

Precalculus

Inverse trig word problem

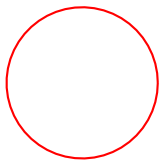
Todor Milev

2019

Example

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?

Example



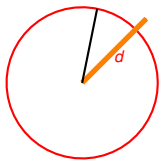
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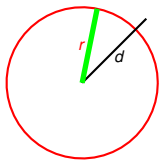


not to scale

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.

Example

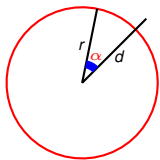


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- Let d be the distance from eyes of seaman to the center of earth.
- Let r be the radius of earth.

Example

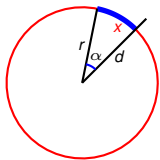


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- Let d be the distance from eyes of seaman to the center of earth.
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Example

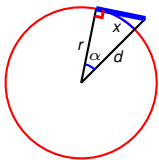


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- Let the distance to the horizon be x .

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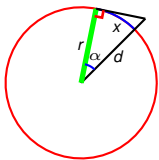


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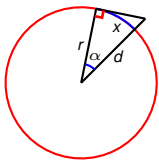
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$$r = 6371 \text{ km}$$

Example



not to scale

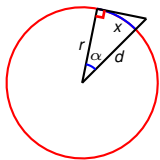
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$$r = 6371 \text{ km}$$

$$d = ?$$

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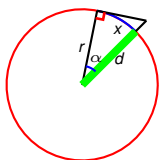
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$$r = 6371 \text{ km}$$

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

Example



not to scale

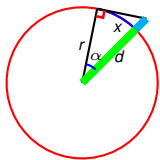
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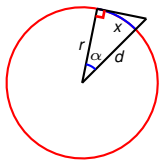
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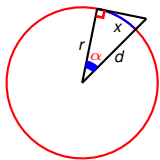
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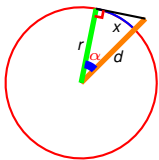
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$$\cos \alpha = ?$$

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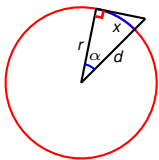
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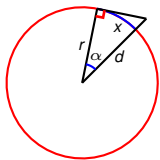
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$$\cos \alpha = \frac{r}{d}$$

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

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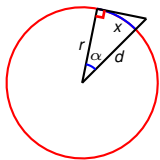
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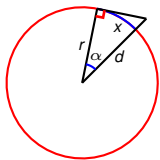
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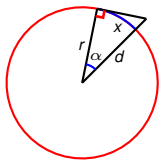
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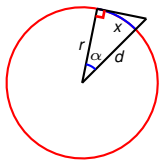
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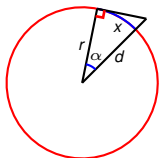
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