

Rolling versus Sliding

OKAY, BUT... HOW? · A closer look

Question: What is a rolling marble doing besides moving forward?

You'll be able to: Identify travelling and spinning, and explain why rolling is not interchangeable with sliding.

Watch a dot on a rolling marble. Its center travels along the track while the dot turns around that center. These are two parts of its movement: travelling and spinning.

A block can slide along a surface without turning. A ball can also skid while it spins. "It is spinning" alone does not prove that it is rolling without slipping.

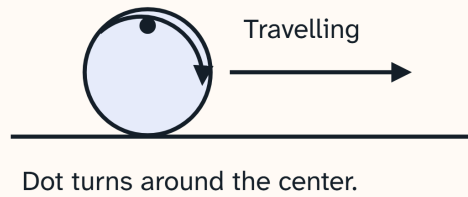
For ideal rolling on a stationary rigid track, the contact does not slide across the surface. Friction there can help the ball turn without draining movement energy through sliding. Real deformation and skidding are different conditions. Treating all friction as the same energy loss would miss that distinction.



OKAY, BUT... HOW?

A closer look with Quinn

Rolling · travels and spins



Dot turns around the center.

Sliding block · no turn here



A spinning ball can also skid.
Arrows show motion, not forces.
Illustration, not to scale.

Travelling plus spinning: two kinds of movement. These arrows show motion, not forces.

Diagram in words: Below Quinn's branded header, a rolling ball with a forward center arrow and a curved spin arrow around a marked dot. A separate sliding-block panel has a forward arrow and no rotation. A note says a spinning ball can also skid.

[Open the full-resolution diagram](#)

Try the idea

A dot circles around a ball's center while the ball moves forward. Have you shown that the ball is not skidding?

Answer: No. You have shown spinning and travelling. To establish rolling without slipping, the contact must not slide against the track. A spinning ball can still skid.

A little further, if you want

Optional: both travelling and spinning carry movement energy. How it is shared depends on the object's shape and mass distribution; a cylinder's formula is not automatically a marble's formula.

See it in action

No published Okay But story currently demonstrates this concept as a separate application.

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Sources

- MIT: Rigid Body Dynamics — Rolling, spin and contact; examples 21.4–21.5.
- OpenStax: Rolling Motion — Ideal rolling energy and real transfers.

Download this lesson with its diagram and answer (PDF)