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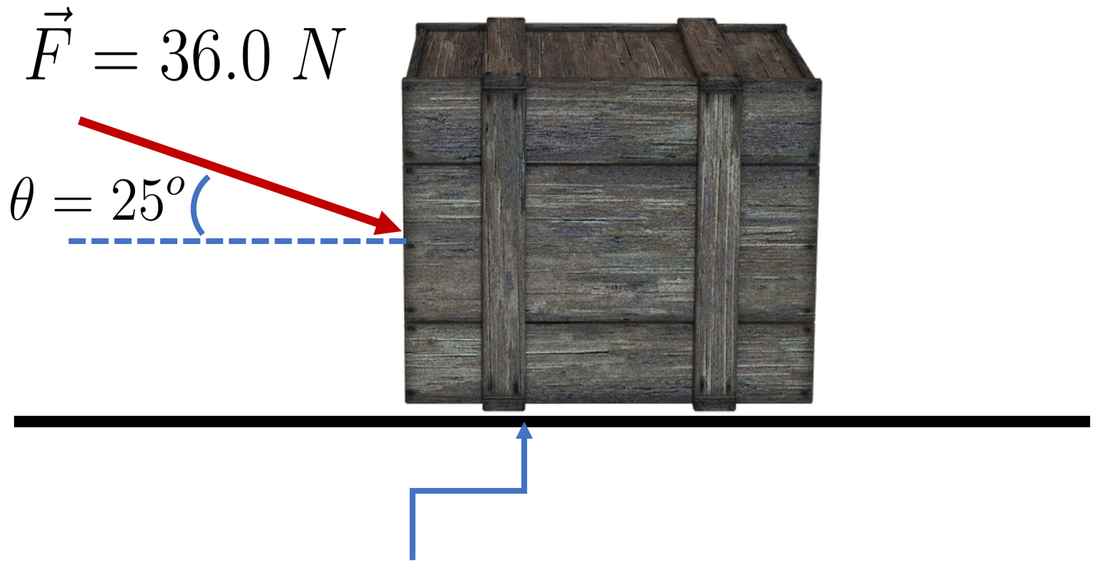
Object Moving on a Frictionless Floor

A wooden crate, mass 6.00 kg, is being pushed by a force of 36.0 N magnitude as shown below, on a frictionless floor.
The force makes a 25^0 angle with the horizontal as indicated.
Find the crate's acceleration.



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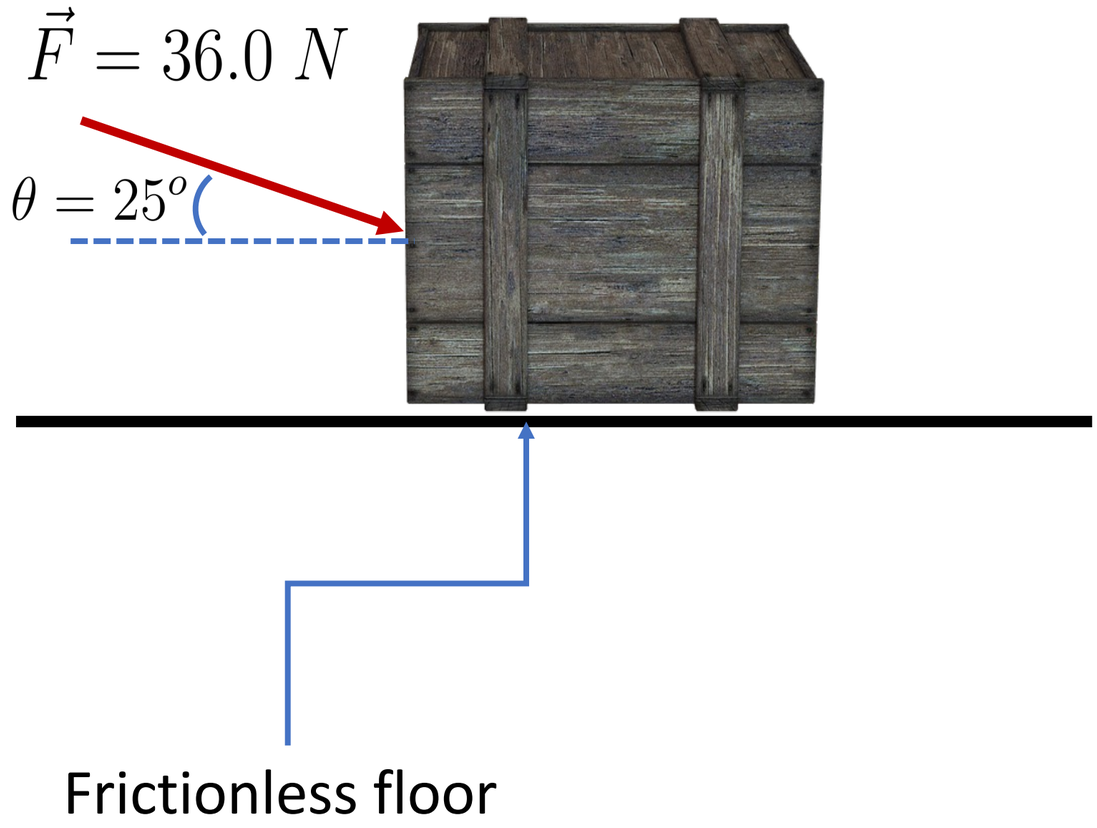
Find the crate's acceleration

