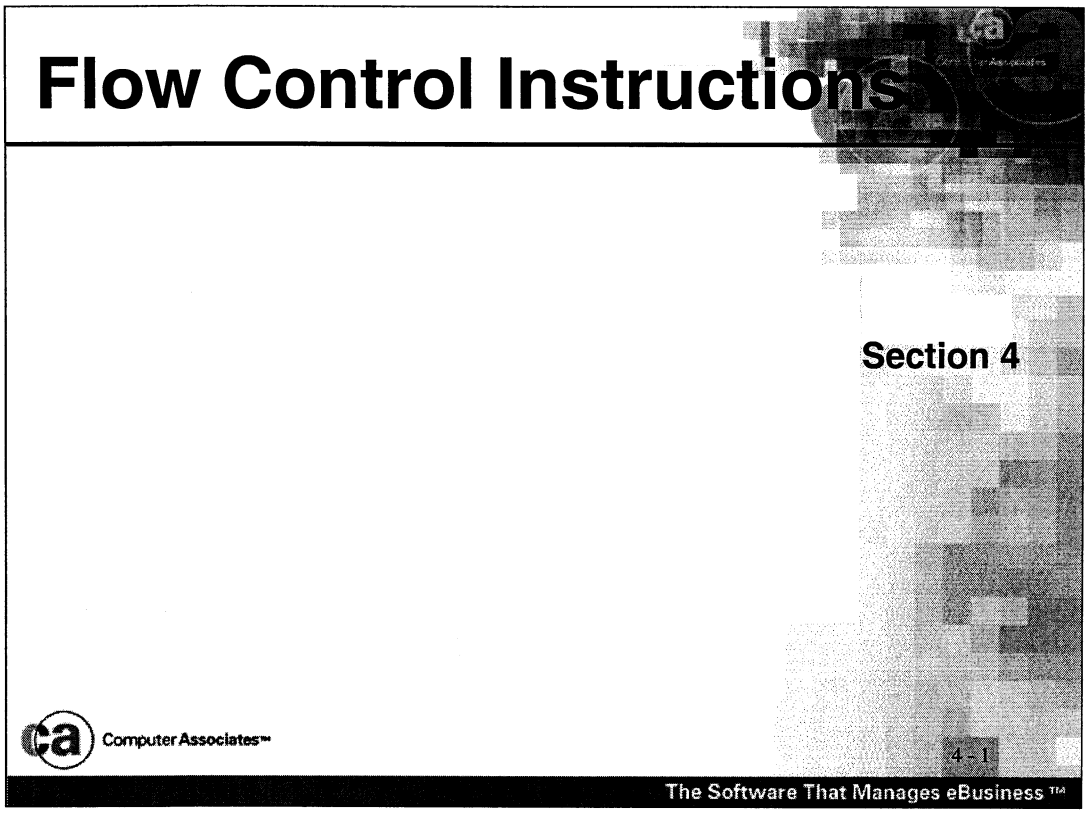
Flow Control Instructions
Section 4
Computer Associates™
4 - 1
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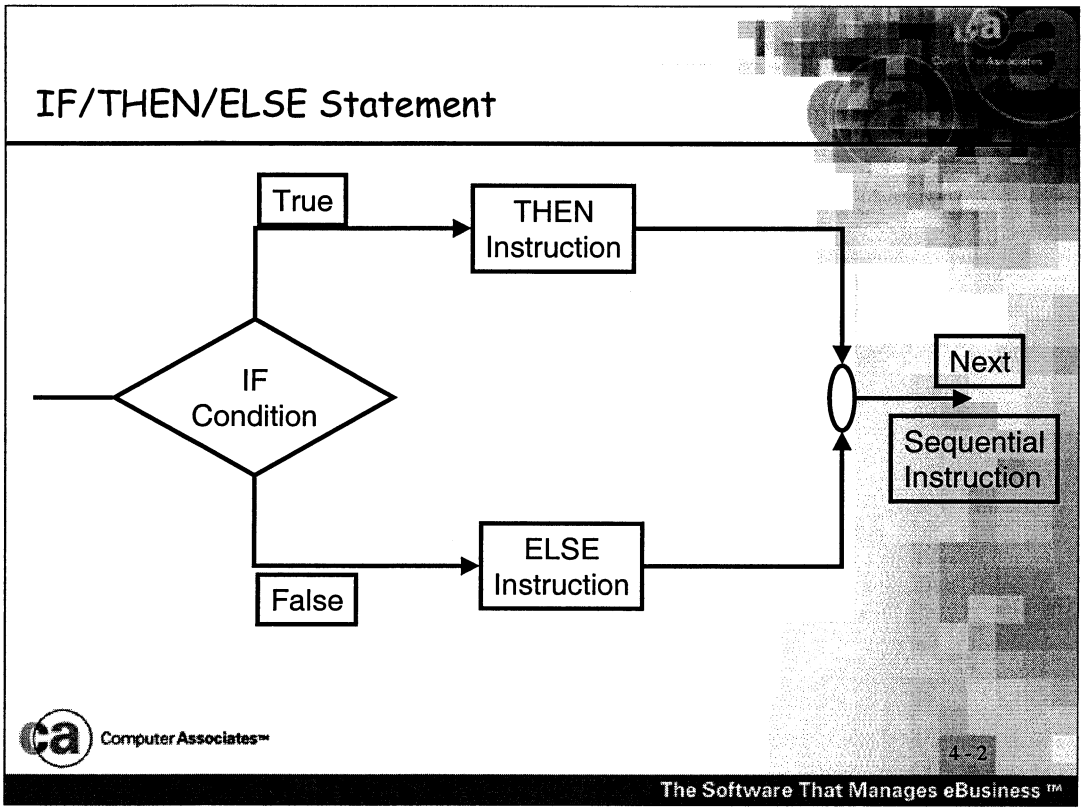
IF/THEN/ELSE Statement
True
THEN Instruction
IF Condition
Next
Sequential Instruction
ELSE Instruction
False
Computer Associates™
4 - 2
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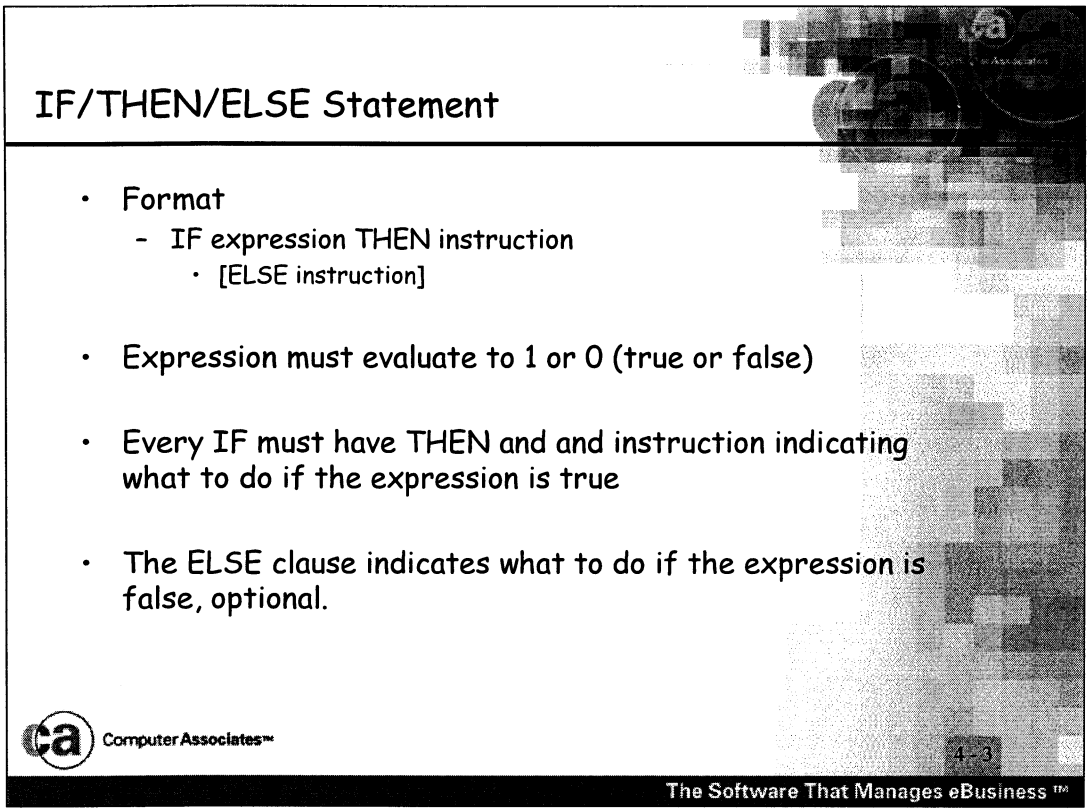
IF/THEN/ELSE Statement
• Format
– IF expression THEN instruction
• [ELSE instruction]
• Expression must evaluate to 1 or 0 (true or false)
• Every IF must have THEN and and instruction indicating what to do if the expression is true
• The ELSE clause indicates what to do if the expression is false, optional.
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4-3
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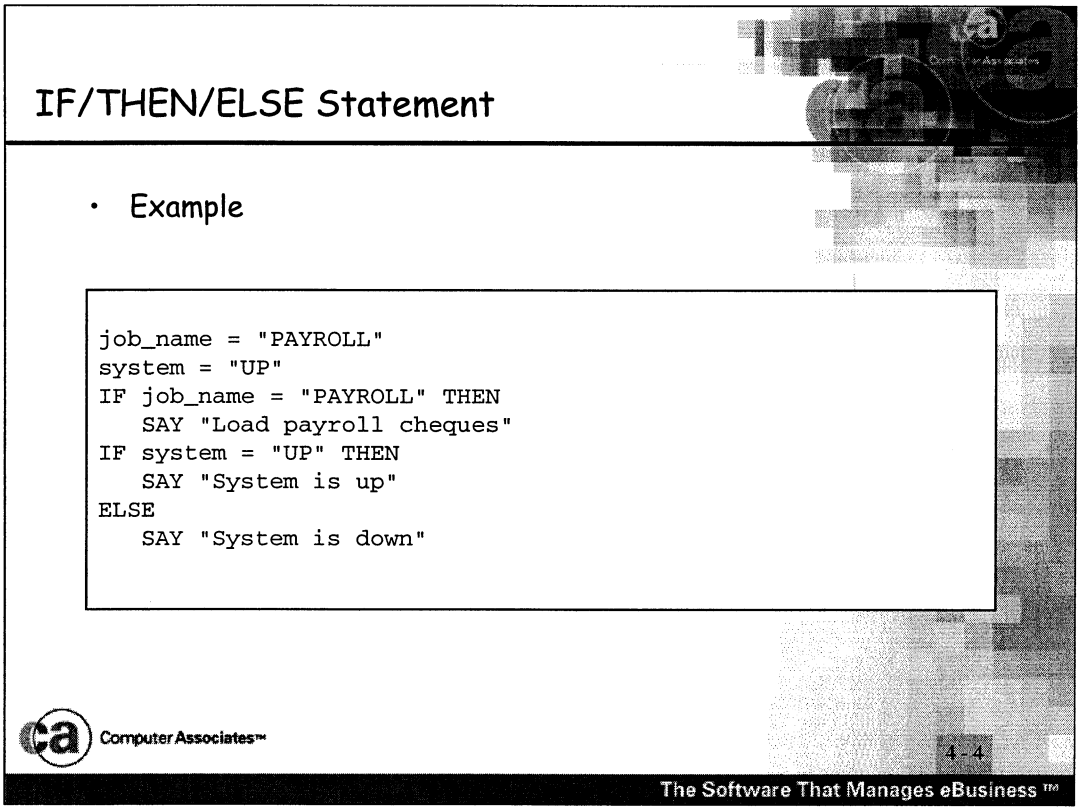
IF/THEN/ELSE Statement
• Example
job_name = "PAYROLL"
system = "UP"
IF job_name = "PAYROLL" THEN
SAY "Load payroll cheques"
IF system = "UP" THEN
SAY "System is up"
ELSE
SAY "System is down"
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4-4
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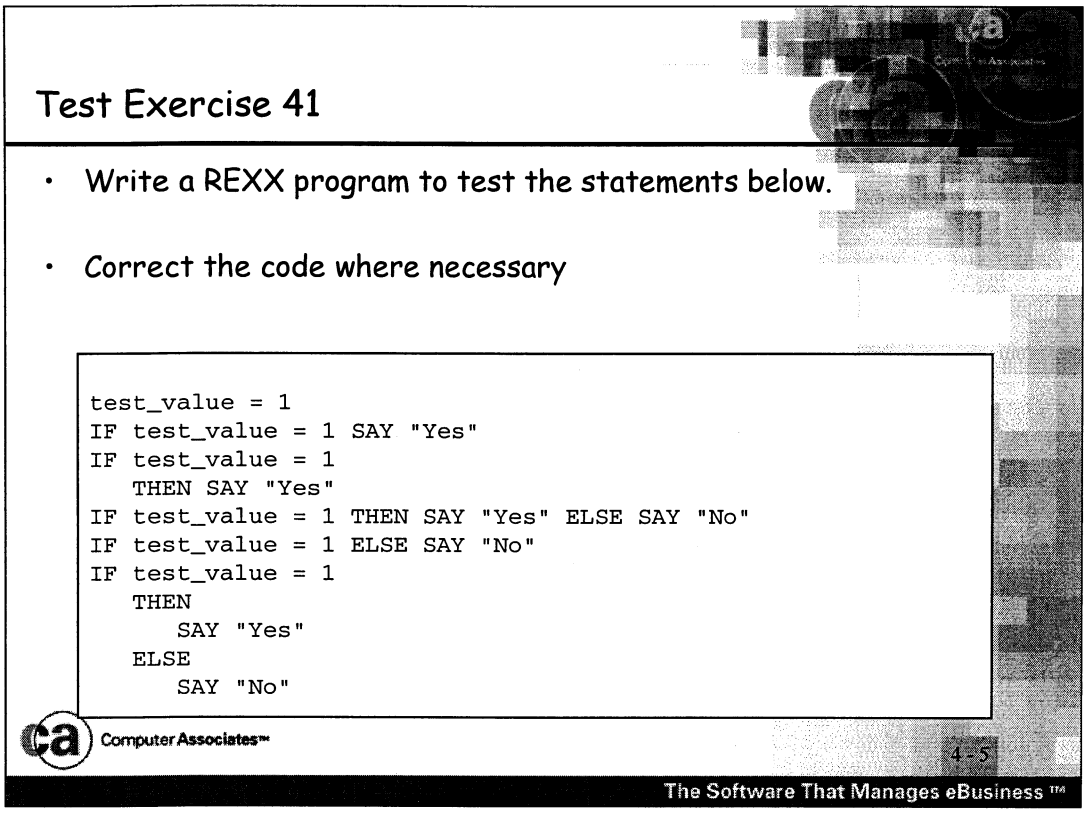
Test Exercise 41
• Write a REXX program to test the statements below.
• Correct the code where necessary
test_value = 1
IF test_value = 1 SAY "Yes"
IF test_value = 1
THEN SAY "Yes"
IF test_value = 1 THEN SAY "Yes" ELSE SAY "No"
IF test_value = 1 ELSE SAY "No"
IF test_value = 1
THEN
SAY "Yes"
ELSE
SAY "No"
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4-5
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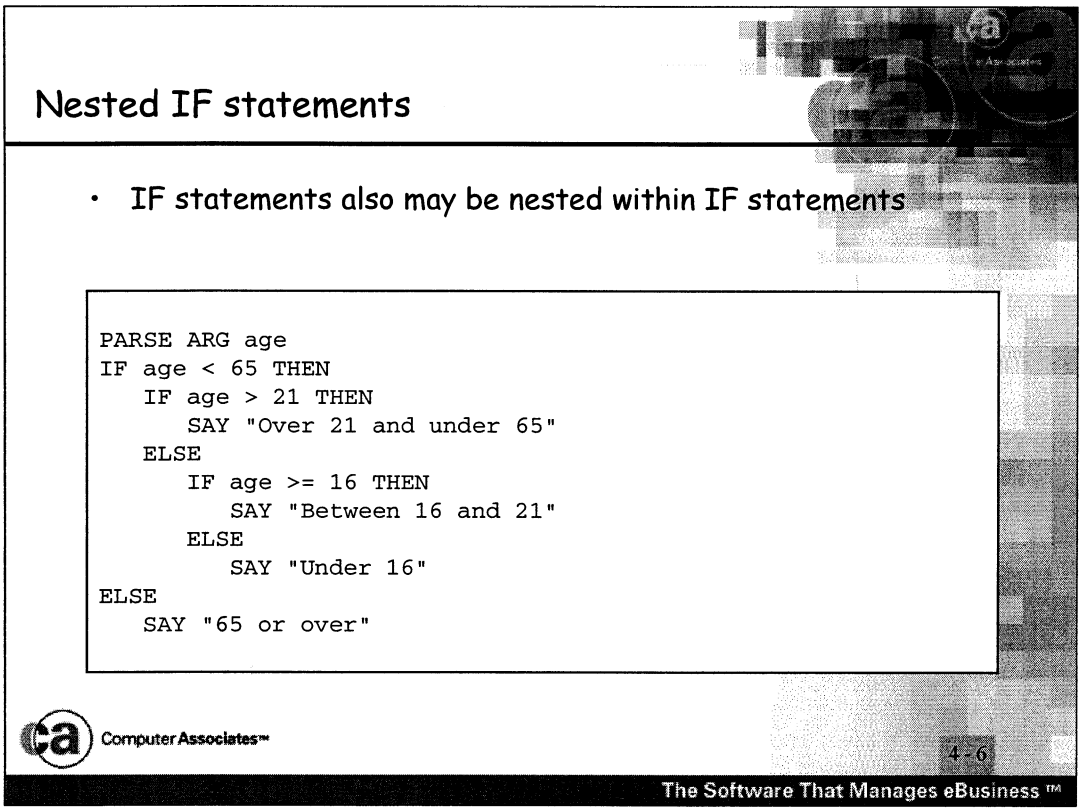
Nested IF statements
• IF statements also may be nested within IF statements
PARSE ARG age
IF age < 65 THEN
IF age > 21 THEN
SAY "Over 21 and under 65"
ELSE
IF age >= 16 THEN
SAY "Between 16 and 21"
ELSE
SAY "Under 16"
ELSE
SAY "65 or over"
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4 - 6
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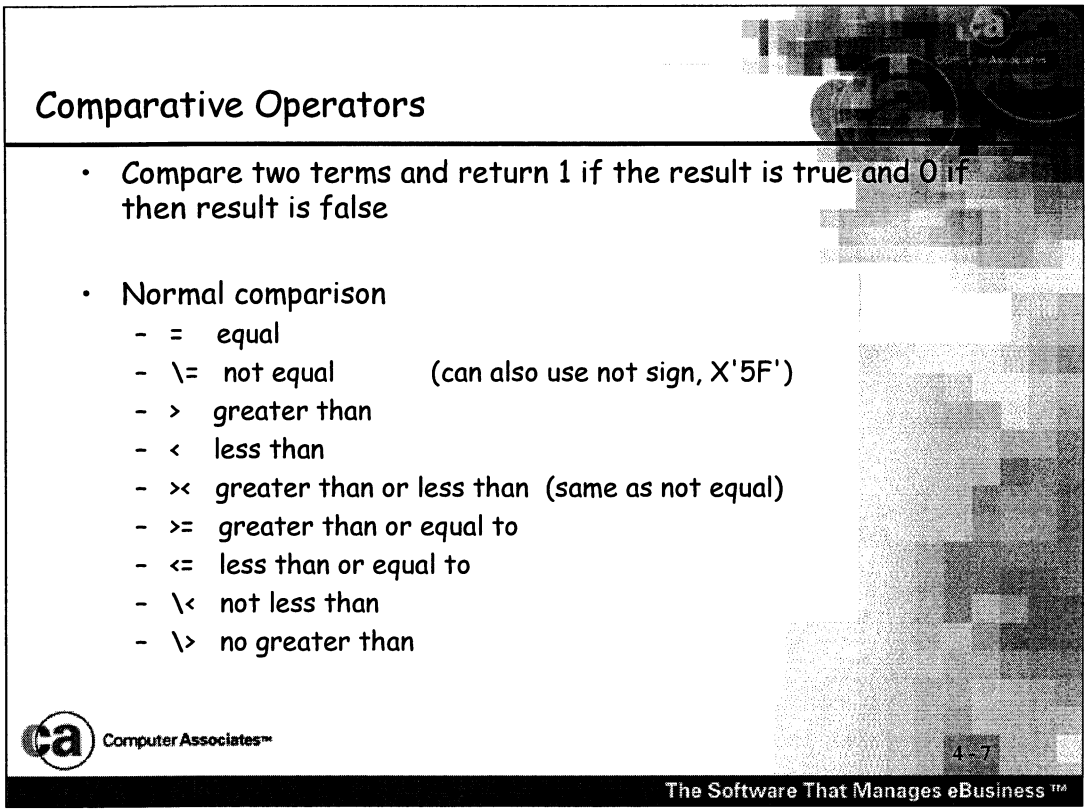

== strictly equal

\== not strictly equal (can also use not sign, X'5F')

Also in 3270 :

¬= not equal

Comparative Operators

- When REXX compares two non-numeric values, it ignores leading and trailing spaces
  - " REXX " = "REXX"
    - Would evaluate as true
- When REXX compares two numeric values it ignores leading and trailing zeros.
  - 00000000012 = 12
  - 12 = 12.000
    - Would evaluate to true

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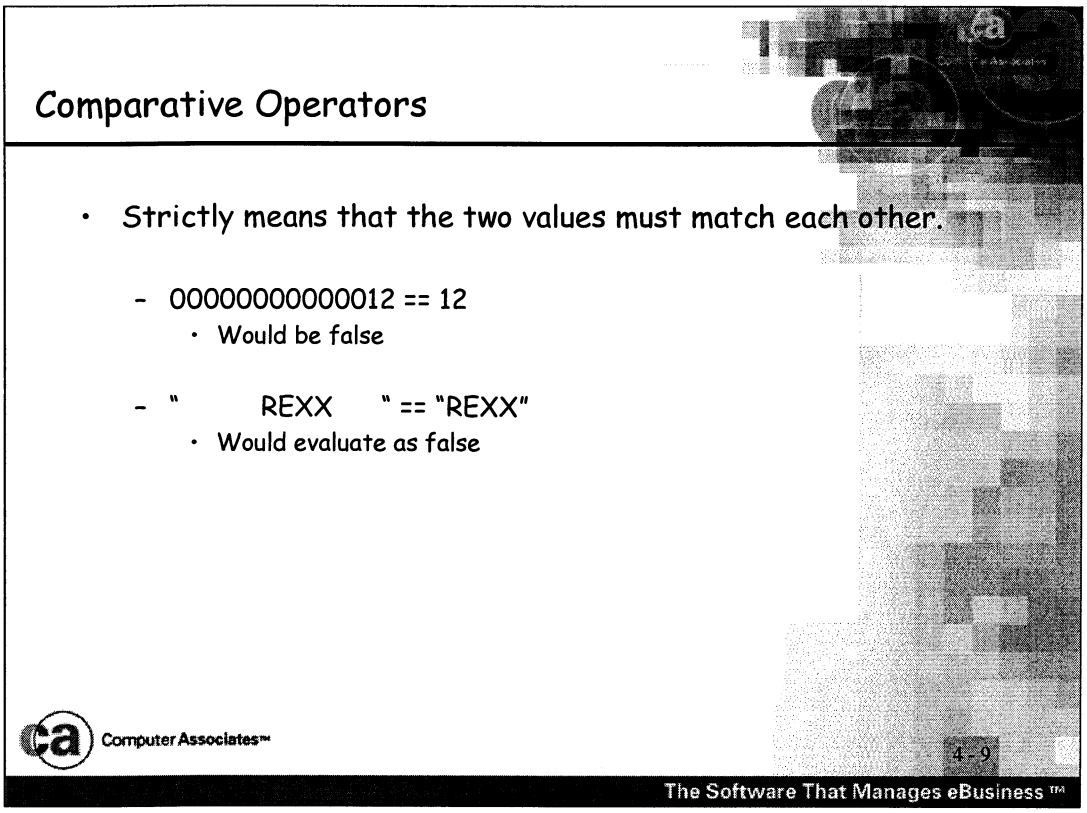
Comparative Operators
• Strictly means that the two values must match each other.
- 00000000000012 == 12
• Would be false
- " REXX " == "REXX"
• Would evaluate as false
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4 - 9
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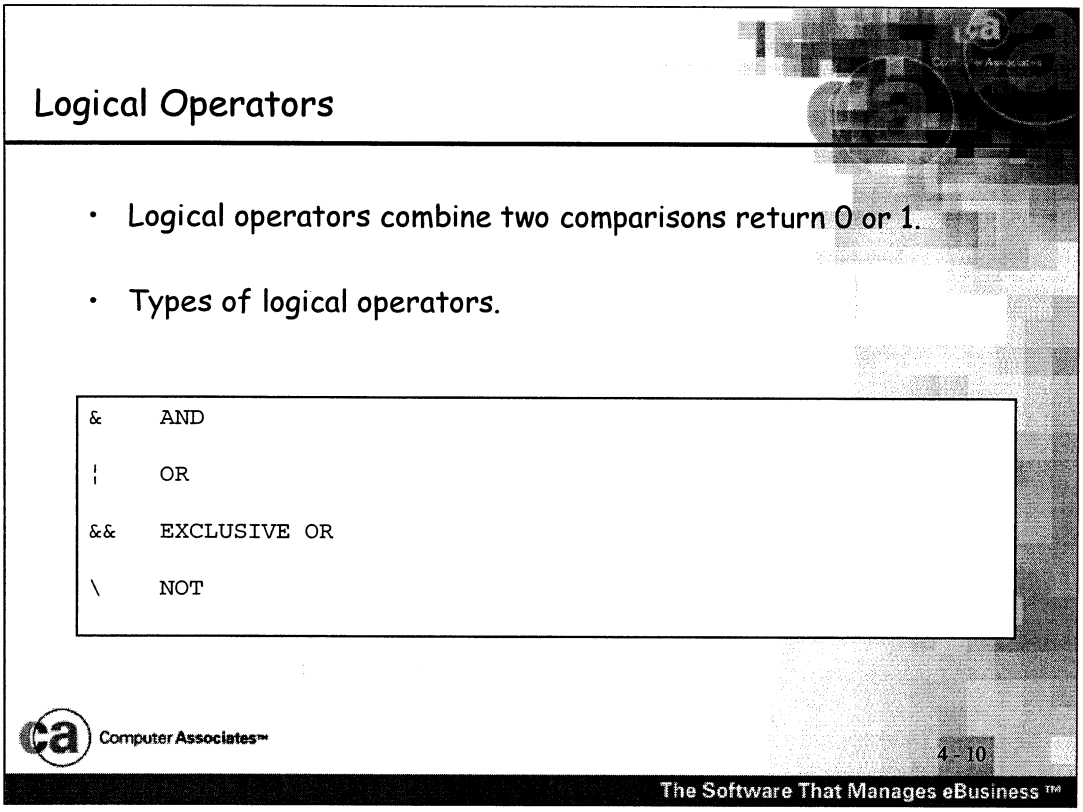

& AND - returns a 1 (true) if both comparisons are true, and a 0 (false) otherwise - performs a logical AND operation

| OR - returns a 1 (true) if at least one comparison of several is true, and a 0 (false) otherwise - performs a logical or operation

&& EXCLUSIVE OR - returns a 1 (true) if ONLY one of a group of comparisons is true, and a 0 (false) otherwise - performs a logical exclusive OR function

\ NOT - returns the reverse logical value for an expression returns false if expression resolves to true, and true if the expression resolves to false

Multiple Logical Operators

- When multiple logical operators are used, &s are evaluated before |s.

```
test_value = 1
old_value = 2000
new_value = 3
IF test_value = 1 & (old_value = 2 | new_value = 3) THEN
   SAY "All ok"
```

4 - 11

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THEN DO and ELSE DO

- This groups several statements together so that REXX will treat them as one instruction
- Often you need to execute more than one instruction in a THEN or ELSE clause

```
system_state = "UP"
IF system_state = "UP" THEN DO
   SAY "The system should be down"
   system_state = "DOWN"
END
```

4 - 12

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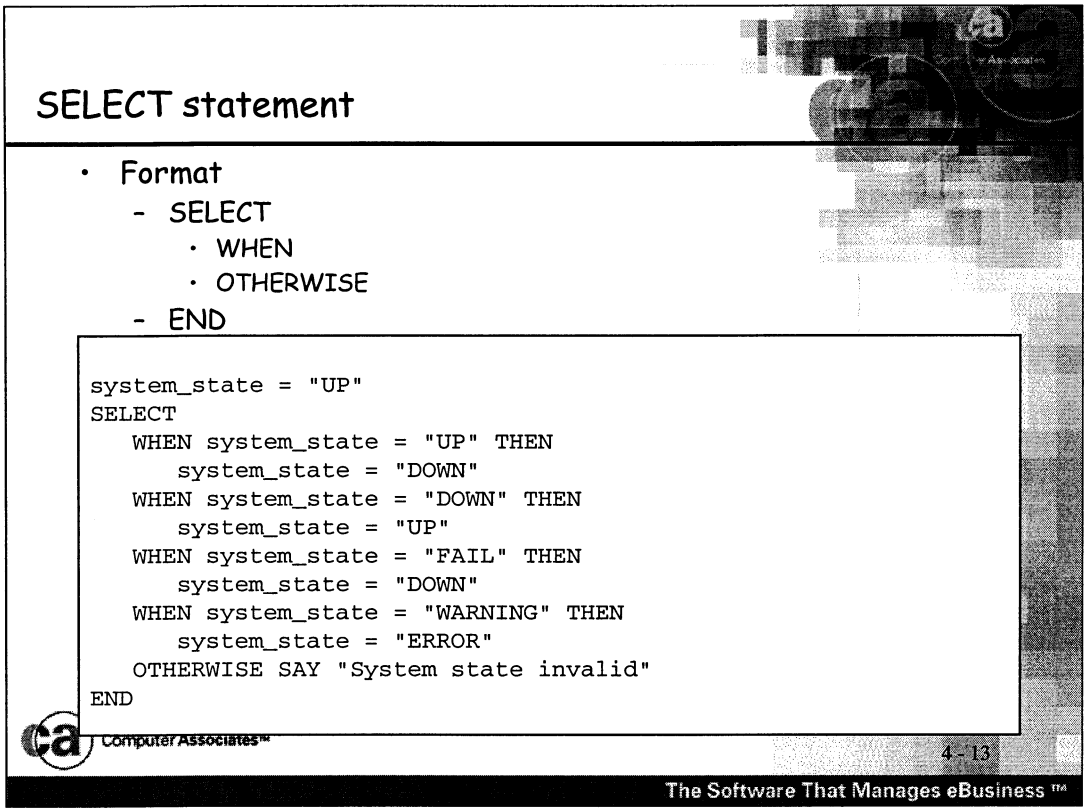
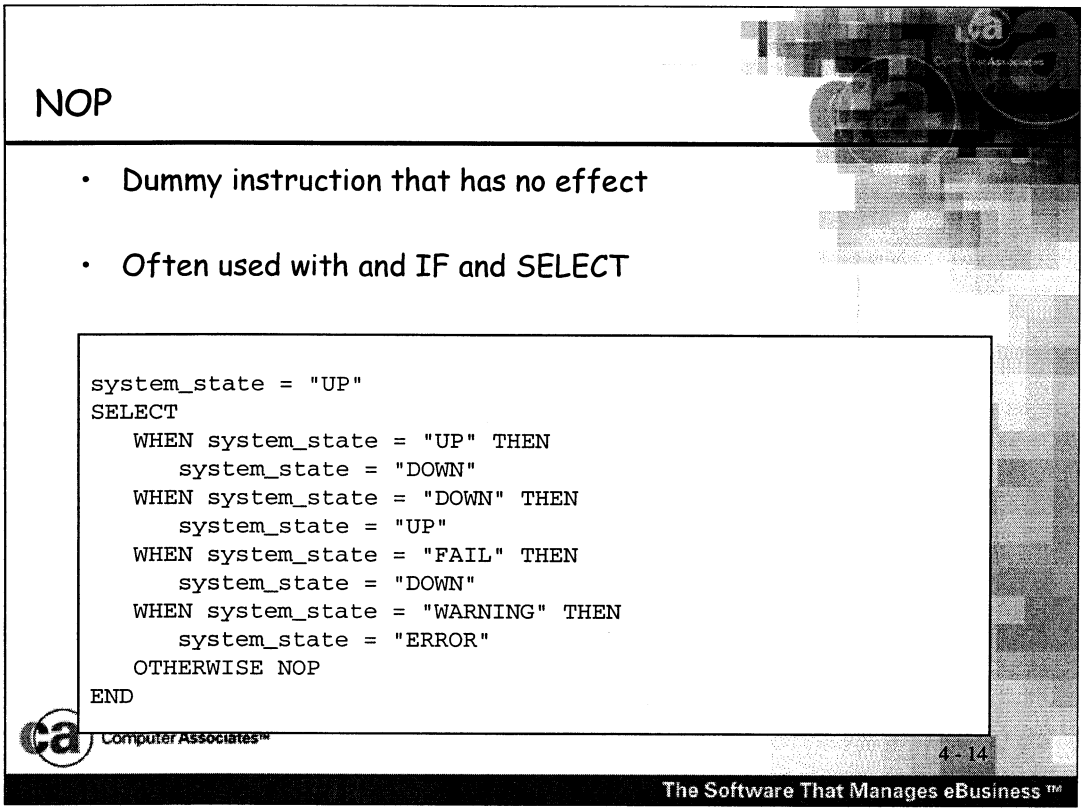


Unlike IF with ELSE, the SELECT statement requires the OTHERWISE for all false conditions.


