**Factorise these Cubics**

Easier…

1. $x^{3}-9x^{2}+26x-24$
2. $x^{3}-x^{2}-x+1$
3. $x^{3}-3x^{2}-4x+12$
4. $x^{3}+4x^{2}-7x-10$

Harder…

1. $3x^{3}-8x^{2}+3x+2$
2. $5x^{3}+6x^{2}-9x-2$
3. $-2x^{3}-5x^{2}+x+6$
4. $10x^{3}+37x^{2}+22x+3$
5. $-3x^{3}+7x^{2}+22x-8$
6. $x^{3}-x^{2}-6x$

Consider further the equation developed from question 1 above…

$x^{3}-9x^{2}+26x-24=0$ which can also be written as $\left(x-2\right)\left(x-3\right)\left(x-4\right)=0$

1. What are values of the roots?
2. What is the product of the roots?
3. What is the sum of the roots?
4. What is the sum of the product-of-pairs-of-roots?

*Make three combinations of pairs of roots and find the product of each of these pairs, then add these three products together. E.g., one pair could be 2 and 3, which multiply to make 6. Repeat for the other two possible pairs then add all three of these products together.*

1. What do you notice here?

**Factorise these Cubics - Answers**

Easier…

1. $x^{3}-9x^{2}+26x-24=\left(x-2\right)\left(x-3\right)\left(x-4\right)$
2. $x^{3}-x^{2}-x+1=\left(x-1\right)\left(x-1\right)\left(x+1\right)=\left(x-1\right)^{2}\left(x+1\right)$
3. $x^{3}-3x^{2}-4x+12=\left(x-2\right)\left(x-3\right)\left(x+2\right)$
4. $x^{3}+4x^{2}-7x-10=\left(x+1\right)\left(x-2\right)\left(x+5\right)$

Harder…

1. $3x^{3}-8x^{2}+3x+2=\left(3x+1\right)\left(x-2\right)\left(x-1\right)$
2. $5x^{3}+6x^{2}-9x-2=\left(5x+1\right)\left(x-1\right)\left(x+2\right)$
3. $-2x^{3}-5x^{2}+x+6=\left(2x+3\right)\left(x+2\right)\left(1-x\right)$
4. $10x^{3}+37x^{2}+22x+3=\left(2x+1\right)\left(5x+1\right)\left(x+3\right)$
5. $-3x^{3}+7x^{2}+22x-8=\left(3x-1\right)\left(4-x\right)\left(x+2\right)$
6. $x^{3}-x^{2}-6x=x\left(x-3\right)\left(x+2\right)$

Consider further the equation developed from question 1 above…

$x^{3}-9x^{2}+26x-24=0$ which can also be written as $\left(x-2\right)\left(x-3\right)\left(x-4\right)=0$

1. What are values of the roots?$ 2, 3, 4$
2. What is the product of the roots? $24$
3. What is the sum of the roots? $9$
4. What is the sum of the product-of-pairs-of-roots? $-26$

*Make three combinations of pairs of roots and find the product of each of these pairs, then add these three products together. E.g., one pair could be 2 and 3, which multiply to make 6. Repeat for the other two possible pairs then add all three of these products together.*

1. What do you notice here?