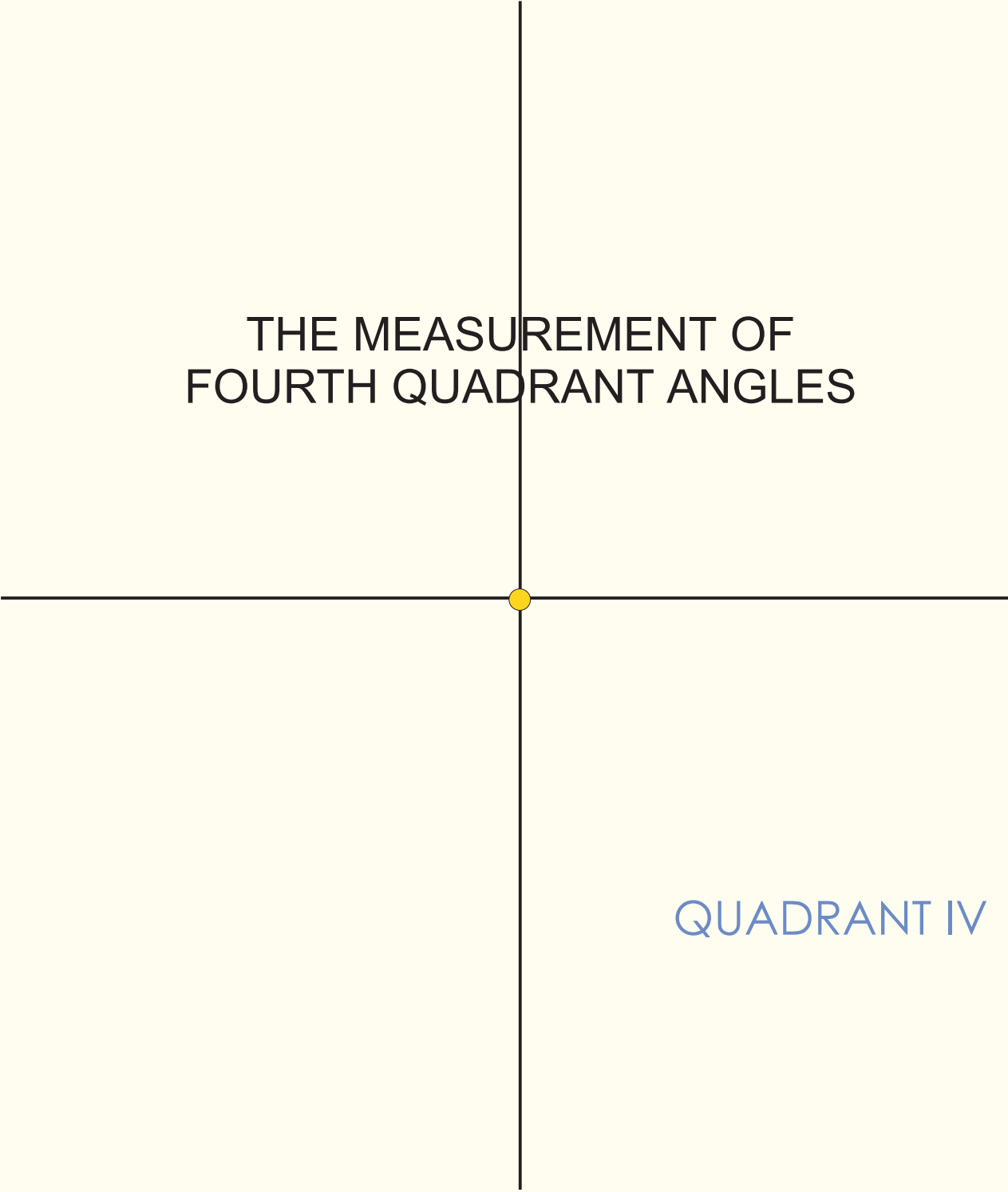


## THE TRIGONOMETRIC MEASURE OF ANGLES

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

--> *taking a look at different quadrants  
of the Cartesian Plane*

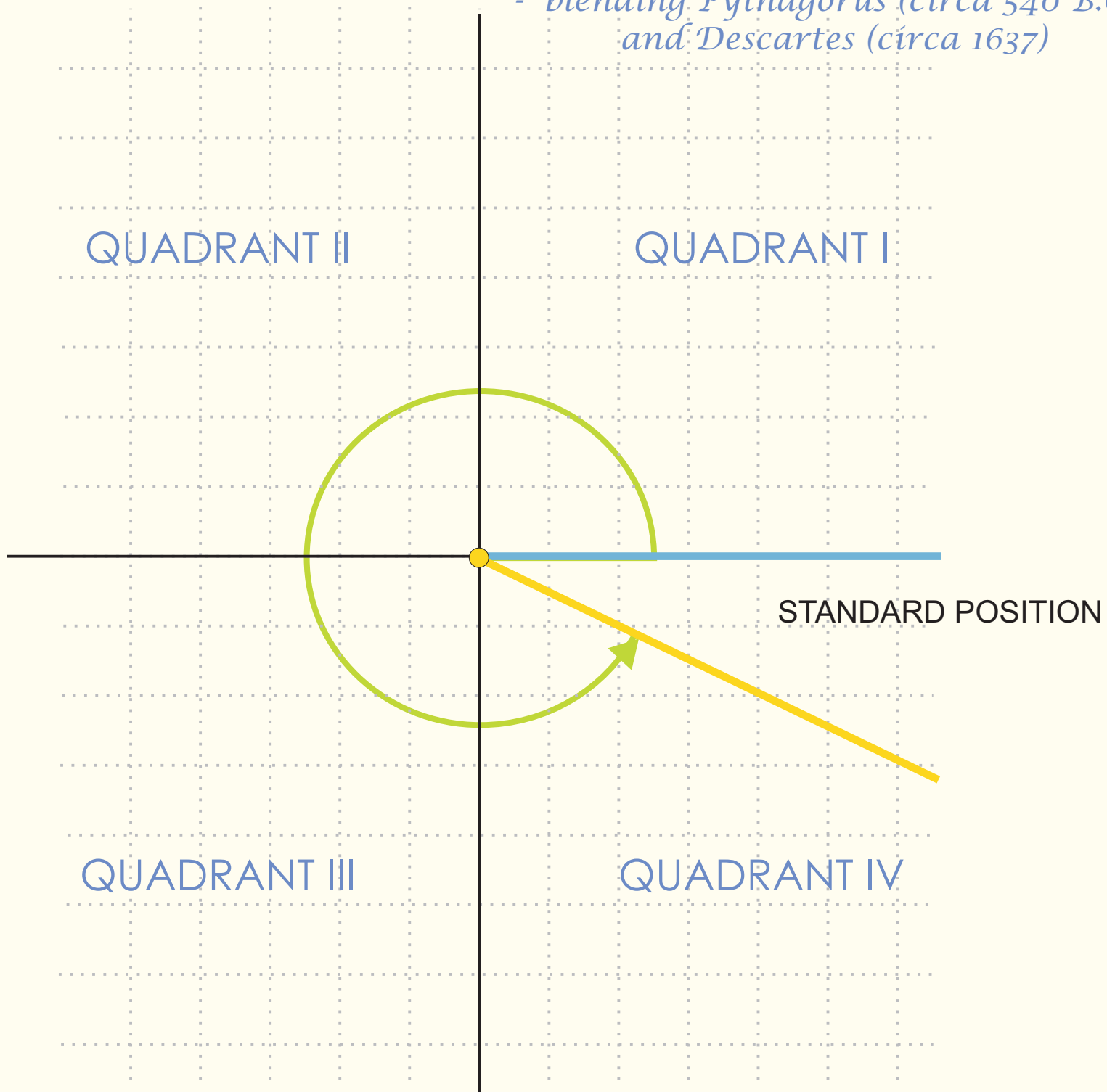


# THE MEASUREMENT OF FOURTH QUADRANT ANGLES

QUADRANT IV

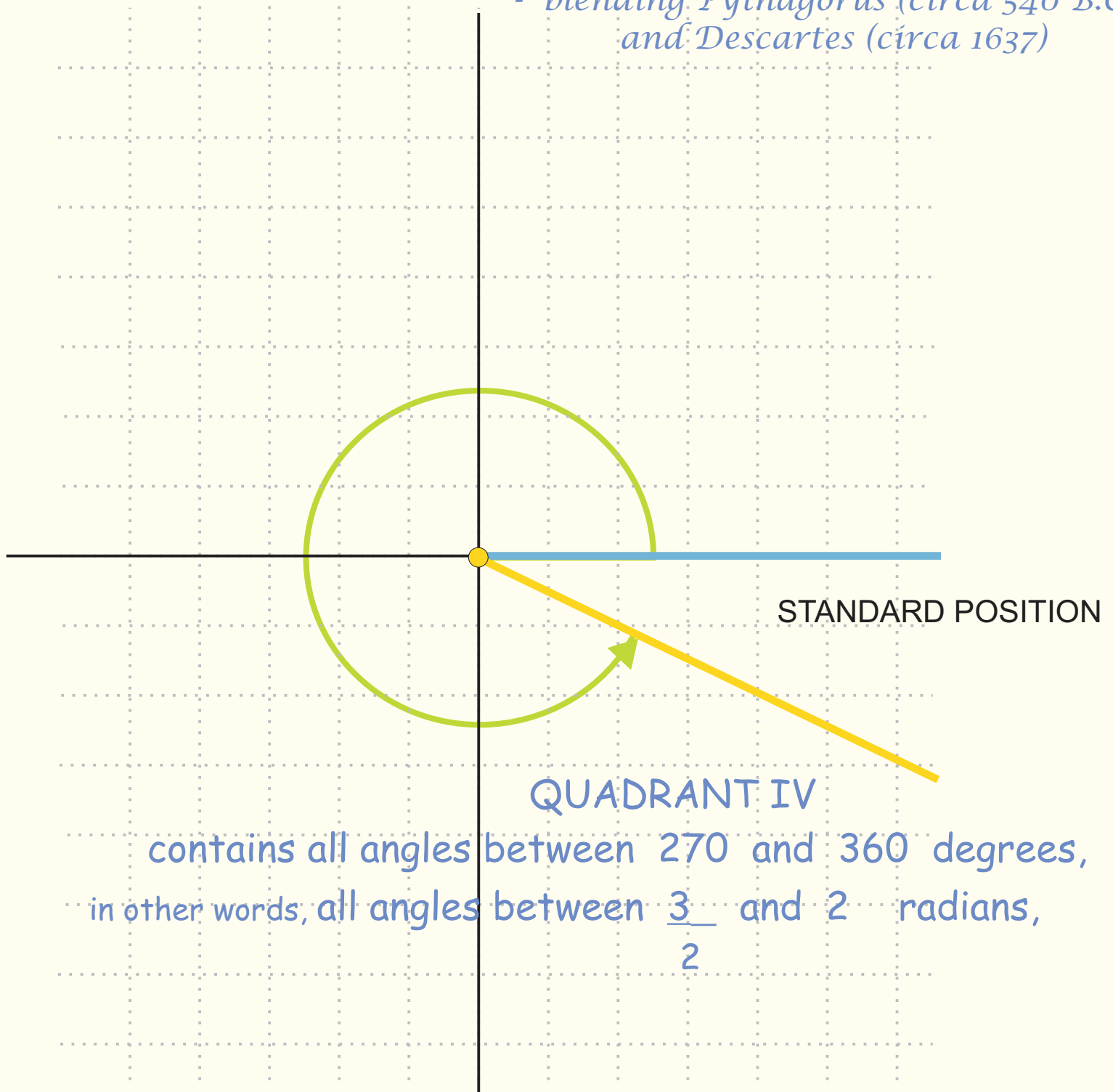
# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*



