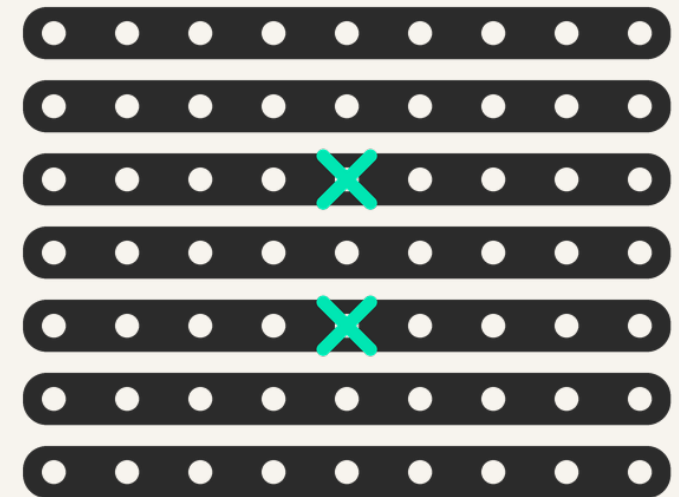


N5 ELECTRONICS • LOGIC

Stripboard Build

Plan it, solder it, test it, keep it.



National 5 Practical Electronics

LEARNING INTENTION

To plan, solder and test a permanent three-input AND process board.

Daily Review

SHOW ME BOARDS

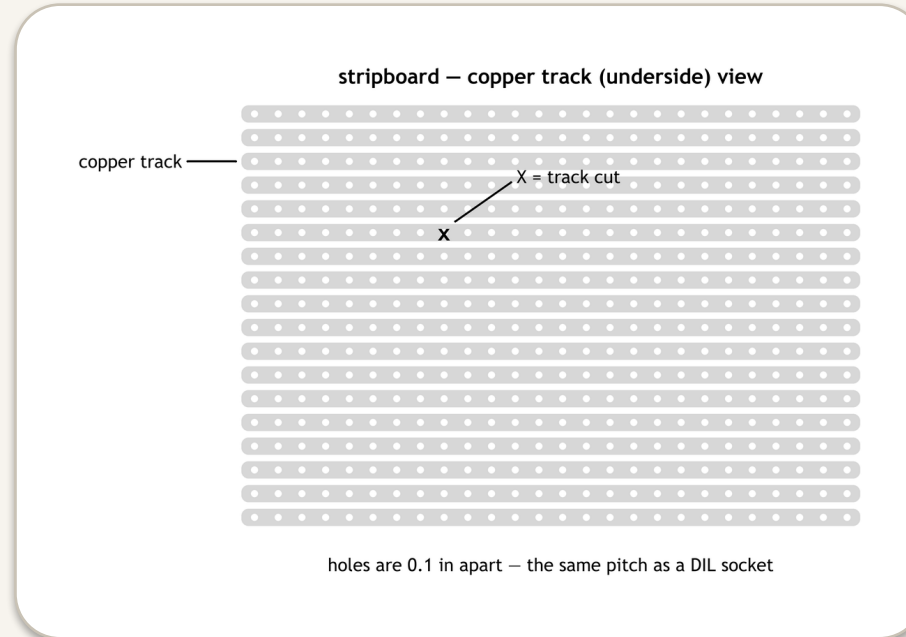
- 1 Which colour of wire is for power only?
- 2 Which pin is 0 V on a 14-pin chip?
- 3 What value of pull-down resistor?
- 4 Why must a chip straddle the breadboard's centre channel?
- 5 What does the probe show at a floating point?

By the end of this build...

- 1 I can produce a stripboard layout using component footprints.
- 2 I can mark track cuts and test points on a layout.
- 3 I can produce a component list with item IDs and costs.
- 4 I can state two safety measures to take when soldering.
- 5 I can complete a pre-power-up checklist and a functionality test.

How stripboard works

Booklet section 10. Copper strips run the whole way along the back.



Holes on a 0.1 inch grid; a continuous copper track behind each row.

- A component's two legs must go into **DIFFERENT** tracks, or it is shorted.

Rules for a layout diagram

Booklet section 10 — every one of these is marked.

- Draw the COMPONENT (top) view, and say so.
- Draw each part with its real footprint, not its circuit symbol.
- Show every wire link and every interconnection.
- Mark each track cut with an X.
- Mark and label your test points — it makes testing far easier.

