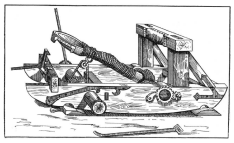


NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

This submission is original work and no part is plagiarized (Prachi) _____(Date)_____

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

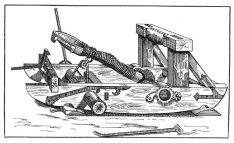
MECHANICAL ENGINEERING DEPARTMENT

Thapar Institute of Engineering and Technology, Patiala

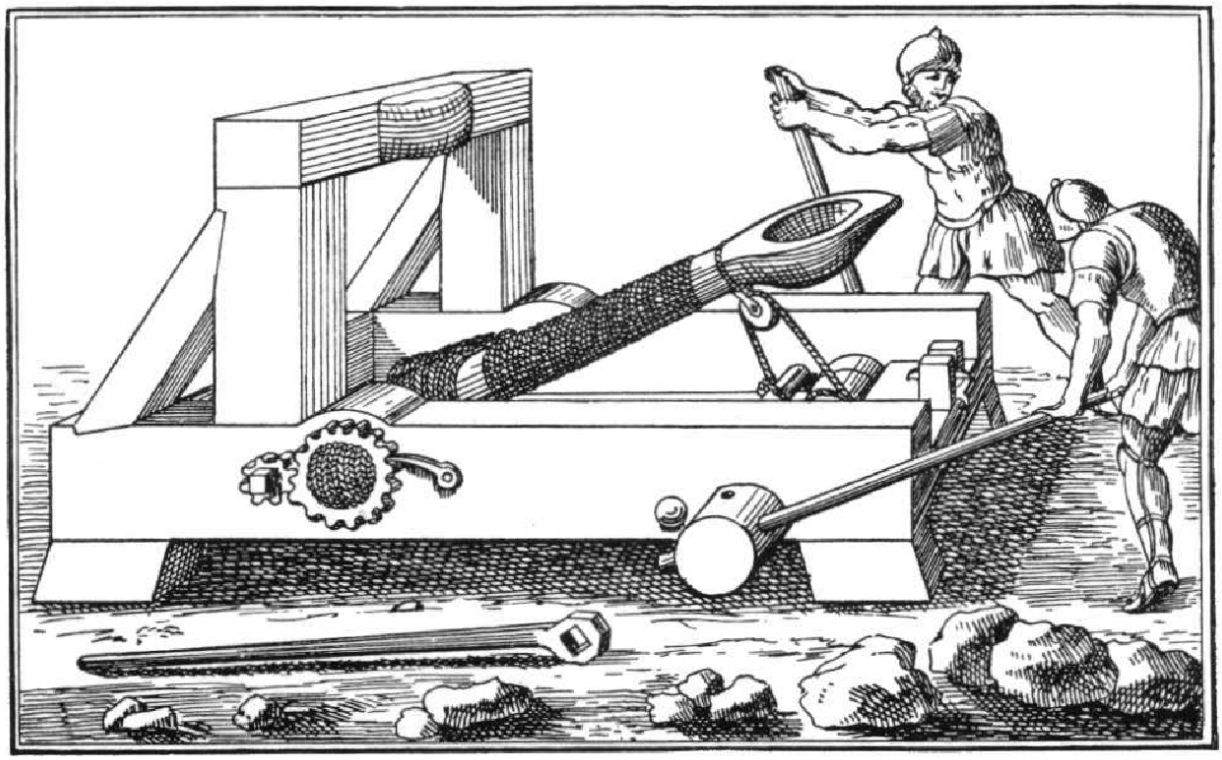
ASSIGNMENT - 2.
DYNAMICS FOR THE MANGONEL-WITH DRAG

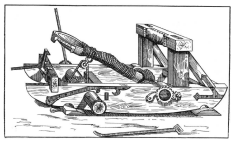
UTA013 Engineering Design Project-I

(Reference: TCD course 1E13



NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21





NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

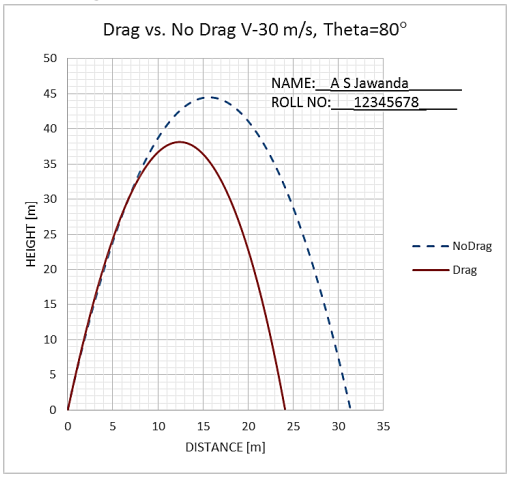
ASSIGNMENT - 2.