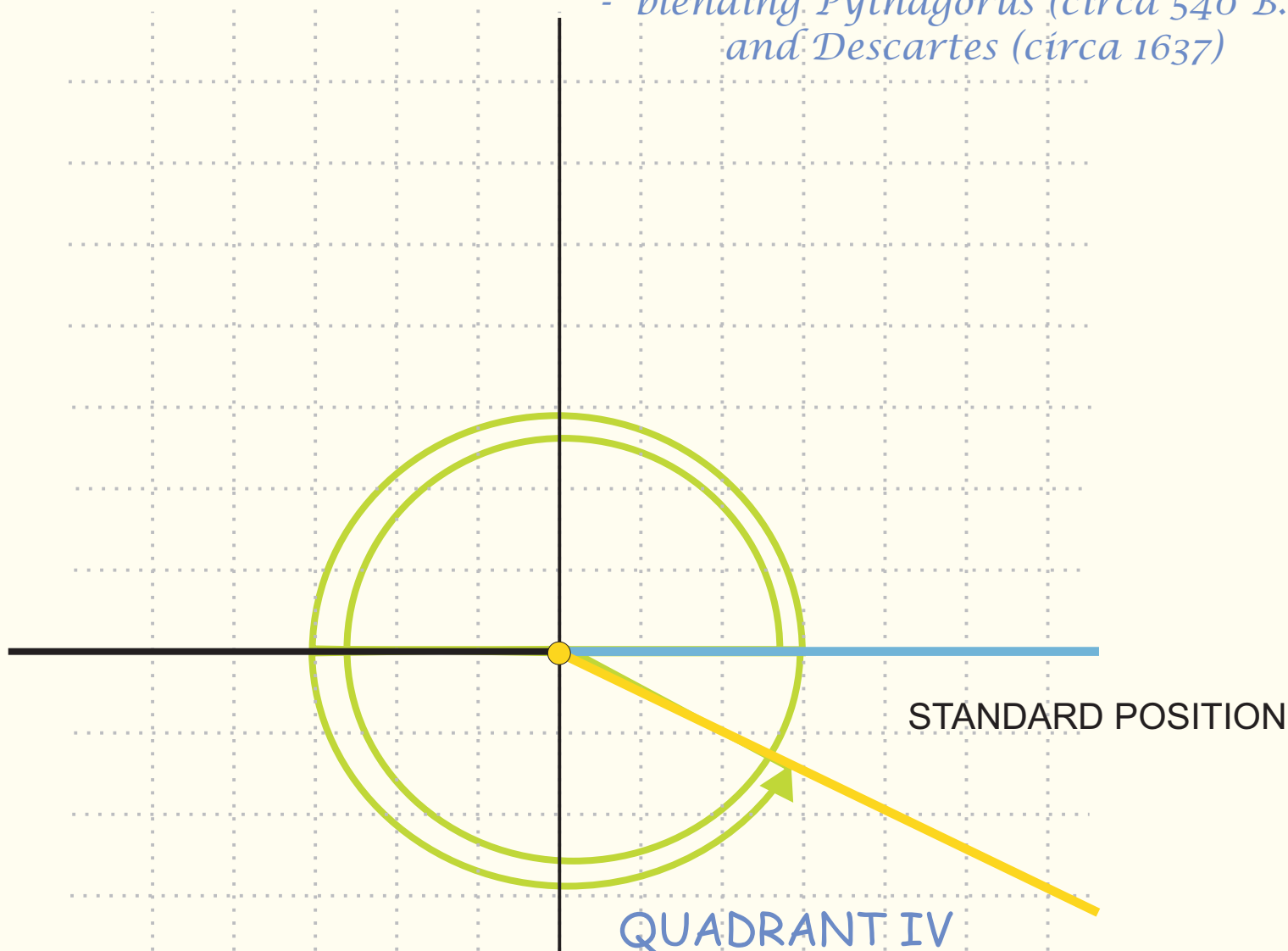
# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*



# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

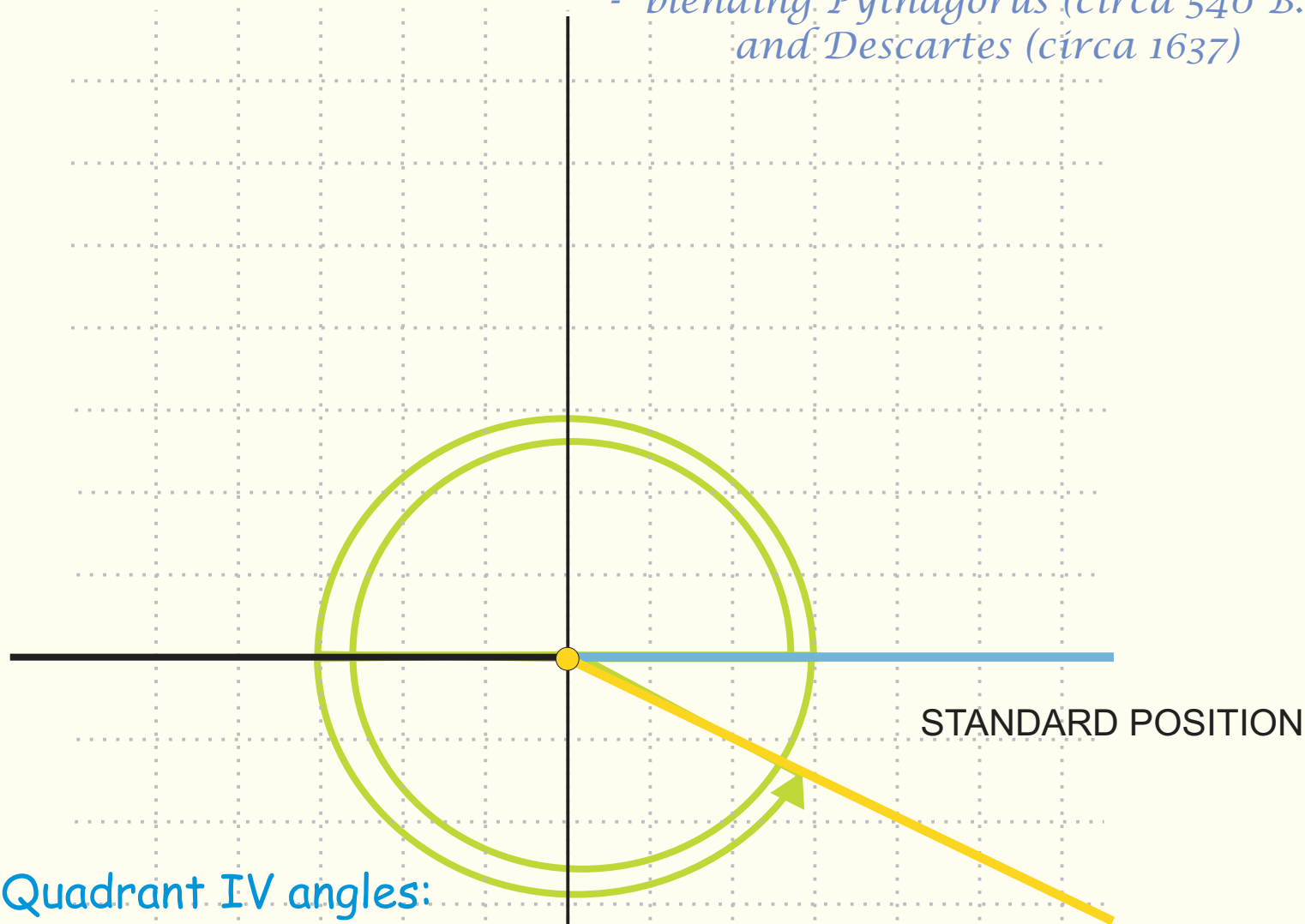


contains all angles between 270 and 360 degrees,  
in other words, all angles between  $\frac{3}{2}$  and 2 radians,

and any angle which is formed by adding one or  
more full revolutions to them, positively.

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*



Quadrant IV angles:

$$300 + 720 = 1020 \text{ degrees, or } \frac{5}{3} + 4 = \frac{17}{3} \text{ radians,}$$

$$315 + 360 = 675 \text{ degrees, or } \frac{7}{4} + 2 = \frac{15}{4} \text{ radians,}$$

$$330 + 360 = 690 \text{ degrees, or } \frac{11}{6} + 2 = \frac{23}{6} \text{ radians.}$$

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## Definition:

Related angle to  
is the acute angle  
between its terminal arm  
and the nearest extension  
of the x-axis.

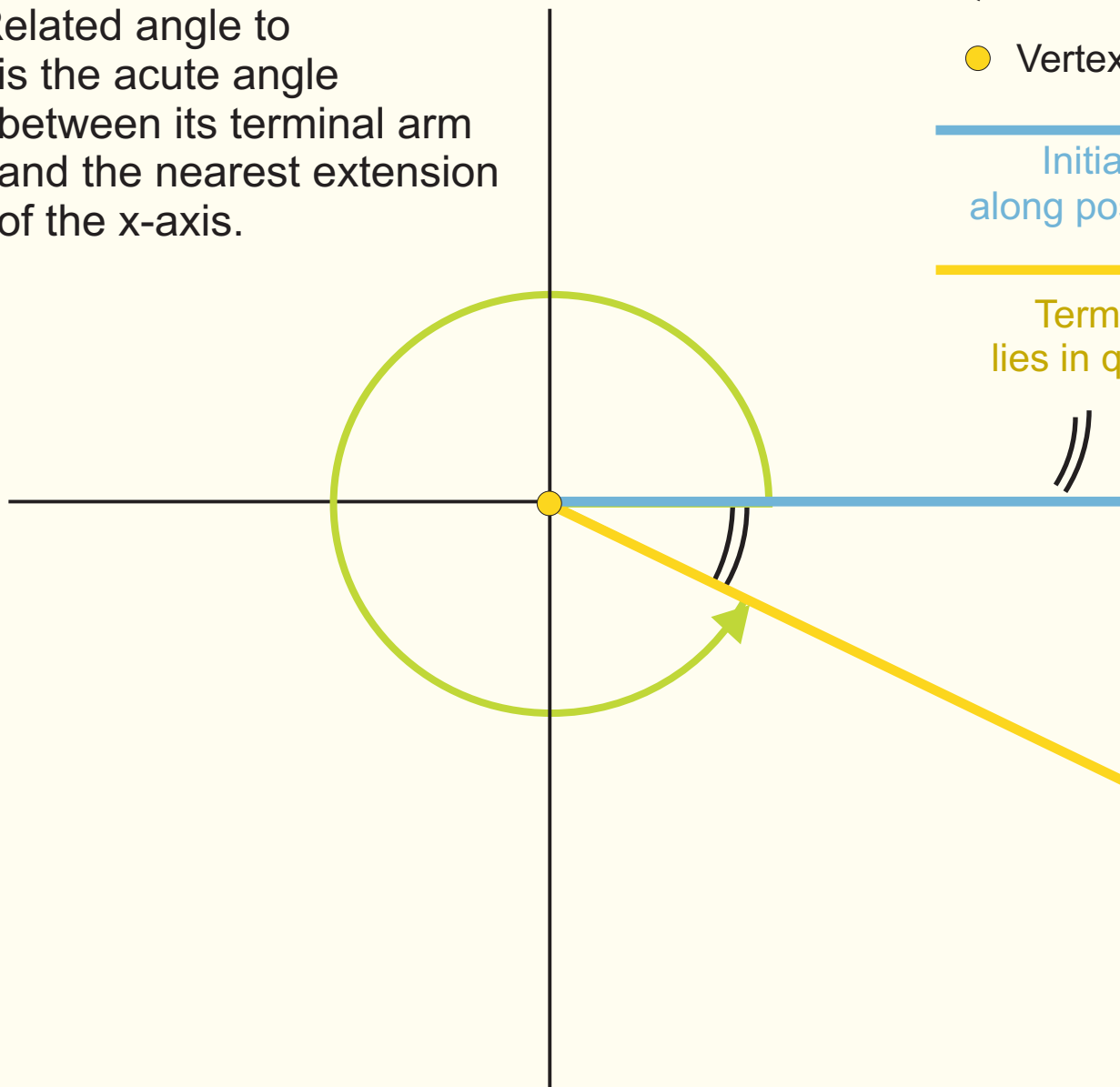
## STANDARD POSITION OF A QUADRANT IV ANGLE

● Vertex at origin

Initial arm  
along positive x-axis

Terminal arm  
lies in quadrant IV

Related angle  
to



# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## Definition:

Related angle to  
is the acute angle  
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of the x-axis.

