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Investigation to find out what affects the size of a shadow.

Aim

To see what happens to the size of the shadow when certain factors are changed.

Variables

There are many variables in which I could change. For our experiment it will be sufficient for us only to change one variable the rest we will keep constant. Here is a list of variable from this I will choose one variable to which I think will have the most effect on the size of the shadow.

- Positioning of screen in co-ordination with the lamp
- Size of the screen and the lamp
- Size of the object used.
- Shape of the object used
- Angle of the screen
- Shape of the screen
- Distance between light and object.

The variable highlighted in red is the one I will change, as this I believe is the factor that affects the size of a shadow the most.

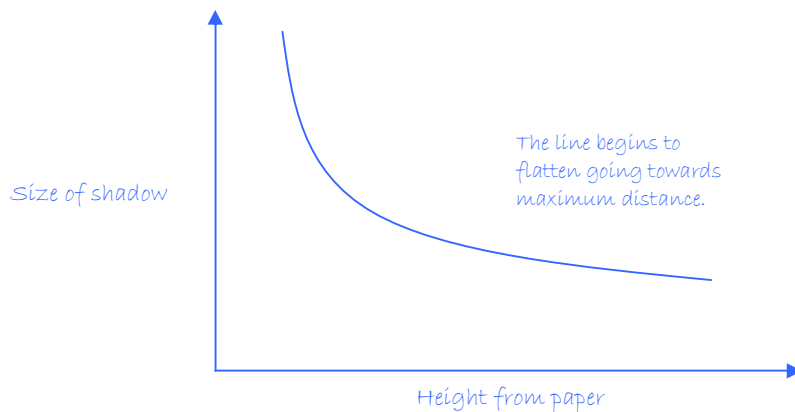
Hypothesis

I predict that the closer the object is to the light source the larger the shadow will be. Therefore the further away the objects from the light source mean the shadow will be smaller. This is due to many factors regarding how light travels and the distance to object lies from the source light. We know that light travels in straight lines so when an object is place in front of a light the light cannot travel around the object or through it so the object blocks out the light. This means that if the objects are closer to light the light source the more light is blocked out. So the further away the object is less light gets blocked out. To show how this works I will go on to draw a scale diagram, which will show roughly how big the shadows, will be.

Distance from screen (cm)	Size of shadow (cm)
10	6
20	7
30	11
40	22

Using these predicted results I can now go on to predict what my graph would look like.

Predicted Graph



From looking at my results and my graph I can see that as the object gets closer and closer to the screen the shadow becomes closer to be the same size as the object itself. This is because there is less and less light to block out.

Fair test

There are many reasons as to why I must make sure the test is fair one. If it not kept fair our results could be unreliable and incorrect this means that our experiment would have been a wasted one. To make sure the test is as fair as possible I will have to control carefully certain factors these are:

- The angle of the object must stay the same otherwise the size of the shadow can be affected by the angle.
- We must make sure we use the same object for all our experiments this is to ensure that all the shadows are proportional to the size of the object. If we used a slightly different sized object are graph wouldn't be true.
- I will measure our results very accurately in some cases three decimal places to ensure our results are very reliable.
- The height of the lamp must remain the same throughout the experiment this is to ensure that we have no anomalies or unjustified results.

If we follow all these guidelines our experiment should turn out reliable as well as successful.

Plan

- Attach boss to clamp stand.
- Connect light source to power pack using connecting wires provided.
- Securely fix the lamp to the boss at 50-cm (use a 100cm ruler to measure accurately).
- Place down sheet of white a4 paper to act as screen again checking the height of the bulb.
- Position object at 5cm intervals from the screen (e.g. 5cm, 10cm, 15cm etc)
- Mark on the screen the size of the shadow accurately with a sharp pencil.
- Tabulate results in an appropriate table making them clear and easy to understand.

Results

Experiment 1

Height from screen (cm)	Shadow size (cm)
40	14
35	11.925
30	8.175
25	6.75
20	5.675
15	5.075
10	4.5
5	4.1

Experiment 2

Height from screen (cm)	Shadow size (cm)
40	15.25
35	11.25
30	9
25	7.125
20	6.375
15	5.525
10	4.875
5	4.575

Experiment 3

Height from screen	Shadow size (cm)
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(cm)	
40	14.875
35	11.2
30	9.025
25	7.65
20	6.4
15	5.475
10	5.05
5	4.5

Average

Height from screen (cm)	Shadow size (cm)
40	14.708
35	11.458
30	8.73
25	7.175
20	6.15
15	5.358
10	4.8
5	4.39

Conclusion

There are many things I am able to draw out of my graphs and tables. I can clearly see that there is a pattern to my results. I can see as the objects height from the screen increases the shadow size clearly increases. I know this to be true because as an object gets closer to a light source more light is blocked out this is because light can only travel in straight lines. There fore the light is unable to pass through or bend round the object. This is also true because our light source was substantially smaller than our object making it impossible for the light to get behind our object. So clearly my results support my prediction and in no way undermine it although my estimations for the shadow size when the object is 40 cm from the screen are too big. This could be because of many reasons these including my diagram was drawn in accurately but the other results were too close so I discarded this reason other reasons could of included my estimation for the size of my light source. I could have estimated this to be to little therefore causing my light rays to be to widely space therefore causing my largely sized shadow.

Evaluation

After doing our experiment I can safely say that our results were sufficient enough to support a firm conclusion. This is due to the fact we repeated the

experiment three times and all the results roughly matched up with each other. This was made possible because we carried our experiment out under fair guidelines and made sure everything was checked and recorded accurately. From looking at my graph it is safe to say that there weren't any anomalies as most of the points touch or are very close to my line of best fit. Although our results were sufficient enough I still believe that the experiment could have taken place under stricter guidelines and in more detail. If I did the experiment again I would make a few alterations to make our results even more reliable. Firstly I would change the light source to a more secure and reliable one making sure the light had no chance of falling or cutting off. This way we could concentrate on the object and the shadows more instead of adjusting the light. I would also make sure we had a device to hold the object in place. This would guarantee the objects were at the same angle and the correct distance from the screen.