1.11 User-centred design

AQA 8552 · Calculator allowed · about 45 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions.

1 Fictional trial of a kitchen timer designed for users with low vision: requirement is numerals at least 12 mm high and audible alarm at least 60 dB at 1 m. Prototype numerals are 10 mm; alarm measures 63 dB. Give a justified design change for the failed requirement and a retest that checks both requirements.

(Total for Question 1 is 4 marks)

2 Fictional user trial for an adjustable craft cutting guide: requirement is to clamp boards 10 to 25 mm thick and remain in position under a 15 N sideways push. Prototype clamp adjusts 12 to 28 mm; it slips at 13 N on a 20 mm board. Six of 8 users found the adjustment knob reachable. Evaluate compliance, propose a change and set out a measurable retest.

(Total for Question 2 is 5 marks)

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3 Fictional trial: 12 users used a library book-rest prototype for 10 minutes. 9 kept their book open, 7 said the angle was comfortable, and 3 said it slid. What fraction and percentage reported sliding, and what should be the first design priority?

(Total for Question 3 is 3 marks)

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4 Fictional interviews with 15 adults about a garden tool gave these coded responses: 11 asked for a lightweight tool, 8 wanted a non-slip grip, and 5 wanted a hanging hole. Requirements: mass no more than 650 g; grip must not slip during a 30 N pull for 10 seconds. State two measurable specifications based on the evidence and explain their value.

(Total for Question 4 is 3 marks)

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5 Fictional trial users measured a portable music stand intended for sheet music 210 mm wide. Their preferred clear widths were 218, 220, 222, 224 and 226 mm. Calculate the mean preferred width and recommend a minimum clear width that accommodates the widest recorded preference.

(Total for Question 5 is 4 marks)

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6 Fictional trial of a folding tablet stand: 10 users tried tablets measuring 180 to 215 mm wide. A fixed 190 mm cradle fitted 6 users; 4 requested adjustment. Specify an adjustable design range that covers the supplied tablet widths, and give one retest.

(Total for Question 6 is 4 marks)

7 Fictional prototype trial: 8 users each rated a clip-on reading light from 1 (poor) to 5 (excellent) for switch access. Ratings were 2, 3, 3, 4, 4, 4, 5, 5. Calculate the mean rating and judge whether it meets a target mean of at least 3.5.

(Total for Question 7 is 4 marks)

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8 Fictional trial of an adjustable book support: requirement is to fit books 18 to 32 mm thick and hold one open for 5 minutes. Prototype slot adjusts from 20 to 30 mm; in a 5-minute test, a 25 mm book stayed open. Identify what passes and fails, then recommend a measurable adjustment and retest.

(Total for Question 8 is 5 marks)

9 Fictional trial for a wheelchair side-bag prototype: requirement is a usable opening at least 160 mm wide and a strap adjustable from 700 to 900 mm. Measurements are opening 154 mm and strap settings 720 to 880 mm. Calculate the opening shortfall and judge both requirements.

(Total for Question 9 is 4 marks)

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Mark scheme · 1.11 User-centred design

Question 1

Enlarge numerals to at least 12 mm	**B1**
Alarm passes at 63 dB against 60 dB	**B1**
Measure numeral height and sound at 1 m after redesign	**M1**
Confirm at least 12 mm and at least 60 dB; include users checking legibility.	**A1**

Answer: Increase numeral height to at least 12 mm; the 63 dB alarm passes. Remeasure numeral height and alarm at 1 m, and ask intended users to confirm legibility.

Question 2

Range misses 10 mm and sideways force test fails at 13 N, below 15 N	**B1**
Six of eight found knob reachable; retain access but the two other responses merit follow-up	**B1**
Extend range to 10 to 25 mm and improve clamp grip or locking	**M1**
Test 10, 20 and 25 mm boards; apply 15 N sideways and confirm no movement, then repeat user reach trial.	**A1**
Repeat trials to see whether the reach finding and clamp performance are consistent.	**B1**

Answer: The prototype fails its lower clamp endpoint and slips before 15 N. Six of eight users found the knob reachable. Extend the range to 10 to 25 mm, improve locking, and retest three thicknesses at 15 N plus user access.

Question 3

3 / 12	**M1**
1/4 = 25%	**A1**
Address slipping first because it affects 3 users and compromises the book-rest function; comfort also needs review.	**B1**

Answer: 3/12 = 1/4 = 25%. Prioritise reducing slip, while investigating the 5 users who did not rate the angle comfortable.

Question 4

Specify mass at or below 650 g, reflecting the most frequently coded need.	**B1**
Specify no slip at 30 N for 10 seconds, making grip performance measurable.	**B1**
Both criteria enable prototype testing; interview counts indicate priorities in this sample, not universal prevalence.	**A1**

Answer: Mass ≤ 650 g and no slip under a 30 N pull for 10 seconds; these turn frequently mentioned needs into testable criteria for this fictional interview group.

Question 5

Sum = 1110 mm; divide by 5	**M1**
Mean = 222 mm	**A1**
Set minimum clear width to 226 mm to accommodate all five observed preferences.	**B1**
This is 16 mm wider than the stated 210 mm sheet width, so check fit in the intended stand.	**B1**

Answer: Mean = 222 mm; a minimum clear width of 226 mm accommodates all five fictional trial preferences.

Question 6

Range must include 180 mm and 215 mm	**M1**
Adjustable cradle span 180 to 215 mm or wider	**A1**
Retest with tablets at both endpoints and confirm secure support without slipping.	**B1**
Adjustable design serves the full stated tablet range, not only the trial users who requested it.	**B1**

Answer: Provide an adjustable cradle span of at least 180 to 215 mm; test 180 mm and 215 mm tablets for secure support.

Question 7

Sum = 30; divide by 8	**M1**
Mean = 3.75	**A1**
Passes the stated 3.5 target, although ratings of 2 and 3 justify considering switch improvements.	**B1**
A mean alone does not show the spread, so retain individual ratings in evaluation.	**B1**

Answer: Mean = 30 / 8 = 3.75, so it meets the target of 3.5; low individual scores still warrant review.

Question 8

25 mm book passes the 5-minute hold test	**B1**
Range fails to cover 18 to 32 mm endpoints	**B1**
A middle-size success cannot demonstrate performance at either limit	**B1**
Extend adjustment range to at least 18 to 32 mm	**M1**
Retest 18 mm and 32 mm books for 5 minutes and verify they stay open.	**A1**

Answer: The 25 mm book passes the hold test, but the 20 to 30 mm range misses both required endpoints. Extend to 18 to 32 mm and retest both endpoint books for 5 minutes.

Question 9

160 - 154	**M1**
Shortfall = 6 mm	**A1**
Opening fails; strap range also fails both endpoints because 720 > 700 and 880 < 900.	**B1**
Adjust opening by at least 6 mm and extend strap adjustment to cover both required endpoints.	**B1**

Answer: Opening is 6 mm too narrow and fails. Strap settings of 720 to 880 mm also fail the required 700 to 900 mm range.

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