Algorithm 1 A Basic Multiplication Algorithm Based on Classic Decimal Multiplication

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   for $i = 0;\ i < 32;\ i{+}{+}$ **do**
      if $multiplier_0 == 1$ **then**
         $product \leftarrow product + multiplicand$
      end if
      $multiplicand \leftarrow multiplicand << 1$
      $multiplier \leftarrow multiplier >> 1$
   end for

Algorithm 2 An Improved Algorithm that Adds to the Left Half of the 64-bit Product Register and Shifts into Place on the Right Half so that a 32-bit ALU Can be Used

>**for** $i = 0$; $i < 32$; $i{+}{+}$ **do**
>> **if** $multiplier_0 == 1$ **then**
>>> $product_{63:32} \leftarrow product_{63:32} + multiplicand$
>>
>> **end if**
>> $product \leftarrow product >> 1$
>> $multiplier \leftarrow multiplier >> 1$
>
> **end for**

Algorithm 3 A Further Improved Algorithm that Utilizes the Unused Right Half of the 64-bit Product Register (which will be shifted out of the register) as the Multiplier (eliminating a register)

$product_{31:0} \leftarrow multiplier$
for $i = 0; i < 32; i++$ **do**
    if $product0 == 1$ **then**
        $product_{63:32} \leftarrow product_{63:32} + multiplicand$
    end if
    $product \leftarrow product >> 1$
end for

Algorithm 4 A Binary Integer Division Algorithm

$remainder \leftarrow dividend$
$divisor \leftarrow divisor << 32$
for $i = 0; i < 33; i{+}{+}$ **do**
    $remainder \leftarrow remainder - divisor$
    if $remainder \geq 0$ **then**
        $quotient \leftarrow quotient << 1$
        $quotient_0 \leftarrow 1$
    else
        $remainder \leftarrow remainder + divisor$
        $quotient \leftarrow quotient << 1$
        $quotient_0 \leftarrow 0$
    end if
    $divisor \leftarrow divisor >> 1$
end for

Algorithm 5 An Improved Binary Integer Division Algorithm Using a 32-bit ALU and that Uses the Unused Left Half of the Remainder as the Dividend, Placing the Remainder in the Left Half of the Reminader Register, and the Quotient in the Right Half of the Remainder Register

$remainder_{63:32} \leftarrow dividend$
$remainder \leftarrow remainder << 1$
for $i = 0; i < 32; i++$ **do**
    $remainder_{63:32} \leftarrow remainder_{63:32} - divisor$
    if $remainder \geq 0$ **then**
        $remainder \leftarrow remainder << 1$
        $remainder_0 \leftarrow 1$
    else
        $remainder_{63:32} \leftarrow remainder_{63:32} + divisor$
        $remainder \leftarrow remainder << 1$
        $remainder_0 \leftarrow 0$
    end if
    $remainder_{63:32} \leftarrow remainder_{63:32} >> 1$
end for