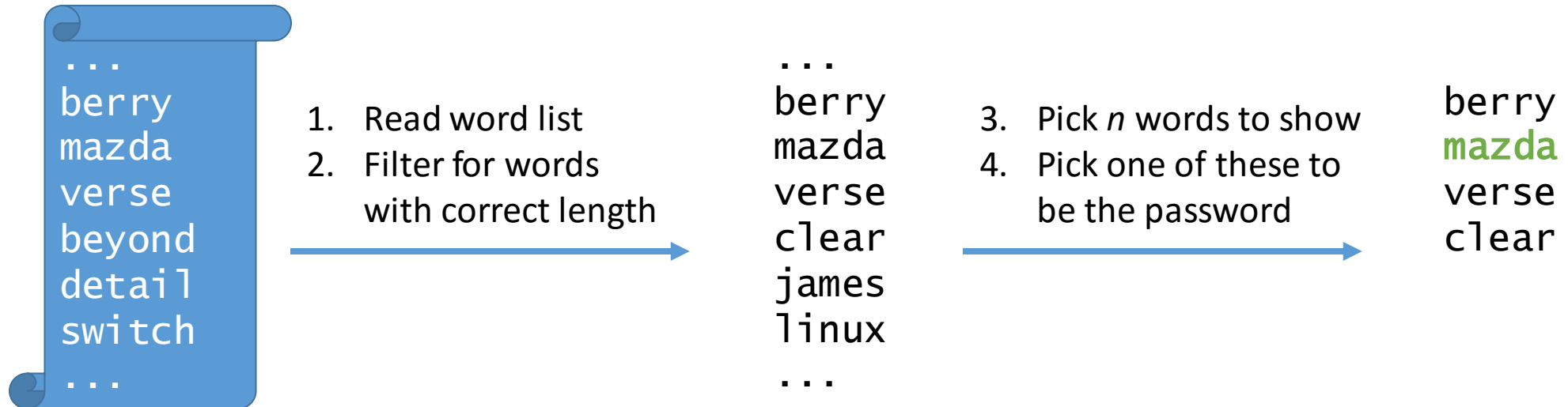
Functionality, Part 1: Getting the words



Functionality, Part 1: Getting the words



Functionality, Part 1: Getting the words



Functionality, Part 1: Getting the words

...
berry
mazda
verse
beyond
detail
switch
...

1. Read word list
2. Filter for words with correct length

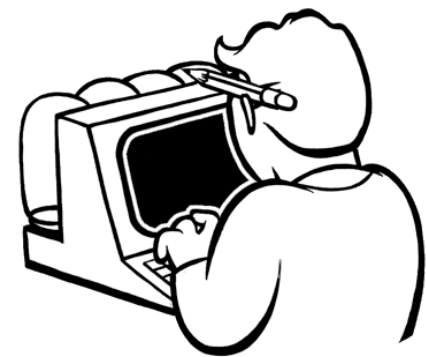


...
berry
mazda
verse
clear
james
linux
...

3. Pick n words to show
4. Pick one of these to be the password



berry
mazda
verse
clear



Functionality, Part 2: Basic interaction

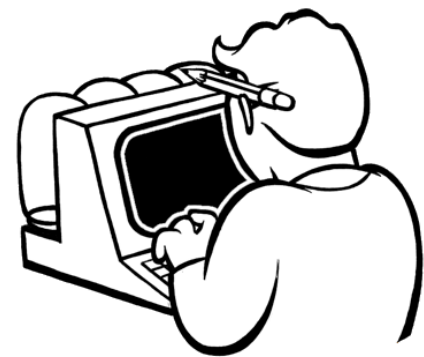
```
TOOL COLD ROWS SOME SHOT MEGA ARMS
> COLD
> Access denied!
> 3 attempts remaining...
> TOOL
> Access granted!
```

- Show choices
- While attempts is not 0:
 1. Reading user input
 2. Check if password is correct
 3. Exit program if password correct

Functionality, Part 2: Basic interaction

```
TOOL COLD ROWS SOME SHOT MEGA ARMS  
> COLD  
> Access denied!  
> 3 attempts remaining...  
> TOOL  
> Access granted!
```

- Show choices
- While attempts is not 0:
 1. Reading user input
 2. Check if password is correct
 3. Exit program if password correct



Functionality, Part 2: More feedback!

```
TOOL COLD ROWS SOME SHOT MEGA ARMS
> COLD
> 1/4 correct.
> Access denied!
> 3 attempts remaining...
> TOOL
> 4/4 correct.
> Access granted!
```

- Show choices
- While attempts is not 0:
 1. Reading user input
 2. Check if password is correct
 - 3. Show how many characters are correct**
 4. Exit program if password correct

Functionality, Part 2: Comparing characters?

Password	T	O	O	L
	↑↓	↑↓	↑↓	↑↓
Guess	C	O	L	D

- In English:
 - For every character index from 0 to *how long the password is*, compare the characters in guess and password, and increment a counter if they match

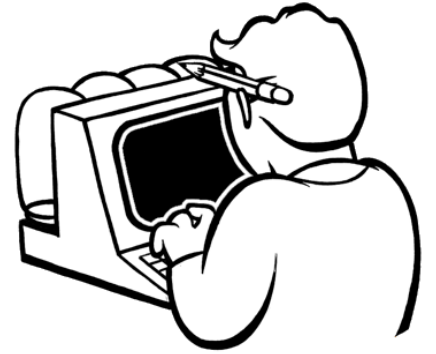
Functionality, Part 2: Comparing characters?

Password	T	O	O	L
	↕	↕	↕	↕
Guess	C	O	L	D

- In English:
 - For every character index from 0 to how long the password is, compare the characters in guess and password, and increment a counter if they match
- In python:

```
matching = 0
for i in range(length):
    if guess[i] == password[i]: matching += 1
```

Functionality, Part 2: Comparing characters?



