

# Password Cracking 101

City of Phoenix  
Information Security and Privacy Office



# Agenda



- Computer accounts
- Password cracking methods
- Guess how long it takes to crack a password
- Creating a strong password
- Tools for home use



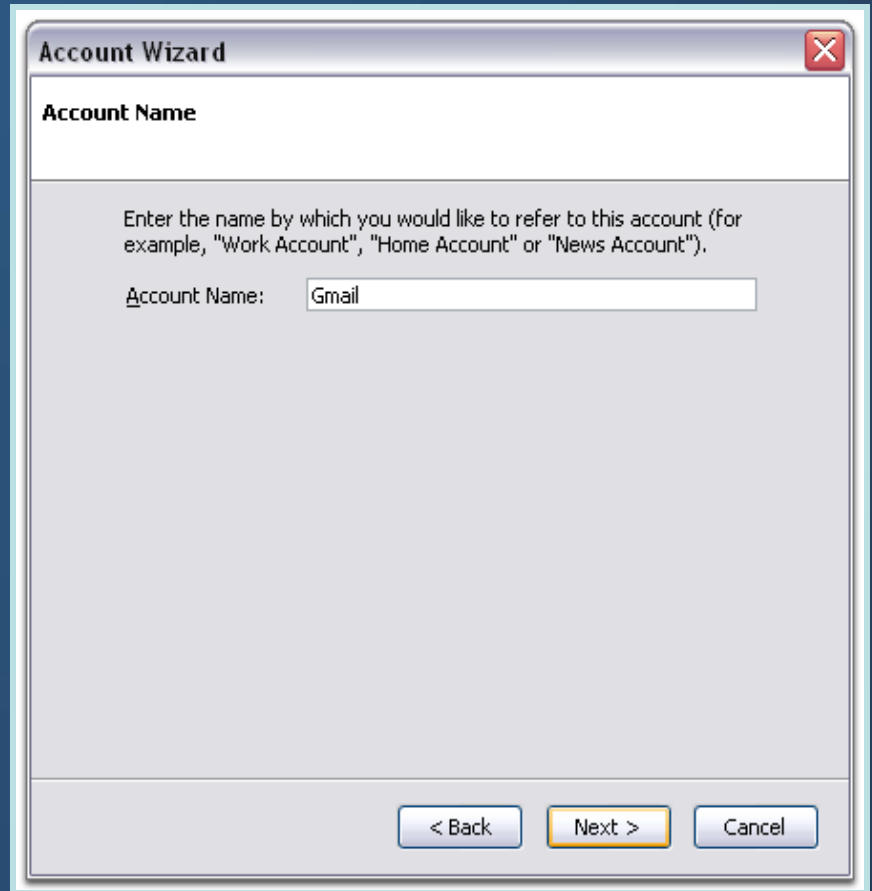


# Computer Accounts



# Computer Accounts

- Identify you to the computer system or network
- Your permissions to access info and systems are based on your account



The image shows a screenshot of the Windows Account Wizard dialog box. The title bar reads "Account Wizard" with a close button (X) in the top right corner. Below the title bar, the text "Account Name" is displayed. A large text area contains the instruction: "Enter the name by which you would like to refer to this account (for example, 'Work Account', 'Home Account' or 'News Account')." Below this text, there is a label "Account Name:" followed by a text input field containing the word "Gmail". At the bottom of the dialog box, there are three buttons: "< Back", "Next >" (which is highlighted with a yellow border), and "Cancel".



# Passwords

- Verify that the person logging into the computer system or network is who he claims to be
- In other words, **your password says you are the account owner**



- aka **authentication**



# Free Bonus Info!

## Authentication Factors

- Something you know
  - Password
- Something you have
  - Badge, token, digital certificate
- Something you are (biometric)
  - Fingerprint, retina



- **More factors = Stronger authentication**



**WANTED**

**Strong  
Passwords**

**REWARD**



## Why Is a Strong Password Important?

- Like the key to your house, your password is the key to your computer account, your access privileges, and your information
- Passwords provide the first line of defense against unauthorized access
- Strong passwords help protect the confidentiality, integrity, and availability of your information and systems





Strong passwords  
can't be easily  
guessed



Someone discovered my  
**PASSWORD.**  
Now I have to rename my dog.

