

Part 2

E.

Handwriting

a. A key element of document examination focuses on handwriting, which includes hand printing and signatures.

b. Despite minor variations due to type of writing instrument, mood, age or stress, everyone's handwriting has their own unique style.



- Once a person starts writing subconsciously, characters form as a result of habit and unique handwriting is formed.

c. Major factors influencing handwriting:

- i. Size of fingers, hands, arms
- ii. Muscular makeup
- iii. Education
- iv. Style and personality



- d. Handwriting examination and comparison is based on three main principles:
 - i. Given a sufficient amount of handwriting, no two skilled writers exhibit identical handwriting features.
 - ii. Every person has a range of natural variation to his or her writing.
 1. No one writes with machine-like precision every time, and variations are evident in a person's handwriting even within the same document. For example, if a person writes an entire page of signatures, each one will vary slightly. A trained forensic document examiner can discriminate between natural variations in a writer's own handwriting and significant differences denoting different writers.
 - iii. No writer can exceed his or her skill level (for example, it would not be possible for a person who has only learned to produce very basic hand-printed letters to execute perfectly formed, highly skilled cursive writing).

In all the ways we express
ourselves nonverbally, none
is quite so personal as our
handwriting.

Betty Edwards, Author

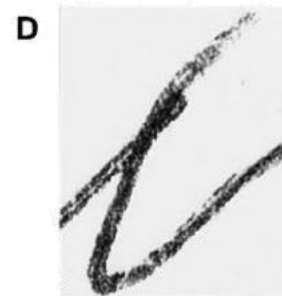
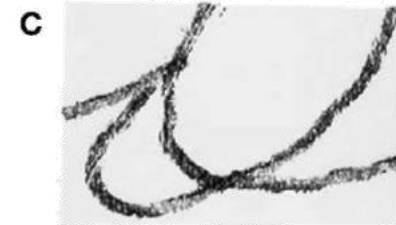
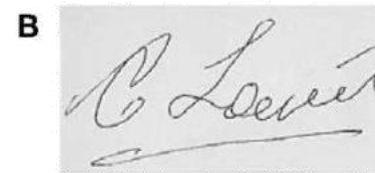
Before fingerprints, retinal scans, or DNA, our signatures served as our identifying “mark” for thousands of years. As we progressed from stone to papyrus to paper, the signature has served to recognize artists, solidify contracts, and communicate the personal messages of writers.

12 MAJOR CHARACTERISTICS OF HANDWRITING:

- i. **Line Quality**- Do the letters flow or are they erratic and shaky?

Smooth- Jack and Jill went ~~up~~ the hill.
Shaky or nervous- Jack and Jill went up the hill.
Juvenile or deliberate- Jack and Jill went up the hill.

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ii. **Spacing**- Are the letters equally spaced or crowded?

I am having good management

ability and analytical skills

4(c)

*Lack of determination and will power
cannot help anyone*

4(d)

the lazy

the lazy

the lazy

iii. **Size Consistency**- Is the ratio of height to width consistent or inconsistent?

The Right of the People

The Right of the People

The Right of the People

Handwriting

WHY WE SHOULD FOCUS MORE ON

Letter Size

THAN

Letter Formation

iv. Continuous- Is the writing continuous or does the writer lift the pen?

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generally the same level of living costs less
in the country than in the city

She was long past the point of coherent
thinking

- v. **Connecting Letters**- Are capital and lowercase letter connected and continuous or not?

The Right of the
The Right of the

Jack

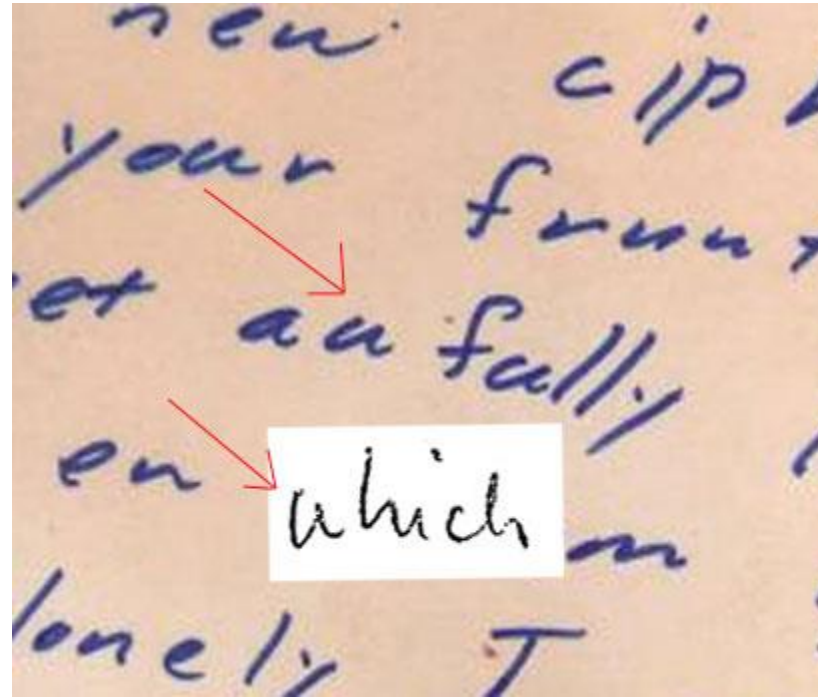
Jack

Across the River

Friday evening
Elizabeth
My Dearest Baby,
I just had to
drop you a line to tell
you how very much I
miss you, & that I love
you more than anything
or anyone else in the
whole wide world.

Mammy,
Before
want you
my wri
put m
ds

- vi. **Lettering Complete-** Are the letters formed completely or are parts missing?



the right of the people
the right of the people

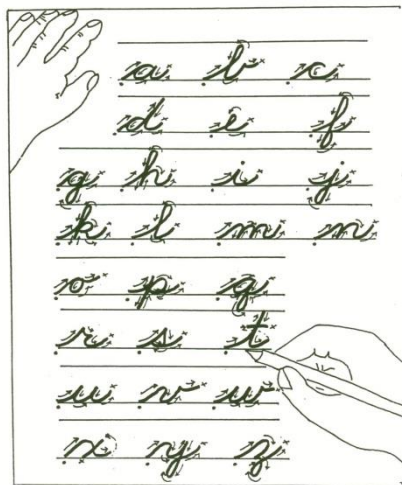
vii. Cursive and Printed Letters- Are the letters printed, written in cursive, or both?

seashore

seashore

seashore

seashore



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Hello everybody. I'd like to welcome you to my life.
A famous person once coined a bizarre phrase about
a monkey.