Password	T	O	O	L
	↕	↕	↕	↕
Guess	C	O	L	D

- In English:
 - For every character index from 0 to how long the password is, compare the characters in guess and password, and increment a counter if they match
- In python:

```
matching = 0
for i in range(length):
    if guess[i] == password[i]: matching += 1
```

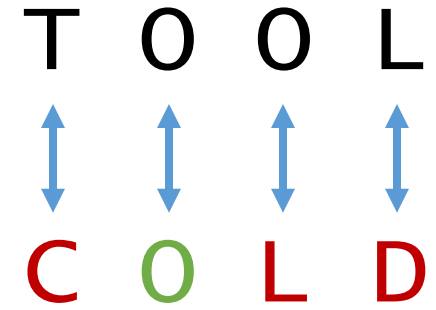
Functionality: done!

...
berry
mazda
verse
beyond
detail
switch
...

Word list
from
Internet

```
TOOL COLD ROWS SOME SHOT MEGA ARMS  
> COLD  
> 1/4 correct.  
> Access denied!  
> 3 attempts remaining...  
> TOOL  
> 4/4 correct.  
> Access granted!
```

Game logic
Processing input and giving feedback
Exiting the program eventually



Comparing
characters of
the solution



ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

```
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * .
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A @ ; " ^ + " + % [ - #    0x5B7A $ . - | ? . : ( | ; |
0x5DD0 , * = LANULIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /  0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = = , > 1 / 7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMB0IL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI > 3 / 7 correct.
0x62B7 AMBLES ? " | / | <      0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

Now the hard part: the user interface!



Fallout 3 Word Puzzle: UI

1. Header text



```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _    0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $    0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! | > G A M B L E D
0x565E $ - | @ | ! # { , ' ? /    > E n t r y d e n i e d
0x0731 | , } / , & " / | ' . "    0x29AD = . | _ & - / ! & ; * * > 1 / 7 c o r r e c t .
0x7AFC ^ B U M P K I N | ' ' ,    0x1C86 * % . & % @ - $ : = , > R E D S K I N
0x6131 : ? . ! , ? # = . / & "    0x778C G U M B O I L + ? & + . > E n t r y d e n i e d
0x2FD4 . ' : , & + _ . $ _ % G    0x0C7B & | ; ' [ ! * ' ' @ , ] > 3 / 7 c o r r e c t .
0x62B7 A M B L E S ? " | / | <    0x88BD / & . ! , * ; - " * L I > M A N I K I N ■
0x08F5 ; ? : - = | > $ : . _ .    0x26E4 M B I N G ' : ^ @ ? [ &
0x16FD $ & * ! - ] $ " : . $ _
```

Fallout 3 Word Puzzle: UI

1. Header text
2. Attempts counter

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _    0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $    0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! | > G A M B L E D
0x565E $ - | @ | ! # { , ' ? /    > E n t r y d e n i e d
0x0731 | , } / , & " / | ' . "    0x29AD = . | _ & - / ! & ; * * > 1 / 7 c o r r e c t .
0x7AFC ^ B U M P K I N | ' ' ,    0x1C86 * % . & % @ - $ : = , > R E D S K I N
0x6131 : ? . ! , ? # = . / & "    0x778C G U M B O I L + ? & + . > E n t r y d e n i e d
0x2FD4 . ' : , & + _ . $ _ % G    0x0C7B & | ; ' [ ! * ' ' @ , ] > 3 / 7 c o r r e c t .
0x62B7 A M B L E S ? " | / | <    0x88BD / & . ! , * ; - " * L I > M A N I K I N ■
0x08F5 ; ? : - = | > $ : . _ .    0x26E4 M B I N G ' : ^ @ ? [ &
0x16FD $ & * ! - ] $ " : . $ _
```

Fallout 3 Word Puzzle: UI

1. Header text
2. Attempts counter
3. Random 'hex codes'

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 SKIN / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & & # ^ * _ LAZUL
0x461E IS - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / MANIKIN
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = LANOLIN ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ BUMPKIN | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ % G
0x62B7 AMBLES ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # GAMB
0x795B LED ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | RAMEKI
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ &
0x75D8 - ^ _ - LANDMAN .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & CANIKIN / ! | > GAMBLED
0x29AD = . | _ & - / ! & ; * * > Entry denied
0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x778C GUMBOIL + ? & + . > REDSKIN
0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x16FD $ & * ! - ] $ " : . $ _
```

Fallout 3 Word Puzzle: UI

1. Header text
2. Attempts counter
3. Random 'hex codes'
4. Passwords embedded in random 'garbage' text

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 S K I N / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & & # ^ * _ L A Z U L
0x461E I S - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / M A N I K I N
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = L A N O L I N ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ B U M P K I N | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ % G
0x62B7 A M B L E S ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # G A M B
0x795B L E D ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | R A M E K I
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ &
0x75D8 - ^ _ - L A N D M A N .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & C A N I K I N / ! |
0x29AD = . | _ & - / ! & ; * *
0x1C86 * % . & % @ - $ : = ,
0x778C G U M B O I L + ? & + .
0x0C7B & | ; ' [ ! * ' ' @ , ]
0x88BD / & . ! , * ; - " * L I
0x26E4 M B I N G ' : ^ @ ? [ &
0x16FD $ & * ! - ] $ " : . $ _

> G A M B L E D
> E n t r y d e n i e d
> 1 / 7 c o r r e c t .
> R E D S K I N
> E n t r y d e n i e d
> 3 / 7 c o r r e c t .
> M A N I K I N ■
```

Fallout 3 Word Puzzle: UI

1. Header text
2. Attempts counter
3. Random 'hex codes'
4. Passwords embedded in random 'garbage' text
5. History

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! |
0x565F $ - | @ | | # [ ' ? /    0x29AD = | _ & - / | & : * *
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = ,
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + .
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ]
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI
0x62B7 AMBLES ? " | / | <      0x26E4 MBING ' : ^ @ ? [ &
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _

