A **Circles**

What is the radius and the centre of the following circle?

$$(x+2)^2+(x-5)^2=49$$

B **Division of Polynomials**

$$x^3-5x-2\div(x+2)$$

C **Factorising Polynomials**

Given that $f(x)=8x^4+3x^3-51x-2$

Show that (x-2) is a factor of f(x).

D **Functions**

$$g(x)=12x+4$$

Find $g^{-1}(x)$

IMC **Tegwen has the same number of brothers as she has sisters. Each one of her brothers has 50% more sisters than brothers. How many children are there?**

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Indices

1 What number is half of 4^{2025}?

2 $4^6 \times 64^3 \times 128^2 \div 32^6$

3 $\frac{16^5 \times 16^8 \times 16^{11}}{32^2 \times 8^6} = 4^p$ Find the value of p.

4 Solve $m^{\frac{3}{2}} = 8$

5 Express as a single power of x: $\sqrt{\frac{x^{\frac{3}{2}} \times x^{\frac{1}{2}}}{(x^2)^3}}$

6 $\frac{(x^3 \times x^w)^5}{x^6 \times x^4 \times x^8} = x^{10}$ Find the value of w.

7 $x^3\sqrt{x^{12} \div x^3} = x^g$ Find the value of g.

8 A Fibonacci type sequence is shown below.

2a+b 2a+b 4a+2b 6a+3b 10a+5b

If $a = 3^n + 1$ and $b = 7^n - 4^n$, what is the value of the eighth term in the sequence.

9 n is an integer.

Between values of $3 < n < 12$, is $2^n - 1$ always prime?

10 For what value of x is $64^{x} = 512^{5}$?

11 Simplify fully $\left(\frac{3mn^2 \times 5m^{\frac{1}{2}} \times 4n}{30m^{\frac{5}{2}}}\right)^4$

12 The sum of two numbers is 90 and they differ by four. What is their product squared?

Indices: Points to Note

$$\frac{m}{n} = mn^{-1}$$

$$\frac{m^3 m^6 m^{-2}}{m^5} = m^{3+6-2-5} = m^2$$

$$\sqrt{4mn} = 2m^{\frac{1}{2}}n^{\frac{1}{2}} = 2(mn)^{\frac{1}{2}}$$

$$4^x = 2^x \times 2^x$$

$$4^x \neq 2 \times 2^x$$

2^x *and* $\sqrt{x}$ can never be negative

$\sqrt[3]{x}$ can be negative