I said to the purple people eater "You and your silly monkey
friend don't go home to the zoo!"

Now, please analyze me.

Sincerely,

Joanne Chaz

viii. **Pen Pressure**- Is the pressure equal or unequal when applied to upward and downward strokes?

Heavy Pressure

Light Pressure

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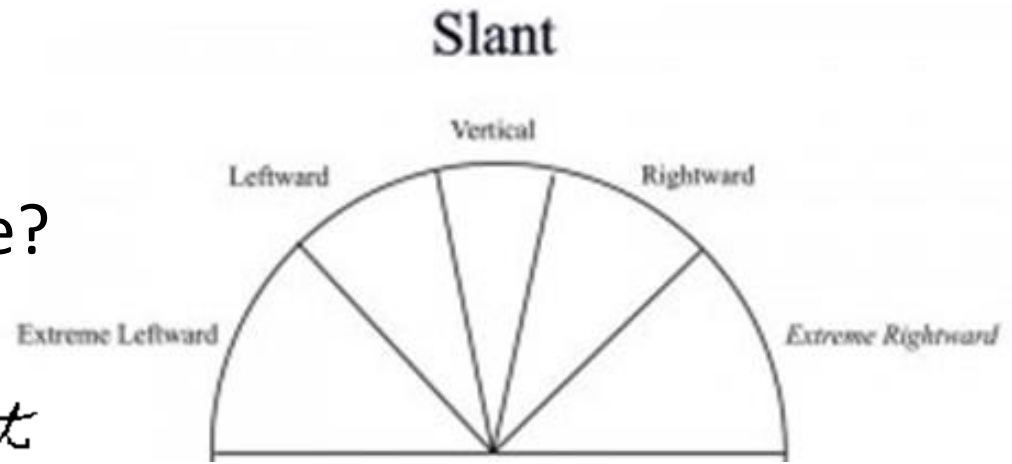
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eye

very much (my mother
last year). I don't
ever told my mother.

ix. **Slant**- Is there a slant? Is it left, right, or variable?



forward slant
backward slant

Dear Michelle,
I'm constantly being told
that my writing is strange.
I'm right handed although

Please let me hear
from you and come
me a friend.
Sincerely
Lybith A. Borden

Strong right

right

vertical

left

varying

- x. **Line Habits**- Is the text on, above, or below the line?

Straight on line:

Jack and Jill went up the hill.

Words leave baseline below it:

Jack and Jill went up the hill.

Words slant up from baseline:

Jack and Jill went up the hill.

2(a) *John D. Rockefeller.*

2(b) *I am a leader*

2(c) *so far wonderful year*

xi. **Fancy** Curls or Loops- Are there fancy curls or loops on any of the letters?

Love and kisses!

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Minnie

Martin Luther King Jr.

Rev. Martin Luther King Jr.
American Civil Rights Hero

Mouse

XOXO

Sincerely,
Carissa

records. Archaeology has
of sports-like activities in the
cultures and sports played on
in the lives of those cultures

xii. Placement of crosses on t's and dots on i's- Is the placement correct? Are t's crossed high, low, or middle? Are the dots on the i to the left, right, or centered?

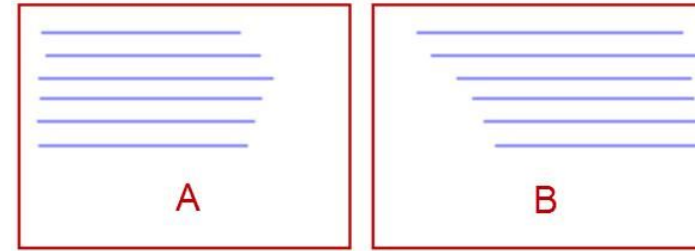
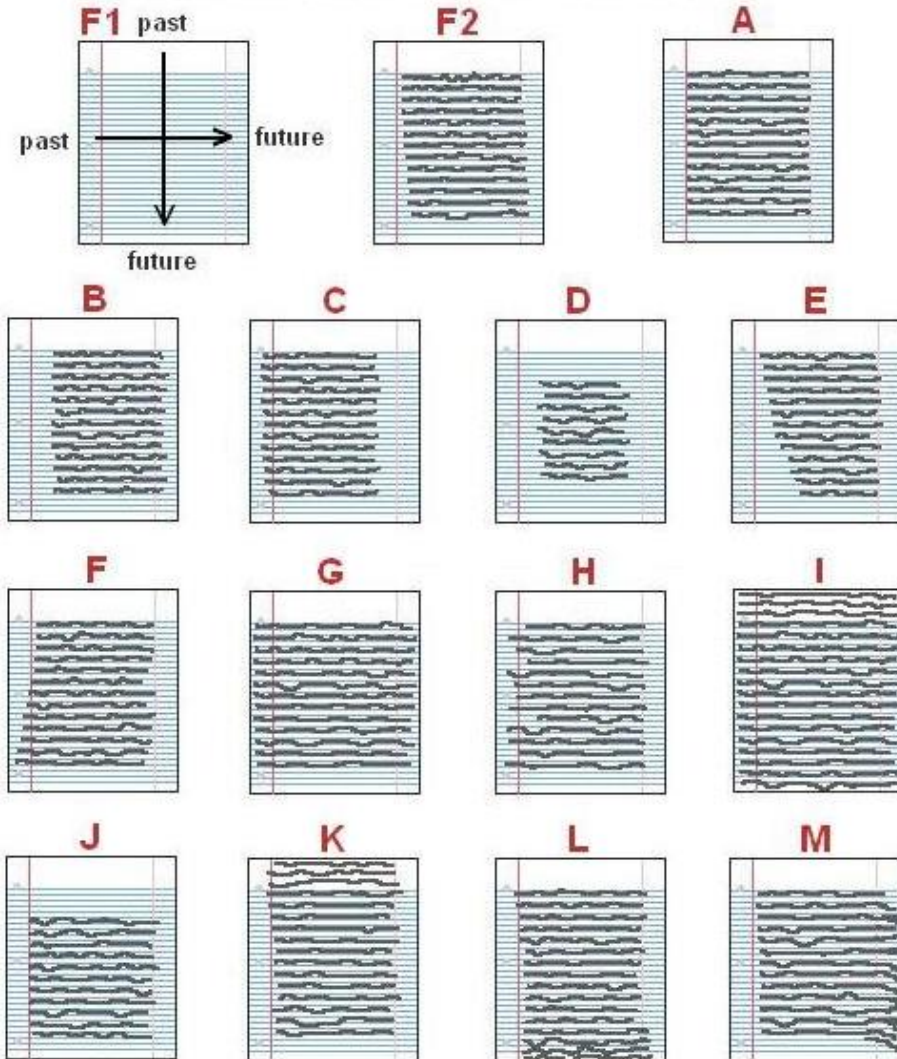
Are t's crossed?
 Lightly? *t* Heavy? *t* Left of stem? *t* Right of stem? *t* Concave? *t* Convex? *t*
 Uncrossed? *t* Short in proportion to stem? *t*

