

# Key to Practical 3

## Stack and Subroutines

### Step 4

```

LowerCount  movem.l  d1/a0,-(a7)

            clr.l    d0

\loop       move.b  (a0)+,d1
            beq      \quit

            cmp.b   #'a',d1
            blo      \loop

            cmp.b   #'z',d1
            bhi      \loop

            addq.l  #1,d0
            bra      \loop

\quit       movem.l  (a7)+,d1/a0
            rts

```

### Step 5

```

UpperCount  movem.l  d1/a0,-(a7)

            clr.l    d0

\loop       move.b  (a0)+,d1
            beq      \quit

            cmp.b   #'A',d1
            blo      \loop

            cmp.b   #'Z',d1
            bhi      \loop

            addq.l  #1,d0
            bra      \loop

\quit       movem.l  (a7)+,d1/a0
            rts

```

```

DigitCount  movem.l  d1/a0,-(a7)

             clr.l    d0

\loop       move.b   (a0)+,d1
             beq      \quit

             cmp.b    #'0',d1
             blo      \loop

             cmp.b    #'9',d1
             bhi      \loop

             addq.l    #1,d0
             bra       \loop

\quit       movem.l   (a7)+,d1/a0
             rts

```

```

AlphaCount  ; Count the number of small letters
             ; and push it onto the stack.
             jsr      LowerCount
             move.l    d0,-(a7)

             ; Count the number of capital letters and add it
             ; to the top of stack (without popping off).
             ; Top of stack = Small letters + Capital letters
             jsr      UpperCount
             add.l     d0,(a7)

             ; Count the number of digits.
             ; The top of stack (Small letters + Capital letters)
             ; is added to the number of digits (D0).
             ; The sum is loaded into D0.
             ; D0 = Small letters + Capital letters + Digits
             ; The top of stack is popped off (postincrement mode).
             jsr      DigitCount
             add.l     (a7)+,d0

             ; Return from subroutine.
             rts

```

**Step 6**

```

Atoui      ; Save registers on the stack.
           movem.l d1/a0,-(a7)

           ; Initialize the output variable to 0.
           clr.l   d0

           ; Initialize the conversion variable to 0.
           clr.l   d1

\loop      ; Copy the current character into D1.
           ; Then A0 points to the next character (postincrement mode).
           move.b  (a0)+,d1

           ; If the copied character is null,
           ; branch to \quit (end of string).
           beq     \quit

           ; Otherwise, the character is converted into an integer.
           subi.b  #'0',d1

           ; Shift the output variable to the left (x10),
           ; and add the integer value.
           mulu.w  #10,d0
           add.l   d1,d0

           ; Next character.
           bra     \loop

\quit      ; Restore registers from the stack and return from subroutine.
           movem.l (a7)+,d1/a0
           rts

```