> GAMBLED
> Entry denied
> 1/7 correct.
> REDSKIN
> Entry denied
> 3/7 correct.
> MANIKIN ■
```

Fallout 3 Word Puzzle: UI

1. Header text
2. Attempts counter
3. Random 'hex codes'
4. Passwords embedded in random 'garbage' text
5. History, including:
 1. Previously entered guesses

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _   0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKTN / ! |
0x565E $ - | @ | ! # { , ' ? /   0x20AD = . | _ & - / ! & ; * *
0x0731 | . } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = ,
0x7AFC ^ BUMPKTN | ! ! ,        0x779C CUMBCIL : ? & + .
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ]
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ &
0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _

> GAMBLED
> Entry denied
> 1/7 correct.
> REDSKIN
> Entry denied
> 3/7 correct.
> MANIKIN ■
```

Fallout 3 Word Puzzle: UI

1. Header text
2. Attempts counter
3. Random 'hex codes'
4. Passwords embedded in random 'garbage' text
5. History, including:
 1. Previously entered guesses
 2. Access denied/granted

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & : * * > Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ! ! ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ! @ _ ] > Entry denied
0x2FD4 : ! , & ! : $ ! : ? @    0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```


Fallout 3 Word Puzzle: UI

- 1. Header text
- 2. Attempts counter
- 3. Random 'hex codes'
- 4. Passwords embedded in random 'garbage' text
- 5. History, including:
 - 1. Previously entered guesses
 - 2. Access denied/granted
 - 3. Feedback (x/y correct)

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : . & ! . ' $ _ % G   0x88BD / & . ! , * ; - " * ! > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x20E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; , : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 0: Separation of concerns

What if we want to use the same UI for a different but similar game?

What if we want to play the same game but with a different UI?

UI, Part 0: Separation of concerns

What if we want to use the same UI for a different but similar game?

What if we want to play the same game but with a different UI?

Game Logic

User interaction

UI, Part 0: Separation of concerns

What if we want to use the same UI for a different but similar game?

What if we want to play the same game but with a different UI?

Game Logic	User interaction
Which words should be selected and displayed?	
Which is the correct password?	
How many attempts are left?	
How many characters were correctly guessed?	

UI, Part 0: Separation of concerns

What if we want to use the same UI for a different but similar game?

What if we want to play the same game but with a different UI?

Game Logic	User interaction
Which words should be selected and displayed?	Printing the words and feedback on screen
Which is the correct password?	Accepting user input
How many attempts are left?	Styling and Layout
How many characters were correctly guessed?	

UI, Part 0: Separation of concerns

What if we want to use the same UI for a different but similar game?
What if we want to play the same game but with a different UI?

Game Logic	User interaction
Which words should be selected and displayed?	Printing the words and feedback on screen
Which is the correct password?	Accepting user input
How many attempts are left?	Styling and Layout
How many characters were correctly guessed?	

→ Let's refactor the existing code to go into 2 separate classes!



UI, Part 1: Header section and 'print_screen()'

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI >3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
```

- UI drawing options:
 - Redraw entire screen
 - Easy to program, inefficient

UI, Part 1: Header section and 'print_screen()'

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL       0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _   0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN         0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /         0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | ! # { , ' ? /    0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . "    0x1C86 * % . & % @ - $ : = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,         0x778C GUMBOIL + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & "    0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . ' : , & + _ . $ _ % G    0x88BD / & . ! , * ; - " * LI >3/7 correct.
0x62B7 AMBLES ? " | / | <        0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
```

- UI drawing options:
 - Redraw entire screen
 - Easy to program, inefficient
 - Redraw only parts that change
 - Hard to program, more efficient
- Typically a mix of both is applied

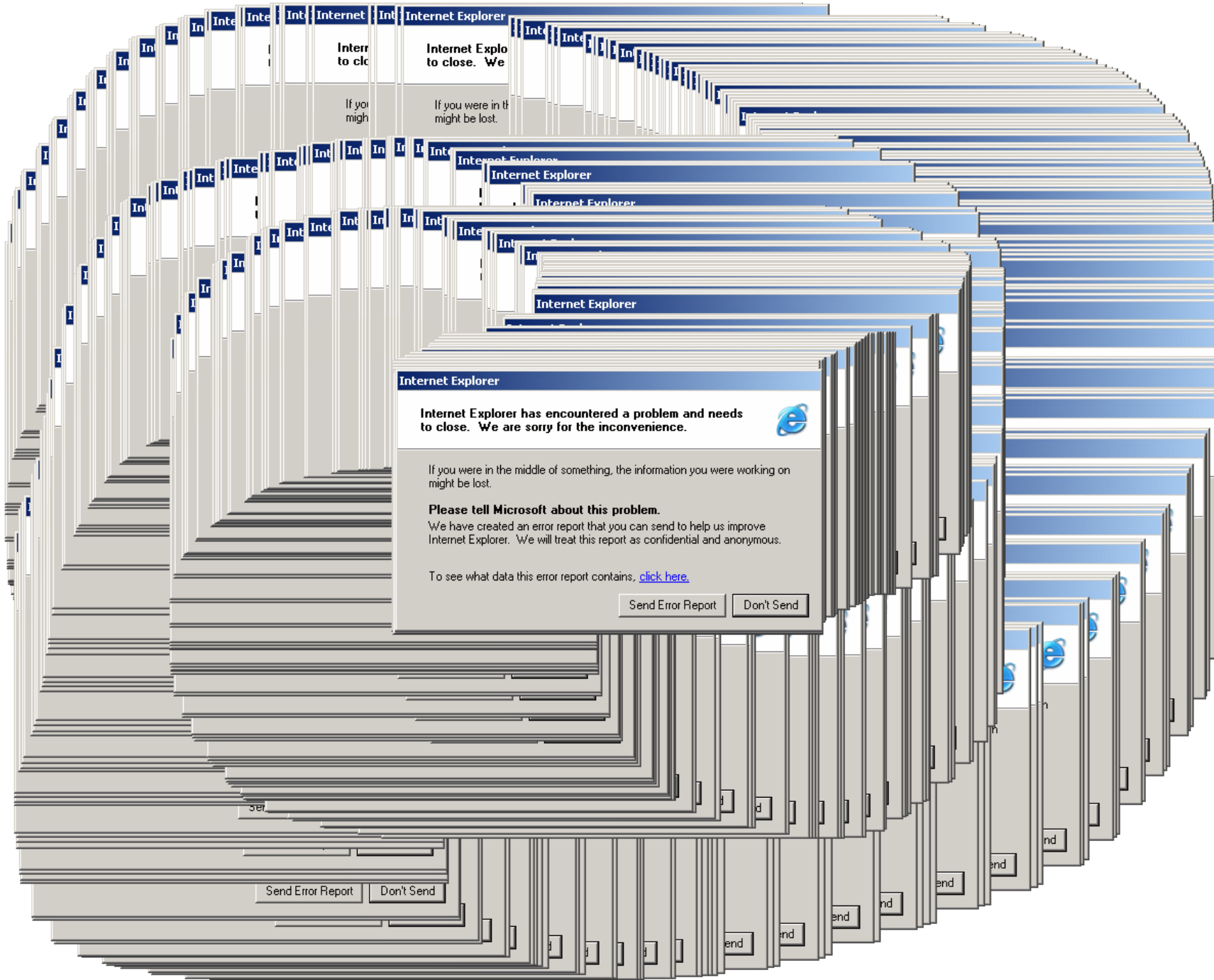
UI, Part 1: Header section and 'print_screen()'