# Strong Passwords Are Not Shared



# Are These Strong Passwords?

**Advanced Password Generator**

File Edit Seed Format Database Mixer Help Registration

Select Random Number Generator  
 Linear Congruential Method  
 Bit Shift Method

Select Mode  
 Simple Mode  
 Advanced Mode

Select Keys  
 All Keyboard  
 Numbers only  
 Letters only  
 Numbers and Letters

Select Case Sensitive  
 Yes, Case Sensitive  
 No

Select Passwords Quantity  
 2  30  50  80  100  200  400  600  800  2000  8000  
 3  40  60  90  150  300  500  700  900  4000  9999

Select Password Length  
 4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  30  34

Use big screen  
 Auto Copy to Clipboard

**GENERATE PASSWORD**

Database

yNiSEf0Ftlz2LMpHyUCD  
nXagQlcKHGrFvicxSYci  
czYxaNEdDsGwPKizEeMc  
PmukcYUICFFpnlGgejiL  
OCTJiEVBCiaFI3HAwrmB  
MeFlwsXuOKvoYwfMnKOl



# Strong Passwords Are Easy to Remember

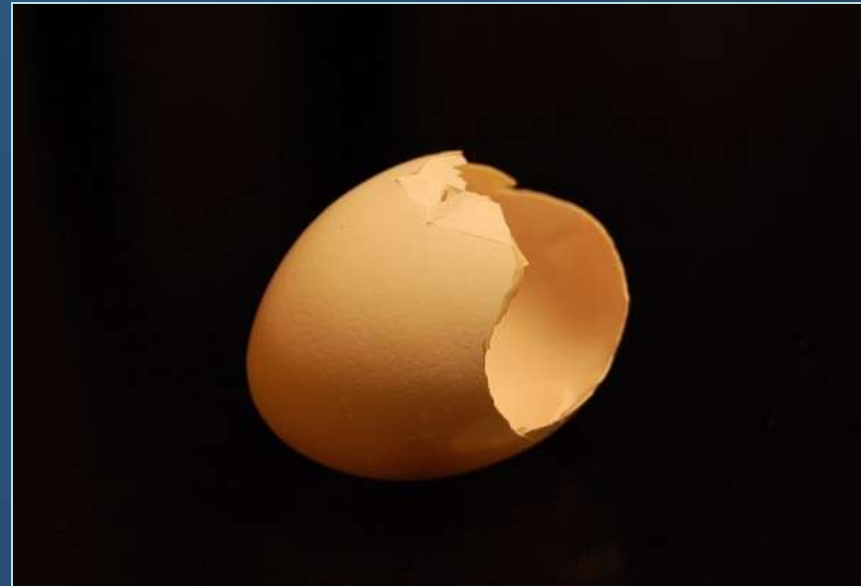
- So you don't have to write them down



# Strong Passwords

## Can't Be Easily Cracked

- Password cracking:  
Using computing technology and power to discover a password
- A typical desktop computer can try between 100,000 and 1 million passwords per second



# Making a Strong Password

- Contains a combination of words, numbers, and characters from an easy-to-remember sentence or phrase
- Does not contain words in a dictionary, regardless of the language
- Does not contain a proper name, such as your spouse's name
- Does not contain numbers associated with you in any way, such as your dog's birthday or your child's social security number



