Exercise walk-through

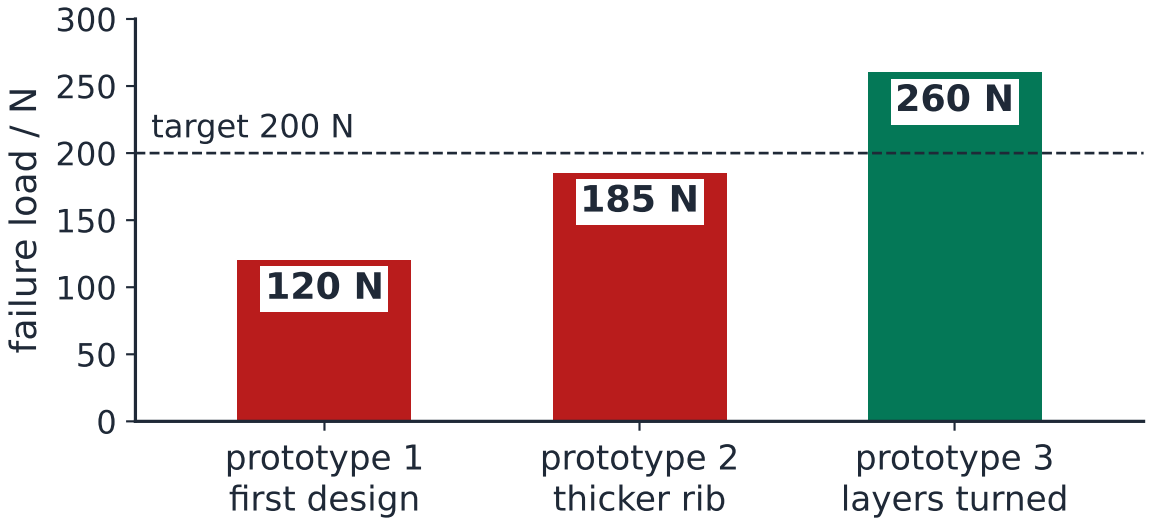
4.1
The design project

International Baccalaureate · IB Diploma · Design Technology · SL

A good design problem

Feature	**Mei's project**
Real need	3 trips in two lessons
Clear context	Classroom desks, students
Manageable	Small, printable part
Testable	Strength, fit, cost, aisle clear

One change at a time



- Prototype 2 changed only the rib.
- Prototype 3 changed only the print direction.

Check yourself

Try these

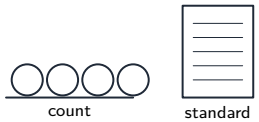
Rewrite "strong", "easy to use" and "cheap" as measurable success criteria with test methods.

A shelf must hold 12 kg of books. With a factor of safety of 2, state a strength criterion.

Evaluate "my project was successful because everyone liked it".

Exercises 2.1·2.2

2.1 Distinguish between **primary** and **secondary** research, with an example of each for a project on bicycle storage at a school. [2]

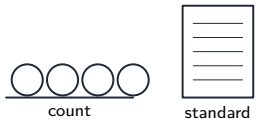


2.2 A student's specification says: "The hook must be strong." Rewrite this as a measurable success criterion and state a test method. [3]



Exercises 2.1·2.2

2.1 Distinguish between **primary** and **secondary** research, with an example of each for a project on bicycle storage at a school. [2]



2.1

primary: data you collect yourself, e.g. counting bikes at the gate / interviewing cyclists; secondary: data others collected, e.g. a bike-rack standard or a website on bike sizes

2.2 A student's specification says: "The hook must be strong." Rewrite this as a measurable success criterion and state a test method. [3]



2.2

a load with a number and unit, e.g. holds 150 N; a condition, e.g. for 1 minute without breaking or permanent bending; test: hang weights, measure the bend before and after

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Exercises 2.3·2.4

2.3 Two ideas for a phone stand are scored from 1 to 5.

Calculate the weighted total for each idea and state which should be chosen. [3]

idea	stability (×3)	cost (×2)	looks (×1)
X	4	3	5
Y	3	5	2

2.4 Explain why a success criterion must be able to **fail**. [2]

pass fail

Exercises 2.3·2.4

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2.3

X: $4\times3+3\times2+5\times1=23$; Y: $3\times3+5\times2+2\times1=21$; choose X, the higher weighted total

