

# [Geomorphology - lab report example](https://assignbuster.com/geomorphology-lab-report-example-lab-report-samples/)

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## Geomorphology

Information: Semester: Due GSC336, Lab Report: Driving and Resisting Forces Lab Objective: To gain a deeper understanding of Driving and Resisting Forces, by building a simple model and applying the knowledge acquired in class.
Lab Specific Goals:
a. To learn and apply geomorphology’s unifying concept, driving and resisting forces.
b. To review the various trigonometric functions and constitutive equations
c. To learn how to build equations, simple models and graphical plots in Microsoft Excel.
Lab Requirements:
a. Computer,
b. Microsoft Excel,
c. Hand-held or online calculator,
d. Printer.
Procure
1. The Lab 1 Microsoft Excel worksheet was downloaded from the “ Module 1” in Canvas.
2. The was opened in worksheet in Microsoft Excel.
3. The matrix elements B2, B3, B4, were filled with the corresponding density (ρ), gravitational acceleration (g) and thickness (z).
The following constants were using in during the Lab:
ρ = 1, 000 kg m-3
g = 9. 8 m s-2
z = 1 m
4. The angles values were then entered in column E2: E18, 0-1. 57, in increments of tenths, e. g., 0, 0. 1, 0. 2,… In the last column, (E18), the value 1. 57 was entered instead of 1. 6. These angle values were expressed in radian units.
5. In columns F2: F18, the angles in radians were converted to degrees. A formula was developed in each cell of the Microsoft Excel to do the conversion.
6. Shear Stress was then calculated. In Column G, a constitutive equation that calculates the corresponding shear stress for each angle (degrees) listed in the worksheet was built. Learn
7. Normal Stress was also calculated. In Column H, a constitutive equation that calculates the corresponding normal stress for each angle (degrees) listed in the worksheet was developed. .
8. A scatterplot in was created in Excel. The y, or response axis, is stress (kPa). The x, or Slope angle (deg) and (2) Normal Stress vs. Slope angle (deg). The axes were properly labeled.
9. The matrix and scatter plot were saved as a pdf, and then printed out.
Results and Discussion
The Data Matrix obtained is as shown below:
Slope angle (radians)
Slope angle (Degrees)
Shear stress (acts to impel material downslope)
Normal stress (acts to hold material in place)
F= M sinθ
F= M cos θ
0
0
0
5092. 958179
0
1000
0. 1
5. 729577951
127. 111854
5067. 514602
99. 83342
995. 00417
0. 2
11. 4591559
1011. 814593
4991. 438094
198. 6693
980. 06658
0. 3
17. 18873385
1505. 072054
4865. 488786
295. 5202
955. 33649
0. 4
22. 91831181
1983. 291331
4690. 925123
389. 4183
921. 06099
0. 5
28. 64788976
2441. 694218
4469. 491286
479. 4255
877. 58256
0. 6
34. 37746771
2875. 700503
4203. 39977
564. 6425
825. 33561
0. 7
40. 10704566
3280. 973739
3895. 309273
644. 2177
764. 84219
0. 8
45. 83662361
3653. 46457
3548. 298134
717. 3561
696. 70671
0. 9
51. 56620156
3989. 451191
3165. 833572
783. 3269
621. 60997
1
57. 29577951
4285. 576534
2751. 737048
841. 471
540. 30231
1. 1
63. 02535746
4538. 881814
2310. 146077
891. 2074
453. 59612
1. 2
68. 75493542
4746. 836086
1845. 472889
932. 0391
362. 35775
1. 3
74. 48451337
4907. 361541
1362. 360347
963. 5582
267. 49883
1. 4
80. 21409132
5018. 854262
865. 6355506
985. 4497
169. 96714
1. 5
85. 94366927
5080. 20025
360. 2616098
997. 495
70. 737202
1. 57
89. 95437384
5092. 956564
4. 055658635
999. 9997
0. 7963267
Shear Stress, T= F/A
Normal Stress, N= F/A
F= M sinθ
F= M cos θ
whereby M= 1000
whereby M= 1000
Area (A)= PI() \*(B4/2)^2
Area (A)= PI() \*(B4/2)^2
T= M sinθ/PI() \*(B4/2)^2
T= M sinθ/PI() \*(B4/2)^2

