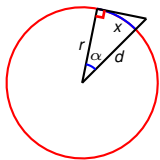# Precalculus
Inverse trig word problem

Todor Milev

2019

Example

not to scale

The horizon at sea is viewed at from a ship height of 10m. How far does the ship need to travel to reach the horizon just observed? Assume earth is round with radius 6371 km and that the ship sails along the shortest curved path.

- Let d be the distance from eyes of seaman to the center of earth.
- Let r be the radius of earth. Let α be the indicated angle.
- Let the distance to the horizon be x.

$r = 6371\text{km}$

$d = 6371\text{km} + 0.01\text{km} = 6371.01\text{km}$

$\cos \alpha = \dfrac{r}{d}$

$\alpha = \arccos\left(\dfrac{r}{d}\right)$

$x = r\alpha = r\arccos\left(\dfrac{r}{d}\right) = 6371\text{km}\arccos\left(\dfrac{6371\text{km}}{6371.01\text{km}}\right) \approx 11.29\text{km}$

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