$$m_{crate} = 6.00\ kg$$

$$\vec{F} = 36.0\ N$$

$$\theta = 25^o$$



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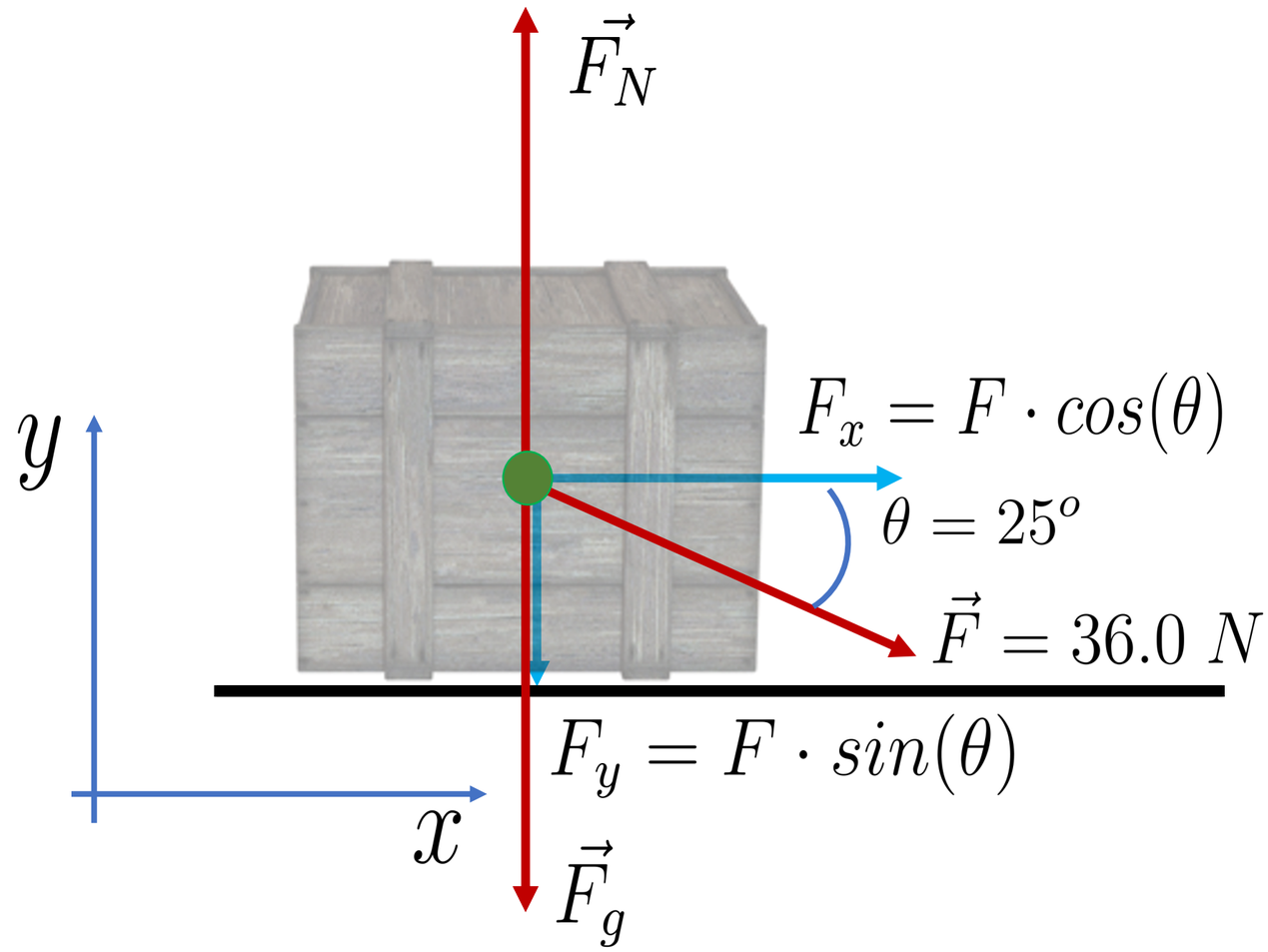
Free Body Diagram (FBD)

