

INKMATHS FLASHCARDS

Mechanics essentials

11 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions in precise wording, the standard results the formulae booklet does not print, a check-yourself question per topic, and the slips that lose marks. The same cards run on the website with spaced-repetition scheduling, at inkmaths.co.uk/flashcards.

STANDARD RESULT

Weight:

$$W = ?$$

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STANDARD RESULT

Moments:

$$\text{moment} = ?$$

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STANDARD RESULT

The friction law:

$$F \leq \mu R$$

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STANDARD RESULT

Projectile components:

$$u \text{ at angle } \theta \Rightarrow ?$$

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STANDARD RESULT

Weight on a slope:

$$\text{components of } mg \text{ on a slope at } \theta: ?$$

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DEFINITION

Define: Limiting equilibrium.

MECHANICS ESSENTIALS

DEFINITION

Define: Uniform beam.

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CHECK YOURSELF

A 5 kg crate is pulled by 30 N against 10 N of resistance. Find its acceleration.

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STANDARD RESULT

moment = force $\times$ perpendicular distance

MECHANICS ESSENTIALS

STANDARD RESULT

$W = mg$, with $g = 9.8 \text{ m s}^{-2}$

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STANDARD RESULT

$u \cos \theta$ across, $u \sin \theta$ up

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STANDARD RESULT

$F \leq \mu R$, equality only at the limit or when sliding

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DEFINITION

The state in which an object is still in equilibrium but on the point of slipping, so friction has reached its maximum value μR .

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STANDARD RESULT

$mg \sin \theta$ along, $mg \cos \theta$ into

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CHECK YOURSELF

Resultant 20 N, so $a = 20/5 = 4 \text{ m s}^{-2}$: $F = ma$ uses the resultant, never a single force.

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DEFINITION

A beam whose mass is evenly spread, so its whole weight can be modelled as acting at its midpoint.

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CHECK YOURSELF

Masses of 7 kg and 3 kg hang over a smooth pulley. Write the two equations of motion.

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SPOT THE ERROR

Say what is wrong with this claim:

At the top of its flight, a projectile's acceleration is zero.

MECHANICS ESSENTIALS

SPOT THE ERROR

Say what is wrong with this claim:

A moving object must have a force pushing it along.

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SPOT THE ERROR

Only the vertical velocity is zero at the apex. Gravity acts all flight long, so the acceleration is 9.8 m s^{-2} downwards there, the same as everywhere else.

MECHANICS ESSENTIALS

CHECK YOURSELF

$7g - T = 7a$ for the falling mass, $T - 3g = 3a$ for the rising one; adding gives $a = 0.4g$.

MECHANICS ESSENTIALS

SPOT THE ERROR

Newton's first law says the opposite: with no resultant force, motion simply continues. Forces change velocity; they are not needed to keep it. What slows real objects is a real backward force, friction or resistance.

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