## STANDARD POSITION OF A QUADRANT IV ANGLE

● Vertex at origin

Initial arm  
along positive x-axis

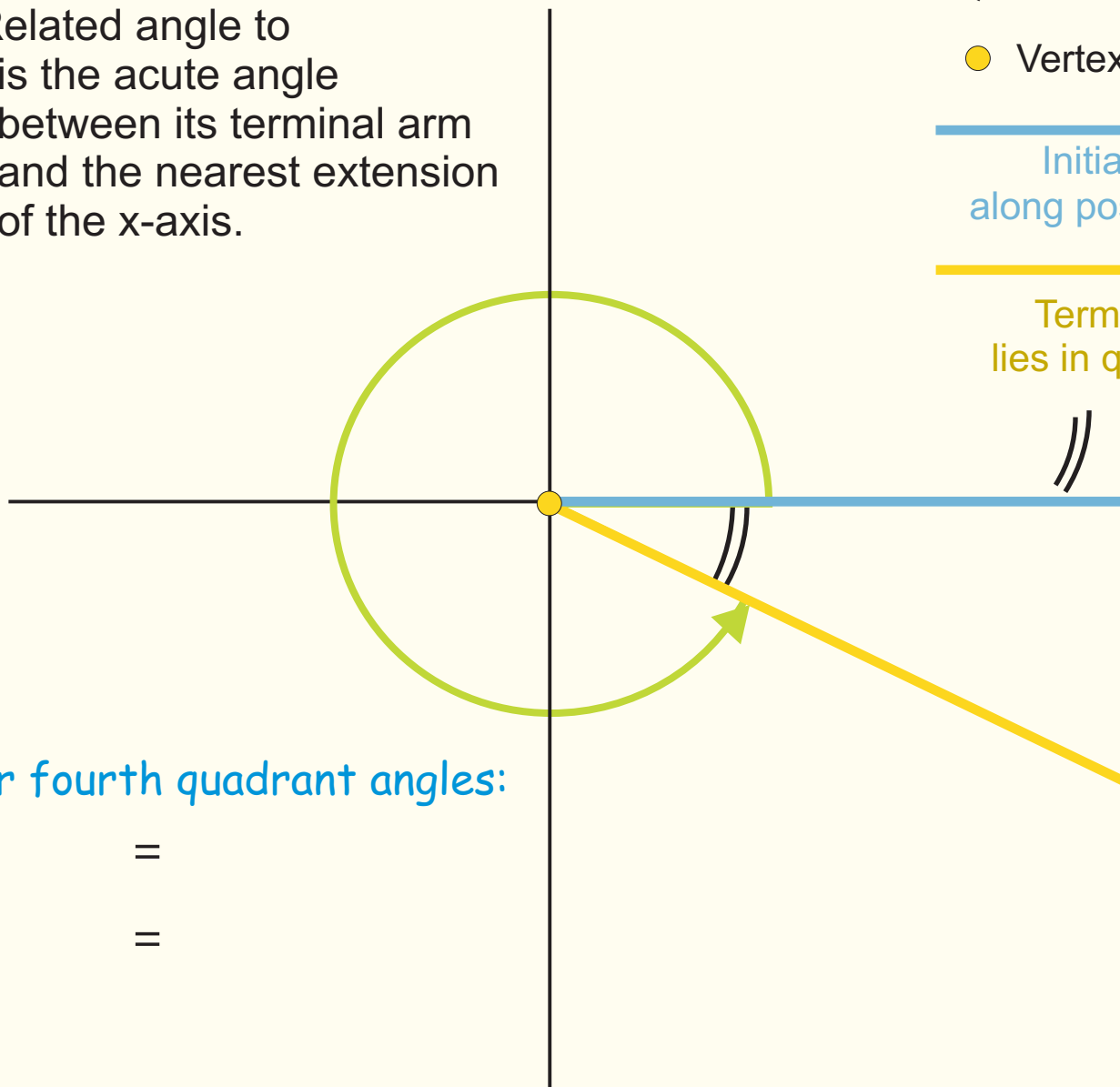
Terminal arm  
lies in quadrant IV

Related angle  
to

For fourth quadrant angles:

=

=



# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

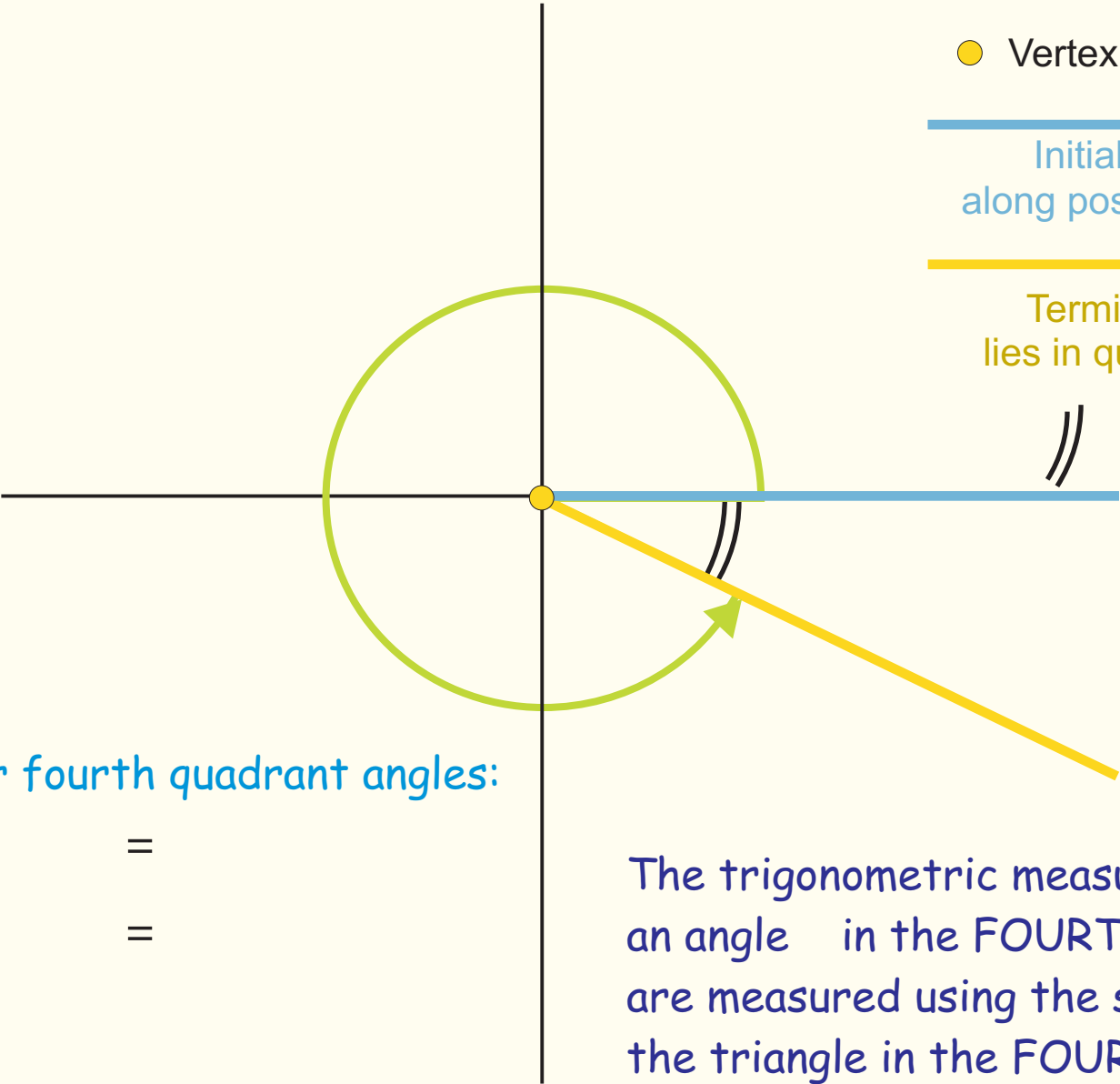
STANDARD POSITION OF  
A QUADRANT IV ANGLE

● Vertex at origin

Initial arm  
along positive x-axis

Terminal arm  
lies in quadrant IV

Related angle  
to



For fourth quadrant angles:

=

=

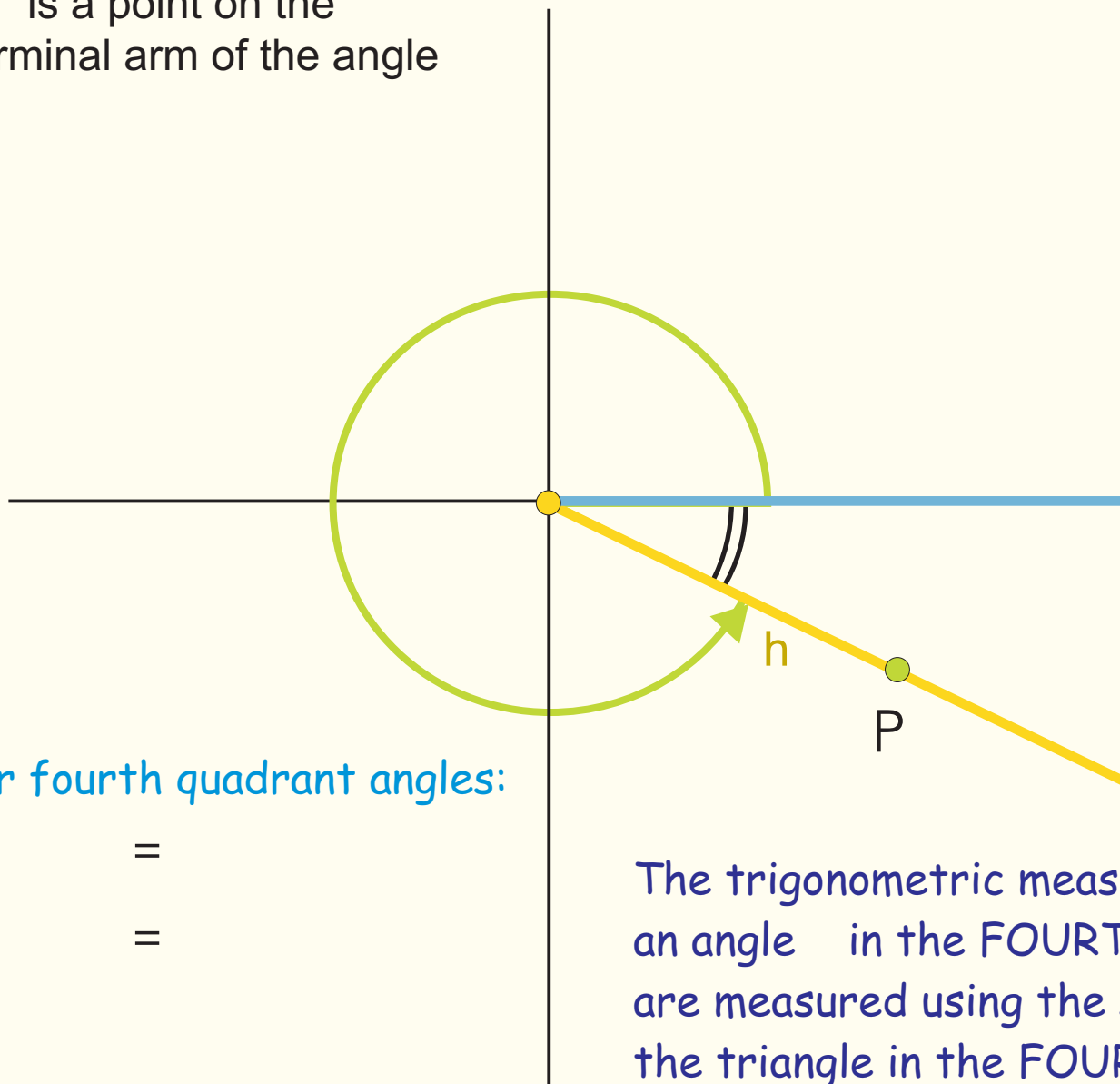
The trigonometric measures of  
an angle in the FOURTH quadrant  
are measured using the sides of  
the triangle in the FOURTH quadrant  
containing its related angle .

