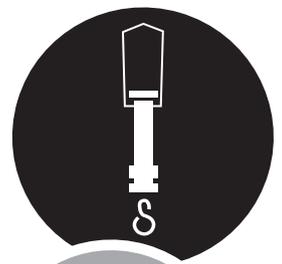
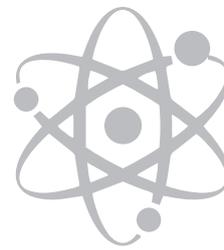




making physics matter



Age
7-11
years

Phizzi problem solving

Magnetic racing game

Problems to solve

Mr Jones' class has been learning about magnets; he planned a maths challenge lesson for the class to work in teams to solve some problems so that they could make a magnetic racing game.

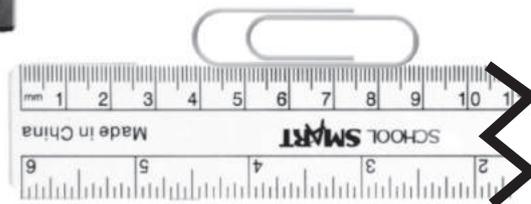
1

For their first challenge, Mr Jones has asked the class to work in teams, using their measuring skills to find out which magnet is the strongest and would be best to use in their racing game. Ryan's group decided they would measure how close each magnet could get to a paper clip before the paper clip was attracted to the magnet.

(a) Measure how close each magnet got to the paper clip from the images below.



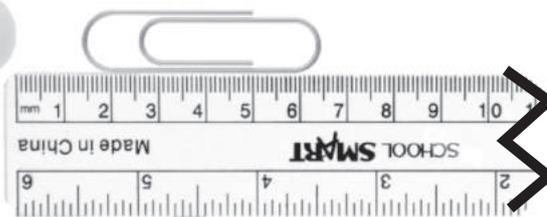
Bar magnet



_____ mm

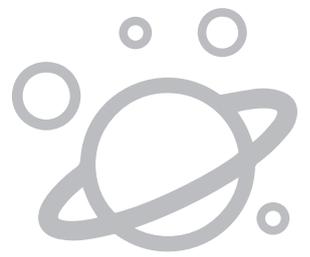
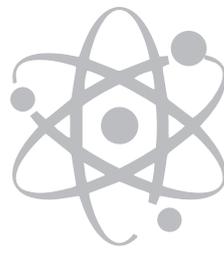
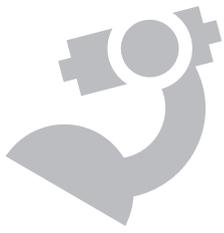


Magnetic marble

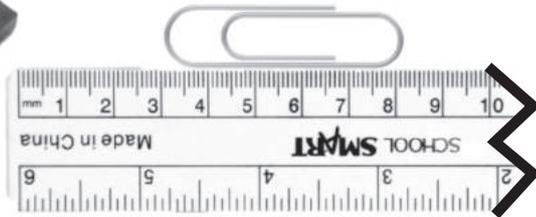
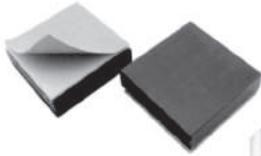


_____ mm





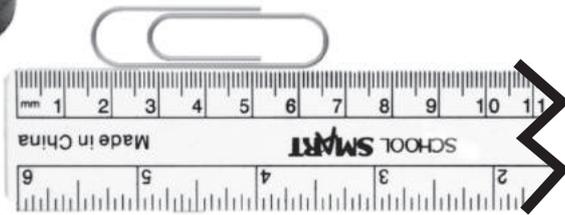
Flexible square magnet
_____ mm



(b) Plan and draw a results table to record and organise the measurements you have made.

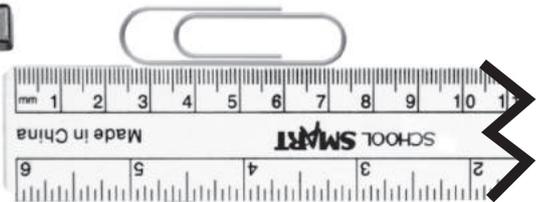
(c) Draw a bar chart of your results. Remember to label you axes clearly.

Ring magnet
_____ mm

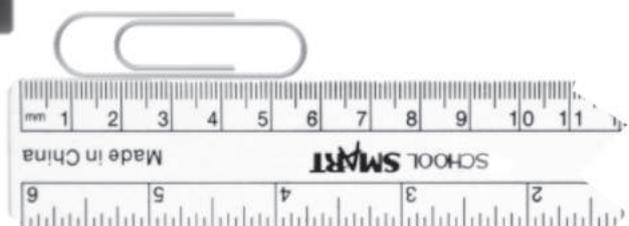


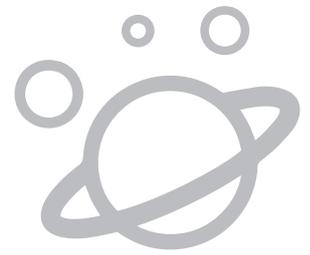
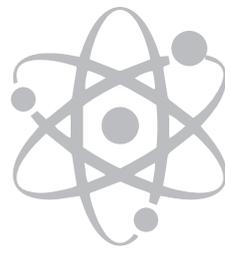
(d) Which magnet would be the best one to use for the magnetic racing game? Explain your answer.

Small horseshoe magnet
_____ mm



Large horseshoe magnet
_____ mm



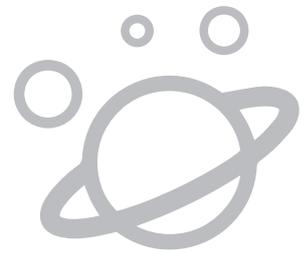
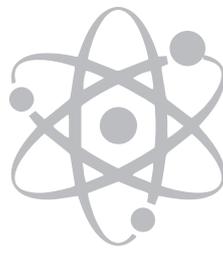


2

Mr Jones allows the children to plan and create their own racetrack on a piece of cardboard, he encourages them to add plenty of bends and turns so that it is challenging. He asks each team to include three 3D structures as part of their design.

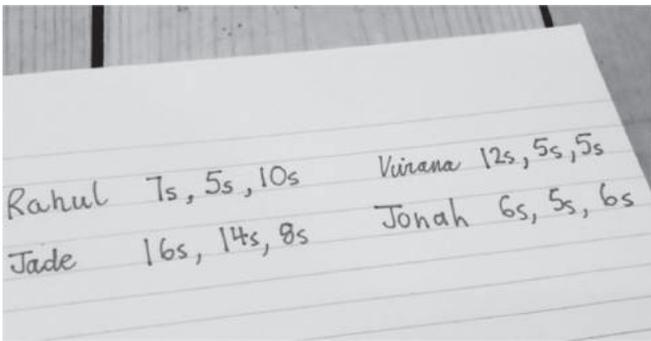


- (a) The first structure is a cube at the finish line which will be the winner's podium. Draw the net to make a cube structure.
- (b) The second structure will be a cuboid which will be the observation tower in the centre of the racetrack. Draw the net to make a cuboid structure.
- (c) The final structure will be a square-based pyramid that will be a sculpture to mark another bend in the track. Draw the net to make a square-based pyramid structure.
- (d) Extra challenge: Jade thinks that the racing game will be better if the racing cars are also 3D models. Can you design a net to make a 3D model of a car that looks like her design?



3

The children taped paper clips to the underside of their paper racing cars and placed them on the track. Two children held the game in the air while the racer held a magnet underneath the cardboard racetrack in a position where it was attracted to the paper car. They could then carefully move the magnet to drag the paper car around the track. Rahul's group decided that they would time each other completing the race so that they could find out who was fastest. They let everyone have three tries to get their fastest time.



- Plan and draw a results table to record and compare their data.
- Based on the data, who do you think should be declared the winner? Explain your decision.
- Draw a bar chart to compare the four children's fastest times around the racecourse.

Super challenge: when scientists have sets of data, they calculate the mean average of the data set to help them compare their results.

The mean of a set of data involves adding together all the quantities you have measured and dividing by the number of quantities there are.

For example:

The mean average of Rahul's race times is $7s + 5s + 10s = 22s/3 = 7.3s$

- Calculate the mean average race time for (i) Viviana, (ii) Jade and (iii) Jonah
- Based on your mean average calculations, who do you think has won the race now?