

! " # \$ % & ' ' (\$) \$ & * ' # 6

+ ' , ' - " & & \$. / & * 0 \$. 1 2 * (") 2

; . *' 6E%&#'

C2*9\$&*'.1

0\$) \$&*'.2

QEI &"96: "T" &6\$/6".2

+4' 5"?\$&*.3

C5I ' '.3

+4' 5"?\$&*. / /" &9", : &" #E * &6' 4- ' 89E.3

Q64E/6E4\$ 24"' /6\$.5

+ ' 96;5

N4D*?5

! " # \$ % & # '

3\$(4\$5"6\$&&"' 24*, "7' &* ' 6', ' - "&&"8 /&*0* " /\$(\$, "9: 2", ' (& #: ' 0" "<' &*, * /\$ / = \$4: .
>\$9*, : ' ?&\$, 6\$ / * @0"4: A' 64"?*B.

C) &\$ / " ") * & * (96\$4%*D 4\$(4\$5"6B* / " ? 24'), "7*, E9"? ' 4%' &96"? ?\$6: 24*, "7' &* ' *
D4\$&*6: 92*9" / / "&6\$/6"? &' ? ! "#\$% \$? (%) ' *%&&+ , .

- %*%&#'

F' "5D") *#" * (#' &*6: 24*, "7' &* ' 6', '- "&&"8 /&*0* 6\$/ , B6"5; \$" #\$. / /. &0%/0. 1
D4\$&*, 9. &' ? 2%34', \$? (%)' *%&&+, ÑApache Derby. !, . ?(\$*#")' 896?*. 9 &' 8
&' "5D") *#" *92", : ("?\$6: JDBC.

A", : ("?\$6', : 9/*8 *&6' 4- '89 # "7' 6 5; 6: :

56%2#7' \$/#8

> H6" # 9, EBS' # "7&" "96\$?*6: ' 0" 6\$/ * #, /\$/* # "& 5; , ? 4' %' &* * (\$) \$&* . 5.

9. &\$. 4: &+ 8

@# # "7&" ?"92", : ("?\$6: 9. , ' 9, * (\$) \$&* ' 5 &' 5; , " ?; 2", &' &" *, * 24"96" &' () "\$(*((
+ %\$") (, . +4' 5"?\$&* . / &' #E "2*9\$&; ? 4\$() ', ' "+4' 5"?\$&* . / / "&9", : &" #E
*&6' 4- '89E".

; <= &. \$0: "9. &0%/0"

C9&"?&"8 9EI &"96: J 2"-24' 7&' #E "96\$K69. "/. &0%/0", 24* H6" # E &' 0")"5\$?, . ' 69. &"?"'
2", ' -Id, ?9K "96\$, : &"' "96\$K69. 6' # 7' 9\$#; #:

- ". \$(/" 1. 01\$, 234) 125 (61) 5 "65

>. 4'	! (?)%0' 4: &. \$0:	! " # \$ % & #'
Id	! \$	L&* /\$, : &; 8 *) ' &6* - */\$6"4, 0' &' 4*4E' #; 8 \$?6" # \$6*B' 9/* . (9#. Defining an identity column)
M\$#*, *.	! \$	-
@#.	! \$	-
C6B' 96?"	F' 6	
= "5*, : &; 8 6', ' - "&	! \$, ' 9, * &' E/\$(\$&* . 8% @ 0' 4' 2. &	
! " # \$ % &* 8 6', ' - "&	! \$, ' 9, * &' E/\$(\$& 8. (#4: &+ 3 0' 4' 2. &	
N) 4' 9	F' 6	
! ' &: 4"7)' &*.	F' 6	
O\$#' 6/*	F' 6	O\$#' 6/* *, * /"##' &6\$4** " /"&6\$/6'

A6' (. 1%&#?

! (= ' ')

¥ PS(\$) \$&&; DÑ(Apache Derby ? 4' 7* #' ?964\$*?\$&*.. Q#. [Embedded Derby](#).

