

If $\sin a = 0.25$ and $\cos b = 0.25$, which of the following is $\sin \frac{b}{2} + \cos \frac{a}{2}$?

- A. 1.60
- B. 1.32
- C. 0.26
- D. 1.06

Solution.

Since $\sin a = 0.25 > 0$ then $a \in (0, \pi)$ where sine is a positive value.

Since $\cos b = 0.25 > 0$ then $b \in (0, \pi)$ where cosine is a positive value.

So $\sin \frac{b}{2} > 0$ and $\cos \frac{a}{2} > 0$.

Express $\sin \frac{b}{2} = f(\cos b)$:

We have the formula:

$$\sin^2 \alpha = \frac{1 - \cos 2\alpha}{2}$$

Use it:

$$\sin^2 \frac{b}{2} = \frac{1 - \cos b}{2}$$

Then

$$\sin \frac{b}{2} = \sqrt{\frac{1 - \cos b}{2}} = \sqrt{\frac{1 - 0.25}{2}} = \sqrt{0.375} \approx 0.61$$

Similarly, express $\cos \frac{a}{2} = f(\sin a)$:

Use this formula $\cos^2 \alpha = \frac{1 + \cos 2\alpha}{2}$:

$$\cos^2 \frac{a}{2} = \frac{1 + \cos a}{2} = \frac{1 + \sqrt{1 - \sin^2 a}}{2} = \frac{1 + \sqrt{1 - 0.0625}}{2} \approx 0.99$$

So calculate $\sin \frac{b}{2} + \cos \frac{a}{2}$:

$$\sin \frac{b}{2} + \cos \frac{a}{2} = 0.61 + 0.99 = 1.6$$

Answer: A. 1.60