DYNAMICS FOR THE MANGONEL-WITH DRAG

The following tasks have been based on the lecture on projectile dynamics for the Mangonel -**With Drag**.Complete the following **individually, copying will be dealt with severely.**

Notes:

1. Ensure the curves are visible and sufficient resolution is provided so that the height and distance is determinable. Keep scale of x-axis and y-axis roughly the same, e.g. 10m on x-axis and y-axis should be forming a square. The following chart is an example for 80 degrees at 30m/s.



Note:Compulsory to Add Text box of Name and Roll No to every graph as shown.

2. The excel graphs for Drag Vs No Drag Velocity=20m/s, Angle=50 degrees have to be shown for evaluation on the same day. While the print of this word document with **graphs(with Name and Roll No in text box)** and **hand written conclusions,name & roll number on every page**, stapled together, is to be submitted in next Tutorial class (if it is a holiday, then as instructed).
3. Do not leave this assignment until the last minute to find you have some IT issue.

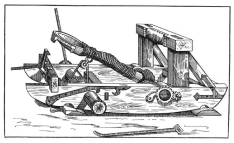
Enjoy the assignment and try to think around the subject as much as possible and take from it any tips that you might use with your own Mangonel design.

Marking Scheme:

Tutorial 2 Total = 10 Marks

Evaluation at end of 2 Hours Tutorial 2: 5 Marks (Drag Vs No Drag. Velocity=30m/s, Angle=80 degrees)

Evaluation of printout and hand written submission: 5 Marks



NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

Assignment 1 (10Marks) + Assignment 2 (10 Marks) = 10 % weightage.

TUTORIAL CLASS EVALUATION **[5 Marks]**

Plot graph for Drag Vs No Drag. Velocity=20m/s, Angle=50 degrees. Use rho=1.2 kg/m^3, Cd=0.4, mass=0.05kg, D=0.045 m.

Evaluated at the end of 2 Hours of tutorial class on computer.

One Marks each for:

1. **Excel sheet formulation,**
2. **Layout,**
3. **Graph double series for Drag vs No Drag,**
4. **Graph clarityand**
5. **Graph format, as given in note.**

NOTE: ***Compulsory*** *to Add Text box of Name and Roll No to every graph as shown.*

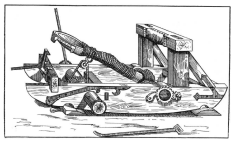
Save this word document adding your name and roll number to the front page. Using the Excel spreadsheets that you have developed in class to model the dynamics of a "missile" cast by the Mangonel which is subject to aero-dynamic drag, cut and paste charts for the following parameters into the document below:

Q1. Use rho=1.2 kg/m^3, Cd=0.4, mass=0.05kg, D=0.045 m.