NOP
• Dummy instruction that has no effect
• Often used with and IF and SELECT
system_state = "UP"
SELECT
WHEN system_state = "UP" THEN
system_state = "DOWN"
WHEN system_state = "DOWN" THEN
system_state = "UP"
WHEN system_state = "FAIL" THEN
system_state = "DOWN"
WHEN system_state = "WARNING" THEN
system_state = "ERROR"
OTHERWISE NOP
END
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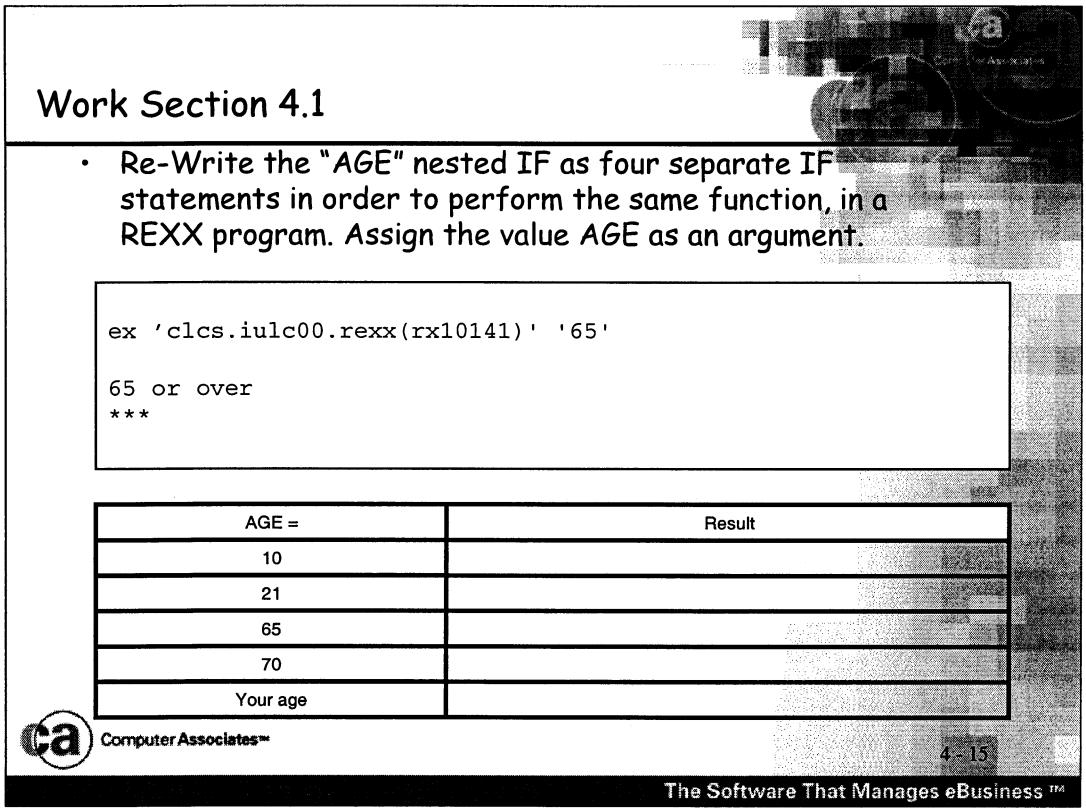
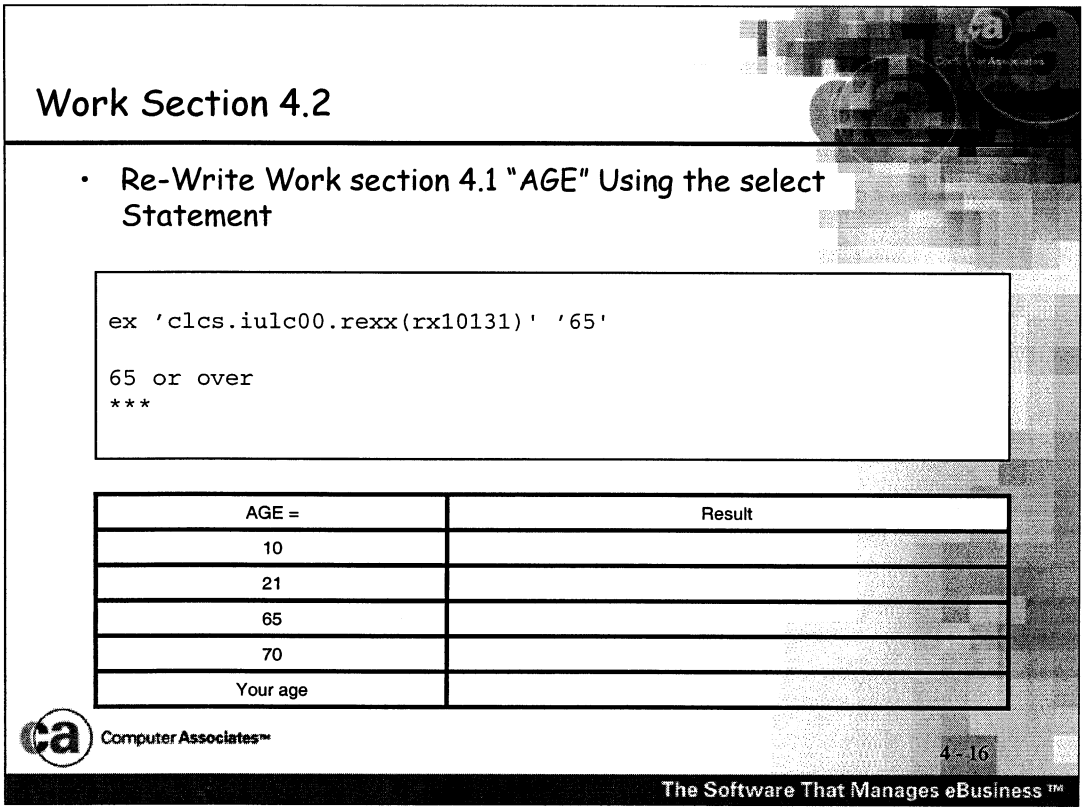



```
IF age < 65 THEN
   IF age > 21 THEN
      SAY "Over 21 and under 65"
   ELSE
      IF age >= 16 THEN
         SAY "Between 16 and 21"
      ELSE
          SAY "Under 16"
ELSE
   SAY "65 or over"
```

Enter the results in the table above.

Hint do not use any else statements.




```
IF age < 65 THEN
   IF age > 21 THEN
      SAY "Over 21 and under 65"
   ELSE
      IF age >= 16 THEN
         SAY "Between 16 and 21"
      ELSE
          SAY "Under 16"
ELSE
   SAY "65 or over"
```

Enter the results in the table above.

Additional program

- Write a REXX program to display the tax paid for each of the codes below given entered at the screen:

Tax Code as a Percent	Result
10	
20	
50	
70	
80	

```
 Please enter your salary.
12000
 Please enter your TAX band.
70
 Your tax for : 12000 : is : 8400.0
 ***
```

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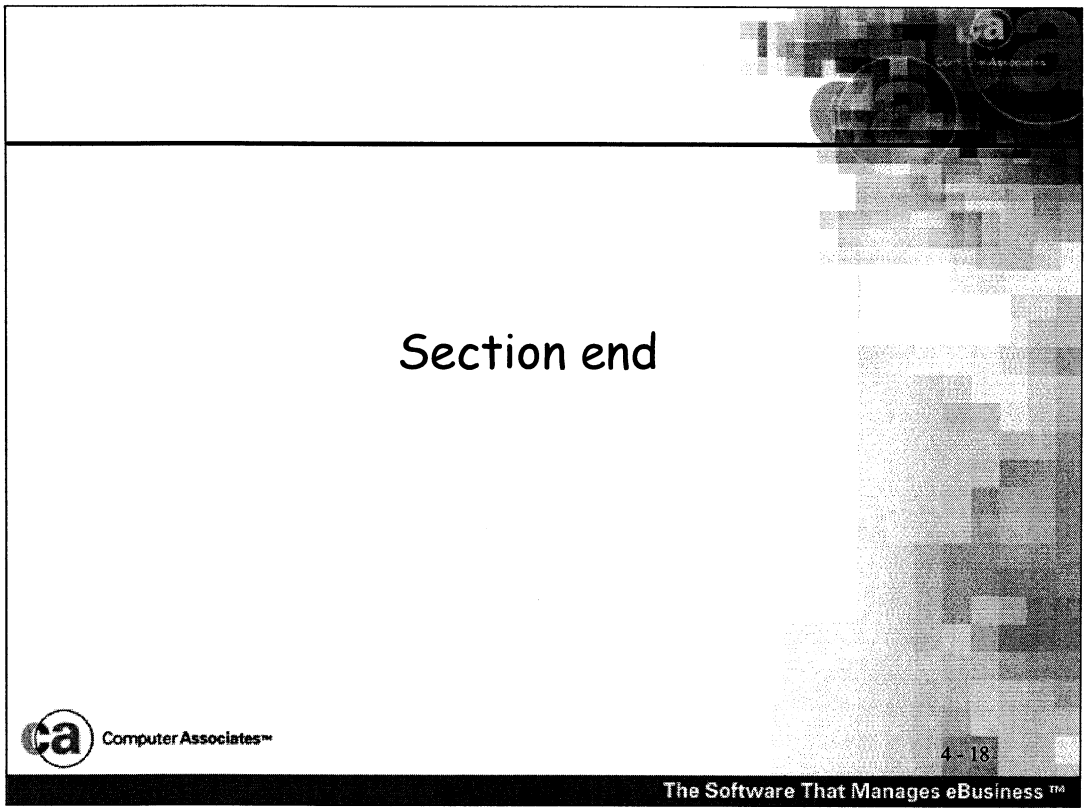
Section end
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4 - 18
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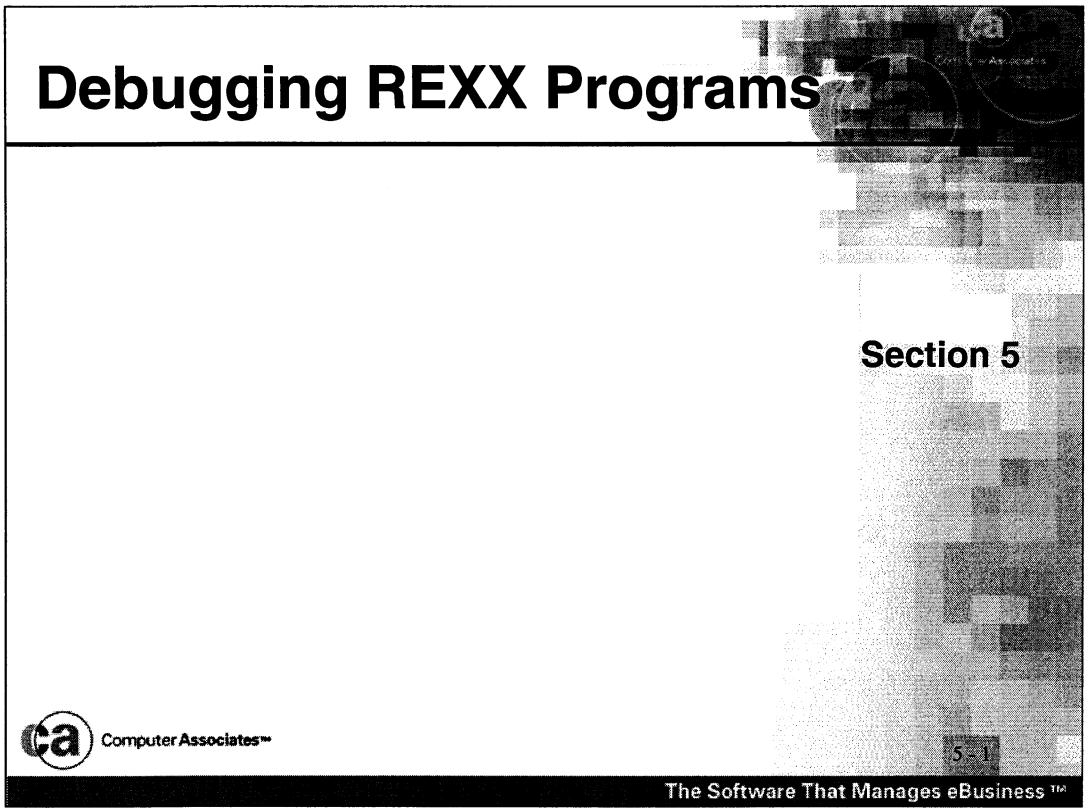
Debugging REXX Programs
Section 5
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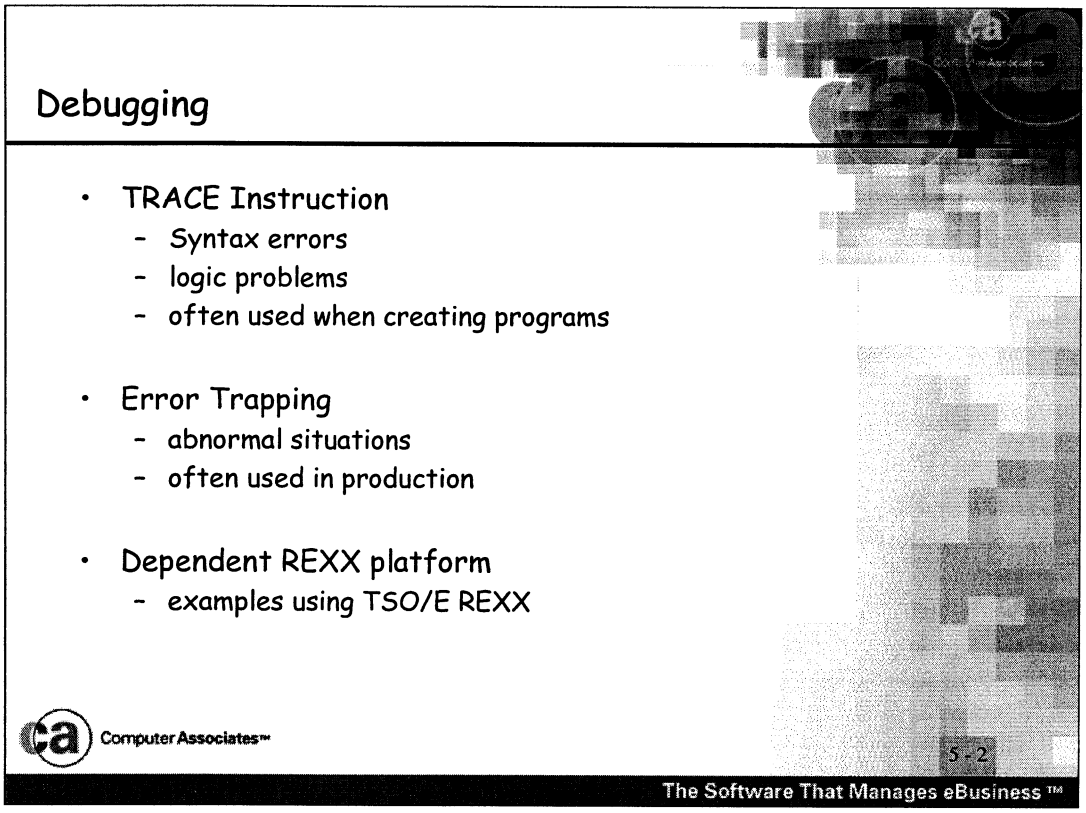
Debugging
• TRACE Instruction
- Syntax errors
- logic problems
- often used when creating programs
• Error Trapping
- abnormal situations
- often used in production
• Dependent REXX platform
- examples using TSO/E REXX
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5 - 2
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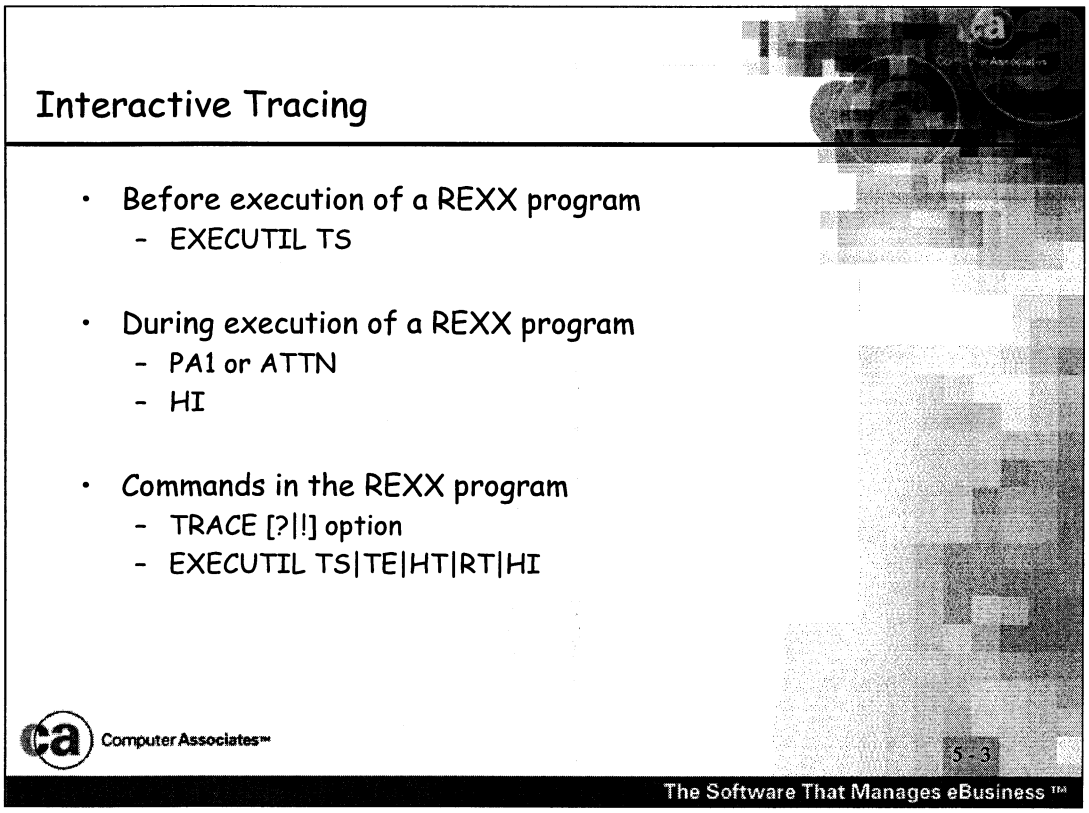
Interactive Tracing
• Before execution of a REXX program
- EXECUTIL TS
• During execution of a REXX program
- PA1 or ATTN
- HI
• Commands in the REXX program
- TRACE [?|!] option
- EXECUTIL TS|TE|HT|RT|HI
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5 - 3
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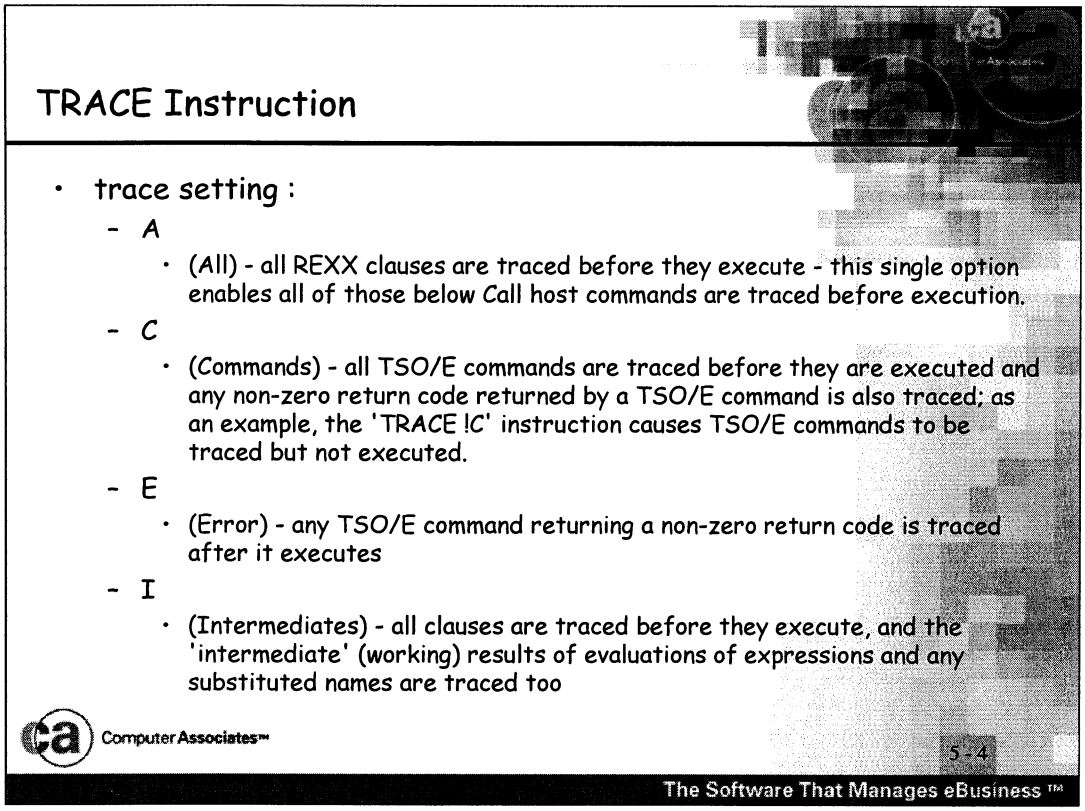

Format :

TRACE <trace setting>

TRACE Instruction

- L
  - (Labels) - labels on instructions that execute are traced
- N
  - (Normal) - a TSO/E command that returns a negative return code is traced after it executes - this trace option is the default if no other is specified
- O
  - (Off) - turns off ALL tracing
- R
  - (Results) - all REXX clauses are traced before they execute, and the final results of evaluating each expression are also traced. The values that are assigned via a PULL, ARG, and PARSE instructions are traced.
- S
  - (Scan) - all clauses in the exec are traced, but not executed. Checking for missing END statements is carried out. 'TRACE S' only works if the 'TRACE S' clause is not imbedded in any other instruction, such as an INTERPRET or an internal routine.