Are i's dotted?
 Lightly? *i* Firmly? *i* Left of stem? *i* Right of stem? *i* Circular pattern? *i*
 Jabbed? *i* No dot? *i*

right right right right

- f. Experts can also look at formatting, such as the margins a writer leaves empty on the page.

Handwriting Analysis: Margins



of the masses as that
 of the rulers. If in
 spite of that knowledge
 we go through that
 course it is because,
 it is the only course
 that has been in
 vogue for so many
 years and which
 has served the purpose
 of providing a status
 in life. Such is the
 fate which we
 have been reduced

Left margin is even:

Our business in Switzerland is great. We are grossing over one million dollars a year. We know this will double by the next decade.

Left margin is jagged:

Our business in Switzerland is great. We are grossing over one million dollars a year. We know this will double by the next decade.

Angle on left margin:

Our business in Switzerland is great. We are grossing over one million dollars a year. We know this will double by the next decade.

Angle on right margin:

Our business in Switzerland is great. We are grossing over one million dollars a year. We know this will double by the next decade.



HANDWRITING ANALYSIS

a. In order to analyze handwriting, a forensic expert also needs an exemplar, which is a known sample of the suspect's writing, which can be compared to the questioned document.

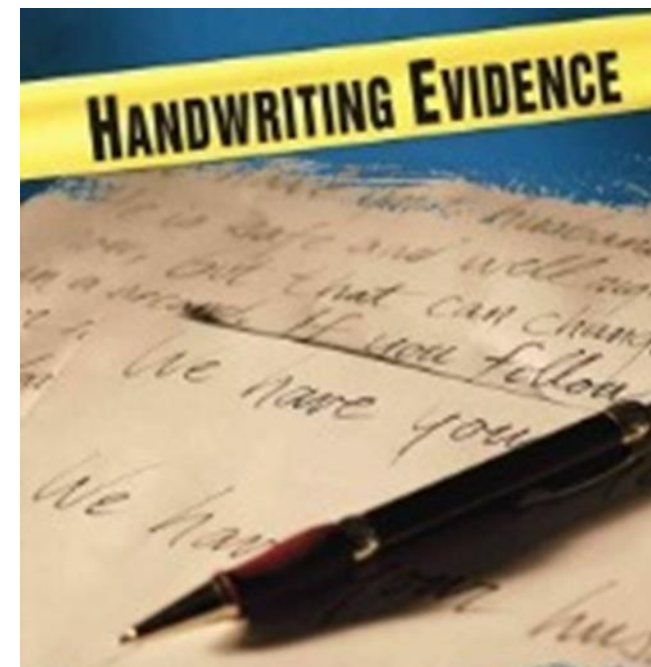
1. Collected writing specimens: writings that were completed by the subject prior to the investigation.

a. These might include letters, diaries, cards, personal notes, cancelled checks, signed receipts, tax records, or other signed legal documents.

To my cousin
Henry B. Warner
who was my early
ideal of a ball player
with my compliments
and Christmas Greetings
A.H. Spalding
Point Loma Calif
Dec. 25th. 1911.

To my old time base
ball friend and recent
political supporter
Mr. C. W. Hornick,
with my compliments
and Christmas Greetings.
A.H. Spalding
Point Loma Calif
Dec. 25th. 1911.

2. **Requested** writing specimens: writings **dictated** by the investigator to the writer.
- a. These are used primarily when collected writing specimens are not readily **available** and the suspect is asked to write a sample under carefully controlled conditions, with the writer being closely monitored.
- b. It is best not to inform the suspect of the **intention** of comparison.



SWORN STATEMENT			
For use of this form, see AR 190-45; the proponent agency is ODCSOPS			
LOCATION KANDAHAR DETENTION FACILITY	DATE 15 FEB 2002	TIME 1700	FILE NUMBER
LAST NAME, FIRST NAME [REDACTED]	SOCIAL SECURITY NUMBER [REDACTED]		GRADE/STATUS E4 SPC
ORGANIZATION (USE UNIT ADDRESS) A CO 202 JTF KANDAHAR AF			
[REDACTED] WANT TO MAKE THE FOLLOWING STATEMENT UNDER OATH:			
I am writing this in response to events that I witnessed while performing my duties as an interrogator with the TF-202 JTF.			
SPC [REDACTED] I was conducting an interrogation of MP [REDACTED] on 3 Jan 2002. Special Forces personnel had been visiting the booth area previously & helping out by giving information that they had from their raids. [REDACTED] I took a break to regroup & check our notes. I was the translator. While we were out of the booth several special-forces members entered the booth. At the time I did not think anything of it, & thought they were just observing him based on previous experiences with their people. This was a different group of people I hadn't seen before [REDACTED] I finished the break & went back to continue the interrogation. When we entered the booth, we found the special forces members all crowded around the prisoner. They were blowing cigarette smoke in his face. The prisoner was extremely upset. It took a long time to calm him down & find out what had happened. The prisoner was visibly shaken & crying. [REDACTED] immediately told them to get out & not to come back anywhere near anyone that we were			



- Known samples should be as similar as possible to the questioned document.
- Including the writing implement, paper, and words written.

ii. The investigator should obtain known writing samples that are similar in character to the document in question.

1.If it is written in cursive, it should be compared to known cursive writing.

2.If it contains upper and lowercase letters, the known writings must also contain upper and lowercase letters.

3.Wherever possible, the investigator should also obtain known writing containing similar combinations of letters and numbers seen in the questioned documents.

