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## What force is required to break certain objects?

This month we will be testing how much force is required to break a number of objects and to see if what we have as the Instrument Choice ranking matches the force required to actually break them.

## The Instrument Choice gift guide!

Christmas is fast approaching and if you are looking for gift ideas for the person that has everything. We have a number of options detailed below that will impress even the hardest person to buy for.



## Can you guess which one will break first?

For this month's experiment we are going to investigate the force required to break certain objects. We will be measuring the force required in Kilograms (kg) and Newtons (N) to crack an egg, pop a Christmas Cracker, snap a chicken wishbone and smash a candy cane. We will have some of the Instrument Choice staff rank which one they think will break first and compare this to the results. To do this a force gauge will be used to apply a consistent force until the object breaks. Read on to find out whether the guesses matched the results!

### Equipment

- 1 x AFG250N - Mecmesin Force gauge with cradle (See our force gauges [here](#))
- 1 x Push plate with rubber cover, 40mm diameter
- 1 x Grabber clamp
- 2 x eggs
- 1 x Candy Cane
- 1 x Christmas Cracker
- 1 x Chicken Wish Bone
- 1 x Plastic Bauble



Figure 1: Equipment used for testing

### Method

- 1) Initially some of the Instrument Choice staff were polled to establish the rankings as to which objects they thought would break first. They ranked them 1 to 6 with 1 being the most amount of force and 6 the least amount of force. This is reflected in the results section.
- 2) The first test was conducted on the bauble. To do this the bauble was placed on a flat level surface. A 40mm rubber surface push plate was then fitted to the force gauge (to help disperse the force over a larger area).

## Product of the month: [Vantage Vue,](#) [MeteoBridge and](#) [Weatherlink Package -](#) [VantageVue+MeteoBridge](#)



An easy to use, flexible, data distribution set up. Pair the Vantage Vue and Weatherlink USB with the MeteoBridge weather router to automatically send data to a range of weather sites, your own web page or data base, even define custom alarms to send warning emails or tweets. No need to run your PC 24/7, the MeteoBridge connects directly to the data logger and ties into your home network via LAN or Wi-Fi.

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Figure 2: Force gauge with cradle being applied to bauble

- 3) A constant force was then applied in a downward direction until the bauble cracked.
- 4) One of the eggs was then placed onto a plate laying down horizontally. The push plate was then situated centrally on the egg and a force was once again applied downwards until the egg cracked.
- 5) Step 4 was repeated with the egg standing vertically. It was held in place by a colleague to ensure it didn't move during the test.



Figure 3: Force being applied to the egg laying horizontally

- 6) The candy cane was next up to be tested. To do this it was held in a horizontal position with the U of the candy can pointing vertically into the air. The push plate was applied centrally to the U and force was applied consistently until the cane cracked.



Figure 4: The force gauge on the candy cane

- 7) The Christmas Cracker was then tested. The grabber clamp was fitted to the Christmas Crackers chemically-impregnated card strip and cardboard. A colleague then held one end in a fixed position and force was applied consistently in a pulling motion until the cracker tore and the strip popped.



Figure 5: Pulling apart the Christmas Cracker

- 9) The last test was performed on the chicken wish bone. The grabber clamp was fitted to sticky tape that had been wrapped around one side of the wishbone and a colleague held the other side firmly. The gauge was then pulled at a consistent force until the bone broke apart.

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Figure 6: The wishbone being pulled apart

10) All peak forces were recorded to establish breaking points and these are reflected in the results section.

**Results**

Object	Daniel's Ranking	Tim's Ranking	Tyson's Ranking	Sam's Ranking
Christmas Cracker	4	4	1	5
Chicken Wishbone	6	5	3	4
Candy Cane	5	6	6	6
Egg Horizontal	3	3	5	3
Egg Vertical	2	2	4	2
Bauble (Plastic)	1	1	2	1

Figure 7: Instrument Choice rankings of which objects will break first. 1=Most force, 6=Least force

Object	Peak Force		Official Ranking
	N	kgf	
Bauble (Plastic)	276.15	28.16	1
Christmas Cracker	60	6.12	2
Egg Vertical	43.85	4.47	3
Candy Cane	43.15	4.4	4
Egg Horizontal	12.2	1.25	5
Chicken Wishbone	10.05	1.03	6

Figure 8: Force in N and kgf to break each object along with their official rating

Person	Number of Correct Guesses
Tyson	1
Tim	1
Sam	1
Daniel	2

Figure 9: Shows the number of correct guesses by each staff member

**Discussion and Conclusion**

The results show that each staff member had similar perceptions with regards to the bauble, and 3 out of the 4 staff members questioned also had very similar guesses with regards to the other objects. The member that went against the normal guesses was Tyson who had a number of different guesses to other staff members. The staff member that identified the most number of official rankings was Daniel with a total of 2, all other staff members only identified 1 correctly. This shows that people's perceptions as to the force required can be significantly different to the actual force required.

Interestingly the bauble was significantly higher than all other objects requiring 276.15N or 28.16kgf to break which is 216.15N or 22.04kgf than its next nearest competitor. The egg in the vertical position was also of significant interest as it required an additional 31.65N or 3.22kgf of force to be applied in order to break it.

If you would like to discuss this experiment further or would like us to test the breaking force of a particular object please contact one of our friendly Scientists via [email](#) or phone on 1300 737 871.



## Instrument Choice Christmas Gift Guide

With Christmas just around the corner and time running out, we know how hard it can be to find the perfect gift. So this year Instrument Choice has put together a list of [Christmas gifts](#) that are [guaranteed](#) to delight.

For the weather buff, the [Davis Vantage Vue weather station](#) is a great choice. It has full weather station functionality measuring temperature, humidity, wind speed (up to 241km/hr) and direction, rainfall (self-emptying) and barometric pressure. It is made in the US so it is rugged and reliable, and has UV stabilised components and is cyclic corrosion tested so it will last under Australia's harsh sun and weather conditions. It also has the fastest update interval of all of the weather stations on the market, as the wind speed and direction readings are updated every 2.5 seconds so you will never miss a gust!



For the chef in the family, an infrared thermometer like the [Dual-IR](#) can be a great gift. Infrared thermometers are great for budding pizza chefs as they can be used to measure the temperature in the pizza oven quickly and easily. They are also great for checking cooking surface/oil temperatures prior to cooking to make sure they are at the right temperature, or for tempering chocolate.



For the outdoor enthusiast in your life, the [Kestrel range](#) of pocket weather meters are a great choice. They are all waterproof units, have a 5 year warranty and are made in the US so they're built to last. From the [Kestrel-1000](#) which just measures wind speed, through to the [Kestrel-4500](#) which measures wind speed and direction, altitude, barometric pressure, temperature and humidity, there's a model for everyone.



And finally, for the person in charge of keeping the swimming pool in top condition, the [EX900](#) is right up their alley. It is a multi-parameter water quality meter which is able to measure chlorine, pH, ORP and temperature which are all the readings they'll need to keep the pool water crystal clear. The [EX900](#) is a waterproof unit and comes in a handy carry case making it very easy to wrap.



And finally, if you're just not sure, give one of our Scientists a call on 1300 737 871 and they can help you find the right gift for the gadget freak in your life.

## Thank you

from everyone at Instrument Choice - stay tuned for next months issue.



### Contact us.

Our experts are happy to help and discuss your project.

Call **1300 737 871** or write an email to [customer-service@instrumentchoice.com.au](mailto:customer-service@instrumentchoice.com.au)



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