

Exercise walk-through

1.2

Ergonomics: fit a range of users

International Baccalaureate · IB Diploma · Design Technology · HL

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?

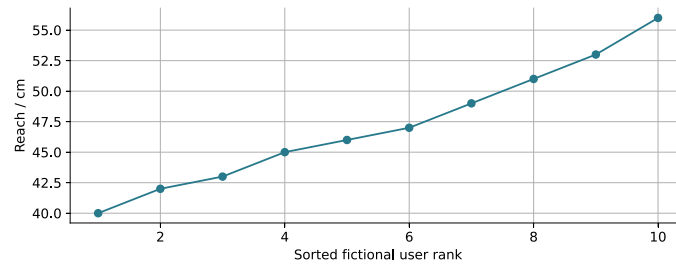
- A handle sized for the average hand can exclude many intended users. Design decisions need a user range, task and context rather than one average.
 - Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.
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■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

Exercises 2.1·2.2

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]

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]

Exercises 2.1-2.2

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- **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]

2.1 A 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.

2.2 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]

2.2 $\text{rank} = \text{ceil}(0.90 \times 20) = 18$; rank is not the measurement value.

Exercises 2.3-3.1

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]

3.1 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]

Exercises 2.3-3.1

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

2.3 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.

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

2.4 anthropometry. anthropometry means Measurement of human body dimensions for a specified population and method.

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]

3.1 Ranks 1 and 4 give 40 and 46 cm. A lower reach accommodates more short-reach users; a 46 cm control exceeds three of five observed reaches. This small fictional sample is not a product standard.