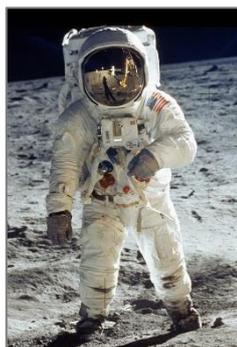




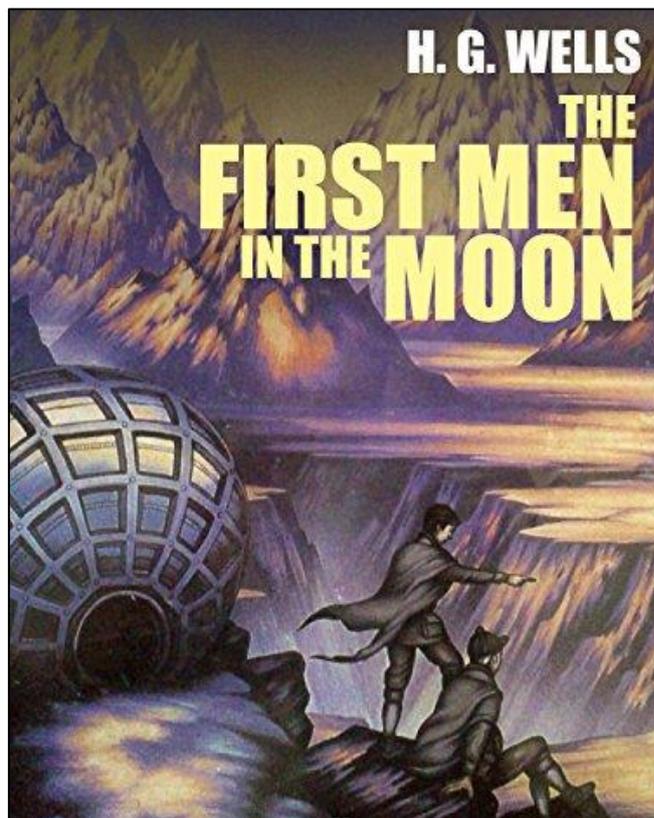
### News

Back in July '69, Neil Armstrong and Buzz Aldrin walked on the moon and, since this is newsletter 69, I thought it might be a good time to look at some mathematical ideas that are related to the moon. Obviously, we would never have been able to get to the moon if it were not for maths; in particular a branch of maths called calculus<sup>1</sup>, which is a way of forming equations to describe things that are moving or changing. Calculus was discovered in the late 1600s by Isaac Newton and Gottfried Leibniz.



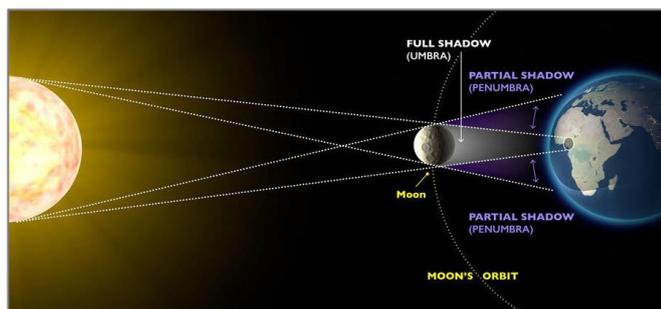
### Puzzle

In the H.G. Wells novel *The First Men in the Moon*, the moon is inhabited by intelligent insects who live in caverns below the surface. These creatures have a unit of distance called a 'lunar'. They use this unit because the moon's surface area, if expressed in square lunars, is exactly equal to the moon's volume in cubic lunars. If the moon's diameter is 2160 miles, how many miles long is 1 lunar?<sup>2</sup>



### Enlargement

Have you noticed that the sun and the moon appear to be similar in size when you look at them in the sky? This is because the sun's diameter is about 400 times bigger than the moon's diameter, but the sun is also about 400 times further away than the moon. During a solar eclipse, you can think of the person watching it as standing at the centre of enlargement.