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI >3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

- UI drawing options:
 - Redraw entire screen
 - Easy to program, inefficient
 - Redraw only parts that change
 - Hard to program, more efficient
- Typically a mix of both is applied
- This is true for all UIs, e.g.
 - Web browser
 - 3D games
 - Mobile phone interface



UI, Part 1: Header section and 'print_screen()'

The program main loop will:

- Call print_screen() to:
 1. Print the header
 2. Print the attempts counter
 3. Print the hex codes and code lines
 4. Print the history
 5. Print a prompt

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #  0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <      0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 1: Header section and 'print_screen()'

The program main loop will:

- Call print_screen() to:
 1. Print the header
 2. Print the attempts counter
 3. Print the hex codes and code lines
 4. Print the history
 5. Print a prompt
- Wait for user input (ENTER/RETURN)

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | | # { , ' ? /   0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI >3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 1: Header section and 'print_screen()'

The program main loop will:

- Call print_screen() to:
 1. Print the header
 2. Print the attempts counter
 3. Print the hex codes and code lines
 4. Print the history
 5. Print a prompt
- Wait for user input (ENTER/RETURN)
- Add the user input to history

```
ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | | # { , ' ? /   0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI >3/7 correct.
0x62B7 AMBLES ? " | / | <      0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 1: Header section and 'print_screen()'

The program main loop will:

- Call print_screen() to:
 1. Print the header
 2. Print the attempts counter
 3. Print the hex codes and code lines
 4. Print the history
 5. Print a prompt
- Wait for user input (ENTER/RETURN)
- Add the user input to history
- Call the game logic to check the guess

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | | # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 1: Header section and 'print_screen()'

The program main loop will:

- Call print_screen() to:
 1. Print the header
 2. Print the attempts counter
 3. Print the hex codes and code lines
 4. Print the history
 5. Print a prompt
- Wait for user input (ENTER/RETURN)
- Add the user input to history
- Call the game logic to check the guess
- Add the logic feedback to history
- Exit if guess correct, else repeat...

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 1: Header section and 'print_screen()'

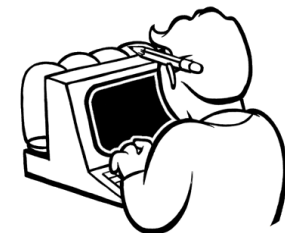
The program main loop will:

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 2. Print the attempts counter
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 4. Print the history
 5. Print a prompt
- Wait for user input (ENTER/RETURN)
- Add the user input to history
- Call the game logic to check the guess
- Add the logic feedback to history
- Exit if guess correct, else repeat...

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = , > 1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMBOIL + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ! @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * LI > 3/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```



UI, Part 2: Generating hex codes

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 S K I N / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & # # ^ * _ L A Z U L
0x461E I S - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / M A N I K I N
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = L A N O L I N ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ B U M P K I N | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ _ % G
0x62B7 A M B L E S ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # G A M B
0x795B L E D ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | R A M E K I
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ &
0x75D8 - ^ _ - L A N D M A N .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & C A N I K I N / ! | > G A M B L E D
0x29AD = . | _ & - / ! & ; * * > E n t r y d e n i e d
0x1C86 * % . & % @ - $ : = , > 1 / 7 c o r r e c t .
0x778C G U M B O I L + ? & + . > R E D S K I N
0x0C7B & | ; ' [ ! * ' ' @ , ] > E n t r y d e n i e d
0x88BD / & . ! , * ; - " * L I > 3 / 7 c o r r e c t .
0x26E4 M B I N G ' : ^ @ ? [ & > M A N I K I N ■
0x16FD $ & * ! - ] $ " : . $ _
```

- What do we need?
 - “0x” every time
 - 4 digits after that
 - 17 rows, 2 columns = 34 in total

