DEFINED $\tan A$ AS (SIDE OPPOSITE)/(SIDE ADJACENT); EVIDENTLY $\tan A =$ ... $\tan A = \frac{\sin A}{\cos A}$
$(\sin A)/(\cos A)$. IT FOLLOWS ALSO FROM THE PYTHAGOREAN THEOREM, WHICH
STATES THAT THE SUM OF THE SQUARES OF THE LEGS OF A RIGHT
TRIANGLE IS EQUAL TO THE SQUARE OF THE HYPOTENUSE) THAT:

$$\sin^2 A + \cos^2 A = 1$$

FROM THIS EQUATION: $\cos^2 A = 1 - \sin^2 A$

WHENCE: $\cos A = \sqrt{1 - \sin^2 A}$

~~WHENCE~~ SUBSTITUTING THE LATTER IN $\tan A = (\sin A)/(\cos A)$ GIVES:

$$\tan A = \frac{\sin A}{\sqrt{1 - \sin^2 A}}$$

60. TRIGONOMETRIC FUNCTIONS OF $45°, 30°,$ AND $60°$.
THE NUMERICAL VALUES OF THE FUNCTIONS OF ANY ANGLE COULD BE
APPROXIMATED BY MEANS OF CAREFULLY CONSTRUCTED DIAGRAM, FOR
INSTANCE, BY MEASURING THE LINES PQ, AP AND SR IN FIGURE 7.
HOWEVER, THE VALUES OF THE TRIGONOMETRIC FUNCTIONS ARE IN ACTUAL
BETTER APPROXIMATED BY MEANS OF SERIES DERIVED IN OTHER BRANCHES   → WHAT BEAUTIES?
OF MATHEMATICS. BUT THE VALUES OF FUNCTIONS OF CERTAIN USEFUL
ANGLES CAN BE DETERMINED EXACTLY FROM THE PROPERTIES OF CERTAIN   —p64
SPECIFIC TRIANGLES. LET US CONSIDER, FOR EXAMPLE, AN ISOSCELE
RIGHT TRIANGLE, THAT IS, ONE HAVING TWO EQUAL LEGS. SUPPOSE
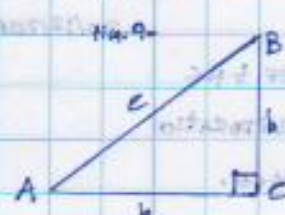WE DENOTE THE EQUAL LEGS (FIGURE 9) ~~TO BE~~ by. ANY LETTER, SAY b;
THAN WE FIND THE HYPOTENUSE BY THE PYTHAGOREAN THEOREM: → PYTHAGOREAN THEOREM
$c^2 = b^2 + b^2$, WHENCE $c^2 = 2b^2$ AND $c = b\sqrt{2}$. $c^2 = b^2 + b^2$

SINCE THE SUM OF THE ANGLES OF ~~ANY~~ ~~STRAIGHT~~ TRIANGLE IS $180°$
AND THE ANGLES OPPOSITE THE EQUAL SIDES OF A TRIANGLE IS EQUAL,
EACH OF THE ACUTE ~~ACUTE~~ ANGLES MUST BE $45°$, SO WE CAN WRITE THE
VALUES OF THE FUNCTION OF THE ANGLE OF $45°$:

$$\sin 45° = \frac{b}{b\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{1\sqrt{2}}{\sqrt{2}\sqrt{2}} = \frac{\sqrt{2}}{2} = \frac{1.4142}{2} = 0.7071$$

$$\cos 45° = \frac{b}{b\sqrt{2}} = \frac{1}{\sqrt{2}} = 0.7071$$

$$\tan 45° = \frac{b}{b} = 1.0000$$