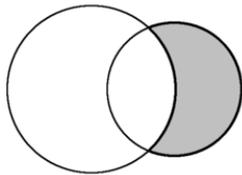
### Did You Know?

The word 'Monday' really means 'moonday' and the word 'month' is really a 'moonth', as it is roughly the amount of time it takes for the moon to orbit the earth.<sup>3</sup>

1. Calculus is not studied at school until year 12. Look it up online though if you're interested. It's really good.  
2. I got this puzzle from Chris Smith. His students found it really difficult but it's a really nice puzzle.  
3. All the days of the week are named after objects in our solar system, although some are easier to decipher than others. Saturn for Saturday, the Sun for Sunday, Jupiter = Thor for Thursday. Why not look the others up?

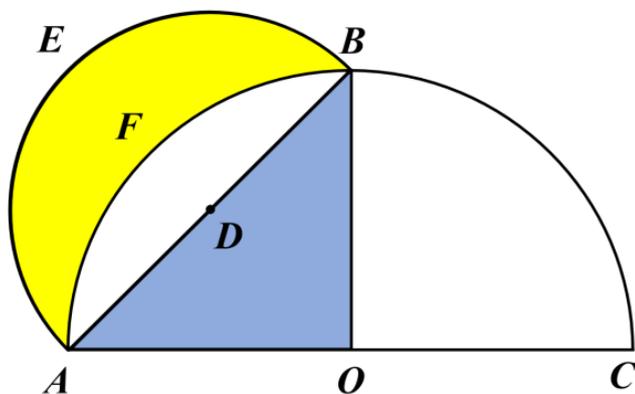
## Maths Word

In mathematics, a **lune** is a shape bounded by two arcs intersecting at two points.<sup>4</sup>



## The Lune of Hippocrates

The Lune of Hippocrates is the yellow lune in the diagram. It is bounded by two arcs, one of which  $AEB$  is a half-circle that has as its diameter the line  $ADB$ . The line  $ADB$  is a chord of the semi-circle  $ABC$ , such that  $OA$  and  $OB$  are both radii of the semi-circle.<sup>5</sup>



The mathematician Hippocrates of Chios proved that the yellow lune  $AFBE$  has the same area as the triangle  $OAB$ .

Why not see if you can prove this too?

Hippocrates of Chios was born around 470 B.C. on the Greek island of Chios.<sup>6</sup> His book on geometry, called *Elements*, in which this result appears, has been lost, but it may have formed the basis of *Euclid's Elements*<sup>7</sup>, which we still have today. We do have Hippocrates' proof though, because Eudemus of Rhodes put it in his book *History of Geometry*, which has also been lost but, luckily for us, Simplicius of Cilicia copied it from Eudemus's book and put it into his commentary on Aristotle's *Physics*, and we have this!<sup>8</sup>

4. Where one curve is concave and the other is convex. If they are both convex, the shape is called a 'lens'.

5. You get the idea. It's what it looks like in the diagram, but in maths we have to describe things in detail!

6. Did you guess that? Now have a guess where Eudemus of Rhodes and Simplicius of Cilicia were born.

7. Maybe Euclid's version was a reboot?

8. You can find an outline of the proof on the Wikipedia page [https://en.wikipedia.org/wiki/Lune\\_of\\_Hippocrates](https://en.wikipedia.org/wiki/Lune_of_Hippocrates)

## Raging Robin!

In last week's newsletter, I said that nobody had sent me a drawing of a raging robin. I was wrong! This one is from Maheatab Moustafa in 8Z.



## The Number Fact

On the front of the newsletter I've said that  $69^2 = 4761$  and  $69^3 = 328509$ , which might seem a bit random and pointless. Can any of you see what the significance of this is?

## The Maths Newsletter

And finally, just to let you know that all the maths newsletters can now be found on our school website at

<http://kechg.org.uk/departments/mathematics/>

Thanks again to Mrs Hayes for sorting this out for me! If you solve any of the old puzzles, send me your solutions and I'll give you house points! 😊