mathematical induction:

you want to prove some formula $F(n)$ that depends on a number n.

Proof:

step 1: base case. prove your formula works for some small n (eg 0, 1, 2) step 2: <u>Assume</u> your formula works for $n-1$,

ie $F(n-1)$ = whatever is true.

Step 3: <u>Use</u> that $F(n-1)$ = whatever plus other stuff you (hopefully!) know to show that $F(n)$ = the formula you want.

$$T_n = T_{n-1} + n$$

$$\ast\ T_m = \frac{m(m+1)}{2}$$ ← trying to prove for all triangular #'s

$$T_2 = \frac{2(2+1)}{2} = \frac{6}{2} = 3$$ THIS WORKS!

$$T_{n-1} = \frac{(n-1)[(n-1)+1]}{2} = \frac{n^2-n}{2}$$

$$T_n = T_{n-1} + n$$

$$\frac{n(n+1)}{2} = \frac{n^2 - n}{2} + n$$

$$\frac{n^2+n}{2} = \frac{n^2-n}{2} + \frac{2n}{2}$$

$$\frac{n^2+n}{2} = \frac{n^2-n+2n}{2}$$

$$\frac{n^2+n}{2} = \frac{n^2+n}{2}$$

$$T_n = \frac{n(n+1)}{2}$$

$$T_{91} = \frac{91(91+1)}{2}$$

$$T_{91} = T_{90} + 91$$

$$T_{10} = \frac{10(10+1)}{2}$$

$$T_{10} = 55$$

Chpt 2.

Everyone (individual problem): 2.2

group	#
A	2.1
B	2.7
C	2.6
D	2.5

Pythagorean triples

no common factors

(3, 4, 5)

(5, 12, 13)

(8, 15, 17)

(7, 24, 25)

Common factors

(6, 8, 10)

(9, 12, 15)

(12, 16, 20)

~~(25, 144, 169)~~

(15, 20, 25)

(18, 24, 30)

We want primitive pythagorean triples (PPTs)

ie a, b, c so that

$a^2 + b^2 = c^2$, but a, b, c have no common factors.

Note that c is always odd, and one of a, b is even and one is odd.

If both a, b were even, then c would be even, and (a, b, c) would have a common factor of 2, so not a PPT.

If a, b were both odd, then c would be even

ie
$a = 2m+1$, $b = 2n+1$, $c = 2k$ for some m, n, k

Then $(2m+1)^2 + (2n+1)^2 = (2k)^2$

$$4m^2+4m+1+4n^2+4n+1 = 4k^2$$

$$\underbrace{\underbrace{2m^2+2m+2n^2+2n}_{\text{even}}+1}_{\text{odd}} = \underbrace{2k^2}_{\text{even}}$$

oops

can't have odd = even.

$\therefore$ must have one a, b even and one odd.