Friction in everyday life for Grade 8

Visual learning guide - Science · Grade 8

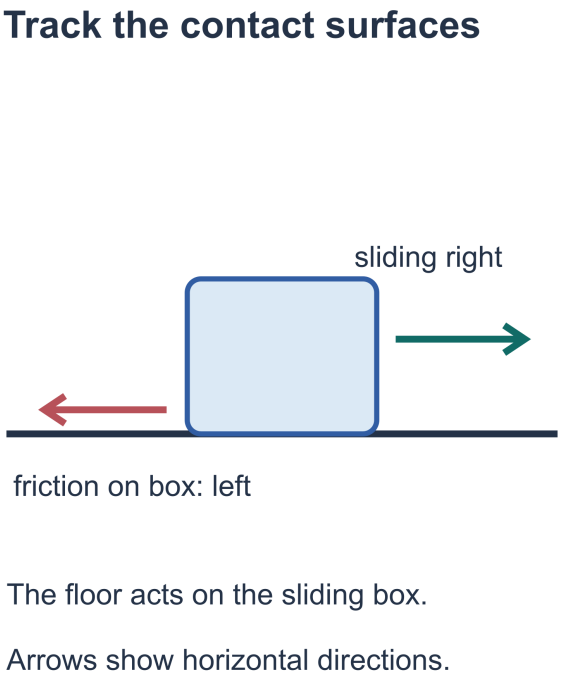
Explain grip, sliding, brakes and fluid resistance by identifying the contact and motion. Use force arrows, worked cases and practice with reasons.

Start with the key idea

Friction is a contact force opposing relative motion or the tendency to slide between surfaces. Static friction can act without sliding and adjusts up to a limit. Sliding and rolling resistance differ. Friction can be useful for grip and braking, while also causing wear and thermal energy transfer.

1. Name the two surfaces and the possible motion

Start with a box on a floor. The contact is between the bottom of the box and the floor. If the box slides right relative to the floor, friction on the box acts left. Label which object receives the force; the floor also experiences a force from the box.



A box sliding right on a floor experiences friction to the left at the contact.

Friction opposes relative sliding or its tendency at the contact. This wording is more reliable than "friction always points backwards". A walking person can receive a forward friction force from the ground because the foot tends to push the ground backwards.

A force diagram should show the chosen object and the relevant forces. For a simple horizontal example, identify friction separately from weight and the supporting force. Do not draw a horizontal friction arrow as though it were the object's weight.

2. Static friction can act before sliding begins

When a small push fails to move a box, static friction can balance the horizontal push. If the push increases while the box remains still, static friction can increase too, up to a maximum determined by the contact conditions.

Static friction is not always equal to its maximum possible value. If the horizontal applied force is zero on a level surface with no other tendency to slide, the required friction may be zero. The force responds to the situation.

Once the push exceeds what the contact can support without sliding, the box begins to slide. This transition explains why starting a heavy object can feel different from keeping it moving. The exact comparison depends on the materials and conditions.

3. Compare sliding and rolling resistance

Sliding friction acts when surfaces move across one another. It can convert organised mechanical energy into internal energy, warming the contacting materials. Rubbing hands is a familiar example, but do not rub so hard that the skin is irritated.

Rolling often reduces resistance compared with dragging the same load on the same surface. Wheels and bearings exploit this. Rolling resistance is not zero: deformation, contact effects and other losses still matter.

Do not use "rolling friction is always least" as a universal rule without conditions. A small wheel on soft ground can face substantial resistance. Make comparisons for a stated load, surface and wheel arrangement.

4. Consider surfaces and the normal contact force

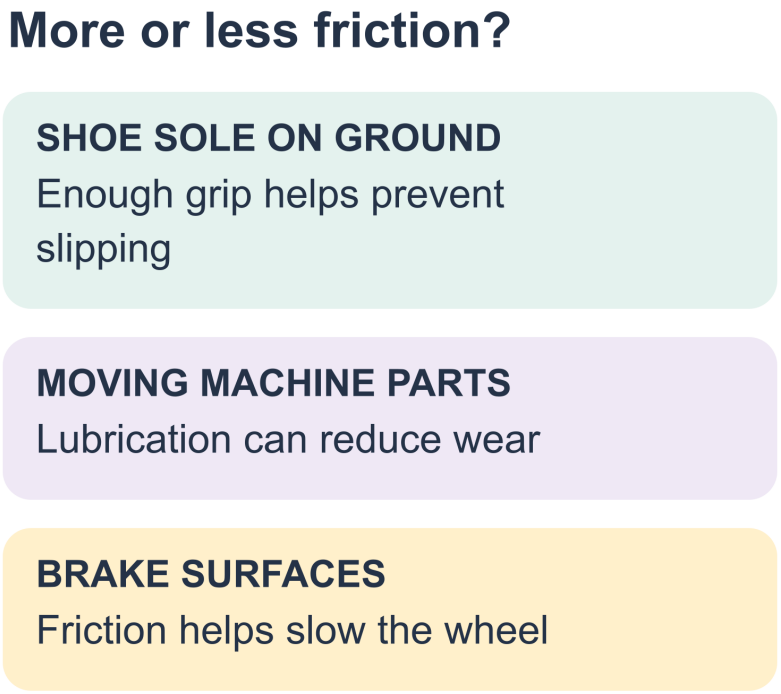
For many dry solid contacts, friction depends on the material pair and how strongly the surfaces are pressed together. The supporting normal force is perpendicular to the contact. On a simple horizontal floor with no other vertical forces, it equals the object's weight.

