

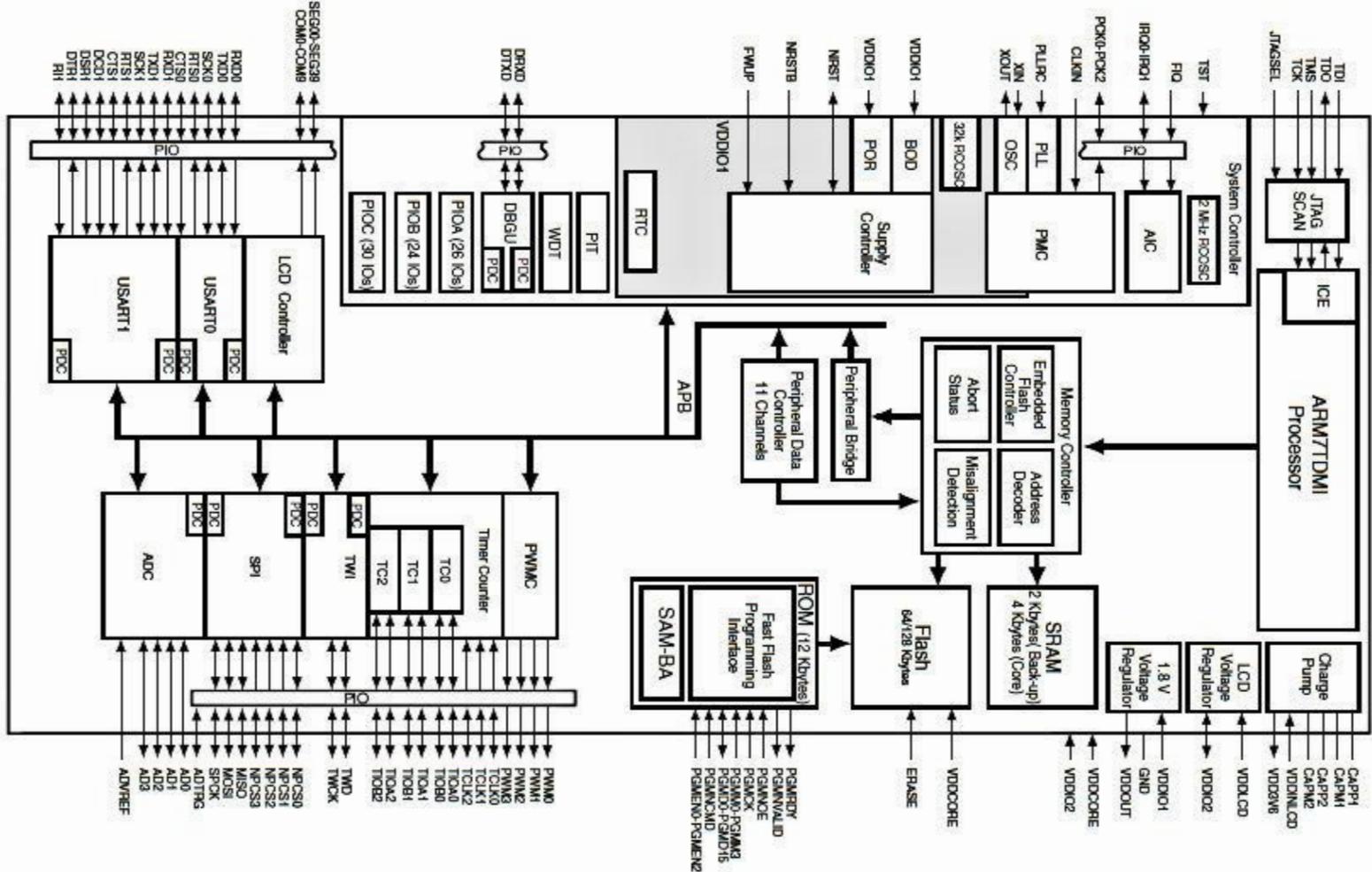
Reprogramming the HP 20b

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