

## Precalculus

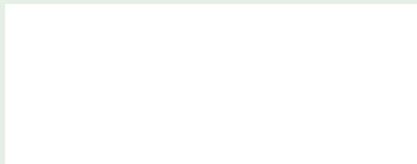
**Simplify basic trigonometric functions  
evaluated on basic inverse trigonometric  
functions**

Todor Milev

2019

## Example

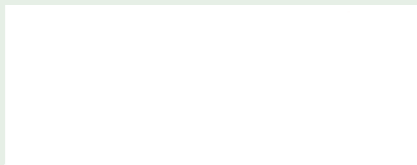
Find  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right)$ .



## Example

Find  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right)$ .

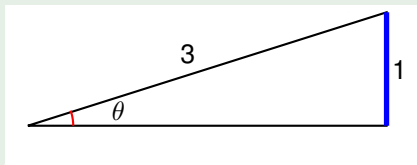
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .



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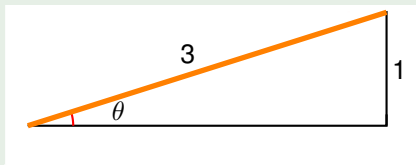
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with **opposite side 1** and hypotenuse 3.



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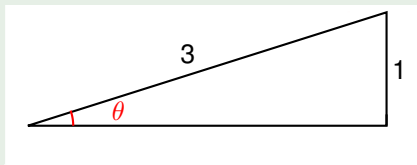
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
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Find  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right)$ .

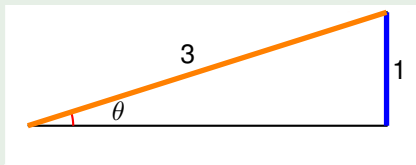
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled.



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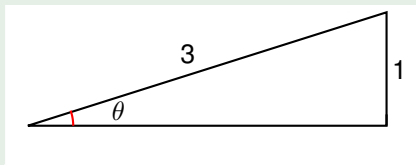
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$



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Find  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right)$ .

- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$  and so  $\theta = \arcsin \left( \frac{1}{3} \right)$ .

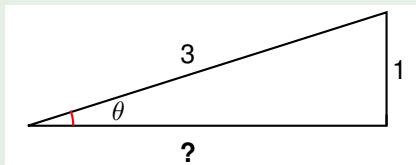




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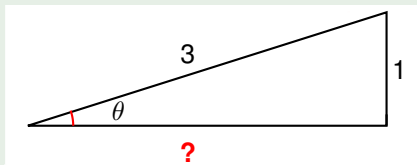
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$  and so  $\theta = \arcsin \left( \frac{1}{3} \right)$ .
- Length of adjacent side = ?



## Example

Find  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right)$ .

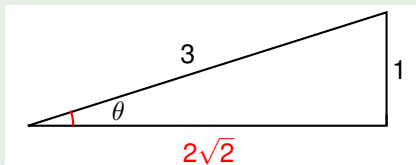
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$  and so  $\theta = \arcsin \left( \frac{1}{3} \right)$ .
- Length of adjacent side =  $\sqrt{3^2 - 1^2}$



## Example

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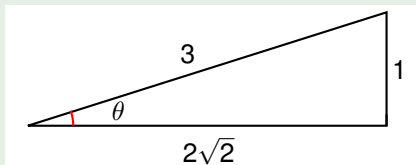
- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$  and so  $\theta = \arcsin \left( \frac{1}{3} \right)$ .
- Length of adjacent side  $= \sqrt{3^2 - 1^2} = \sqrt{8} = 2\sqrt{2}$ .



## Example

Find  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right)$ .

- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$  and so  $\theta = \arcsin \left( \frac{1}{3} \right)$ .
- Length of adjacent side  $= \sqrt{3^2 - 1^2} = \sqrt{8} = 2\sqrt{2}$ .
- Then  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right) = ?$



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- Let  $\theta = \arcsin \left( \frac{1}{3} \right)$ , so  $\sin \theta = \frac{1}{3}$ .
- Draw a right triangle with opposite side 1 and hypotenuse 3.
- Let the angle  $\theta$  be as labeled. Then  $\sin \theta = \frac{1}{3}$  and so  $\theta = \arcsin \left( \frac{1}{3} \right)$ .
- Length of adjacent side  $= \sqrt{3^2 - 1^2} = \sqrt{8} = 2\sqrt{2}$ .
- Then  $\tan \left( \arcsin \left( \frac{1}{3} \right) \right) = \frac{1}{2\sqrt{2}}$ .