5-5

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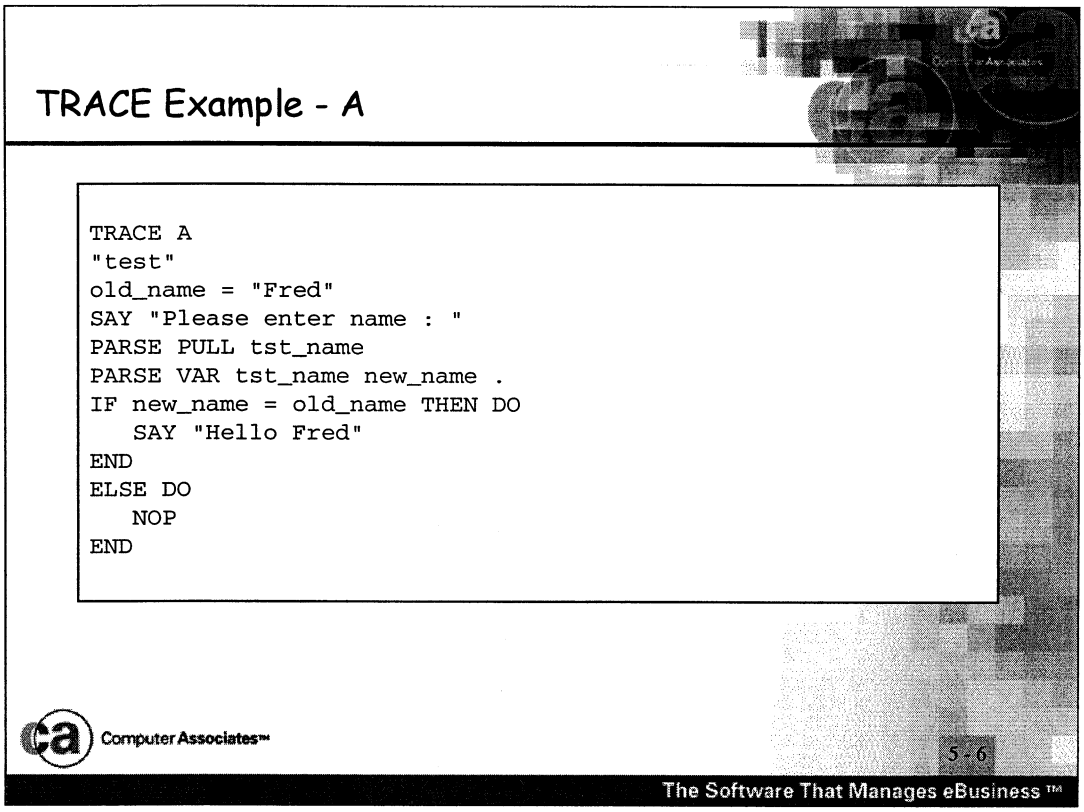
TRACE Example - A
TRACE A
"test"
old_name = "Fred"
SAY "Please enter name : "
PARSE PULL tst_name
PARSE VAR tst_name new_name .
IF new_name = old_name THEN DO
SAY "Hello Fred"
END
ELSE DO
NOP
END
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5 - 6
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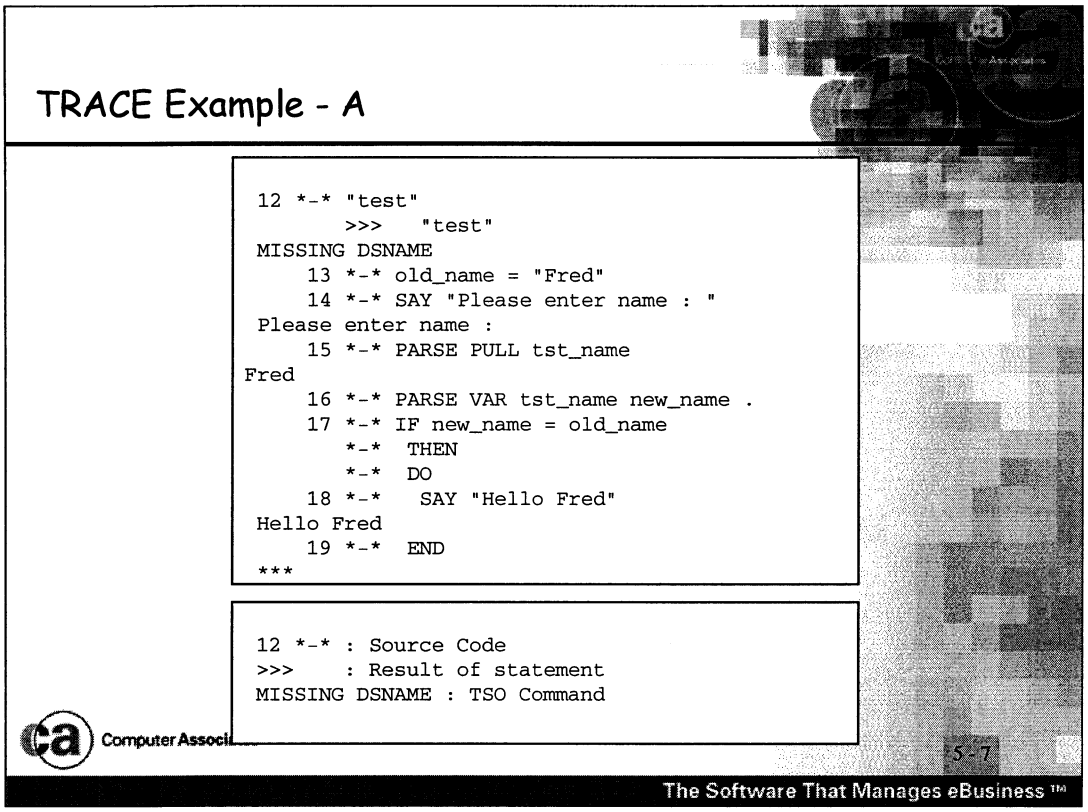
TRACE Example - A
12 *-* "test"
>>> "test"
MISSING DSNAME
13 *-* old_name = "Fred"
14 *-* SAY "Please enter name : "
Please enter name :
15 *-* PARSE PULL tst_name
Fred
16 *-* PARSE VAR tst_name new_name .
17 *-* IF new_name = old_name
- THEN
- DO
18 *-* SAY "Hello Fred"
Hello Fred
19 *-* END
***
12 *-* : Source Code
>>> : Result of statement
MISSING DSNAME : TSO Command
Computer Associ
5-7
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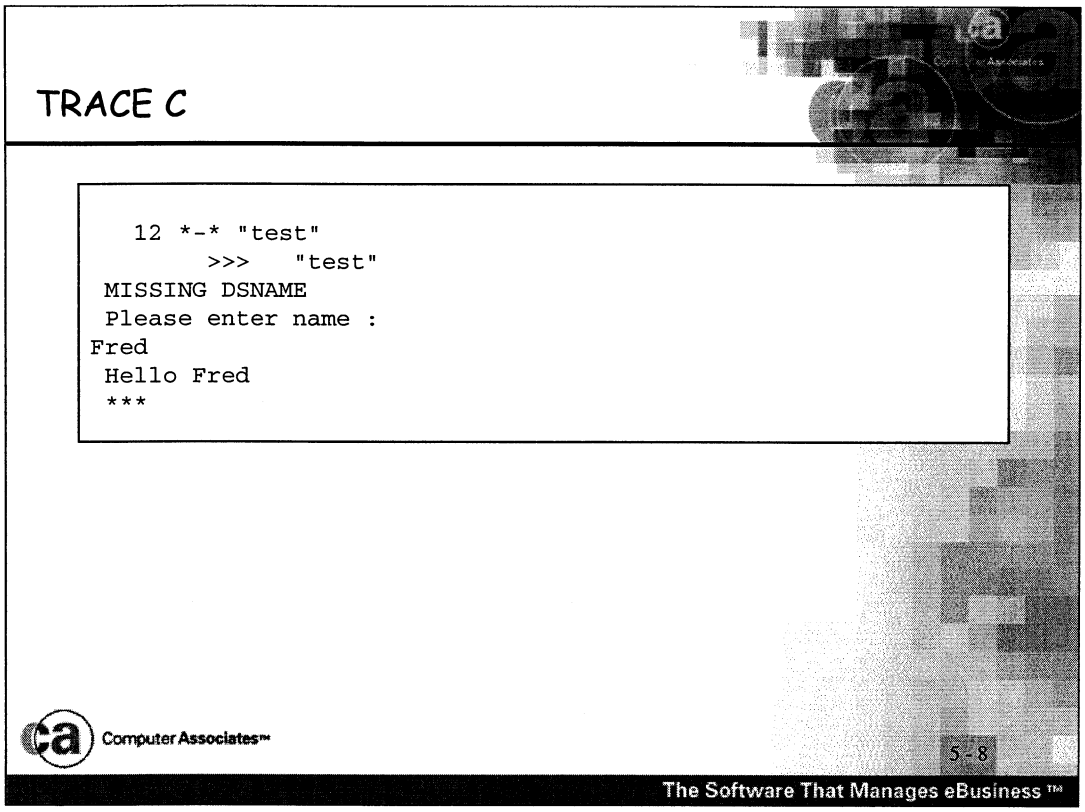
TRACE C
12 *-* "test"
>>> "test"
MISSING DSNAME
Please enter name :
Fred
Hello Fred
***
Computer Associates™
5 - 8
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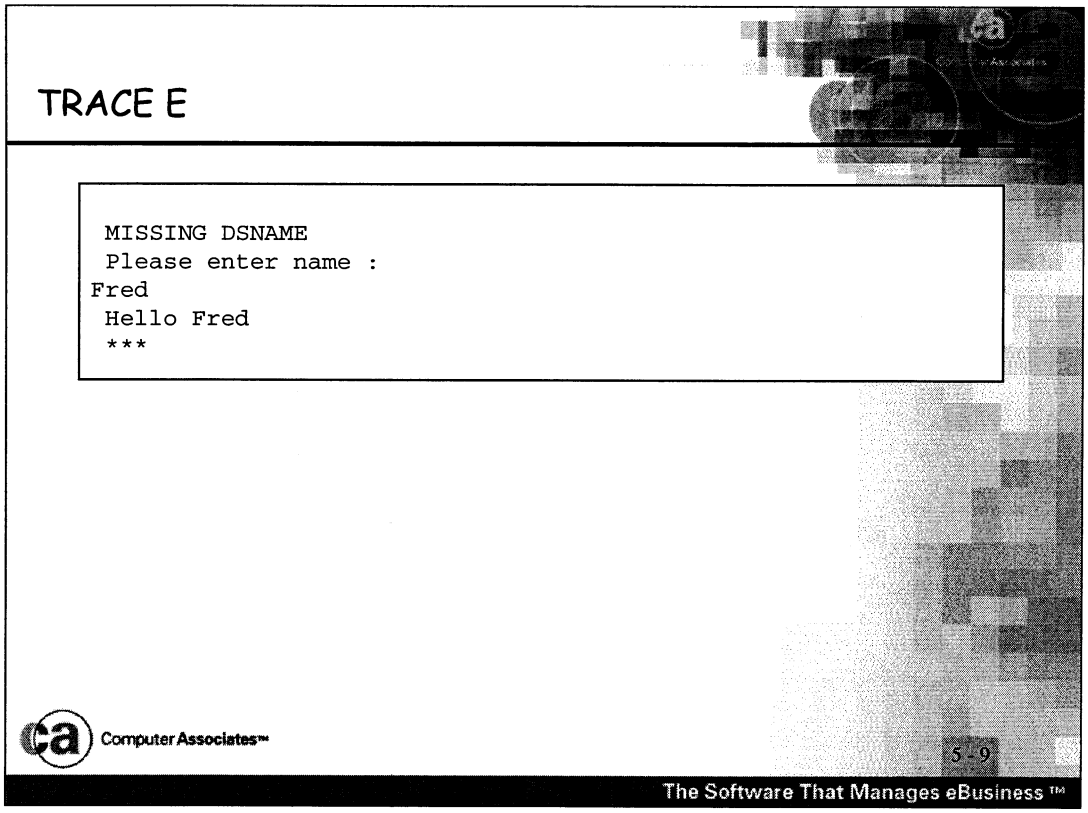
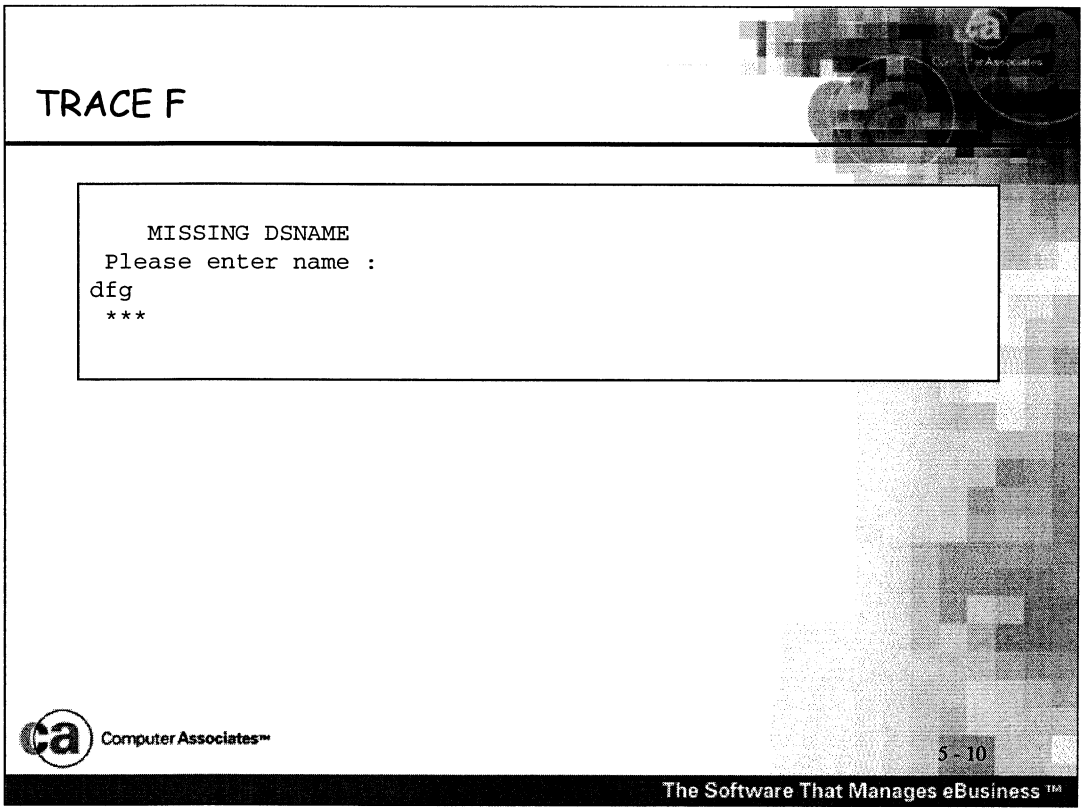
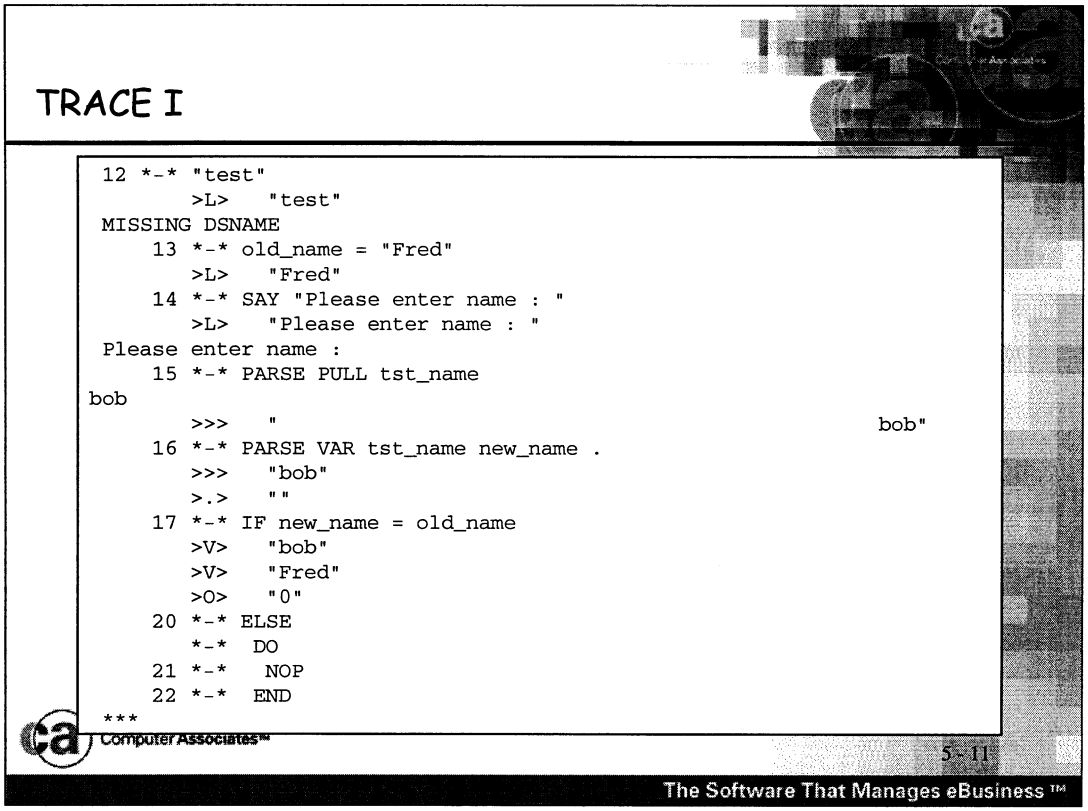


Traces error after execution.



F - Failure (Same as Normal)


TRACE I
12 *-* "test"
>L> "test"
MISSING DSNAME
13 *-* old_name = "Fred"
>L> "Fred"
14 *-* SAY "Please enter name : "
>L> "Please enter name : "
Please enter name :
15 *-* PARSE PULL tst_name
bob
>>> " bob"
16 *-* PARSE VAR tst_name new_name .
>>> "bob"
>.> ""
17 *-* IF new_name = old_name
>V> "bob"
>V> "Fred"
>O> "0"
20 *-* ELSE
- DO
21 *-* NOP
22 *-* END
***
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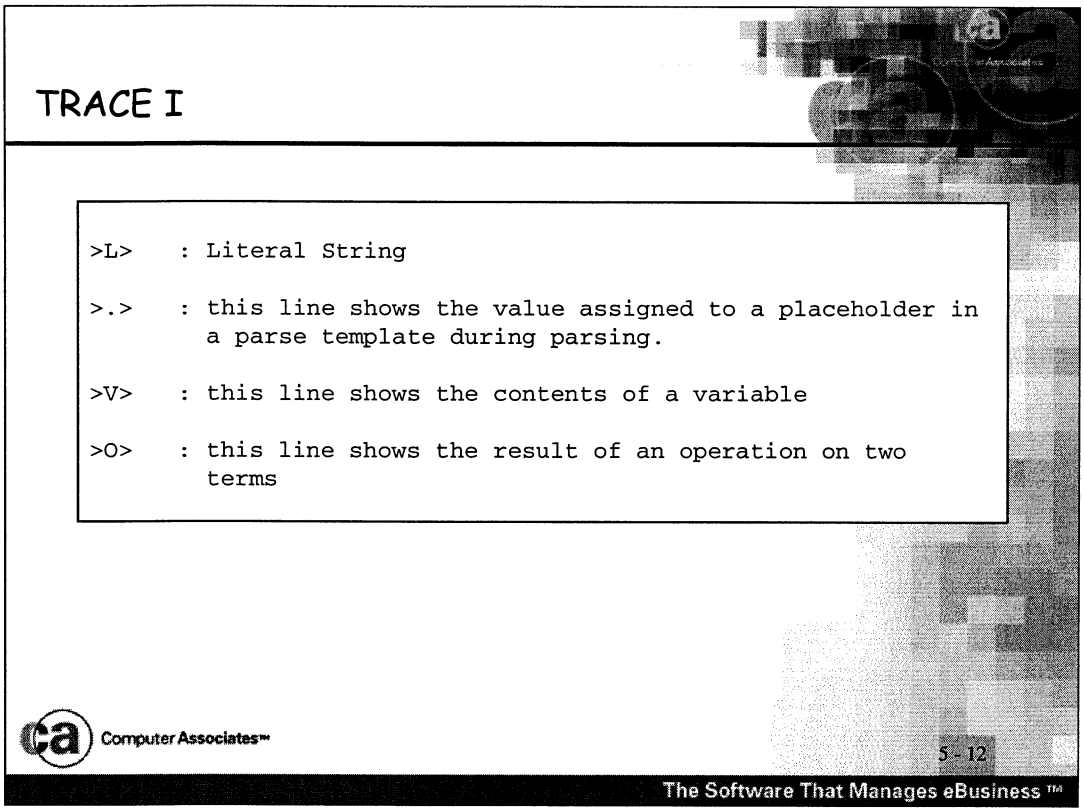
TRACE I
>L> : Literal String
>.> : this line shows the value assigned to a placeholder in a parse template during parsing.
>V> : this line shows the contents of a variable
>O> : this line shows the result of an operation on two terms
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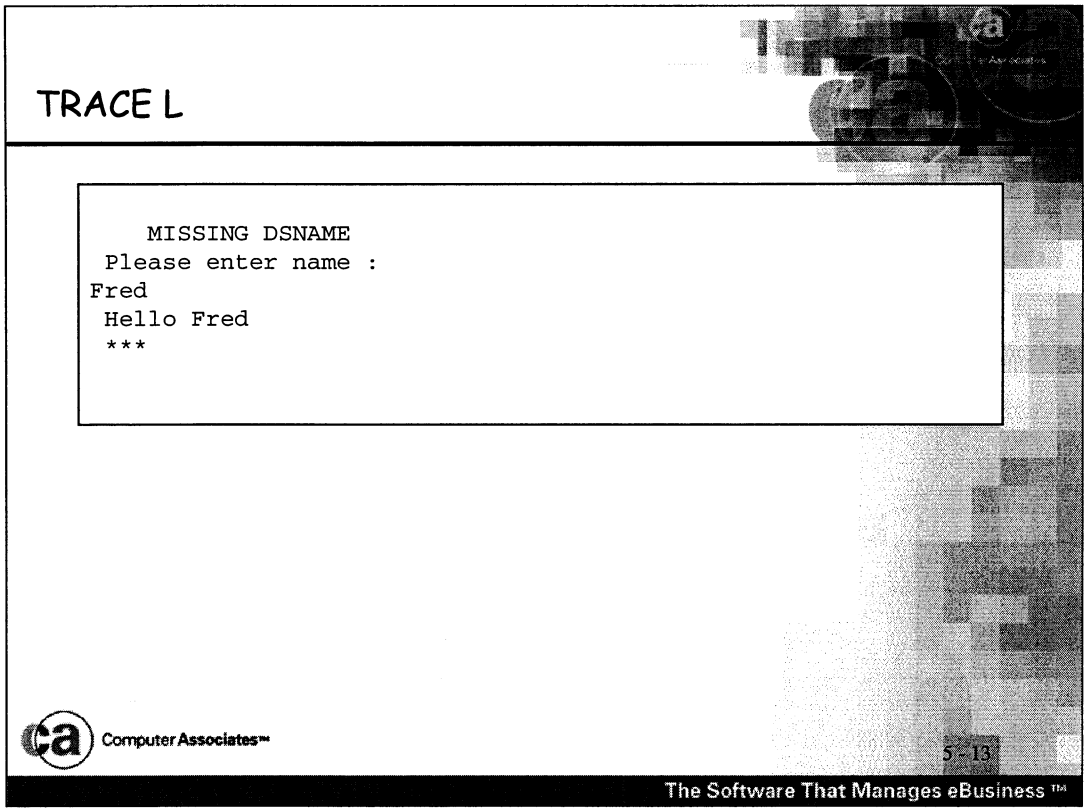
TRACE L
MISSING DSNAME
Please enter name :
Fred
Hello Fred
***
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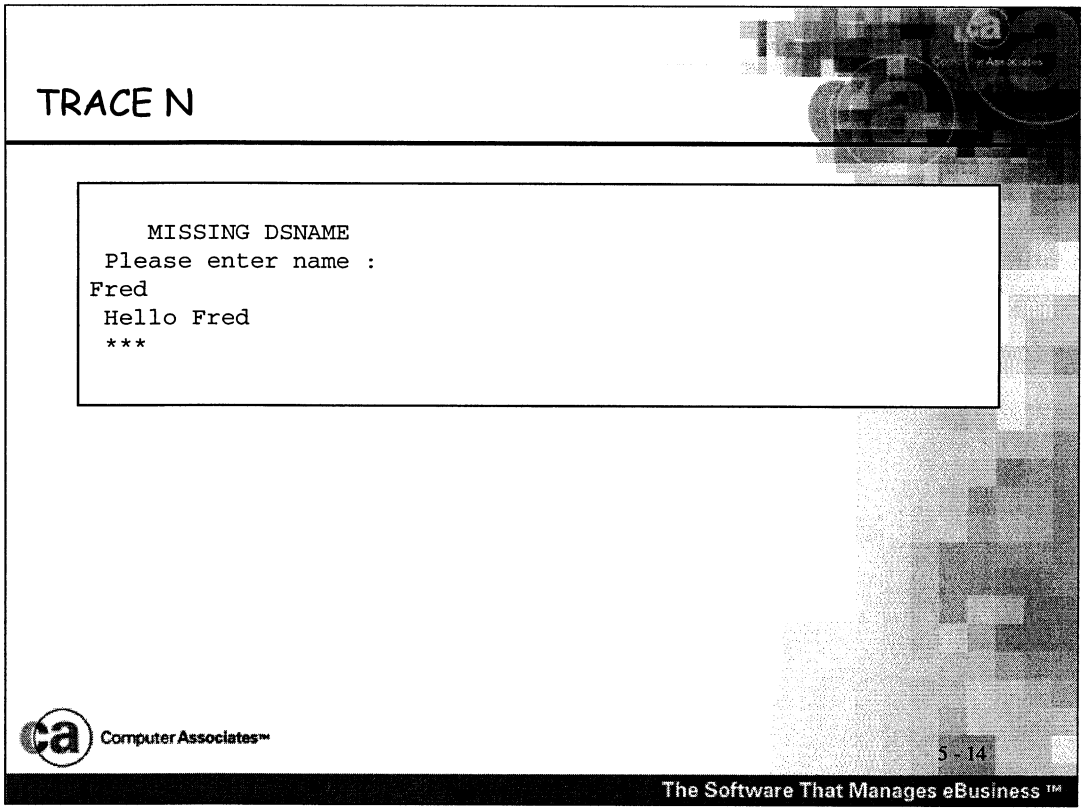
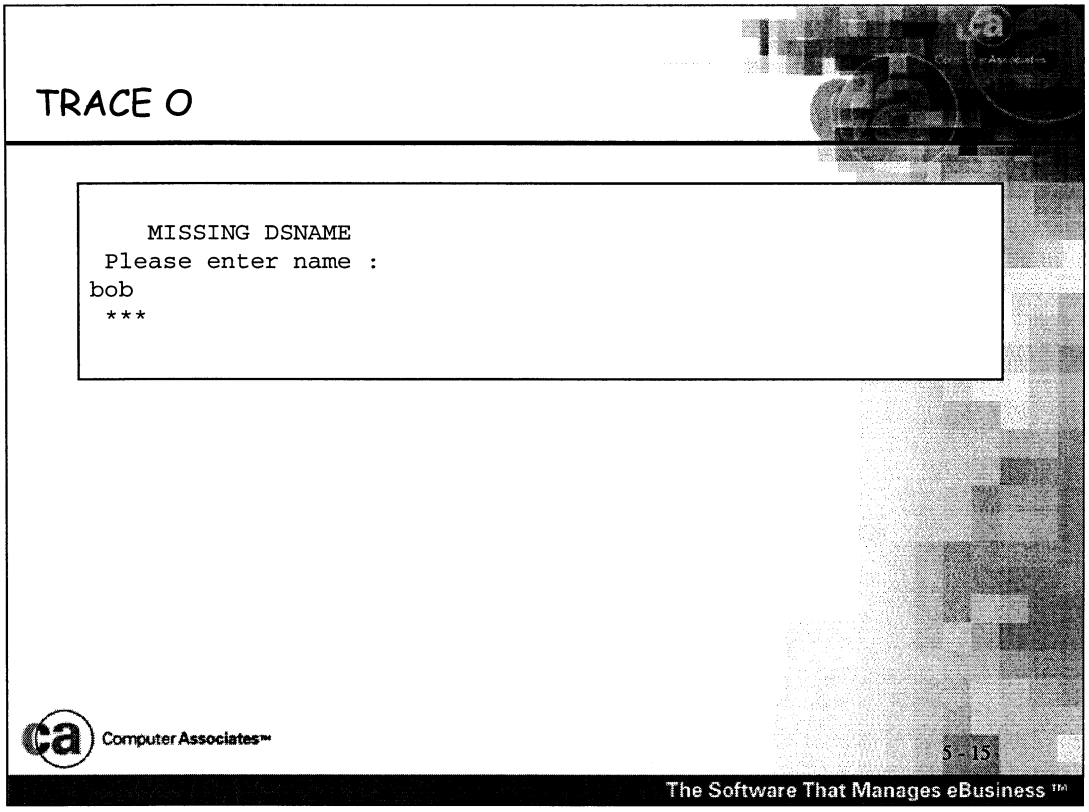


Normal - Default (Same as Failure)


TRACE O
MISSING DSNAME
Please enter name :
bob
***
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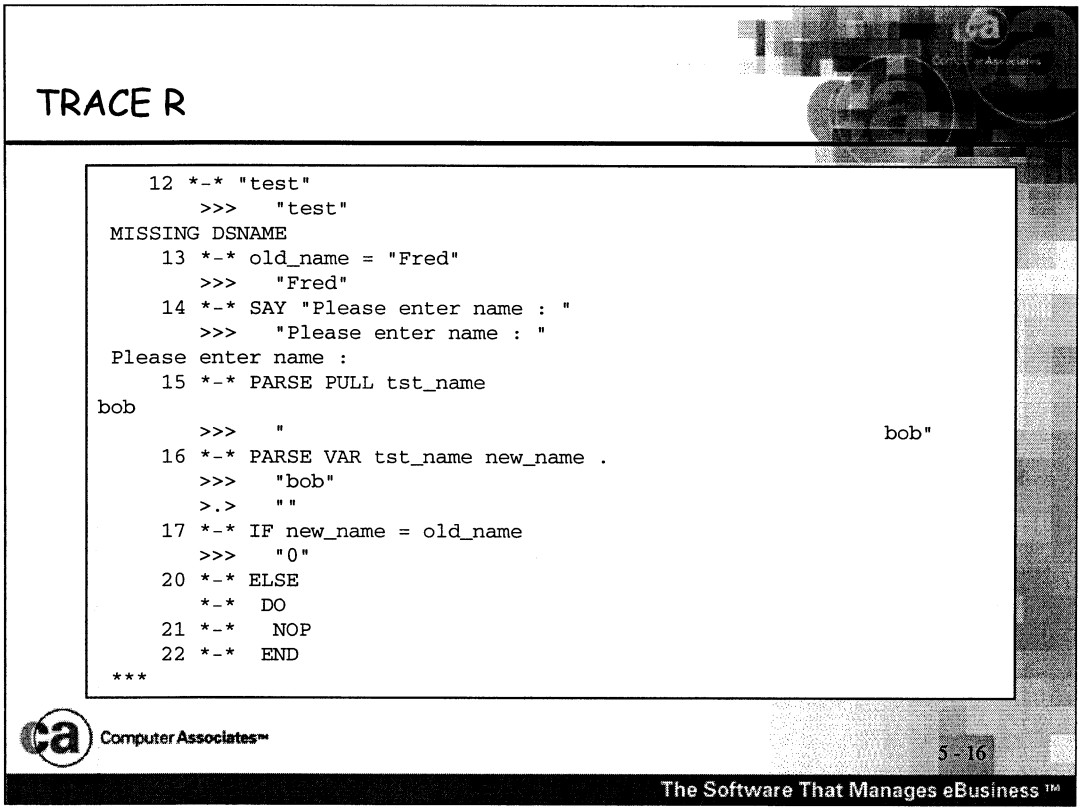
TRACE R
12 *-* "test"
>>> "test"
MISSING DSNAME
13 *-* old_name = "Fred"
>>> "Fred"
14 *-* SAY "Please enter name : "
>>> "Please enter name : "
Please enter name :
15 *-* PARSE PULL tst_name
bob
>>> " bob"
16 *-* PARSE VAR tst_name new_name .
>>> "bob"
>.> ""
17 *-* IF new_name = old_name
>>> "0"
20 *-* ELSE
- DO
21 *-* NOP
22 *-* END
***
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5-16
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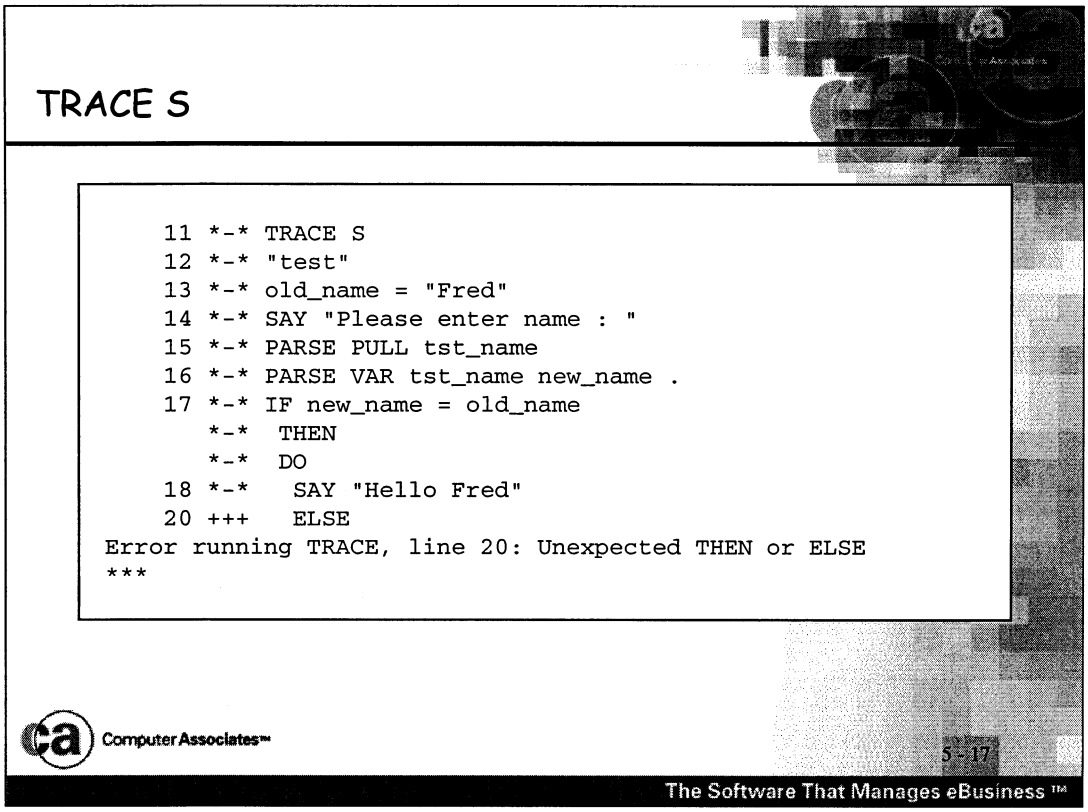
TRACE S
11 *-* TRACE S
12 *-* "test"
13 *-* old_name = "Fred"
14 *-* SAY "Please enter name : "
15 *-* PARSE PULL tst_name
16 *-* PARSE VAR tst_name new_name .
17 *-* IF new_name = old_name
- THEN
- DO
18 *-* SAY "Hello Fred"
20 +++ ELSE
Error running TRACE, line 20: Unexpected THEN or ELSE
***
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5 - 17
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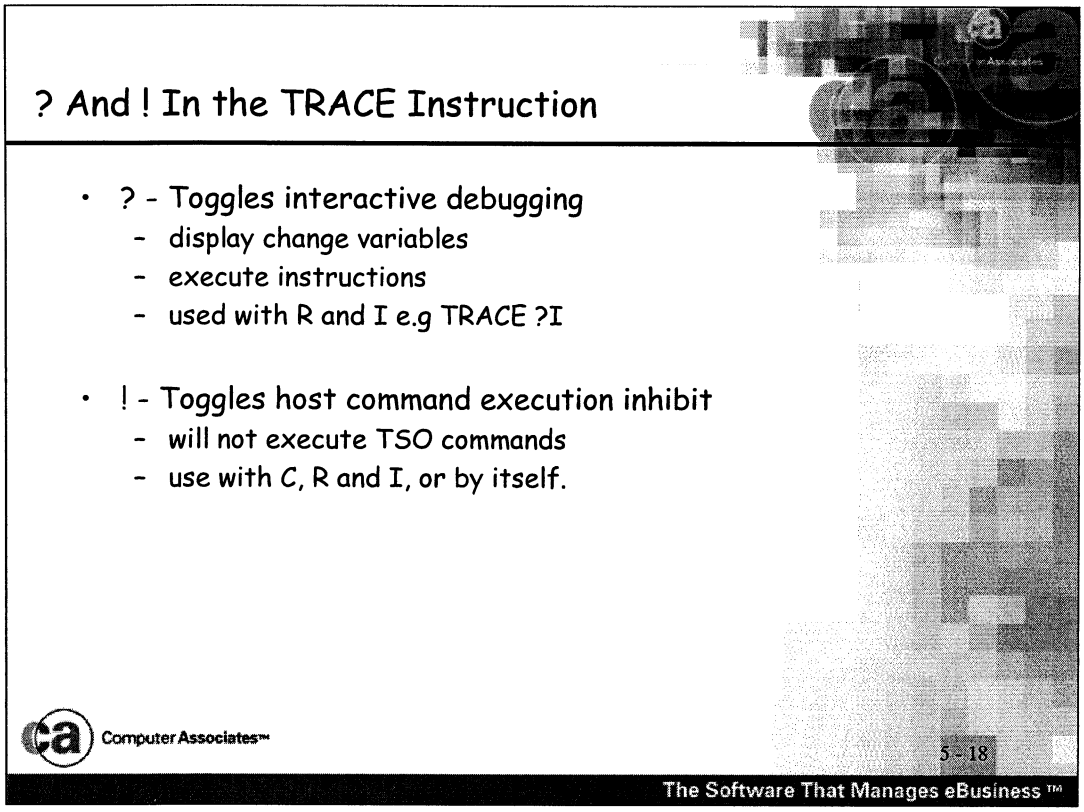
? And ! In the TRACE Instruction
• ? - Toggles interactive debugging
- display change variables
- execute instructions
- used with R and I e.g TRACE ?I
• ! - Toggles host command execution inhibit
- will not execute TSO commands
- use with C, R and I, or by itself.
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5 - 18
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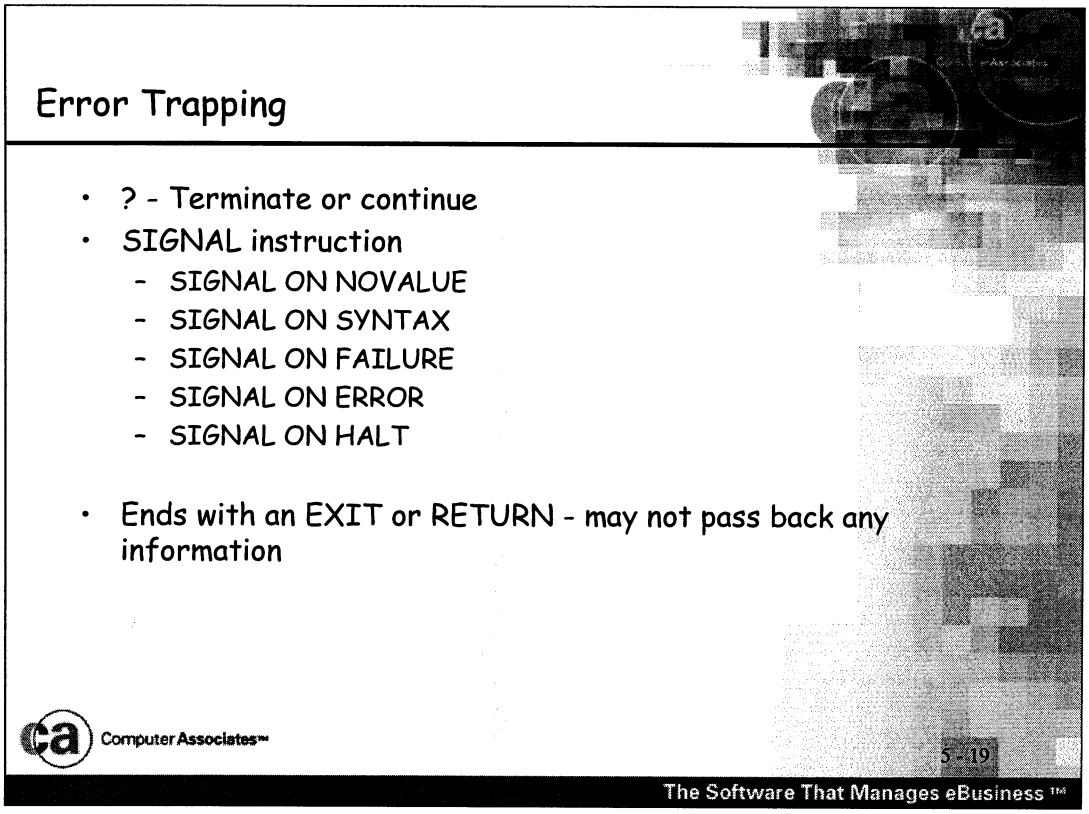