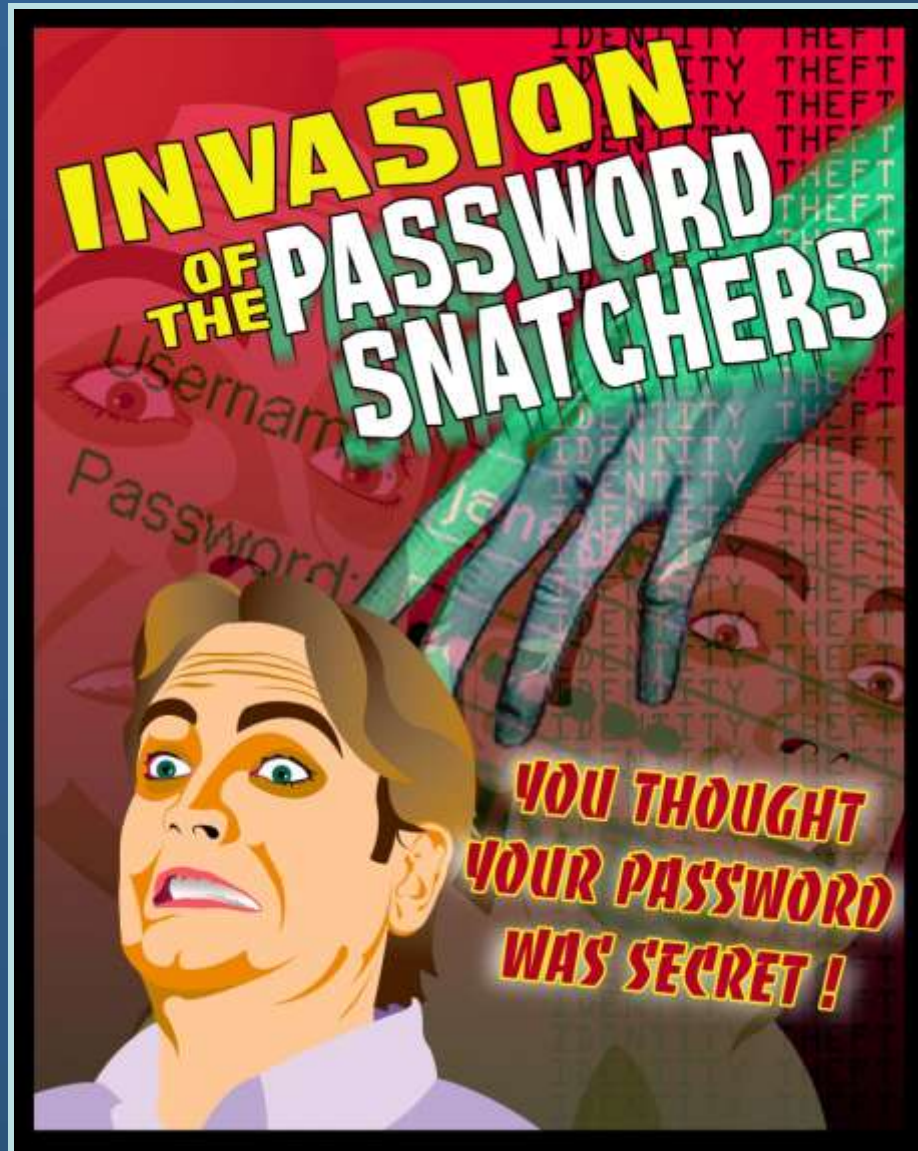
# Using a Password Strength Checker

- “Call me paranoid, but how do we know these sites aren’t harvesting the passwords they test?”
- Don’t use your actual password
- Use a “test” password with the same number of letters (caps and lower case), numbers, and special characters in the same locations as your actual password
- Your actual password would have the same strength

Test Your Password	
Password:	*****
Hide:	<input checked="" type="checkbox"/>
Score:	80%
Complexity:	Very Strong
Additions	
<input checked="" type="checkbox"/>	Number of Characters
<input type="checkbox"/>	Uppercase Letters
<input checked="" type="checkbox"/>	Lowercase Letters
<input checked="" type="checkbox"/>	Numbers
<input type="checkbox"/>	Symbols
<input checked="" type="checkbox"/>	Middle Numbers or Symbols
<input type="checkbox"/>	Requirements



# Password Cracking 101





# Cracking Methods

- Dictionary
  - Tries words in a dictionary (any language)
- Pre-computed
  - Compares encrypted password with lists of cracked passwords
- Hybrid
  - Checks common numbers or symbols substitutes for letters, such as 3 for E, or \$ for S
- Brute Force
  - Attempts every combination of characters

```
BRUTE FORCE
time elapsed
0d 0h41m 3s
time left
1d21h 3m29s
% done
1.496%
current test
@G@ZD7
keyrate
4841073 k/s
```



# WARNING

- Password cracking programs are available on the Internet
- Do **NOT** visit sites that host them
- Do **NOT** download them
- Why?
  - These sites often contain malware



# Time to Crack

Password	Crack Method	Time to Crack
Barbara1		
Chicago5		
Gandalf1		



# Time to Crack

Password	Crack Method	Time to Crack
Barbara1	Dictionary	0d0h0m0s
Chicago5	Dictionary	0d0h0m0s
Gandalf1	Dictionary	0d0h0m0s



# Time to Crack

Password	Crack Method	Time to Crack
October7		
OctobeR7		



# Time to Crack

Password	Crack Method	Time to Crack
October7	Dictionary	0d0h0m1s
0ctobeR7	Brute Force	0d2h23m7s



# Time to Crack

Password	Crack Method	Time to Crack
time2Fly		
Sp1drman		
Qwert123		



# Time to Crack

Password	Crack Method	Time to Crack
time2Fly	Brute Force	0d1h35m33s
Sp1drman	Brute Force	0d0h11m17s
Qwert123	Hybrid	0d0h0m25s





# Time to Crack

Password	Crack Method	Time to Crack
goBears4		
goBears!		
GoEag1es		
GoE@g1es		



# Time to Crack

Password	Crack Method	Time to Crack
goBears4	Brute Force	0d2h33m58s
goBears!	Brute Force	0d2h32m58s
GoEag1es	Pre-computed	0d0h2m47s
GoE@g1es	Brute Force	0d5h13m38s



# Sample Output

GoEagles	0d 0h 2m 47s	Precomputed H...
GoE@gles	0d 5h 13m 38s	Brute Force



# Time to Crack

Password	Crack Method	Time to Crack
4*20+7ya		
4sc&7yrA		
87yr.aGo		







# Time to Crack

Password	Crack Method	Time to Crack
4*20+7ya	Brute Force	> 1d6h24m3s
4sc&7yrA	Brute Force	> 1d6h24m3s
87yr.aGo	Brute Force	> 1d6h24m3s



# Still Going...

User Name	LM Password	<8	Password	Audit Time	Method
 t-getty1	????????A				
 t-getty2	????????A				
 t-getty3	????????O				
 t-ghost	????????!				



