ABC formula for the HP-15C (and HP-11C)

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Contents

1 The ABC formula HP-15C code

```
key strokes                              step    display code(s)  remark


ON                                                                Put the calculator ON
 g  P/R                                                           Enter program mode
 f  CLEAR PRGM                                                    Clear program space is needed

 f  LBL A                                01      42,21,11         Start position ABC formula
   STO 3                                 02      44 3             Save 'c'
   R↓                                    03      33
   CHS                                   04      16
   STO 2                                 05      44 2             Save '-b'
   R↓                                    06      33
    2                                    07      2
    ×                                    08      20
   STO 1                                 09      44 1             Save '2a'
    2                                    10      2
    ×                                    11      20               '4a'
   RCL 3                                 12      45 3
    ×                                    13      20               '4ac'
   RCL 2                                 14      45 2
   g  x²                                 15      43 11            'b*b'
    −                                    16      30
   CHS                                   17      16               'd = b*b - 4ac'
   g  TEST 2                             18      43,30, 2         If d < 0 then NO solutions
   GTO 1                                 19      22 1
```

key strokes	step	display code(s)	remark
$\sqrt{x}$	20	11	Square root of 'd'
STO 0	21	44 0	Save square root of 'd'
RCL 2	22	45 2	
+	23	40	
RCL 1	24	45 1	
÷	25	10	+ ABC formula
STO 4	26	44 4	Save x1
RCL 2	27	45 2	
RCL 0	28	45 0	
–	29	30	
RCL 1	30	45 1	
÷	31	10	- ABC formula
STO 5	32	44 5	Save x2
RCL 4	33	45 4	Read x1
g RTN	34	43 32	Return with x1 in X and x2 in Y
f LBL 1	35	42,21, 1	The are no real value solutions
0	36	0	
STO 4	37	44 4	Save 0 in x1
STO 5	38	44 5	Save 0 in x2
ENTER	39	36	
g RTN	40	43 32	Return with 0 in X and 0 in Y, no real value solutions

2 How to use the ABC formula

A quadratic equation with real or complex coefficients has two solutions, called roots. These two solutions may or may not be distinct, and they may or may not be real. With this program only real solutions are calculated.

Having:

$$ax^2 + bx + c = 0$$

The RPN coded ABC formula starts with Label "A". If Label "A" is the first step the program can be started with the R/S (Run/Stop) button. Enter the values a, b and c and execute the function by pressing the R/S key.

Example with $a = 1$, $b = -5$ and $c = 4$:

Keystrokes:
```
   1
ENTER
   5
CHS
ENTER
   4
R/S
```

running

Result: 4.0000 $x \lessgtr y$ 1.0000

So the solution is: $x_1 = 1$ and $x_2 = 4$