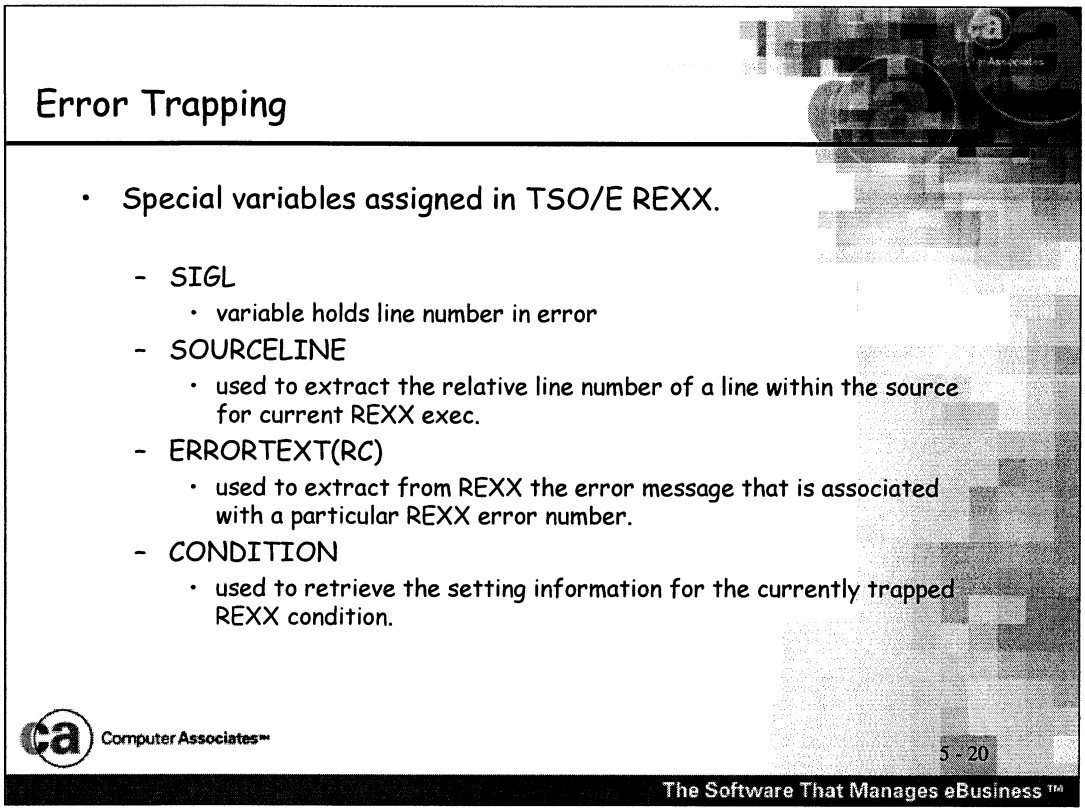
ERROR - a TSO command ends with a non-zero return code

FAILURE - a TSO command ends with a negative return code

HALT - the terminal attention key is pressed and a HI (Halt Interpretation) command is entered

NOVALUE - an uninitialized variable is used in an expression or in a PARSE template

SYNTAX - a REXX interpretation syntax error happens


Error Trapping
• Special variables assigned in TSO/E REXX.
- SIGL
• variable holds line number in error
- SOURCELINE
• used to extract the relative line number of a line within the source for current REXX exec.
- ERRORTEXT(RC)
• used to extract from REXX the error message that is associated with a particular REXX error number.
- CONDITION
• used to retrieve the setting information for the currently trapped REXX condition.
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5 - 20
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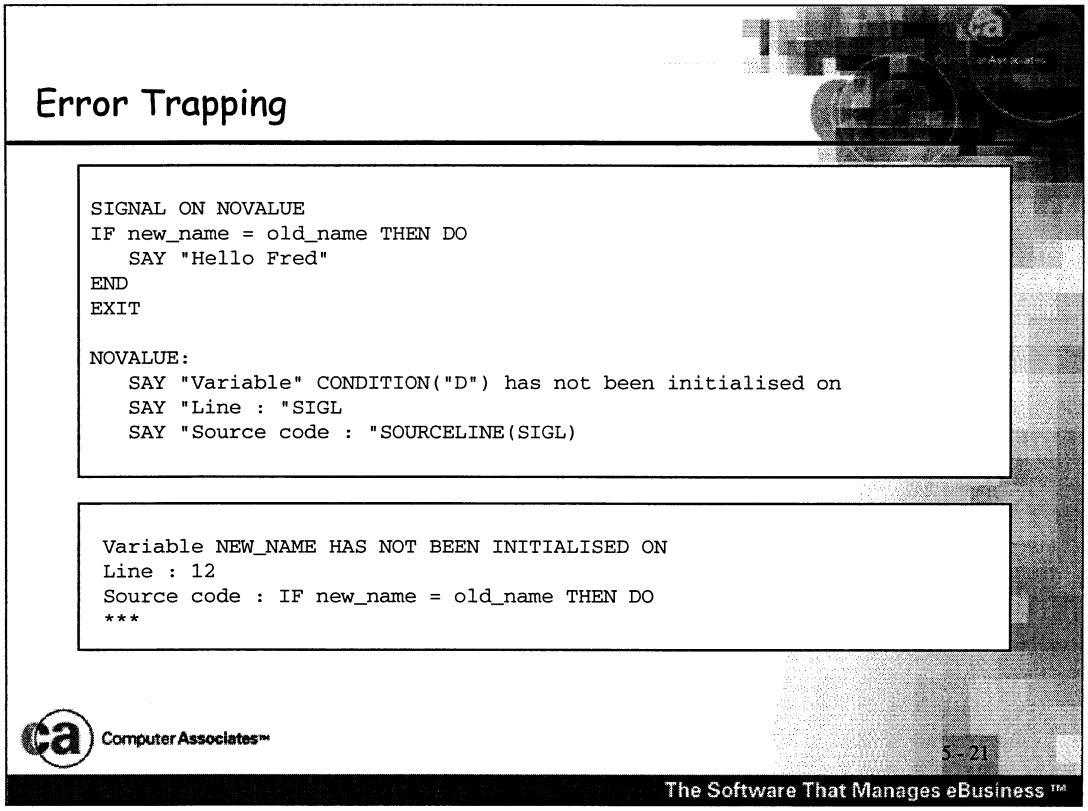
Error Trapping
SIGNAL ON NOVALUE
IF new_name = old_name THEN DO
SAY "Hello Fred"
END
EXIT
NOVALUE:
SAY "Variable" CONDITION("D") has not been initialised on
SAY "Line : "SIGL
SAY "Source code : "SOURCELINE(SIGL)
Variable NEW_NAME HAS NOT BEEN INITIALISED ON
Line : 12
Source code : IF new_name = old_name THEN DO
***
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5-21
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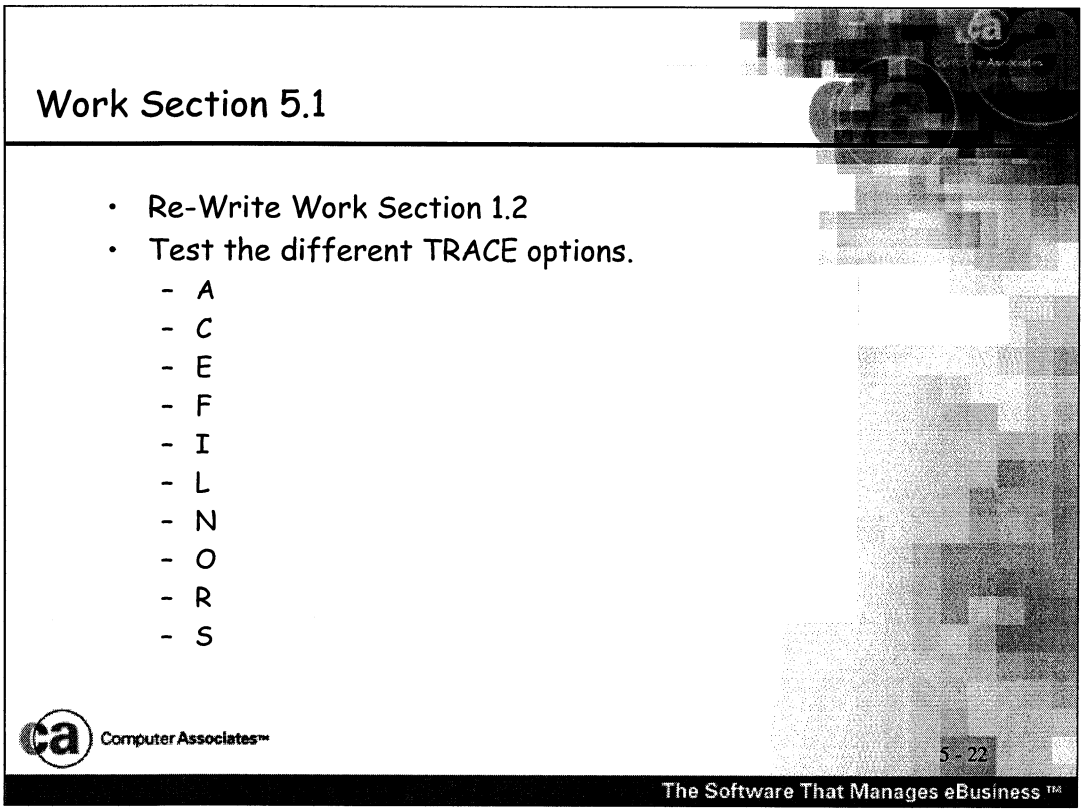
Work Section 5.1
• Re-Write Work Section 1.2
• Test the different TRACE options.
- A
- C
- E
- F
- I
- L
- N
- O
- R
- S
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5 - 22
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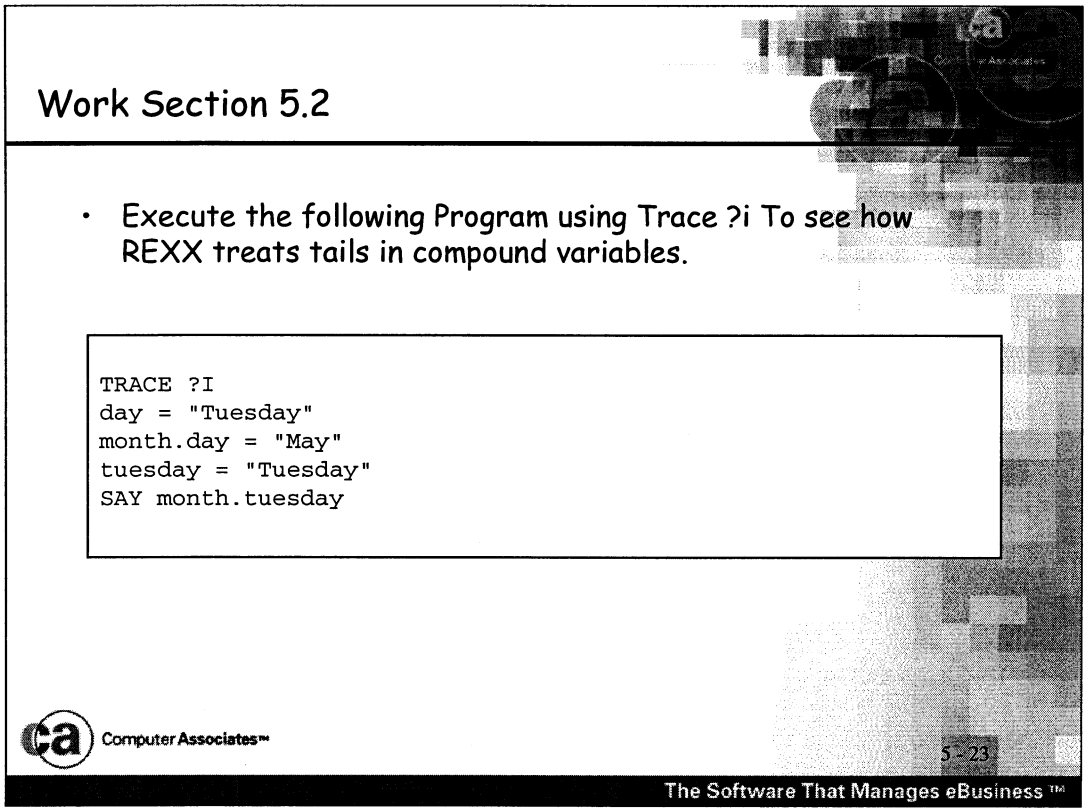
Work Section 5.2
• Execute the following Program using Trace ?i To see how REXX treats tails in compound variables.
TRACE ?I
day = "Tuesday"
month.day = "May"
tuesday = "Tuesday"
SAY month.tuesday
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Additional program

- Try using the TRACE() function instead
- e.g.
- TRACE(I)

- What is the difference ?

- Write a program using SIGNAL ON NOVALUE.
  - Use a SAY statement to display a variable which has not been initialised and use the NOVALUE label to give an appropriate message

5 - 24

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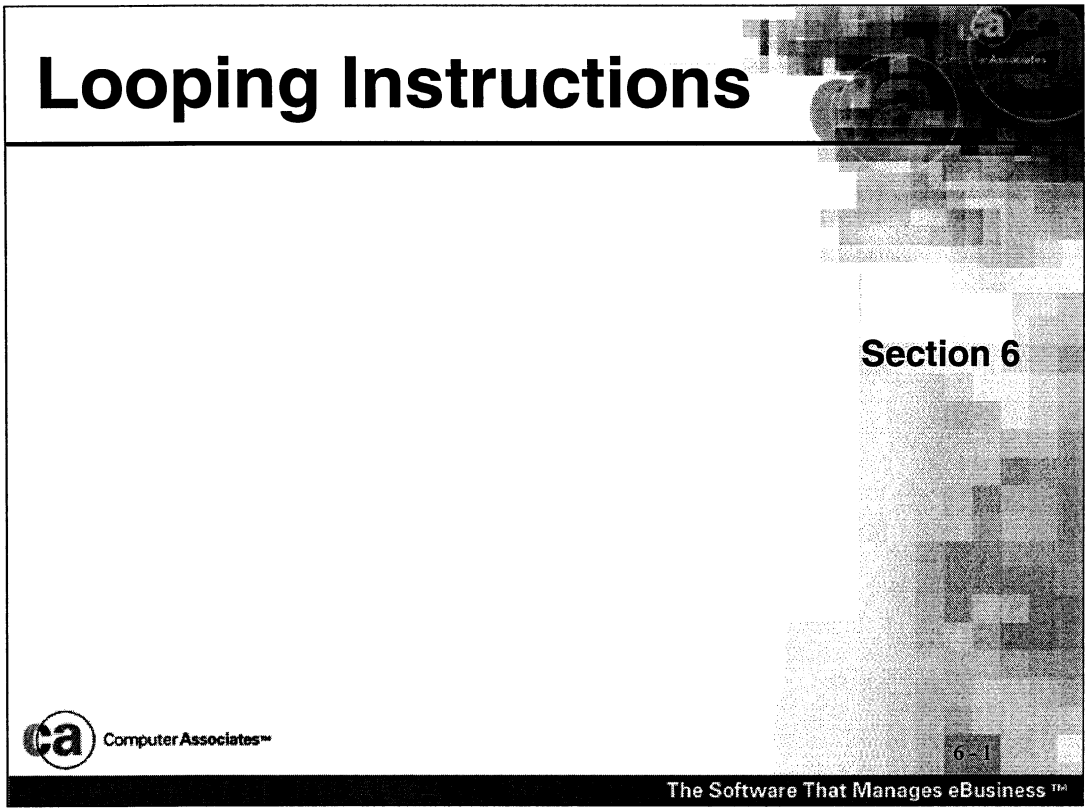
Looping Instructions
Section 6
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6-1
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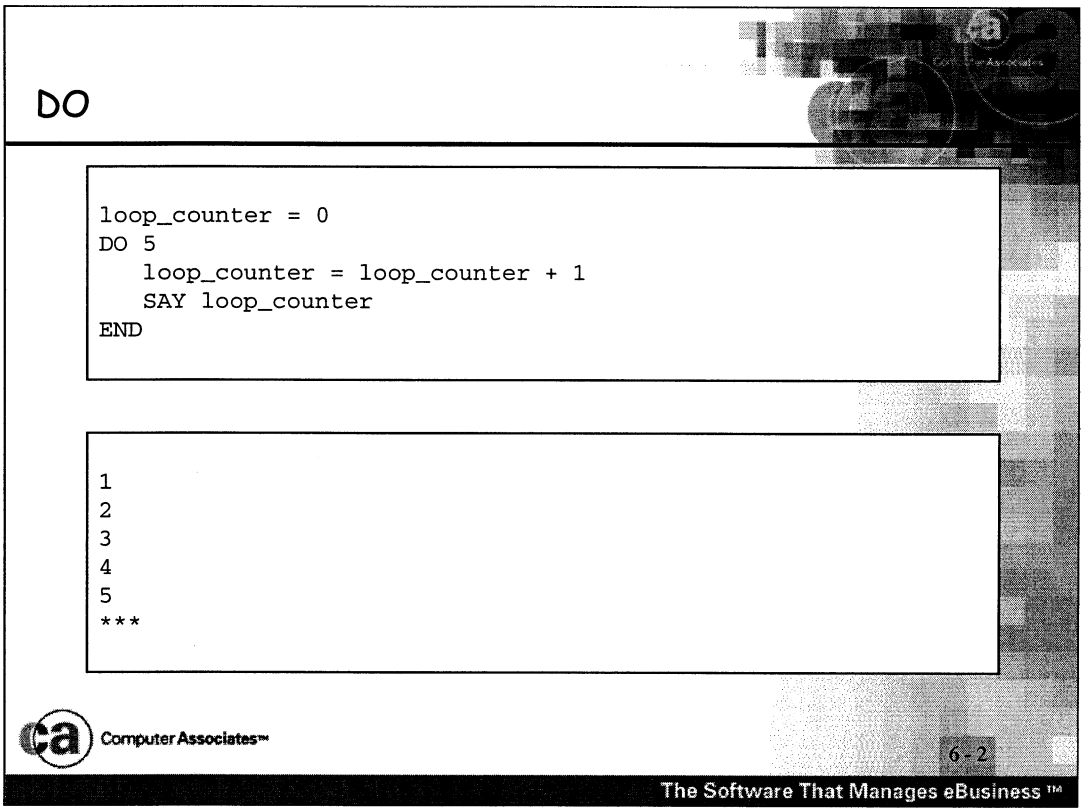
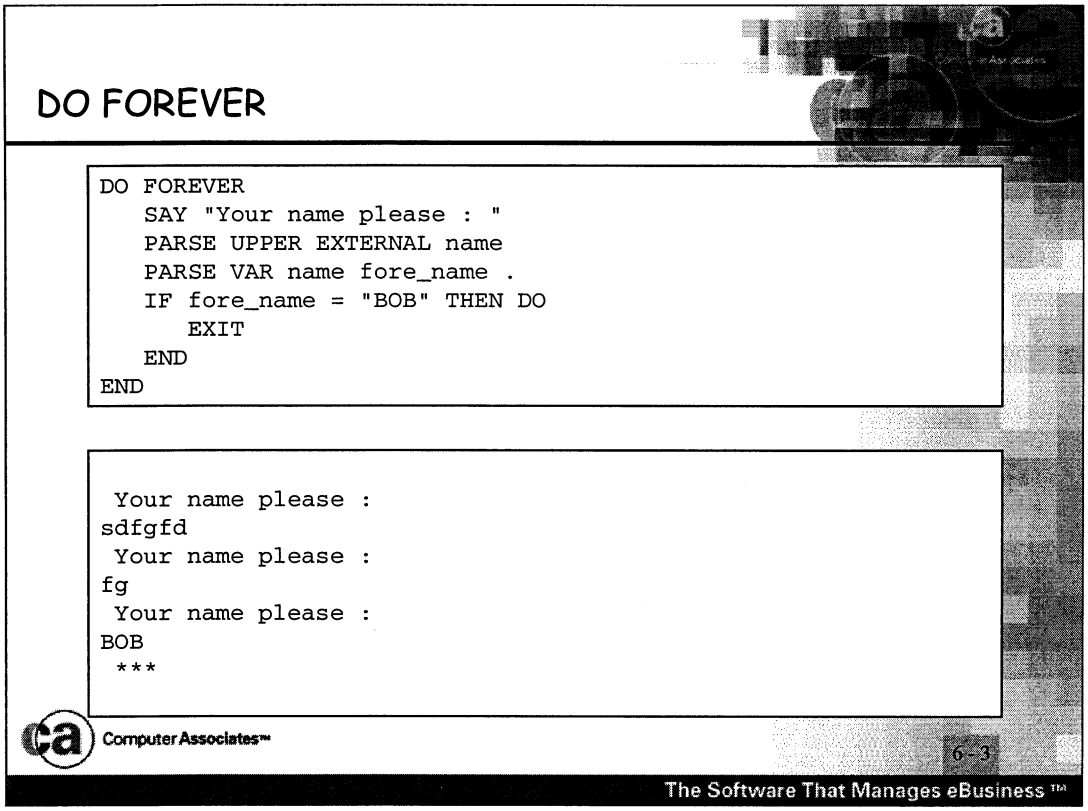
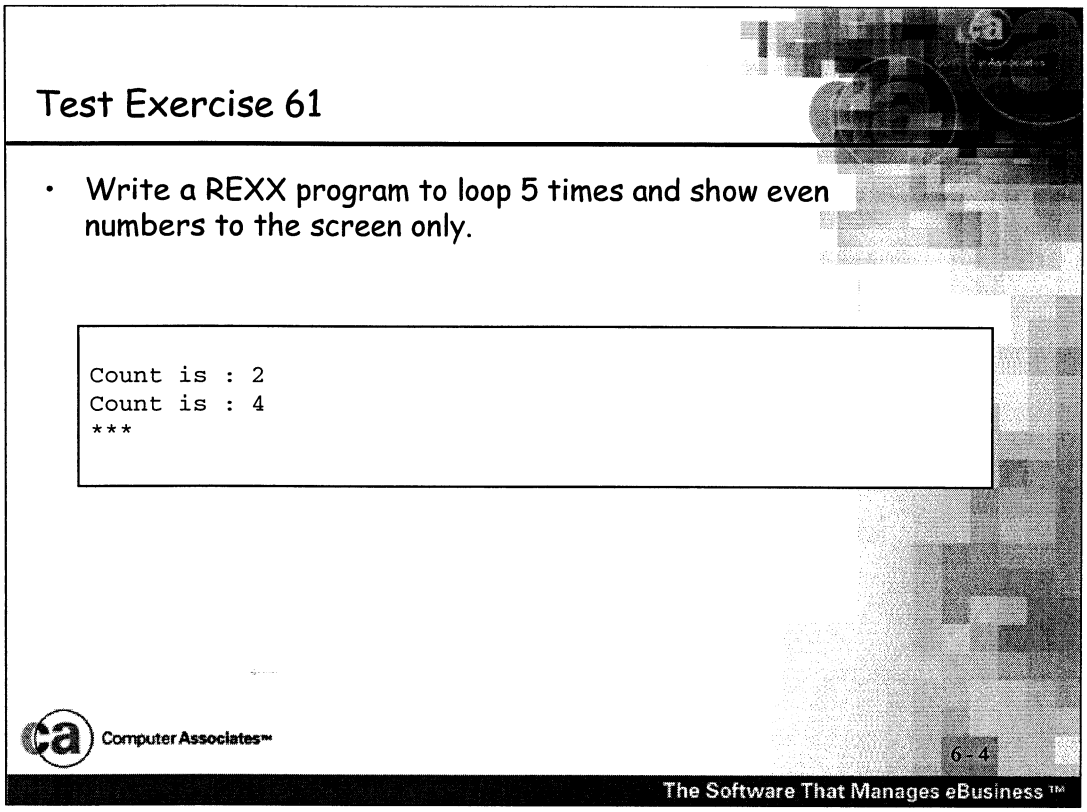
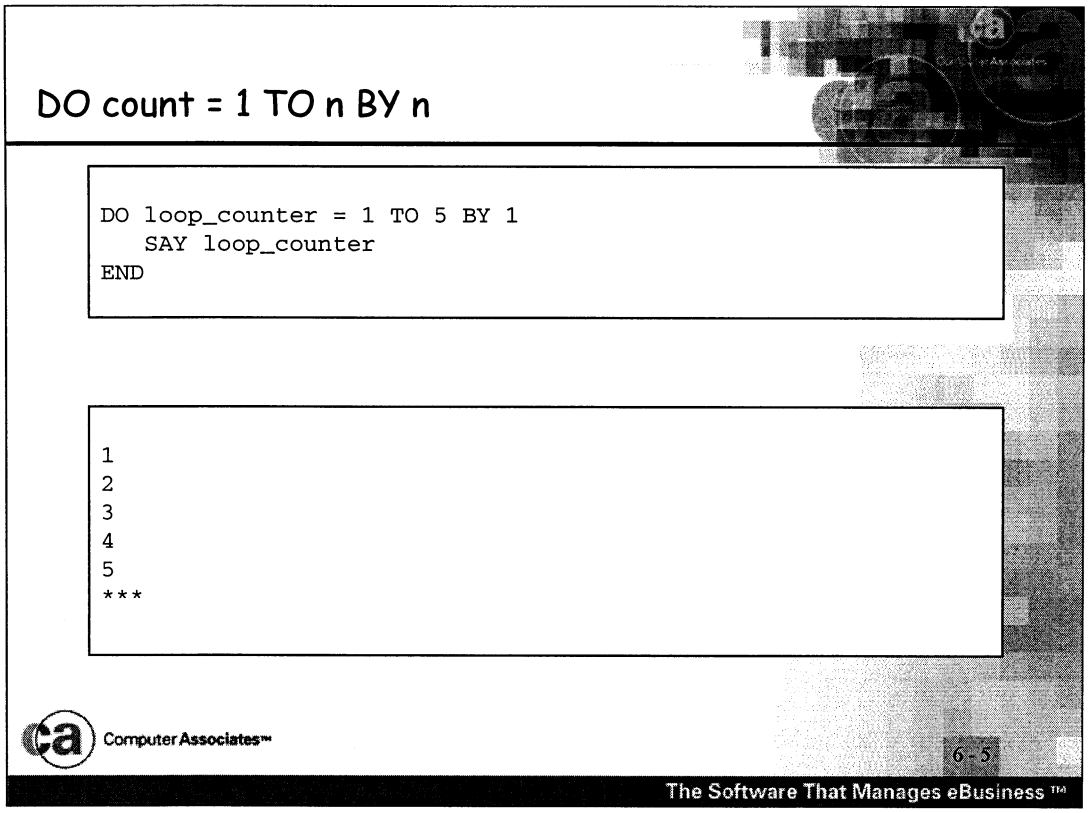
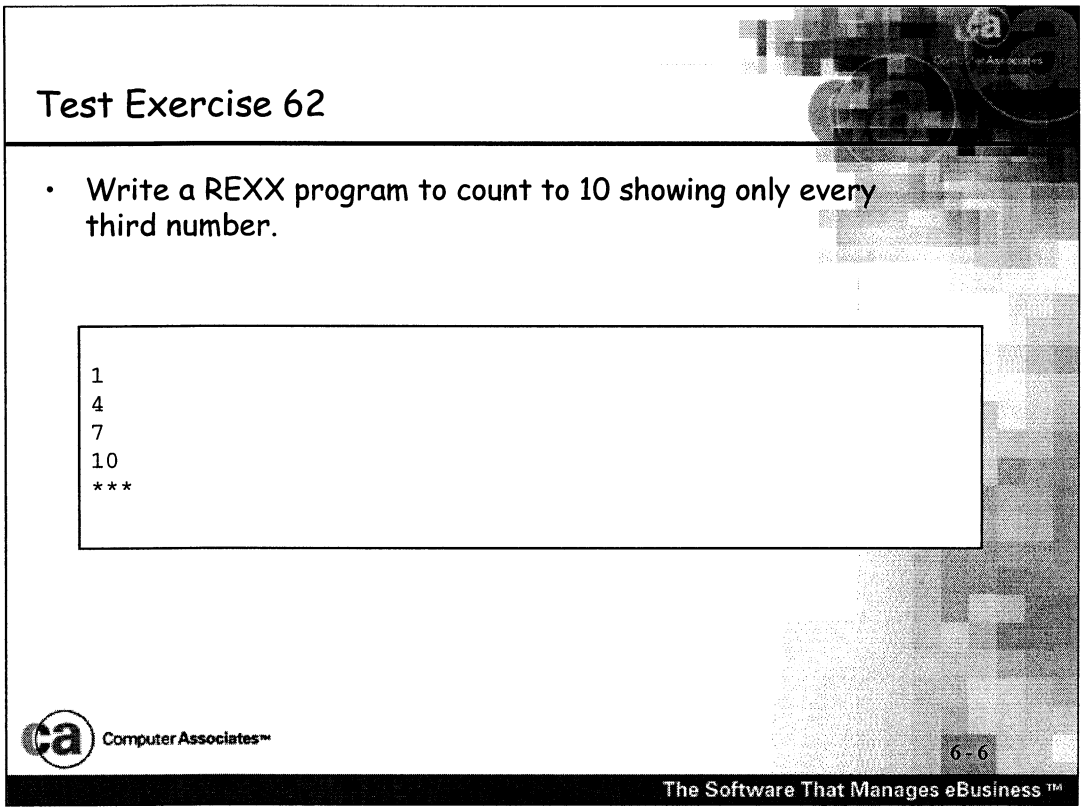
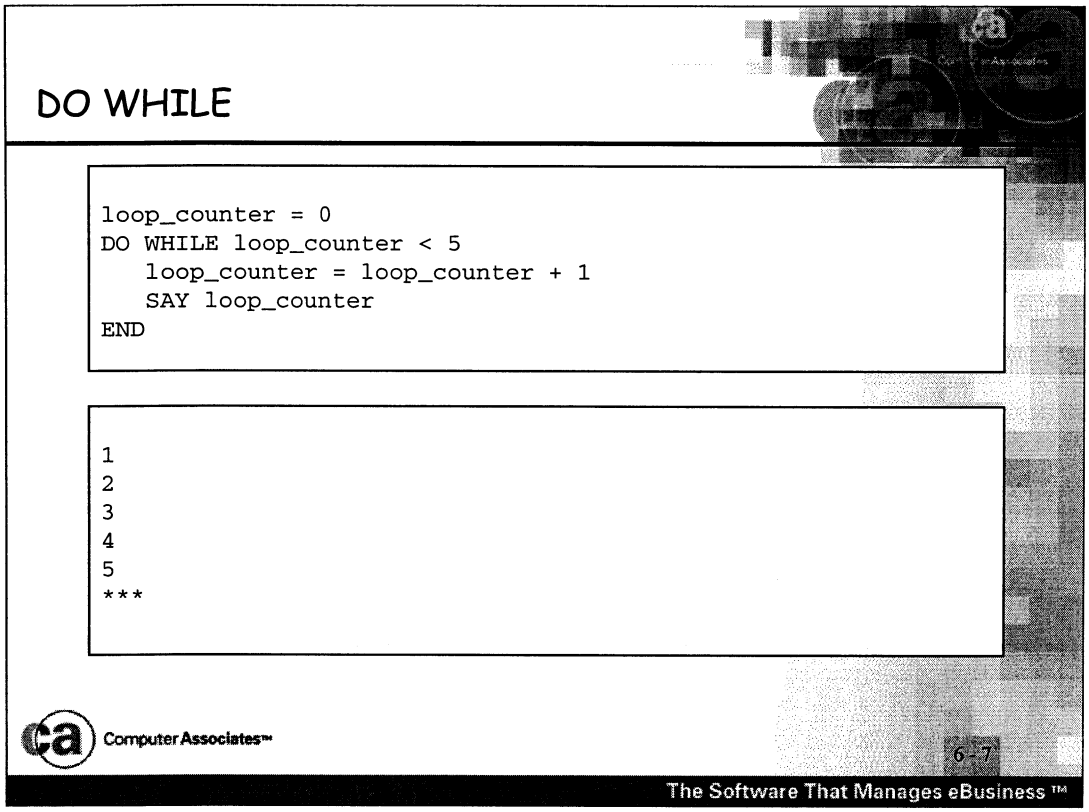

