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To the Editor, *The Mathematical Gazette*

THE SUM OF THREE CONSECUTIVE SQUARES

DEAR SIR.—Those who were stimulated to supply proofs of my conjecture that

$$(m+1)^2+(m+2)^2+(m+3)^2 \quad \text{when} \quad m>0$$

can be expressed as the sum of three other squares by use of the formulae

$$(3n-1)^2+(3n)^2+(3n+1)^2=(5n)^2+(n+1)^2+(n-1)^2,$$
$$(3n)^2+(3n\pm 1)^2+(3n\pm 2)^2=(5n\pm 2)^2+(n\mp 1)^2+n^2,$$

may be interested to know of another set of formulae that provides alternative sets of three squares when $m>4$:

$$(9n-1)^2+(9n)^2+(9n+1)^2=(11n+1)^2+(11n-1)^2+n^2,$$
$$(9n)^2+(9n\pm 1)^2+(9n\pm 2)^2=(13n\pm 1)^2+(7n\pm 2)^2+(5n)^2,$$
$$(9n\pm 1)^2+(9n\pm 2)^2+(9n\pm 3)^2=(11n\pm 3)^2+(11n\pm 2)^2+(n\mp 1)^2,$$
$$(9n\pm 2)^2+(9n\pm 3)^2+(9n\pm 4)^2=(13n\pm 4)^2+(7n\pm 2)^2+(5n\pm 3)^2,$$
$$(9n\pm 3)^2+(9n\pm 4)^2+(9n\pm 5)^2=(13n\pm 5)^2+(7n\pm 4)^2+(5n\pm 3)^2.$$

There are also incomplete sets of formulae that sometimes provide alternative sets:

$$(5n)^2+(5n\pm 1)^2+(5n\pm 2)^2=(7n\pm 2)^2+(5n)^2+(n\pm 1)^2,$$
$$(5n\pm 1)^2+(5n\pm 2)^2+(5n\pm 3)^2=(7n\pm 3)^2+(5n\pm 2)^2+(n\mp 1)^2$$
$$=(7n\pm 2)^2+(5n\pm 3)^2+(n\pm 1)^2.$$

$$(7n)^2+(7n\pm 1)^2+(7n\pm 2)^2=(11n\pm 2)^2+(5n)^2+(n\mp 1)^2,$$
$$(7n\pm 1)^2+(7n\pm 2)^2+(7n\pm 3)^2=(11n\pm 3)^2+(5n\pm 2)^2+(n\mp 1)^2.$$

From these formulae we find that

$$2^2+3^2+4^2=0^2+2^2+5^2,$$
$$3^2+4^2+5^2=0^2+1^2+7^2=0^2+5^2+5^2,$$
$$4^2+5^2+6^2=2^2+3^2+8^2,$$
$$5^2+6^2+7^2=1^2+3^2+10^2=2^2+5^2+9^2,$$
$$6^2+7^2+8^2=1^2+2^2+12^2=2^2+8^2+9^2=0^2+7^2+10^2,$$
$$7^2+8^2+9^2=3^2+4^2+13^2=3^2+8^2+11^2=1^2+7^2+12^2$$
$$=0^2+5^2+13^2=5^2+5^2+12^2,$$
$$8^2+9^2+10^2=2^2+4^2+15^2=1^2+10^2+12^2=0^2+7^2+14^2,$$
$$9^2+10^2+11^2=2^2+3^2+17^2=5^2+9^2+14^2,$$

etc., there being always at least two different alternative sets for three consecutive squares for $m>4$.

Yours faithfully,

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