$$m_{crate} = 6.00\ kg$$

$$\vec{F} = 36.0\ N$$

$$\theta = 25^o$$



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Free Body Diagram (FBD)

$$m_{crate} = 6.00\ kg$$

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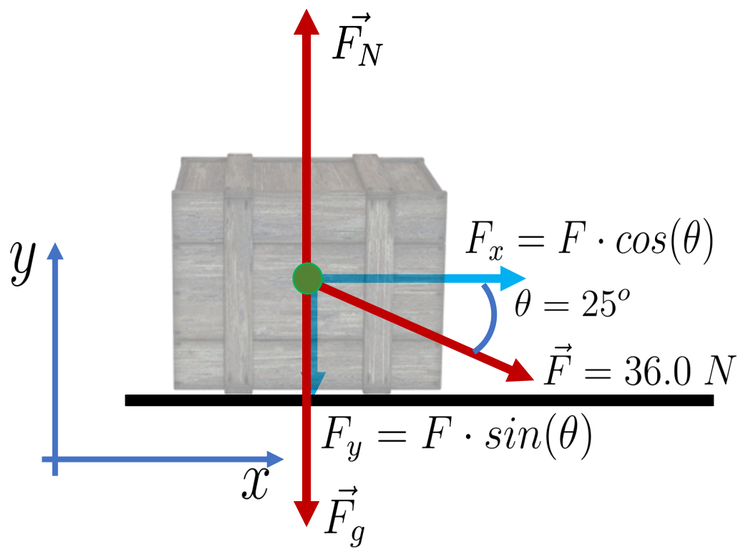