UI, Part 2: Generating hex codes

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 S K I N / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & # # ^ * _ LAZUL
0x461E I S - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / M A N I K I N
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = L A N O L I N ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ B U M P K I N | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ _ % G
0x62B7 A M B L E S ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # G A M B
0x795B L E D ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | R A M E K I
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ &
0x75D8 - ^ _ - L A N D M A N .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & C A N I K I N / ! | > G A M B L E D
0x29AD = . | _ & - / ! & ; * * > E n t r y d e n i e d
0x1C86 * % . & % @ - $ : = , > 1 / 7 c o r r e c t .
0x778C G U M B O I L + ? & + . > R E D S K I N
0x0C7B & | ; ' [ ! * ' ' @ , ] > E n t r y d e n i e d
0x88BD / & . ! , * ; - " * L I > 3 / 7 c o r r e c t .
0x26E4 M B I N G ' : ^ @ ? [ & > M A N I K I N ■
0x16FD $ & * ! - ] $ " : . $ _
```

- What do we need?
 - “0x” every time
 - 4 digits after that
 - 17 rows, 2 columns = 34 in total
- For simplicity, we will generate “0x0000” *columns*rows* times

UI, Part 2: Generating hex codes



```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 S K I N / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & # # ^ * _ L A Z U L
0x461E I S - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / M A N I K I N
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = L A N O L I N ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ B U M P K I N | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ _ % G
0x62B7 A M B L E S ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # G A M B
0x795B L E D ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | R A M E K I
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ & _
0x75D8 - ^ _ - L A N D M A N .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & C A N I K I N / ! | > G A M B L E D
0x29AD = . | _ & - / ! & ; * * > E n t r y d e n i e d
0x1C86 * % . & % @ - $ : = , > 1 / 7 c o r r e c t .
0x778C G U M B O I L + ? & + . > R E D S K I N
0x0C7B & | ; ' [ ! * ' ' @ , ] > E n t r y d e n i e d
0x88BD / & . ! , * ; - " * L I > 3 / 7 c o r r e c t .
0x26E4 M B I N G ' : ^ @ ? [ & > M A N I K I N ■
0x16FD $ & * ! - ] $ " : . $ _
```

- What do we need?
 - “0x” every time
 - 4 digits after that
 - 17 rows, 2 columns = 34 in total
- For simplicity, we will generate “0x0000” *columns*rows* times
- Generating random hex codes left as an exercise for you :)

UI, Part 3: Generating "code"

- What do we need?
 - The words separated (padded) by random characters
 - Split into pieces

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _    0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $    0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! | > G A M B L E D
0x565E $ - | @ | ! # { , ' ? /    > E n t r y   d e n i e d
0x0731 | , } / , & " / | ' . "    0x29AD = . | _ & - / ! & ; * * > 1 / 7   c o r r e c t .
0x7AFC ^ B U M P K I N | ' ' ,    0x1C86 * % . & % @ - $ : = , > R E D S K I N
0x6131 : ? . ! , ? # = . / & "    0x778C G U M B O I L + ? & + . > E n t r y   d e n i e d
0x2FD4 . ' : , & + _ . $ _ % G    0x0C7B & | ; ' [ ! * ' ' @ , ] > 3 / 7   c o r r e c t .
0x62B7 A M B L E S ? " | / | <    0x88BD / & . ! , * ; - " * L I
0x08F5 ; ? : - = | > $ : . _ .    0x26E4 M B I N G ' : ^ @ ? [ & > M A N I K I N ■
0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 3: Generating "code"

- What do we need?
 - The words separated (padded) by random characters
 - Split into pieces
- Total size:
 - line width * columns * rows

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 S K I N / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & & # ^ * _ L A Z U L
0x461E I S - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / M A N I K I N
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = L A N O L I N ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ B U M P K I N | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ % G
0x62B7 A M B L E S ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # G A M B
0x795B L E D ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | R A M E K I
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ &
0x75D8 - ^ _ - L A N D M A N .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & C A N I K I N / ! |
0x29AD = . | _ & - / ! & ; * *
0x1C86 * % . & % @ - $ : = ,
0x778C G U M B O I L + ? & + .
0x0C7B & | ; ' [ ! * ' ' @ , ]
0x88BD / & . ! , * ; - " * L I
0x26E4 M B I N G ' : ^ @ ? [ &
0x16FD $ & * ! - ] $ " : . $ _

> G A M B L E D
> E n t r y d e n i e d
> 1 / 7 c o r r e c t .
> R E D S K I N
> E n t r y d e n i e d
> 3 / 7 c o r r e c t .
> M A N I K I N ■
```

UI, Part 3: Generating "code"

- What do we need?
 - The words separated (padded) by random characters
 - Split into pieces
- Total size:
 - line width * columns * rows
- Total padding size:
 - total - length of words

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -     0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * LAZUL        0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! |
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * *
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = ,
0x7AFC ^ BUMPKIN | ' ' ,         0x778C GUMBOIL + ? & + .
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ]
0x2FD4 . ' : , & + _ . $ % G     0x88BD / & . ! , * ; - " * LI
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ &
0x08F5 ; ? : - = | > $ : . $ _   0x16FD $ & * ! - ] $ " : . $ _

>GAMBLED
>Entry denied
>1/7 correct.
>REDSKIN
>Entry denied
>3/7 correct.
>MANIKIN ■
```

UI, Part 3: Generating “code”

- What do we need?
 - The words separated (padded) by random characters
 - Split into pieces
- Total size:
 - line width * columns * rows
- Total padding size:
 - total - length of words
- Individual padding size:
 - Total padding / #words + 1

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _    0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $    0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! | > G A M B L E D
0x565E $ - | @ | ! # { , ' ? /    > E n t r y d e n i e d
0x0731 | , } / , & " / | ' . "    0x29AD = . | _ & - / ! & ; * * > 1 / 7 c o r r e c t .
0x7AFC ^ B U M P K I N | ' ' ,    0x1C86 * % . & % @ - $ : = , > R E D S K I N
0x6131 : ? . ! , ? # = . / & "    0x778C G U M B O I L + ? & + . > E n t r y d e n i e d
0x2FD4 . ' : , & + _ . $ _ % G    0x0C7B & | ; ' [ ! * ' ' @ , ] > 3 / 7 c o r r e c t .
0x62B7 A M B L E S ? " | / | <    0x88BD / & . ! , * ; - " * L I
0x08F5 ; ? : - = | > $ : . _ .    0x26E4 M B I N G ' : ^ @ ? [ & > M A N I K I N ■
0x16FD $ & * ! - ] $ " : . $ _
```

