

Run sheet, Shadow and Shape

Goal. Every girl notices how a shadow changes and draws what she saw twice.

Before you start

- Find the light before the girls arrive: a sunny window, an open door or one lamp. Check a thing stood up casts a clear edge. **No usable light? Run a different pack.**
- One light serves about twelve girls; queue two pairs at a time. Lamp behind you, cable down.
- At each place: Sheets A and B, a pencil, and a thing to stand up, even her own hand.
- Write up where all can see: FIRST. THEN. BIGGER. SMALLER. SAME.

The clock, 45 minutes

- 0 to 5 min: find the light
- 5 to 16 min: make a shadow and draw round it
- 16 to 28 min: change one thing
- 28 to 38 min: draw it the second time
- 38 to 45 min: say what changed and close

Run 45 if you can. In 30: 0 to 3, 3 to 11, 11 to 19, 19 to 26, 26 to 30. In 60: 0 to 6, 6 to 20, 20 to 34, 34 to 48, 48 to 60, where the last stretch adds one more change on Sheet B. With mostly four-year-olds, shorten the middle, never the close.

What you do

1. Stand between the light and a wall or the floor. Ask: "What is that dark shape?"
2. Say it once, plainly: a shadow is where something blocks the light.
3. Put the girls in pairs. Send each pair to a place where they can see the light.
4. One girl holds her object still so its shadow falls on Sheet A. The other draws round the shadow edge.
5. Walk the room and reach every pair once. Steady the paper with a hand or a stone.
6. Swap, so both girls have drawn and both have held.
7. Stop the room. Say: "Change one thing. Move it nearer the light, or turn it round. One thing only."
8. Each pair changes one thing and draws the new shadow on Sheet B.
9. Each girl lays Sheet A beside Sheet B and says out loud what is different.
10. Read the three words aloud and let each girl circle one on Sheet B: bigger, smaller, same.
11. Go round. Each girl says one true sentence: "I moved it nearer and the shadow got bigger."
12. Close by holding one object up and asking the room to guess its shadow before you show it.

Watch for

1. A girl changes one thing on purpose and can say which thing she changed.
2. Her two sheets lie side by side and the two outlines are not the same size or shape.
3. A girl predicts before she looks: "It will get bigger", and then checks it herself.

What goes wrong most. The shadow keeps moving because the hand holding the object keeps moving. Give the holder something to rest her wrist on, or lay the object flat against the paper and tilt it instead.

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Learner sheets, Shadow and Shape