DO
loop_counter = 0
DO 5
loop_counter = loop_counter + 1
SAY loop_counter
END
1
2
3
4
5
***
Computer Associates™
6-2
The Software That Manages eBusiness ™

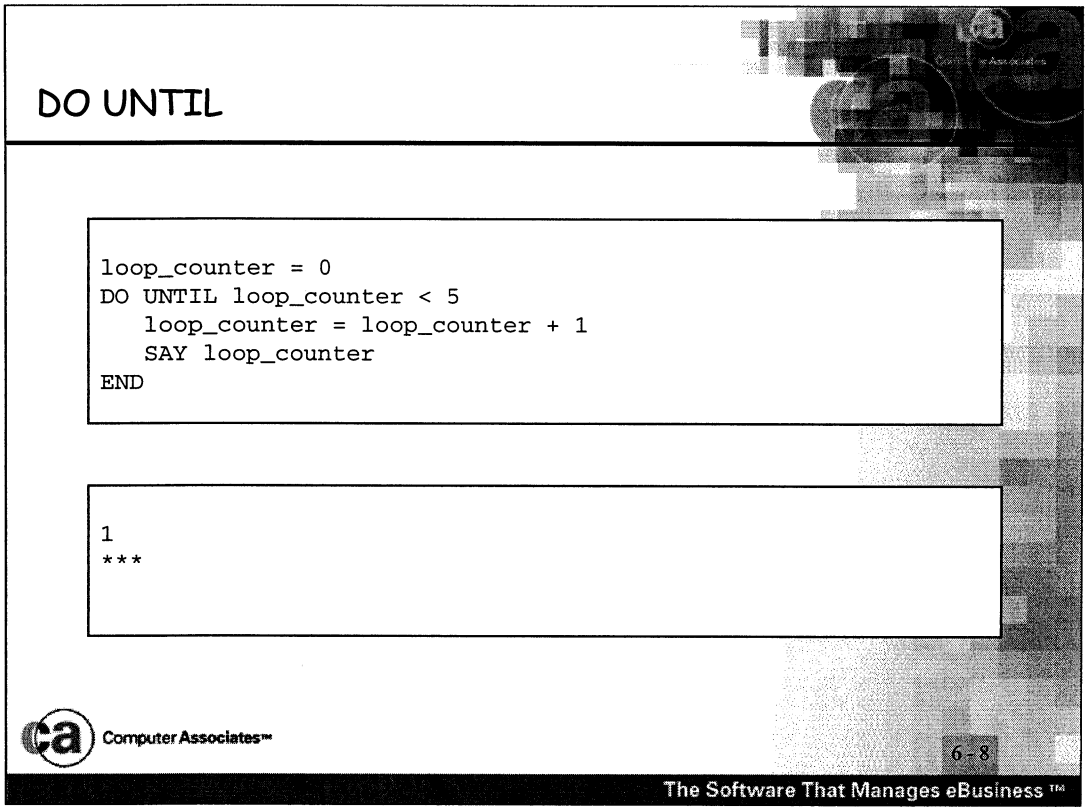

DO FOREVER
DO FOREVER
SAY "Your name please : "
PARSE UPPER EXTERNAL name
PARSE VAR name fore_name .
IF fore_name = "BOB" THEN DO
EXIT
END
END
Your name please :
sdfgfd
Your name please :
fg
Your name please :
BOB
***
Computer Associates™
6-3
The Software That Manages eBusiness ™

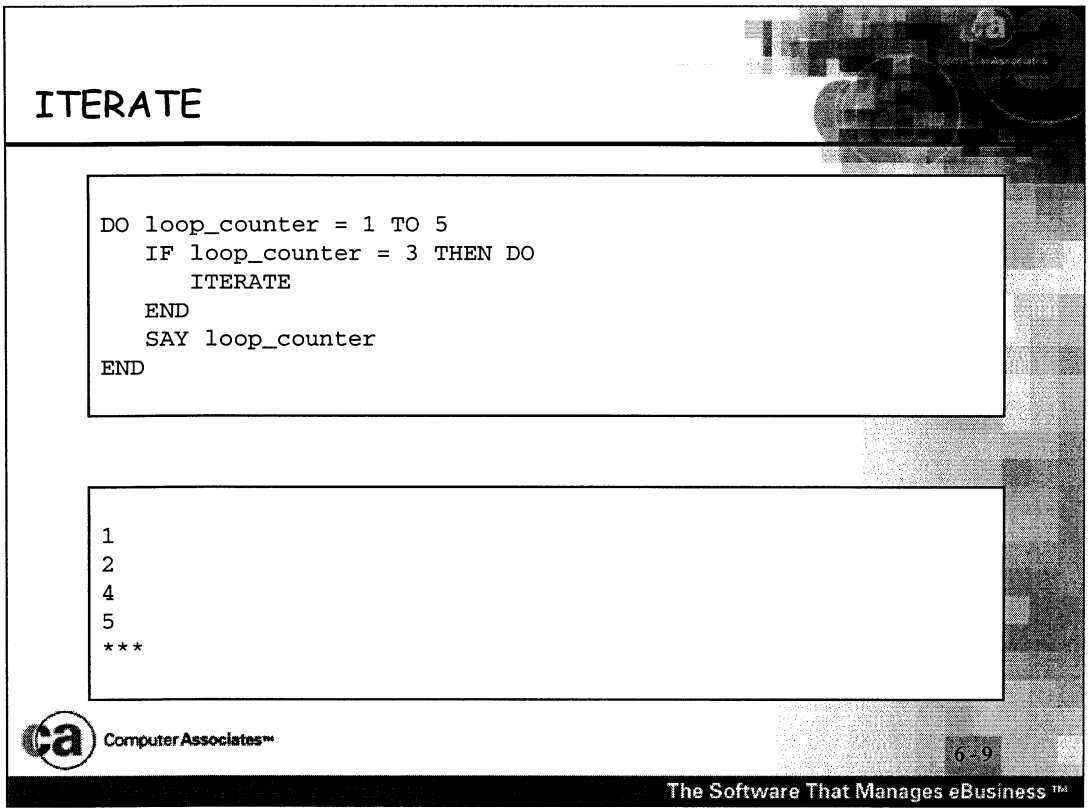

Test Exercise 61
• Write a REXX program to loop 5 times and show even numbers to the screen only.
Count is : 2
Count is : 4
***
Computer Associates™
6 - 4
The Software That Manages eBusiness ™

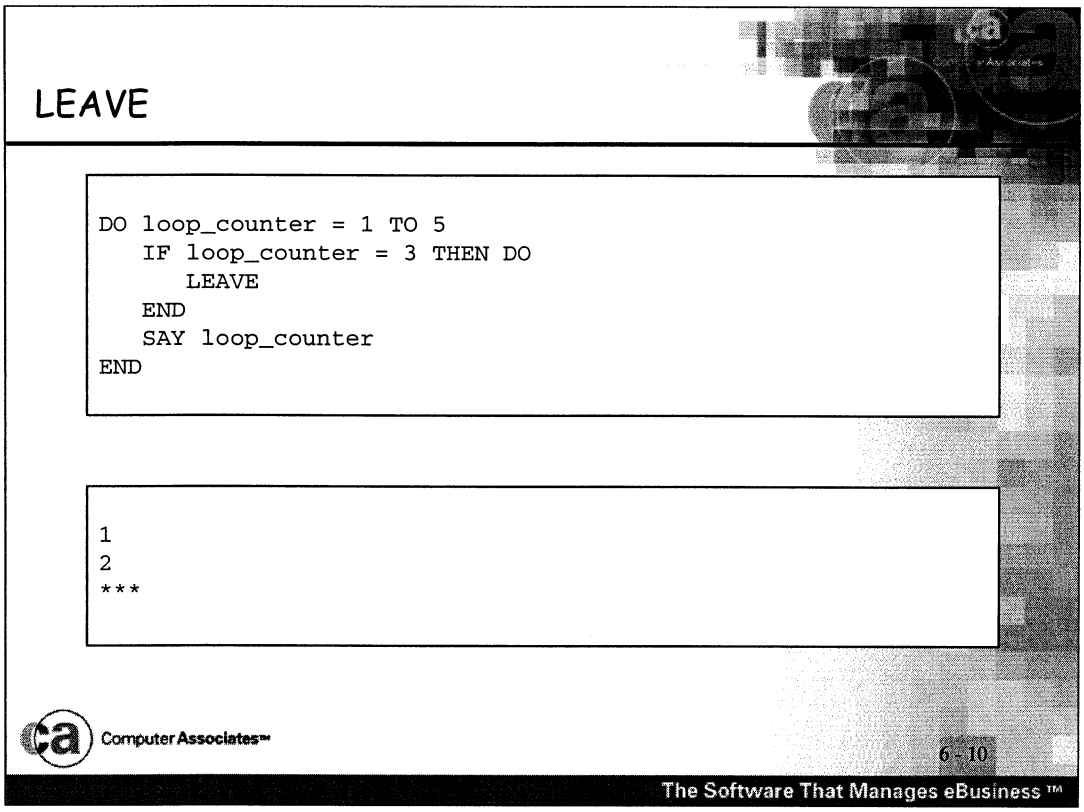

DO count = 1 TO n BY n
DO loop_counter = 1 TO 5 BY 1
SAY loop_counter
END
1
2
3
4
5
***
Computer Associates™
6 - 5
The Software That Manages eBusiness ™

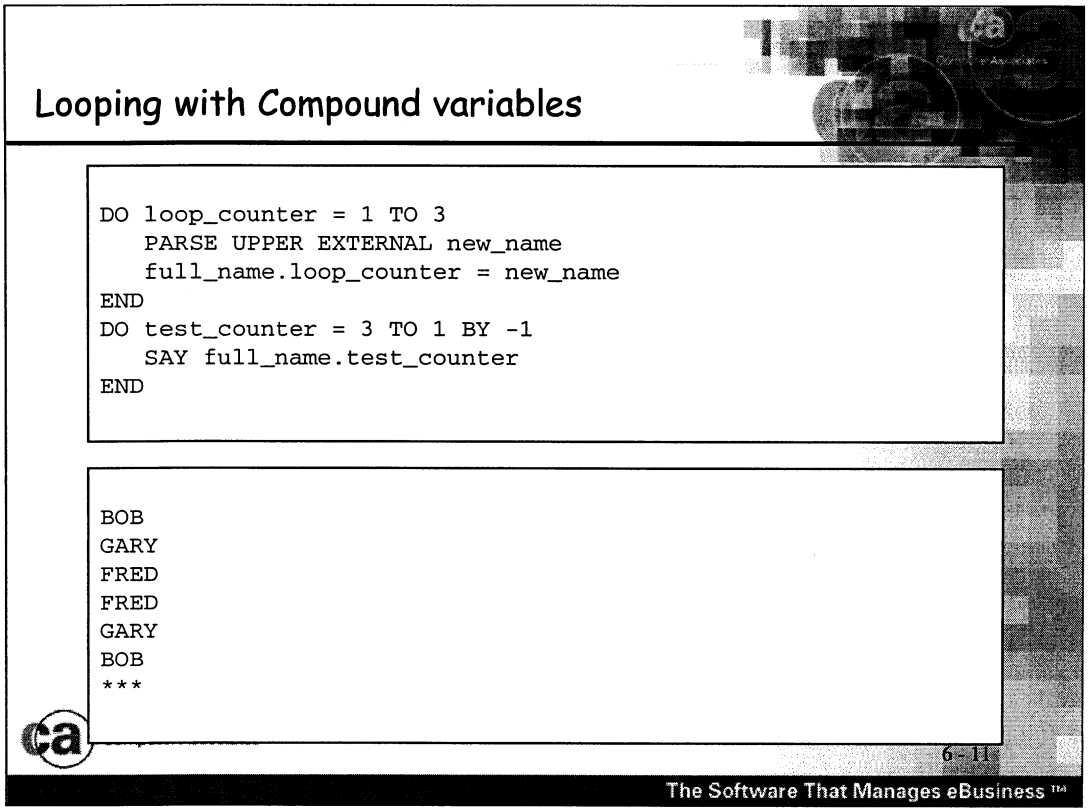

Test Exercise 62
• Write a REXX program to count to 10 showing only every third number.
1
4
7
10
***
Computer Associates™
6 - 6
The Software That Manages eBusiness ™

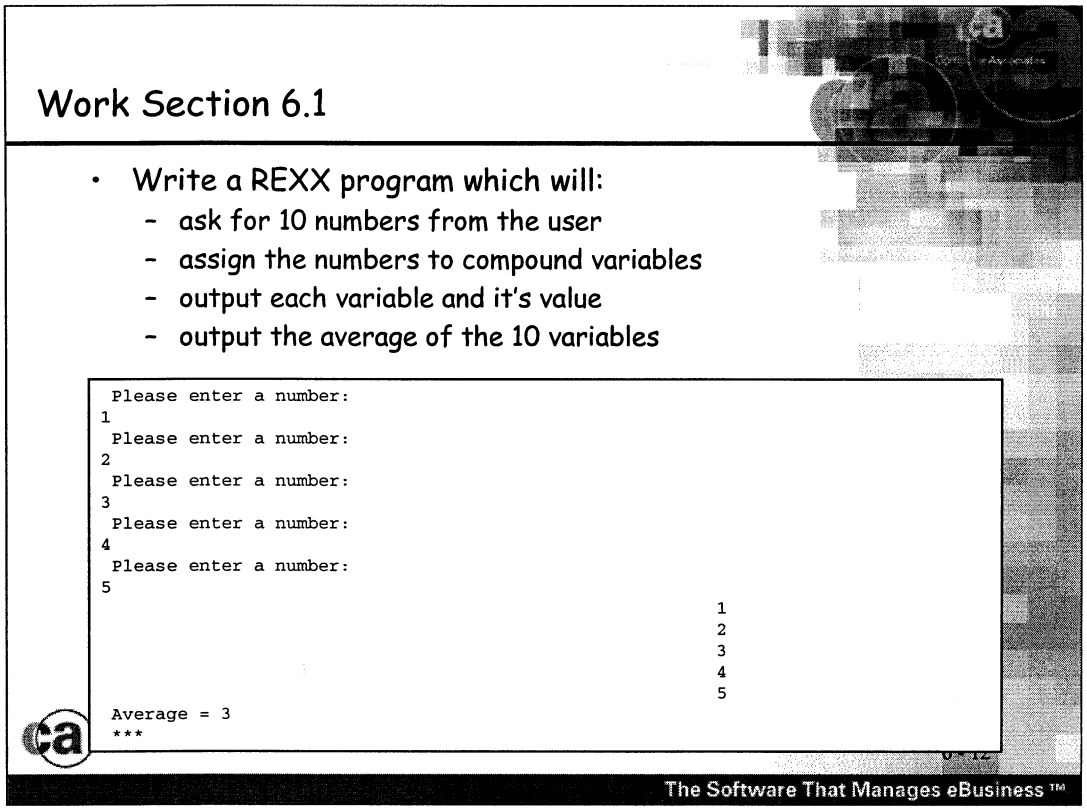

DO WHILE
loop_counter = 0
DO WHILE loop_counter < 5
loop_counter = loop_counter + 1
SAY loop_counter
END
1
2
3
4
5
***
Computer Associates™
6-7
The Software That Manages eBusiness ™

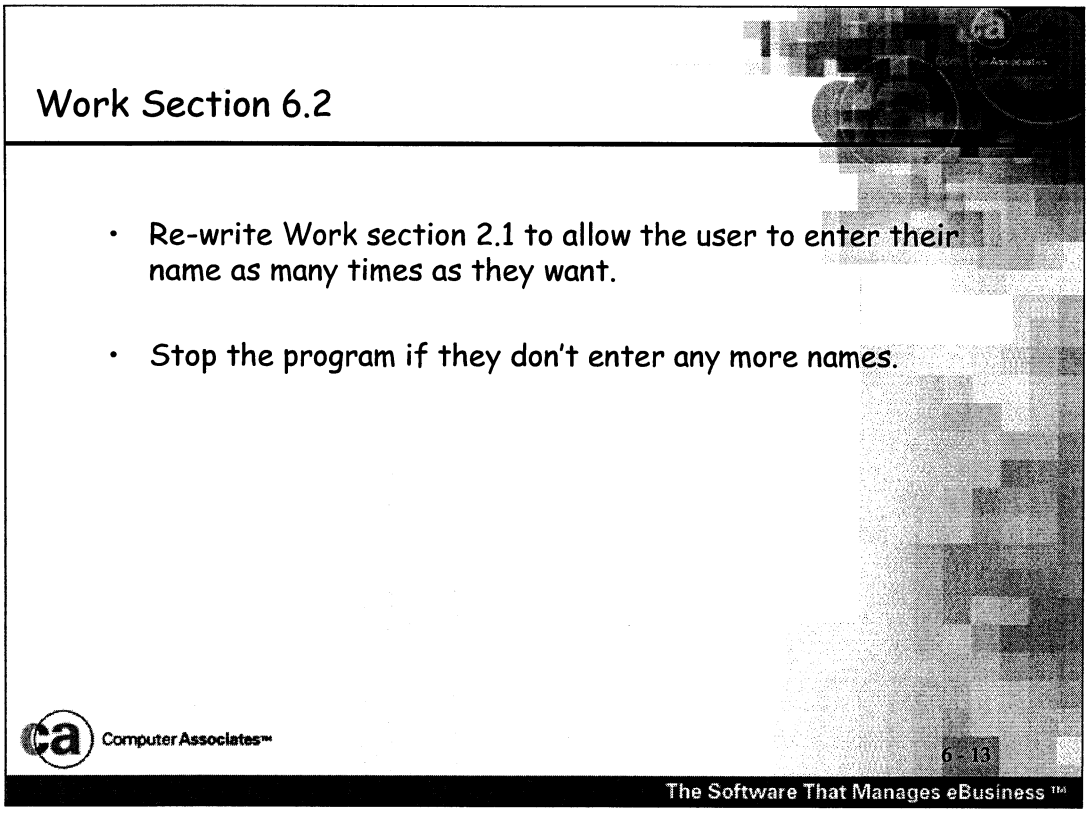

DO UNTIL
loop_counter = 0
DO UNTIL loop_counter < 5
loop_counter = loop_counter + 1
SAY loop_counter
END
1
***
Computer Associates™
6 - 8
The Software That Manages eBusiness ™


ITERATE
DO loop_counter = 1 TO 5
IF loop_counter = 3 THEN DO
ITERATE
END
SAY loop_counter
END
1
2
4
5
***
Computer Associates™
6-9
The Software That Manages eBusiness ™


LEAVE
DO loop_counter = 1 TO 5
IF loop_counter = 3 THEN DO
LEAVE
END
SAY loop_counter
END
1
2
***
Computer Associates
6 - 10
The Software That Manages eBusiness ™


Looping with Compound variables
DO loop_counter = 1 TO 3
PARSE UPPER EXTERNAL new_name
full_name.loop_counter = new_name
END
DO test_counter = 3 TO 1 BY -1
SAY full_name.test_counter
END
BOB
GARY
FRED
FRED
GARY
BOB
***
6 - 11
The Software That Manages eBusiness ™


Work Section 6.1
• Write a REXX program which will:
- ask for 10 numbers from the user
- assign the numbers to compound variables
- output each variable and it's value
- output the average of the 10 variables
Please enter a number:
1
Please enter a number:
2
Please enter a number:
3
Please enter a number:
4
Please enter a number:
5
1
2
3
4
5
Average = 3
***
The Software That Manages eBusiness ™


Work Section 6.2
• Re-write Work section 2.1 to allow the user to enter their name as many times as they want.
• Stop the program if they don't enter any more names.
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6 - 13
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Additional Program

- Re-write program 6.1 and find the highest number entered.
- Also display the numbers in reverse order.

6 - 14

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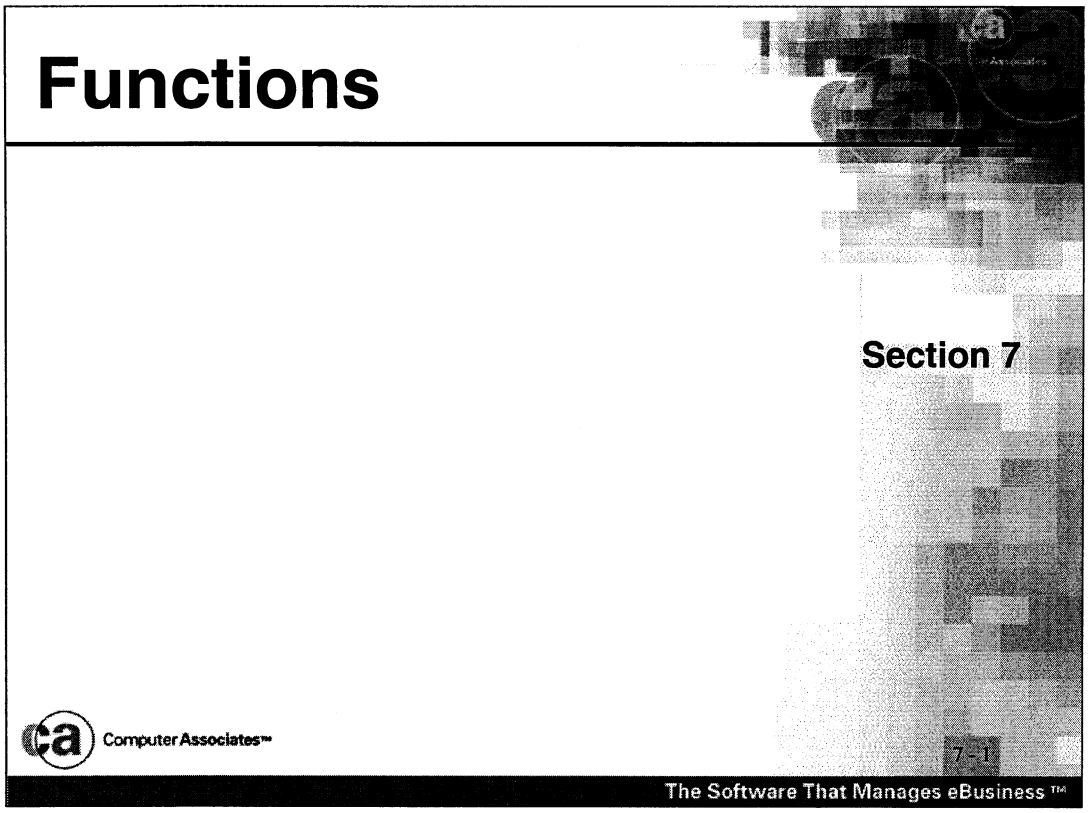
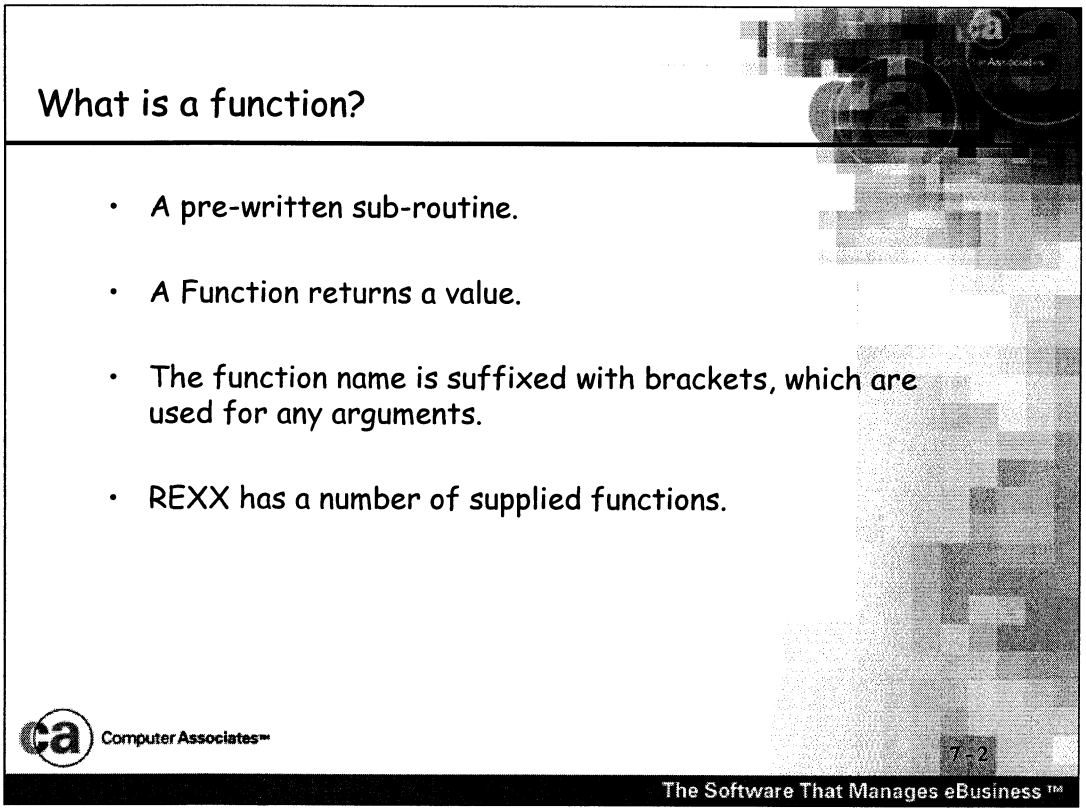

Functions
Section 7
Computer Associates™
7 - 1
The Software That Manages eBusiness ™


What is a function?
• A pre-written sub-routine.
• A Function returns a value.
• The function name is suffixed with brackets, which are used for any arguments.
• REXX has a number of supplied functions.
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7-2
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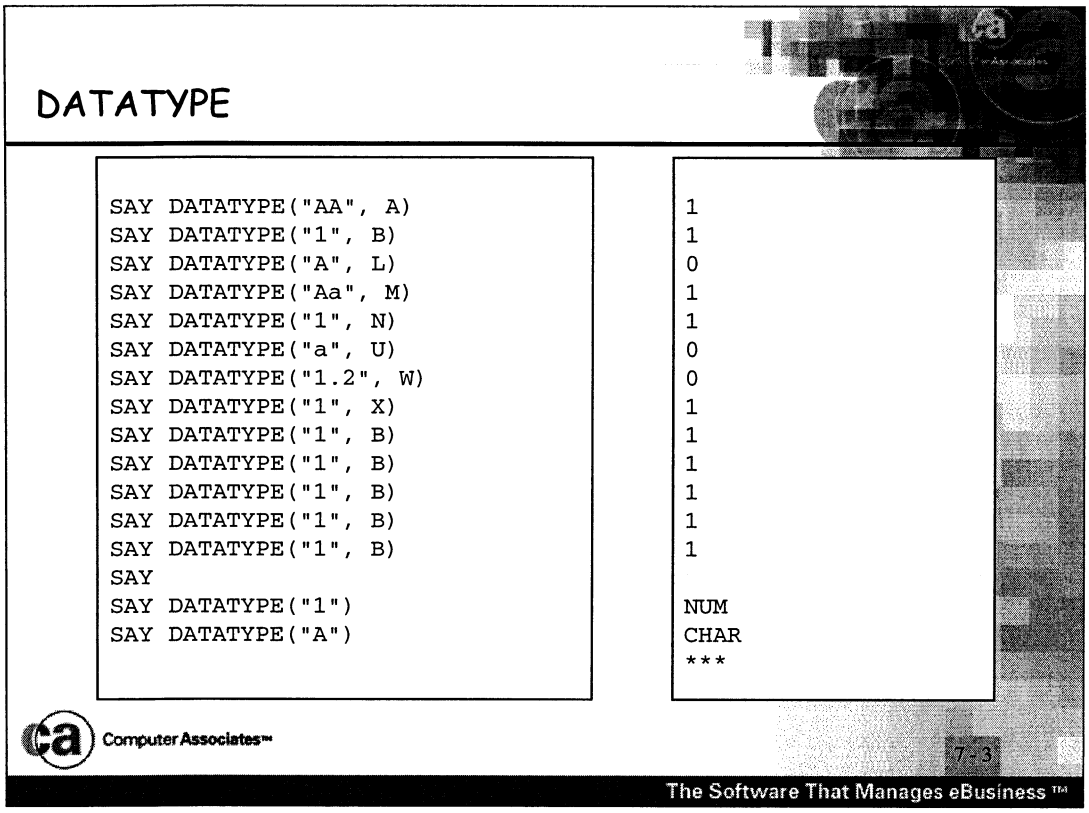


A for Alphanumeric, returns a 1 if 'string' contains upper or lower case letters or the numbers 0 through 9.

