

Please answer the following two problems on a separate pieces of paper (1 sheet only per question). Make sure your work is easy to read, organized, and photographed or scanned properly. **DO NOT TYPE OUT** your solutions.

I would recommend solving the problems on scrap paper, and then organizing your final submission after you have completed the entire process. I don't want to see scribbled out work, wandering calculations, etc.

Part of this task is (i) the physics understanding, and part of this task is (ii) your presentation skills and the following of instructions. The problems require some thinking **BEFORE** starting, but do not require a great deal of calculations.

You are welcome to collaborate and discuss your solutions with your peers; in fact, I would encourage it.

Problem One

A speeding car slams on the brakes and slides across dry asphalt onto loose gravel. **Prove** using (i) forces and kinematics **OR** (ii) energy analysis **OR** (iii) BOTH (required for level 4), that the car travelled approximately 28m on the loose gravel.

Situation Details:

- The car was travelling at 72km/hr when it slammed on the brakes
- Skid distance on asphalt was 20m in length
- Asphalt coefficient of friction is $\mu = 0.6$
- Loose gravel coefficient of friction is $\mu = 0.3$
- Mass of the car is 1000kg

Level	1	2	3	4
Communication Layout of solution is well labelled, organized, easy to follow. Units of measure are present and used correctly. Diagrams are used to assist in the understanding and organization of concepts. (layout of problem, free body diagrams, etc.) Solution is clearly written on ONE sheet of paper.				
Calculations Formula and solving process is clearly laid out and easy to follow. Fnet statements, conservation of energy calculations, etc. are easy to find and follow. Calculations are accurate and maintain a reasonable level of significance. Values are reasonable and make sense for the problem.				
Physics Concepts The proof is valid from a physics concepts standpoint. The approximate value of 28m on the loose gravel is clearly proven. A minimum of one technique was used correctly (level four requires both kinematics and energy approaches)				

Problem Two

An electronics engineer needs to create a small circuit that will restrict the current in one resistor to a desired amount. They need to have a current of 100-300mA flowing through a 10-ohm resistor. Their circuit is part of a larger project and has the following criteria that must be met.

Circuit Details:

- There are three resistors, and ALL must be used (100 Ω , 100 Ω , 10 Ω)
- The power supply (battery) is 12 V
- The circuit may be series, parallel, or both
- The current through the 10 Ω must be held to **100-300mA**

Level	1	2	3	4
Communication Layout of solution is well labelled, organized, easy to follow. Units of measure are present and used correctly. Circuit Diagram is drawn neatly (ruler) and has all values labelled with units Solution is clearly written on ONE sheet of paper.				
Calculations Formula and solving process is clearly laid out and easy to follow. Calculations are accurate and maintain a reasonable level of significance. Values are reasonable and make sense for the problem.				
Physics Concepts The proof is valid from a physics concepts standpoint. Electricity concepts are applied correctly.				

The final circuit diagram, using proper symbols should be submitted with this task, as well as supporting calculations to verify your findings.

Circuits can be modelled and explored using the **PHet simulations** found on my website (or Google it). Only submit your final circuit diagram and calculations. This is strongly recommended as it can save you a great deal of time.

Final Submission of this task will include TWO PAGES ONLY, one for each problem.

Please save as a PDF and submit as ONE file (two pages, one file).

Thank you for persevering until the end of the course. You should be proud of yourself and what you have accomplished. Finish strong and then rejoice in your success.