Q DGGLWLRQ WR VFRULQJZKWXKHQWD UHVSRQVLHQV LEV
FRQVLGHUDWLRQZHLDQFH JLYHQ RULJLQDOI

Calculators are NOT permi

7KH HyTXDWaxRQUHSUHVHQWV D SDUDEaRO ŽÒPRU DOO U

L f x $\frac{x}{x}$ DQG f_n LxL f f_n x

nIRU « &RPSXWfH ZLWK SURRI

&RQVLGHU WKn WKnUHH QXPEHZKnUV D SRVLWLYH LQ

D)LQG ZLWK SURnIRU DOLYDXHO WKUHH QXPEHUV D

E3URYH WKDW WKHUH DUnIRQILZKLWKQ\RQHQRIYWKXHW
LV D SULPH QXPEHU

WKH FRUUHFW URRP NH\

,Q WKH ILJXUH $%&' LV D VTXDUH 0 LV WKH PLGSRI
DQG 1 LV WKH%PLGSRQ&QLQRI WHUVHFW DW

THE 2012-2013 KENNESAW STATE UNIVERSITY
HIGH SCHOOL MATHEMATICS COMPETITION
PART II

SOLUTIONS

D **HQ WRVKRZ WKD WWKHUHLVD RLQ** y **KLKSD VHVWKURKD OSDDROD**
ZWKHTW LRQ RIWKHIRUP $y = x^2 + 2ax + a$ **HW** mQ n **QW**
QW

pQB

$x = - - R$ $y = - QW$ $-$

E **QW** $y = x^2 + 2ax + a$ **QW**
QD $y = x + ax + a + a - a = x + a + a - a$ **QW**
QW $- a \; a - a$ **QW**
$y = f(x) = - x^2 - x$

QW

$f(x) = \frac{x-}{x+}$ $f(x) = f(f(x)) = \frac{\left(\frac{x-}{x+}\right)-}{\frac{x-}{x+}+} = \frac{x-}{x}$ **QD**

$f(x) = f(f(x)) = \frac{\left(\frac{x-}{x}\right)-}{\frac{x-}{x}+} = \frac{x-}{x-}$ **QD** $f(x) = \frac{\quad}{-x}$ $f(x) = \frac{x+}{-x}$

$f(x) = x$ **QD** $f(x) = \frac{x-}{x+}$ **QW** $f_{6n}(x) = x$ **QD**

QD $f = f = \frac{-}{\quad} = \frac{\quad}{\quad}$

Ï CMB Ï = AmNB a =

and Ï MPN Ï = AmPC = d. Using quadrilateral BMPN

d = ï 227.0

Sin d = sa2)n (=2 7 0 ma2 7 0 cos 2 a7 0 = ï scions 2 2

Without loss of generality, let CB = 2, so

and CM = √5.

Using DMBC, a = sin 2/√5. Therefore, using the

appropriate double angle = 1 − 2 = 1 − 2 ÷ 0 = 3/5 formula, cos 2

a = 1 Therefore sin d = 3/5

Since CM and AN are medians of triangle ABC, point

of the triangle, so that AP = CP = l CM = √5.