N for Numeric, returns a 1 if 'string' is a valid number acceptable to REXX

W for Whole number, returns a 1 if 'string' is a whole number acceptable to REXX under the current setting of NUMERIC DIGITS.

L for Lowercase, returns a 1 if 'string' contains ONLY lowercase letters in the range A-Z.

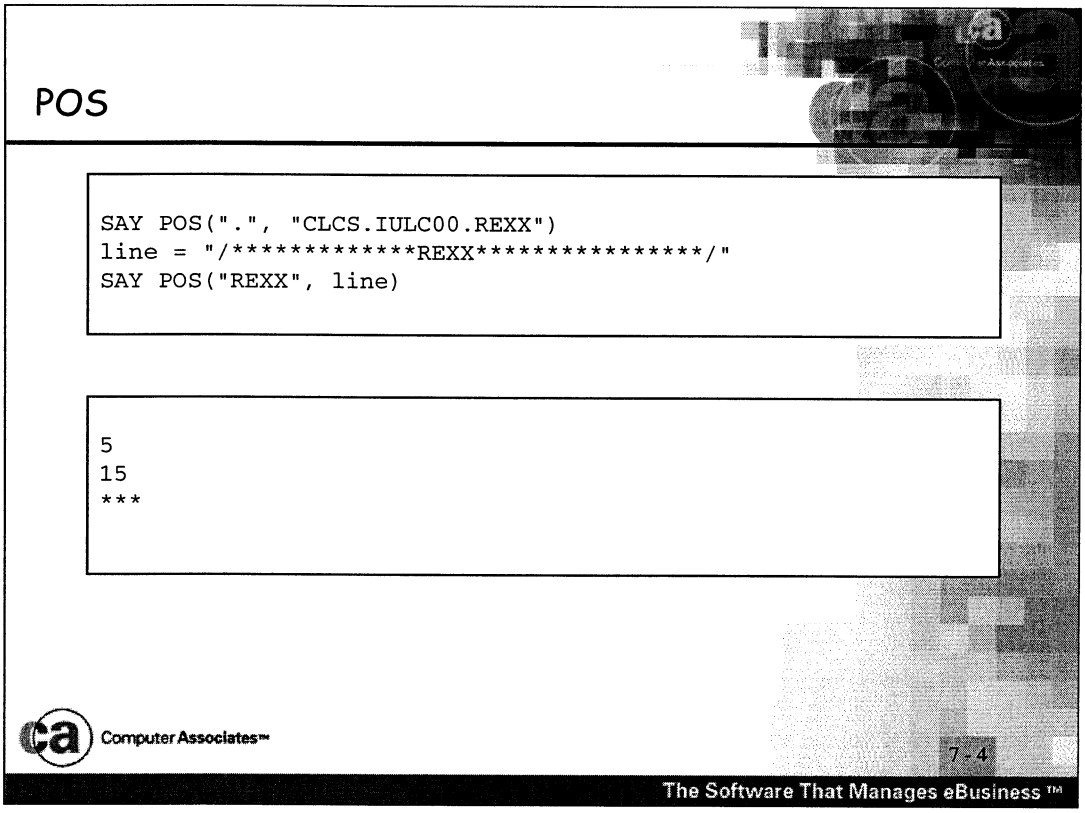
U for Uppercase, returns a 1 if 'string' contains ONLY uppercase letters in the range A-Z.

M for Mixed case, returns a 1 if 'string' contains either upper or lowercase letters in the range A-Z.

S for Symbol, returns a 1 if 'string' contains only the characters that are valid for forming REXX symbols.

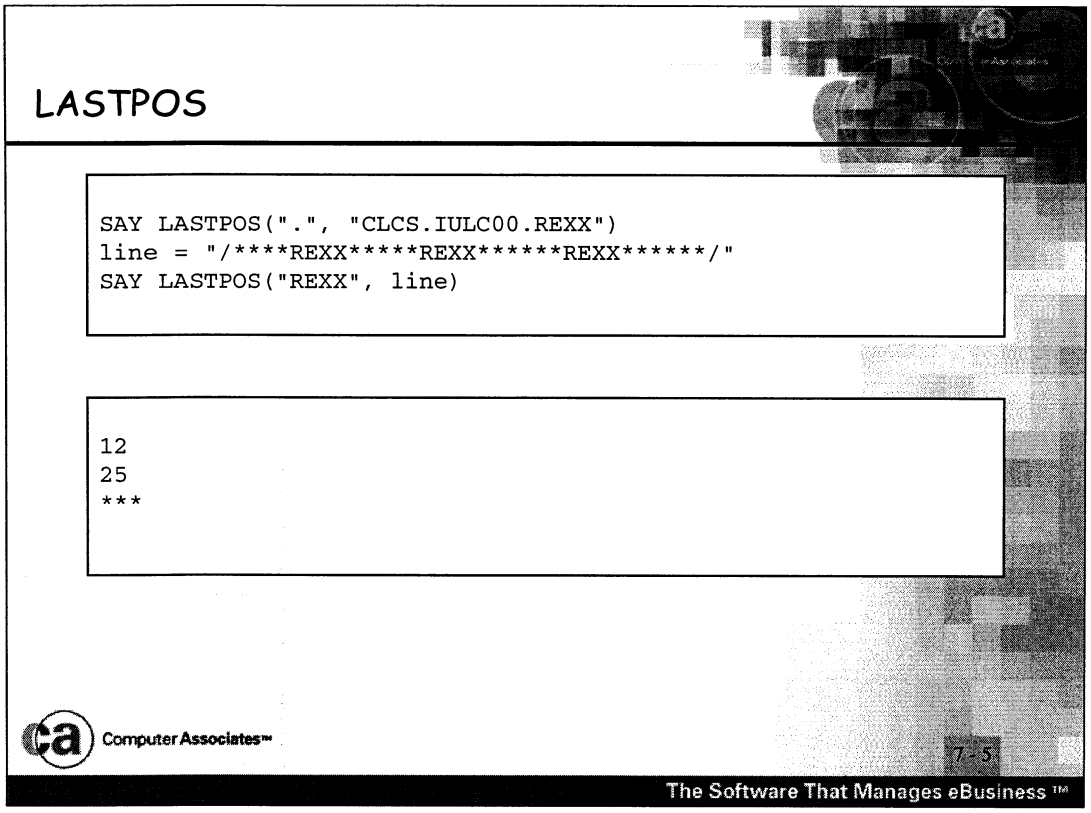
B for Bitstring, returns a 1 if 'string' contains ONLY 0's and 1's.

X for Hexadecimal, returns a 1 if 'string' contains valid hexadecimal characters in the ranges a-f, A-F, 0-9, or blank. A 1 is also returned if 'string' is a null (zero length) string.



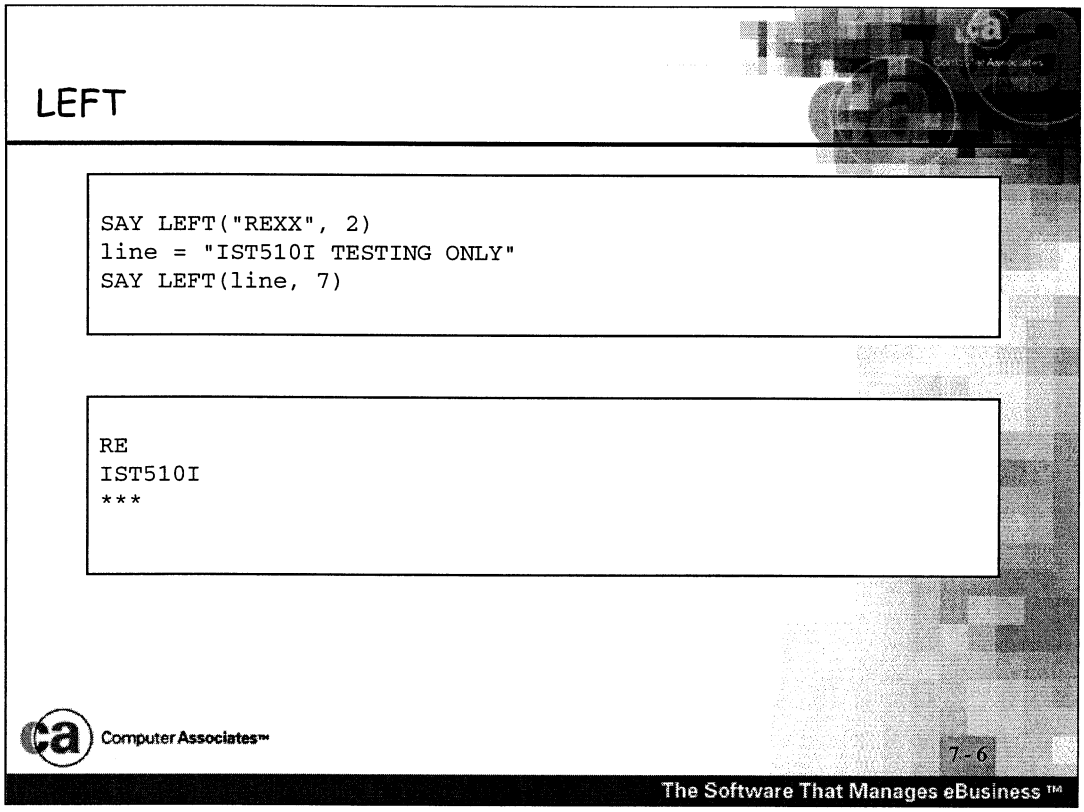

```
POS(substring,string{,startloc})
```

Returns the position of one string, in another.



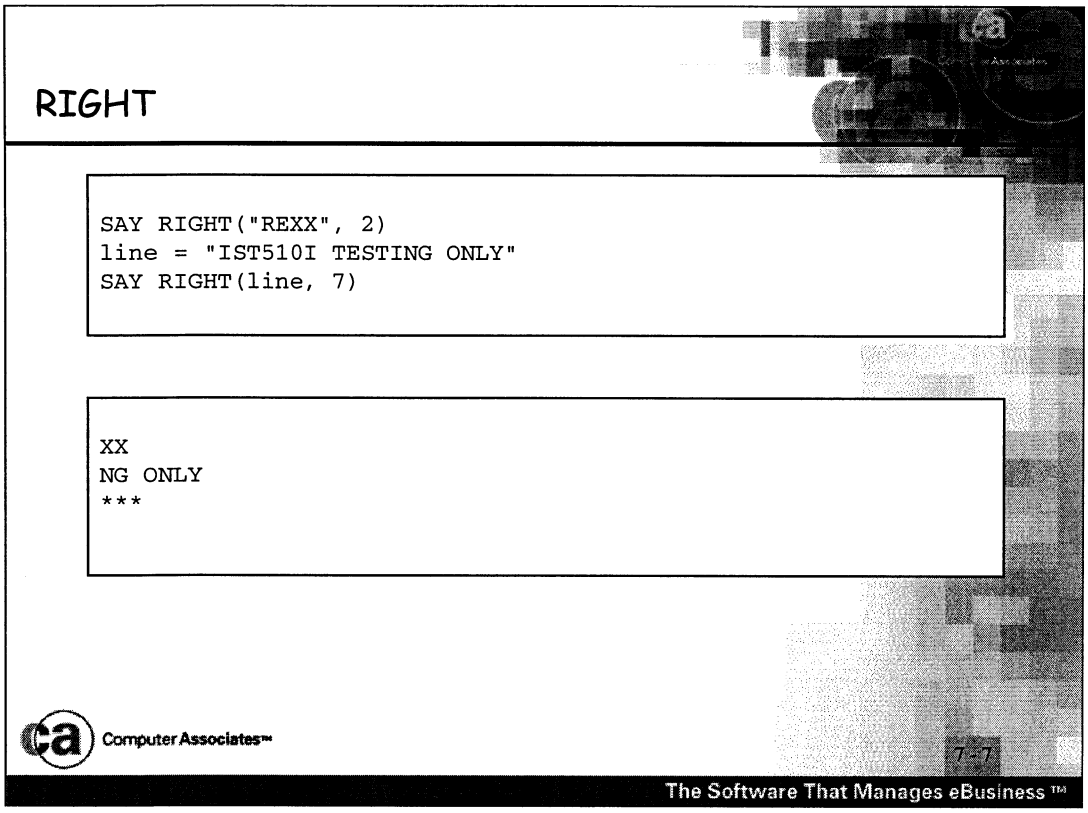
`LASTPOS(substring,string{,start})`

Returns the position of the last occurrence of one string in another.



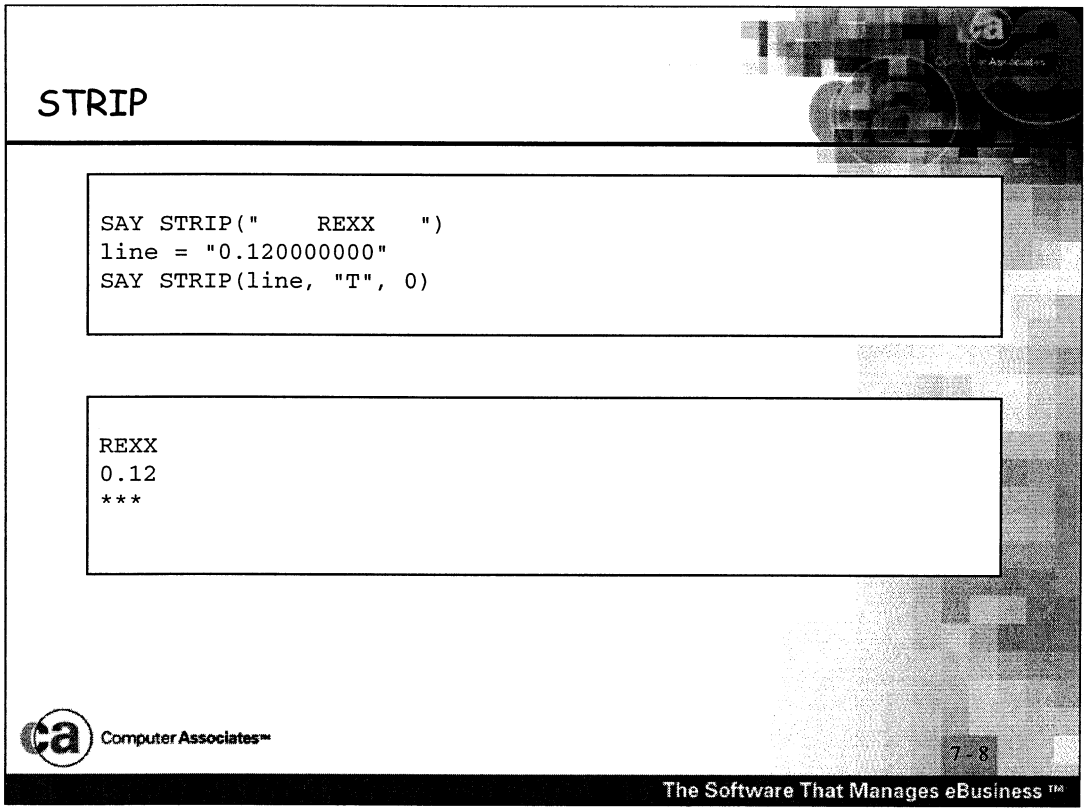
`LEFT(string,length{,pad})`

Returns a string of length, containing the leftmost length.



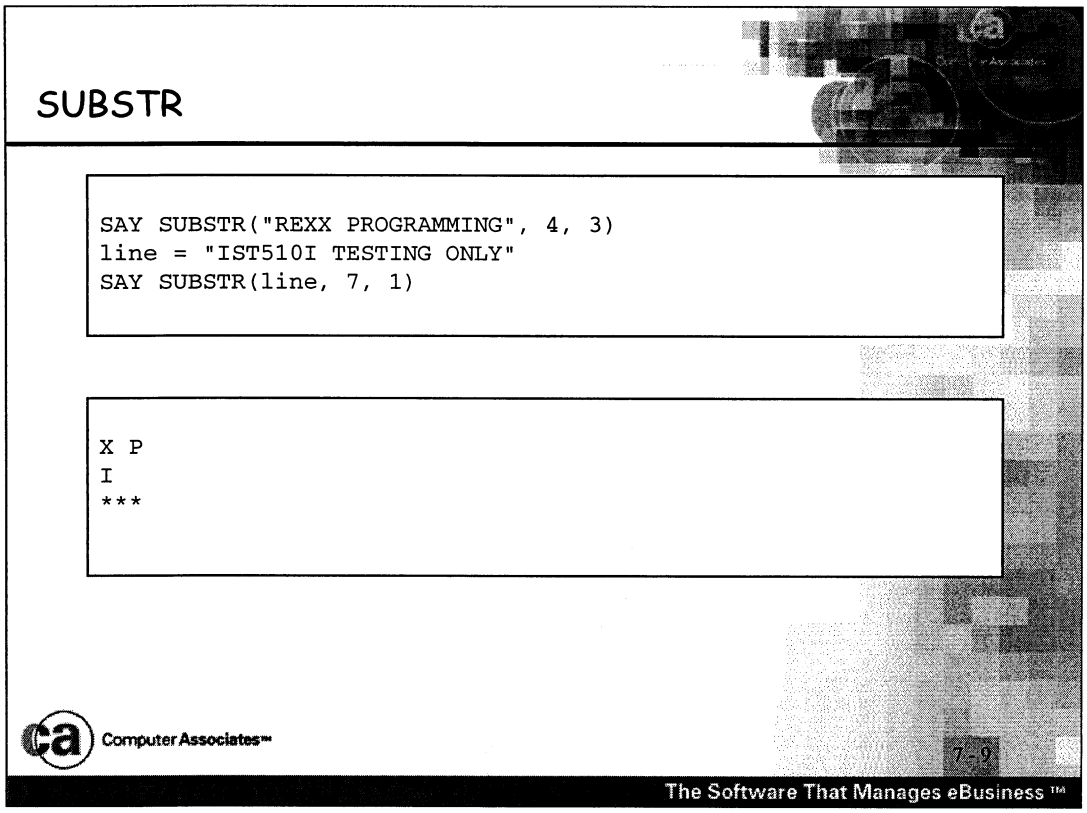
`RIGHT(string,length{,pad})`

Returns a string of length, containing the rightmost length.



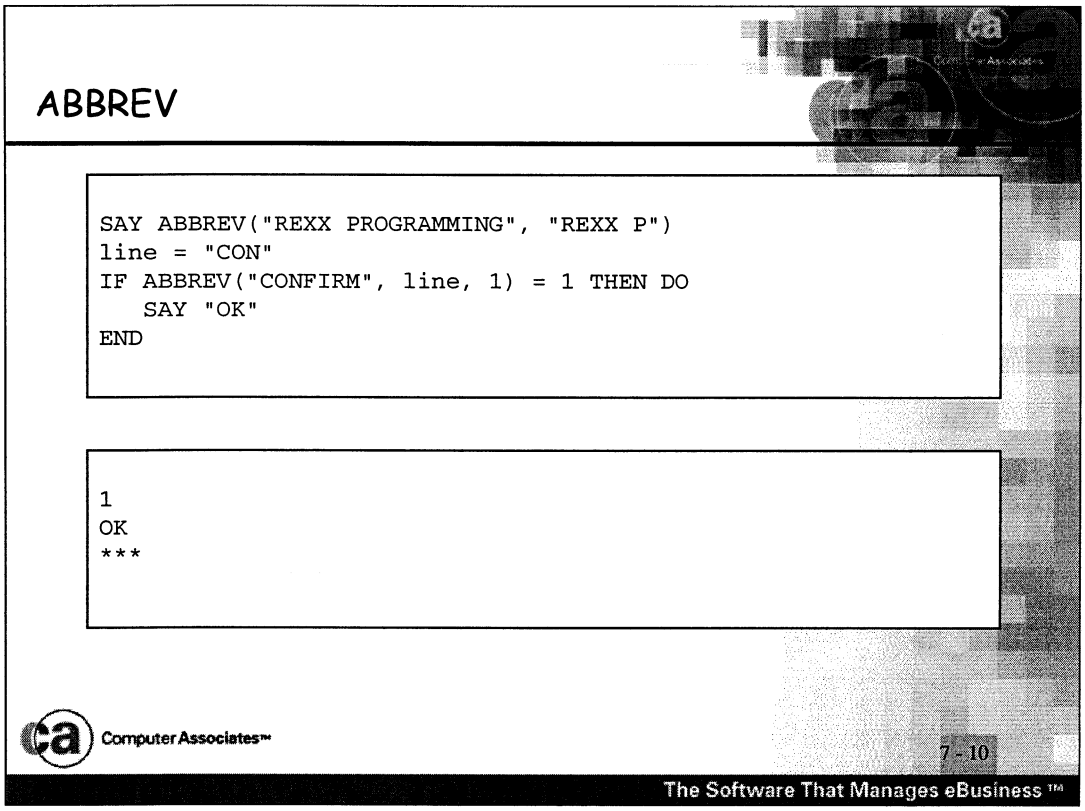

```
STRIP(string{,{option}{,char}})
```

Returns string with leading or trailing characters or both removed.



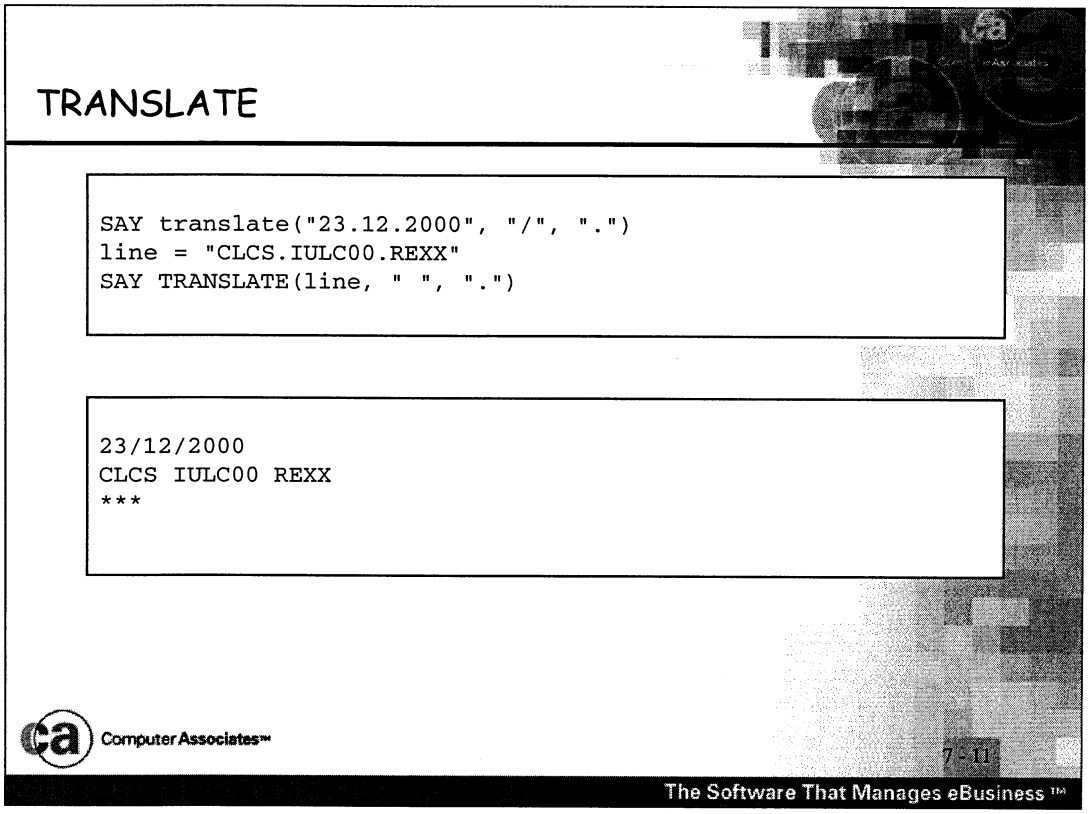
SUBSTR(string,n{,{length}{,pad}})

Returns the substring of string that begins at the nth character and is of length



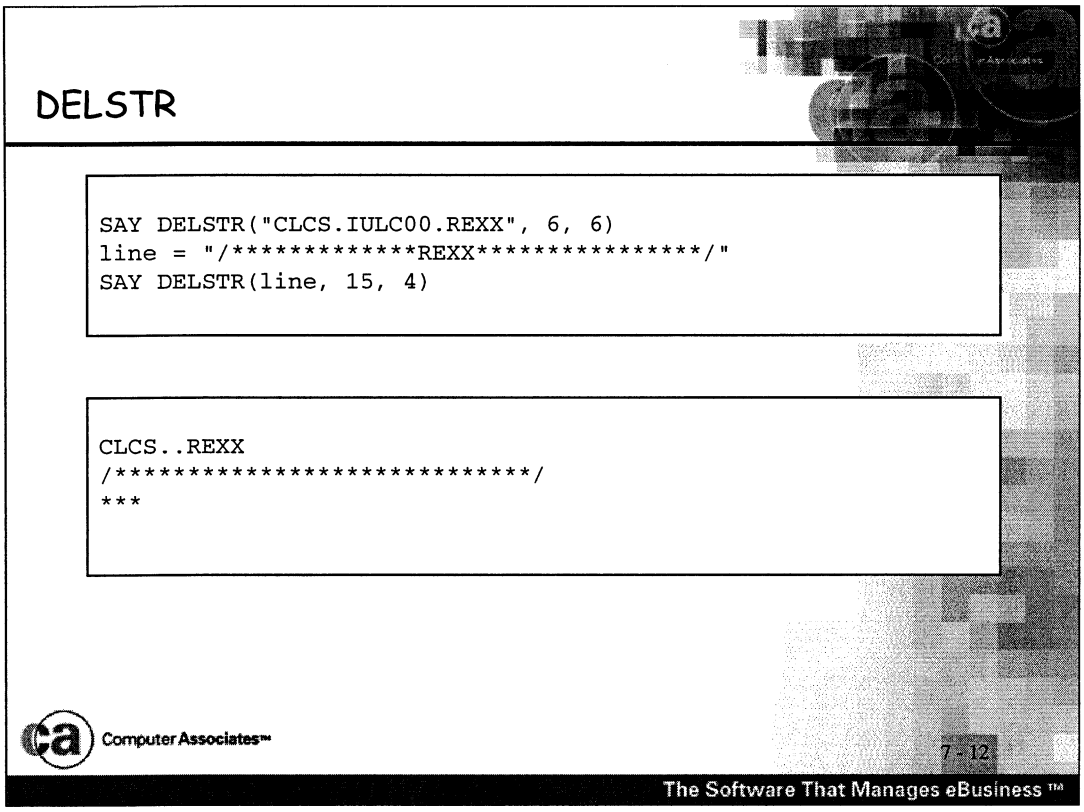
ABBREV(string,prefix{,length})

Returns 1 if info is equal to the leading characters of information.