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

**h** = distance from P to the origin

P is a point on the  
terminal arm of the angle



For fourth quadrant angles:

=

=

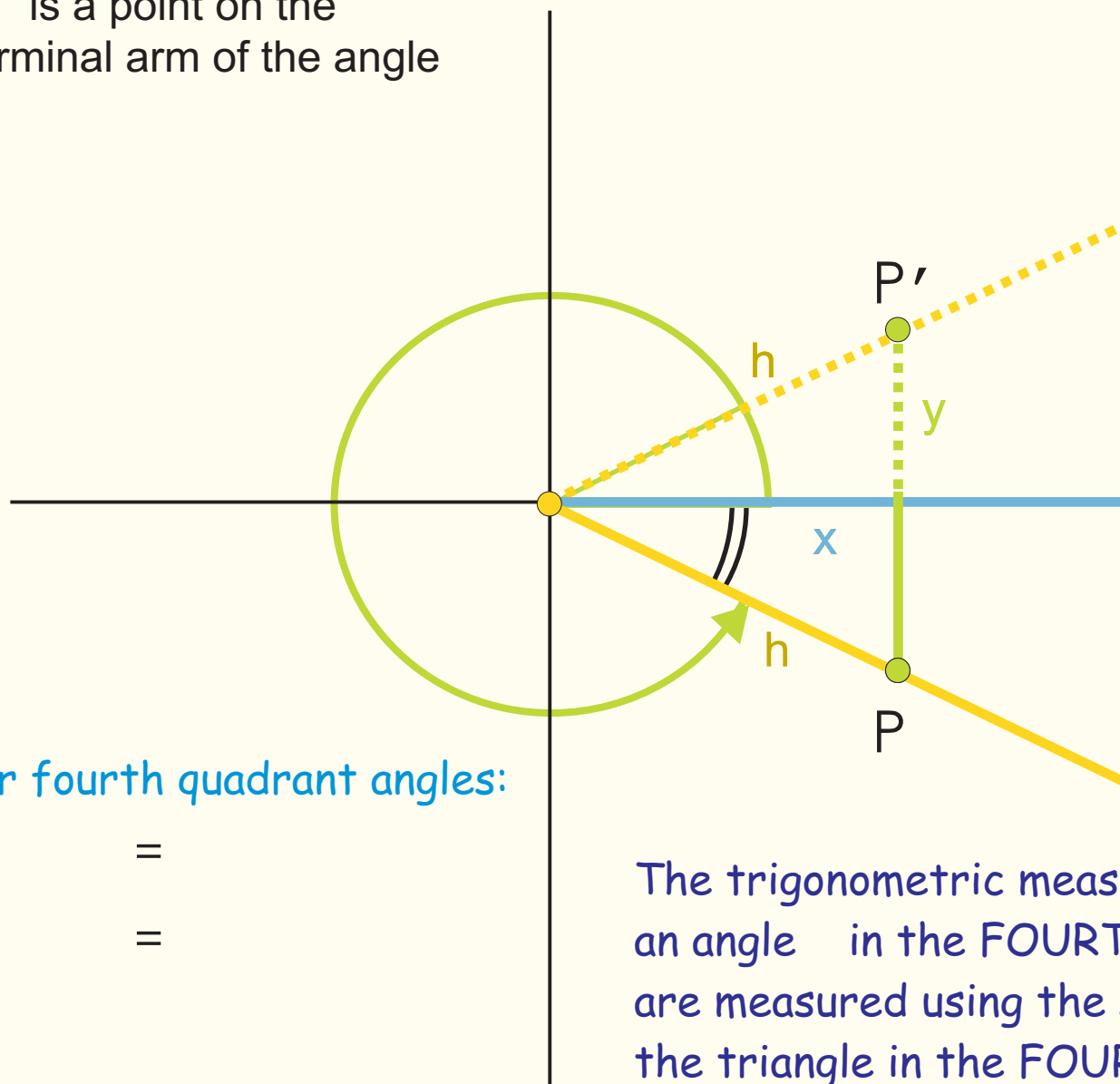
The trigonometric measures of  
an angle in the FOURTH quadrant  
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# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

**h** = distance from P to the origin

P is a point on the  
terminal arm of the angle



For fourth quadrant angles:

=

=

The trigonometric measures of  
an angle in the FOURTH quadrant  
are measured using the sides of  
the triangle in the FOURTH quadrant  
containing its related angle .

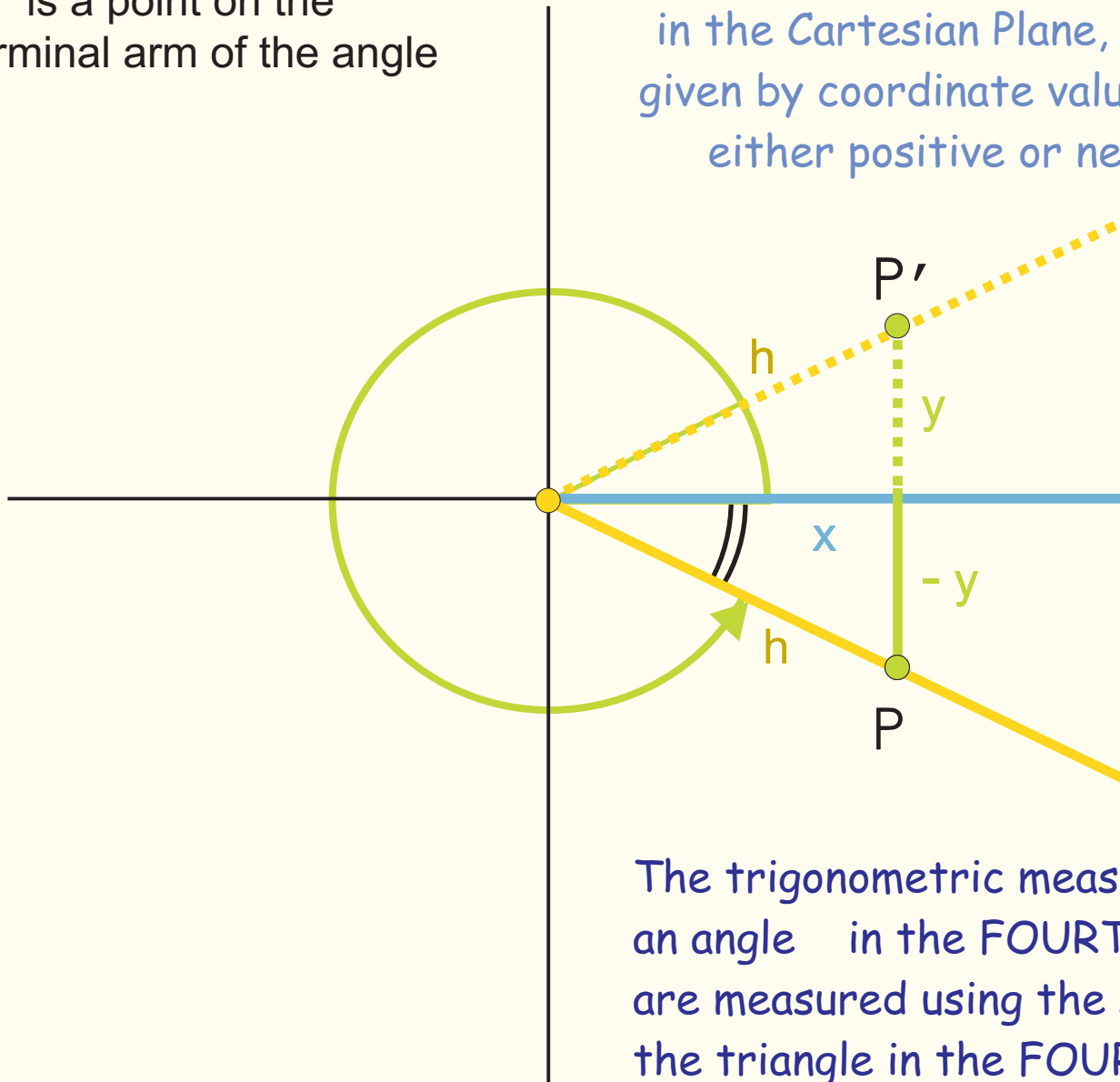
# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

$h$  = distance from  $P$  to the origin

$P$  is a point on the  
terminal arm of the angle

Keep in mind that,  
in the Cartesian Plane, the sides  
given by coordinate values may be  
either positive or negative.



The trigonometric measures of  
an angle in the **FOURTH** quadrant  
are measured using the sides of  
the triangle in the **FOURTH** quadrant  
containing its related angle.

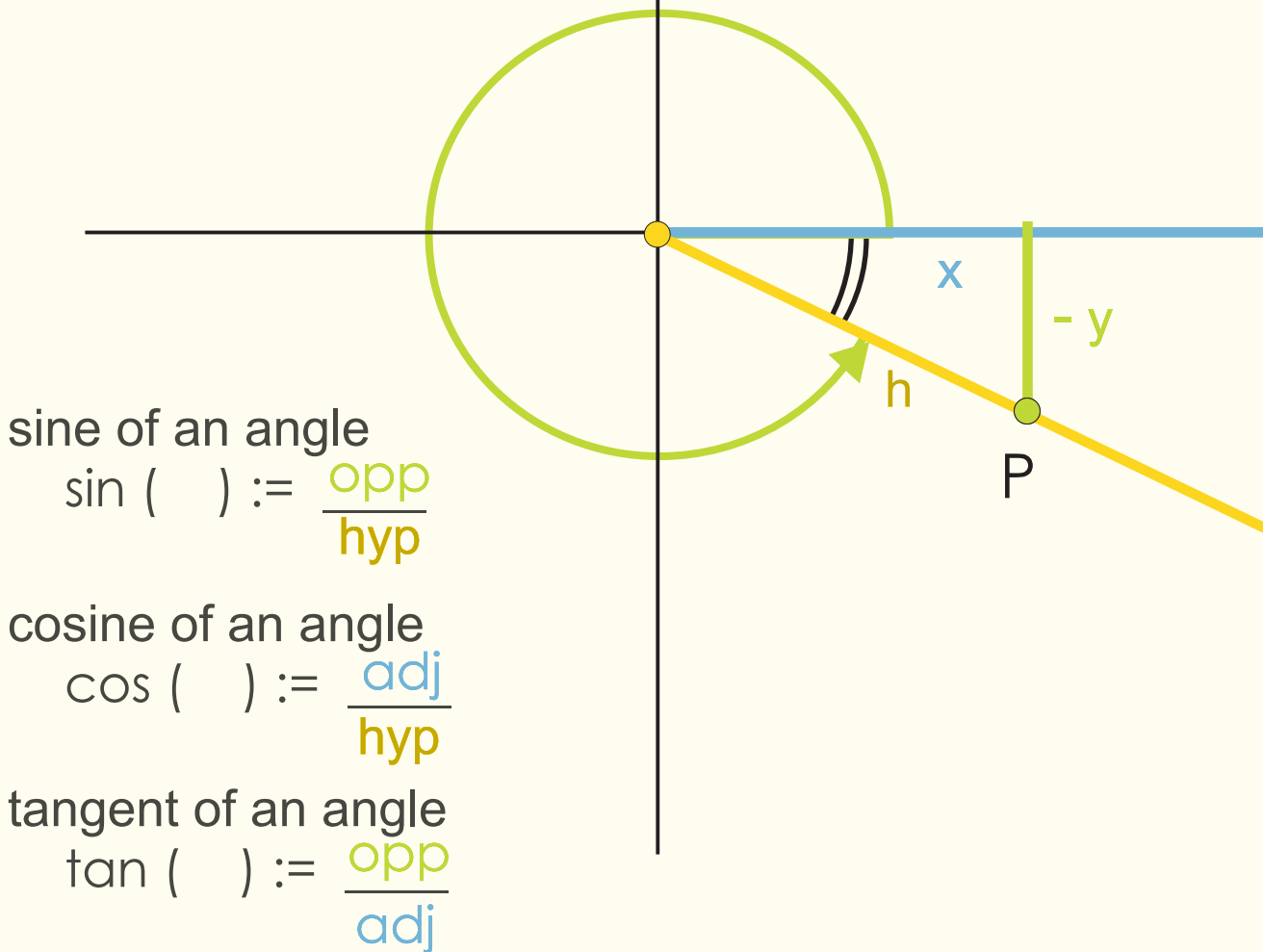
# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

**h** = distance from P to the origin

P is a point on the  
terminal arm of the angle

The trigonometric measures of  
an angle in the FOURTH quadrant  
are measured using the sides of  
the triangle in the FOURTH quadrant  
containing its related angle .

