

## Trigonometri – Nilai Trigonometri Sudut 18, 36, 54 dan 72 SESI 2

### Pertanyaan:

1.  $\sin 54^\circ - \sin 18^\circ = \dots$
2.  $\sin 54^\circ \sin 18^\circ = \dots$
3.  $\sin 54^\circ = \dots$
4.  $\sin 18^\circ = \dots$
5.  $\cos 36^\circ - \cos 72^\circ = \dots$
6.  $\cos 36^\circ \cos 72^\circ = \dots$
7.  $\cos 36^\circ = \dots$
8.  $\cos 72^\circ = \dots$

### Jawab:

1.  $\sin 54^\circ - \sin 18^\circ = \dots$

$$\begin{aligned}\sin 54^\circ - \sin 18^\circ &= (\sin 54^\circ - \sin 18^\circ) \frac{2 \cos 18^\circ}{2 \cos 18^\circ} = \frac{2 \sin 54^\circ \cos 18^\circ - 2 \sin 18^\circ \cos 18^\circ}{2 \cos 18^\circ} \\ &= \frac{\sin 72^\circ + \sin 36^\circ - \sin 36^\circ - \sin 0^\circ}{2 \cos 18^\circ} = \frac{\sin 72^\circ}{2 \cos 18^\circ} = \frac{\cos 18^\circ}{2 \cos 18^\circ} = \frac{1}{2}\end{aligned}$$

2.  $\sin 54^\circ \sin 18^\circ = \dots$

$$\begin{aligned}\sin 54^\circ \sin 18^\circ &= \frac{1}{2} (2 \sin 54^\circ \sin 18^\circ) = \frac{1}{2} (\cos 36^\circ - \cos 72^\circ) = \frac{1}{2} (\cos 36^\circ - \cos 72^\circ) \frac{2 \cos 18^\circ}{2 \cos 18^\circ} \\ &= \frac{1}{2} \left( \frac{2 \cos 36^\circ \cos 18^\circ - \cos 72^\circ \cos 18^\circ}{2 \cos 18^\circ} \right) = \frac{1}{2} \left( \frac{\cos 54^\circ + \cos 18^\circ - \cos 90^\circ - \cos 54^\circ}{2 \cos 18^\circ} \right) \\ &= \frac{1}{2} \left( \frac{\cos 18^\circ - 0}{2 \cos 18^\circ} \right) = \frac{1}{2} \left( \frac{\cos 18^\circ}{2 \cos 18^\circ} \right) = \frac{1}{2} \left( \frac{1}{2} \right) = \frac{1}{4}\end{aligned}$$

3.  $\sin 54^\circ = \dots$

Dari soal no 1 diperoleh  $\sin 18^\circ = \sin 54^\circ - \frac{1}{2}$

Substitusikan ke  $\sin 54^\circ \sin 18^\circ = \frac{1}{4}$  diperoleh:

$$\sin 54^\circ \left( \sin 54^\circ - \frac{1}{2} \right) = \frac{1}{4} \Rightarrow \sin^2 54^\circ - \frac{1}{2} \sin 54^\circ = \frac{1}{4} \Rightarrow 4 \sin^2 54^\circ - 2 \sin 54^\circ - 1 = 0$$

$$\sin 54^\circ = \frac{2 \pm \sqrt{4+16}}{8} = \frac{2 \pm \sqrt{20}}{8} = \frac{2 \pm 2\sqrt{5}}{8} = \frac{1 \pm \sqrt{5}}{4}$$

Rumus  $abc$

Karena sudut lancip, maka  $\sin 54^\circ = \frac{1 + \sqrt{5}}{4}$

4.  $\sin 18^\circ = \dots$

Dari soal no 1 diperoleh  $\sin 54^\circ = \sin 18^\circ + \frac{1}{2}$

Substitusikan ke  $\sin 54^\circ \sin 18^\circ = \frac{1}{4}$  diperoleh:

$$\left(\sin 18^\circ + \frac{1}{2}\right)\sin 18^\circ = \frac{1}{4} \Rightarrow \sin^2 18^\circ + \frac{1}{2}\sin 18^\circ = \frac{1}{4} \Rightarrow 4\sin^2 18^\circ + 2\sin 18^\circ - 1 = 0$$

$$\sin 18^\circ = \frac{-2 \pm \sqrt{4+16}}{8} = \frac{-2 \pm \sqrt{20}}{8} = \frac{-2 \pm 2\sqrt{5}}{8} = \frac{-1 \pm \sqrt{5}}{4}$$

Rumus abc

Karena sudut lancip, maka  $\sin 18^\circ = \frac{-1 + \sqrt{5}}{4}$

Sampai di sini, kita bisa menentukan nilai-nilai trigonometri yang lainnya yaitu Kosinus dan Tangen dengan bantuan segitiga siku-siku. Kita juga bisa mencari nilai-nilai trigonometri untuk sudut  $36^\circ$  dan  $72^\circ$  dengan rumus sudut berelasi di kuadran 1 ( $\sin [90 - A] = \cos A$ , dst). **Monggo dilengkapi sebagai latihan ....**

5.  $\cos 36^\circ - \cos 72^\circ = \dots$  (*perhatikan jawaban no 2*) atau

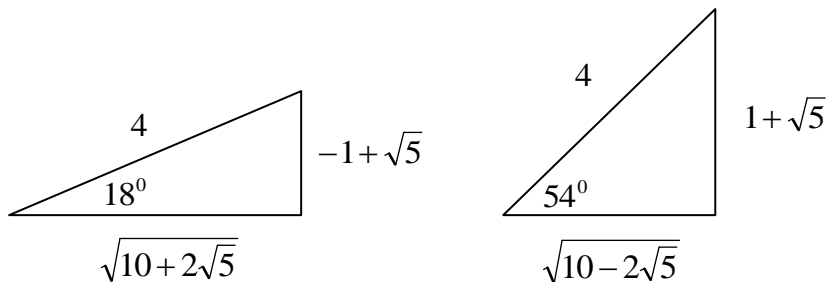
$$\begin{aligned} \cos 36^\circ - \cos 72^\circ &= (\cos 36^\circ - \cos 72^\circ) \frac{2(\cos 36^\circ + \cos 72^\circ)}{2(\cos 36^\circ + \cos 72^\circ)} = \frac{2\cos^2 36^\circ - 2\cos^2 72^\circ}{2(\cos 36^\circ + \cos 72^\circ)} \\ &= \frac{\cos 72^\circ + 1 - (\cos 144^\circ + 1)}{2(\cos 36^\circ + \cos 72^\circ)} = \frac{\cos 72^\circ - \cos 144^\circ}{2(\cos 36^\circ + \cos 72^\circ)} \\ &= \frac{\cos 72^\circ + \cos 36^\circ}{2(\cos 36^\circ + \cos 72^\circ)} = \frac{1}{2} \end{aligned}$$

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

6.  $\cos 36^\circ \cos 72^\circ = \frac{1}{4}$  (langkah pengerjaan seperti no 2)

7.  $\cos 36^\circ = \dots$  (gunakan hasil soal 5 dan 6, atau sudut berelasi di kuadran 1)

8.  $\cos 72^\circ = \dots$  (gunakan hasil soal 5 dan 6, atau sudut berelasi di kuadran 1)



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