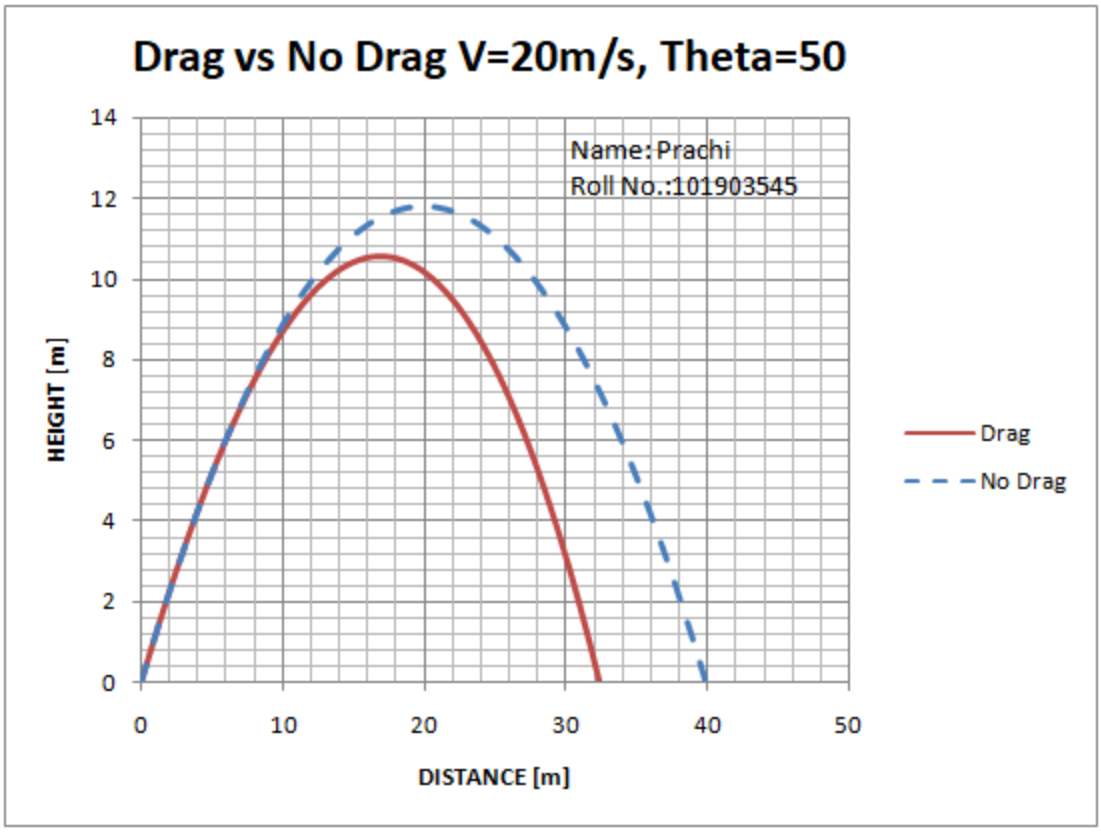
a. Drag Vs No Drag. Velocity=20m/s, Angle=50 degrees

Soft copy evaluated at the end of 2 Hours of practical class on computer.

