

1.2 Ergonomics: fit a range of users

Name: _____ Class: _____ Date: _____

Total: 10 marks

KEY WORDS anthropometry • ergonomics

Objective

Ergonomics: fit a range of users. Supported HL concept preparation; original classroom practice, not an official IB paper or assessed learner work.

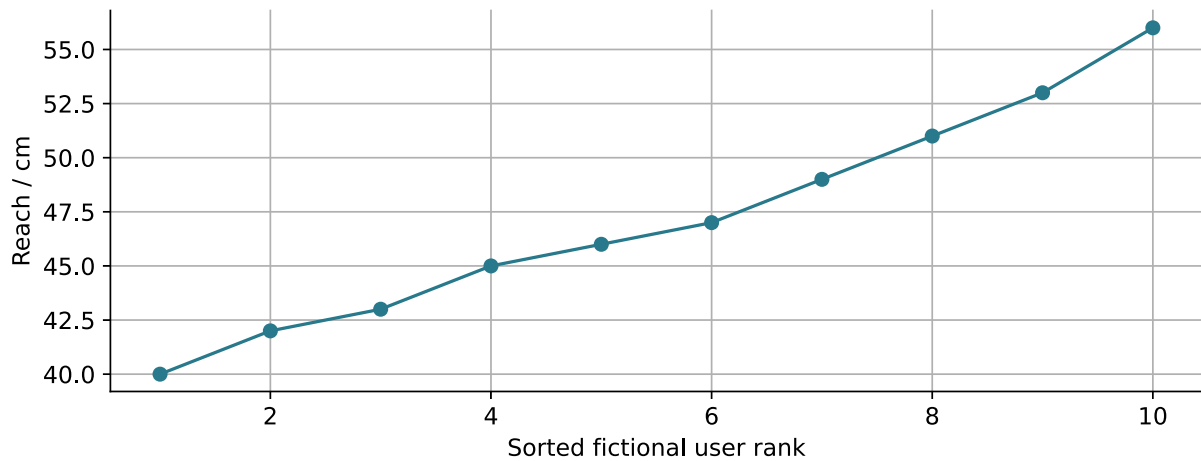
1 Key knowledge and worked examples

■ What would explain this observation?

- A handle sized for the average hand can exclude many intended users. Design decisions need a user range, task and context rather than one average.
 - Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.
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■ Build the model

- **Anthropometry** measures body dimensions; **ergonomics** considers interactions between people, tasks and products. A percentile locates a value within a specified distribution. Choosing a lower or upper percentile depends on whether the dimension concerns reach, clearance or another function. Adjustable design may accommodate a broader range than a single fixed dimension.
- anthropometry: Measurement of human body dimensions for a specified population and method; ergonomics: Study of interactions between people, tasks and systems to inform design.



■ Choose evidence that can test it

- A clearance dimension often needs to consider larger relevant body dimensions, while reach can require smaller relevant dimensions. Neither principle automatically selects a universal percentile. The measured population, posture, clothing, capability and task determine relevance. Consider physical, perceptual and cognitive demands together rather than assuming body size explains every usability issue.
- Define a consenting user group and task. Use attributed data or anonymous teacher-approved measurements, record measurement posture and units, and test safe low-fidelity models before construction. Include users whose access needs differ. Set measurable acceptance criteria and retain qualitative feedback about grip, visibility and comprehension alongside dimensions.

■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: sorted fictional reach measurements are 40, 42, 43, 45, 46, 47, 49, 51, 53 and 56 cm. Under a stated nearest-rank classroom convention, the 10th percentile uses rank $\text{ceil}(0.10 \times 10) = 1$, giving 40 cm; the 90th uses rank 9, giving 53 cm. A 53 cm control distance is beyond the recorded reach of eight users. The small fictional sample does not define a product standard.

Example:

A stated nearest-rank method uses $\text{ceil}(p \times n)$. For $p=0.90$ and $n=20$, find the rank. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- Percentile methods differ, especially for small samples. A percentile is not a percentage of a body dimension. An average dimension and a successful test by one user do not establish accessible design.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

A product dimension based on the mean automatically accommodates every intended user. This claim is false: Percentile methods differ, especially for small samples. A percentile is not a percentage of a body dimension. An average dimension and a successful test by one user do not establish accessible design.

Key:

Ergonomics: fit a range of users: A clearance dimension often needs to consider larger relevant body dimensions, while reach can require smaller relevant dimensions. Neither principle automatically selects a universal percentile. The measured population, posture, clothing, capability and task determine relevance. Consider physical, perceptual and cognitive demands together rather than assuming body size explains every usability issue.

2 Practice

2.1 Which decision is most defensible when a fixed control is unreachable for some intended users? Choose one answer.

- **A** Test a closer or adjustable position against the specified user range
 - **B** Use only the largest measured reach
 - **C** Assume the average guarantees access [1]
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2.2 A stated nearest-rank method uses $\text{ceil}(p \times n)$. For $p=0.90$ and $n=20$, find the rank. Show the relation, substitution and units. [2]

2.3 Decide whether this claim is true and justify: A product dimension based on the mean automatically accommodates every intended user. [2]

2.4 Measurement of human body dimensions for a specified population and method:
write the technical term. [1]

3 Exam-style questions

3.1 Sorted fictional reaches are 40,42,44,46,48 cm. Under nearest rank, find the 20th and 80th percentiles. Which end of the range matters for maximum control reach? [4]