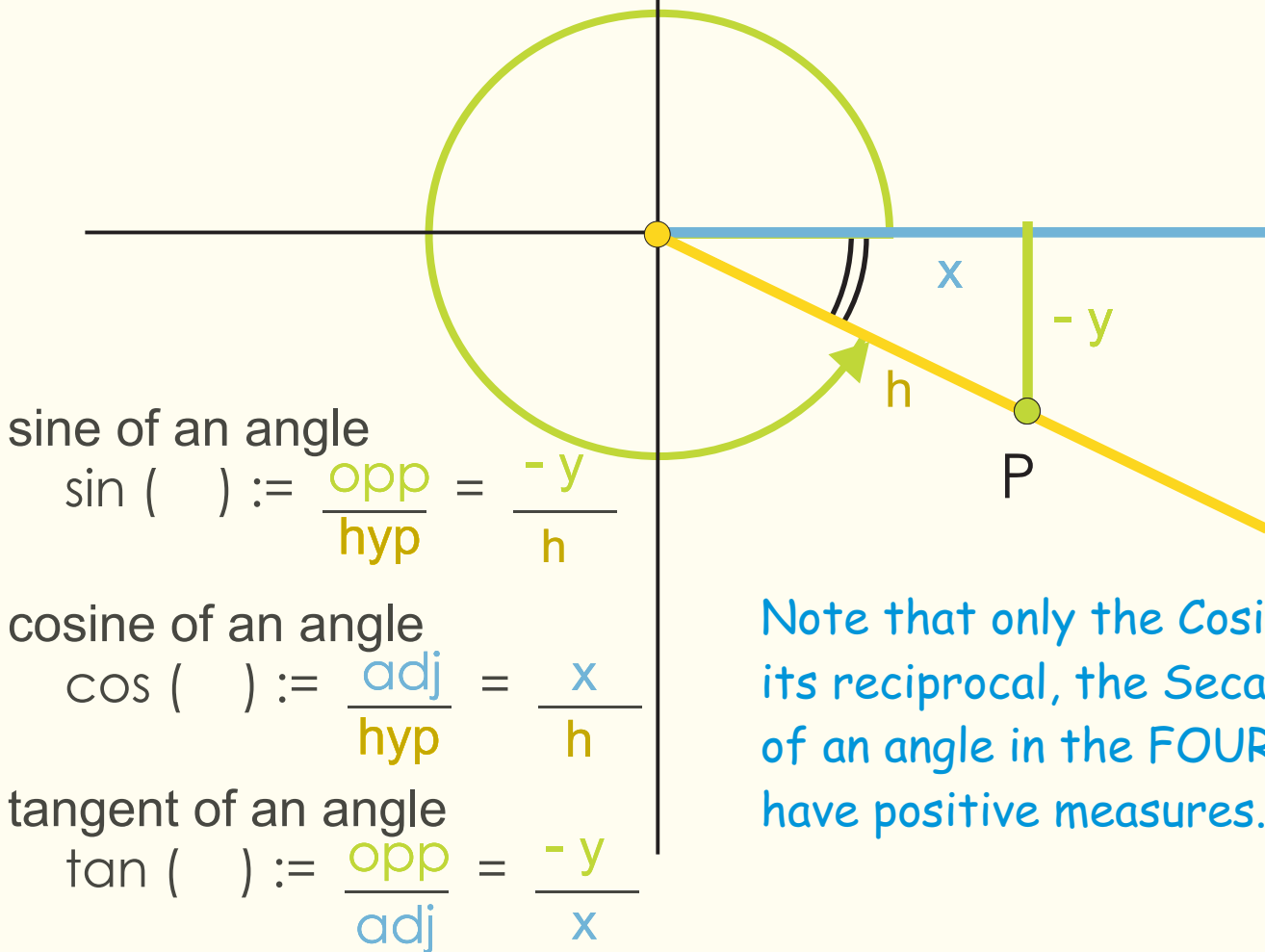


# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

**h** = distance from P to the origin

P is a point on the  
terminal arm of the angle



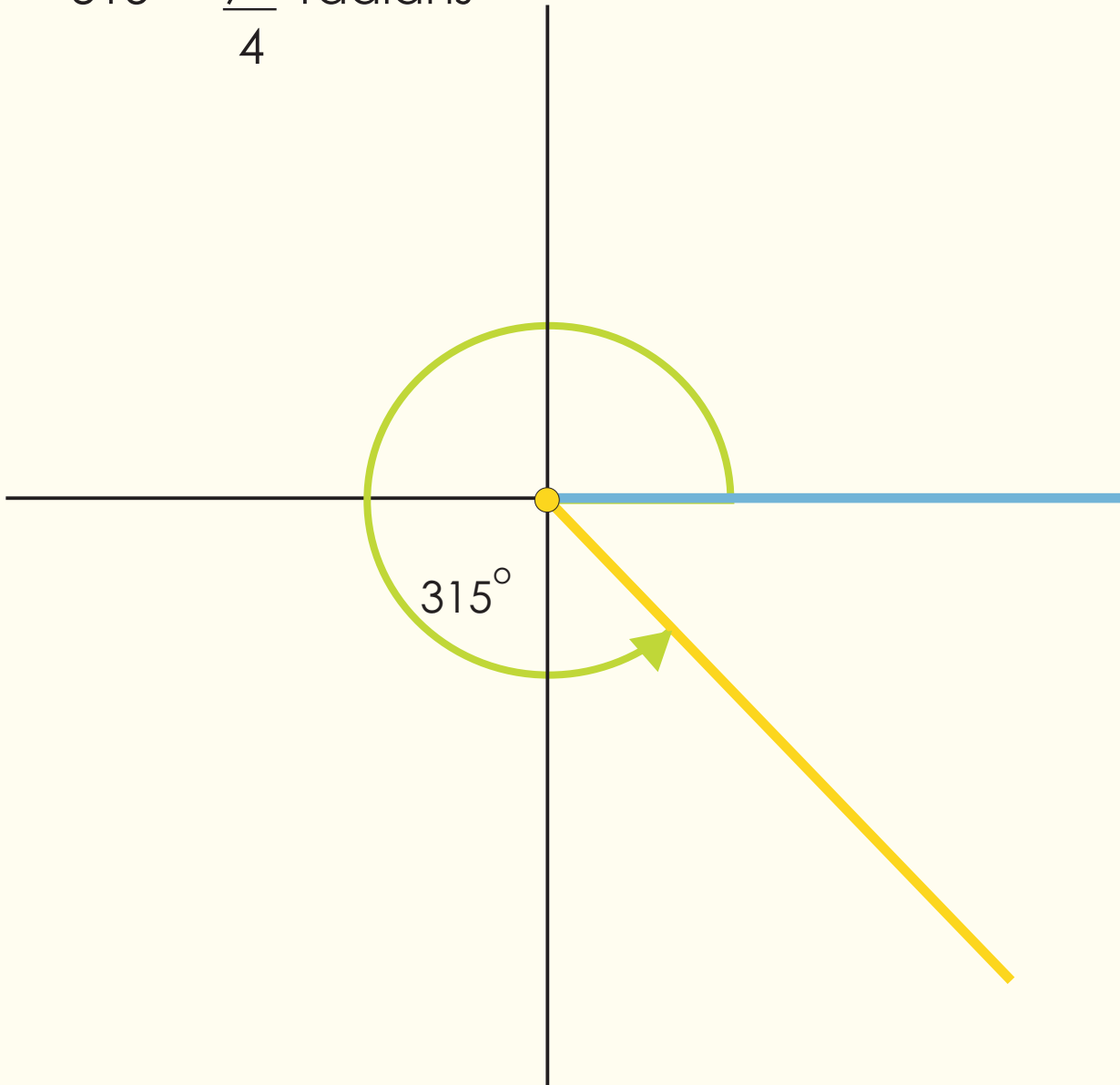
Note that only the Cosine and  
its reciprocal, the Secant,  
of an angle in the FOURTH quadrant  
have positive measures.

## THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

### EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$



Find the sine, cosine and tangent values of  $\frac{7}{4}$  radians .

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

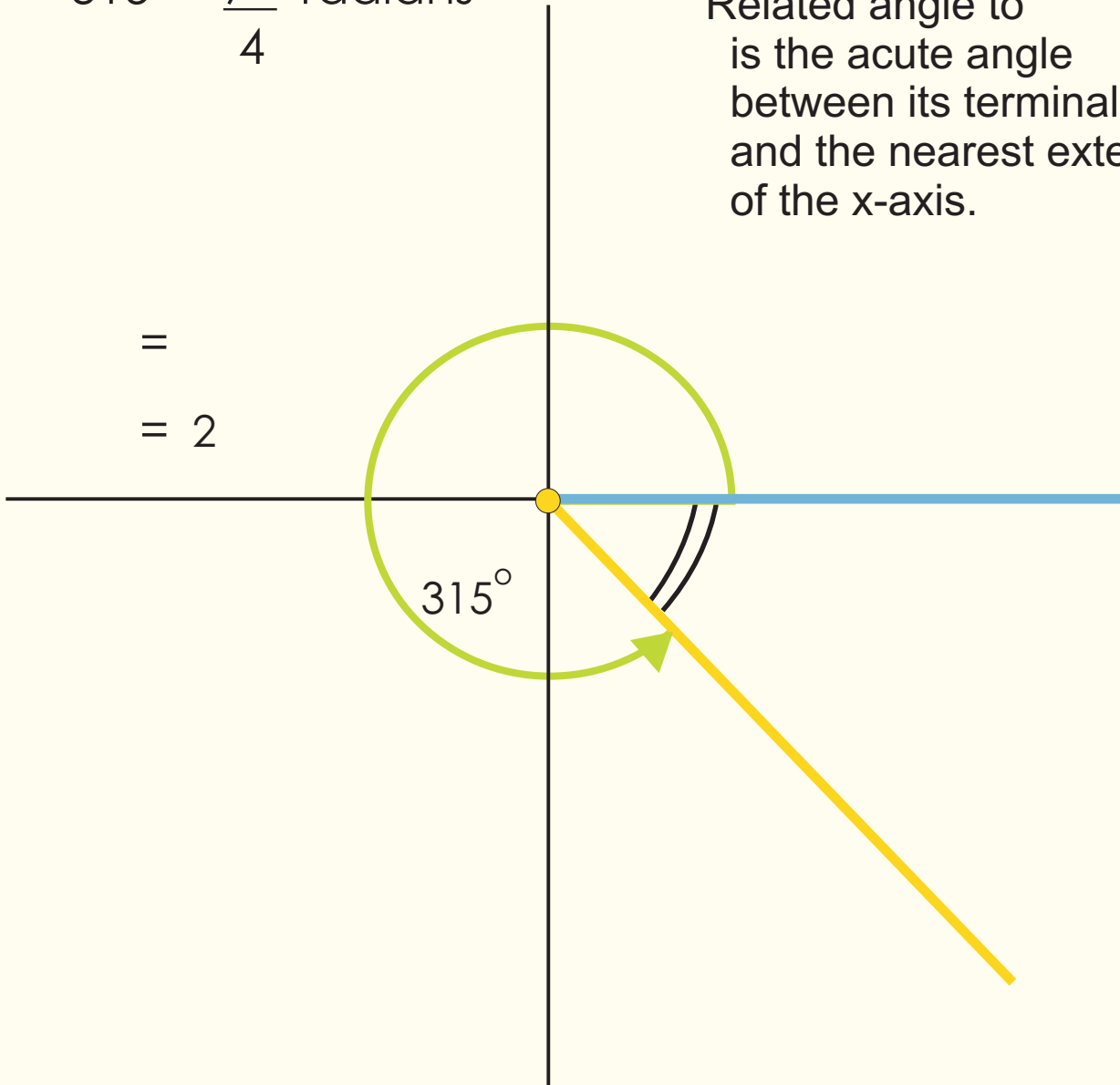
## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$

Related angle to  
is the acute angle  
between its terminal arm  
and the nearest extension  
of the x-axis.