2.4 Explain why a success criterion must be able to **fail**. [2]

pass fail

2.4

a criterion that cannot fail does not test anything / gives no evidence; a measurable criterion shows whether the product works and what to improve

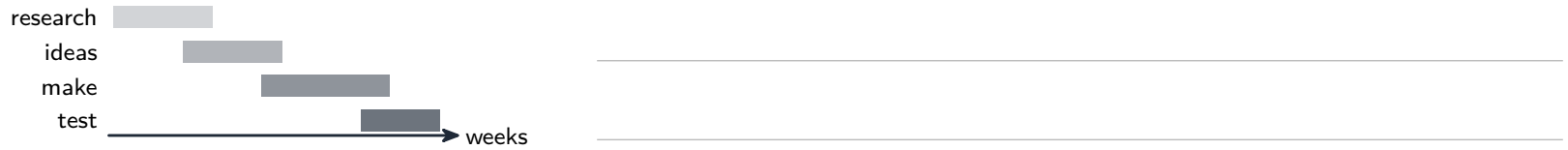
Exercise 2.5

2.5 Outline how a **Gantt chart** helps a student plan a design project. [2]



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2.5

shows each task as a bar against time, so the order, overlaps and deadlines are clear; the student can see early if they are falling behind and change the plan

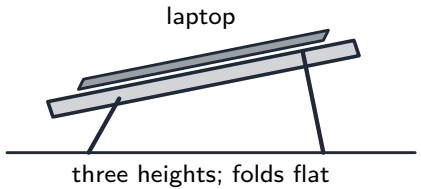
Setup for exercise 3.1

3.1 Ana designed a folding laptop stand for students. Her success criteria and test results are shown.

success criterion	result	met?
holds 50 N for 1 minute with no lasting bend	held; 2 mm bend, fully recovered	yes
three heights from 80 to 150 mm	80, 115 and 150 mm	yes
folds flat to 25 mm or less	32 mm	no
mass under 600 g	540 g	yes
costs under ¥40 to make	¥36 (materials only)	partly verified
at least 8 of 10 users rate comfort 4 or 5 out of 5	6 of 10	no

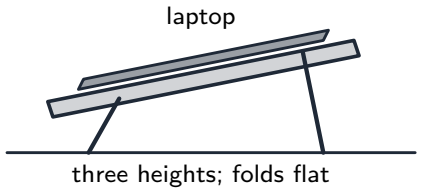
Exercise 3.1 (a)

(a) Identify **two** criteria that were **not** met. [2]



Exercise 3.1 (a)

(a) Identify **two** criteria that were **not** met. [2]



(a) folds flat to 25 mm or less (32 mm); comfort, 8 of 10 users (only 6 of 10)

Exercise 3.1 (b)

(b) The cost criterion is marked “partly verified”. Explain why. [2]

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(b) the ¥36 covers materials only; labour, energy and finishing were not counted, so the full cost may be over ¥40

Exercise 3.1 (c)

(c) Explain **one** limitation of Ana's comfort test. [3]

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(c) only 10 users, so the result may not represent all students; a short test, so it does not show comfort over a long study session; users may be friends who rate it kindly, or tested in one setting

Exercise 3.1 (d)

(d) Suggest **two** improvements to the stand, each linked to the evidence. [4]

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(d) any two, linked to evidence: thinner legs or a hinge that folds the legs inside the top, because it folded to 32 mm, not 25 mm; a slightly angled top or a lip to stop the laptop sliding, because only 6 of 10 users were comfortable; cost every part including labour to check the ¥40 target

Exercise 3.1 (e)

(e) Evaluate how successful the stand is against its specification. [7]

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(e) Evaluate how successful the stand is against its specification. [7]

(e) award up to [7]: strength met: held 50 N with full recovery; the three heights 80 to 150 mm met; mass met at 540 g, so it is easy to carry; but it did not fold flat enough to fit in a bag, which is a key need for students; comfort below target (6 of 10), so the main user need is only partly met; cost not fully verified; judgement: partly successful: strong and adjustable, but needs redesign of the folding and the top, then retesting with more users