MA330 Lecture Notes
Date: Oct 3rd

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D
(a, b, 4) i.e. a^2-Db^2=4
<a,b,4>*<a,b,4>= a^2+Db^2, 2ab, 16
---- reduce, divide by 2
<Db^2+2, ab, 4>

a^2=Db^2+4
a^2+Db^2=2Db^2+4

If a or b is even
Then ab is even

Db^2+2 if b is odd and a is even then there is no further reduction

Case 1: b=2r
<4Dr^2+2, 2ar, 4> → <2Dr^2+1, ar, 1>

Case 2: b is odd
Calculate <a, b, 4> * <Db^2+2, ab, 4> = <a(Db^2+2)+Dab^2, a^2b+Db^3+2b, 16>
Remember a^2=Db^2+4
<2Dab^2+2a, 2Db^3+4b, 16 >
------ reduce divide by 2
<Dab^2+a, Db^3+3b ,4> b = 2r+1

B(Db^2+3)
B(D+1) mod 2

Case 3: a is odd b is odd

Consider a^2=Db^2+4
Look mod 4
x = 0,1,2,3
x^2 = 0,1,0,1
a^2=Db^2 mod 4

Case 4: b^2=0 mod 4

A^2= 0 mod 4
So a, b are both even
If b^2=1 then a^2=1 is possible but then D=1 mod 4 on a^2=0 mod 4 and D=0 mod 4