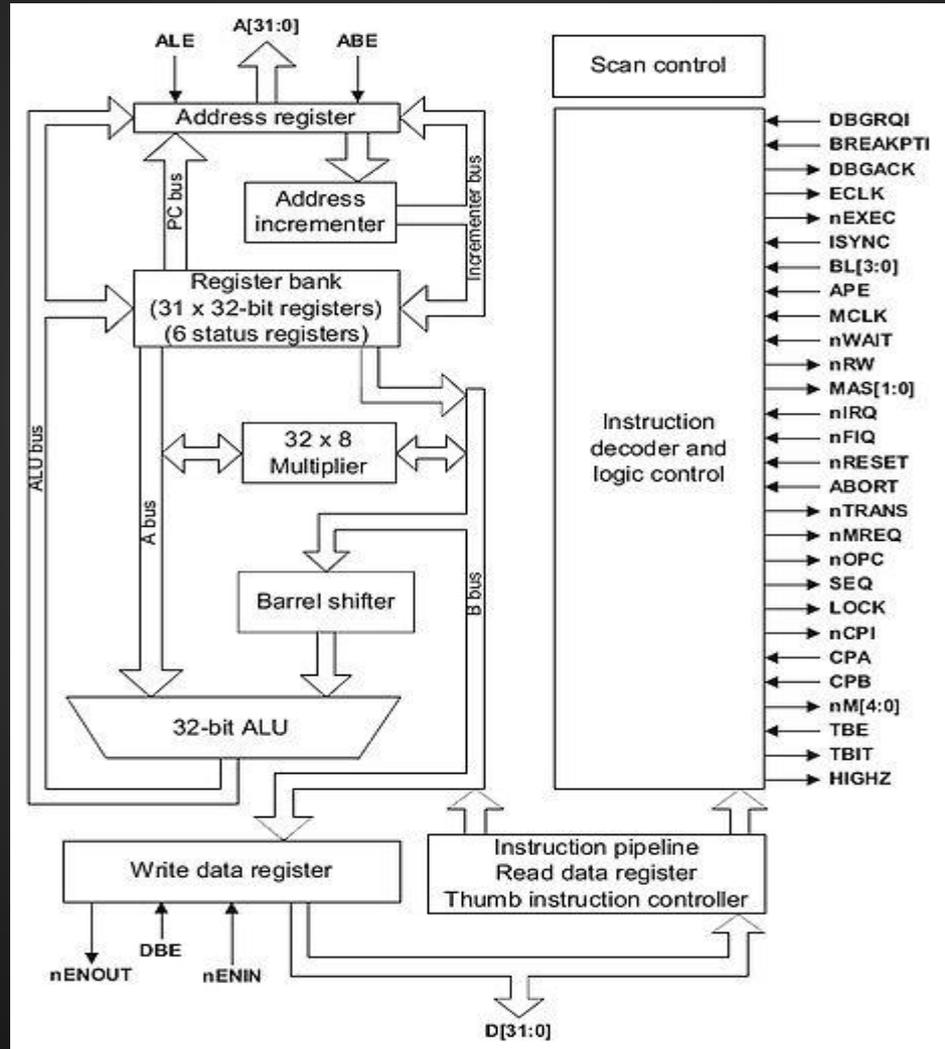
Introduction to the HP 20b