<Insert Graph>

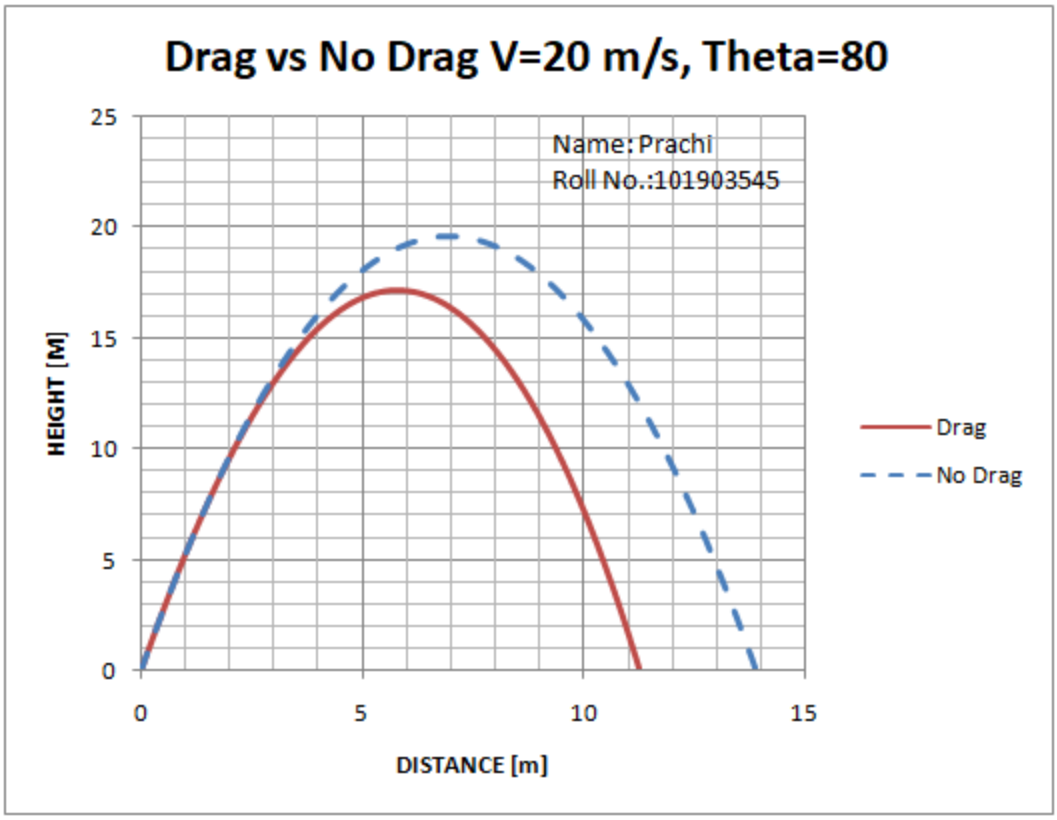


NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21



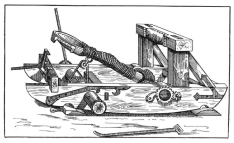
b. Drag Vs No Drag. Velocity=20m/s, Angle=80 degrees

<Insert Graph>

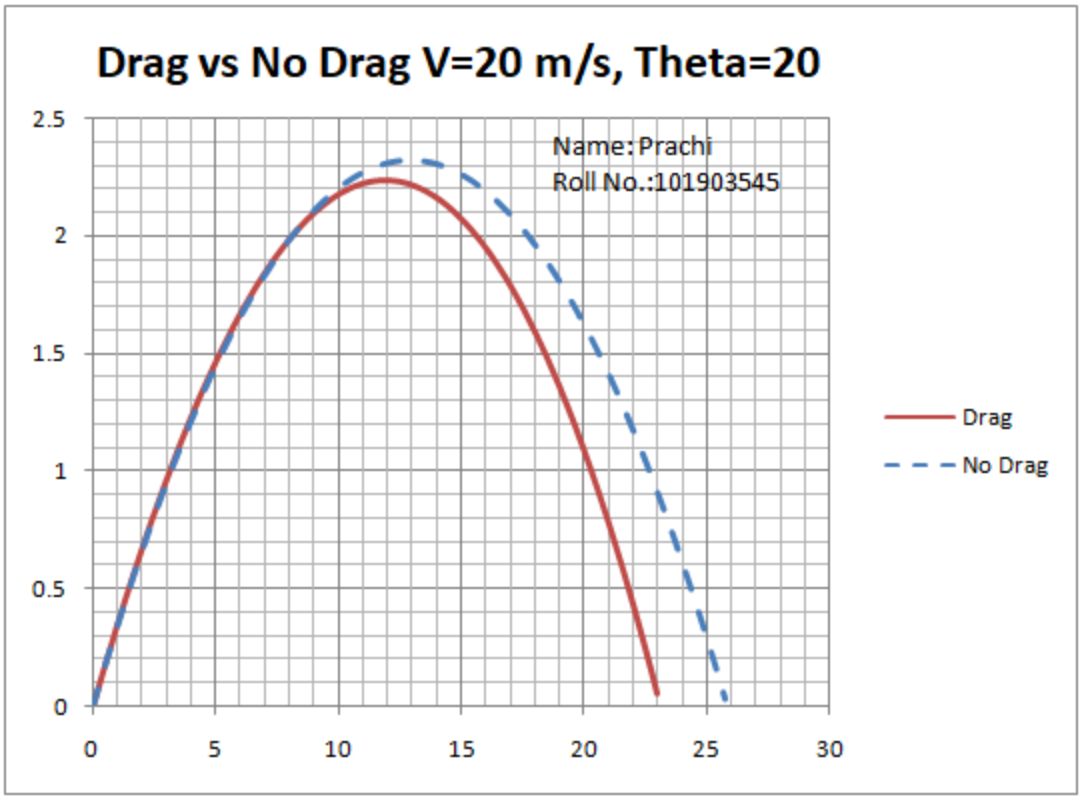


c. Drag Vs No Drag. Velocity=20m/s, Angle=20 degrees

<Insert Graph>

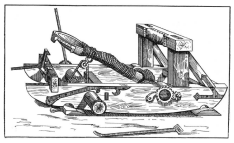


NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21



Q2. Read, from the figures determined in Q1 or directly from the results calculated using your spreadsheets, the predicted max. horizontal distances travelled (in the x-direction when y = 0 approx.) for the "drag" and "no-drag" cases. Complete the following table with **hand written values**. Round your results to nearest integer (no decimal places).

