

GIVE SPARK · HANDS-ON SCIENCE LAB

Slow-Fall Spinners

How does blade length affect a paper spinner's fall?

Teacher Guide

Grades 3–5 · Forces and motion · 55 minutes

FREE LAB

OVERVIEW

The lab at a glance

One lesson, one driving question and nine timed drops for each team.

THE DRIVING QUESTION

How does blade length affect a paper spinner's fall?

Children predict first, then let three rounds of drops show whether a pattern is there.

What children do

Teams cut out and fold three paper spinners with different blade lengths. They keep the paper, blade width, stem, folds and paper clips the same. They drop each one from the same height, time the fall and repeat the set three times. Then they look across their nine times and decide whether there is a pattern.

What children learn

A paper spinner turns as it falls, even though it has no motor. Air pushes on the blades and slows the fall. Children find out from their own data whether longer blades change how long the spinner stays in the air. They also learn why one drop is not enough, and that "we did not find a clear difference" is a valid conclusion.

Success looks like

1. I kept the release height, the release method and the paper clip the same for every drop.
2. I timed three rounds and recorded every time, including the ones that surprised me.
3. I described what my results suggest and how sure I am.

The three spinners

SPINNER	BLADE LENGTH	WHAT STAYS THE SAME
A	6 cm	Blade width, stem, paper clip, paper and folds
B	5 cm	Blade width, stem, paper clip, paper and folds
C	4 cm	Blade width, stem, paper clip, paper and folds

AT A GLANCE

Time: 55 minutes.

Grouping: pairs or teams of three.

Standards link: supports NGSS 3-5-ETS1-3, carrying out fair tests in which variables are controlled. It also connects to forces and motion in 3-PS2-1.

SESSION PLAN

STAGE	MIN
Introduce the phenomenon	5
Build and prepare	12
Plan a fair comparison	6
Test	17
Examine the evidence	10
Close	5
Total	**55**

THE STUDENT RESOURCE

A separate two-page PDF. Page 1 is the recording page. Page 2 has the three spinner templates at full size, with the print setting and a 5 cm check line on the page.

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PREPARATION

Get ready

What to gather, how the spinner is made and where to drop it.

Materials

For each team

- The template page, which has spinners A, B and C
- 3 identical small paper clips
- Scissors and a ruler
- A stopwatch
- The recording page and a pencil

How the spinner is made

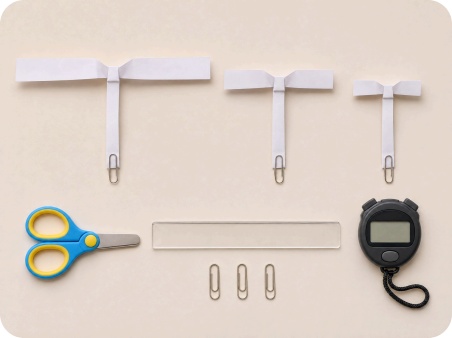
The template page has every line drawn. If you prefer to make your own, start with a paper rectangle 6 cm wide and 16 cm long.

1. From the top edge, cut down the center for 6 cm. This makes two blades, each 3 cm wide.
2. Draw a line across the paper 8 cm below the top.
3. Along that line, cut inward 2 cm from each side. The middle 2 cm stays uncut.
4. Fold the two lower side sections inward to form a narrow stem.
5. Fold the bottom 1 cm of the stem upward and slide on a paper clip.
6. Fold the two blades in opposite directions, so they stick out flat.

Spinners B and C are made the same way with the blades shortened equally from their tips to 5 cm and 4 cm.

The drop zone

Mark a release height about 1.5 m above the floor that children can reach without climbing. A strip of tape on a wall or a door frame works well. Choose a clear indoor space away from fans and open windows. Children hold each spinner by the stem, with the stem pointing down and the bottom of the stem level with the mark. They use the same reference for all three spinners, and they let go without throwing or pushing.



Spinners A, B and C. The blade lengths differ. The stem and paper clip are the same.

SAFETY

Children release from a marked height they can reach from the floor. Nobody stands on a chair or a table. Carry scissors with the blades closed.

TIMING A SHORT FALL

The fall lasts only a second or two, so times will vary. The timer starts on the word “go” as the spinner is released and stops when it first touches the floor. The same child should time every drop where possible.

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TEACHING SEQUENCE

Run the lesson

One falling spinner raises the question. Three rounds of timed drops give the evidence.