Show Me — Layout rules

SHOW ME BOARDS

- 1 Which view do you draw — component or track?
- 2 What does an X mark on a layout?
- 3 Do you draw a resistor's symbol, or its footprint?
- 4 Why must a component's two legs go into different tracks?
- 5 What should you mark and label to make testing easier?

Layout rules

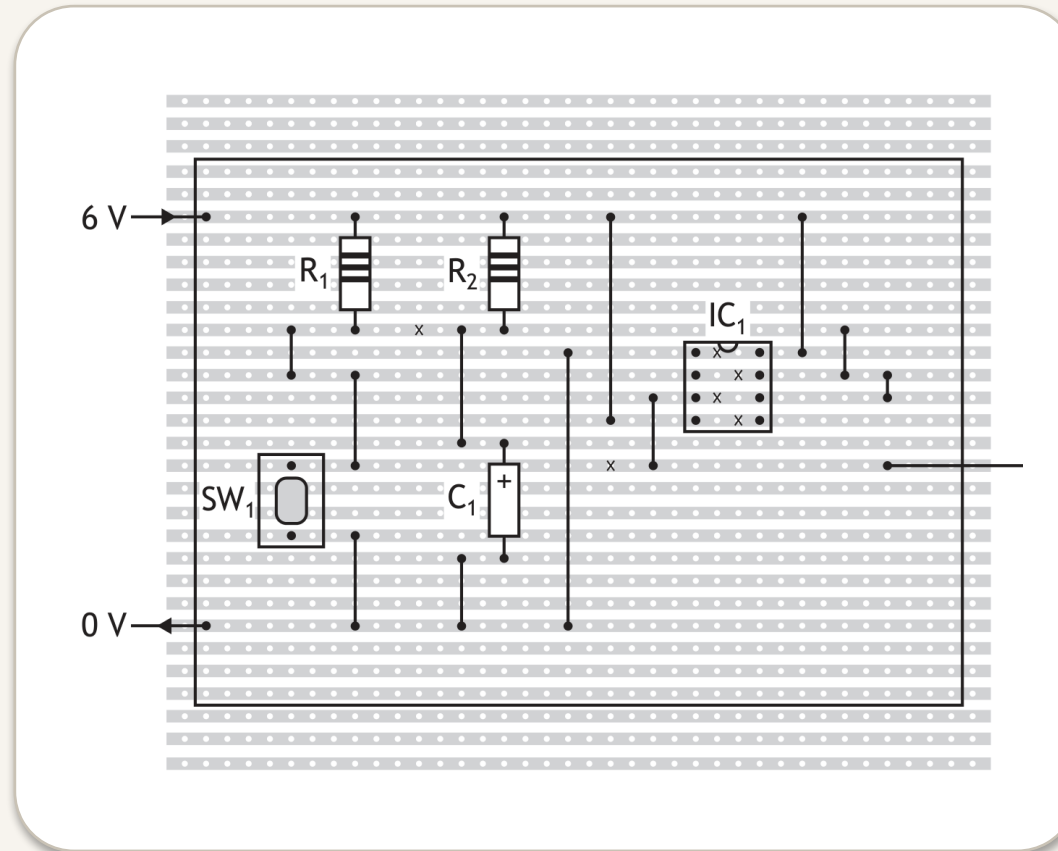
SHOW ME BOARDS

EXTRA PRACTICE

- 1 Which side of the board do the copper tracks run along?
- 2 Which way do the tracks run relative to the IC's pins?
- 3 What must sit between the two rows of IC pins, and why?
- 4 Name one thing a layout must show that a circuit diagram does not.
- 5 Why is a DIL socket soldered instead of the chip?

