



Puzzle 6: Design for Additive Manufacturing

Question:

You are designing a component that will be produced using additive manufacturing. The design includes a 10 mm thick solid block. However, to reduce material use and print time, you decide to redesign it using a lattice structure. If the original solid design weighs 500 grams, how much material would you save if the lattice design is 40% of the density of the solid block?

Hint:

Calculate the weight of the lattice structure based on the density reduction.

These puzzles encourage critical thinking and problem-solving skills, which are essential for students in additive manufacturing. Feel free to adapt or expand these puzzles based on the specific learning objectives of your class!

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You said:

give me more like this

ChatGPT said:

ChatGPT

Absolutely! Here are more additive manufacturing puzzles to challenge and engage your students:

Puzzle 7: Topology Optimization Challenge

Question:

You are designing a lightweight bracket using topology optimization techniques for additive manufacturing. The original bracket weighs 2 kg and needs to withstand a load of 1000 N. By applying topology optimization, you can reduce the weight by 60% while still meeting the strength requirements. What is the final weight of the optimized bracket?

Hint:

Calculate the percentage reduction in weight.

Puzzle 8: Infill Density Decision



19MEE307 Additive Manufacturing

Question:

You are printing a large-scale model that needs to be both lightweight and strong. The printer offers infill options of 20%, 50%, and 80%. If the model weighs 1 kg at 100% infill, how much would it weigh at 50% infill? Additionally, what would be the trade-offs between using 20% infill and 80% infill in terms of strength and material usage?

Hint:

Think about the relationship between infill percentage, weight, and structural strength.

Puzzle 9: Cooling Rate Conundrum

Question:

During the printing of a metal part, you notice that rapid cooling is causing internal stresses, leading to warping and cracking. The cooling rate can be controlled by adjusting the environment around the print. If the ideal cooling rate is 10°C per minute to avoid these issues, how would you modify the print environment if the current cooling rate is 20°C per minute?

Hint:

Consider how you can control the cooling environment, like using an enclosure, insulation, or adjusting ambient temperature.

Puzzle 10: Support Structure Optimization

Question:

You need to print a complex part with overhangs that exceed 45 degrees. Support material will be required, but you want to minimize post-processing time. The printer allows for generating tree-like supports, grid supports, or traditional solid supports. Which support type would you choose to optimize material use and ease of removal, and why?

Hint:

Think about the ease of removal, material usage, and the impact on surface quality.
