09 / STUDENT ACTIVITY

How large can an open box be?

Suggested MYP Years 4-5 | 50 minutes | Quadratic area and cubic volume

Name: _____ Class: _____ Date: _____

Inquiry question

Which corner cut makes the largest open box from a fixed sheet?

A sheet measures 20 cm by 30 cm. Cut equal squares of side x cm from all four corners and fold up the sides to form an open box. Ignore material thickness and tabs. First restrict x to whole centimetres with 1 <= x <= 9.

You need: Paper; ruler; scissors optional; calculator

1. Sketch the net and express the box dimensions in terms of x.

2. Choose a systematic method to compare all permitted cuts.

3. Find the best whole-centimetre cut and check your volume independently.

4. Allow any real cut with 0 < x < 10. Use a graph or numerical search to refine the best cut; distinguish a numerical estimate from a proof.

Record your investigation

Use the space below and extra paper for diagrams, tables, calculations and your conclusion.

Exit response: What did you revise, and what evidence changed your mind?

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09 / TEACHER NOTES

How large can an open box be?

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Teaching purpose

A simple net connects spatial reasoning to functions, constraints and the precision of a recommendation.

Expected findings / checked solution

$V = x(20 - 2x)(30 - 2x)$ cm³. For $x = 1$ through 9, volumes are 504, 832, 1008, 1056, 1000, 864, 672, 448, 216. The integer maximum is 1056 at $x = 4$. Numerical optimisation on the continuous domain gives x about 3.924 cm and V about 1056.31 cm³. Zero and 10 are excluded because the box degenerates.

Neutral teacher prompt

How do you know your proposed maximum is the largest across the domain you are using?

Support

Build the $x = 2$ net and label each dimension before writing a formula.

Extension

Compare the integer optimum with the continuous optimum and evaluate the practical significance of the difference.

Suggested lesson rhythm

Launch for 5 minutes; explore for 35 minutes; compare approaches for 7 minutes; finish with a 3-minute exit response.

Formative evidence

Look for chosen methods, defined variables, independent checks and explanations. These are teaching activities, not IB-issued assessments or automatic criterion scores. Use current school assessment guidance for summative work.

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