What one looks like

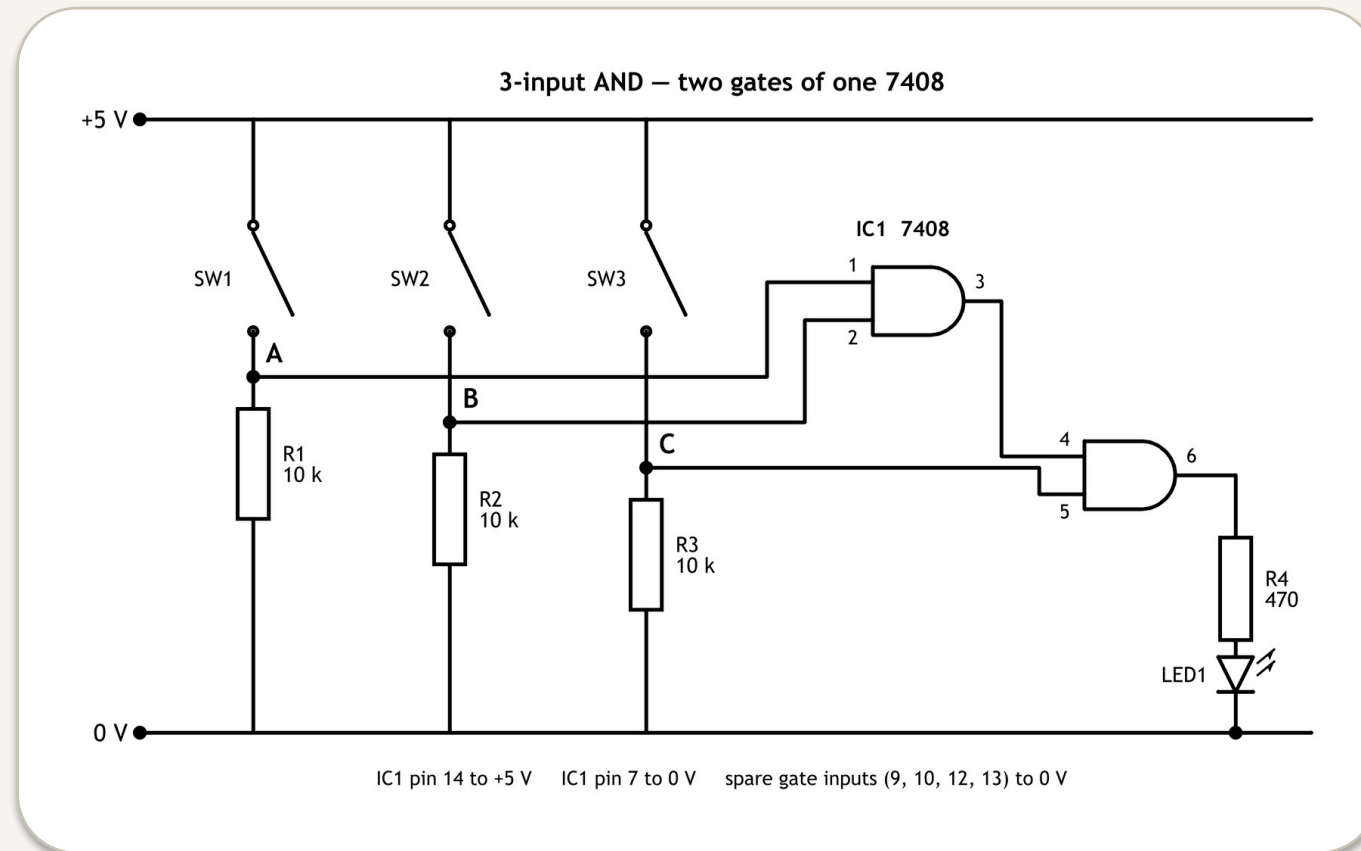
An SQA stripboard plan: top view, X track cuts, labelled supply rails.



From the SQA National 5 question paper 2025.

What you are building

Two of the four AND gates in one 7408, lighting an LED when all three inputs are 1.



The LED lights only when switch A AND switch B AND switch C are all at logic 1.

Your turn

Complete the truth table for the circuit.
Use column D for pin 3, and column Z for pin 6.

Task 4a – Truth table

Task 4a – Answers

Z is logic 1 on the last row only – all three switches at logic 1.

A	B	C	D pin 3	Z pin 6
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	0	0
1	0	0	0	0
1	0	1	0	0
1	1	0	1	0
1	1	1	1	1

Your turn

Complete the component list.
Prices are for a batch of 100 – look up the batch price.
Do not multiply the single-unit price.
Remember the DIL socket and the stripboard itself.

Task 4b – Component list

Task 4b – Answers

A complete list. Order codes and prices change – check the current catalogue.

