

Classic distance formula is  $d = \text{SQR}((x_2-x_1)^2 + (y_2-y_1)^2)$  and it is well known that if you are comparing the magnitude of two distances you can avoid doing the square root operation as the square of the distances sort in the same order. However, to avoid the square root and the multiplication is the intent of this approximation.

The following approximation is based on a combination of linear components of the min and max functions.

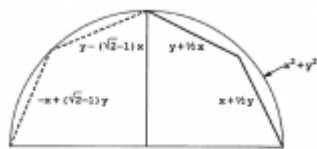


Figure 1. Equations of (approximate) unit distance.

The formula is  $d = \max(|x_d|, |y_d|) + 1/2 \times \min(|x_d|, |y_d|)$  where  $x_d = (x_1-x_2)$  and  $y_d = (y_1-y_2)$

Note that for 6502 we will use a shift right to calculate the multiply by 1/2.

```
; gives approximate distance from (x1,y1) to (x2,y2)
; with only overestimations, and then never by more
; than (9/8) + one bit uncertainty.

; input: x1,y1 x2,y2
; uses: A xd,yd
; output: approximate distance between x1,y1 and x2,y2 in A
```

```
Dist:
  lda x1
  sec
  sbc x2
  sta xd
  bcs posxdiff
  eor #$FF
  adc #1
posxdiff:
  sta xd
  lda y1
  sec
  sbc y2
  bcs posydiff
  eor #$FF
  adc #1
posydiff:
  cmp xd
  bcs ygreater
  lsr
  clc
  adc xd
  rts
ygreater:
```

```
l sr xd  
c lc  
a dc xd  
r ts
```

derivation: A FAST APPROXIMATION TO THE HYPOTENUSE page 427 of Graphics Gems 1

From:

<https://codebase64.org/> - Codebase 64 wiki

Permanent link:

[https://codebase64.org/doku.php?id=base:approximation\\_to\\_distance&rev=1581367536](https://codebase64.org/doku.php?id=base:approximation_to_distance&rev=1581367536)

Last update: **2020-02-10 21:45**