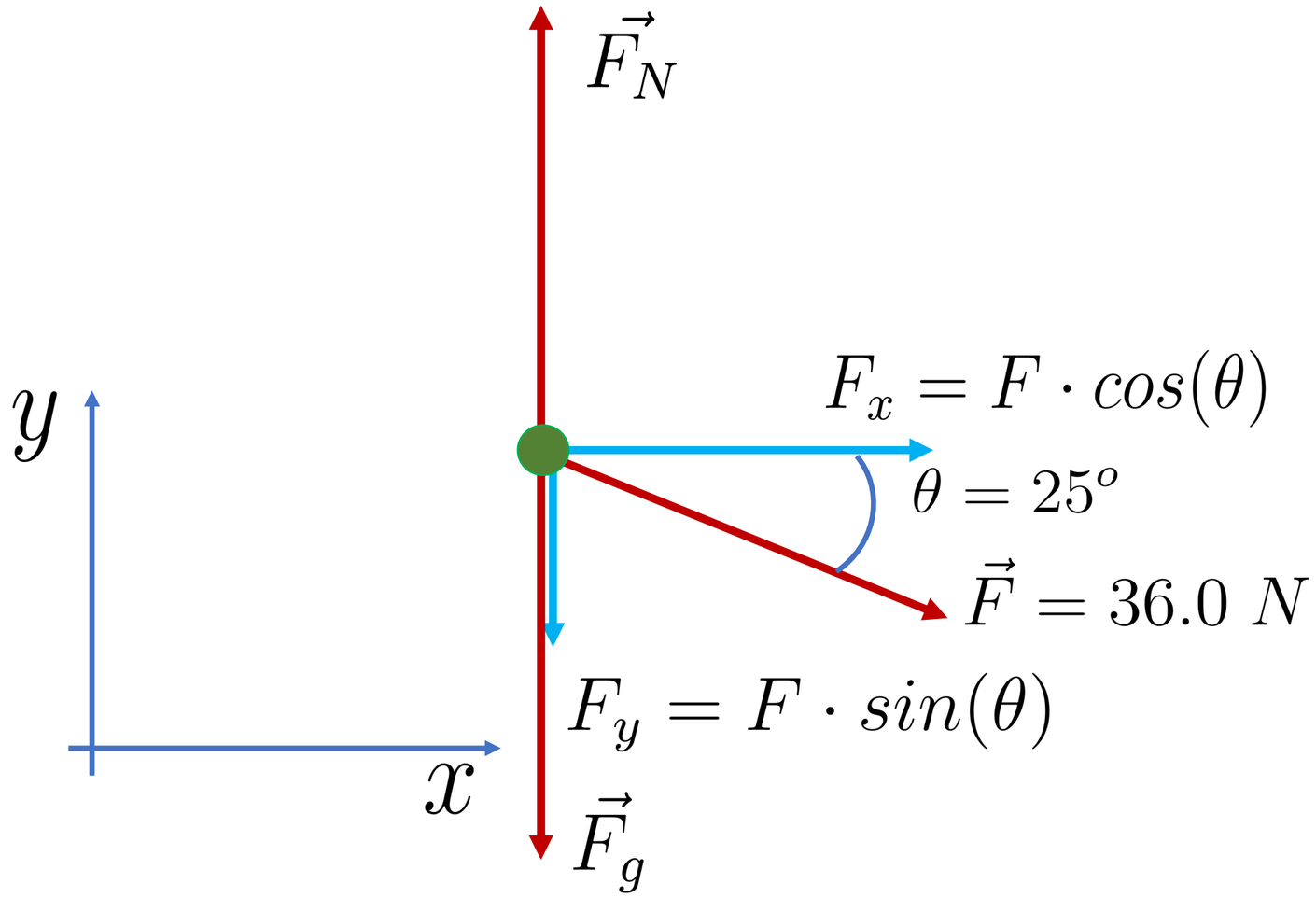

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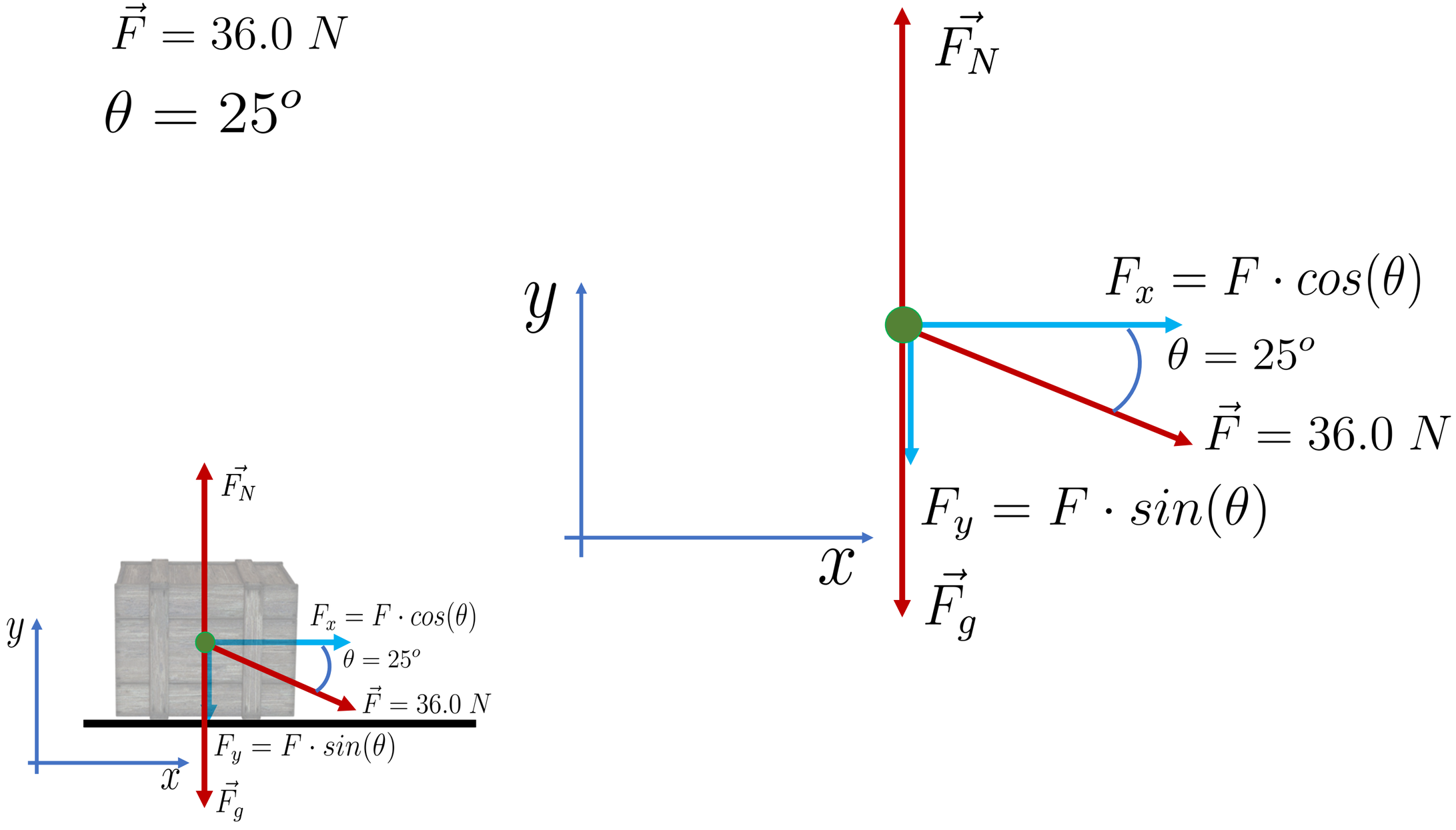
Newton's 2nd law

