Simpler Problem

$x^2 = -1$

$x = \pm\sqrt{-1}$

↑ imaginary number

$x^2 = 7$

$x = \pm\sqrt{7}$

$\sqrt{-1} = i$

$i^2 = -1$

$x^2 = -9$

$x = \pm 3i$

$\sqrt{-9} = \sqrt{9}\sqrt{-1}$

$= 3\ i$

$w^2 = -7$

$w = \pm\sqrt{7}\, i$

Imaginary Unit i

The imaginary unit, written i, is the number whose square is -1. That is,

$$i^2 = -1 \quad \text{and} \quad i = \sqrt{-1}$$

Complex Numbers and Pure Imaginary Numbers

A complex number is a number that can be written in the form

$$a + bi$$

where a and b are real numbers. A complex number that can be written in the form

$$0 + bi$$

$b \neq 0$, is also called a pure imaginary number.

Ex: $(4+3i) + (2-7i)$

$6 - 4i$

$(4+3i) - (2-7i)$

$2 + 10i$

$(4+3i)(2-7i)$

$8-28i+6i-21i^2$

$8-22i-21i^2$

$8-22i+21$

$29-22i$

Ex: (p 583)

10. $(-7+2i)+(5-3i)$

14. $(-6+i)-(3+i)$

18. $-2i(5+4i)$

20. $(6+2i)(4-i)$

22. $(-9+2i)(-9-2i)$

34. $y^2 - 2y + 5 = 0$

36. $8x^2 - 7x + 2 = 0$

38. $5m^2 - 6m + 7 = 0$

$$y^2 - 2y + 5 = 0$$

$$y^2 - 2y + (-1)^2 = -5 + 1$$

$$(y-1)^2 = -4$$

$$y - 1 = \pm 2i$$

$$y = 1 \pm 2i$$

$$8x^2 - 7x + 2 = 0$$

$a = 8$

$b = -7$

$c = 2$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(8)(2)}}{2(8)}$$

$$= \frac{7 \pm \sqrt{49 - 64}}{16}$$

$$= \frac{7 \pm \sqrt{-15}}{16}$$

$$x = \frac{7 \pm \sqrt{15}\, i}{16}$$

$$8x^2 - 7x + 2 = 0$$

$$x^2 - \frac{7}{8}x + \frac{2}{8} = 0$$

$$x^2 - \frac{7}{8}x + \left(-\frac{7}{16}\right)^2 = -\frac{1 \cdot 64}{4 \cdot 64} + \frac{49}{256}$$

$$\left(x - \frac{7}{16}\right)^2 = \frac{-64 + 49}{256}$$

$$\left(x - \frac{7}{16}\right)^2 = \frac{-15}{256}$$

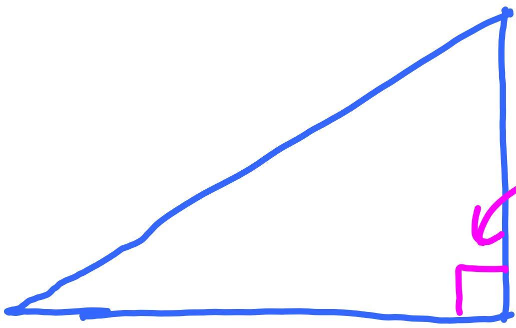
$$x - \frac{7}{16} = \pm \frac{\sqrt{15}\, i}{16}$$

$$x = \frac{7 \pm \sqrt{15}\, i}{16}$$

$$5m^2 - 6m + 7 = 0$$

Trigonometry

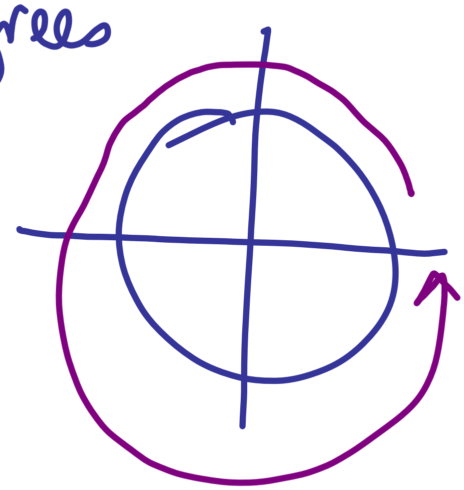
Tri - gono - metry



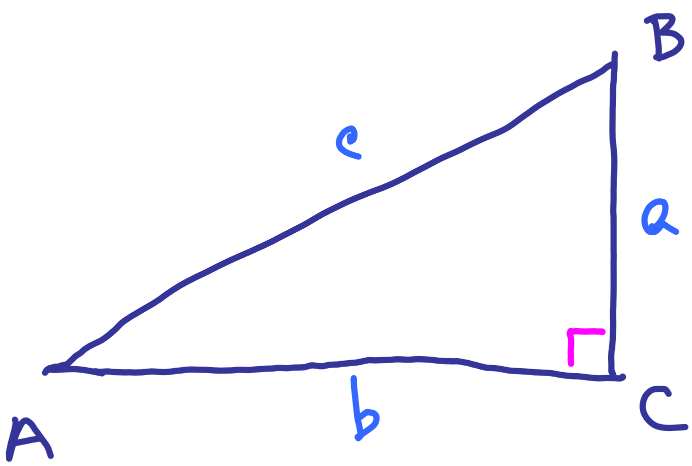
90° right angle

180°

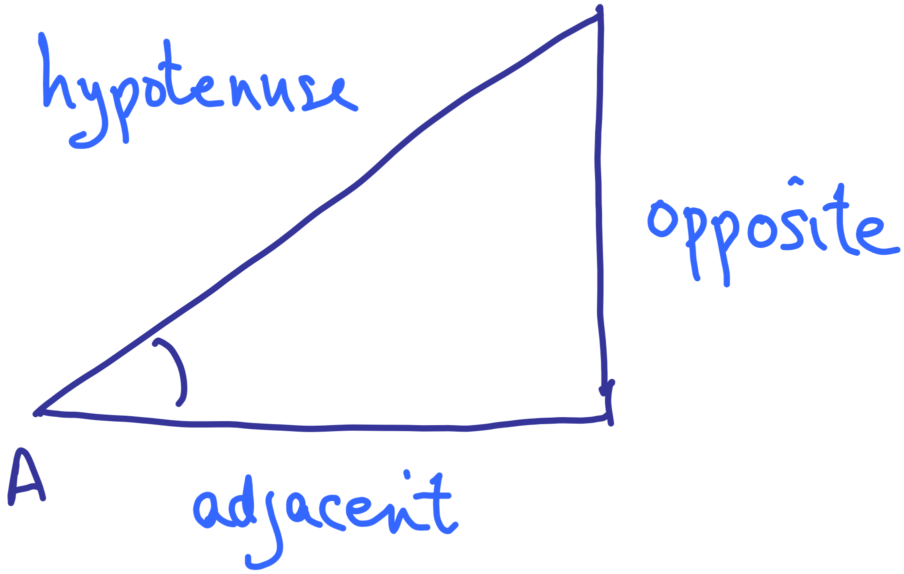
degrees



360°



θ theta



Sine $\qquad \sin A = \dfrac{opp}{hyp}$

secant $\qquad \sec A = \dfrac{hyp}{adj}$

Cosine $\qquad \cos A = \dfrac{adj}{hyp}$

cosecant $\qquad \csc A = \dfrac{hyp}{opp}$

tangent $\qquad \tan A = \dfrac{opp}{adj}$

cotangent $\qquad \cot A = \dfrac{adj}{opp}$