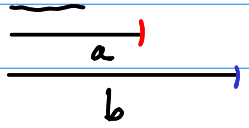
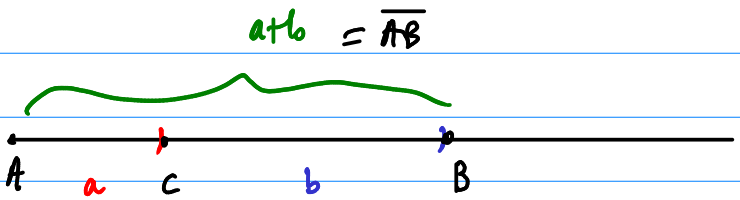
M621 9/10/18

§1.6 Constructible Numbers

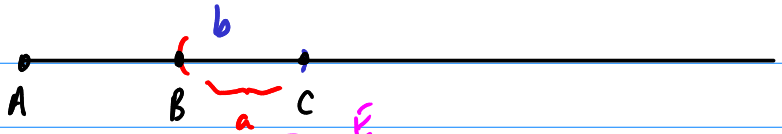
Ex. 1



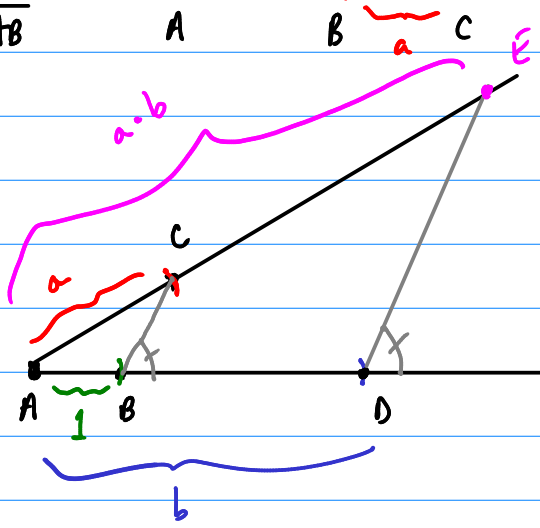


addition

subtraction: $b-a$: $\overline{AB}$



Multiply: $a \cdot b$



$\Delta ABC \sim \Delta ADE$

so

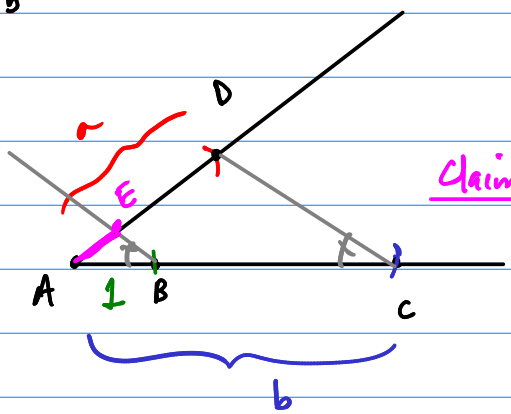
$$\frac{\overline{AC}}{\overline{AB}} = \frac{\overline{AE}}{\overline{AD}}$$

and

$$\frac{a}{1} = \frac{\overline{AE}}{b}$$

therefore, $\overline{AE} = a \cdot b$ ∎

Division: $\frac{a}{b}$



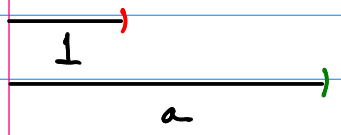
Claim: $\overline{AE} = \frac{a}{b}$

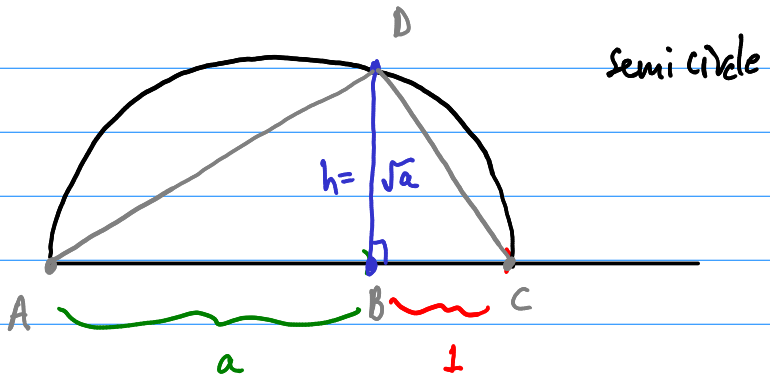
$$\frac{\overline{AD}}{\overline{AC}} = \frac{\overline{AE}}{\overline{AB}}$$

$$\frac{a}{b} = \frac{\overline{AE}}{1}$$

∎

Ex. Square Root:





semi circle

$\Delta ADC \sim \Delta ABD \sim \Delta DBC$

$$\frac{\overline{BD}}{\overline{AB}} = \frac{\overline{BC}}{\overline{BD}} \Rightarrow \frac{\overline{BD}}{a} = \frac{1}{\overline{BD}}$$

$$\Rightarrow (\overline{BD})^2 = a$$

$$\Rightarrow \overline{BD} = h = \sqrt{a}$$ ■

Ex. $\sqrt{\frac{2\sqrt{3}}{5}}$ Construct it!

1. $\sqrt{3}$
2. $2\sqrt{3}$
3. $\frac{2\sqrt{3}}{5}$

or

2*. $\frac{\sqrt{3}}{5}$

3*. $2\left(\frac{\sqrt{3}}{5}\right)$

4. $\sqrt{\frac{2\sqrt{3}}{5}}$

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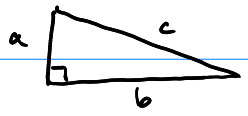
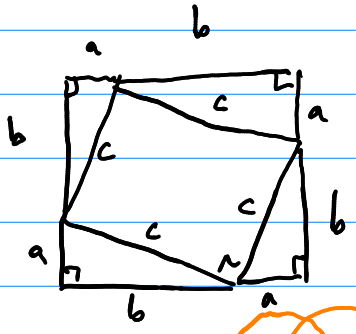
§1.7 Pythagorean Thm

A triangle ABC is right w/ hypotenuse opposite angle C if and only if

$$a^2 + b^2 = c^2.$$

Proof 1.





"Square"

Area $= s^2 = (a+b)^2 = (a+b)(a+b) = a^2 + 2ab + b^2$

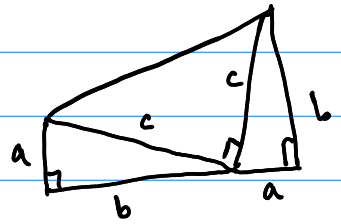
Also, Area $= 4 \cdot \text{Area}(\triangle) + \text{Area}(\diamond) = 4 \cdot \frac{1}{2}ab + c^2$

Setting these equal, $a^2 + 2ab + b^2 = 2ab + c^2$

and

$a^2 + b^2 = c^2$ ∎

Garfield (yr?)



Use area of trapezoid.