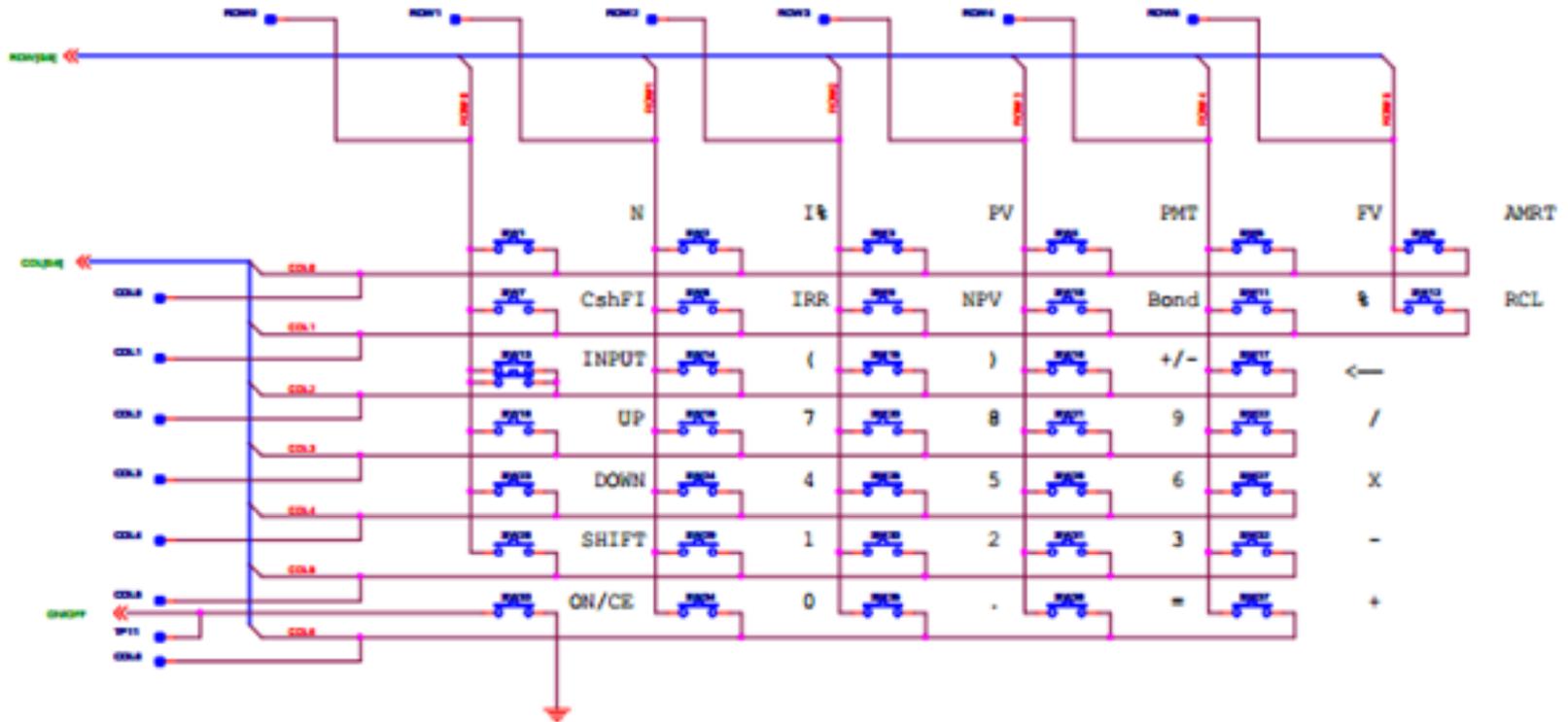
Platform: Processor



Platform: Processor



Platform: Keyboard



Software

Architecture and Design

Lab 1: Getting Started: Hello World

```
while (slot >= 0)
{
    if (x > 0)
    {
        lcd_put_char7(x%10+ASCIIADD, slot);
        x /= 10;
    }
    else
    {
        if (negative)
        {
            lcd_put_char7('-', slot);
            negative = 0;
        }
        else
        {
            lcd_put_char7(' ', slot);
        }
    }
    slot--;
}
```

Goal:

