Math 321

Beat (a,b): "a has beat b in a race"

2-ary predicate

Beat (Mark , Matt)

" Mark has beat Matt in a race."
the

Binding: turn function into proposition.
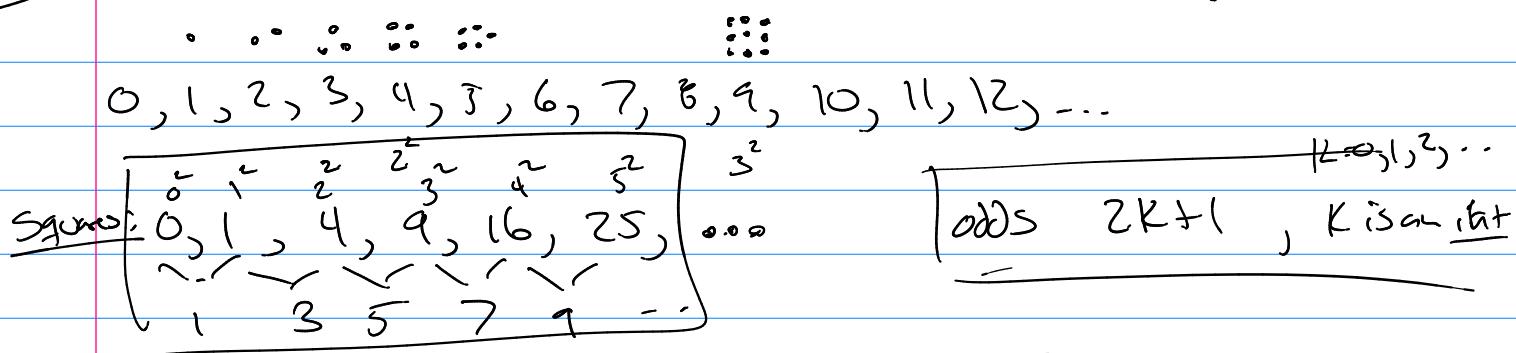
① Evaluation: Beat (Mark, Matt)
 Beat (Matt, Mark)

Quantification: $\forall b \exists a$ Beat (b,a)

 $\exists a \forall b$ Beat (b,a)

Proof Strategies → experiment

Pf ?: all odds can be written as a difference of two squares.

. .· .·. :·: :::   :::

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, ...

Squares: $0^2, 1^2, 2^2, 3^2, 4^2, 5^2$ 3^2

0, 1, 4, 9, 16, 25, ...

1   3   5   7   9   ...

cases

 $k = 0, 1, 2, ...$

odds $2k+1$, k is an int

$(k+1)^2 - (k)^2 = k^2 + 2k + 1 - k^2$

$= 2k+1$

(pf) odd $2k+1$, k is an int

$$\frac{2k+1}{\text{odd}} = \frac{(2k+1+k^2)-k^2}{} = \frac{(k+1)^2 - k^2}{\text{diff of squares}}$$

☒

(Open problems)

$$\boxed{1+3 = 4} \leftarrow$$

$$\rightarrow \boxed{3^2 + 4^2 = 5^2} \leftarrow \qquad x^n + y^n = z^n \quad n \geq 3$$

$$x^2 + y^2 = z^2$$

(Exam I)   11 probs @ 10pts each   100pts = 100%

(1.1/1.2) Prop. Logic (w/o functions)   (2 probs)
             symbols, ops, truth tables
       ① Truth Table everyone should know.
       ② arg → symbols (+) truth table

(1.3) Logical Equiv.   (3 probs)

       ① Show ▭ ≡ △ by truth table
       ② Show ▭ ≡ △ by (discussion)
                                    ↑
                              when T?
                          or when F?

       ③ use logical equiv.

(ex) ▭ ≡ S_1 ≡ S_2 ≡ S_3 ≡ ... ≡ △

1.4/1.5 Prop. functions ↔ Quantification

(1 problem)

    ① eng ⇄ sym

1.6 Rules of Inf. (2 prob)

    ① given premises → you state some conclusions

    ② given bad argument → you find the problem.

1.7/1.8 Proofs (3 probs)

    ① $\sqrt{2}$ is irrational w/ lemma
    ② by case proof
    ③ existence (non-constructive)