Scatter Plot
Helpful definitions:
Matrix - a rectangular array of numbers, symbols, or expressions, arranged in rows and columns. The individual items in a matrix are called its elements or entries.
Radian - standard unit of angular measure, used in many areas of mathematics.
Constitutive equation - a relation between two physical quantities (especially kinetic quantities as related to kinematic quantities) that is specific to a material or substance, and approximates the response of that material to external stimuli, usually as applied fields or forces.
Questions
1. Is shearing force a Driving or Resisting Force? Is normal force a Driving or Resisting force? Which is which? In your own words, justify your answers. (5 pts)
2. In your own words, explain Normal and Resisting Forces using a Boulder on a hillslope as an example. Hint: see you textbook, Chapter 1, for help. (5 pts)
3. Based on your scatter plot and knowledge acquired from your textbook, what is the critical angle, in degrees, that determines if the boulder would move, or not? Why did you choose this angle? (5 pts)
4. A local business informs you they have a 1 m-thick rock slab with a density of 1000 kg m-3 lying in their backyard that slopes at 25 degrees. Given normal weather conditions and unsaturated soils, will this rock slide and potentially destroy their business? Justify your answer in terms of angle, Driving and Resisting forces. (5 pts)
Answer to the Questions
1. Is shearing force a Driving or Resisting Force? Is normal force a Driving or Resisting force? Which is which? In your own words, justify your answers. (5 pts)
Shear force is a driving force because its effect is felt parallel to the slope. Normal force is a resisting force because it effects acts perpendicular to the slope (Lemke).
2. In your own words, explain Normal and Resisting Forces using a Boulder on a hillslope as an example. Hint: see you textbook, Chapter 1, for help. (5 pts)
Normal forces or resting forces on a boulder cliff tends to restrict the movement of an object. The angle of the slope is a contributing factor to the movement of a boulder along a hill slope. Additionally, the stability of the slope also affects the movement of an object. In this case, factors such as friction and cohesion determine how fast an object moves (Lemke).
2. Based on your scatter plot and knowledge acquired from your textbook, what is the critical angle, in degrees, that determines if the boulder would move, or not? Why did you choose this angle? (5 pts)
The critical angle for determining whether the boulder would move, or not is 45. 840 degrees. At this point, the boulder would assume a stationery motion. The value is arrived by observing the point of intersection between the curves of shear and normal stress.
4. A local business informs you they have a 1 m-thick rock slab with a density of 1000 kg m-3 lying in their backyard that slopes at 25 degrees. Given normal weather conditions and unsaturated soils, will this rock slide and potentially destroy their business? Justify your answer in terms of angle, Driving and Resisting forces. (5 pts)
At 25 degrees, the sheer force on the rock will be 984. 807753 while the normal stress will be 173. 6481777 (in the opposite direction). This means that the forces propelling the rock slab downwards are greater than the resisting forces. Assuming that the weather conditions remain at normal levels it is highly likely that the rock in question will inflict a considerable damage to the surrounding property.
Conclusion
The experiment is of great essence. This is because it gives the relationship between the weights of an object, the forces acting on it, the angle of inclination and the acceleration due to gravity. This concept can be, for instance, used by geomorphologists to establish the effects and extent of flooding on flood plains. Also the concept is applicable in monitoring the changes in river position and patterns, among other geomorphological applications. Work Cited
Lemke, Karen A. “ Slope Stability & Mass Wasting.” University of Wisconsin-Stevens Point, December 1, 2013. Web. January 26, 2015 < http://www4. uwsp. edu/geo/faculty/ lemke/geomorphology/lectures/10\_mass\_wasting. html>