# Key Take Away

- The longer and more complex a password, the harder it is to crack



# Bad Passwords

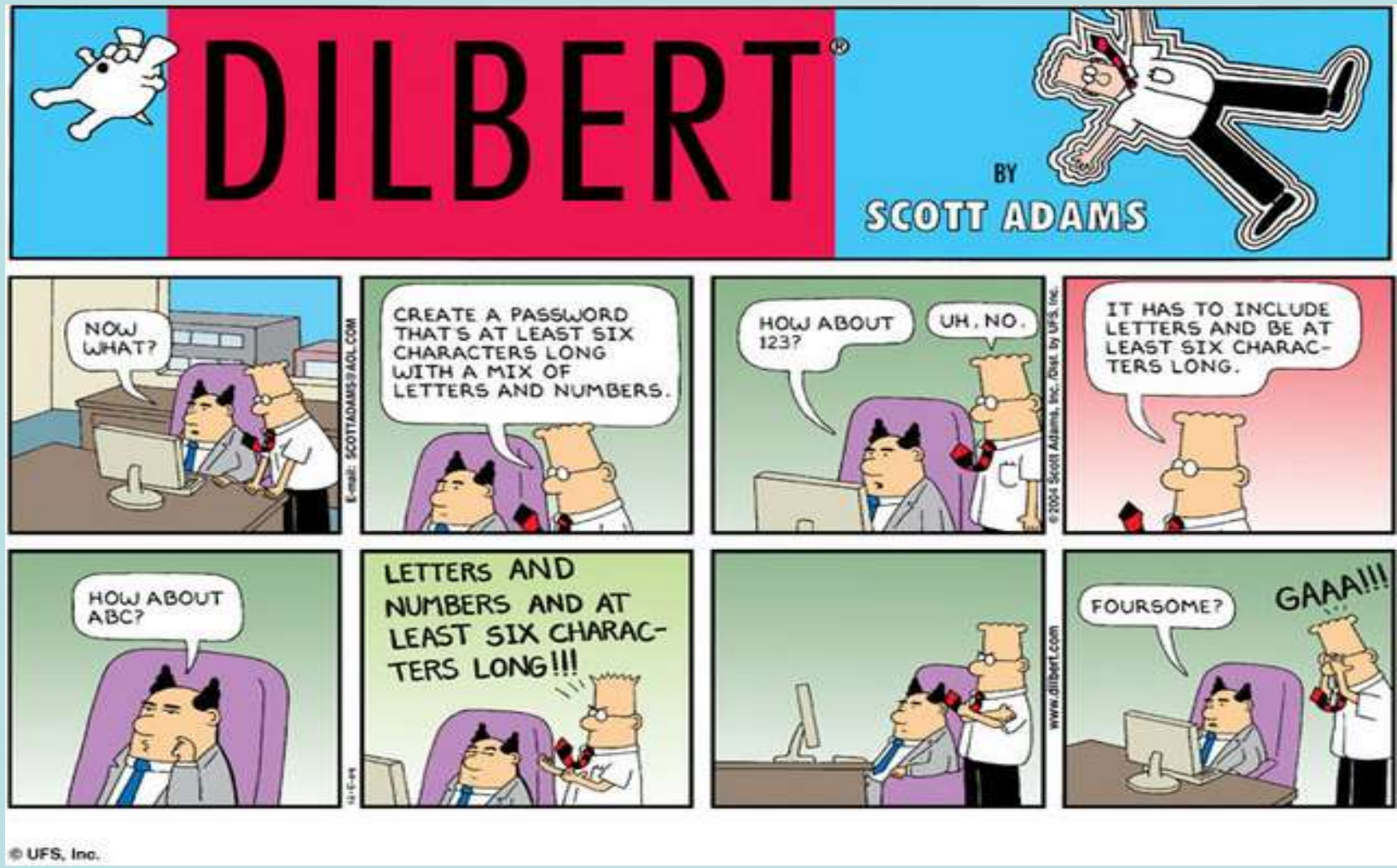
- Personally related to you
  - Address, birthday, anniversary, license plate, social security number, favorite car, hobby, or sports team
- Job-related
  - Job title, work location
- Family-related
  - Spouse, children, or pets' names or birthdays
- Similar to or match your User ID
- Dictionary words
  - No matter what the language