UI, Part 3: Generating “code”

- What do we need?
 - The words separated (padded) by random characters
 - Split into pieces
- Total size:
 - line width * columns * rows
- Total padding size:
 - total - length of words
- Individual padding size:
 - Total padding / #words + 1

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _    0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $    0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! | > G A M B L E D
0x565E $ - | @ | ! # { , ' ? /    > E n t r y d e n i e d
0x0731 | , } / , & " / | ' . "    0x29AD = . | _ & - / ! & ; * * > 1 / 7 c o r r e c t .
0x7AFC ^ B U M P K I N | ' ' ,    0x1C86 * % . & % @ - $ : = , > R E D S K I N
0x6131 : ? . ! , ? # = . / & "    0x778C G U M B O I L + ? & + . > E n t r y d e n i e d
0x2FD4 . ' : , & + _ . $ _ % G    0x0C7B & | ; ' [ ! * ' ' @ , ] > E n t r y d e n i e d
0x62B7 A M B L E S ? " | / | <    0x88BD / & . ! , * ; - " * L I > 3 / 7 c o r r e c t .
0x08F5 ; ? : - = | > $ : . _ .    0x26E4 M B I N G ' : ^ @ ? [ & > M A N I K I N ■
0x16FD $ & * ! - ] $ " : . $ _
```



UI, Part 4: Formatting

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED
0x2593 S K I N / * $ : / " + -
0x7C26 @ ( / : / % @ " ) : % :
0x265D ^ & # # ^ * _ L A Z U L
0x461E I S - - ^ * & " # % : &
0x1F50 . " ; @ ! " $ $ ^ ! : _
0x23C5 % , ; - / M A N I K I N
0x0D1A . @ ; " ^ + " + % [ - #
0x8421 & % ! , ] " # | / . / $
0x5DD0 , * = L A N O L I N ; /
0x565E $ - | @ | ! # { , ' ? /
0x0731 | , } / , & " / | ' . "
0x7AFC ^ B U M P K I N | ' ' ,
0x6131 : ? . ! , ? # = . / & "
0x2FD4 . ' : , & + _ . $ _ % G
0x62B7 A M B L E S ? " | / | <
0x08F5 ; ? : - = | > $ : . _ .

0x1204 / @ @ / : & - # G A M B
0x795B L E D ; & * ! . / ! @ %
0x7AF8 # - # ? : * , $ ! = @ ^
0x0438 # . & ; . | R A M E K I
0x32C7 N - * . % | / ^ $ * . _
0x352D ' = - @ ; ? , $ + = ^ &
0x75D8 - ^ _ - L A N D M A N .
0x5B7A $ . - : | ? . : ( | ; |
0x766C & + $ ) ! . # ? @ | - /
0x550A ? & C A N I K I N / ! |
0x29AD = . | _ & - / ! & ; * *
0x1C86 * % . & % @ - $ : = ,
0x778C G U M B O I L + ? & + .
0x0C7B & | ; ' [ ! * ' ' @ , ]
0x88BD / & . ! , * ; - " * L I
0x26E4 M B I N G ' : ^ @ ? [ &
0x16FD $ & * ! - ] $ " : . $ _

>GAMBLED
>Entry denied
>1/7 correct.
>REDSKIN
>Entry denied
>3/7 correct.
>MANIKIN ■
```

- What do we need?
 - Print hex codes
 - Print lines
 - Print history

UI, Part 4: Formatting

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _    0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $    0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! |   > G A M B L E D
0x565E $ - | @ | ! # { , ' ? /    0x29AD = . | _ & - / ! & ; * *   > E n t r y   d e n i e d
0x0731 | , } / , & " / | ' . "    0x1C86 * % . & % @ - $ : = ,     > 1 / 7   c o r r e c t .
0x7AFC ^ B U M P K I N | ' ' '    0x778C G U M B O T I + ? & + .     > R E D S K I N
0x6131 : ? . ! , ? # = . / & "    0x0C7B & | ; ' [ ! * ' ' @ , ]   > E n t r y   d e n i e d
0x2FD4 . : , & + _ . $ _ % 0      0x88BD / & . ! , " ; - " L L     > 3 / 7   c o r r e c t .
0x62B7 A M B L E S ? " | / | <    0x26E4 M B I N G ' : ^ @ ? [ &   > M A N I K I N ■
0x08F5 ; ? : - = | > $ : . _ .    0x16FD $ & * ! - ] $ " : . $ _
```

- What do we need?
 - Print hex codes
 - Print lines
 - Print history
- But: The terminal prints *line by line!*

UI, Part 4: Formatting

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :   0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &    0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' ' ' '    0x778C GUMBOTI + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . : , & + _ . $ _ % @    0x88BD / & . ! , ; , - " LL >5/7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

- What do we need?
 - Print hex codes
 - Print lines
 - (Print history)
- But: The terminal prints *line by line!*
- For every row, print correct parts of the complete output
 - Hex + code + Hex + code (+ history)

UI, Part 4: Formatting

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED    0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -    0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % : 0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ LAZUL    0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : & 0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _ 0x352D ' = - @ ; ? , $ + = ^ & _
0x23C5 % , ; - / MANIKIN    0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - # 0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $ 0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = LANOLIN ; /    0x550A ? & CANIKIN / ! | >GAMBLED
0x565E $ - | @ | ! # { , ' ? / 0x29AD = . | _ & - / ! & ; * * >Entry denied
0x0731 | , } / , & " / | ' . " 0x1C86 * % . & % @ - $ : = = , >1/7 correct.
0x7AFC ^ BUMPKIN | ' ' '    0x778C GUMBOTI + ? & + . >REDSKIN
0x6131 : ? . ! , ? # = . / & " 0x0C7B & | ; ' [ ! * ' ' @ , ] >Entry denied
0x2FD4 . : , & + _ $ _ % 0 0x88BD / & . ! , ; , - " LL >5/7 correct.
0x62B7 AMBLES ? " | / | <    0x26E4 MBING ' : ^ @ ? [ & >MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ . 0x16FD $ & * ! - ] $ " : . $ _
```

- What do we need?
 - Print hex codes
 - Print lines
 - (Print history)
- But: The terminal prints *line by line!*
- For every row, print correct parts of the complete output
 - Hex + code + Hex + code (+ history)



UI, Part 4: Formatting (cont.)