$$\sum \vec{F} = m\ \vec{a}$$

$$m_{crate} = 6.00\ kg$$

$$\vec{F} = 36.0\ N$$

$$\theta = 25^o$$



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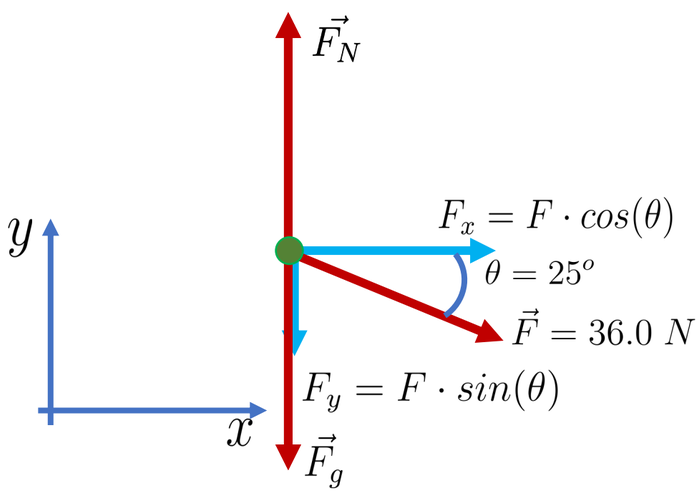
Newton's 2nd law

