SCIENCE FOUNDATIONS

Friction

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how your shoes grip the sidewalk, your car brakes stop on a wet road, and a match lights when you strike it, because rubbing surfaces push back against motion. A driver in winter counts on tire tread and road salt to keep enough grip to stop. A carpenter sands wood smooth to reduce friction, then uses glue and screws to hold the joint where friction alone is not enough. Knowing friction tells you when grip helps you and when it gets in the way, and how to change it.



Rule

Friction: friction always acts opposite to the motion, or opposite to the attempted motion.

Static friction holds a still object in place, and kinetic friction acts on a sliding object. Rougher surfaces and more weight increase friction.

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Worked examples

EXAMPLE 1

Q A box is pushed right but does not move. Which way does friction act?



SOLUTION

Ask the attempted motion: the push tries to move it right.

Friction opposes attempted motion, so it acts left.

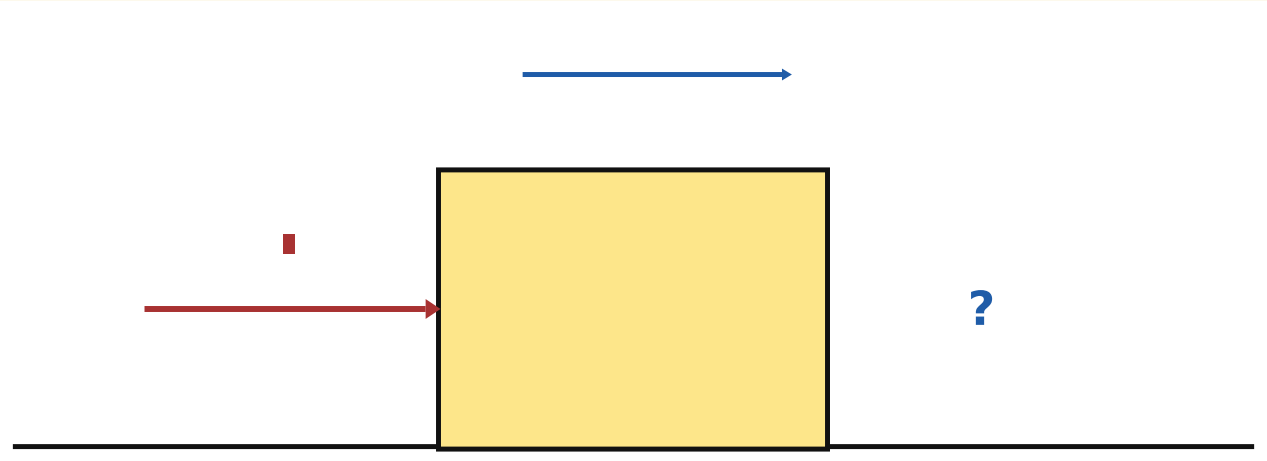
Since it does not move, static friction equals the push.

The result is friction left, equal to the push.

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EXAMPLE 2

Q A box slides right. Which way does kinetic friction act?



SOLUTION

Ask the motion: the box moves right.

Friction opposes motion, so it acts left.

Label it kinetic friction.

The result is friction left.

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Practice questions

1

Friction direction vs motion?

A Opposite

B The same direction

C Upwards

D Downwards

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2

A book is pushed left but does not move. Which way does friction act?

A Right

B Left

C Up

D Down

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3

A sled slides left. Which way does kinetic friction act?

A Right

B Left

C Up

D Down

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4

Static or kinetic for a sliding box?

A Kinetic

B Static

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5 Static or kinetic for a still box?

A Static

B Kinetic

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6 Does roughness increase friction?

A Yes

B No

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7 Does more weight increase friction?

A Yes

B No

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8 What lets you walk without slipping?

- A Friction
- B Gravity
- C Air resistance
- D Magnetism

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9 What does friction oppose?

- A Motion or attempted motion
- B Only motion
- C Only still objects
- D Only falling objects

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10

Can friction ever help motion?

A Yes, for example walking and gripping

B No, friction always slows things down

C Yes, friction always speeds things up

D No, friction never acts on people

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ANSWER KEY

1. Opposite
2. Right
3. Right
4. Kinetic
5. Static
6. Yes
7. Yes
8. Friction
9. Motion or attempted motion
10. Yes, for example walking and gripping

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