123456	CHARLIE	HELLO	FENDER	GOLF	DONALD	MUFFIN	GIANTS	ROSEBUD	CALVIN
PASSWORD	SUPERMAN	SCOOTER	ANTHONY	BOND007	BIGDADDY	REDSOX	BOOTY	JAGUAR	SHAVED
12345678	ASSHOLE	PLEASE	BLOWME	BEAR	BRONCO	STAR	BLONDE	GREAT	SURFER
1234	PORSCHE	FERRARI	COOKIE	TIGER	PENIS	TESTING	COOL	SAMSON	KELLY
	DALLAS	CHICKEN	DOCTOR	VOYAGER	SHANNON	GULUVEU	COOPER	KELLY	KELLY
	JESSICA	CHelsea	MAVERICK	GATEWAY	RANGERS	MURPHY	0000	1313	PAUL
12345	PANTIES	BLACK	CHICAGO	GATORS	BIRDIE	FRANK	FIRE	SCORPIO	MINE
dragon	PEPPER	DIAMOND	DIABLO	ANGEL	TROUBLE	HANNAH	SANDRA	MOUNTAIN	KING
qwerty	AUSTIN	NASCAR	SEXSEX	JUNIOR	WHITE	DAVE	POOKIE	MADISON	RACING
676767	WILLIAM	JACKSON	HARDCORE	THX1138	TOP GUN	EAGLE 1	PACKERS	MADISON	5555
mustang	DANIEL	CAMERON	666666	PORNO		III	EINSTEIN	987654	5555
letmein	SUMMER	WILLIE	WELCOME	BADBOY	DEBBIE	MOTHER	DOLPHINS	BRAZIL	EAGLE
baseball	HEATHER	COMPUTER	CHRIS	BIRKES	GREEN	NATHAN	00000	LAUREN	HEATH
master	HAMMER	AMANDA	PANTHER	SPIDER	SUPER	RAIDERS	CHEVY	JAPAN	NEWYORK
michael	YANKEES	WIZARD	YAMAHA	MELISSA	GAZWSX	STEVE	WINSTON	NAKED	LITTLE
FOOTBALL	JOSHUA	xxxxxxx	JUSTIN	BOOGER	MAGIC	FOREVER	WARRIOR	SQUIRT	REDWINGS
SHADOW	BITME	MONEY	BANANA	1212	LAKERS	ANGELA	SAMMY	STARS	SMITH
monkey	ENTER	PHOENIX	DRIVER	FLYERS	RACHEL	IPER	SLUT	APPLE	STICKY
ABC123	ASHLEY	MICKEY	MARINE	FISH	SLAYER	OU182	8675309	ALEXIS	COCACOLA
PASS	THUNDER	BAILEY	ANGELS	PORN	SCOTT	JAKE	ZXCVCNM	AAAA	ANIMAL
E COWBOY	PURPLE	HOOTERS		MATRIX	2222	LOVERS	NIPPLES	BONNIE	BRONCOS
6767	SILVER	ANDREA	WILSON	TEENS	ASDF	SUCKIT	POWER	PEACHES	PRIVATE
JORDAN	RICHARD	HORN	BUTTHEAD	SCOOBY	VIDEO	GREGORY	VICTORIA	JASMINE	SKIPPY
HARLEY	DAKOTA	DEAN'S		JASON	LONDON	BUDDY	VAGINA	KEVIN	MARVIN
RANGE	ORANGE	PLAYER		WALTER	7777	WHAT EVER	ASDFGH	MATT	BLONDES
Iwantu	MERLIN	SUNSHINE	CAPTAIN		MARLBORO	YOUNG	VAGINA	9WERTYU	ENJOY
JENNIFER	MICHELLE	MORGAN		BOSTON	BRAVES	NICHOLAS	TOYOTA	DANIELLE	GIRL
HUNTER	CORVETTE	STARWARS	CHESTER	YANKEE	INTERNET	LUCKY	TRAVIS	BEAVER	APOLLO
----	BIGDOG	BOOMER	COWBOYS	LOVER	ACTION	HELPME	HOTDOG	4321	PARKER
----	CHEESE	EDWARD	Smokey	BARNEY	CARTER	JACKIE	PARIS	4123	QWERT
2000	MATTHEW	CHARLES	Xavier	VICTOR	JASPER	MONICA	ROCK	RUNNER	TIME
TEST	121212	GIRLS	STEVEN	TUCKER	MONSTER	MIDNIGHT	X XXX	SWIMMING	SYDNEY
BATMAN	PATRICK	COFFEE	Viking	PRINCESS	TERESA </td <td>COLLEGE</td> <td>EXTREME</td> <td>DOLPHIN</td> <td>SYDNEY</td>	COLLEGE	EXTREME	DOLPHIN	SYDNEY
TRUSTNO1	MARTIN	XXXXXX	BLUE	MERCEDES	JEREMY	BABy	REDSKINS	GORDON	WOMEN
THOMAS	FREEDOM	bulldog	EAGLES	5150	IIIIIII	BRIAN	EROTIC	CASPER	VOODOO
TIGGER	GINGER	nc1701	WINNER	DOGGIE	CRYSTAL	MARK	DIRTY	STUPID	MAGNUM
ROBERT	BLOWJOB	rabbit	SAMANTHA	222222	PETER	STARTREK	FORD	SHIT	JUICE
ACCESS	SPARKY	PEANUT	HOUSE	GUNNER	HORNEY	SIERRA	ARSENAL	SATURN	ABGRYU
LOVE	YELLOW	JOHNNY	MILLER	BUBBA	BEER	LEATHER	ACCESS 14	GEMINI	77777
buster	CAMARO	JOHNNY	FLOWER	2112	ROCKET	232323	WOLF	APPLES	DREAMS
1234567	SECRET	WINTER	JACK	FRED	THAMAN	4444	NIPPLE	AUGUST	MAXWELL
SOCCER	DICK	BRAVUDY	FIREBIRD	JOHNSON	OLIVER	4444	WIPPLE	3333	MUSIC
HOCKEY	FALCON	COMPAG	BUTTER	JOHNSON	PRINCE	BEACH	LOVEYOU	CANADA	RUSH2112
KILLER	TAYLOR	CARLOS	UNITED	xxxxxx	BEACH	AMATEUR	ALEX	BLAZER	Russia
GEORGE	131313	JAMES	TURTLE	MEMBER	BOOBS	777777	FLORIDA	HUNTING	SCORPION
SEXY	123123	MIKE	STEELERS				ERIC	KITTY	REBECCA
ANDREW	BITCH	BRANDON	TIFFANY				HAPPY	RAINBOW	TESTER
			TOMCAT				SOPHIE	112233	MISTRESS
							LADIES	ARTHUR	PHANTOM
							NAUGHTY	ALBERT	BILLY
								CREAM	6666