	25 Degrees	45 Degrees	75 Degrees
x (with drag) [m]			
x (no drag) [m]			



NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

Q2

	25°	45°	75°
x (with drag) [m]	27m	33m	16m
x (no drag) [m]	31m	41m	20m

Q3. Complete the following table by **hand written values** for the maximum distance travelled in x. Use values rho=1.2 kg/m^3, mass=0.05kg, D=0.045m, theta=45degrees in this question.

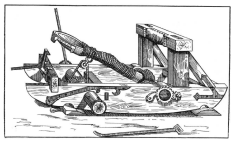
Cd \ Velocity	10m/s	30m/s	40m/s
0			
0.5			
1.0			

Q3

Cd / Velocity	10 m/s	30 m/s	40 m/s
0	10.182 m	91.641 m	163.2 m
0.5	9.459 m	56.646 m	79.661 m
1.0	8.834 m	42.352 m	55.503 m

Q4. Complete the following table by **hand written values** for the maximum distance travelled in x. Use values rho=1.2 kg/m^3, Cd=0.4, D=0.045m, Theta=45degrees in this question.

mass \ Velocity	10m/s	30m/s	40m/s
0.020 [kg]			
0.040 [kg]			
0.080 [kg]			



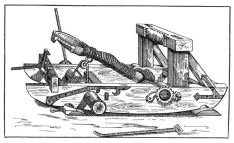
NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

Q4 mass \ Velocity	10 m/s	30 m/s	40 m/s
0.020 [kg]	8.834 m	42.351 m	55.502 m
0.040 [kg]	9.459 m	56.649 m	79.660 m
0.080 [kg]	9.773 m	69.336 m	104.823 m

Q5. For a 30m/s launch velocity, taking the values rho=1.2 kg/m^3, Cd=0.4, mass=0.05kg, D=0.045 m find the maximum horizontal distance of travel for launch angle varying from 20 to 70 degrees and record **hand written values** in table below. Plot the graph and use it to find the angle of launch which would give maximum horizontal distance of travel.

Velocity	Max. Distance in x
20°	
25°	
30°	
35°	
40°	
45°	
50°	
55°	
60°	
65°	
70°	

