

MATHEMATICS (updated 05/8/07)

Director's Comments

I make every attempt to minimize errors on the keys and make sure that the problems are valid, workable, and the correct answer is available. However, with all of my efforts and the efforts of the person(s) who proofs the tests, **ERRORS HAPPEN**. I will try to post any corrections to the current years tests and any comments pertaining to errors or problem statements in the sections below. If any one knows of any errors or thinks there are errors please email me so I can address them. If a constructive comment on a particular problem is sent to me I will address it and other items in the "Off on a Tangent" section below. Your report of errors and constructive comments will assist me in making the tests better.

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UIL Test Comments — 2007

SAC - - - > # 9 answer choice C should be 6.5

#10 all of the answer choices are written incorrectly -- they should be:

(A) $\log(3y^2)$ (B) $(6x^2)$ (C) $\log(2xy^6)$ (D) $\log 6y^4$ (E) $\log(3xy^4)$

#24 the word "new" needs to be removed

A - - - > no errors reported, however two problems were somewhat unclear (#32 and #44) -- see Off on a Tangent below for the discussion on these two problems.

B - - - > no errors, however an assumption has to be made on #59 -- see Off on a Tangent below for the discussion on #59

District 1 - - - #45 should say increasing order not decreasing

#54 does not have any correct answer choices. Since no correct answer choice is available then the problem should be thrown out. The correct answer choices should be:

(A) 57 (B) 53 (C) 61 (D) 27 (E) 74 --- with (C) being the answer

District 2 - - - #16 is an invalid problem, hence it should be thrown out -- see Off on a Tangent below for the discussion on #16

#19 stirred up some interesting comments -- see Off on a Tangent below for the discussion on #19

#42 -- an interesting comment was shared with me about this problem-- see Off on a Tangent below for some discussion on #42

Regional - - - #20 has a typo. Answer (D) should be have been 2.7182818284... -- see Off on a Tangent below for the discussion on #20

State - - - # 7 was missing a horizontal line separating the rectangle into 8 rectangular partitions.

#19 should have had parentheses around the third term. It should have been $(a^3 - 3b)$ -- the answer would then be letter C -- see Off on a Tangent for further discussion

#31 had two answers counted as correct, D & E -- see Off on a Tangent for discussion

#51 was thrown out because it did not have a correct answer available -- correct answer choices should have been:

(A) $4/5$ (B) $1/3281$ (C) $17/86$ (D) $5/3282$ (E) $5/12$ --- (B) being the answer

TMSCA Test Comments — 2007 (tests I wrote for TMSCA)

12 - - - #55 an assumption has to be made -- see Off on a Tangent below for the discussion on #55
#56 is an invalid problem -- see Off on a Tangent below for the discussion on #56

State - - - no errors or comments reported

Canton Test Comments — 2007 (tests I wrote for Canton)

Fall Invitational - - - > no errors or comments reported

Spring Invitational - - - > #36 -- There are 2 correct answers A & E

Off on a Tangent

Article 1: Off on a tangent... Your Favorite Number

Earlier this summer I was thinking about some things I wanted to share at this year's Student Activity Conferences (SAC). I got to thinking about how some of us math folks are rational most of the time and a little irrational at other times. We tend to be a little odd compared to others, but we always think of ourselves as being in our prime. Naturally, that thought is more imaginary than it is real. We tend to have deficient bank accounts, an abundant amount of weight, and a perfect-ly good sense of humor. We tend to be happy most of the time, but get a little unhappy when we forget to be frugal and become wasteful. We are lucky to know what we know, but unlucky in our attempt to share a lot of our knowledge with others. Speaking of sharing knowledge ...

Off on a tangent ...

Do you have a favorite number?

Are you sure it is your favorite?

Do you know anything about your favorite number?

Hmmm... let's see what you know about your number.

Is it RATIONAL or IRRATIONAL?

Is it EVEN or ODD?

Is it a UNIT, COMPOSITE or PRIME?

Is it REAL or IMAGINARY?

Is it WHOLE? NATURAL? INTEGER?

Is it a FIBONNACI number? A LUCAS number? Both? Neither?

Is it DEFICIENT, PERFECT, OR ABUNDANT?

Is it HAPPY or UNHAPPY?

Is it ECONOMICAL (frugal), EQUIDIGITAL, or EXTRAVAGANT (wasteful)?

Is it LUCKY or UNLUCKY?

Odd-ly enough, I have been sharing this knowledge about numbers at the SACs this Fall. If you were lucky enough to attend any of the four SACs then you were happy to gain an abundant amount of interesting and useful knowledge about numbers that you may or may not have known. If you were unlucky and unable to attend then you may be somewhat unhappy. Being "un" is not much fun. I hope those of you happy math folks who were lucky will make good use of the knowledge I shared and I hope

those of you unhappy math folks who were unlucky will seek out this knowledge as you prepare for the upcoming contests.

Good Luck! Work Hard! Play Fair!
I am off on another tangent ...

UIL Test A 2007

#32 is stated in such a way that it appears to be looking for the interest after 12 months. In reality, the interest is only 11 months. I rewrote the problem as follows to try to clear up the confusion.

32. Frugal Frank deposits \$50 into a money market account on the first day of every month for a year beginning on Feb.1 and ending on Jan. 31. The annual interest rate of 4.8% is compounded monthly at the end of each month. How much interest will Frank earn during that year?

#44 is stated in such a way that some interpreted as possible arrangements of just the answers, holding the order of the problems fixed. Others interpreted it as arrangements of both problems and answers. I rewrote the problem as follows to clear up the problem.

44. Mr. Trowbridge creates a multiple choice test with 5 questions. He has 4 possible answers for each question. How many arrangements of questions and answers are possible?