500 WORST PASSWORDS TAKEN FROM PERFECT PASSWORD SELECTION, PROTECTION, AUTHENTICATION BY MARK BURNETT



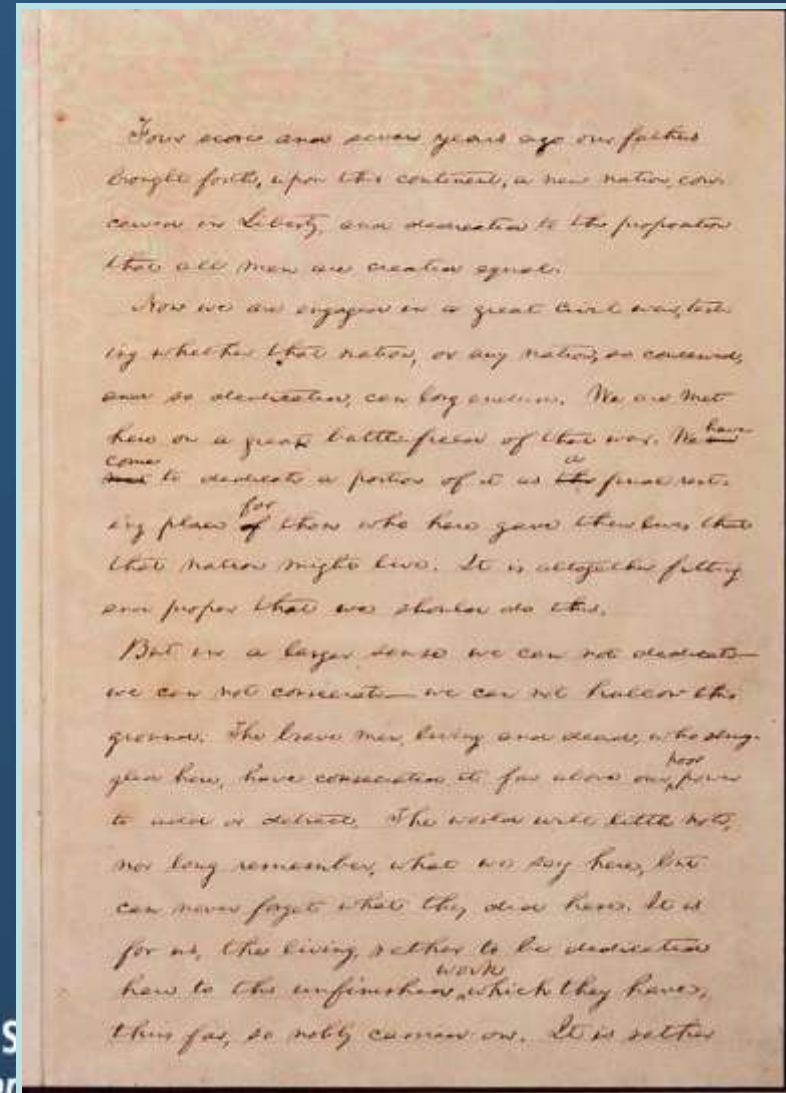
# Picking a Strong Password



# Unleash Your Creativity!

## Base Passwords on a Phrase

- $4 * 20 + 7 \text{ya}$
- $4 \text{sc} \& 7 \text{yrA}$
- $87 \text{yr.aGo}$
- Fourscore and seven years ago (Gettysburg Address)



Unleash Your Creativity!