Item ID	Component	Description	Qty
IC1	AND gate IC	7408 quad 2-input AND, 14-pin DIL	1
SK1	DIL socket	14-way DIL socket	1
R1-R3	resistor	10 k carbon film 0.25 W (pull-downs)	3
R4	resistor	470 Ω carbon film 0.25 W (LED series)	1
LED1	LED	5 mm red LED	1
SW1-SW3	switch	SPDT slide switch	3
—	stripboard	cut to 24 $\times$ 18 holes	1
—	wire	single core: red, black, one signal colour	—

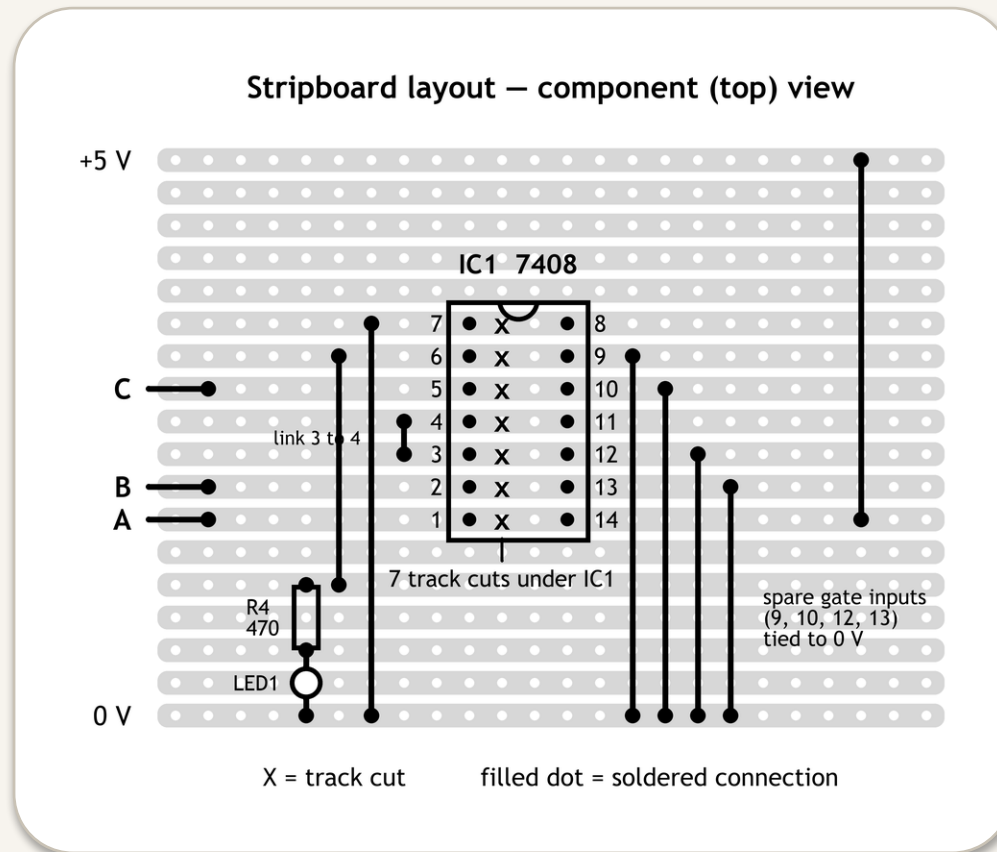
Your turn

Plan your stripboard layout on the grid.
Mark the track cuts with X.
Add test points T1 to T5.
Show every wire link.

Task 4c — Layout

Task 4c – Answers

One correct layout. Any layout that is electrically correct and clearly drawn counts.



Component top view, with the track cuts and the pin 3 to pin 4 link.

Checking a layout

Work down this list against your own drawing.

- The IC crosses the tracks, so every pin has its own track.
- A cut sits between the two rows of IC pins – seven in all.
- The link from pin 3 to pin 4 is there: it joins the two gates.
- Each pull-down resistor bridges two different tracks.
- The LED and its resistor are in the output path, not across the supply.
- Test points are marked and labelled, and it says 'top view'.

Checkpoint

SHOW ME BOARDS

- 1 How many track cuts does this build need, and where do they go?
- 2 Explain why the link from pin 3 to pin 4 is essential.
- 3 Name two items candidates routinely leave off a component list.

Watch Out

Three things the course reports find every year.

THE MISTAKE

- One long track can serve both rows of the chip.
- Multiply the single-unit price by the quantity.
- The component list stops at the electronic parts.

THE CORRECT ANSWER

- Cut between the rows, or pin 1 shorts to pin 14.
- Look up the batch-of-100 price. That is where the marks are.
- Include the DIL socket and the stripboard itself.

