1.10 Tolerances and Quality Control: 10-minute Pack

AQA 8552 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Show working for calculations. Unless stated otherwise, all stated tolerance limits are inclusive. Use the units given and distinguish a result for an inspected sample from a claim about every unit. Credit equivalent valid calculation methods and justified inspection or process improvements; award each distinct achievement only once.

1 A laser-cut acrylic panel has a slot specified as 20.0 mm ± 0.3 mm. Both tolerance limits are included. State the smallest and largest acceptable slot widths.

(Total for Question 1 is 2 marks)

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2 An injection-moulded clip thickness is specified as 2.40 mm ± 0.08 mm, inclusive. The current calliper reads to the nearest 0.1 mm. For this comparison, assume ideal rounding and no other measurement error. The table gives two actual thicknesses. State the acceptable range. Use the table to explain why the calliper cannot reliably distinguish conformity near a limit, and suggest a more suitable instrument and one check on its use.

Clip	Actual thickness (mm)
A	2.31
B	2.34

(Total for Question 2 is 4 marks)

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3 A batch of aluminium pins has a diameter specification of 8.00 mm ± 0.05 mm, inclusive. The table records five inspected pins. State the acceptable range, identify each conforming measurement and state how many inspected pins fail.

Pin	Measured diameter (mm)
A	7.94
B	7.95
C	8.00
D	8.05
E	8.06

(Total for Question 3 is 3 marks)

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Mark scheme · 1.10 Tolerances and Quality Control: 10-minute Pack

Question 1

lower limit = 20.0 - 0.3 = 19.7 mm	**B1**
upper limit = 20.0 + 0.3 = 20.3 mm	**B1**

Answer: 19.7 mm to 20.3 mm inclusive

Question 2

acceptable range is 2.32 mm to 2.48 mm	**B1**
2.31 mm is below the lower limit but 2.34 mm is within tolerance; both round to 2.3 mm on this calliper, so its reading cannot distinguish their conformity (or another valid rounding example near a limit)	**B1**
use a calibrated instrument with finer resolution and suitable accuracy for the limits, such as a micrometer reading to 0.01 mm; credit an equivalent suitable instrument	**B1**
check zero/calibration against a known reference, or repeat measurements at consistent points with controlled measuring force; credit an equivalent valid check	**B1**

Answer: 2.32 mm to 2.48 mm inclusive. The 2.31 mm clip fails and the 2.34 mm clip conforms, but both display 2.3 mm. Use a calibrated micrometer reading to 0.01 mm with suitable accuracy, and check its zero against a reference.

Question 3

acceptable range is 7.95 mm to 8.05 mm inclusive	**B1**
7.95 mm, 8.00 mm and 8.05 mm conform	**B1**
7.94 mm and 8.06 mm fail: 2 pins	**B1**

Answer: Conforming: 7.95, 8.00 and 8.05 mm; 2 fail

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