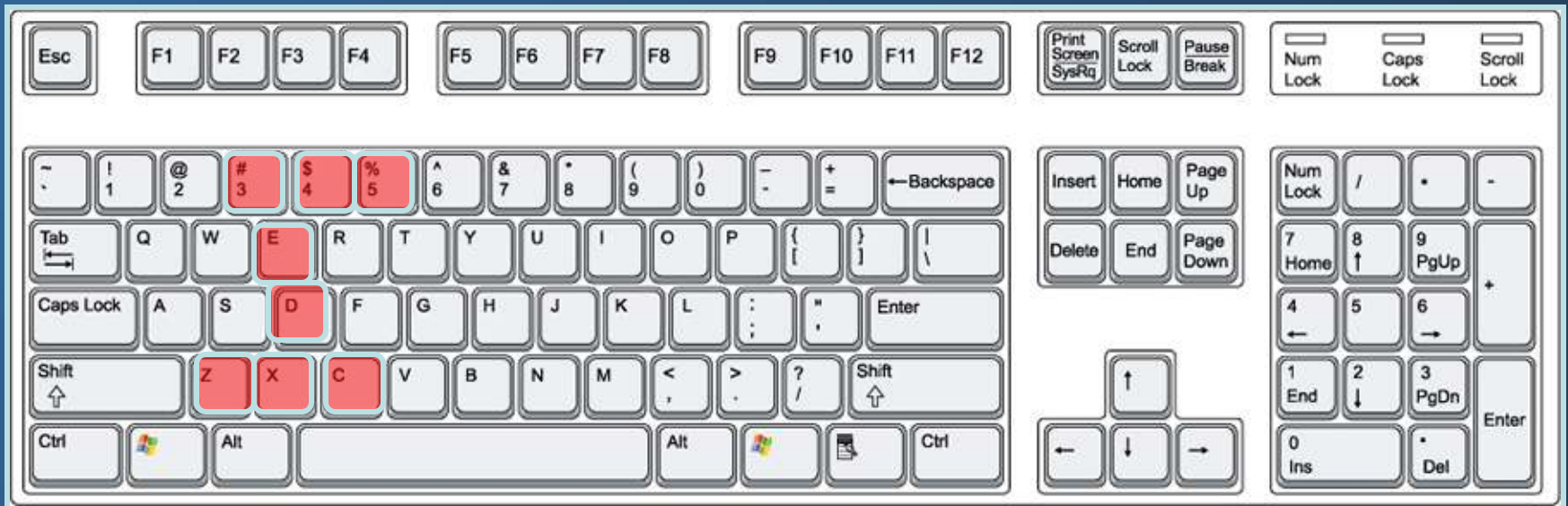
Base Passwords on a Phrase

- Wygc?GB!



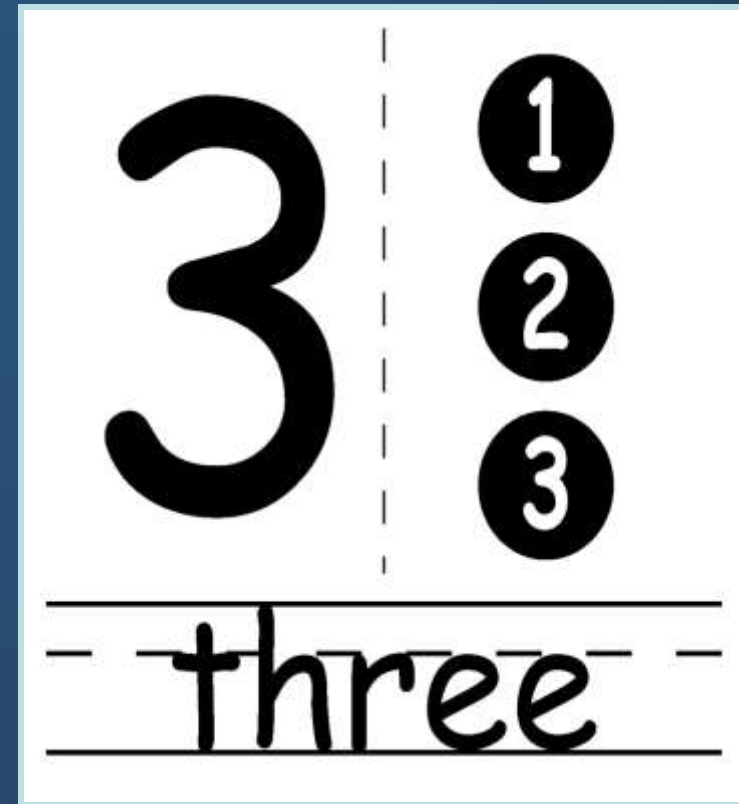
# Use a Keyboard Pattern

- 3\$5EdZxc
  - Forms the letter “I” (kinda)