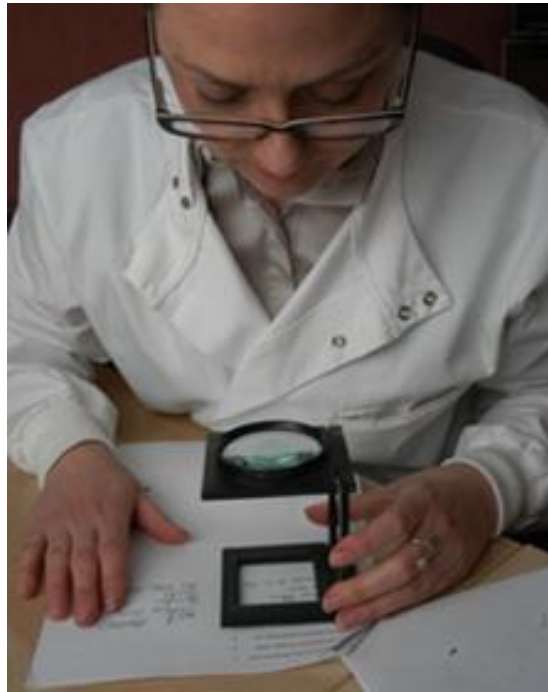
4.For comparison purposes, it is recommended that investigators obtain 20–30 repetitions of signatures, 15–20 repetitions of bank checks, 3–4 repetitions of entire written letters.

iii. The investigator should also attempt to obtain known writing that is prepared around the same **time** period as the questioned writing.

1. This is particularly important in cases involving writing from **young** people (up to mid-teens), as writing formation may still be at a **developmental** stage, and by **elderly** persons, as writing may deteriorate with age or illness.



- b. The expert will examine the questionable document for detectable traits and record them.
- c. Finally, the expert will compare and draw conclusions about the authorship of the questionable document.



- i. If a sufficient amount of evidence is submitted, an examiner will reach a conclusion that may range from **identification** (a definitive determination of authorship or source) to **elimination** (a definitive determination of non-authorship or from another source).

RESULT: IDENTIFICATION

Questioned Signatures

Exhibit Q1 Ana D. Halindz
Exhibit Q2 Ana D. Halindz
Exhibit Q3 Ana D. Halindz
Exhibit Q4 Ana D. Halindz

Known Signatures

Exhibit K1 Ana D. Halindz
Exhibit K2 Ana D. Halindz
Exhibit K3 Ana Halindz
Ana Halindz
Ana Halindz
Exhibit K4 Ana D. Halindz

RESULT: ELIMINATION

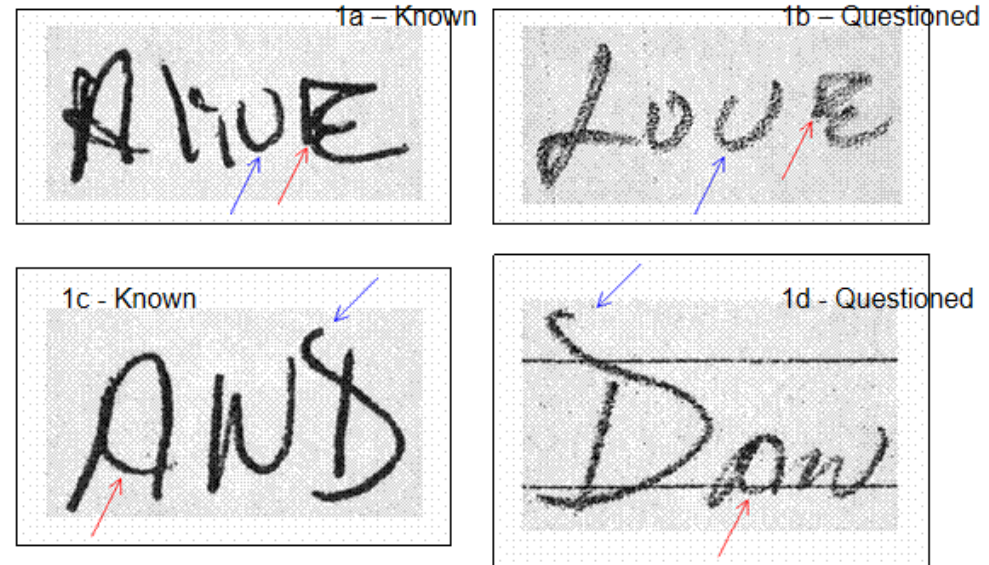
Questioned Writing

Exhibit Q1 Sig T tablet
Exhibit Q2 Sig T tablet

Known Writing

Exhibit K1 Sig T tablet
Exhibit K2 Sig T tablet
Exhibit K3 Sig T tablet
Exhibit K4 Sig T tablet
Exhibit K5 Sig T tablet

1. Two writings came from one person if their similarities are unique and no unexplainable differences are found.



“Handwriting comparisons are based on the principles that no two people write exactly alike and that characteristics reoccur throughout every person’s writing, although no one writes exactly the same way twice. This combination of characteristics is unique to every individual and is used by document examiners for comparison.” -- <http://www.fbi.gov>

- ii. If no determination can be made based on the evidence, the examiner will issue an **inconclusive** result.
- iii. Most laboratories also permit a broader range of conclusions, called **qualified** conclusions, that fall somewhere **in between** the definitive conclusions of identification or elimination.
- iv. Many practitioners also choose to provide a defining description of the results of their examination. For instance, for a handwriting exam, identification may be phrased, “The evidence very strongly supports the proposition that the questioned writing was written by the writer of the specimens.”



RESULT: FORGERY

Questioned Signatures

Exhibit Q1

Betty J. Hairston

Known Signatures

Exhibit K1

Betty J. Hairston

Exhibit K2

Betty Hairston

Exhibit K3

Betty Hairston

Exhibit K4

Betty J. Hairston

Exhibit K5

Betty J. Hairston

SHORTCOMINGS IN HANDWRITING ANALYSIS

Although an experienced document expert can detect many cases of forgery, some may be missed.