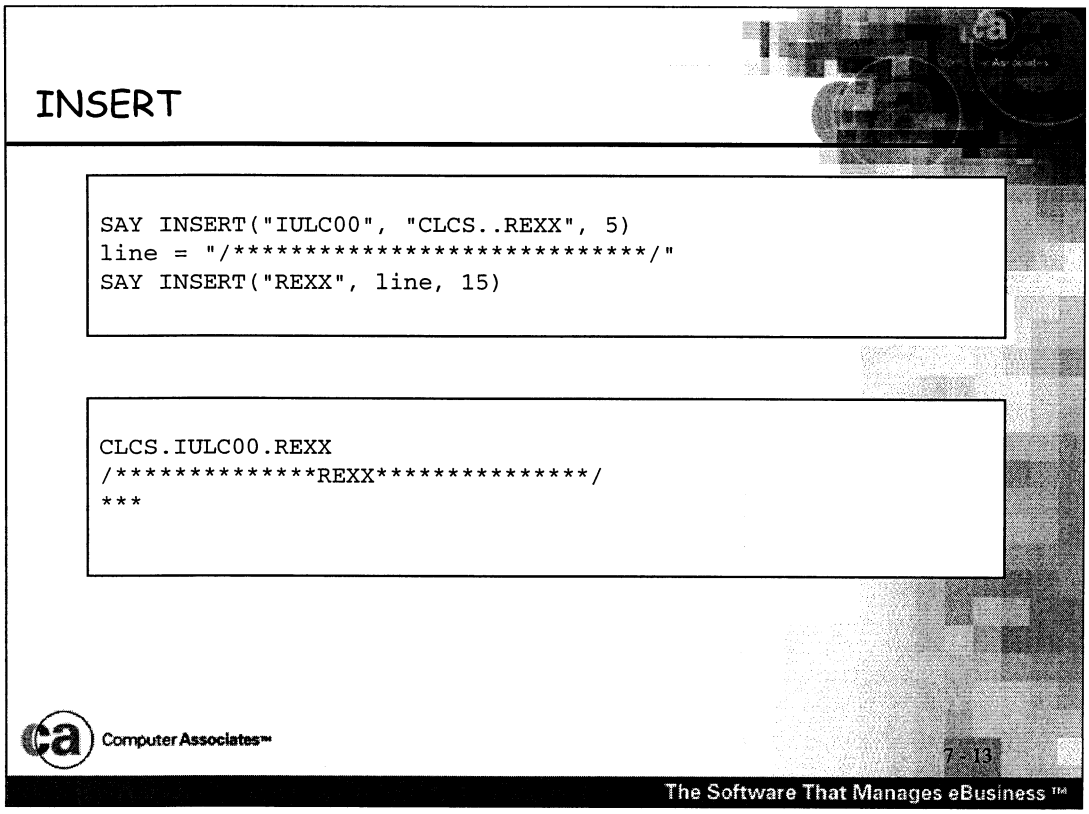
`TRANSLATE(string{,{outtab}{,{intab}{,pad}}})`

Returns string with each character translated to another character.



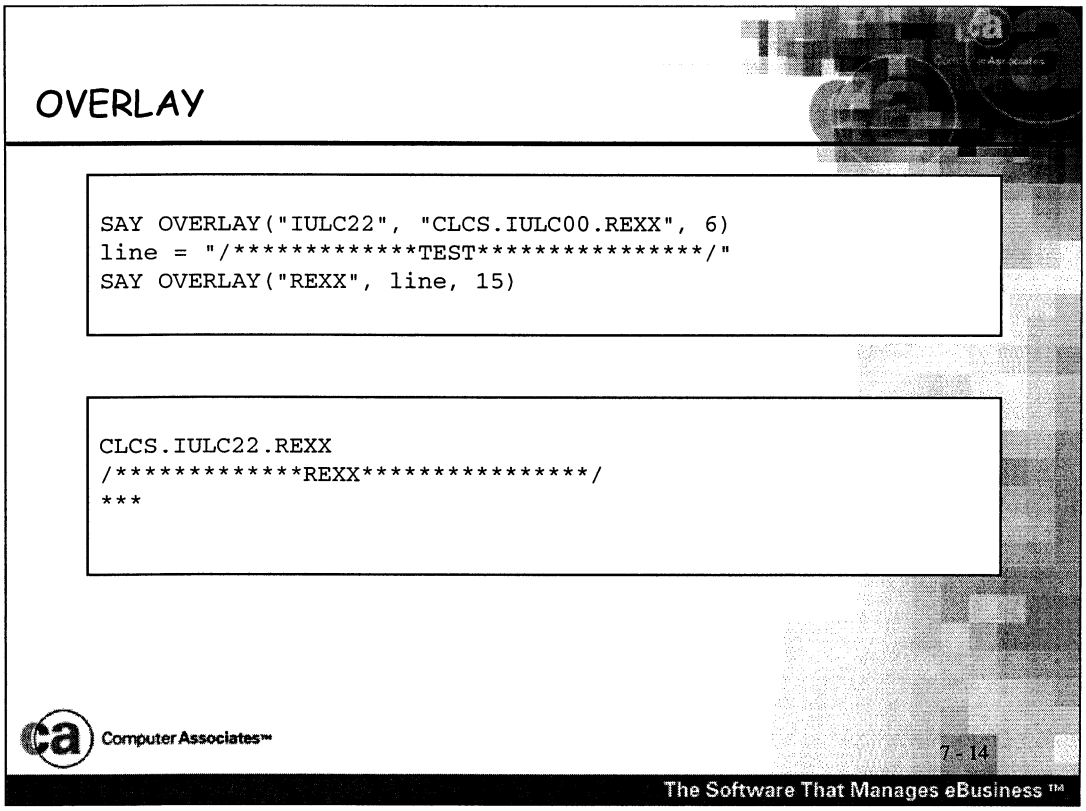
`DELSTR(string,n,length)`

Returns string after deleting the substring that begins at the nth character and is of length characters.



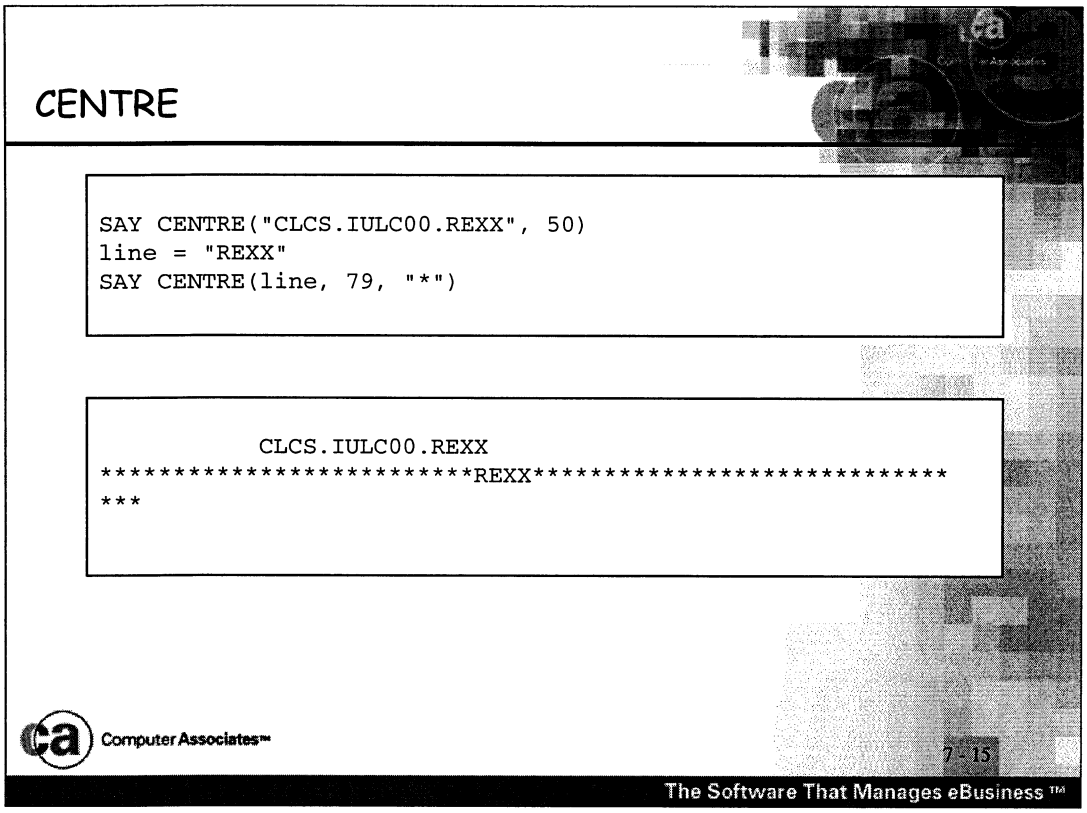
`INSERT(ins,target{,{n}{,{length}{,pad}}})`

Inserts the string new, padded or truncated to length length, into the string target after the nth character.



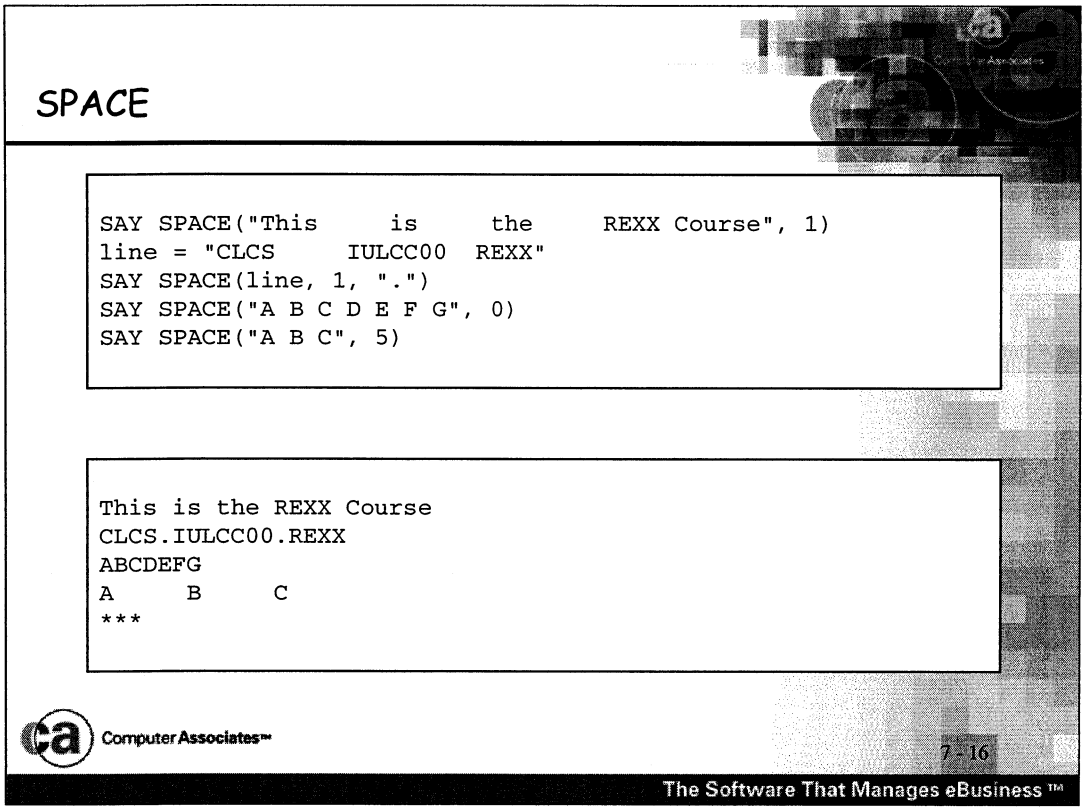
OVERLAY(new,target(,{n}{,{length}{,pad}}})

Returns the string target, which, starting at the nth character, is overlaid with the string new, padded or truncated to length length.



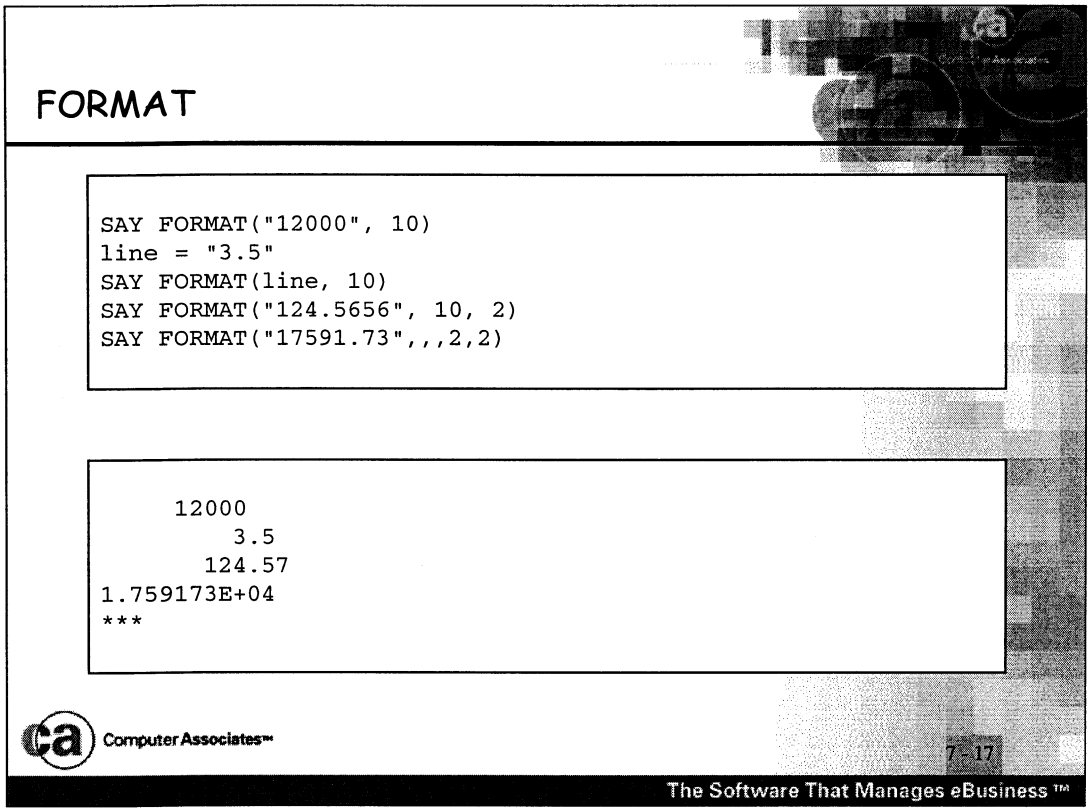
`CENTRE(string,length{,pad})`

Returns a string of length length with string centered in it, with pad characters added as necessary to make up length.



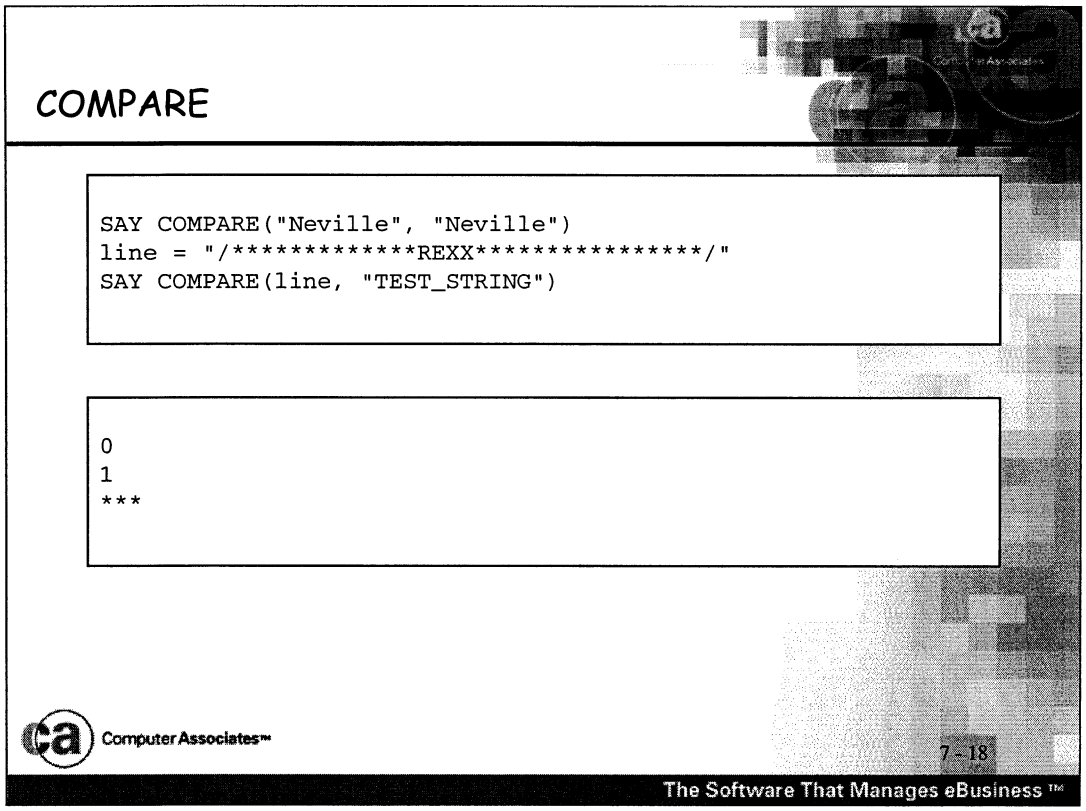
`SPACE(string{,{n}{,pad}})`

Returns the blank-delimited words in string with n pad characters between each word.



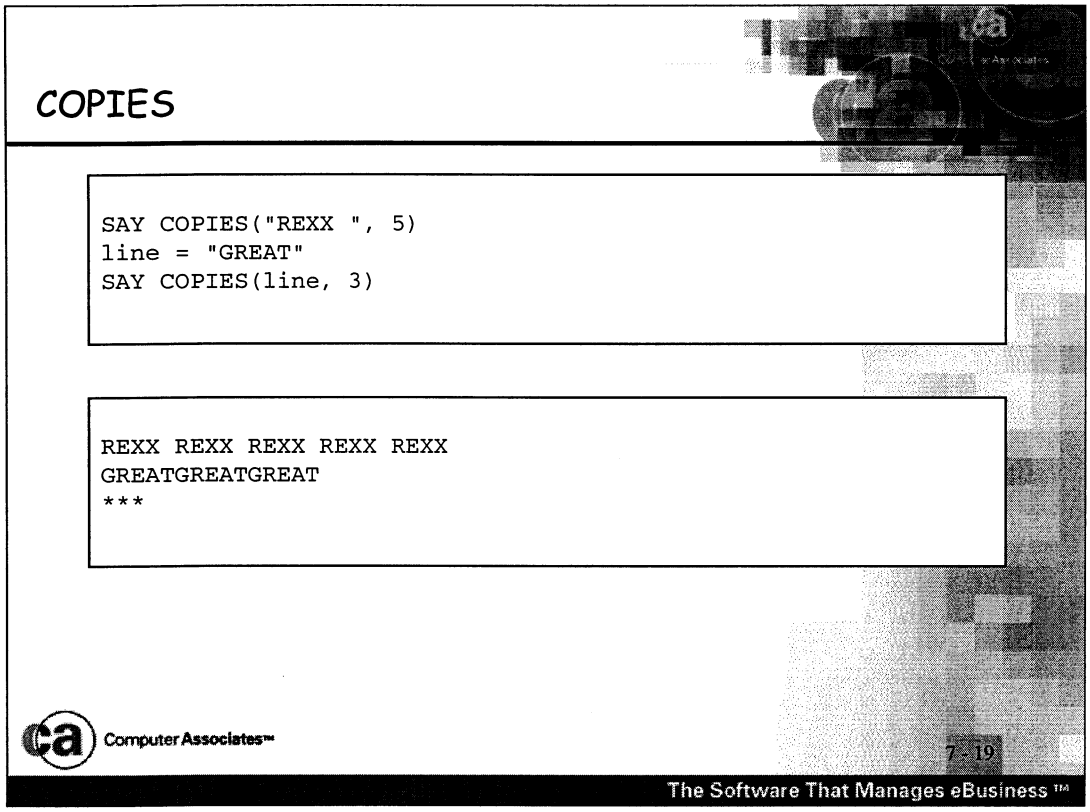
FORMAT(number{,{before}}{,{after}})

Returns number, rounded and formatted.



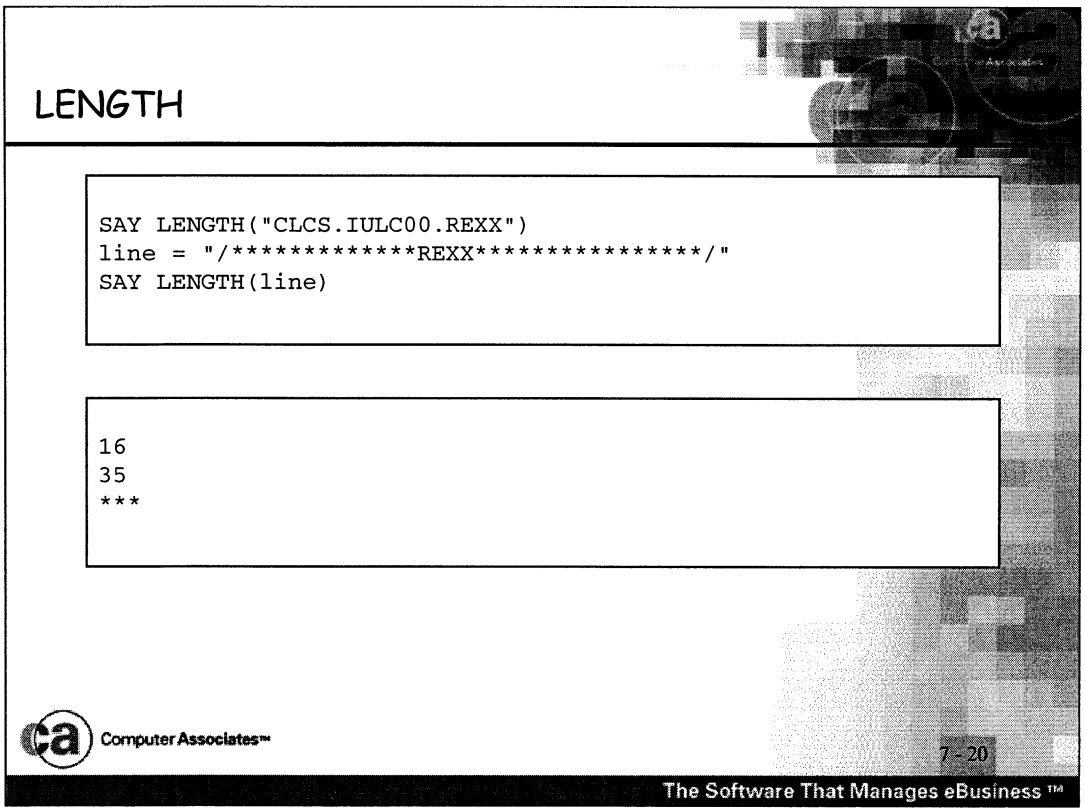
COMPARE(string1,string2(,pad))

Returns 0 if the strings, string1 and string2, are identical. Otherwise, returns the position of the first character that does not match.



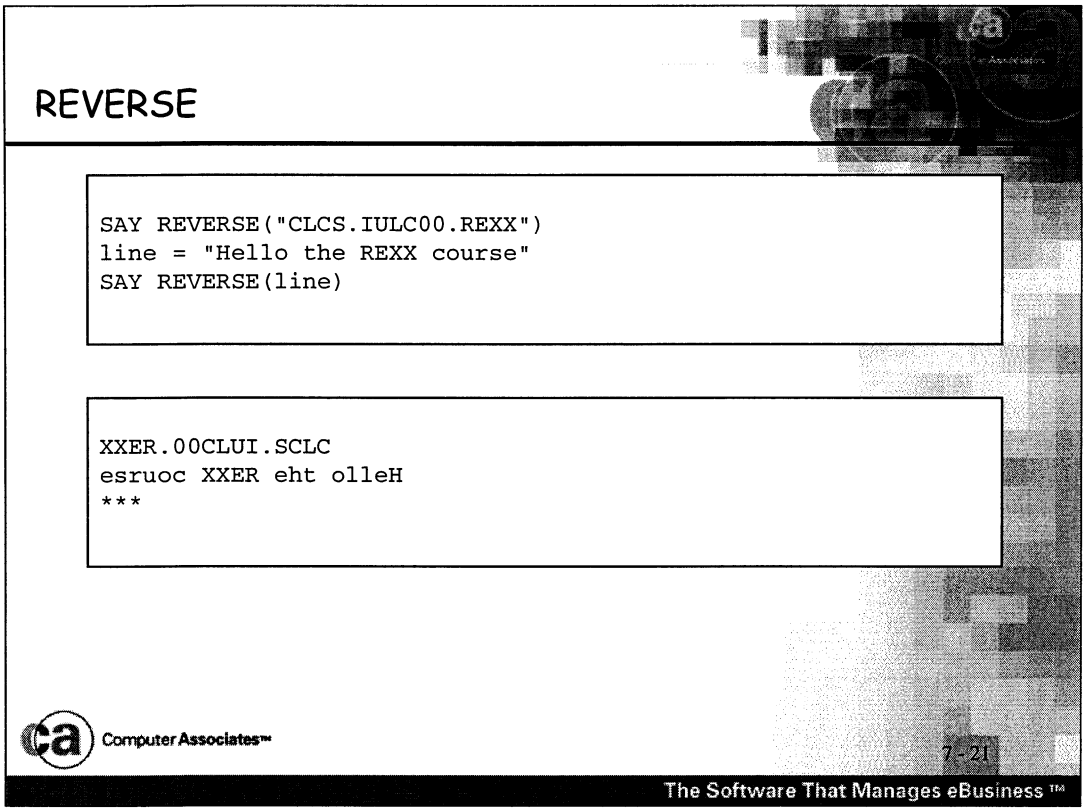
`COPIES(string,n)`

Returns n concatenated copies of string.



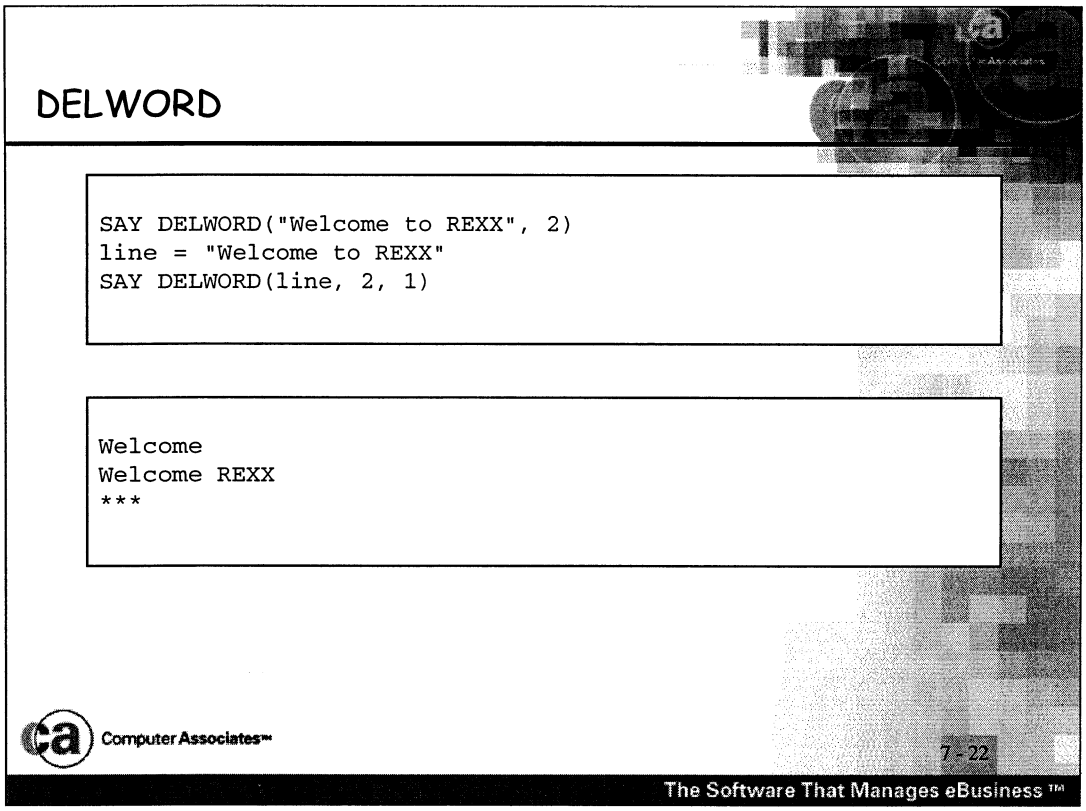
LENGTH(string)

Returns the length of string.



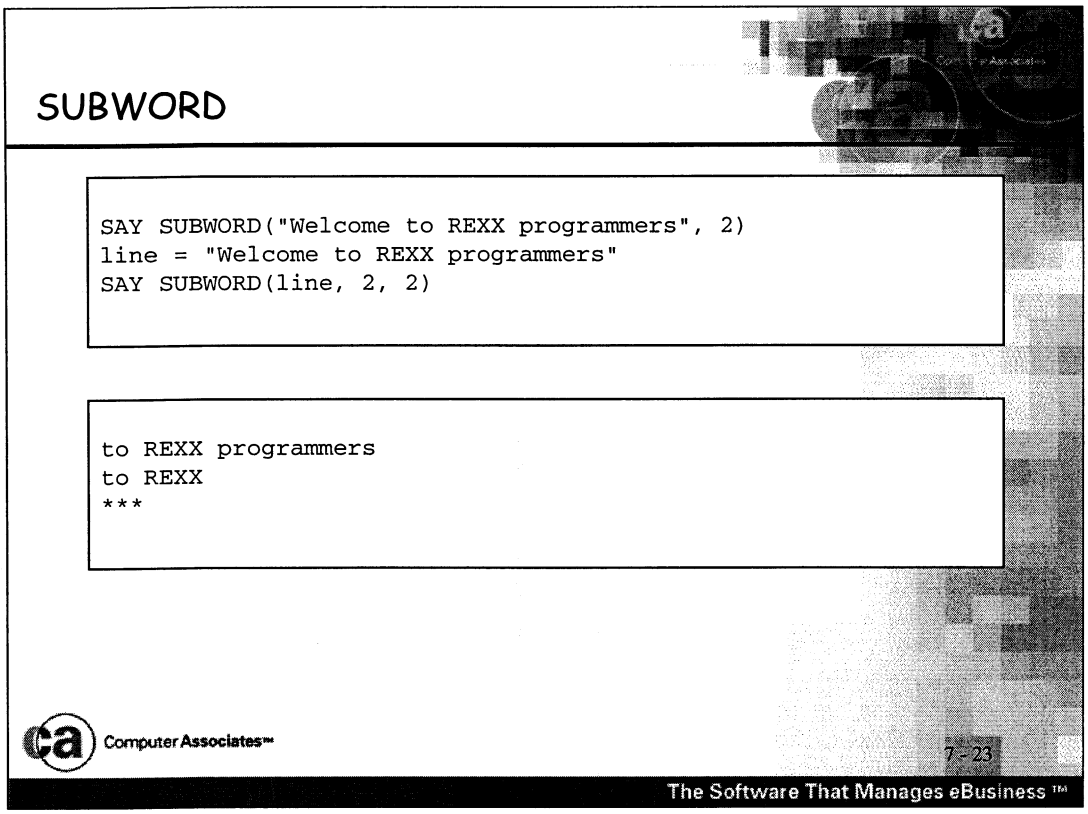
`REVERSE(string)`

Returns string, swapped end for end.