# How Many Passwords?

- Work
- Personal – high security
  - Online banking
- Personal – low security
  - News sites
- Recommended
  - Social media ONLY



# Tools for Home Use

- Password Safe
  - Free Windows utility
  - Designed by Bruce Schneier
  - Keeps passwords securely encrypted on your computers
  - Just one “Safe Combination” to remember



- <http://passwordsafe.sourceforge.net/>

*City of Phoenix does not endorse or support any tools for home use*

**Information Technology Services**  
*"Connecting Phoenix to Information"*



## Tools for Home Use

- LastPass
  - Free utility
  - Just one “master password” to remember
  - Can automatically log you on to web sites and complete forms needed to buy goods online
- [https://lastpass.com/features\\_free.php](https://lastpass.com/features_free.php)

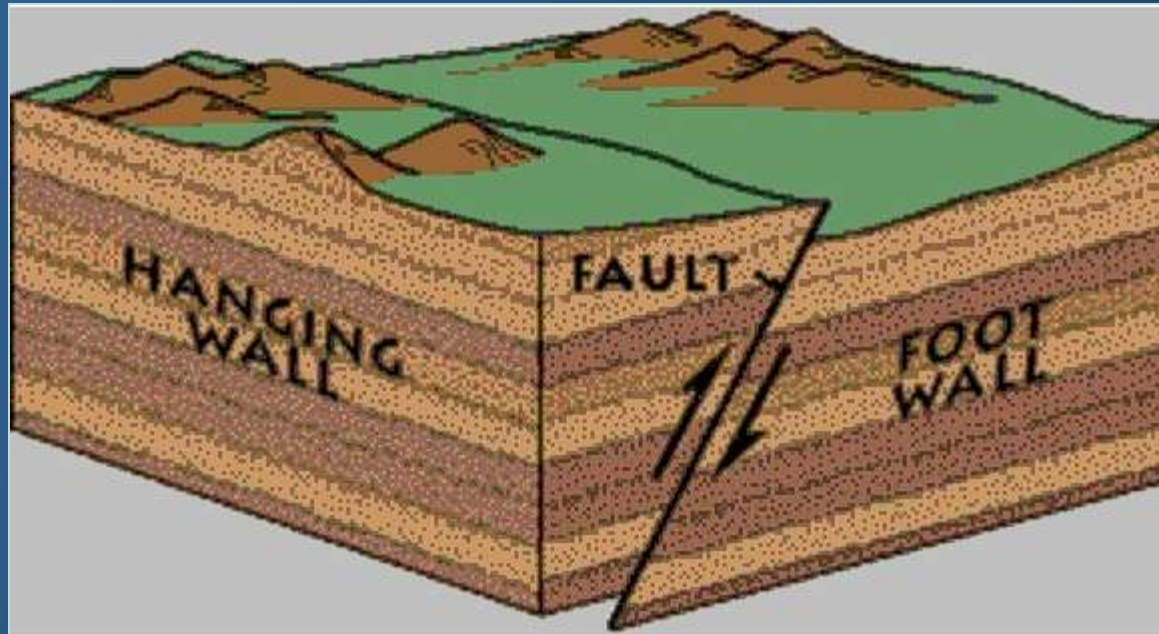


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# Reminder

- Change default passwords
  - Passwords that “come with” a device or set by the vendor





# You Can

- Protect yourself
- Pick strong, easy-to-remember passwords!



# Resources

- Password Meter password strength checker
  - <http://www.passwordmeter.com/>
- Computer World's review of password managers
  - [http://www.computerworld.com/s/article/9191339/4\\_password\\_managers\\_offer\\_security\\_anytime\\_anywhere?source=CTWNLE\\_nlt\\_security\\_2010-10-18](http://www.computerworld.com/s/article/9191339/4_password_managers_offer_security_anytime_anywhere?source=CTWNLE_nlt_security_2010-10-18)
- Password Managers
  - <http://passwordsafe.sourceforge.net/>
  - [https://lastpass.com/features\\_free.php](https://lastpass.com/features_free.php)



# Thanks!

Questions? Contact  
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