=

= 2



Find the sine, cosine and tangent values of  $\frac{7}{4}$  radians .

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$

$$= 2$$

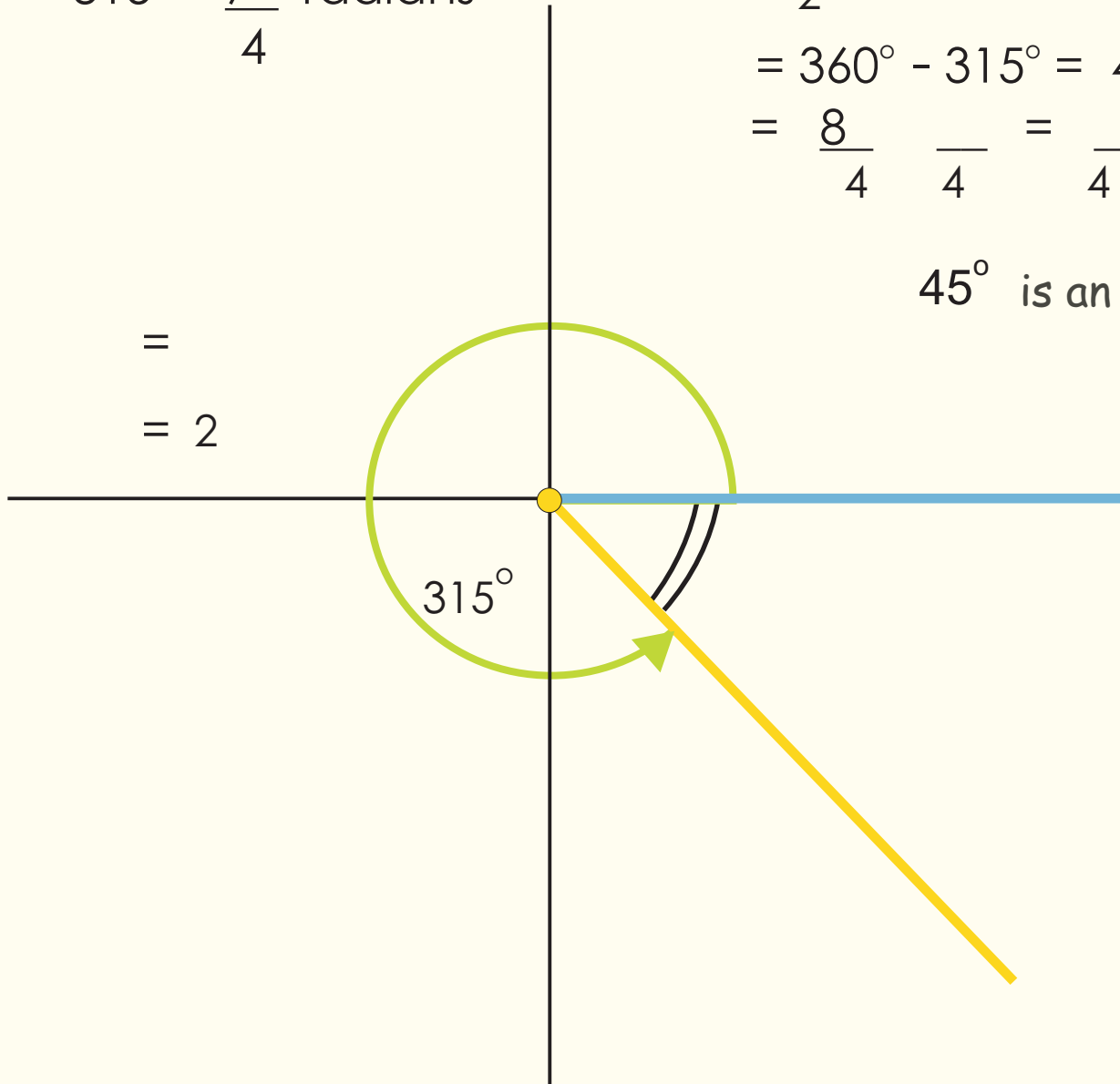
$$= 360^\circ - 315^\circ = 45^\circ$$

$$= \frac{8}{4} - \frac{1}{4} = \frac{7}{4} \text{ radians}$$

$45^\circ$  is an acute angle.

$$=$$

$$= 2$$



Find the sine, cosine and tangent values of  $\frac{7}{4}$  radians .

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

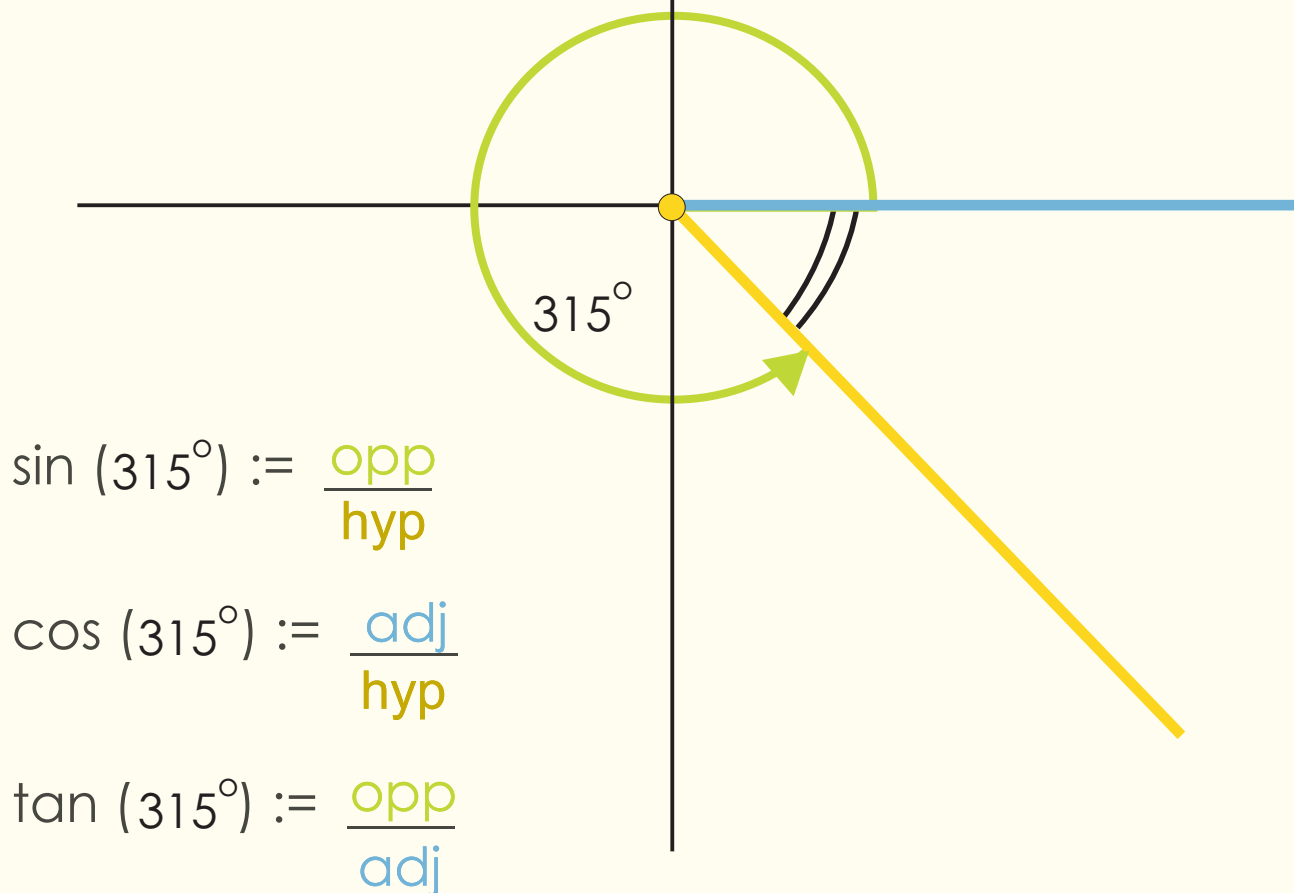
- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$

$$= 45^\circ = \frac{1}{4} \text{ radians}$$

The trigonometric measures of an angle in the FOURTH quadrant are measured using the sides of the triangle in the FOURTH quadrant containing its related angle.