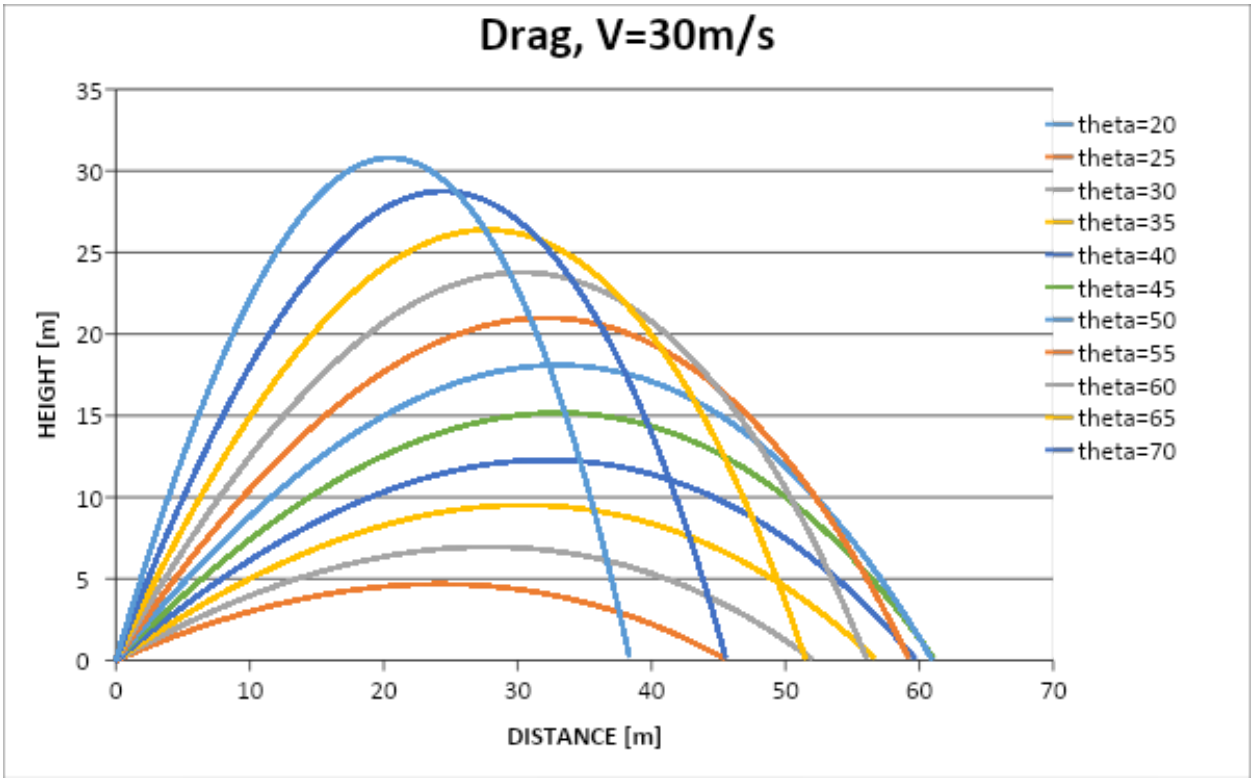
<Insert Graph>



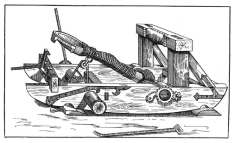
NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

Q5

Velocity	Max Distance in x
20°	45.71 m
25°	52.02 m
30°	56.83 m
35°	59.72 m
40°	60.69 m
45°	61.11 m
50°	59.33 m
55°	56.08 m
60°	51.52 m
65°	45.62 m
70°	38.41 m



(Reference: TCD course 1E13



NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

NOTE: Answers to Q6,Q7, Q8, Q9 and Q10 to be **hand written only**

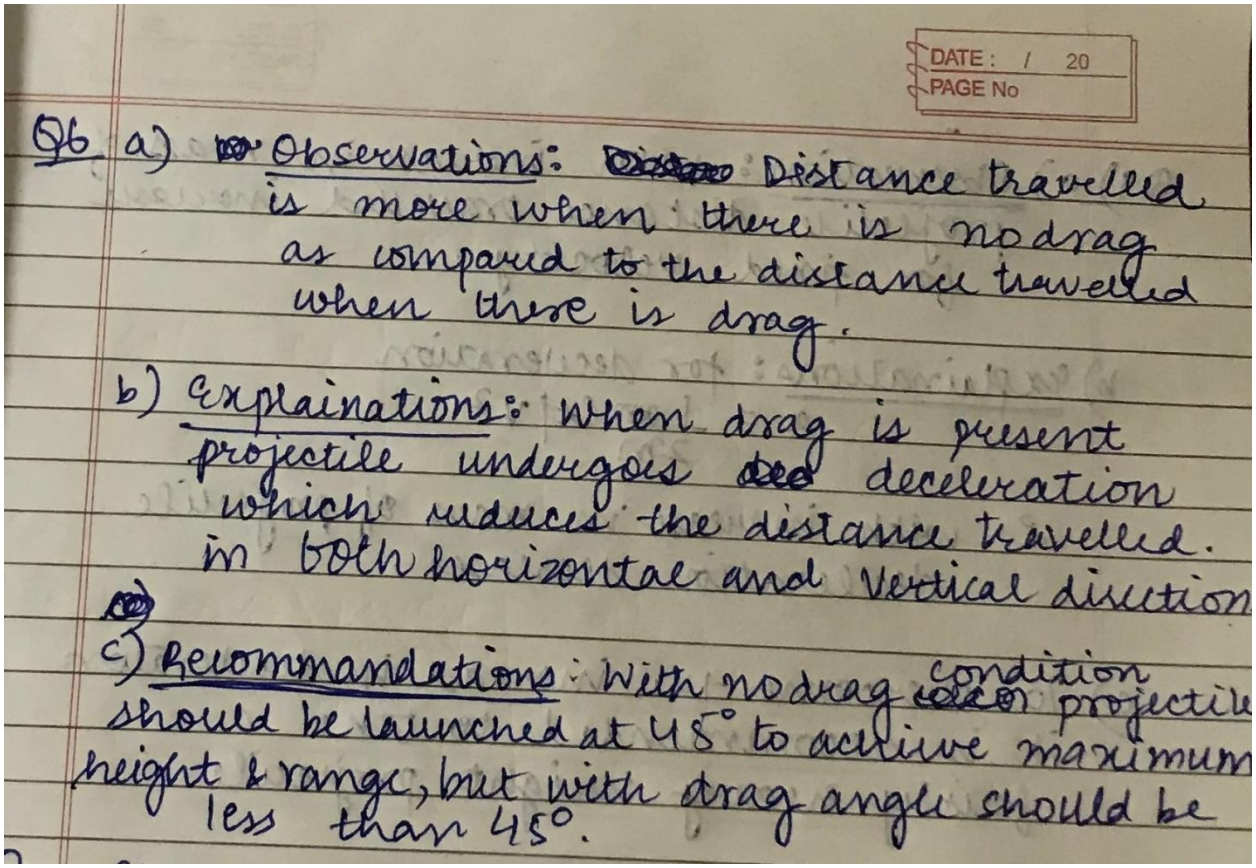
[5 Marks]

