

Week 8 Angles, triangles, and trigonometry Continued Lecture Note

Notebook: Computational Mathematics

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Cornell Notes

Topic:

Sequences and Series
Continued

Course: BSc Computer Science

Class: Computational
Mathematics[Lecture]

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Essential Question:

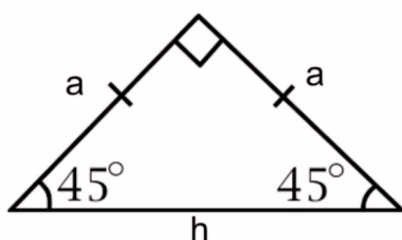
What are angles and what is trigonometry and how are these related to the study of triangles?

Questions/Cues:

- What is an example of Pythagoras theorem applied?
- What is an example of the Law of Sines applied?
- What is an example of the Law of Cosines applied?

Notes

Examples: Triangle Rectangle Isosceles



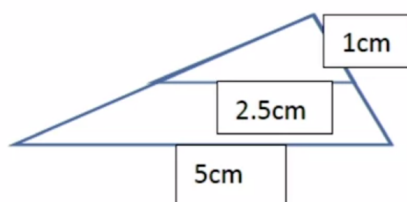
$$a^2 + b^2 = 2a^2 = h^2 \quad \text{Pithagora's theorem}$$

$$\rightarrow a = h/\sqrt{2}$$

$$a/h = 1/\sqrt{2} = \sin(45^\circ)$$

$$\rightarrow \sin(45^\circ) = 1/\sqrt{2} = \sqrt{2}/2$$

What is the length of the righthand side of the larger triangle?



Similar triangles

$$\rightarrow 1\text{cm}/X = 2.5\text{cm}/5\text{cm}$$

$$\rightarrow X = 2\text{cm}$$

Examples: Generic Triangle

$a=8\text{ cm}$ $b=3\text{ cm}$ $\alpha=58^\circ$ $c=?$ Note: $\sin(58^\circ)=0.848$

Use sine ratio: $a/\sin(\alpha)=b/\sin(\beta)=c/\sin(\gamma)$

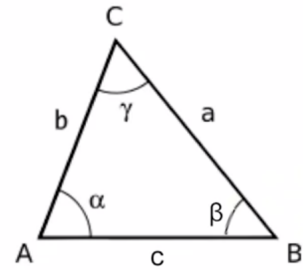
$$\rightarrow \sin(\beta)=b \sin(\alpha)/a \rightarrow \sin(\beta)=3 \times 0.848/8=0.318$$

$$\rightarrow \beta=\sin^{-1}(0.318)=18.54^\circ$$

$$\rightarrow \gamma=180^\circ-18.54^\circ-58^\circ=103.46^\circ$$

but $c/\sin(\gamma)=a/\sin(\alpha)$

$$\rightarrow c=a \sin(\gamma)/\sin(\alpha)=8 \times 0.97/0.848=9.15\text{cm}$$



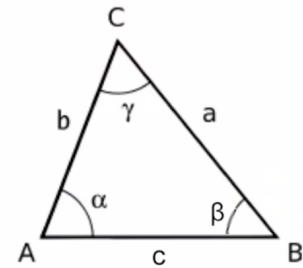
Examples: Generic Triangle

$a=6\text{ cm}$ $b=4\text{ cm}$ $c=3\text{ cm}$ $\alpha=?$

Use cosine rule: $a^2=b^2+c^2-2bc \cos(\alpha)$

$$\rightarrow \cos(\alpha)=\frac{b^2+c^2-a^2}{2bc}=\frac{16+9-36}{24}=-0.458$$

$$\rightarrow \alpha=\cos^{-1}(-0.458)=117.3^\circ$$



Summary

In this week, we learned how apply Pythagoras theorem, Sine law and Cosine law to a triangle.