¥ > 5\$(') \$&&; D &* 24* /\$/*D E9, "?*.D &')", 7&; " /\$(\$6: 9. /"&6\$/6; , B: *) \$&&; ' ??')' &;) %61' ' %65) 1.

¥ 75%*6(' %23' 218 &') " 2E96* #; .

A6' (. 1%&#? / /. &\$. 4: &. 8< #&0' 62' 3\$<

!

>) \$&&" # 4\$() ', ' 9")' 47\$69. 64' 5"?\$&* . / /. &\$. 4: &. 8< * &6' 4- ' 89E B\$4# 1+ ". 4&' &. C- -5, 6" # " 7&" " 96\$?*6: E7' 4\$(4\$5"6\$&&; 8 04\$- *B' 9/*8 * &6' 4- ' 89.

A4*, "7' &* ' ?) \$&&" # 9, EBS')", 7&" 5; 6: #&0' 6%/0#1&+ 8, 6" ' 96: 24"04\$##\$)", 7&\$ 2"96". &&" "7*) \$6: "6 2", : ("?\$6', . ??") \$ /" # \$&).

A4* #' 4 ?(\$* #")' 896?* . :

```
$ ./contacts
!"#$%&&' ( )&*+'. , -. %/ - 0/*1/*2 3*45".
6. %78 9/%: ; %./". < : 9*: % )%&. ' ). %- --"1*. " 'list'.

> list
| # |      =; (      | 0' ; *#*(      | >'. ' /%?1"&*(      | @%7.. "#"$%&      | A% ; ; "&. ' /*B      |
| - | -----      | -----      | -----      | -----      | -----      |
| 1 | , #"): ' &1/      | ACDC)      | 20. 12. 1990      | +7-(999)-123-45-67      | Twitter      |
| 2 | >"&*:      | E' -"1""-      | 11. 02. 1996      | +7-(999)-123-45-68      | Read-only      |
| 3 | F#"&'      | E%#%. %-'      | 30. 12. 1986      | +7-(999)-123-45-69      | G+%&<)*      |

> add
H-"1*. " *; (:
> Katy
H-"1*. " $' ; *#*! :
> Perry
H-"1*. " %. D": . -% (*#* ' -', ": #* "+% &". )
> -
H-"1*. " 1'. C /%?1"&*( :
> 25. 10. 1984
H-"1*. " ; %7*#<&8B . "#"$%& (*#* ' -', ": #* "+% &". )
> +79172342542
H-"1*. " 1%; ' 5&*B . "#"$%& (*#* ' -', ": #* "+% &". )
> -
H-"1*. " ' 1/" : :
> US, California
H-"1*. " )% ; ; "&. ' /*B:
> Roar
A%&. ' ). C: 9"5&% : %2/' &J&.
> list
| # |      =; (      | 0' ; *#*(      | >'. ' /%?1"&*(      | @%7.. "#"$%&      | E' ; ". ) *      |
| - | -----      | -----      | -----      | -----      | -----      |
| 1 | , #"): ' &1/      | ACDC)      | 20. 12. 1990      | +7-(999)-123-45-67      | Twitter      |
| 2 | >"&*:      | E' -"1""-      | 11. 02. 1996      | +7-(999)-123-45-68      | Read-only      |
| 3 | F#"&'      | E%#%. %-'      | 30. 12. 1986      | +7-(999)-123-45-69      | G+%&<)*      |
| 4 | Katy      | Perry      | 25. 10. 1984      | +7-(917)-234-25-42      | Roar      |
> exit
>% -: ./ "D*
```

¥ \$./contacts (\$2E9/\$' 6 24*, " 7' &*'.)

¥ > ÑQ24*0, \$%' &* ' &\$??").

■

> ; ?") 24"04\$##; , - "4#\$6 ??")\$ &')", 7& ; 8 51*) 125(9""6?' 696?"? \$6: &' (9%' 3* ? 4' %' &* * # "0E6 "6, * B\$6: 9.

