# Forces and Incline Planes

Ch 5.25 in book



## Objectives

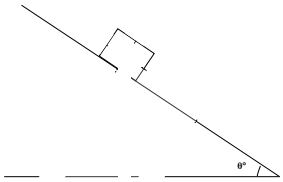
- Analyze the motion of an object on an inclined plane without and with friction



## Frictionless surface

- Free body diagram
- Define $F_N$

## Frictionless plane




- Free body diagram

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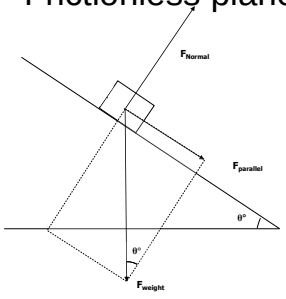
## Frictionless plane




- Steps:
  - Calculate weight
  - Calculate normal force
  - Calculate the parallel force
  - Calculate the acceleration

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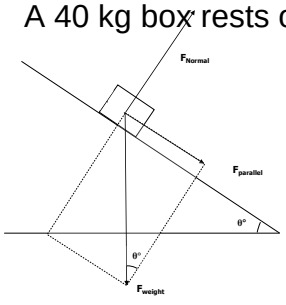
## Example 1

A 40 kg box rests on an 18° incline.




- Steps:
  - Calculate weight
  - Calculate normal force
  - Calculate the parallel force
  - Calculate the acceleration

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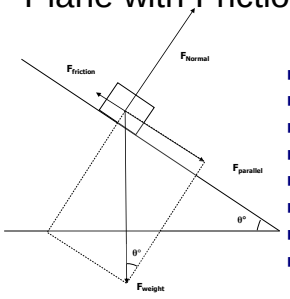
## Plane with Friction




- Calculate weight
- Calculate normal force
- Calculate parallel force
- Calculate $F_{f,s}$
- Does object slide?
- If so, calculate $F_{f,k}$
- Calculate net force
- Calculate acceleration

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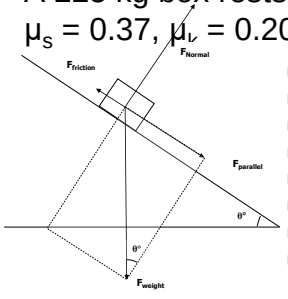
## Example 2

A 225 kg box rests on a 20° incline. $\mu_s = 0.37$, $\mu_\nu = 0.20$:




- Calculate weight
- Calculate normal force
- Calculate parallel force
- Calculate $F_{f,s}$
- Does object slide?
- If so, calculate $F_{f,k}$
- Calculate net force
- Calculate acceleration

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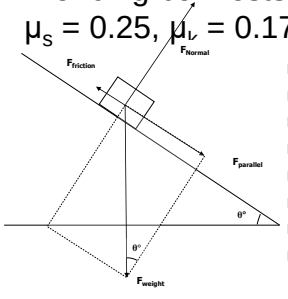
## Example 3

A 540 kg box rests on a 31° incline. $\mu_s = 0.25$, $\mu_\nu = 0.17$:




- Calculate weight
- Calculate normal force
- Calculate parallel force
- Calculate $F_{f,s}$
- Does object slide?
- If so, calculate $F_{f,k}$
- Calculate net force
- Calculate acceleration

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