Q6. From the results of question 2, write one or two sentences to address each of the following:

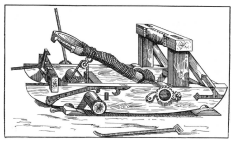
a) Observations:

b) Explanations:

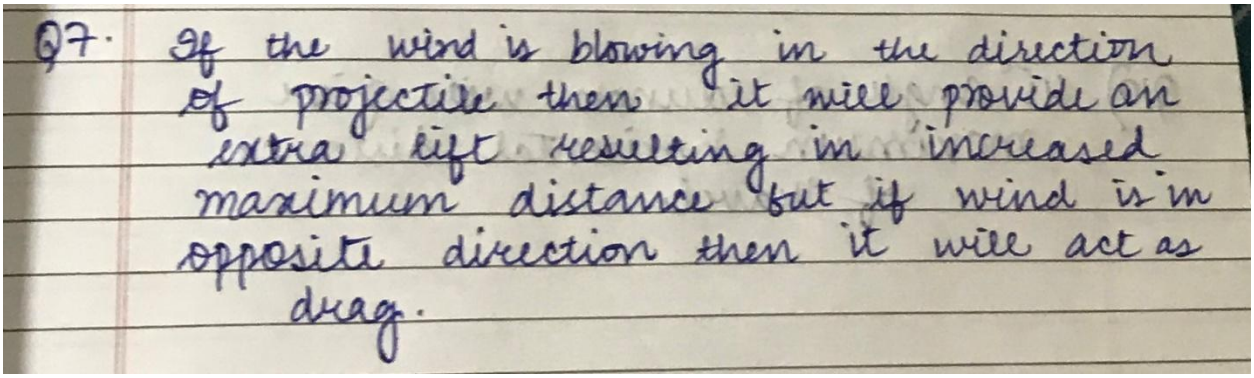
c) Recommendations with regards to the optimum use of the Mangonel:



Q7. If we were to test the mangonel outside in windy conditions, what comments have you to add based on the above analysis in question 6.