UIL Test B 2007

#59 (also #55 on TMSCA #12 test) requires that an assumption be made. The assumption is that the x-axis and the y-axis are in their standard horizontal and vertical positions. There is nothing in the problem that keeps the axes from being rotated to any other position. I didn't catch this until later in the year's tests. So, unless otherwise stated, continue to make the assumption that the axes are in their standard horizontal and vertical positions.

TMSCA #12, 2007

#55 (see #59 on Test B comments)

#56. It appears that you can solve this problem in at least two ways.

If you multiply you get $\cos^2 - \sin^2 = \cos 2x = .25$

If you add you get $x = 30, 2x = 60 \cos 2x = .5$

How can that be? After looking at both methods mathematically and finding no errors in either computations, it appeared that there had to be a false statement. I graphed both $\cos x + \sin x$ and $\cos x - \sin x$ and discovered the false statement. The maximum value of $\cos x + \sin x$ is about 1.414 or $\sqrt{2}$.

So, $\cos x + \sin x$ cannot equal $[\sqrt{3} + \sqrt{2}]/2 = 1.573$ as stated in the problem.

Hence, false statement in the problem. Hence, it is an invalid problem.

UIL District 2 2007

- #16. The problem has a 2×1 matrix equaling a 2×1 matrix times a 2×2 matrix. That is not valid. It should have been a 2×1 matrix equaling a 2×2 matrix times a 2×1 matrix.

$$\begin{pmatrix} 6 \\ -90 \end{pmatrix} = \begin{pmatrix} 1 & 5 \\ 7 & 2 \end{pmatrix} \begin{pmatrix} x \\ 4 \end{pmatrix}$$

$2 \times 1 = 2 \times 2 \quad 2 \times 1$

The answer for x would be -14 (B on the answer key)

- #19. In retrospect I wish I would not have used phi (the golden ratio) as an answer choice. Phi is considered by some math folks as algebraic since it solves the equation $x^2 - x - 1 = 0$. Others state their reasoning that it is a special case and it falls into the transcendental category. Several coaches sent me various websites to justify phi as being algebraic and I sent them various websites to justify phi as being transcendental. I found one site that claimed phi to be an algebraic transcendental number. I will not use phi in the future when referring to the question of algebraic or transcendental. However, I do think it has given us all something more to look at. Here are a couple of interesting websites that you might be interested in looking at.

www.daviddarling.info/encyclopedia/G/golden_ratio.html

<http://www.ka-gold-jewelry.com/p-articles/golden-spiral.php>

<http://www.halexandria.org:80/dward089.htm>

<http://www.halexandria.org:80/dward101.htm>

- #42. When you look at the drawing, the center O is on the longest side of the triangle. Hence, the longest leg would be the diameter and the radius would be $1/2$ of 13 or 6.5, which is the answer. However, if this is all true then the triangle would have to be a right triangle. Which, of course, would mean that 8, 11, & 13 would have to be a Pythagorean triple. It is not. So, what happened? I put the wrong picture on the test. The picture should have had the center O below the longest side of the triangle, not on it. Then the segment from O to the vertex shown would have been a circumradius. The triangle would not have to have been a right triangle and the side lengths would not have to be a Pythagorean triple. An interesting thing is that if the correct picture would have been on the test then the length of the circumradius would have been 6.527 cm. Now, if you round it to the nearest tenth (as the problem states) you would get the answer of 6.5. If this problem should appear again the center O will not be on the triangle.

UIL Regional 2007

- #20. Answer choice (D) 2.7182881828... has an extra 8 in it. It should have been 2.7182818284... Since the typo was not discovered until after several regions had already completed the test it would have been unfair to contact the remaining regions about the typo. I had to decide to keep the problem and answer as it was or throw the problem out. It was my opinion that the students would not look much past the first three decimal places and would not notice the typo. In fairness to the competitors I decided to keep the problem and answer as it appeared on the test.

UIL State 2007

- #7. The missing segment was discovered early in the test and a correct drawing was placed on the board for the students.

#19. A lengthy discussion about this problem took place among the graders before grading the test began. After the discussion two choices were available, throw the problem out or give credit to those who left it blank or put answer C. The majority vote was to NOT throw it out. I made the final decision to give credit to those who left it blank or put answer C. I based my decision on several factors. One, the majority vote was in favor of it. Two, based on the way I wrote the problem using the multiplication and division symbols to make it appear that there were 4 terms involved, I felt the students would read the problem as I intended it, especially under the stress of the speed they have to work under. And third, since it was a short basic Algebra problem I felt that most, if not all, students would work the problem. The error was mine, not theirs. So, happy or not, I made the final decision.

#31. My intentions for this problem was not the way the problem was stated. The way in which the problem was stated, both D and E were correct. My original intentions were for the students to identify the correct inequality that the shaded portion of the graph represented. The question should have read:

Which of the following inequalities would be best represented by the shaded region of the graph shown?

And the answer choices should have been: (with A being the correct answer)

- (A) $y \geq 3 + \text{absval}(x^2 - 1)$ (B) $y \leq 3x^2 - 3$ (C) $y \leq \text{absval}(x^2 + 1) - 3$
(D) $y \geq 3x^2 + 1$ (E) $y \leq 1 + \text{absval}(x^2 - 3)$

Have a great summer. See you at one of the SACs

2007 SAC Dates

Sept. 15 – UNIVERSITY of North Texas, Denton
Oct. 13 – University of Texas, AUSTIN

Sept. 22 – Texas Tech University, Lubbock
Nov. 3 – Sam Houston State UNIVERSITY, Huntsville