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED    0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -  0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ L A Z U L  0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &  0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N  0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #  0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $  0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /   0x550A ? & C A N I K I N / ! |
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * *
0x0731 | , } / , & " / | ' . "  0x1C86 * % . & % @ - $ : = = ,
0x7AFC ^ B U M P K I N | ' ' ,   0x778C G U M B O I L + ? & + .
0x6131 : ? . ! , ? # = . / & "  0x0C7B & | ; ' [ ! * ' ' @ , ]
0x2FD4 . ' : , & + _ . $ _ % G  0x88BD / & . ! , * ; - " * L I
0x62B7 A M B L E S ? " | / | <  0x26E4 M B I N G ' : ^ @ ? [ &
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

• Printing the history

- Only print as many history lines as there are rows of hex/code
- If there is not enough history, print nothing there
- Latest history at the bottom
- Last line should not have a newline

```
>GAMBLED
>Entry denied
>1/7 correct.
>REDSKIN
>Entry denied
>3/7 correct.
>MANIKIN
```

UI, Part 4: Formatting (cont.)

```
ROBCO INDUSTRIES (TM) TERMALINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 S K I N / * $ : / " + -    0x795B L E D ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :    0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & # # ^ * _ L A Z U L    0x0438 # . & ; . | R A M E K I
0x461E I S - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * . _
0x1F50 . " ; @ ! " $ $ ^ ! : _   0x352D ' = - @ ; ? , $ + = ^ &
0x23C5 % , ; - / M A N I K I N    0x75D8 - ^ _ - L A N D M A N .
0x0D1A . @ ; " ^ + " + % [ - #    0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x766C & + $ ) ! . # ? @ | - /
0x5DD0 , * = L A N O L I N ; /    0x550A ? & C A N I K I N / ! |
0x565E $ - | @ | ! # { , ' ? /    0x29AD = . | _ & - / ! & ; * *
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = ,
0x7AFC ^ B U M P K I N | ' ' ,    0x778C G U M B O I L + ? & + .
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ]
0x2FD4 . ' : , & + _ . $ _ % G    0x88BD / & . ! , * ; - " * L I
0x62B7 A M B L E S ? " | / | <   0x26E4 M B I N G ' : ^ @ ? [ &
0x08F5 ; ? : - = | > $ : . _ .   0x16FD $ & * ! - ] $ " : . $ _
```

• Printing the history

- Only print as many history lines as there are rows of hex/code
- If there is not enough history, print nothing there
- Latest history at the bottom
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```
>GAMBLED
>Entry denied
>1/7 correct.
>REDSKIN
>Entry denied
>3/7 correct.
>MANIKIN
```



ROBCO INDUSTRIES (TM) TERMLINK PROTOCOL
ENTER PASSWORD NOW

2 ATTEMPT(S) LEFT: ■ ■

```
0x758A / ^ | | # * $ , . RED      0x1204 / @ @ / : & - # GAMB
0x2593 SKIN / * $ : / " + -      0x795B LED ; & * ! . / ! @ %
0x7C26 @ ( / : / % @ " ) : % :  0x7AF8 # - # ? : * , $ ! = @ ^
0x265D ^ & & # ^ * _ LAZUL      0x0438 # . & ; . | RAMEKI
0x461E IS - - ^ * & " # % : &   0x32C7 N - * . % | / ^ $ * .
0x1F50 . " ; @ ! " $ $ ^ ! : _  0x352D ' = - @ ; ? , $ + = & |
0x23C5 % , ; - / MANIKIN        0x75D8 - ^ _ - LANDMAN .
0x0D1A . @ ; " ^ + " + % [ - #   0x5B7A $ . - : | ? . : ( | ; |
0x8421 & % ! , ] " # | / . / $   0x0650 0 0 0 0 0 0 0 0 0 0 0 0
0x5DD0 , * = LANOLIN ; /        0x550A ? & CANIKIN / ! | > GAMBLED
0x565E $ - | @ | ! # { , ' ? /   0x29AD = . | _ & - / ! & ; * * > Entry denied
0x0731 | , } / , & " / | ' . "   0x1C86 * % . & % @ - $ : = = , > 1 / 7 correct.
0x7AFC ^ BUMPKIN | ' ' ,        0x778C GUMB01L + ? & + . > REDSKIN
0x6131 : ? . ! , ? # = . / & "   0x0C7B & | ; ' [ ! * ' ' @ , ] > Entry denied
0x2FD4 . ' : , & + _ . $ _ % G   0x88BD / & . ! , * ; - " * LI > 3 / 7 correct.
0x62B7 AMBLES ? " | / | <       0x26E4 MBING ' : ^ @ ? [ & > MANIKIN ■
0x08F5 ; ? : - = | > $ : . _ .  0x16FD $ & * ! - ] $ " : . $ _
```

Future work

POWER



More things to do!

- Exercise 11
 - Random hex codes
 - More fun choice of words (more shared characters)
 - Alternative game rules

```
0x758A  
0x2593  
0x7C26  
0x265D  
0x461E  
0x1F50  
0x23C5  
0x0D1A  
0x8421  
0x5DD0  
0x565E  
0x0731  
0x7AFC  
0x6131  
0x2FD4  
0x62B7  
0x08F5
```


More things to do!

- Exercise 11
 - Random hex codes
 - More fun choice of words (more shared characters)
 - Alternative game rules
- And furthermore...
 - Removal of duds / replenishing allowance

