

Chapter 5 - Forces and Friction

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5.3 - Friction - Pg. 6

Personal notes:



5.1 - Resolving Forces

Notes

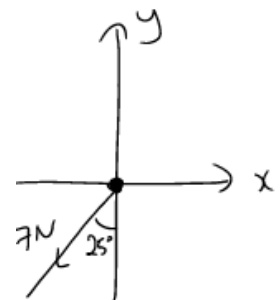
Recall: You have learnt how to find the magnitude of a force in vector form.

- E.g. Given $F = (3i + 4j)N$, find $|F|$ and the angle it makes with the i -direction.

When reversing this process (i.e. magnitude and θ is given, but need to work out the force in i and j -direction), this is known as resolving the force.

Example

Resolve the following force in a) x -direction, b) y -direction and c) write the force in $xi + yj$ form.



Notes

Any resultant force that is "diagonal" can be resolved into two directions:

i)

ii)

If there are more than 1 forces acting on the body, then

i)

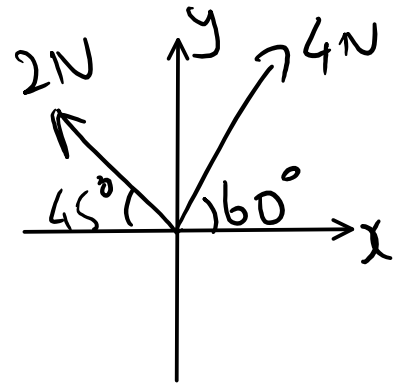
ii)



5.1 - Resolving Forces

Example

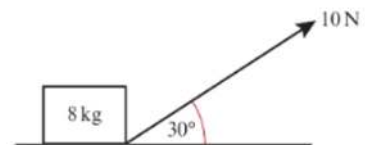
Find the sum of forces in a) x -direction and b) y -direction.



Example

A box of mass 8 kg lies on a smooth horizontal floor. A force of 10 N is applied at an angle of 30° causing the box to accelerate horizontally along the floor.

- Work out the acceleration of the box.
- Calculate the normal reaction between the box and the floor.



5.2 - Inclined Planes

Notes



5.2 - Inclined Planes

Example

A particle of mass 10kg slides downwards from rest at an angle α , where $\tan\alpha = \frac{3}{4}$.

Find a) the acceleration of the particle

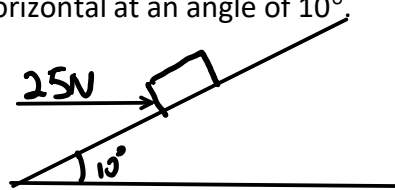
b) the distance it slides in the first 2 seconds.

Example

A box of mass 2kg is pushed up on a smooth plane by a horizontal force of magnitude 25N. The plane is inclined to the horizontal at an angle of 10° .

a) Find the reaction force of the box.

b) Find the acceleration of the box.



5.3 - Friction

Notes

Formula about *friction* (f):

Example

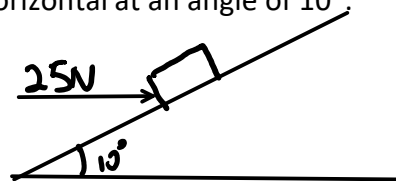
A block of mass 5kg is pulled along a rough horizontal surface by a horizontal force P . The coefficient of friction between the block and the surface is 0.4. Find the magnitude of frictional force and acceleration of the block if

- a) $P = 10\text{N}$
- b) $P = 50\text{N}$

Example

A box of mass 2kg is pushed up on a rough plane by a horizontal force of magnitude 25N. The plane is inclined to the horizontal at an angle of 10° . Given the coefficient of friction is 0.015.

- a) Find the reaction force of the box.
- b) Find the acceleration of the box.



**Compare to Example 2 in chp 5.2 and easily see the difference in calculation between smooth and rough plane