Introduce the phenomenon 5 MINUTES

DO Drop one spinner from the marked height.

ASK "What do you notice about how it moves? What might happen if its blades were shorter?"

Accept different predictions. Children write theirs on the recording page.

Build and prepare 12 MINUTES

DO Teams cut out and fold spinners A, B and C. Check that each one has its blades folded in opposite directions and carries an identical paper clip.

Plan a fair comparison 6 MINUTES

ASK "What do we need to keep the same on every drop?"

Agree on the release height, the release method, the paper, the paper clip, the location and the person timing. Explain that short falls are hard to time exactly, so repeated drops help show whether a pattern is real.

Test 17 MINUTES

1. Drop spinner A. Time from the release until it first touches the floor.
2. Record the time and whether it spun smoothly.
3. Do the same for B and then C.
4. Complete three rounds, with A, B and C in each round.

If a spinner hits a person or furniture, the team drops it again and notes why the first drop was left out.

Examine the evidence 10 MINUTES

ASK

- "Which spinner usually stayed in the air longest? Did the same spinner win every round?"
- "Are the differences large enough to be convincing?"
- "Did any spinner fall sideways or fail to spin?"

If the times overlap, "We did not find a clear difference" is a valid conclusion. Praise it when the data supports it.

Close 5 MINUTES

DO Children complete the sentences on the recording page. "Across our three rounds, we noticed ___. Our results suggest ___." They compare this with the prediction they wrote at the start. Allow a few minutes for cleanup within this stage.

LOOK FOR

Children who look across all three rounds before they decide. Listen for "usually" and "in two rounds out of three", which show they are weighing the evidence.

IF THIS HAPPENS

A spinner tumbles and does not spin. Check that the blades fold opposite ways and sit flat. Open them out to a level T shape.

It drifts sideways into something. Move away from doors and vents and drop again.

Times for one spinner vary a lot. That is normal for a fall this short. It is the reason for three rounds.

WHY ROUNDS, NOT SETS

Dropping A, B, C and then A, B, C again spreads any change in the room or the timer across all three spinners.

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The science behind it

Why a spinner spins, the ideas children bring and how to adjust the investigation.

The science behind it

Gravity pulls the spinner down. As it falls, air pushes up against the blades. Because the two blades are tilted in opposite directions, the air pushes each one sideways as well as up, and the two sideways pushes turn the spinner around its stem.

The size and shape of the blades affect how the spinner rotates and how much the air slows it. Larger blades catch more air, so a spinner with longer blades often falls more slowly. Let the class data say whether that showed up in your room.

Trimming the blades also removes a little mass. So this investigation compares three spinner designs. It does not separate blade length perfectly from every other factor, and it is worth saying so to older children.

Ideas children often bring

A CHILD MIGHT SAY	YOU COULD RESPOND
“It spins because we twisted it.”	Nobody twisted it. Ask what is touching the blades all the way down.
“The fastest time wins.”	We are asking which stays up longest, so look for the longest time.
“A won once, so A is the slowest.”	Ask what the other two rounds show.

Support and challenge

Support. Give a team pre-cut spinners so their time goes on dropping and timing. They can also compare by eye, dropping two spinners side by side.

Challenge. Ask children to find the middle time for each spinner and compare those three numbers. Older classes can discuss why the middle value is fairer than the best one.

ASSESSMENT

Use the recording page and the discussion.

Fair test: names what was kept the same.

Data: records all nine times and notes how each spinner moved.

Conclusion: matches the claim to the strength of the evidence.

TAKE IT FURTHER

Add a clip. Test one spinner with one, two and three paper clips.

Change the width. Keep the blade length the same and trim the blades narrower.

FINAL EXPLANATION

Ask every team for the same three things. Tell us what you found, show the evidence, and explain what you think caused it.

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Vicky Brooks
Give Spark

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Slow-fall spinners

How does blade length affect a paper spinner's fall?

Name _____ **Date** _____

1 My prediction

I think the spinner that stays in the air longest will be **A** **B** **C** **about the same**

because _____

2 Our fair test

What will we keep the same on every drop?

_____

3 Our results

Time each fall in seconds, from the release until the spinner first touches the floor. Do round 1 for A, B and C before you start round 2.

SPINNER	ROUND 1	ROUND 2	ROUND 3	HOW DID IT MOVE?
A · 6 cm				
B · 5 cm				
C · 4 cm				

4 Look at the evidence

Our results showed **A usually stayed up longest** **B** **C** **no clear difference**

The times that support our answer are _____

5 What we found

Across our three rounds, we noticed _____

Our results suggest _____

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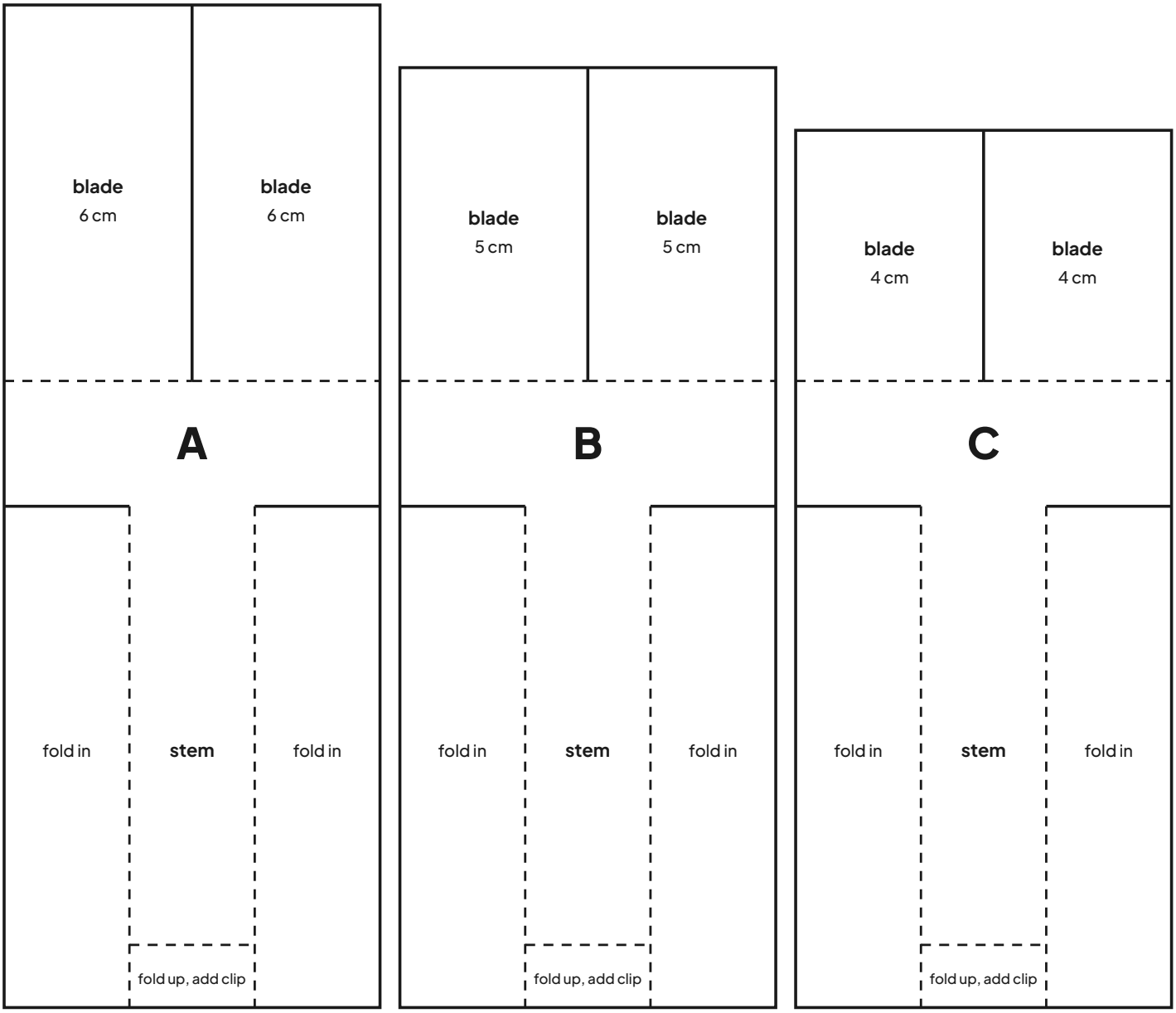
Spinner templates

The blade lengths differ. Keep the paper, blade width, stem, folds and paper clips the same.

Cut along every solid line. **Fold** along every dashed line. Fold one blade toward you and the other away from you. Fold the two stem flaps in, fold the bottom up and slide on a paper clip.



Print at 100% or Actual Size. Do not fit to page.

Check: this line should measure 5 cm.

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