The Excel Math Competition

May 2025 (Introductory Algebra/Geometry Exam)

1. This is a 60 minute individual exam.

2. No collaboration or external devices (like a calculator) are allowed for this test.

3. The first 10 questions are worth [5] points each and are multiple choice.

4. The last 5 questions are worth [10] points each and are short response.

5. Each of the final 5 questions have answers which are positive integers between 000 and 999, inclusive.

6. The questions are arranged in roughly ascending difficulty.

7. If you believe a question is seriously flawed, or have an answer which is not one of the listed answers, there will be a 10-minute dispute period after the test, after which no disputes will be accepted.

8. In the event of a dispute, **leave the question blank** and let your proctor know after the testing time ends.

9. All disputes will be considered on an individual-by-individual basis, so no student will receive credit if they did not submit a dispute, except for in the case of a question being thrown out.

Test writer:
Ryan Rohit

Test Editor:
David Zapata

**Problem Contributors:**
Ryan Rohit
Satvik Mentada
Rohin Teegavarapu

1 [5]

Derek's math final is coming up, and he really needs an A in his class to avoid summer school! Unfortunately, he has no idea what he needs on his final exam to get an A. If his class is weighted at Homework: 20%, Quizzes: 20%, Tests: 50%, and Final: 10%, and he has an average of 100, 70, and 90 in the homework, quizzes, and test categories respectively, what does Derek need on his final exam to get an A (90 or higher)?

   a) 70%   b) 80%   c) 90%   d) 100%   e) 110%

2 [5]
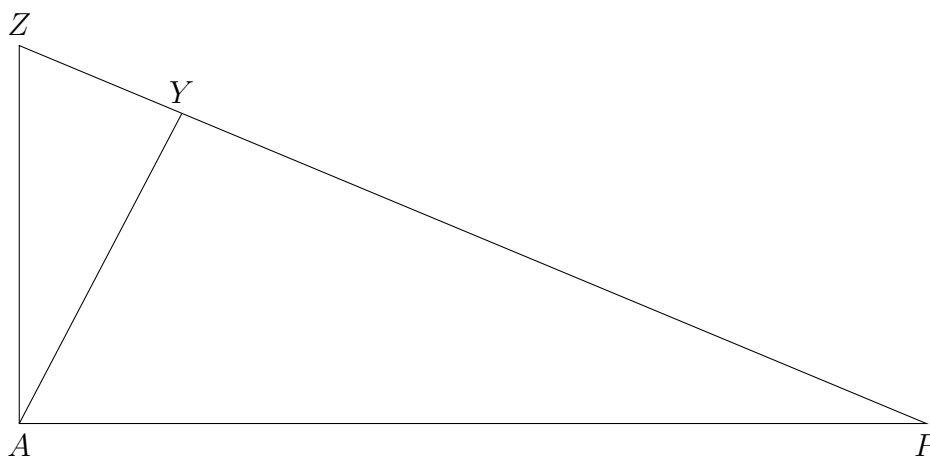
In right triangle ZAP (where $\angle A = 90°$), $\overline{AY}$ is the altitude to the hypotenuse $\overline{ZP}$ where Y is on $\overline{ZP}$. $|\overline{ZA}| = n$, $|\overline{ZP}| = 3n - 6$, and $|\overline{ZY}| = \frac{3n}{n-2}$. The length of $\overline{AP} = m\sqrt{n}$ (when in simplest radical form), find $m + n$

   a) 16   b) 18   c) 20   d) 22   e) 24

3 [5]

Enan is currently being haunted by the GOTG (Ghost of the Geometry), and the only way he can fend it off is by answering a question correctly. How many distinct ways are there to rearrange the letters in the word GEOMETRY where multiple of the same letters are not considered distinct from each other?

   a) 10800   b) 20160   c) 40320   d) 45480   e) 50400

4 [5]

David's calculator somehow broke in the middle of his Statistics class, and all it keeps on doing is repeating the digits "378" over and over again. How many factors does the number 378,378 have?

   a) 72   b) 84   c) 96   d) 108   e) 120

5 [5]

Since it's May, let's get into the Cinco de Mayo spirit! Cinco De Mayo's date of 5/5/25 (M/D/Y) has a very special property of the date and the month multiplying to the year (5*5 = 25). Considering that May 5, 2025 is a Monday, and 2025 is NOT a leap year, what is the day of the week of the last time this property was satisfied? To clarify, the property is a date of a/b/c, where a*b=c, and where c is the last two digits of the year.

  a) Tuesday   b) Wednesday   c) Thursday   d) Friday   e) Saturday

6 [5]

According to many students, last month's Excel Math Competition in April was extremely difficult. Some even said they ended up guessing on every question with their eyes closed! The test included 10 multiple-choice questions, each with five answer choices (we'll ignore the free response questions). Suppose Bhuv, Zoohas, and Rodium all took the test and guessed randomly on each question. What is the expected total number of correct answers among the three of them?

