Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

laser cutting: wasting; injection moulding: forming; FDM printing: additive; riveting: joining: all four; two or three

2.2

(a) blow moulding

(b) extrusion

(c) vacuum forming

2.3

fixed costs such as moulds and machines are shared between more items; automation reduces labour per item / bulk buying lowers material costs

2.4

(a) $15n = 25\,000 + 5n$, $n =$ **2500**

(b) printing 60 000; moulding $25\,000 + 20\,000 = 45\,000$; saving = **¥15 000**

2.5

advantage: screws can be undone; so the kettle can be repaired, or parts separated for recycling; disadvantage: more parts and assembly time; so the cost per kettle may rise / the joint may need a seal against water

3.1

(a) mass production combined with choice for each buyer; e.g. buyers choose colours, sizes or features and flexible automated lines make each order

(b) each order changes the CAD data, e.g. size and colours; the CAM software sends this straight to CNC machines / printers; so each shoe can differ with no new tools or set-up time

(c) parts arrive only when needed, so there is no buffer stock; a late delivery from a supplier, e.g. of foam, would stop the line; orders are delayed and customers may cancel

(d) award up to [8]: automation gives consistent quality and accurate soles for each custom order; works around the clock, so faster delivery; lower labour cost per pair in the long run; but high set-up cost for machines and software; needs skilled technicians for set-up and repair; some workers may lose their jobs or need retraining, which has a social cost; a breakdown stops all production; judgement: worth it if sales volume is high enough to cover the investment