Y axis

Solve for Normal Force

$$\sum F_y = 0$$



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Newton's 2nd law

Y axis

Solve for Normal Force

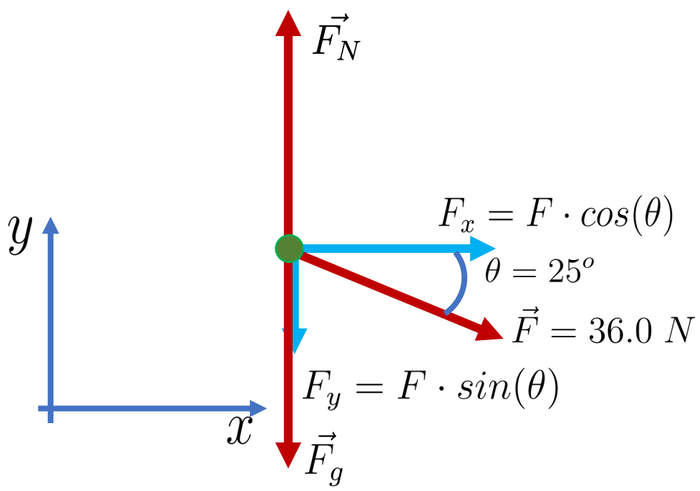
$$\sum F_y = 0$$

$$F_N - F_g - F_y = 0$$

$$F_N = F_g + F_y$$

$$F_N = m \cdot g + F \cdot sin(\theta)$$

$$\boxed{F_N = 74.1\ N}$$



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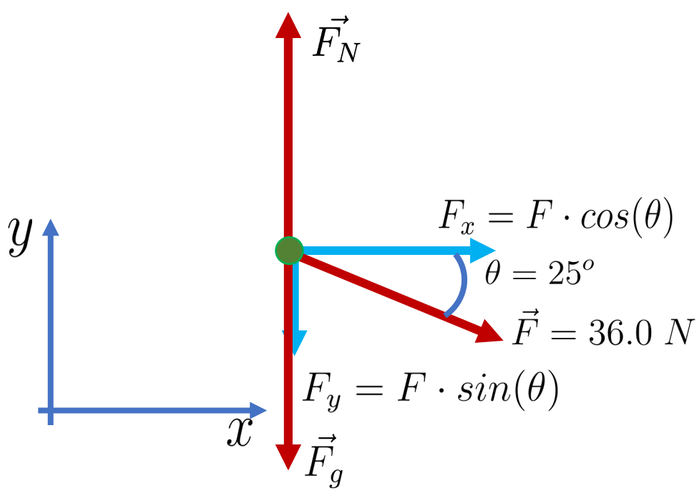
Newton's 2nd law

X axis

$$\sum F_x = m\ a_x$$



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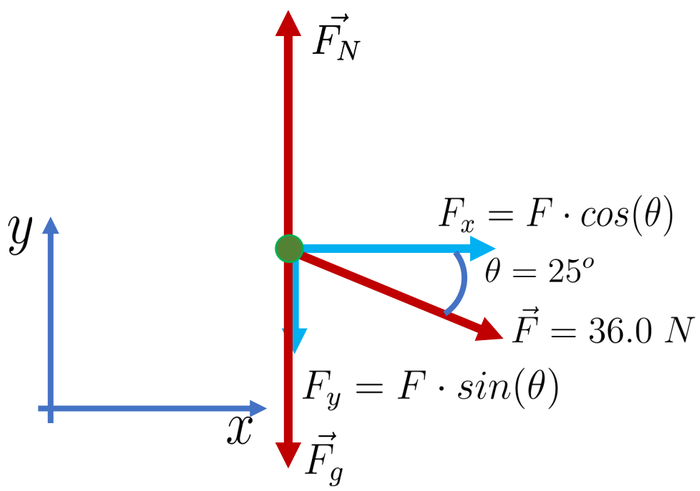
Newton's 2nd law

X axis

$$\sum F_x = m\ a_x$$

Solve for acceleration



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Newton's 2nd law

X axis

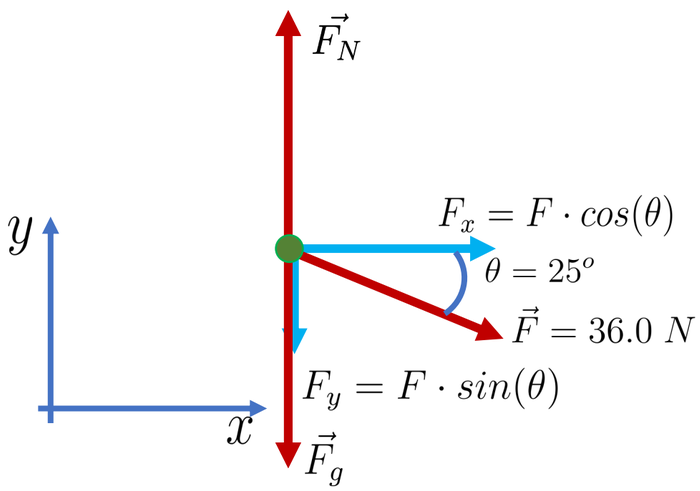
$$\sum F_x = m\ a_x$$

Solve for acceleration

$$F_x = ma_x$$

$$32.6\ N = 6.00\ kg\ \cdot a_x$$

$$a_x = 5.43\ \frac{m}{s^2}$$



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