$$\sin (315^\circ) := \frac{\text{opp}}{\text{hyp}}$$

$$\cos (315^\circ) := \frac{\text{adj}}{\text{hyp}}$$

$$\tan (315^\circ) := \frac{\text{opp}}{\text{adj}}$$

THE TRIGONOMETRIC MEASURES OF  $315^\circ$

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$

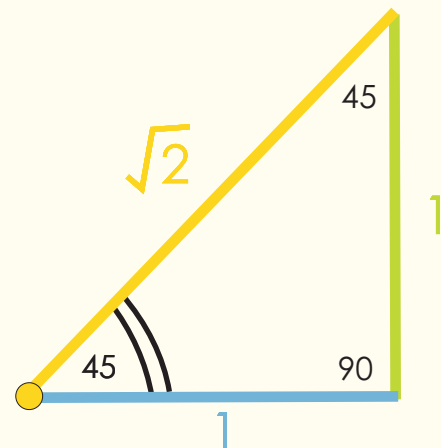
**h** = distance from P to the origin

P is a point on the  
terminal arm of the angle

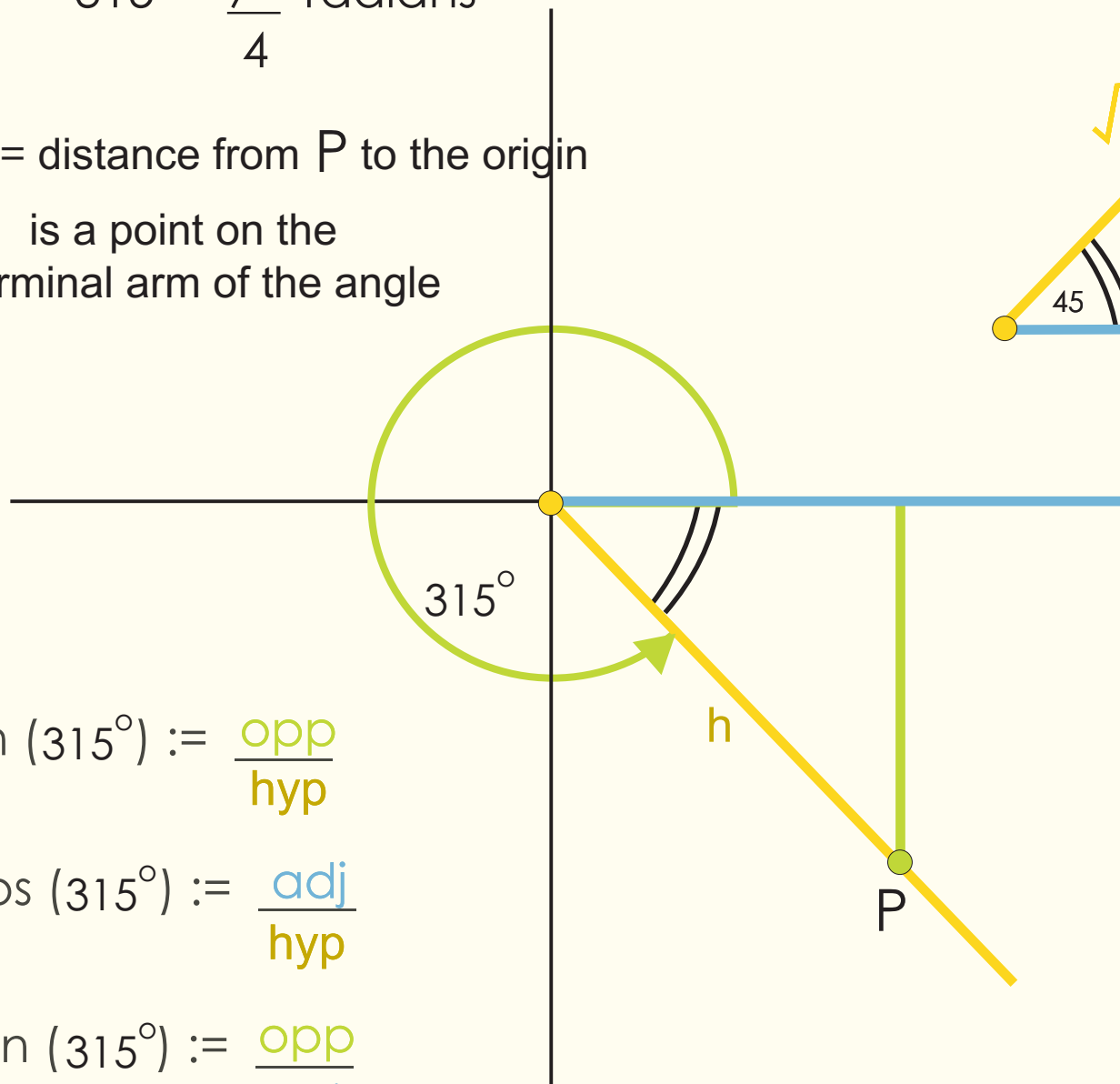
$$\sin (315^\circ) := \frac{\text{opp}}{\text{hyp}}$$

$$\cos (315^\circ) := \frac{\text{adj}}{\text{hyp}}$$

$$\tan (315^\circ) := \frac{\text{opp}}{\text{adj}}$$



$$\begin{aligned} 45^\circ \\ \text{hyp} &= \sqrt{2} \\ \text{opp} &= 1 \\ \text{adj} &= 1 \end{aligned}$$



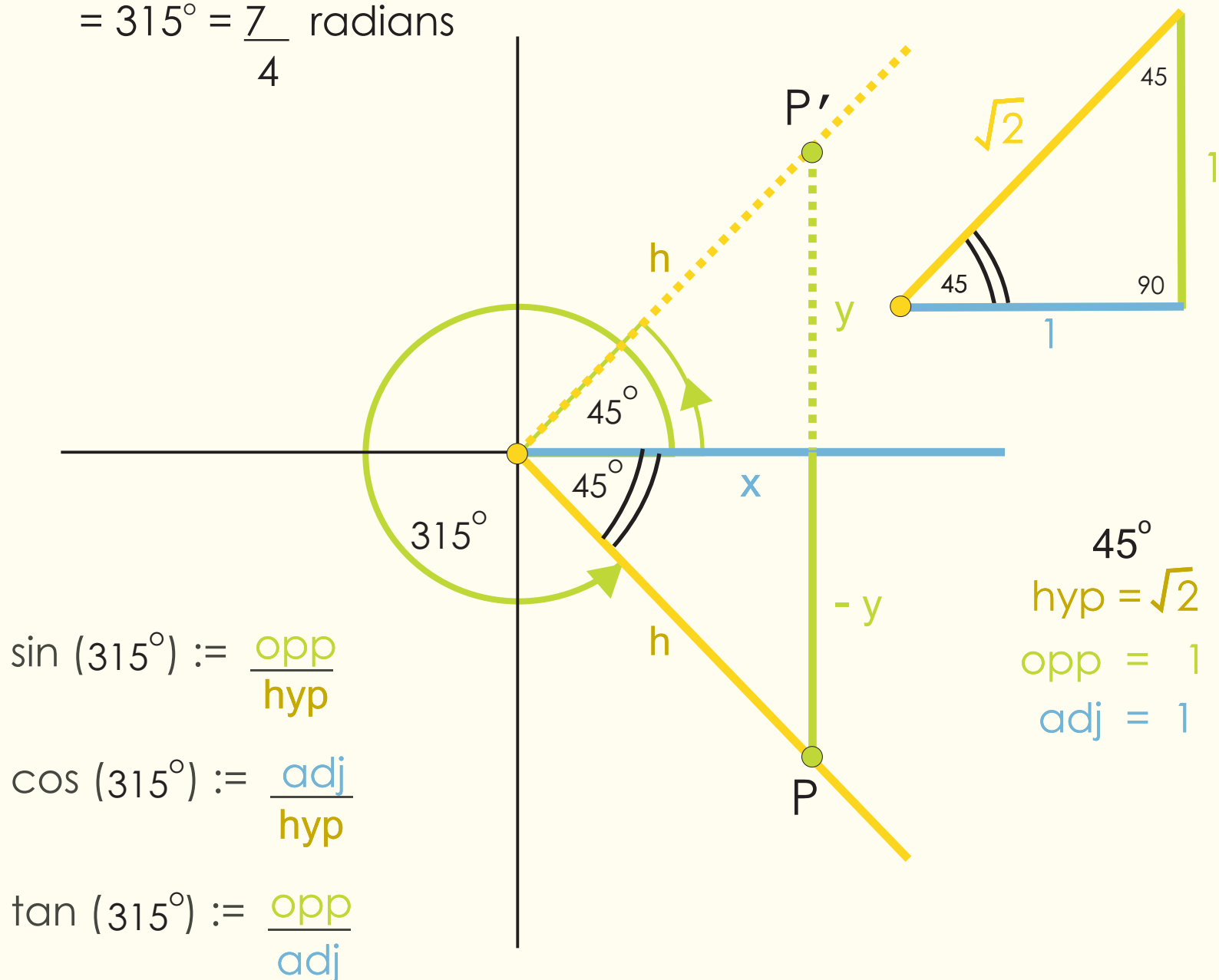
THE TRIGONOMETRIC MEASURES OF  $315^\circ$

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$



$$\begin{aligned} 45^\circ \\ \text{hyp} &= \sqrt{2} \\ \text{opp} &= 1 \\ \text{adj} &= 1 \end{aligned}$$

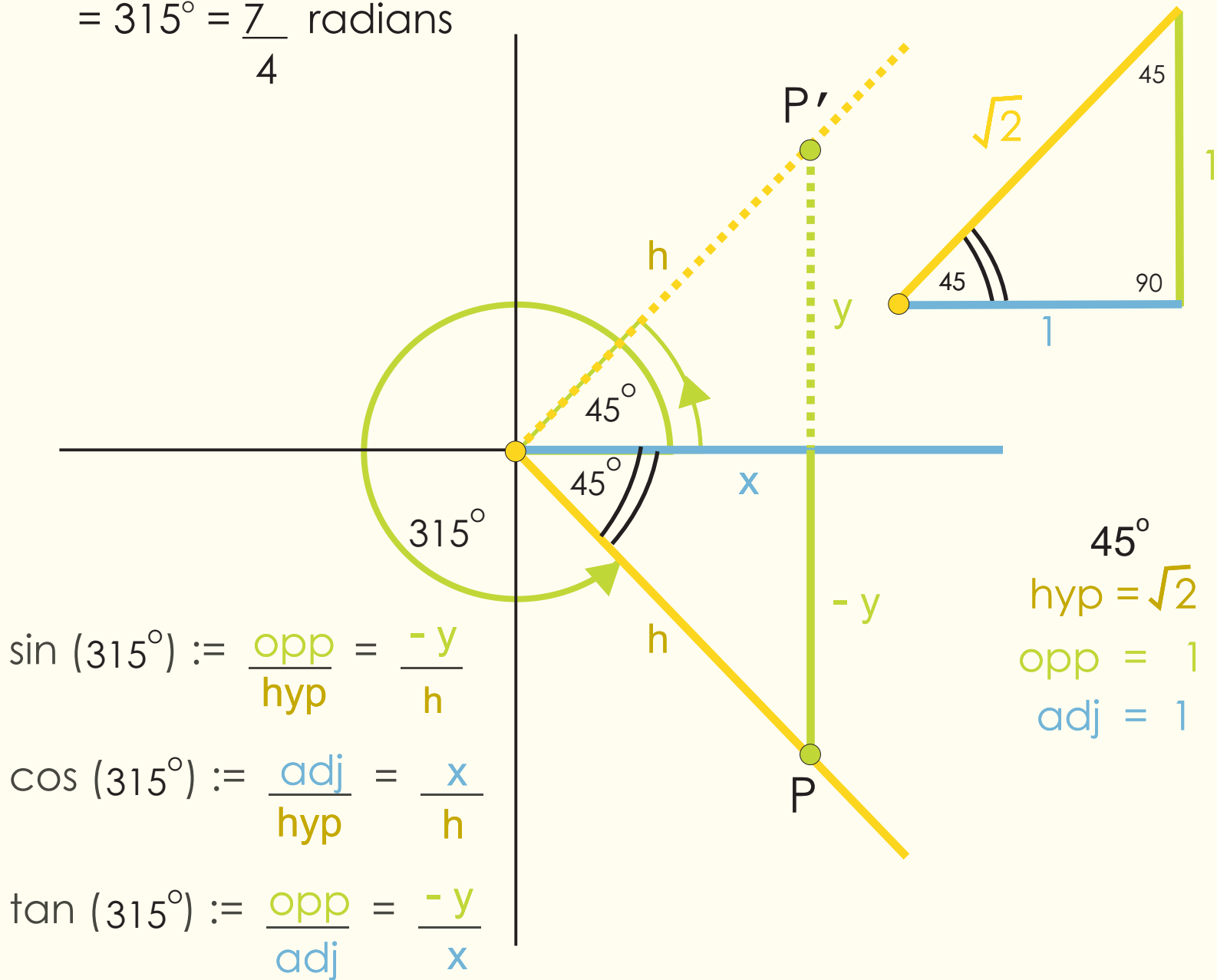
THE TRIGONOMETRIC MEASURES OF  $315^\circ$

