Test Subject Practice Exam

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Difficulty: Medium

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1. A researcher is studying the effect of a new fertilizer on plant growth. Two groups of 20 identical plants each are used; one group receives the new fertilizer, and the other group receives a standard fertilizer. After four weeks, the height of each plant is measured. Describe a statistical method that could be used to determine if there is a significant difference in plant height between the two groups. Explain why this method is appropriate and what assumptions must be met for the results to be valid. Detail the steps involved in performing the analysis.

2. Two objects, A and B, are moving towards each other. Object A has a mass of 5 kg and is moving at a velocity of 10 m/s. Object B has a mass of 3 kg and is moving at a velocity of -8 m/s (negative indicating opposite direction). If the two objects collide inelastically (meaning they stick together after the collision), calculate the final velocity of the combined mass. Show your calculations and explain the principles of conservation of momentum that are relevant to this problem.

3. A company is considering two different marketing campaigns to increase sales. Campaign A is expected to generate a 15% increase in sales with a 5% chance of failure, while Campaign B is expected to generate a 20% increase in sales with a 10% chance of failure. If the current sales are $1,000,000, calculate the expected value of each campaign's increase in sales. Based on your calculations, which campaign appears to be the better choice and why? Consider risk and potential payoff in your explanation.