  a) 2   b) 3   c) 4   d) 6   e) 9

7 [5]

Consider a regular polygon with n sides. How many values of n exist such that the measure of an interior angle is a positive integer?

  a) 21   b) 22   c) 23   d) 24   e) 25

8 [5]

Rishan LOVES video games; he hasn't gotten off COD in 20 hours! In COD, Rishan's character has three attacks: a punch that does 1 HP, a fireball that does 3 HP, and a sword slash that does 6 HP. If an enemy has 50 HP, how many different combinations of attacks can Rishan perform to eliminate his enemies given that he must deal EXACTLY 50 HP of damage to eliminate his enemy? Note that different orders of the same numbers of each attack do NOT count as a different combination of an attack; three fireballs and a punch is counted as the same combination as one punch and three fireballs.

  a) 79   b) 80   c) 81   d) 82   e) 83

9 [5]

Kha has just finished The Minecraft Movie, and now he's obsessed with cubes. He decides to create an 8x8x8 cube out of individual 1x1x1 cubes, and paint the outside to look like a diamond block. Unfortunately, Kha's annoying cousin Jemail knocked over the whole structure, scattering the cubes everywhere! Kha decides to pick up a random cube off the floor. What is the probability that this cube has either 1 or 2 sides painted?

a) $\frac{1}{2}$ b) $\frac{65}{128}$ c) $\frac{33}{64}$ d) $\frac{17}{32}$ e) $\frac{9}{16}$

10   [5]

Which of the following answer choices is logically equivalent to the statement: "If David is eating and watching TV, then he's not writing math problems."?

a) If David is writing math problems, then he is not eating or not watching TV.

b) If David is not eating or not watching TV, then he is writing math problems.

c) If David is not writing math problems, then he is eating and watching TV.

d) If David is eating or watching TV, then he is not writing math problems.

e) If David is eating and watching TV, then he is writing math problems.

11   [10]

What is the 10s digit and 1st digit of 7^{2025}? Suppose the actual integer value of 7^{2025} is ...abc, your answer should be of the form $0bc$.

12   [10]

Express the decimal $1.037\overline{537}$ as a fraction in simplest form; report the numerator of this fraction.

13   [10]

Santa Clop has decided to visit Ridgeville High and give presents to all the kids in the entire school! The kids at RHS are really picky about what they want, though, so the principal left Mr. Clop instructions on how many students want each gift:

- 40% of the students want a basketball, 30% want shoes, and 30% want a puppy.

- Of the students who want a basketball, half want an NCAA ball, while the other half want an NBA ball. $\frac{1}{3}$ of the NBA balls are green, $\frac{1}{3}$ are blue, and $\frac{1}{3}$ are red; the NCAA balls are half split into gold balls, and half split into silver balls. Finally, $\frac{1}{4}$ of the students receiving a basketball are girls, so they requested a women's basketball; the rest of the basketballs provided are male's.

- Of the students who want shoes, twice as many want Nike as Adidas. Of those who want Nikes, $\frac{1}{4}$ of them want cleats, $\frac{1}{4}$ of them want basketball shoes, and $\frac{1}{2}$ of them want sandals. Of those who want Adidas, $\frac{1}{5}$ of them want loafers, $\frac{3}{10}$ of them want sneakers, and $\frac{1}{2}$ of them want dress shoes. Across both brands and all types of shoes, the color distribution is 15% green, 20% red, 30% brown, and 35% gold.

- All dogs are golden retrievers.

Given that there are 270,000 students at RHS, find the number of students that have a green women's NCAA basketball + the number of students that have brown Nike cleats + the number of students that want gold Adidas sneakers. This should result in a five-digit integer, where you will then take the last 2 digits and subtract them from the first three digits (so for five-digit integer $abcde$, evaluate $abc - de$). Report the final number.

14 [10]

There are multiple integers n between 800, 1000 that when its digits are reversed (as in the number abc becomes cba), the new number formed is $p\%$ of n, where p is an integer between 1 and 100, inclusive. Find the ONLY value of n in this interval such that when its digits are reversed, the new number formed is $p\%$ of n, where p is an integer between 1 and 100 and is NOT equal to 1, 10, or 100.

15 [10]

There exists a right triangle ABC at right angle B such that $\overline{AB}$ is 8 and $\overline{BC}$ is 15. There also exists angle bisector $\overline{BD}$, median $\overline{BE}$, and altitude $\overline{BF}$ such that points D, E, and F, all lie on hypotenuse $\overline{AC}$. If $|\overline{DE}| \cdot |\overline{AF}| \cdot |\overline{FC}|$ can be expressed as a simplified fraction $\frac{m}{n}$, find the sum of the largest prime factors of m and n.