write a method that prints an integer argument on the calculator LCD

Lab 2: Listening to the Keyboard

```
int keyboard_key ()
{
    int i;
    int j;

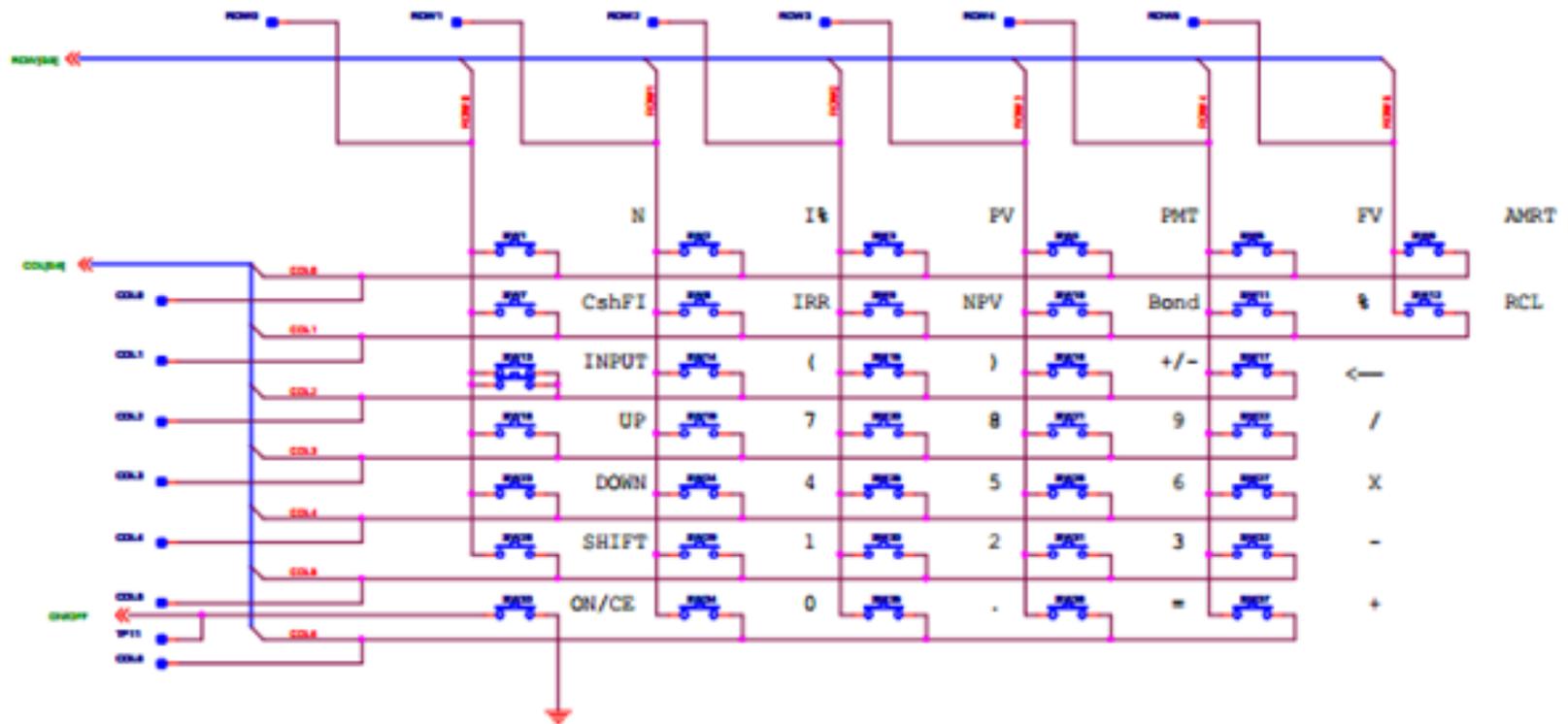
    for (j = 0; j < 7; j++)
    {
        keyboard_column_low(j);

        for (i = 0 ; i < 6 ; i++)
        {
            if (!keyboard_row_read(i))
            {
                keyboard_column_high(j);
                return keyArray[j][i];
            }
        }
        keyboard_column_high(j);
    }

    return -1; |
}
```

Goal:

write a method that returns a code indicating which key is being pressed (if any)



Lab 3: Entering and Displaying Numbers

```
while (!operationPressed)
{
    int keyPressed = keyboard_key();
    if (keyPressed != -1)
    {
        int tempKey = keyPressed;
        while (tempKey != -1)
        {
            tempKey = keyboard_key();
        }

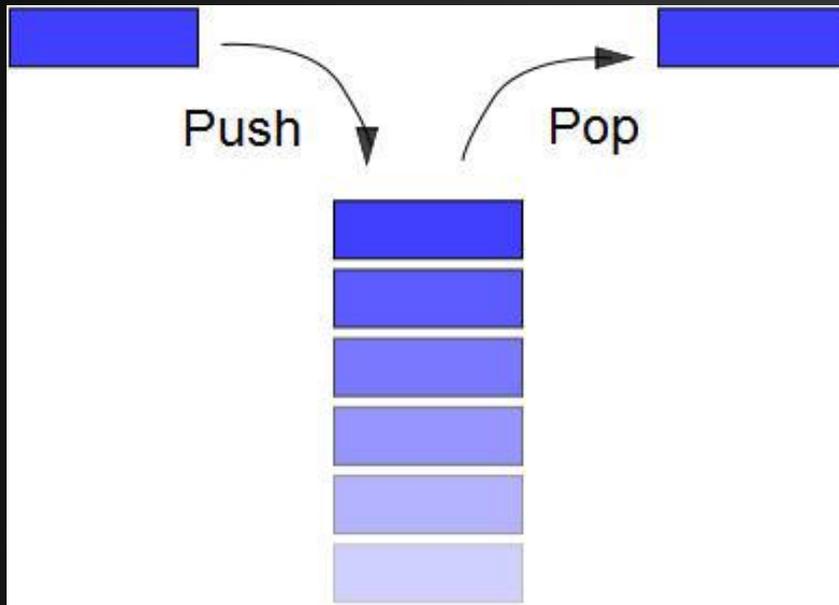
        if (keyPressed >= '0' && keyPressed <= '9')
        {
            pressedKey = 1;
            if (slot_count < SLOTS)
            {
                result->number = result->number*10 + (keyPressed - '0');
                if (result->number != 0)
                    slot_count++;
            }
        }
        else
        {
            result->operation = (char)keyPressed;
            if (!pressedKey)
                result->number = INT_MAX;
            operationPressed = 1;
        }
    }

    lcd_print_int(result->number);
    lcd_put_char7(result->operation, 0);
}
```