D#%4: &+ 3 \$" #\$. / ". **' 6E #1%' 8+ , /. 8%&*

F" "5D") * #" 2"))' 47\$6: 9, ')EJI * 8 92*9"/ /"# \$&):

¥ **list** - ?; ?' 96* 92*9"/ 9"D4\$&' && D /"&6\$/6"?
 ¥ **add** -) "5\$?*6: &"?; 8 /"&6\$/6
 ¥ **delete** - E) \$, *6: /"&6\$/6
 ¥ **edit** - * (#' &*6: /"&6\$/6
 ¥ **about** - ?; ?' 96* 6' /96 24*?; B&"0") *\$, "0\$ "C 24"04\$##' ", 0)' E/\$(\$& 'K \$?6"4 * 2"9, \$&*'
 2"6" #/\$#
 ¥ **import** - * #2" 46 ?9' D /"&6\$/6"? * (- \$8, \$
 ¥ **export** - H/92" 46 ?9' D /"&6\$/6"? ? - \$8,
 ¥ **exit** - ?; D")

; 06</0<6% " 6. ' /0%

A4"' /6) ", 7' & * #' 6: 2) ' 4' ?\$ *9D") &; D - \$8, "?:

1. ! \$&. 1&. ', /"6"4"' 9") ' 47*6:
 R 4' \$, * (\$<* J 6', ' - "&&"8 /&*0*
2. C4? 0' \$0. 1. > &K#:
 R JUnit 5 @Test' ;

A' \$0+

+' 96;) ", 7&; " . /6+ 1%0: /\$/ #* &*#E# , "0*/E 4\$5"6; 9 *%&&+ 8#: &1(26, 21: ' ") (%) (%
 1.) 18\$%) (% 3; "\$%) (%)

#

> 6' 96\$D # "7&" 9" () \$?\$6: 5\$(E) \$&& D ? 2\$#.6*. Q#. [Using in-memory databases.](#)

F6, #1

; . *' 6E #8. '

N4D*?) ", 7' & 9") ' 47\$6: :

1. A4"' /6, 9" () \$&& 8 ? IntelliJ IDEA.
2. @9D") &; ' - \$8, ; 24*, "7' &*..
3. G\$". 4&?' 8+ 3 **jar**-- \$8, , ?/, J B\$. - \$8, ; 61) ! (<3' "/((, &' "5D") * #; '), . ' 0" 9" () \$&*..
 R @#. ĦŦ 6"B&"96*, B6" * E **\$4D*?S**, (\$ *9/, J B' &* ' # ' "2= (' %) (, - \$8, \$.
 R !, . (\$2E9/\$ # "7' 6 5; 6: 24*, "7' & - \$8, 2/%) "' (, 619");) 1# 25' 16((26' (&5).

#

A") - \$8, \$#* /. &2#H<6%I ##), . 95"4/* jar ? "5I ' # 9, EBS' * #' ' 69. ? ?*) E
6", B6")", 7&" 5; 6: 2"&.6&", /\$/ 5; , 9"54\$& jar. S9, * "& 9"5*4\$' 69. ?
Intellij IDEA, 6" &*B' 0"), . H6"0")', \$6: 92' <*\$, : &" &' &<E&. : IDE 9" () \$K6
H6* - \$8, ; \$?6"#S6*B' 9/* ?) *4' /6"4** idea/arti facts.

G8? %6, #1%

@#. \$4D*?\$ 9"96\$?, . ' 69. 2" - "4#E, ' HW6_zzz_0' ; *#*(_=; (.zip, 0) ' :

¥ zzzŒ&" #' 4 04E22; .

¥ 0' ; *#*(ŒŒ\$%\$ - \$#*, *. , \$6*&* <' 8.

¥ =; (ŒŒ\$%' *#. , \$6*&* <' 8.

\$

S) * &96?' &&; 8) "2E96* #; 8 - "4#\$6 \$4D*?\$ - .zip.