

# Proper Humdingers! - A Collection of maths based puzzles designed to wrack your brain and test your problem solving

**Humdinger**  
**NOUN**

**A remarkable or outstanding person or thing of its kind.**

**'a humdinger of a question'**

**“And with this first step he takes on a humdinger of a theological problem: Why do bad things happen to good canines? Or, you know, people.”**

**- Candida Moss**

**@mrlyonsmaths**

## Proper Humdingers: Crop-dusting

A crop-duster travels on a bearing of  $069^{\circ}$  for 1200 meters, it turns to a bearing of  $209^{\circ}$  and continues for a further 1400 meters. It then returns home by the shortest path.

As it travels it sprays its pesticide over a radius of 50 meters around its flight path.

- How far did the plane have to fly to get home?
- What is the return bearing of the plane?
- Work out the area of the crop-dusted path.
- What is the area of the inside triangle?

## Proper Humdingers: Probably doable

**Design a probability question with 6 distinct outcomes. No one outcome can be more than 0.20 and all 'paths' must have a conditional element.**

**Now design a different probability question (including its answer) containing 3 distinct outcomes. This question must contain 4 different common probability related errors.**



## Proper Humdingers: 'Revolution'ary

**Two circles meet at a tangent.**

**The longest distance between the two circles extreme edges is 40cm.**

**The two circles are not equal in size.**

**The area of the largest circle is  $729\pi$ .**

**a) What is the area of the smallest circle?**

**b) Assuming the smaller circle is able to 'roll' around on the larger circles circumference, how many complete revolutions would it make?**

**c) The smaller circles area increases by 15% yet the longest distance between the circles extreme edges remains at 40cm. What percentage has the larger circle decreased by?**

# Proper Humdingers: Seagull Shenanigans

Dave is stood at the coordinate (0,0), Pete is stood 6 units in front of Dave. Dave kicks a ball high into the air towards Pete. The ball flies through the air reaching a maximum height of 9 units before landing at Pete's Feet.

- a) Give the function of the balls trajectory in the form  $(x+a)^2+b$ .
- b) A seagull swoops through the balls trajectory on the path  $y = 10-x$ . Give the intercept coordinates of the ball and seagull.
- c) A second seagull swoops in on the path  $y = 2x+1$ .  
List the integer coordinates that fall within the regions:
- $y > 2x+1$
  - $y < 10-x$
  - $y < \text{the answer to part a.}$
- d) At the point where the ball is at its zenith. What is the minimum size the ball would have to be to potentially hit both seagulls at the same time?  
Give your answer in the form  $y^2+x^2=a^2$ .

# Proper Humdingers: Cornetto Conumdrums

Dave has an ice cream cornet. The ratio of the circumference of the cone's opening to the circumference of the ice cream sphere on top is 3:5. The ice cream ball has a volume of  $36\pi$ .

- a) What is the circumference of the cone's opening? (give answer to 2 dp)
- b) The cone's length is in a ratio with the radius of the ice cream ball. The ratio is 7:2. How long is the sloped edge of the cone? (give answer to 2 dp)
- c) What is the full angle at the apex of the cone? Give answer to 3 sf)
- d) Given that the cone's length stays the same, what is the smallest angle the cone's apex would have to be for the ice cream balls horizontal circumference to disappear into the cone? (give answer to 3 sf)
- e) A small child ran up to Dave and bit the bottom 4cm off of his cone! By volume, how much cone does Dave have left? (give answer to 3 dp)



## Proper Humdingers: Bag of tricks

For some unknown reason there are a number of coloured shapes in a bag.

- 1) There are  $x$  green triangles.
- 2) There are  $y$  blue triangles.
- 3) The amount of green squares is 5 less than the number of green triangles.
- 4) The amount of red circles is equal to the total number of green and blue triangles.
- 5) There are 3 times as many red triangles as blue triangles.
- 6) There are 35 blue shapes.
- 7) There are 35 circles.
- 8) The ratio of blue triangles to blue squares is 1:5.
- 9) There are 50% less green shapes than red shapes.
- 10) There are  $y$  blue circles and  $y$  green circles.

You take a shape out of the bag look at it and place it to the side, you then take another.

Which of the following combinations are you more likely to choose?

- a) a green triangle followed by any circle.
- b) a green square followed by any triangle.
- c) a blue triangle followed by any red shape.

## Proper Humdingers: Circular Orbits

**Dave the astronaut orbits the earth at a constant speed of 26,000 km/h.**

**It takes Dave a convenient 90 minutes to complete one full circular orbit.**

**The European Space Agency (ESA) advises Dave to extend his orbit by 20% to compensate for some contrived reason they just thought up (but it's mostly for giggles!).**

**Calculate the difference in heights between the two trajectories.**



## Proper Humdingers: Fractionally Perplexing

**If  $\frac{2}{3}$  of  $\frac{7}{10}$  of people are between the ages of 36-59 and 25% of 140% of people are over 59.**

**What is the fraction of adults below the age of 36 given the fact that 12% of the sum of adults aged 36 or over would be considered children and are aged less than 18?**

## Proper Humdingers: Dave and his donuts

**Dave likes donuts.**

**He reckons he can eat at a maximum of 12 donuts per minute.**

**One day (probably a Tuesday) Pete challenges Dave to eat 9 donuts in the first hour, 18 in the second, 31 in the third, 48 in the fourth and so on in this fashion for the next 24 hours.**

- a) Could Dave complete his challenge? Prove it.**
- b) How many donuts will Dave have consumed in 10 hours?**
- c) All the donuts are uniform in size and shape. If someone attempted to arrange the donuts consumed within the 10 hours into a square pattern. To the nearest minute, how long would it take Dave to eat the donuts not used in the square?**

## Proper Humdingers: Chocoprofit...

**McBiscuits want to release a new chocolate bar. It is going to be mathematically similar to their previous bar but bigger by a factor of 2. Their old 125g bar used a blend of their special chocomix and powdered milk in the ratio of 3:2. Their chocomix costs £1.20 per kilogram to produce and they can source their powdered milk at a cost of 60p per kilogram.**

- a) McBiscuits charge 45p per 125g bar. What profit can they expect to make on the sale of one bar?**
- b) McBiscuits plan on selling their larger bar for £1. Would they expect to make a profit?**



## Just a few notes...

- Any attempt to crow bar in some \*ahem\* 'real life maths' is pure indulgence on my part. The more ludicrous the situation, the more fun I have designing questions!

- Although many of the examples could be explained with a diagram, I have purposefully avoided this. It is my intention for the end user to expand thier own problem solving skills deconstucting the information as they go. At the end of the day, they could always draw their own diagram!

- Andy x

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