PERIOD 2 — SOLDER

Irons on

Socket first, then the passives, then the switches. The chip goes in last of all.

Your turn

Complete the Do / Do not table for soldering safety.
Two of each, at least, before anyone picks up an iron.

Section 10 – Safety when soldering

Soldering safety — Answers

Go over these before the irons are switched on.

DO	DO NOT
Return the iron to its stand whenever it is not in use.	Touch the bit, or a joint you have just made.
Wear eye protection.	Solder the IC directly — use the socket.
Work in a ventilated area.	Leave the lead trailing over the bench.
Wash your hands afterwards.	Leave the iron unattended.

Your turn

Solder the DIL socket first, then the resistors and LED.
Then the switches, then the wire links.
Make every track cut, and check each one.
The 7408 goes into the socket last of all.

Section 10 – Build the board

PERIOD 3 – TEST

Two stages, both in tables

Power off first. Then power on, with the probe. Never write a test up as a paragraph.

Stage 1 – before the power goes on

Booklet section 10. Carried out with the power OFF.

What will be tested	How
Continuity of the +5 V track	continuity tester along the rail
Continuity of the 0 V track	continuity tester along the rail
All track cuts complete	no bleep across a cut
No solder bridges between tracks	look, then test adjacent pairs
DIL socket orientation	compare against your layout
All components match the list	check item ID by item ID
Supply set to 5 V	set it before connecting anything

Stage 2 – the functionality test

Power ON, with the logic probe. These expected values are printed in your booklet.

Test	Expected
T1 – voltage at the +5 V rail	5 V
T2 – voltage at the 0 V rail	0 V
T3 – SW1 at 0 V	logic 0 (green LED on the probe)
T3 – SW1 at +5 V	logic 1 (red LED on the probe)
T4 – A and B both at logic 1	logic 1
T4 – A at logic 1, B at logic 0	logic 0
T5 – A, B and C all at logic 1	logic 1
T5 – any switch open	logic 0
LED1 with all three at logic 1	lit

Your turn

Run Stage 1 with the power OFF. Record every result.
Then Stage 2 with the probe, and fill the measured
column.

Record both as tables – never as a paragraph.

Section 10 – Testing

Common faults, and what causes them

Booklet section 10. Match the symptom, then probe to confirm.

Symptom	Likely cause
LED always on	output linked to the wrong track; LED across the supply; a cut missed
LED never on	LED reversed; IC1 reversed; pin 14 or pin 7 not connected
Output ignores one switch	that pull-down bridges the same track at both ends
Chip runs hot	pin 7 and pin 14 swapped, or a solder bridge between tracks
Behaviour changes when you touch it	a floating 74HC input — a pull-down or a wiper not connected

PERIOD 4 — EVALUATE

Say what the evidence shows

'It worked' earns nothing. 'Every row matched my truth table, including the 1 1 1 row' earns the mark.

What a good evaluation does

- Answers the question that was asked, in a full sentence.
- Quotes evidence from your own test results.
- Names the item ID of anything that went wrong.
- Says what you changed, and whether it fixed it.
- Is honest about what is still not right.

Your turn

Did the board behave exactly as your truth table predicted?

Evaluate the quality of your soldering.

What faults did you find, and how did you repair them?

What would you do differently next time?

Section 10 – Evaluation

Exam Practice

Stripboard questions. Bring the paper; nothing is reproduced here.

Paper	Question	Marks	What it asks
N5 2025	11	6	Stripboard layout to circuit diagram, every part labelled
N5 2024	11	6	The same task, on a two-transistor circuit

Plenary – the whole booklet

SHOW ME BOARDS

- 1 State the voltage for logic 1 in a 5 V system.
- 2 When is an XOR output logic 1?
- 3 A circuit has three inputs. How many rows does its table need?
- 4 Name the three sections of a system.
- 5 Which pin is 0 V on a 14-pin chip?

Plenary – the whole booklet

SHOW ME BOARDS

EXTRA PRACTICE

- 1 Which resistor stops an input floating when the switch is open?
- 2 Where does a logic probe's red wire connect?
- 3 Which colour of wire is for 0 V only?
- 4 What does an X mark on a stripboard layout?
- 5 Name two things a component list must not leave out.

LOOKING AHEAD

The assessed practical

Everything you have just done, once more, for 51 of the 70 practical marks.