NAME: Prachi Singhroha Roll No: 101903545 Group: 2CO21

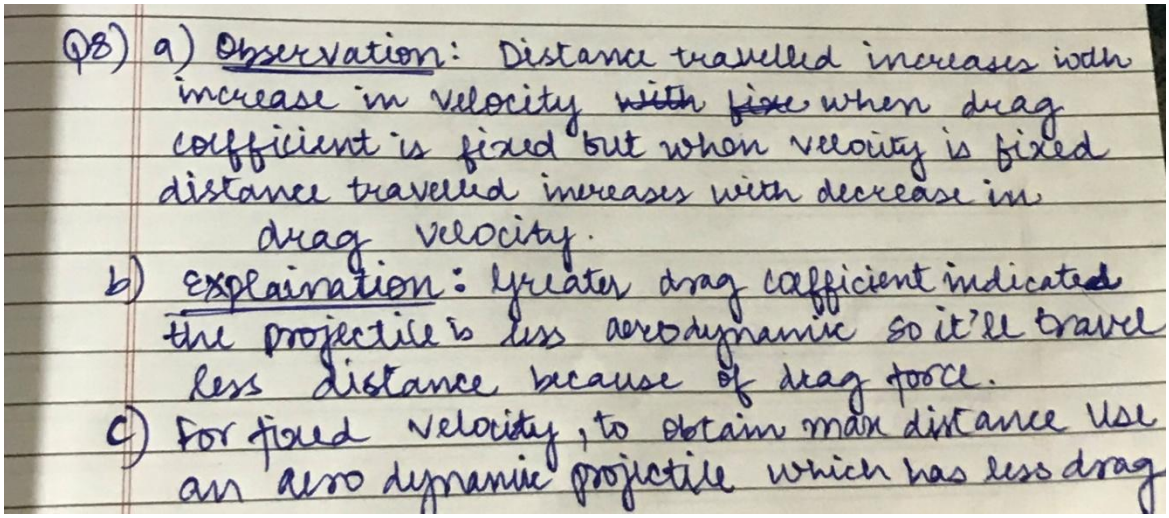


Q8. From the results of question 3, write one or two sentences to address each of the following;

a) Observations:

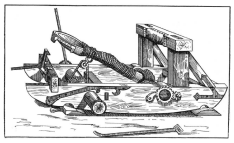
b) Explanations:

c) Recommendations with regards to the optimum use of the Mangonel:



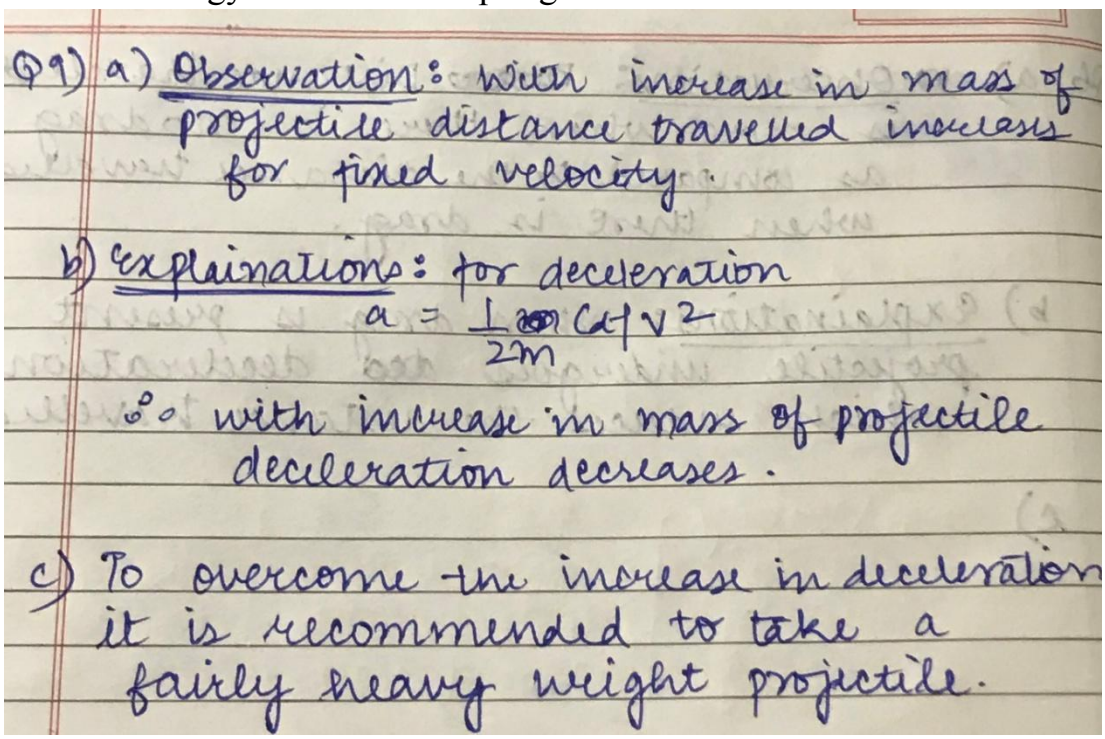
Q9. From the results of question 4, write one or two sentences to address each of the following;

a) Observations:



b) Explanations:

c) Recommendations with regards to the optimum use of the Mangonel. For this last point, consider the effect of a change in mass when all other aerodynamic and physical parameters remain fixed, e.g. the potential energy stored in the "spring":



Q10. From question 5 angle of launch which would give maximum horizontal distance of travel is: