$x^2 - 6x + 13$ can never be less than what number?
Solve the equation

\[ x^{-1} + 5x^{-\frac{1}{2}} - 36 = 0 \]
Find all the solutions to

$$3^{2x^2 - x - 6} = 1$$
Corbett's Conundrums

4th December

The interior angle of a regular polygon exceeds the exterior angle by 160°.

Find the number of sides.
Corbett's Conundrums

5\textsuperscript{th} December

Find the area of this trapezium in the form $a\sqrt{b}$ cm\textsuperscript{2}
Corbett's Conundrums

6th December

The positive integers $y$ and 16 are such that their arithmetic mean exceeds their geometric mean by 2.

Find the possible values of $y$. 
A circle with centre (2, -3) has the line $4y - 3x = 7$ as a tangent.

Find the radius of the circle.
Find the area of the shaded region.
Fill in each circle with a prime number so that the sum of the large triangle equals 20 and each small triangle has the same sum.
Corbett's Conundrums

10\(^{th}\) December

How many numbers with two digits, which when reversed, produce a number which is 75% greater?

How many produce a number which is 25% greater?
Corbett's Conundrums

$11^{th}$ December

\[ x = 4999(1 + 2 + 3 + \ldots + 5000) \]
\[ y = 5000(1 + 2 + 3 + \ldots + 4999) \]

Find the value of $x - y$
In a sack, there are seven sticks with lengths 2cm, 4cm, 5cm, 8cm, 10cm, 11cm and 19cm.

If three are picked at random, what is the probability that they can form a triangle?
Corbett's Conundrums

13th December

DG = 3cm and DE = 5cm.
GH is parallel to EF.
The area of triangle DGH is 6cm$^2$
Find the area of GHFE
Corbett's Conundrums

14th December

Continue the pattern

1
11
21
1211
111221
...
...
...
Coloured cards are associated with numbers as follows: Blue 2, Red 3, Green 5 and White 7.

Some cards are selected and the product is 70560.

How many of each colour are selected?
Corbett's Conundrums

16th December

Which is larger $2^{100}$ or $3^{75}$?
Corbett's Conundrums

17th December

After completing the "cross-number puzzle," find the sum of all nine integers.

Across
A₁: A prime number
A₂: A multiple of 53
A₃: A perfect number

Down
D₁: A power of 5
D₂: A power of 2
D₃: A power of 3
Find the perimeter and area of the shaded region bounded by the 3 semi-circles.
Corbett's Conundrums

19th December

Let \( f(x) \) = the total number of factors of \( x \).

\[
f \left( f(20) + f(36) + f(96) + f(15) \right) = ?
\]
The sides of a right angled triangle are:

\[ w - y, \quad w \quad \text{and} \quad w + y \]

Find the ratio of \( w \) to \( y \).
Corbett's Conundrums

21st December

There are four pairs of positive integers \((x, y)\) such that \(x^2 - y^2 = 225\)

Find these pairs
Six cylinders, each of radius 1.2m and length 8m, are stacked as shown. The centres of the ends of the cylinders are labelled A, B and C.

(a) Find the length of AB
(b) Calculate h, the height of the stack.
(c) Calculate the volume.
If you add the square of Chelsea's age to the age of Jamie, the sum is 81. However if you add the square of Jamie's age to the age of Chelsea, the result is 297.

Find Chelsea's and Jamie's ages.
Corbett's Conundrums

24th December

Find:

\[ \sqrt{6 + \sqrt{6 + \sqrt{6 + \cdots}} \text{ to infinity}} \]
Corbett's Conundrums

25th December

Solve for a, b and c.

\[a + b + c = 12\]
\[3a + 2b + c = 26\]
\[4a + 3b + c = 32\]
AB is a tangent to the circle.
Angle BAC is 90°, AC = 6cm and AB = 18cm.

Find the radius of the circle.
Corbett's Conundrums

27th December

How many squares, in total, can be found on a chess board?
An equilateral triangle is inscribed in a square below.

What is the ratio of the area of the equilateral triangle to the area of the shaded triangle?
When a number is divided by 3 the remainder is 2.
When it is divided by 4 the remainder is 3.
When it is divided by 5 the remainder is 4.

What is the smallest possible number which satisfies these conditions?
A square, regular hexagon and an equilateral triangle all have the same perimeter.

Find which polygon has the greatest area.
Choose any four digit number, where the first digit is larger than the last.
Reverse your number and subtract it from your original.
Taking your answer, add it to it's reverse.
Note your final answer and repeat this process five more times.

Try to make conjectures about your starting number and the final answer.

Try to prove algebraically.