

LESSON 7

Make a Clock

60 minutes

Coding and Interactive Creators

WHAT THIS LESSON DOES

Embark on an exciting journey to create your own digital clock using Scratch. You'll start by creating a new project, uploading a clock face, and drawing the hands of the clock. Then, you'll program each hand to move accurately, representing seconds, minutes, and hours. Finally, challenge yourself by turning your clock into an alarm clock.

WHAT STUDENTS SHOULD BE ABLE TO DO

- Understand and apply the basics of Scratch programming.
- Create and manipulate sprites in Scratch.
- Understand the concept of time and how it is represented on a clock.
- Apply mathematical concepts to program the movement of clock hands.
- Extend programming skills by adding an alarm feature to the clock.

BEFORE THE LESSON

- Open and log in to the Scratch website on your own device and confirm the school filter is not blocking it. Pupils will each need a device and a Scratch login to save work.
- Download the clock face image from step 2 in advance and have it ready, or check pupils can access and save it themselves.
- Check sound is on and working on at least one device for the alarm challenge in the final step.

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HOW THE LESSON RUNS

Create a new Scratch project
Upload the clock face
Draw the seconds hand
Program the seconds hand
Draw the minutes hand
Program the minutes hand
Draw the hour hand
Program the hour hand
Account for the minutes
Challenge!

TEACHING MOVES

- 1. Create a new Scratch project. Show pupils how to start a fresh project and delete the cat sprite. Confirm everyone has a blank stage before moving on.
- 2. Upload the clock face. Make sure every pupil uploads the clock as a sprite, not a backdrop, and adds the go to x:0 y:0 block. It must sit dead centre or the hands will not line up.
- 3. Draw the seconds hand. Stress the one thing that breaks this lesson: start every line from the centre cross. Model holding Shift for a straight line before pupils try it.
- 4. Program the seconds hand. Walk through why 6 degrees: 360 divided by 60. Show the current second block from Sensing and how multiplying by 6 points the hand.
- 5. Draw the minutes hand. Remind pupils to start from the centre again and make this hand shorter than the seconds hand. Check the red 8 pixel line before they code.
- 6. Program the minutes hand. Point out this mirrors the seconds hand exactly, 6 degrees per minute, just using the current minute block instead. Let pupils spot the pattern themselves.
- 7. Draw the hour hand. Third hand, same centre-start rule, shortest and thickest at 12 pixels green. Check all three hands line up at the centre before coding.
- 8. Program the hour hand. Explain the twist here: 30 degrees per hour, and the current hour block uses 24 hour time so it needs adjusting to fit a 12 hour face.
- 9. Account for the minutes. Show why the hour hand should creep between numbers: add 0.5 degrees per minute. Compare a real clock so pupils see the hour hand is never exactly on the number.
- 10. Challenge! Let pupils attempt the alarm before revealing the answer. Point them at a forever loop with an if condition checking hour and minute together.

WHAT TO WATCH FOR

- Pupils draw a hand starting away from the centre, so it swings around a point that is not the middle of the clock. Have them zoom in on the paint editor to the grey circle and cross, and start every line exactly there. If a hand is wrong, redraw rather than nudge.
- Pupils expect the hour hand to jump cleanly from number to number and think their code is broken when it sits between two numbers. Show a real clock or the classroom clock. The hour hand always sits part way, which is exactly what the 0.5 degrees per minute does.
- Pupils confuse the seconds and minutes maths since both use 6 degrees, and paste the wrong sensing block. Have them read their block aloud: current second times 6 for the seconds hand, current minute times 6 for the minutes hand. The number changes, the block does not.

DIFFERENTIATION

- Emerging: Pair them with a partner for the drawing steps so the centre-start rule is checked twice before any code is added. Give them the seconds hand fully then let them copy the exact pattern for minutes, changing only the sensing block.
- Developing: Ask them to explain back why 6 degrees for seconds and 30 for hours before they move on, so the maths is theirs not just copied.
- Proficient: Point them straight at the alarm challenge without the answer, and ask them to set it to a different time than 10:30. Challenge them to add a second alarm or a visual signal alongside the sound.