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Continuing to explore four consecutive numbers

Q1:

a	b	c	d
$n-1$	n	$n+1$	$n+2$

Let Odd be O and let Even be E

Why can't $bd-ac$ be even?

if n is odd

a	b	c	d
E	O	E	O
$n-1$	n	$n+1$	$n+2$

$b \times d$ is $O \times O$ is ODD

$a \times c$ is $E \times E$ is EVEN

$\odot \odot$ $bd-ac$ is Odd minus Even
which is odd.

Result: $bd-ac$ can never be even

if n is even

a	b	c	d
O	E	O	E
$n-1$	n	$n+1$	$n+2$

$b \times d$ is $E \times E$ is EVEN

$a \times c$ is $O \times O$ is ODD

$\odot \odot$ $bd-ac$ is Even minus Odd
which is odd.

Result: $bd-ac$ can never be even

Q2

Example

a	b	c	d
1	2	3	4

$$b \times c = 2 \times 3$$

$$= 6$$

$$a \times d = 1 \times 4$$

$$= 4$$

$$6 - 4 = 2$$

$$(bc) - (ad)$$

Example 2

a	b	c	d
10	11	12	13

$$b \times c = 11 \times 12$$

$$= 132$$

$$a \times d = 10 \times 13$$

$$= 130$$

$$132 - 130 = 2$$

$$(bc) - (ad)$$

Proof

a	b	c	d
$n-1$	n	$n+1$	$n+2$

$$b \times c = (n) \times (n+1)$$

$$= n^2 + n$$

$$a \times d = (n-1) \times (n+2)$$

$$= (n-1) \times n + (n-1) \times 2$$

$$= n^2 - n + 2n - 2$$

$$= n^2 + n - 2$$

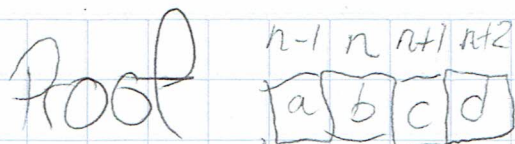
$$bc - ad = (n^2 + n) - (n^2 + n - 2)$$

$$= 2$$

Q3

a	b	c	d
10	11	12	13

$$\begin{aligned}
 a+b+c+d &= 10+11+12+13 \\
 &= 46 \\
 &= 2 \times 23 \text{ odd}
 \end{aligned}$$



$$\begin{aligned}
 a+b+c+d &= (n-1)+n+(n+1)+(n+2) \\
 &= n-1+n+n+1+n+2 \\
 &= 4n+2 \\
 &= 2 \times 2n+2 \\
 &= 2(2n+1)
 \end{aligned}$$

$\because 2n+1$ is odd,
 $2 \times (2n+1)$
 is $2 \times \text{odd factor}$

Q4 (refer to Q3) $a+b+c+d = 4n+2$ is not a multiple of 4
 It cannot be written as $4 \times (n+1)$
 $\because 2$ is less than 4
 not 4

Q5 (refer to Q3) $a+b+c+d = 4n+2$

Try $4n+2 = 3 \times$

Try $4n+2 = 6$

0	1	2	3
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$n=1$ The four consecutive nos is

Try 15

$4n+2 = 15 \times$

Try 26

$4n+2 = 26$

$n=6$

5	6	7	8
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$= 2 \times (2n+1)$

For this to be a multiple of 3,
 $2n+1$ must be a multiple of 3
 then it can be divided exactly
 by 3 or

$(2n+1) = 3y^*$

* y is an integer
 y is not 0

$n = \frac{3y-1}{2}$

The consecutive numbers are: $n-1$, n , $n+1$, $n+2$

$\frac{3y-1}{2} - 1$	$\frac{3y-1}{2}$	$\frac{3y-1}{2} + 1$	$\frac{3y-1}{2} + 2$
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There is an infinite choices of four consecutive nos