Roughness is one influence, but microscopic adhesion and deformation also matter. Polishing a surface does not guarantee friction decreases in every situation. School models simplify this behaviour; state the model rather than treating it as an exception-free law.

Changing the apparent contact area alone does not necessarily change dry friction in the simple model. A broad box face and a narrow face can have similar sliding friction when the load and material pair remain the same, although real soft surfaces can behave differently.

5. Friction can help or hinder the task

Shoe soles need enough grip for walking. Brakes use friction to slow motion. Writing with a pencil depends partly on contact that leaves material on paper. Removing all friction would make many ordinary actions difficult.



Shoe soles and brakes need friction, while machine contacts may benefit from reduced friction and wear.

Lubricants can reduce direct contact and wear in moving machine parts. Bearings replace much sliding with rolling. Streamlined shapes can reduce fluid resistance. These are different ways to change resistance, chosen for different jobs.

Never put oil on brakes or shoe soles to demonstrate friction reduction. Use safe pictures or classroom models. A useful material in one location can make another location unsafe because the task needs grip.

6. Extend the idea to drag in air and water

A moving object in air or water experiences fluid resistance, often called drag. Its size depends on speed, shape, orientation and fluid properties. The effect is not identical to the simple dry-friction model for a block.

A cyclist crouching changes the shape presented to the air. A swimmer's position changes water resistance. Increasing speed can greatly increase drag, so do not assume that doubling speed merely doubles the resisting force in every regime.

For a final explanation, identify the contact or fluid, the motion and whether resistance helps the task. Then suggest a change and explain its trade-off. "Increase friction" and "reduce friction" are decisions that need a purpose.

5 worked examples with reasoning

1. A box slides right on a fixed floor. Draw friction on the box.

1. Identify the relative sliding direction: right.
2. Friction on the box opposes that sliding.
3. Draw its arrow left.

2. A box remains still under a small push. Is friction absent?

1. There is a tendency to slide.
2. Static friction can balance the push.
3. It need not be at its maximum value.

3. Why do wheels help move a suitcase?

1. They replace much sliding with rolling.
2. Rolling resistance is often lower for the stated conditions.
3. It is reduced, not eliminated.

4. Why should brake surfaces not be lubricated for an experiment?

1. Braking requires sufficient friction.
2. Reducing it can reduce stopping ability.
3. Use a safe model instead of changing real brakes.

5. Why can friction act forward on a walking person?

1. The foot tends to push backwards against the ground.
2. The ground's friction force on the foot can act forward.
3. The direction follows relative sliding tendency at the contact.

Use the ideas without looking at the notes

Choose walking, braking and moving a suitcase. For each, identify the contact, draw the relevant friction direction and explain whether more or less resistance helps.

Common questions

Can friction act on a stationary object?

Yes. Static friction can balance a tendency to slide.

Is friction always harmful?

No. Grip, writing and braking depend on it.

Is rolling resistance zero?

No. It is often lower than sliding resistance under comparable conditions.

Why does friction's direction need care?

It follows relative sliding or its tendency at the contact, not always the object's overall travel direction.

Is air resistance the same as dry sliding friction?

Both resist motion, but their detailed behaviour and models differ.

Connect your learning

- Review force effects and contact area
- Distinguish thermal energy transfer mechanisms

Ask about guided Science learning if your child needs help explaining these ideas.

About this guide

Original explanations, examples, diagrams and practice by BananaLearn. The grade label indicates the intended learning level; this is not an official textbook extract or exam paper.

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Practice worksheet - Science · Grade 8

Name: _____ Date: _____

Show your working. Answers and explanations follow on a separate page.

Try each task before opening its answer. Give an example or reason, not only a label.

Write an answer and your reason before opening the explanation. Check the reasoning as well as the final answer.

1. A book slides left on a desk. Which way is friction on it?

2. Can static friction be non-zero when an object is still?

3. Is static friction always at its maximum?

4. Can required friction be zero on a level surface?

5. Why can rubbing surfaces become warm?

6. Do wheels eliminate all resistance?

7. Why are tyre treads useful?

8. Why lubricate suitable moving machine parts?

Practice continued

9. What does normal mean in normal contact force?

10. Must friction always point opposite a person's forward motion?

11. Name the resistance from air around a moving cyclist.

12. Does more apparent contact area always mean more dry friction?

13. Should you oil a shoe sole to test reduced friction?

14. Give one helpful and one unwanted effect of friction.

Answers and explanations

Answer key - Science · Grade 8

Friction in everyday life for Grade 8

1. Right.
It opposes the relative sliding.
2. Yes.
It can oppose a tendency to slide.
3. No.
It adjusts up to a limiting value.
4. Yes.
If no force tends to cause sliding.
5. Mechanical energy is transferred into internal energy.
Friction dissipates organised motion.
6. No.
Rolling resistance and other losses remain.
7. They help maintain suitable grip, especially in relevant surface conditions.
The purpose is controlled contact rather than zero friction.
8. To reduce direct friction and wear.
Use depends on the machine design.
9. Perpendicular to the contact surface.
It does not mean ordinary or average.
10. No.
It opposes relative sliding at the contact and can act forward on a foot.
11. Drag or air resistance.
It depends on speed, shape and other conditions.
12. No.
The simple dry-contact model does not predict that automatically.
13. No.
That creates a slipping hazard.
14. For example: grip while walking; wear in machinery.
Its value depends on the task.