GHOST IN THE MACHINE (answer)

by Giovanni Della-Libera, David Miller, John Doty, & Andrew Becker

This puzzle seems to be a set of virtual machine programs based on a stack. The title indicates there may be something awry. The flavortext provides two hints. NPR, being the inverse of RPN, (Reverse Polish Notation, the normal way a stack machine works) is your first clue this is not entirely the case. The second clue is the flavortext, referencing two actors who have played Q's. The aha is that the machines operate with a queue, not a stack!

Program invocation, X(n), begins with an initial Enqueue(n).

```
Instruction         Operation  (All operations are integral, not floating point)
LOAD n              Enqueue(n)
ADD                 X = Dequeue(); Y = Dequeue(); Enqueue(X+Y)
SUB                 X = Dequeue(); Y = Dequeue(); Enqueue(X-Y)
MUL                 X = Dequeue(); Y = Dequeue(); Enqueue(X*Y)
DIV                 X = Dequeue(); Y = Dequeue(); Enqueue(X/Y)     // floor
JMP lbl             Transfer program control to instruction labeled lbl
JZ lbl              X = Dequeue(); IF X == 0 JMP lbl
JLEZ lbl            X = Dequeue(); IF X <= 0 JMP lbl
JGEZ lbl            X = Dequeue(); IF X >= 0 JMP lbl
DUP                 X = Dequeue(); Enqueue(X); Enqueue(X)
ROLL n              For I = 1 to n Enqueue(Dequeue())
POP                 Dequeue()
RET                 Return Dequeue()
```

Formulas for all machines, based on x as the input.

```
A         -x
B         5x
C         (x*(x+1))/2  // Triangle numbers
D         x + 10
E         2^x
F         22/7*x^2
G         x + 1
H         (x-1)/4
I         x^2 - 18x + 9
J         x^2 - 1
K                66
L         100 - x
M         BitCount
N         Fib
O         Floor(Sqrt)
P         x^x
Q         x*5280*12*2.54/3600
```

R	3X^3+1X^2-18X+12
S	x
T	x!
U	5/9*(x-32) (F->C)
V	2*x^2+6x-16
W	110*(X-1)
X	x == 0 ? 1 : 2
Y	x - x^2
Z	3-5/x

The final message translates to the following invocations.

N	24	46368
A	15	-15
M	15	4
E	5	32
O	24	4
F	8	201
J	7	48
U	5	-15
S	15	15
T	8	40320
I	8	-71
C	6	21
E	5	32
C	13	91
O	71	8
R	15	10092
R	11	3928
E	8	256
S	33	33
P	4	256
O	133	11
N	7	13
D	14	24
E	11	2048
N	13	233
T	5	120

This reveals a message, NAME OF JUSTICE CORRESPONDENT.

The Justice Correspondant for NPR is Ari Shapiro, your answer.