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$



THE TRIGONOMETRIC MEASURES OF  $315^\circ$

# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

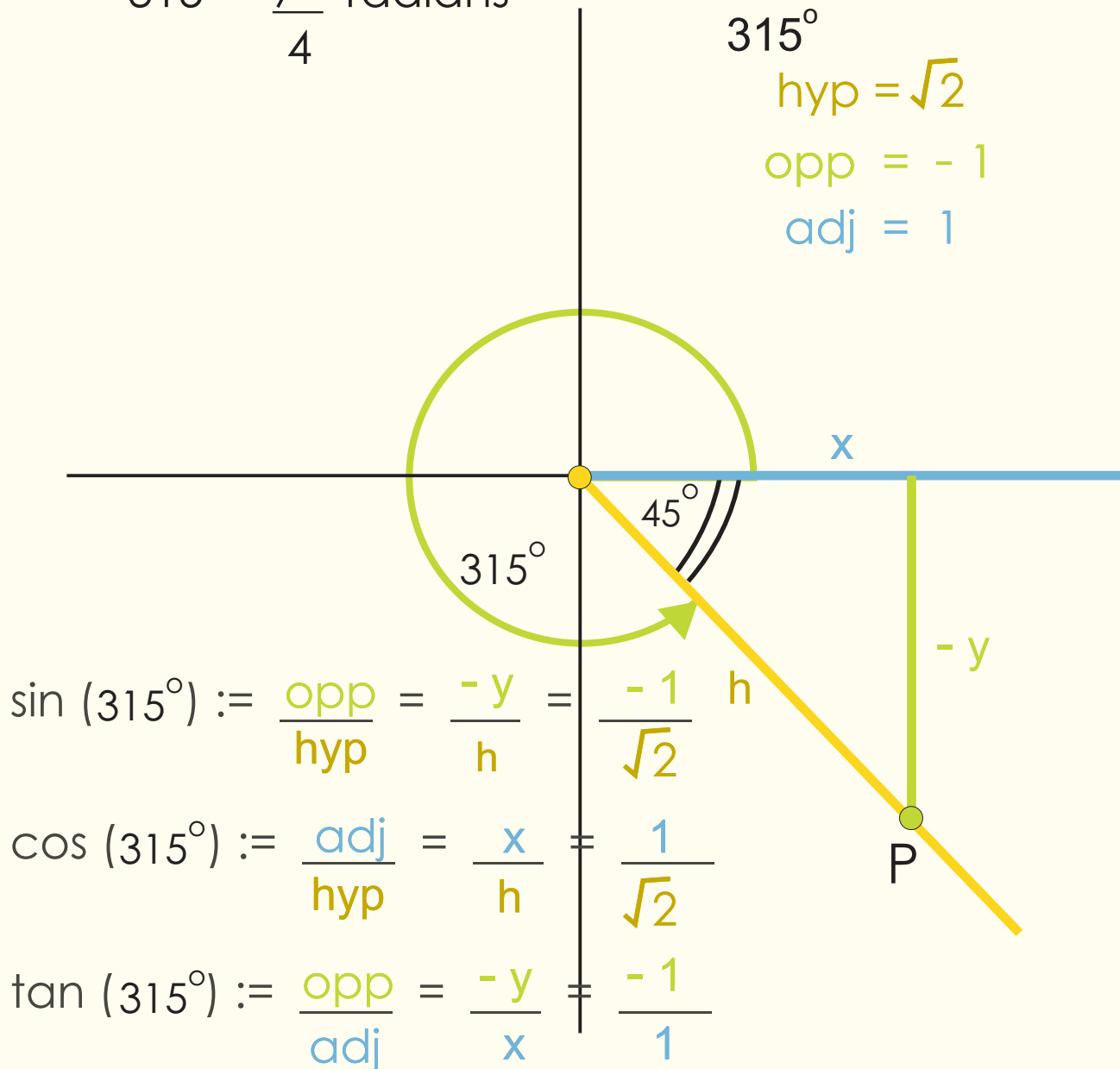
- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

$$= 315^\circ = \frac{7}{4} \text{ radians}$$

$$\begin{aligned} 315^\circ \\ \text{hyp} &= \sqrt{2} \\ \text{opp} &= -1 \\ \text{adj} &= 1 \end{aligned}$$

$$\begin{aligned} 45^\circ \\ \text{hyp} &= \sqrt{2} \\ \text{opp} &= 1 \\ \text{adj} &= 1 \end{aligned}$$



$$\sin (315^\circ) := \frac{\text{opp}}{\text{hyp}} = \frac{-y}{h} = \frac{-1}{\sqrt{2}}$$

$$\cos (315^\circ) := \frac{\text{adj}}{\text{hyp}} = \frac{x}{h} = \frac{1}{\sqrt{2}}$$

$$\tan (315^\circ) := \frac{\text{opp}}{\text{adj}} = \frac{-y}{x} = \frac{-1}{1}$$

THE TRIGONOMETRIC MEASURES OF  $315^\circ$

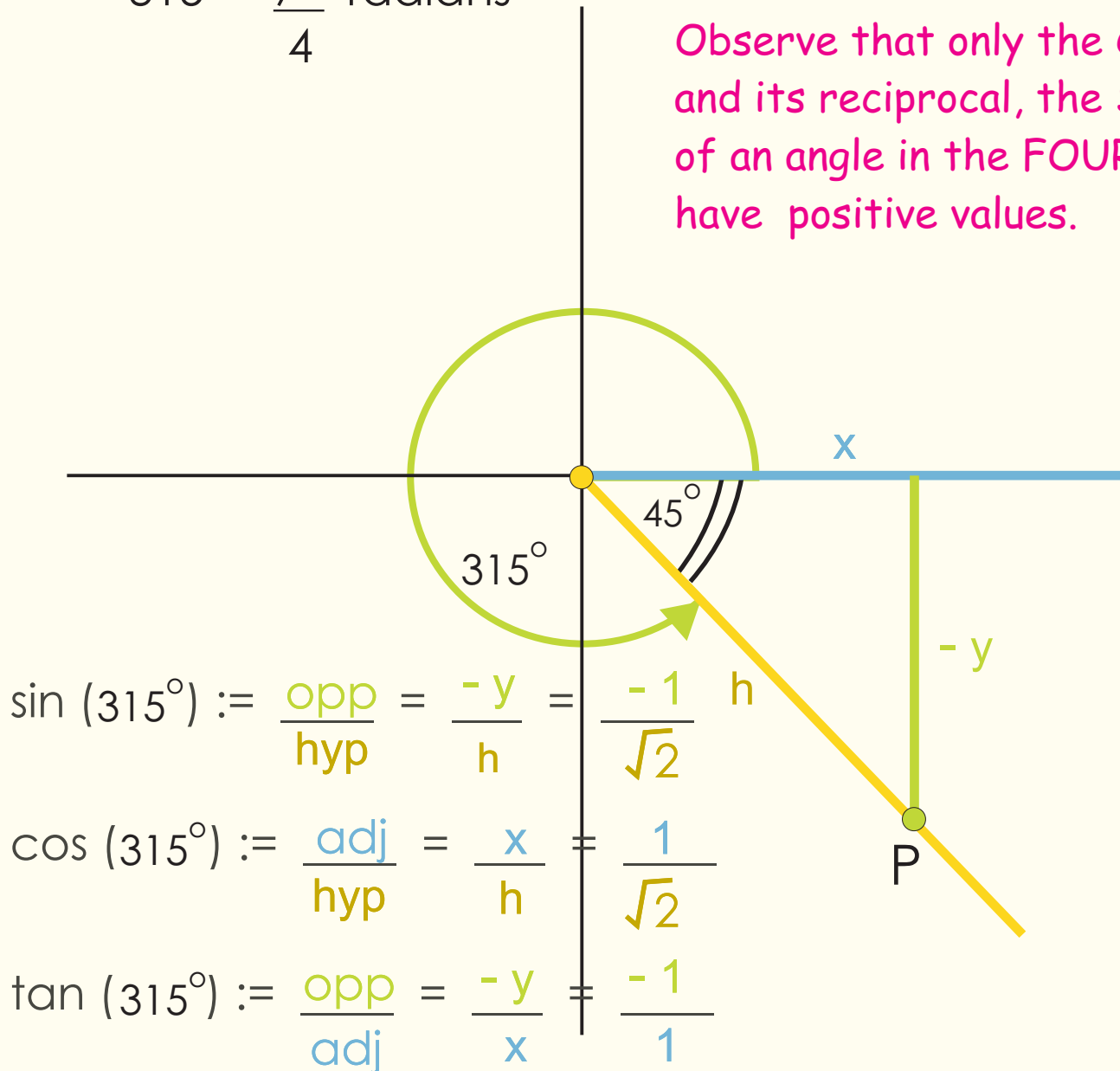
# THE TRIGONOMETRY OF ANGLES IN QUADRANT IV

- *blending Pythagorus (circa 540 B.C.)  
and Descartes (circa 1637)*

## EXAMPLE

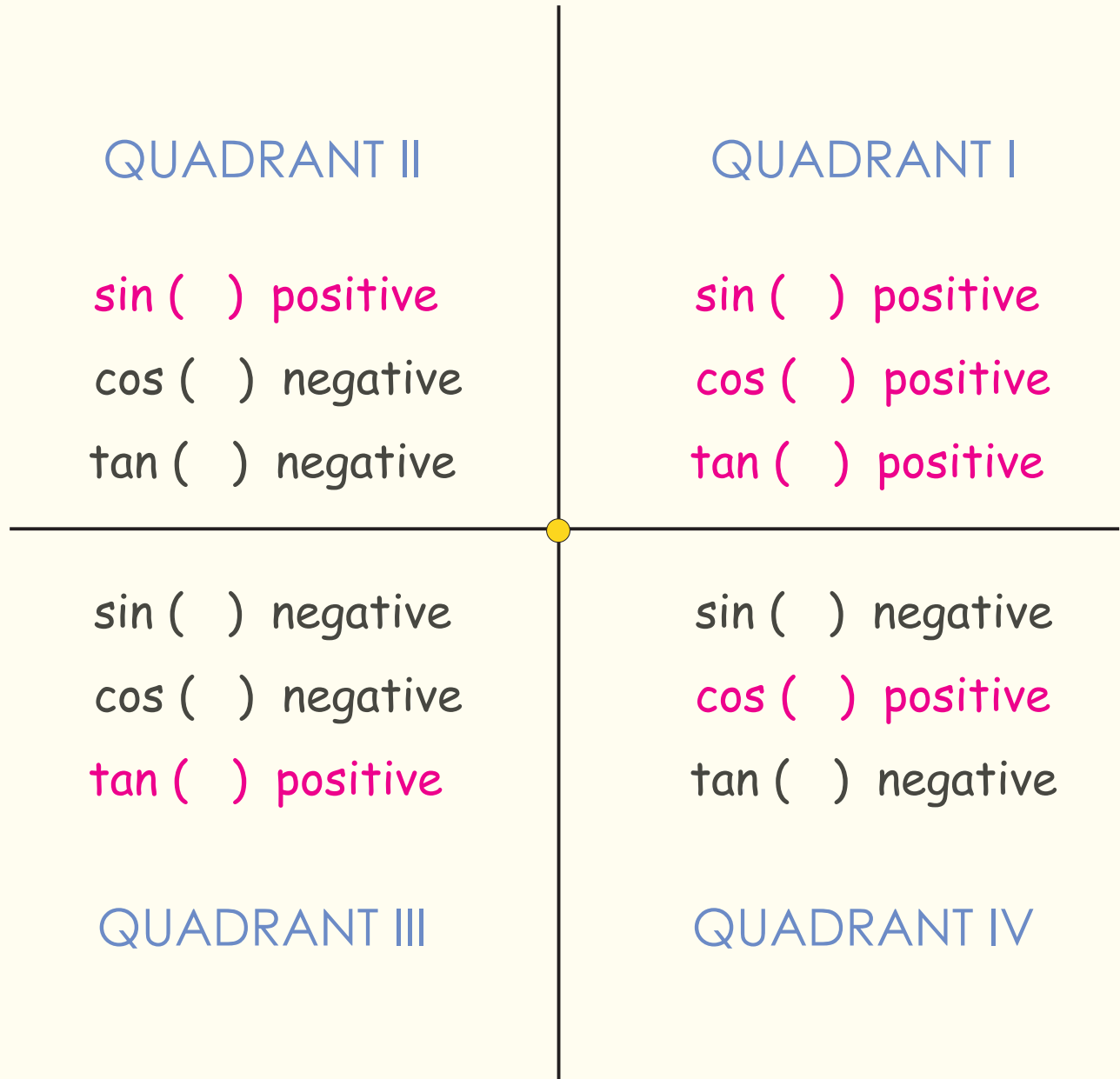
$$= 315^\circ = \frac{7}{4} \text{ radians}$$

Observe that only the Cosine,  
and its reciprocal, the Secant,  
of an angle in the FOURTH quadrant  
have positive values.



THE TRIGONOMETRIC MEASURES OF  $315^\circ$

# THE TRIGONOMETRY OF QUADRANT ANGLES



# THE CAST FORMULA

S

QUADRANT II

$\sin ( \ )$  positive  
 $\cos ( \ )$  negative  
 $\tan ( \ )$  negative

A

QUADRANT I

$\sin ( \ )$  positive  
 $\cos ( \ )$  positive  
 $\tan ( \ )$  positive

$\sin ( \ )$  negative  
 $\cos ( \ )$  negative  
 $\tan ( \ )$  positive

QUADRANT III

T

$\sin ( \ )$  negative  
 $\cos ( \ )$  positive  
 $\tan ( \ )$  negative

QUADRANT IV

C