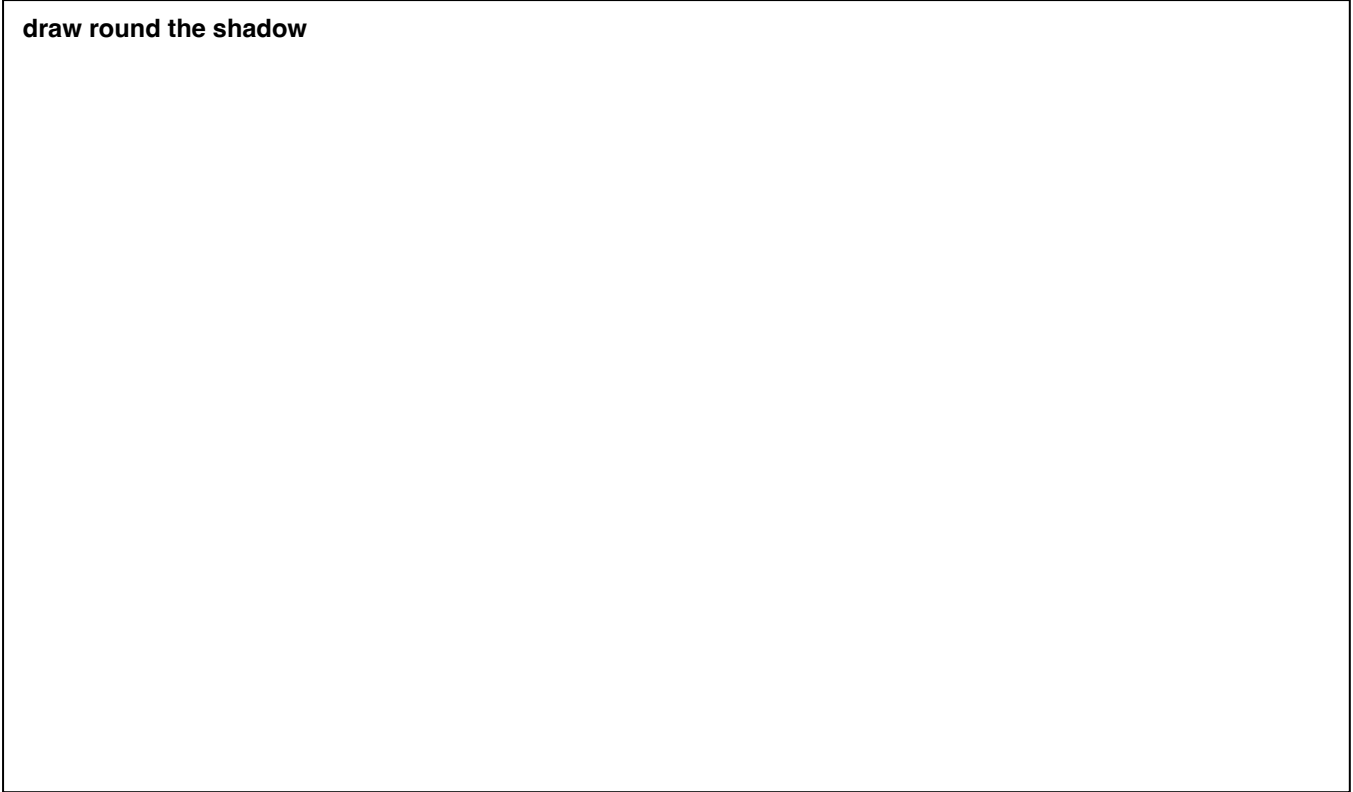
Sheet A, my first shadow

One copy per girl

Name: _____ Date: _____

FIRST. Hold your object still in the light so its shadow falls inside the box. Your partner draws round the edge of the shadow. Then swap.

draw round the shadow



What made this shadow? You can draw it or write it.

Where was the light? Your leader will read these words to you. Mark one.

☐

WINDOW

☐

DOOR

☐

LAMP

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Sheet B, my shadow changed

One copy per girl

Name: _____ Date: _____

THEN. Change one thing. Move it nearer the light, or turn it round. One thing only. Draw round the new shadow. Lay this sheet beside Sheet A and look at both.

after I changed one thing

Next to Sheet A, this shadow is. Your leader will read these words to you. Mark one.

☐

BIGGER

☐

SMALLER

☐

SAME

I changed:

More time? Say what will happen before you try it, then try it and draw it on the back.

I think it will get _____

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What to print

- **Once, for yourself:** page 1, the run sheet.
- **One copy per girl:** page 2 (Sheet A) and page 3 (Sheet B). That is 2 pages per girl.
- **You do not need:** pages 4 to 12, the guide and the key. The session runs without it.

Guide, Shadow and Shape

Group 4 to 30 · Materials: paper, pencil, a light already in the room · SDG 4, 5 · EN edition · Released · Nameet Potnis, author and English editor

Before you enter the room

- **Check the light at the hour you will run the session. If there is no usable light, run a different pack.**
- One window or one lamp serves about twelve girls. With more, run the light as a station, two pairs at a time.
- Change one thing only between the two drawings.
- A lamp goes behind you, cable tucked down, and no girl moves it. Daylight is safer.

Read this once at home. In the room you only need the run sheet. Where this says "you", it means whoever is running the session: a teacher, a volunteer, an older sister.

Who it is for

- **For ages 4 to 7.** Girls who have noticed shadows without ever being asked to look at one on purpose.
- **Looking and figuring out.** Not the same as Watch and Wonder: there the thing changes on its own while she watches, here she changes one thing on purpose.
- **Group size.** 4 to 30 girls, working in pairs. Above about 20, run the 60 minute version, because every pair needs a spot where they can see the light and you cannot make more light than the room has.
- **Different levels in one room.** The job is the same for everyone: make a shadow, draw it, change one thing, draw it again. A girl who cannot yet write puts two outlines on her two sheets and says the difference out loud. A girl who is ready writes what she changed, then predicts the next one before she tries it. Nobody gets a different sheet.

What you need

- One learner sheet per girl, or plain paper
- One pencil per girl, or one shared between two
- One light source that is already in the room: a window with sun on it, an open door, or a lamp that is already there and already on
- One object per pair to stand up in the light: a pencil, a folded strip of paper, a comb, a leaf, a key, or her own hand
- **Free and optional:** a stone or a book to weigh the paper down, and a wall, a door or a cloth to catch a shadow if the floor is awkward
- **Nothing here costs money, and nothing has to be installed or fetched.**

Check the light before the session, at the hour the session runs. Sun moves. A window that threw a hard shadow at ten o'clock may throw nothing at three. If the day is flat and grey and there is no lamp, run the session against a doorway: the gap in the wall is a light source and a hand held in it will cast an edge. If there is genuinely no usable light, this is the one pack that will not run, and it is better to run a different pack than to run this one in the dark.

Why the session is shaped this way

You make the first shadow, not them. Stand in the light yourself and ask what the dark shape is. Every girl in the room has seen a shadow. Almost none has been asked to explain one. Asking first, then saying the sentence, means she meets the idea as something she nearly knew.

One sentence, said once, and then dropped. "A shadow is where something blocks the light." Do not build on it, do not test it, do not ask anyone to repeat it back. The drawing is what teaches the rest.

Draw round it, do not draw it. Drawing a shadow from memory turns this into an art lesson, and a girl who thinks she cannot draw will stop. Drawing round the edge of a real shadow is tracing, and every girl can do it. The outline she ends up with is evidence, not a picture, and it is hers.

One girl holds, one girl draws, then swap. Two hands cannot do this alone. The holding is the harder job and it is worth naming as a job, because it is where the confident girl would otherwise take the pencil and do both.

Change one thing. Not two. Moving the object nearer the light makes the shadow bigger; turning it round makes the shadow a different shape. If a girl does both at once she has a different shadow and no idea which change did it. This is the whole method of the pack, and it is worth more than any fact about light.

The two boxes are the same size on purpose. The comparison is the point, so the first shadow and the second get identical space, and the two sheets lie side by side on the desk while she looks. A girl who can see both at once can answer "what is different" by pointing, and a box that is bigger than the other would answer it for her, wrongly.

Read the three words aloud before anyone circles one. Bigger, smaller, same. A girl who cannot read them must not be shut out of the answer by the reading. Say them, point at them in order, then let the room choose.

Predicting comes last, not first. Once she has changed one thing and seen what happened, ask her what will happen next time before she tries it. A prediction from a girl who has already seen one result is a real prediction. A prediction from a girl who has seen nothing is a guess about a stranger's rules.

Including everyone

A girl who cannot yet read or write much. Nothing in this session requires her to read or to write. She makes a shadow with her own hand and draws round it, which is the same task as everybody else at the same standard. The two boxes on her sheets take outlines, not words. Read the three words on Sheet B aloud, point at each one as you say it, and let her circle the one she means. For the line that asks what she changed, she says it and you write her words on her sheet, in her words, not tidied up. If she would rather not speak, she can show you with her hands what she moved, and you write that. She finishes with the same two drawings on the same two sheets as everyone else, and you say so out loud.

A girl who joins late. Seat her with a pair, making a three, and hand her a sheet and an object. Say the task in one sentence: "Make a shadow, draw round it, then change one thing and draw it again." She has missed nothing she needs, because every step stands on its own and the first shadow can be made at any minute of the session. Do not rewind the room and do not ask her why she is late.

Boys in the room. They do the same activity and the same sheets. Watch two things so the session stays centred on the girls: who is holding the object and who is holding the pencil. If a confident child has taken both jobs in a pair, hand the pencil to the other child and give the confident one the holding job, which is the harder one. In the closing round, use one rule, said once and applied to everyone: nobody speaks twice until everyone who wants to has spoken once.

If it goes wrong

The shadow will not stay still. The hand holding the object is moving, which nobody notices while it is happening, and the girl with the pencil ends up chasing an edge that has already left. Give the holder something to rest her wrist on: the edge of a desk, a book, her other hand, a wall. If that does not settle it, change the task rather than the child: lay the object flat on the paper and tilt it up slightly, so one end

stays on the page. A traced outline that is a bit wrong is still evidence. Chasing a perfect one wastes the minutes you need for the second drawing.

Half the room has good light and half has none. This is the usual shape of a real room, and it is not a fault in the session. Do not split the group into a lucky half and an unlucky half working on different things. Run the light as a station instead: two pairs at the window at a time, while everyone else uses the minutes to finish an outline, label a drawing, or hold the object for a neighbour. Everyone gets their turn at the light, nobody waits with nothing to do, and the session runs a little longer in the middle. In the 30 minute version, decide before the session which single light source you will use, and queue at it from minute three.

Adapting it

Change the objects for things the girls in your room would recognise, and the session is unchanged. That is what the licence is for.

- The object: a pencil, a comb, a leaf, a key, a spoon, a folded paper strip, or her own hand.
- The surface: paper on a desk, paper on the floor, paper taped to a wall, or a swept patch of ground with the outline scratched in.
- The light: a window, a doorway, a lamp that is already on. Never one that has to be bought or brought.
- Home language: run the whole spoken part of the session in it, including the three words, and bridge them into English on the sheet only if written English is part of what you are teaching.

Running it shorter or longer

30 minutes. 0 to 3 find the light, 3 to 11 make a shadow and draw round it, 11 to 19 change one thing, 19 to 26 draw it the second time, 26 to 30 say what changed and close. Girls do not swap holder and drawer, so each girl draws one outline and holds for the other, and the closing round takes volunteers rather than going all the way round. With one light source and a group over about twelve, you will not get every pair to the light twice. Run 45 if you can.

45 minutes. The clock on the run sheet.

60 minutes. 0 to 6 find the light, 6 to 20 make a shadow and draw round it, 20 to 34 change one thing, 34 to 48 draw it the second time, 48 to 60 one more change and close. In the last stretch each girl says out loud what a second change will do, writes it on the prediction line at the foot of Sheet B, then makes the change and draws a third outline on the back of that sheet. Pairs swap objects with a neighbouring pair before the third try, so the prediction is about the rule and not about one familiar pencil.

Closing, in every version. Hold one object up in the light with its shadow hidden, and ask the room to say what shape the shadow will be before you show it. Take three answers, including wrong ones, without correcting them, then show it. End there: the guess is the thing you are teaching, not the answer.

Keeping it safe

If you use a lamp, it gets hot and it has a cable. Put it behind you and out of reach, tape or tuck the cable down so nobody trips, and never let a girl move it. Daylight from a window or an open door is safer and free. If you use small objects to cast shadows, nothing goes in the mouth. Before you hand anything out, check it cannot fit inside a child's mouth: if it fits inside a ring made by your thumb and first finger it is too small for this room. Seeds, beads, coins and small bottle caps are out. Count what you handed out back in at the end.

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Key and facilitation cues

Answers and what to say, Shadow and Shape

Answers

The shadows depend on the room, the light and the object in each girl's hand, so there is no answer sheet. What tells you a secure answer from a lucky one is these four checks, and each takes about five seconds per girl.

Check	A secure answer looks like this
The outline came from a real shadow	Her line follows an edge, including the bits that are not neat. A drawing done from memory is smooth and symmetrical in a way a real shadow is not
One thing changed, not two	Asked what she changed, she names one thing and can show you
The drawing matches the word she circled	Her second outline really is bigger, or smaller, or the same size as the first
She can say what caused it	"I moved it nearer the light" beats "it just got bigger", and both are better than silence

A girl can draw two good outlines and not yet be able to say why they differ. That is ordinary at this age. The drawings are the evidence; the sentence comes later, sometimes in a later session.

Sheet A. Any outline that came from a real shadow is correct, however wobbly. The object line is correct if it names or shows what she held, and a drawing counts as much as a word. The light circle is correct if it matches the room. If she used her own hand, "my hand" is the complete right answer and nothing more is needed.

Sheet B. The box is correct if it shows a shadow she actually made after one deliberate change. The two sheets are meant to be read side by side, so lay Sheet A next to Sheet B before you judge anything: the boxes are the same size, so the outlines can be compared straight off. Bigger, smaller or same is judged against her own two drawings, not against physics: if her outlines show a smaller shadow and she has circled smaller, she is right, even if you think the change should have made it bigger. What she changed is correct if it names one thing. Accept "I put it close", accept "I turned it", accept a drawn arrow, and write her words for her if she wants them written. The prediction line at the foot of the sheet, and the third outline on the back of it, are the 60 minute stretch, and are blank in the 30 and 45 minute versions.

What counts as one change. Moving the object nearer the light or further from it. Turning it round. Tilting it. Standing it up instead of lying it flat. Moving the paper nearer the wall. Any one of those alone is a change. Two at once is not, and the fix is to try again, not to mark it wrong.

What you might see

What is on the page	What to offer next
Sheet A done, Sheet B blank	She has done the real work. Ask out loud: "What would happen if you moved it closer?" Let her try it, draw it on Sheet B, and leave the writing alone
Two outlines that look almost identical	Ask which one thing she changed. Often it was a small move. Ask her to make a big one: right up against the light, or flat on its side
Two clear outlines and a word circled that matches them	Ask her to predict the next one before she tries it, then hand her a different object so the prediction is about the rule
A neat, symmetrical drawing that is not a traced shadow	Say nothing about the drawing. Stand beside her, hold the object yourself, and ask her to put her pencil on the dark edge and follow it

Sticky points

What happens	What to say or do
The shadow keeps moving while she draws	Rest the holder's wrist on a desk, a book or her other hand. If it still moves, lay the object flat on the paper and tilt it
She says she cannot draw	"You are not drawing it. You are going round the edge." Put your finger on the dark edge and ask her to follow it
One girl holds and draws, and her partner watches	Hand the pencil to the partner and give the first girl the holding job. Say that holding is the harder one, because it is
There is no shadow where she is sitting	Move her, not the lesson. Two pairs at the light at a time, everyone else finishing an outline or holding for a neighbour
She changes two things at once and cannot say why it looks different	Do not mark it wrong. "Put it back how it was. Now change just one thing." Let her run it again
She circles a word that seems wrong to you	Look at her two sheets, not at what you expected. If it matches her drawings, she is right. If it does not, lay Sheet A beside Sheet B and ask her to look again
She asks whether shadows are alive, or whether hers follows her	Answer it straight and short: it is where she blocks the light, so it goes where she goes. Then back to the paper
She asks whether she is good at science	"You changed one thing and you worked out what it did. That is what science is." Then move on

Say what you saw, never what she lacks: "Your second one is much bigger, what did you do?", not "you have not done it properly".

After the session

Keep the sheets. Sheet A and Sheet B are two sheets that make a before and after when laid side by side, and the next looking and figuring out session can open with "show the person next to you what you changed", which takes one minute and gives every girl something true to say.

If the light was poor and half the room queued, note the hour. The same room at a different hour is often a different room, and that is worth knowing before next time.

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