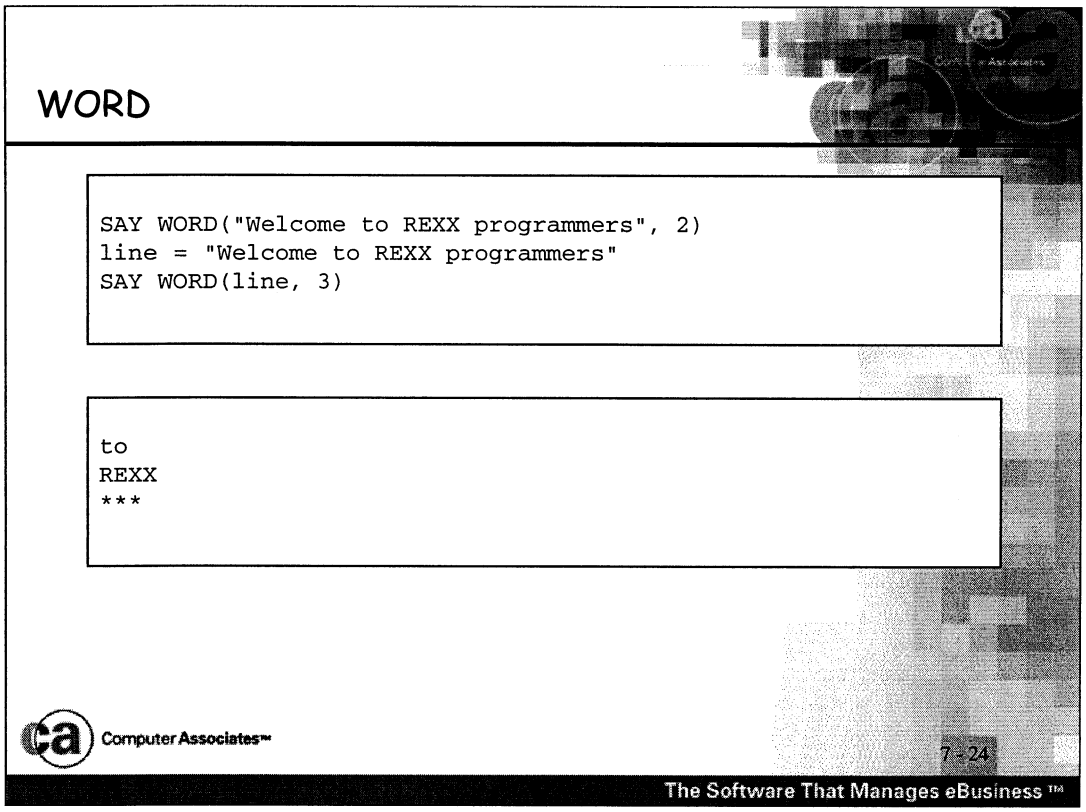
`DELWORD(string,n{,length})`

Returns string after deleting the substring that starts at the nth word and is of length blank-delimited words.



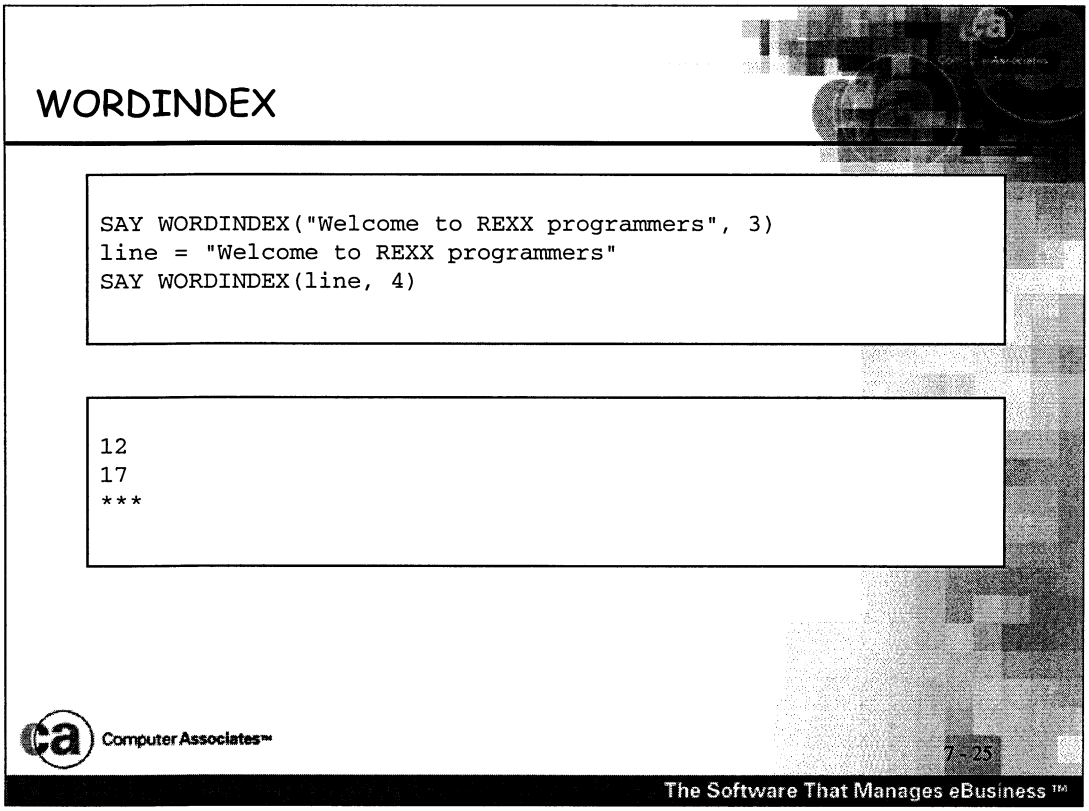
`SUBWORD(string,n{,length})`

Returns the substring of string that starts at the nth word, and is up to length blank-delimited words.



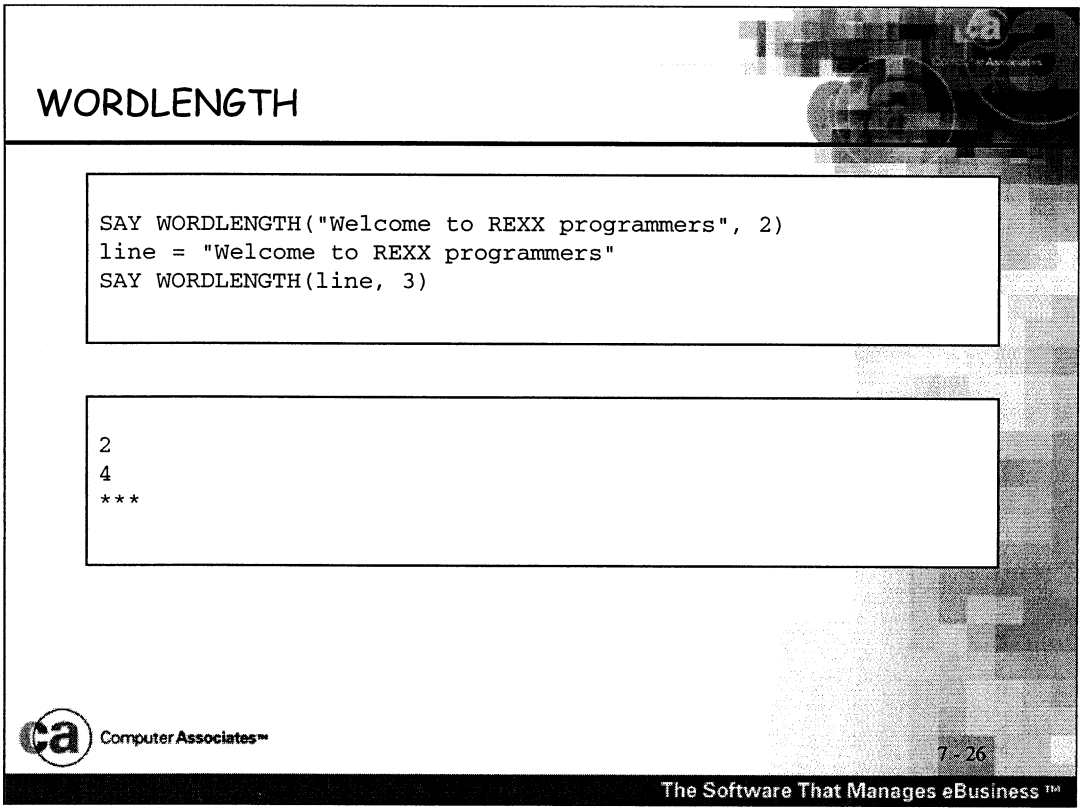
`WORD(string,n)`

Returns the nth blank-delimited word in string or returns the null string if fewer than n words are in string.



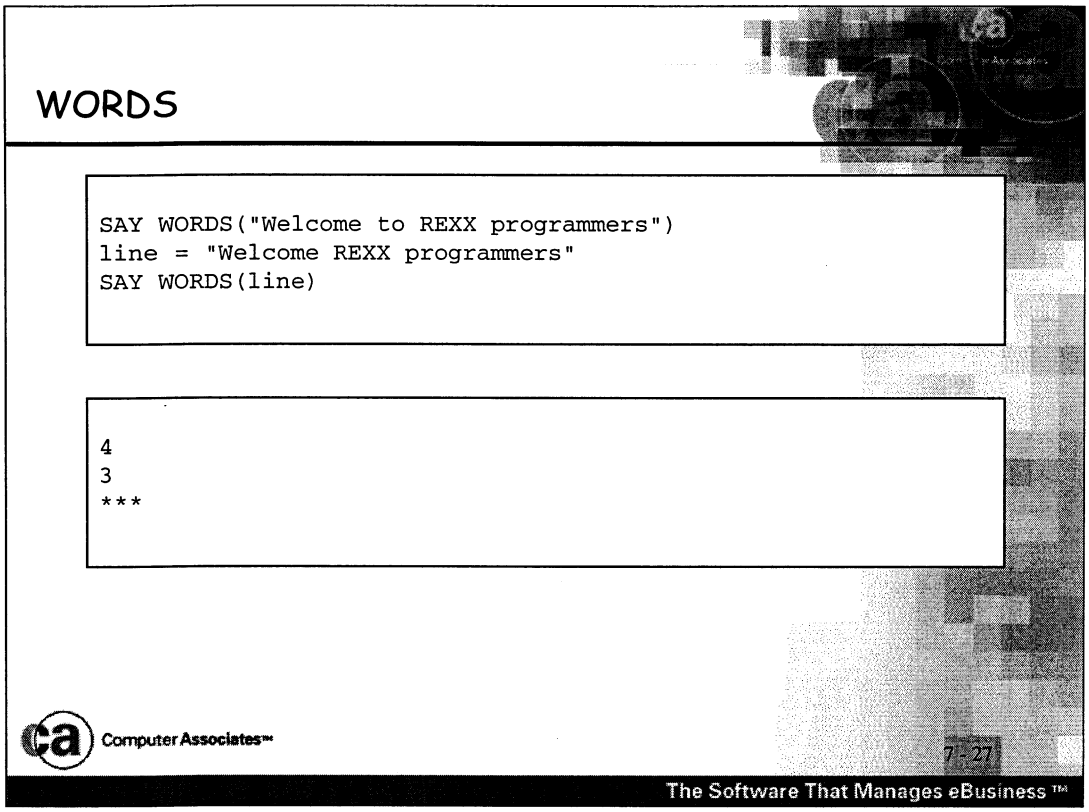
`WORDINDEX(string,n)`

Returns the position of the first character in the nth blank-delimited word in string or returns 0 if fewer than n words are in string.



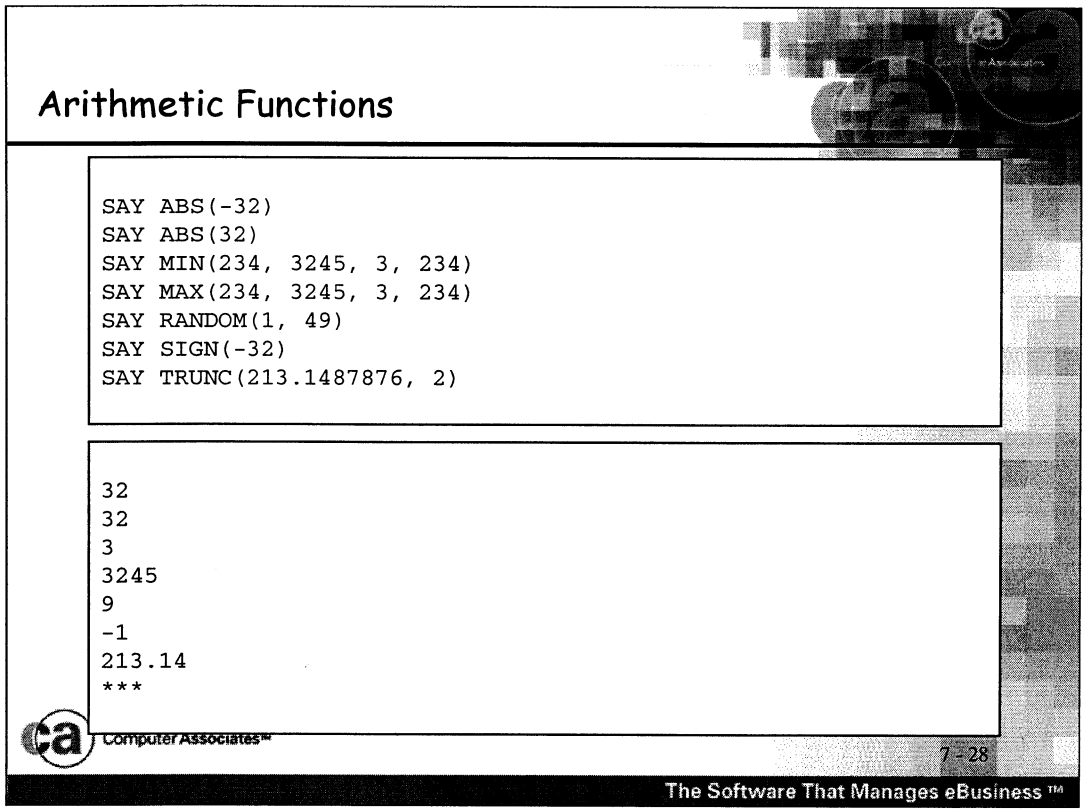
`WORDLENGTH(string,n)`

Returns the length of the nth blank-delimited word in string or returns 0 if fewer than n words are in string.



`WORDS(string)`

Returns the number of blank-delimited words in string.



ABS(number)

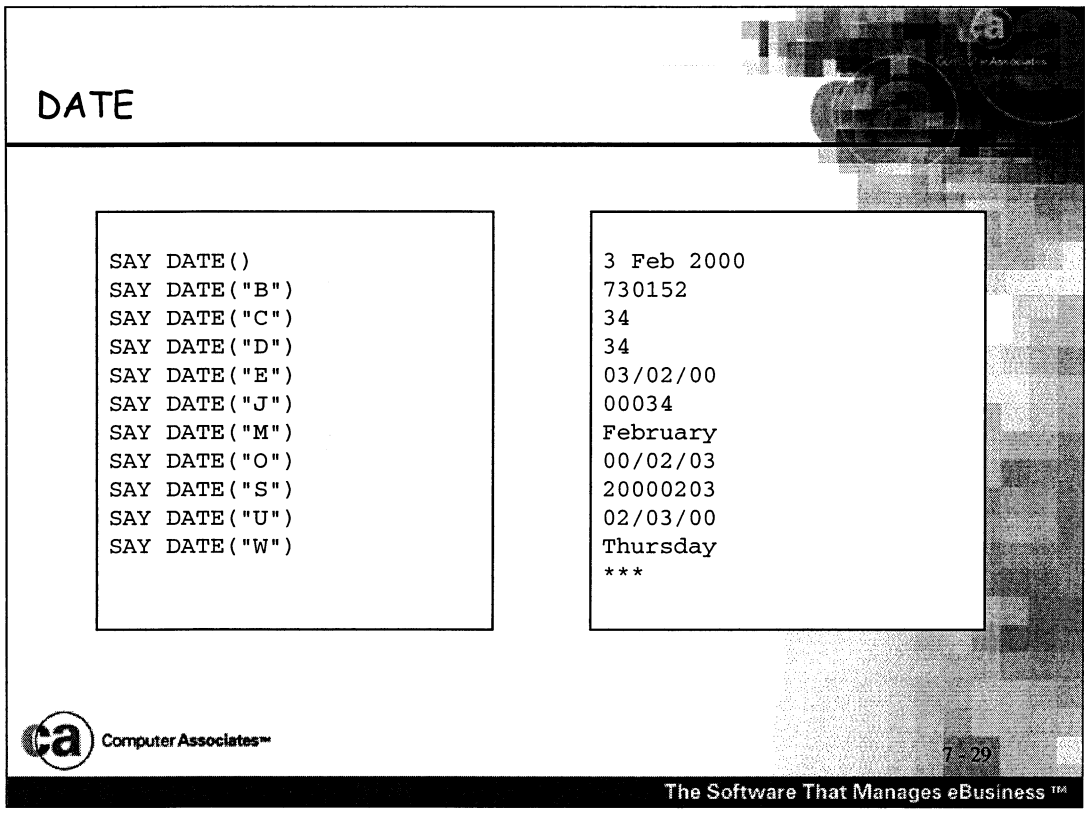
MIN(number{,number}...)

MAX(number{,number}...)

RANDOM({min}{,{max}{,seed}})

SIGN(number)

TRUNC(number{,n})



C as in Century, returns number of days into the current century in the form 'ddddd' with leading zeros stripped.

D for Days, returns number of days into the current year in the form 'ddd' with leading zeros stripped.

U returns date in USA format, 'mm/dd/yy'

E for European dates, returns the date in the form 'dd/mm/yy'

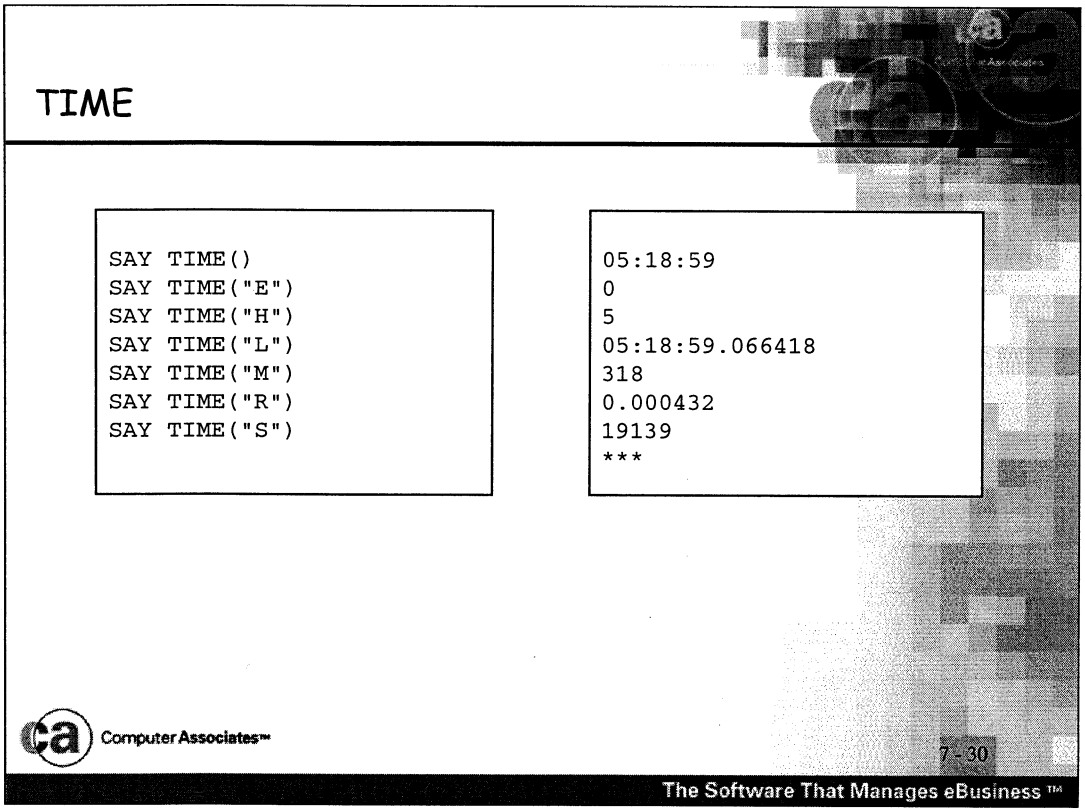
J returns a Julian date in the form 'yyddd'

M returns the full name of the current month (e.g., December)

O as in 'Ordered' date, returns the date in the form 'yy/mm/dd', allowing sorting in chronological date sequence

S returns an alternative sort-format date in the form 'yyyymmdd'

W returns the day of the week (e.g. 'Tuesday', 'Sunday', etc.)



E - Causes TIME to return the elapsed time since a previous TIME('R') in seconds and microseconds.

R - Causes TIME to return the elapsed time since a previous TIME('R') in seconds and microseconds. And causes the elapsed time to be Reset.

H - Causes TIME to return the number of hours since midnight on the same day in the form 'hh', with no leading zeros

L - Causes TIME to return the current time of day in the form hh:mm:ss.uuuuuu, where 'uuuuuu' is a fractional number of seconds, in microseconds (millionths of seconds)

M - Causes TIME to return the current time of day as the number of minutes since midnight on the same day in the form mmmm, with no leading zeros

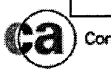
S - Causes TIME to return the current time of day as the number of seconds since midnight on the same day in the form sssss, with no leading zeros

Work Section 7.1

- Write a REXX program which will:
  - Format a title in the the centre of the screen and underlined.
  - Show today's date in the format : mm/dd/yy
  - Show the time in the format : hh:mm:ss
  - Show the date in the format DD-MM-YY

```
                    Function Program
                    ================

The american formatted date is : 02/03/00
This program was executed at : 05:42:57
The european date : 03-02-00
***
```



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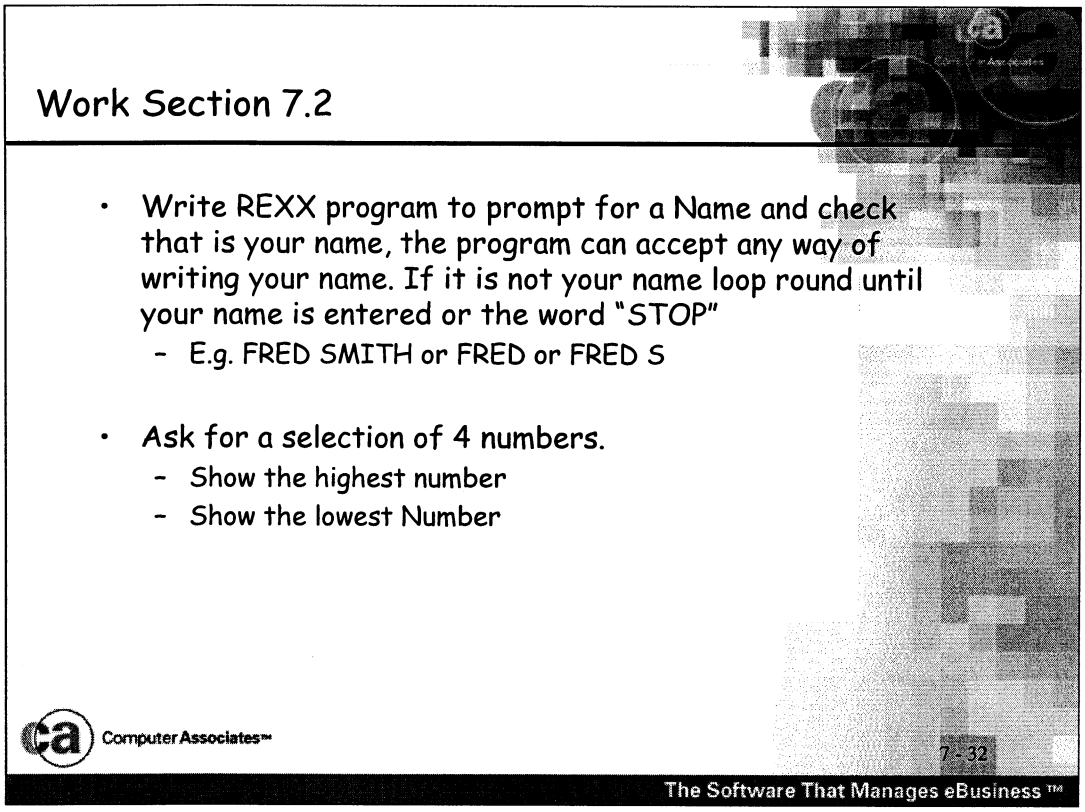
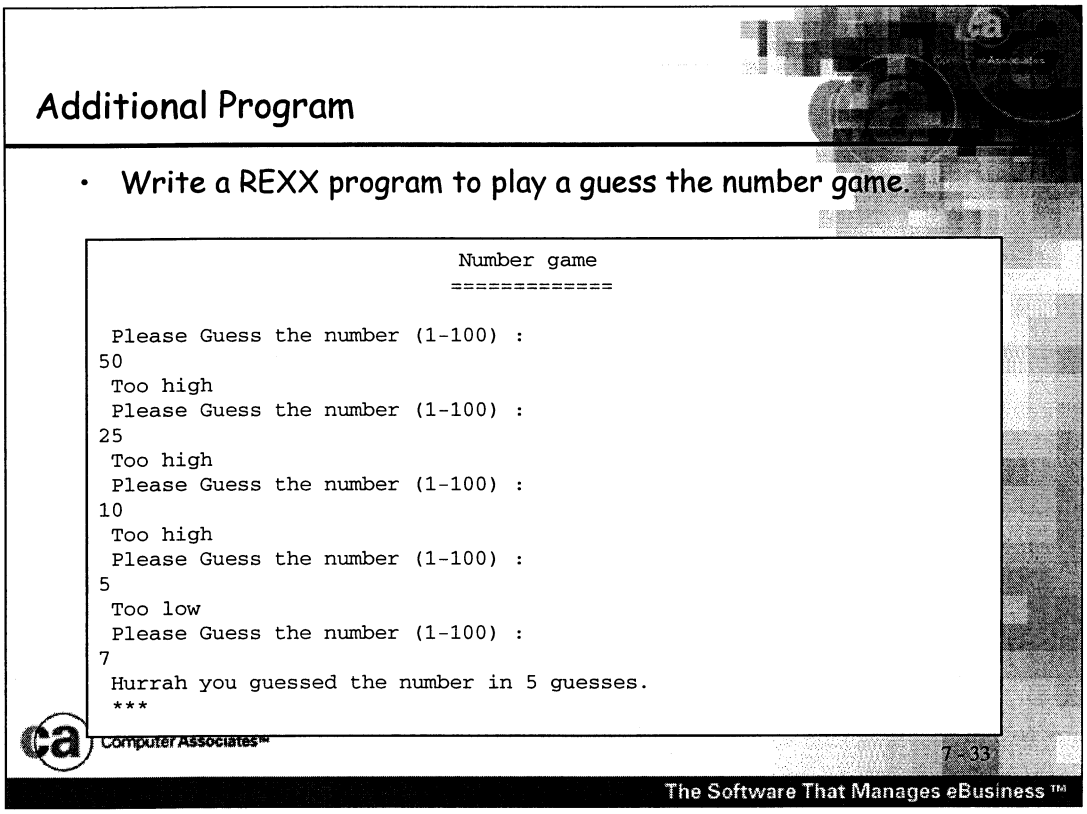



```
 Please enter your name :
mick smith
 Please enter your name :
mike de
 Please enter four numbers
1
2
3
6
 The highest number is : 6
 The lowest number is : 1
 ***
```


Additional Program
• Write a REXX program to play a guess the number game.
Number game
==========
Please Guess the number (1-100) :
50
Too high
Please Guess the number (1-100) :
25
Too high
Please Guess the number (1-100) :
10
Too high
Please Guess the number (1-100) :
5
Too low
Please Guess the number (1-100) :
7
Hurrah you guessed the number in 5 guesses.
***
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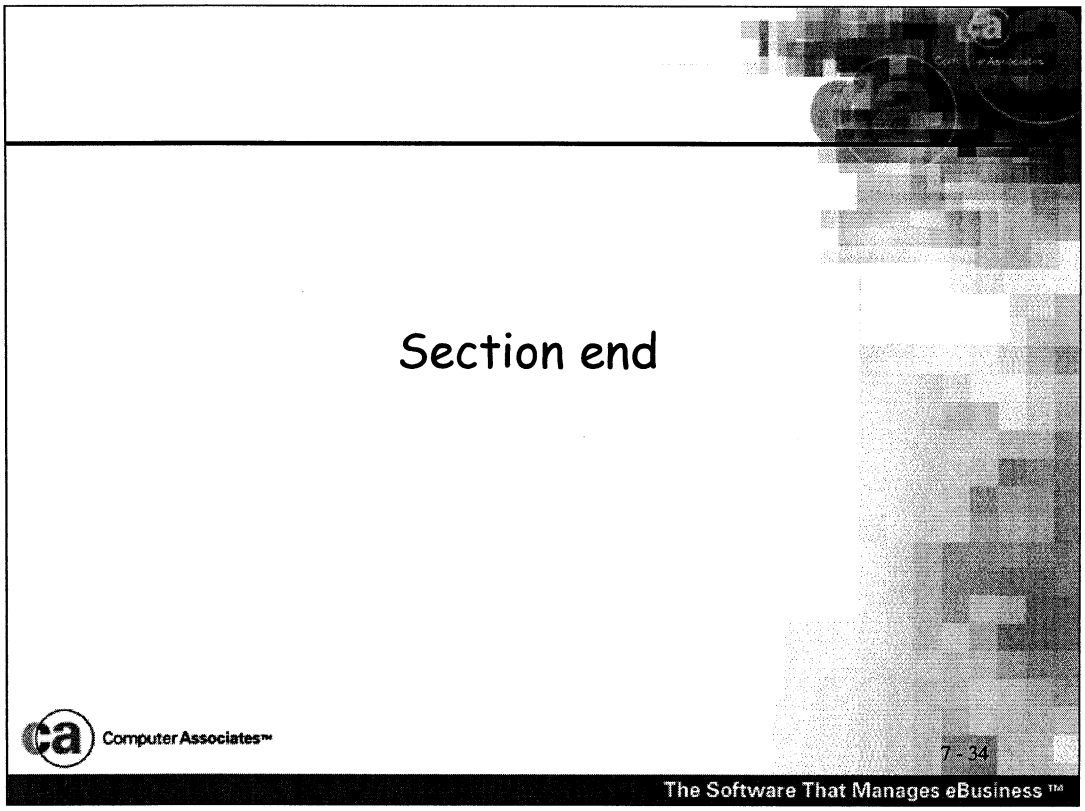
Section end
Computer Associates™
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