Goal:

allow the user to input a number followed by an operation and display it on the LCD

Lab 4: An RPN Calculator

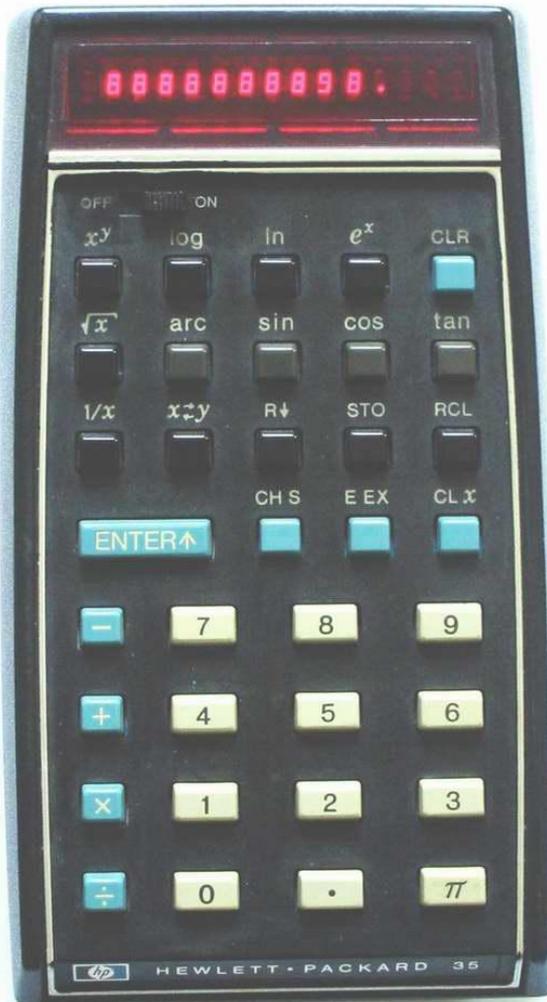


Goal:

implement a stack and make the calculator behave like an RPN calculator

User Guide

How to use the final product



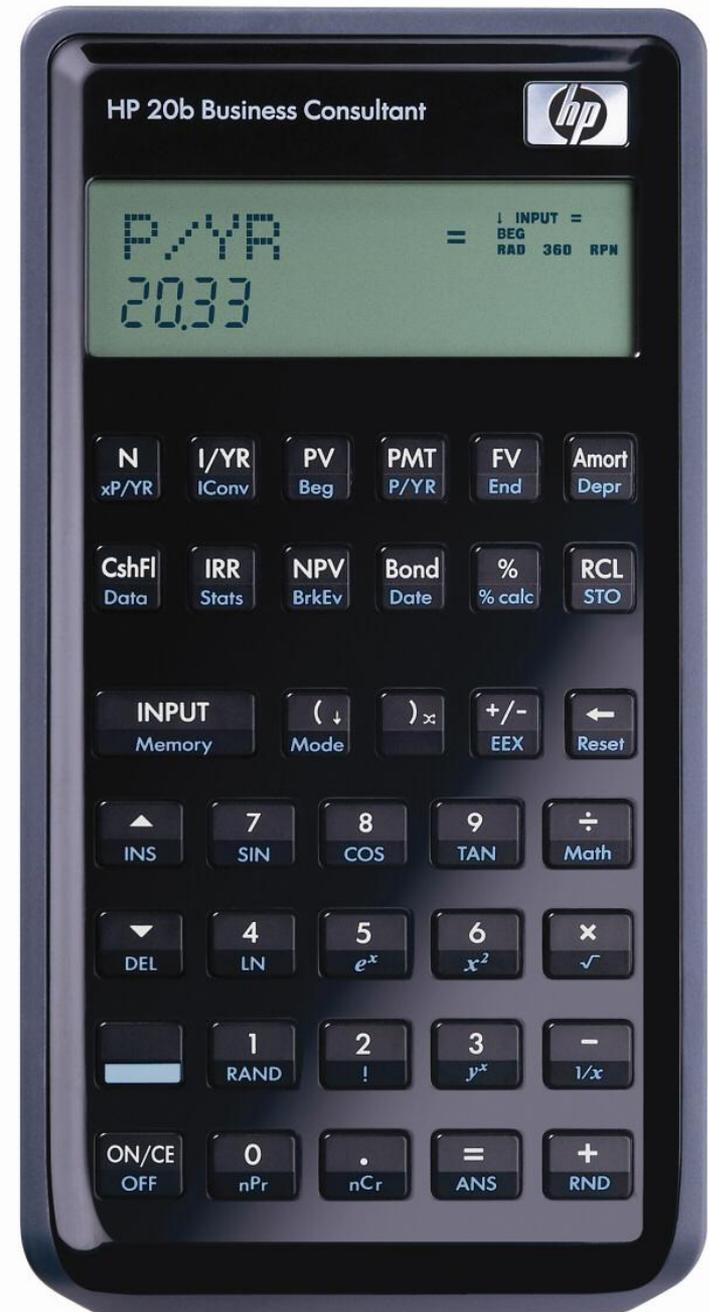
User Guide

Reverse Polish Notation

1 → INPUT → 3 → INPUT → +

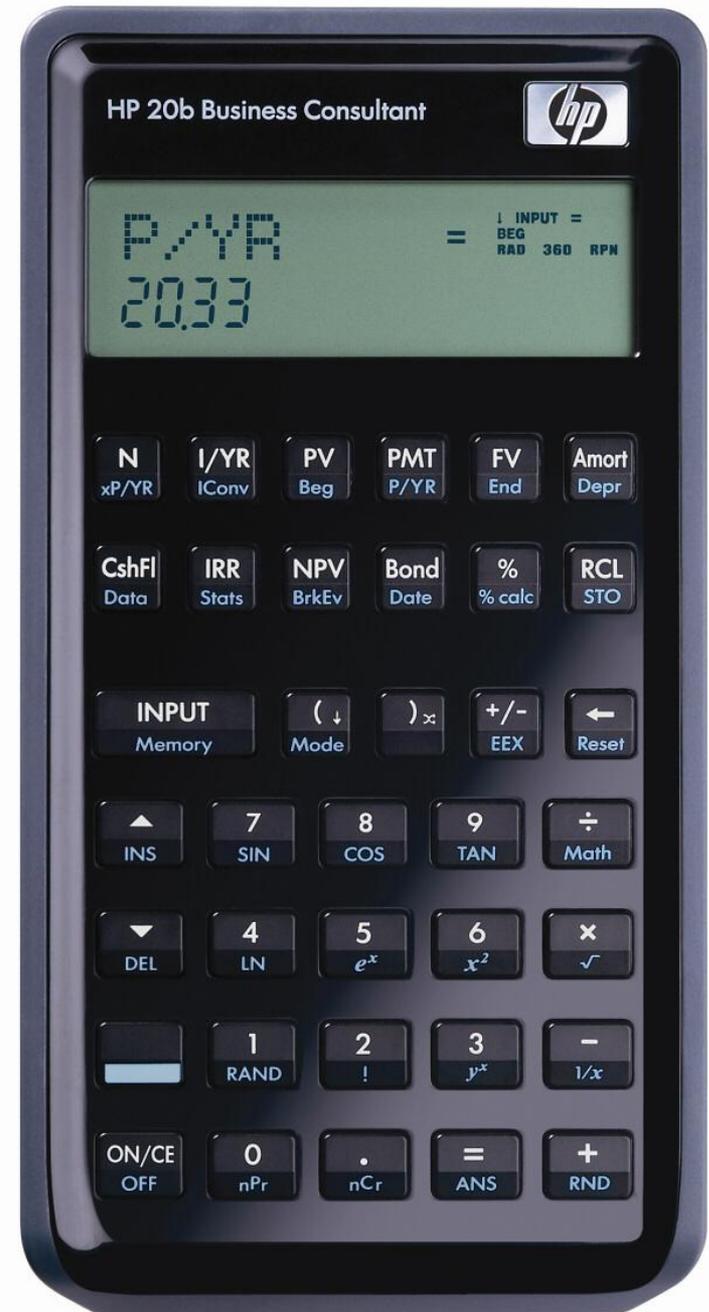
Is the same as

1 → + → 3 on a normal
calculator



User Guide

- Negative Sign
- 2147483647



Conclusions

- Simple calculator tasks are still somewhat difficult to program
- Project groups must communicate effectively in order to succeed