```
, GLEETED@ " " :
; # ^ / ! [ % . + / & ^
] - | # ; ? & # = / ? C
UDDLED , = " - @ '
, " / [ ? $ _ " - / ] |
_ $ ^ - " = ! ! + L O B
ATED ; ; : ? = @ $ "
: { ^ / @ $ & % } " | "
? = . ^ @ $ ! . . . . . >
. . % & = * . # % . / = >Dud removed.
@ ^ # " | ? ? @ & % ? & >
; * + - $ FLICKED >Dud removed.
- ^ | / , " @ & ; { , # >
##%$ } | $ @ % / . ! >Allowance
. ' ; . . . . . & / >replenished.
, - # | * ^ / < : , , : >{
# ? > $ ; * @ # % , , *
```

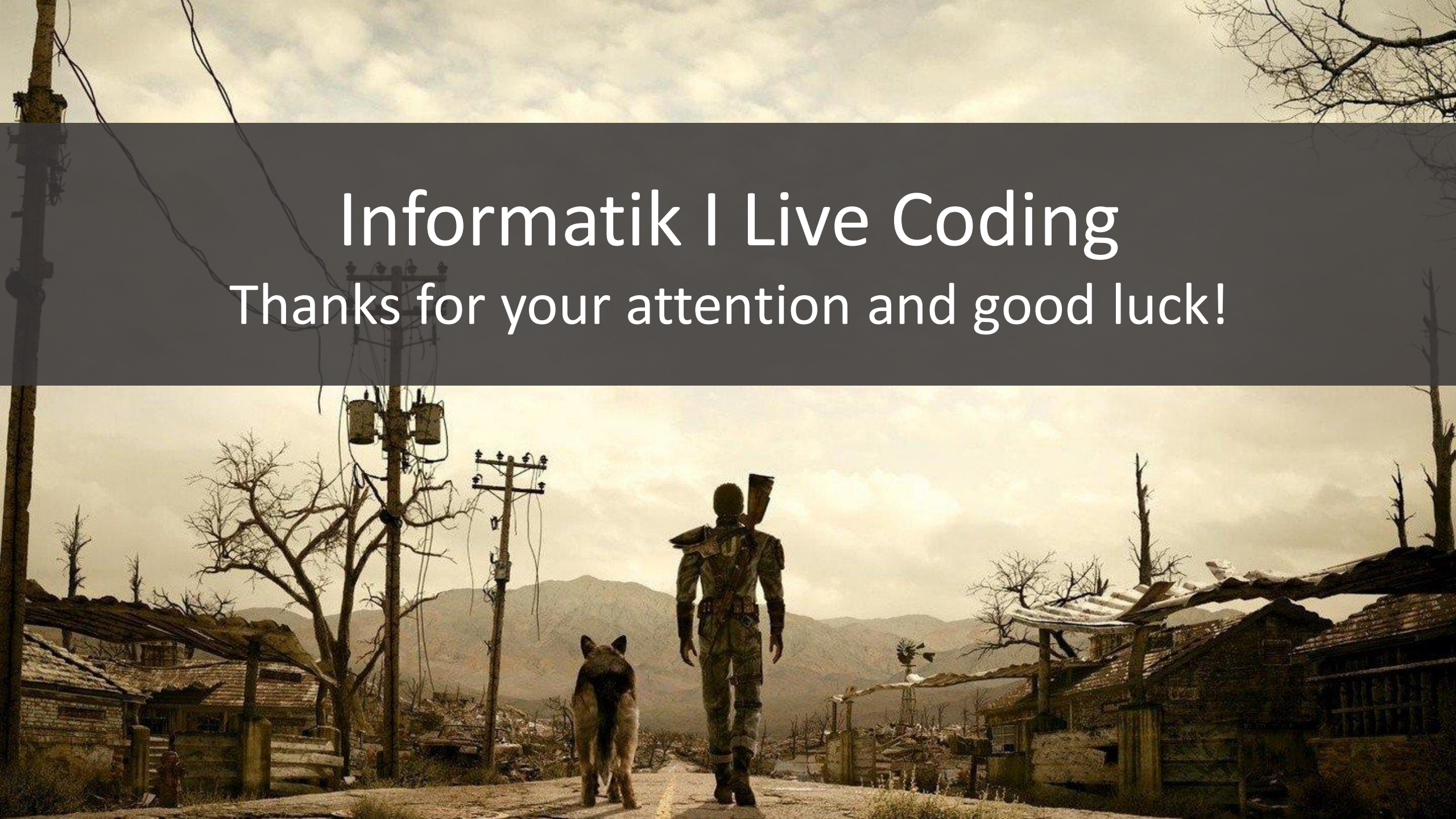
More things to do!

- Exercise 11
 - Random hex codes
 - More fun choice of words (more shared characters)
 - Alternative game rules
- And furthermore...
 - Removal of duds / replenishing allowance
 - Moving the cursor instead of redrawing the entire screen
 - Using terminal commands or *ncurses*
 - Different UI (for example using Kivy)

Some advice for the exam and the future

- Learning by doing
 - Write your own programs from scratch!
 - No copying from friends
 - No «reading and understanding» without any writing
 - Keep practicing, solve small problems
 - Write a text-based adventure game
 - Write a simple, interactive calculator (+ - / * etc.)
 - Solve the exercises by yourself! (And don't memorize them)
- It's hard for everyone in the beginning, just keep practicing!

Informatik I Live Coding
Thanks for your attention and good luck!



Quality Management

Please provide us with your feedback regarding the Informatik 1 lecture!

<https://qmsl.uzh.ch/de/XELN4> (DE)

<https://qmsl.uzh.ch/en/XELN4> (EN)

The links are also provided in the OLAT forum in the post “Course Evaluation”.

