Candidate 3 evidence

Optimum angle of release for a projectile to have Maximum Range.

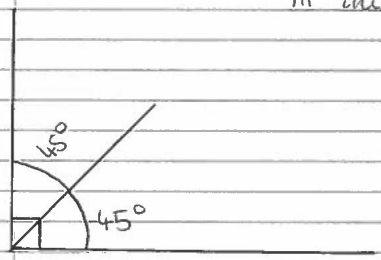
Aim: To find at what angle when a projectile is released will it go its Maximum range.

Underlying physics:

As we know the optimum angle is 45°.
to prove this we can see that a projectile will go its farthest when the horizontal value of its angle (Cos) is equal to its ~~horizontal~~ vertical angle (Sin).
The only time this can be is when the angle is at 45°

For example.

In this case $\sin\theta = \cos\theta$
∴ it will travel to its Maximum Range.



Method:

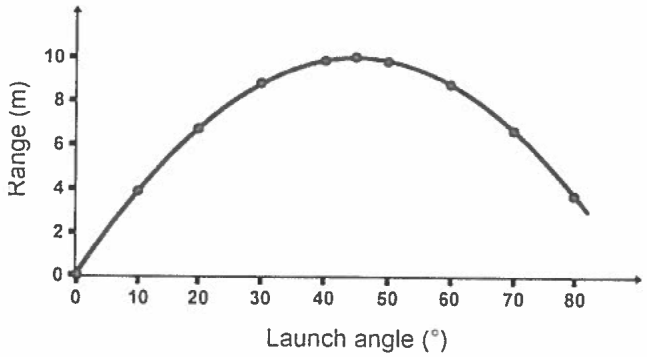
We used a piece of kit called a 'Ballistic Launcher' to fire our projectile. We used the same amount of power each time so that it was fair.
We had a tape measure on the ground and we would measure ~~the~~ how far away from the launcher the ball landed. We got these results.

Angle at which launcher was fired (°)	Range (m) Attempt 1	Attempt 2	Attempt 3
10	1·8	1·8	1·75
20	3	3·05	3
30	3·3	3·3	3·4
40	3·5	3·4	3·5
50	3·1	3·15	3·1
60	2·6	2·7	2·8
70	1·9	1·85	1·9

This gave us averages of.

Angle (°)	Average Range (m)
10	1·78
20	3·02
30	3·33
40	3·46
50	3·12
60	2·7
70	1·88

A source from BBC Bitesize had the results.



http://www.bbc.co.uk/schools/gcsebitesize/science/triple_ocr_gateway/space_for_reflection/projectile_motion/revision/2/

graph

* For the graph my average range values have been rounded to the nearest 0.05s.

Analysis: My Graph is quite similar to the graph which was found on the internet but, did not fire at 45° when they did. And in our Results we found 40° to be the angle at which the ball traveled furthest. Our Results did however follow a similar trend to the results of the BBC experiment.

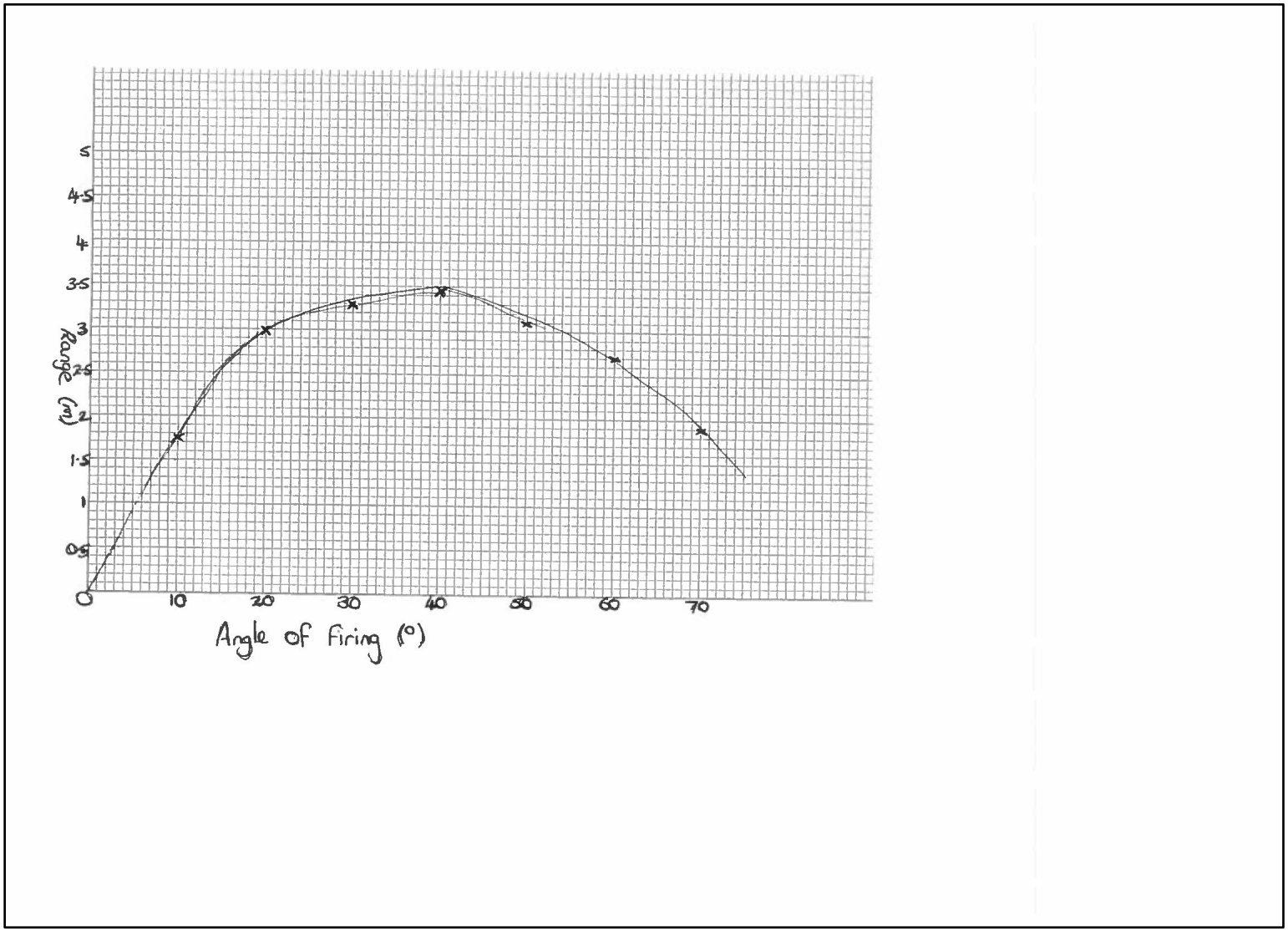
Conclusion: I found in my experiment that the angle to fire a projectile at to get maximum Range is 40° which gave us a range of 3.46 metres.

Evaluation: In our practical there were 2 reasons why our results were not as good as they could have been because

1. The launcher was only fired every 10° meaning we leapfrogged the optimum angle entirely

and reason 2. our method of measuring the ball was not very good because it was very hard to tell where the ball had actually landed because the ball would roll and bounce.

To solve problems 2 we could have used a long sandpit to stop the ball from bouncing and rolling. This way we could measure how far the ball had travelled and get much more accurate results.


Range (m)
5
4·5
4
3·5
3
2·5
2
1·5
1
0·5
0
10
20
30
40
50
60
70
Angle of Firing (°)