Difficulties can occur when:

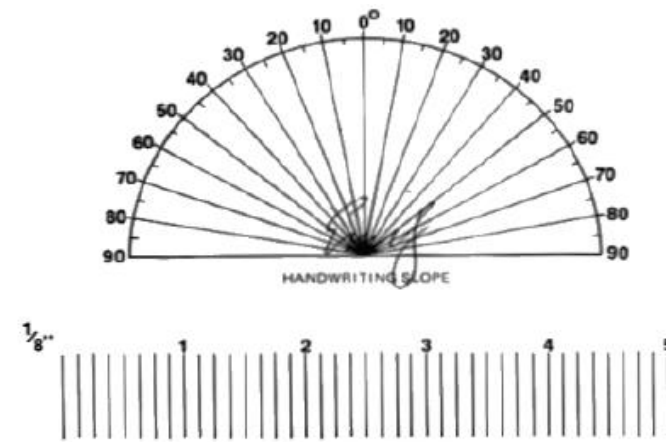
- Not enough known samples to use for a comparison
- Questioned writing contains only a few words
- Writing is deliberately disguised
- Drugs or alcohol alter writing habits

To help eliminate deception:

- Require several pages of writing
- Write from dictation
- Do not show the suspect the questioned document or give direction on spelling or punctuation
- Write the desired text at least three times
- Combine signature with other writing

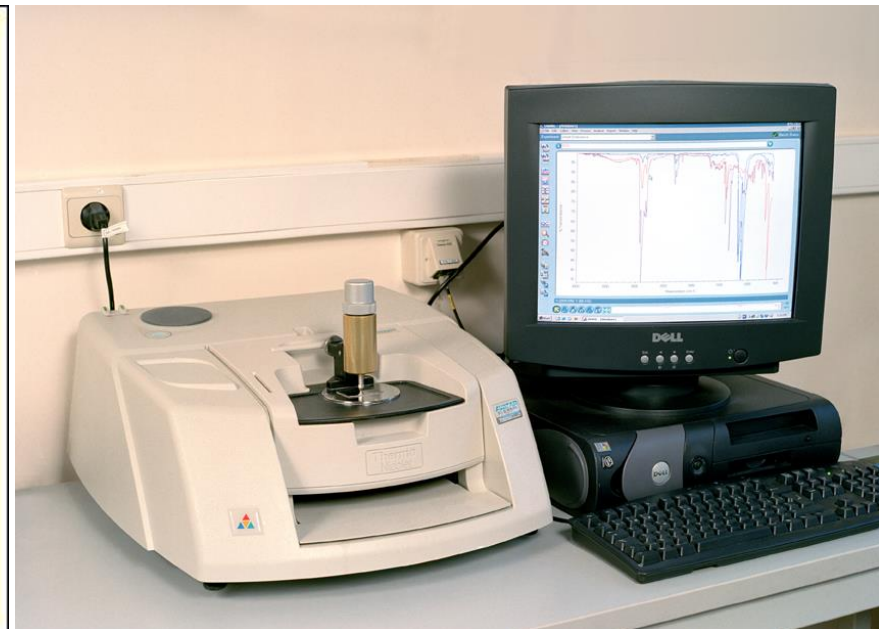
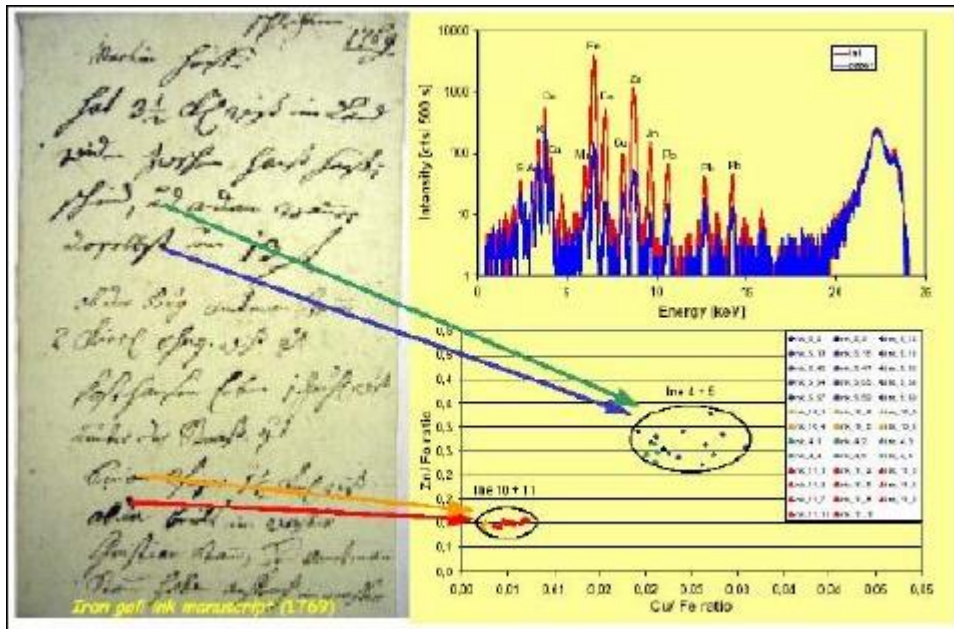
G. TOOLS USED FOR HANDWRITING ANALYSIS

a. A typical Questioned Documents Unit in a crime laboratory is equipped with microscopes, digital imaging instrumentation, infrared and ultraviolet light sources, video analysis tools and specialized equipment including electrostatic detection devices (EDD) and materials to perform analytical chemistry.



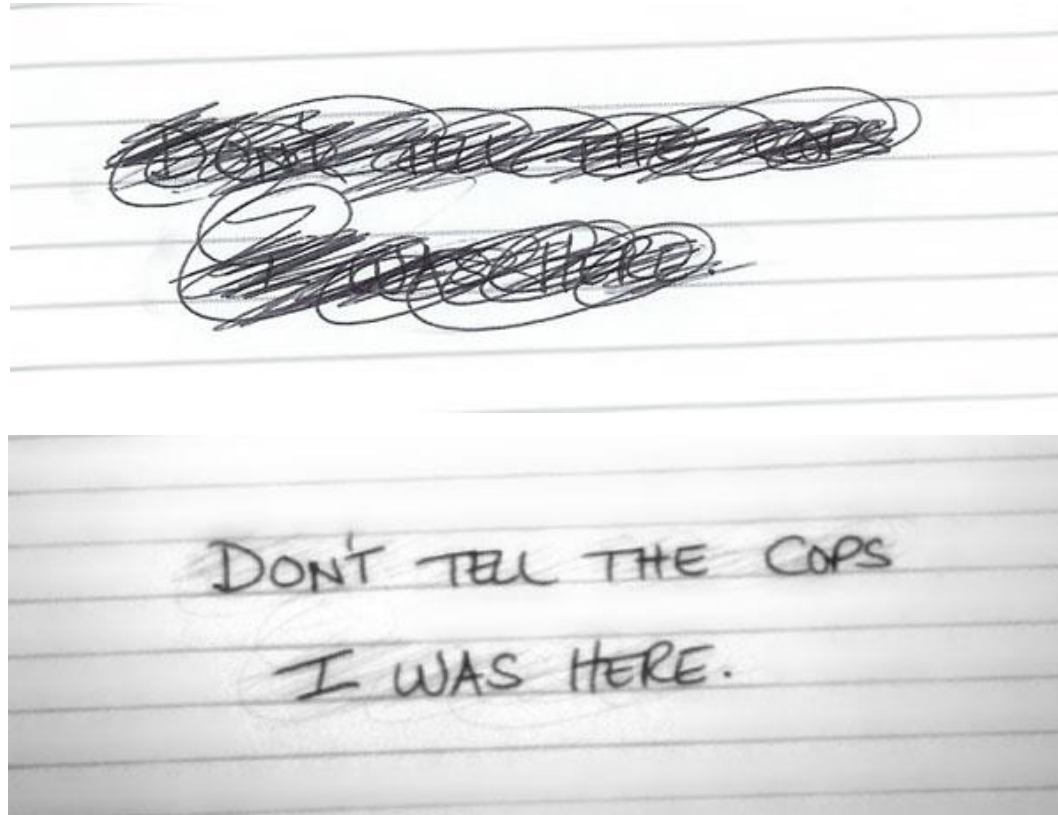
Basic measuring tools

- b. Initial comparisons are done with the naked eye, a handheld lens, an illuminated magnifier, or microscope.
- c. Later, infrared spectrosopes may be used to determine if more than one type of ink was used, based on wavelengths of light absorbed and reflected by each type of ink.



TOOLS USED IN DOCUMENT ANALYSIS

- d. Many forensic document examiners use only non-destructive techniques that use light and/or electrostatic detection to examine documents for indented impression evidence or ink differentiation.



Forensic investigators have access to tools and machines that enable them to read a letter where the ink has been washed away, see what lies beneath scribbles and read a letter from indentations left on another sheet of paper.

i. Electrostatic Detection

Device (ESDA)- Revealing text from indented impressions

1. An Electrostatic Detection

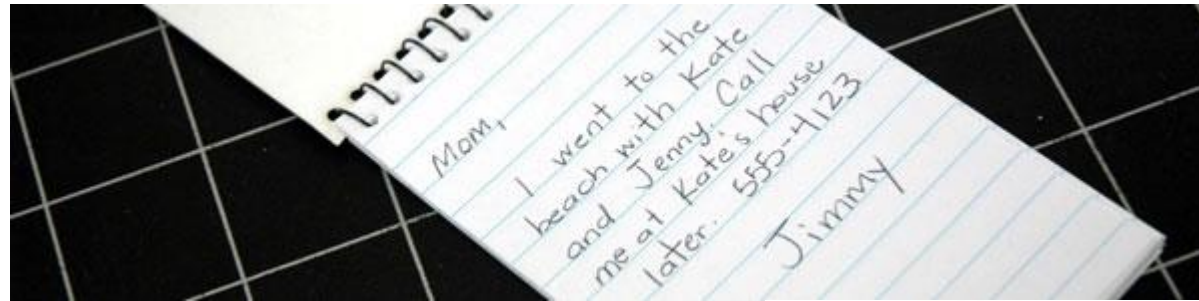
Apparatus (ESDA) uses the principle that indented areas of a document carry less negative charge than surrounding areas. This causes the toner used in the EDD to be attracted to these areas, revealing indentations that are present.



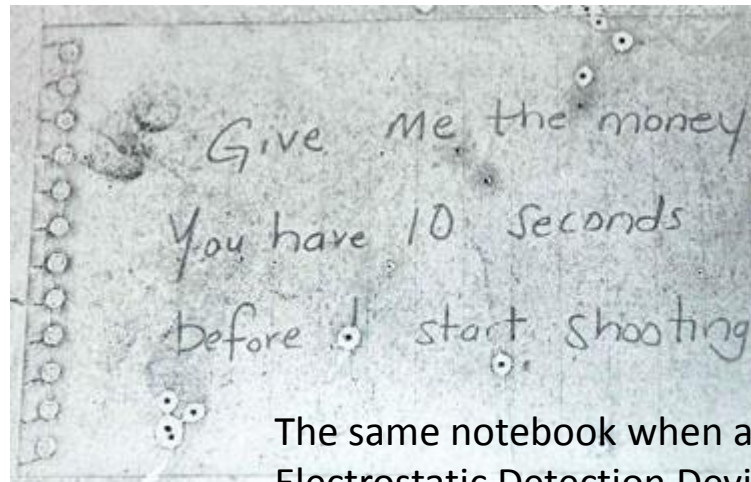
REVEALING TEXT FROM INDENTED IMPRESSIONS

- Using this technique, indented impressions have been recovered from up to seven layers of paper beneath the original writings. Research has demonstrated that impressions can be successfully visualized from documents up to 60 years old, provided the papers are not mishandled or stored improperly.

[Video Clip](#)



A notebook found with suspect's personal effects.



The same notebook when analyzed with an Electrostatic Detection Device (ESDA) reveals invisible impressions of the robbery demand note.



ii. Video Spectral Comparator (VSC)-

Detecting alterations, obliterations, erasures and page substitutions.

1. Alterations, obliterations and erasures not visible to the human eye can often be detected through use of photography and other imaging devices that utilize **ultraviolet** and **infrared** wavelengths of light.
2. Using radiation filtered at various wavelengths, an imaging instrument such as a video spectral comparator (VSC) can reveal writing that has been **added** with a different **ink**, or has been altered or removed by exploiting variations in the way different inks respond to different wavelengths of light.

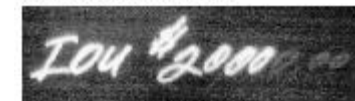


Altered Entry

IOU \$20,000.00
Normal View



Infrared Reflectance



Infrared Luminescence

Obliterated Entry

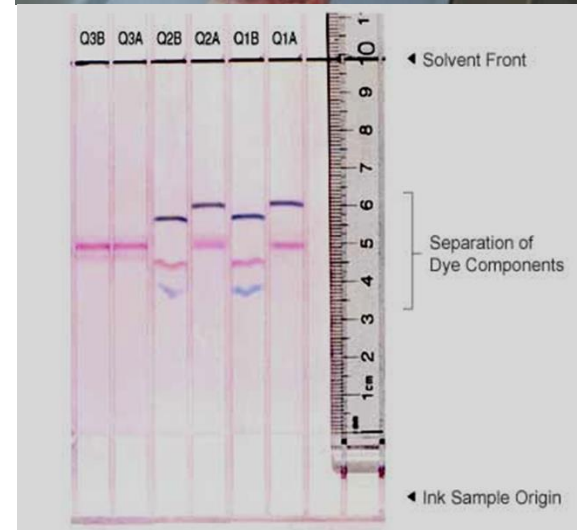
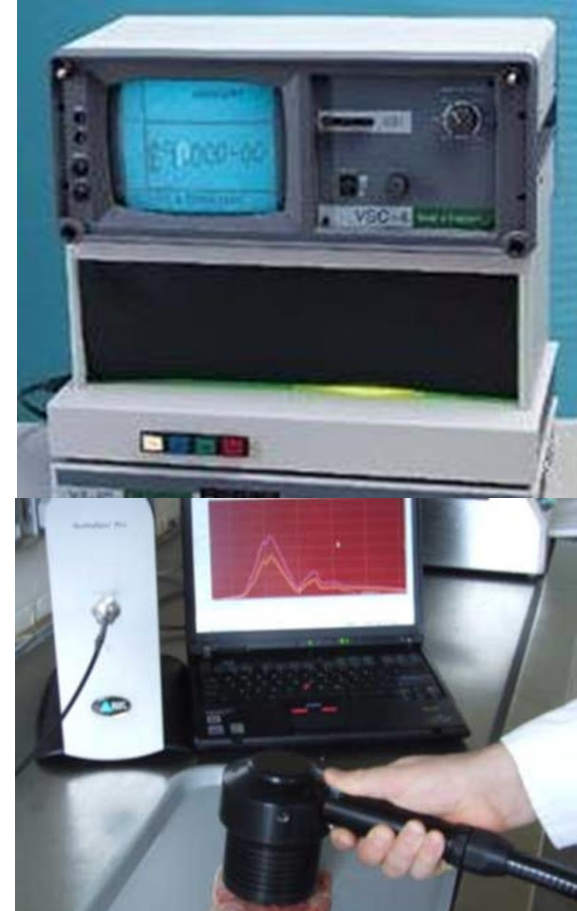


Normal View



Infrared Luminescence

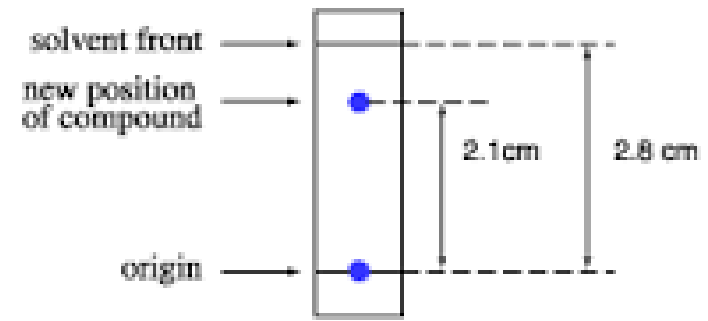
- **Video Spectral Comparator-** used to analyze inks and see whether they are the same or different. Document examiners look at them under different lighting conditions where some wavelengths of light are blocked. This can uncover layers in documents where words have been scribbled out or written over.
- **Infrared Reflectance-** used to show the residue of pencil marks. This can be done clearly even if the writing has been erased. Pencils are made of graphite which is a form of carbon – and this absorbs infrared light well
- **Thin Layered Chromatography-** used to separate and leave a unique pattern for each ink for identification. Inks are made up of different compounds; the mixtures are often copyrighted so each company has its own.



iii. Chromatography-

Determining individual dye components

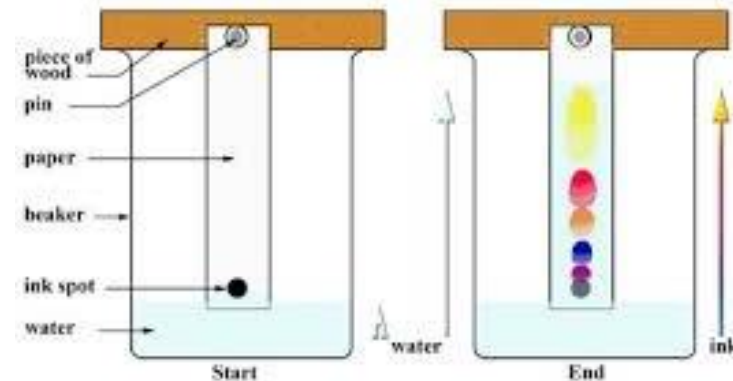
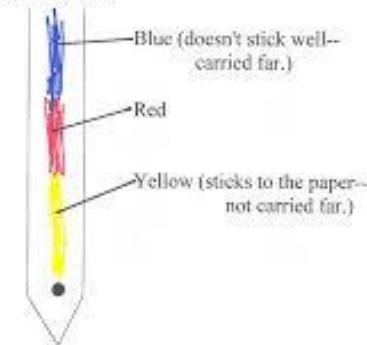
- i. Chromatography is a family of techniques used for separating mixtures. It involves a small cutting from the questioned document being dissolved in a solvent then analyzed. This is one of the few destructive techniques employed by the document examiner. The inks can be compared to the International Ink Library, a database maintained by the U.S. Secret Service that contains data on more than 9,500 inks that have been manufactured since 1920.



$$R_f = \frac{2.1}{2.8} = 0.75$$

Paper Chromatography

Paper chromatography separates mixtures using a solvent (water) that carries a solute (ink) up a strip of paper.



- e. For analyses of documents created by print machines, examiners may rely on various databases created for comparison purposes.
 - i. Documents created on a typewriter or printed with ink jet, laser printers, fax machines and photocopiers may be sourced to a particular make or model, or even to a specific machine.
 - ii. When possible, the examiner should obtain **known standards** and any available accessories from the machine in question and the machine itself should be **submitted** for examination.



f. During handwriting analyses, examiners compare samples provided from particular populations.

- i. Certain agencies, such as the U.S. Secret Service and the German Federal Police, maintain larger databases. For example, the Forensic Information System for Handwriting (**FISH**) maintained by the U.S. Secret Service Forensic Laboratory contains handwriting samples from tens of thousands of writers.



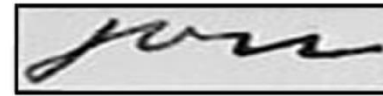
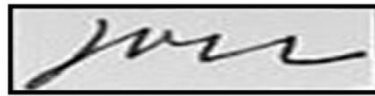
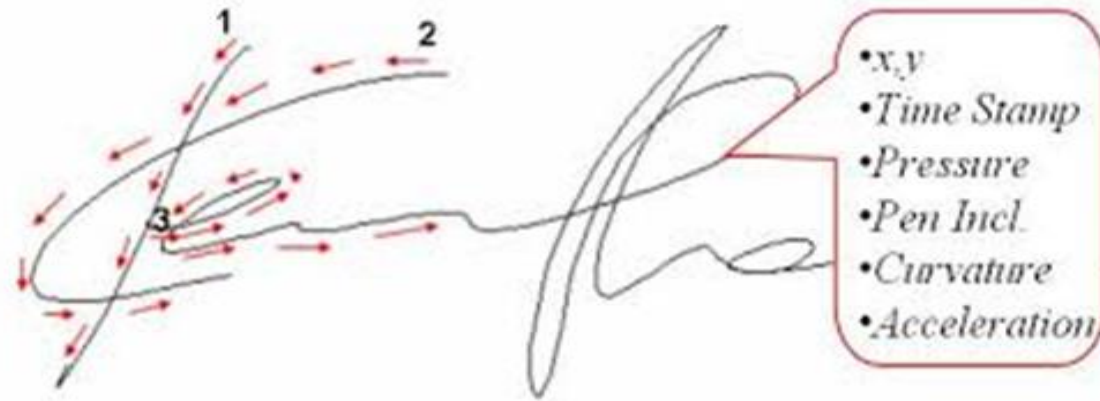
- g. Technology can also assist experts in analysis
- i. Signature recognition research in the 1970s focused on the use of static or **geometric** characteristics (what the signature looks like).
 - ii. Today's machines with touch sensitive technologies allow **dynamic** characteristics (how the signature was made).

iii. **Biometric** Signature Pads are programmed to evaluate the **speed**, pressure, and rhythm of a person's signature and are able to recognize how a person writes so that it can easily **detect** differences and recognize forgeries.

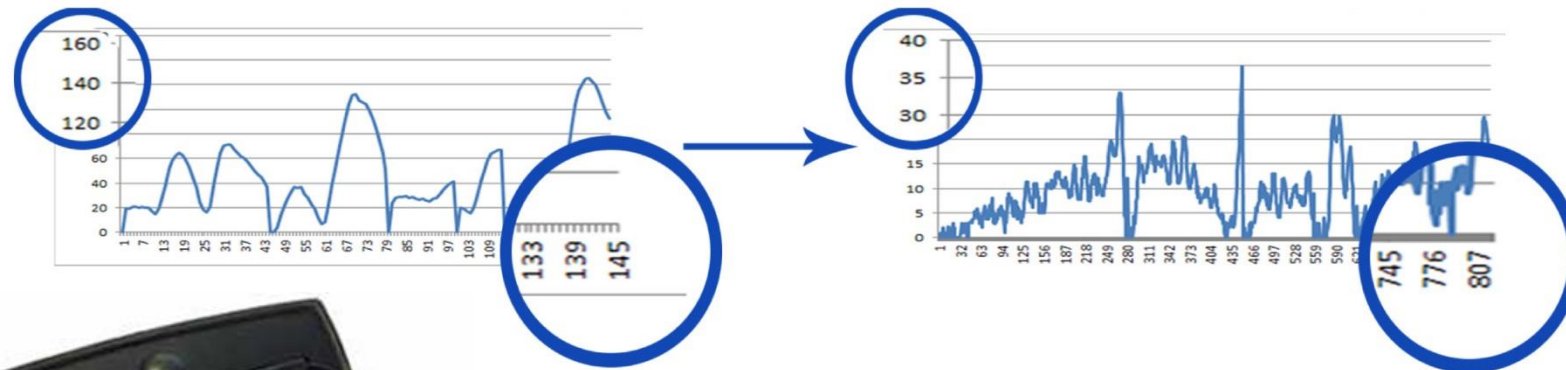


iv. Behavioral biometrics such as signature pressure profiles are a growing focus for the **security** and biometrics community.





Biometric data identifies that the signatures were created from two different people...



The signature pad represents the “xy” coordinates of a graph. The pad senses the electro-static presence of the stylus. As it “writes” the signature, the software records its location at regular intervals, most commonly every 1/100 of a second.

Handwriting Activity 10-1

See Ms. Robbins to
pick this up

Handwriting Analysis Activity:

Activity:

Copy the following sentence and numbers two times.

Copy:

The quick brown fox jumps over the lazy dog. 1234567890

- Do you know why this sentence is used?
- Look for unique characteristics in your handwriting. Focus on each of the 12 elements we discussed in class (Data table on next slide).
- Discuss your results and compare with a classmate.

Handwriting Analysis Activity:

Data Table

Characteristic #	Yes	No	Comments (and measurements in mm) If required
1. Is line quality smooth?			
2. Are words and margins evenly spaced?			Margins: Words:
3. Is the ratio of small letters to capital letters consistent? What is the ratio?			
4. Is the writing continuous?			
5. Are letters connected between capitals and lowercase letters?			
6. Are letter formations complete?			(Be specific, which letters?)
7. Is all of the writing cursive?			(Be specific, which words?)
8. Is the pen pressure the same throughout?			
9. Do all letters slant to the right?			
10. Are all letters written on the line?			
11. Are there fancy curls or loops?			(which letters?)
12. Are all i's and t's dotted and crossed? (top, middle, or not)			i's t's

Additional Activity:

- Each student in the class is to find an old writing assignment. Tear off the top corner so your name is removed (Keep the missing piece, this is another great way to show how matches can be found and will be used and the 'answer key' later). Teacher will collect these, shuffle, and randomly pass them back out to students.
- Students should display their exemplars (created using the previous slide) around the room.
- Students are to circulate the room until they have identified who their paper belongs to.
- When all students think they have found their match, have them compare with the missing corners. Is it a match?