1. If you view Tim’s notes at the end of the test, you’ll see that if you have something, then the equation is an ellipse. (C)
2. 2 kilometers = 2000 meters. seconds. (B)
3. The area of a trapezoid is given by , where and represent the lengths of the two bases, and represents the height. (This formula is given on Tim’s notes.) Plugging in and , we find that the area is square feet. (A)
4. We know that after a time , Let’s solve for : seconds. (D)
5. 1.5625% = so after 6 doublings (6 minutes later) Tim will see everything. Thus, Tim will see 100% of what is around him in the 7th minute. (C)
6. 2 and 3 are prime, while 1 is neither prime nor composite. Only 4 is composite. (D)
7. To add fractions, we need to find a common denominator. The LCM of 2, 4, and 6 is 12, so let’s turn everything into a denominator of 12: . (C)
8. In order for something to be both a perfect square and a perfect cube, it must be something raised to the 6th power. The first sixth power is . (E)
9. By definition, a rational number is one that can be written as a fraction with integer numerator and denominator. The opposite of a rational number (numbers that cannot be written as a fraction with integer numerator and denominator) are known as irrational numbers. (B)
10. We’re given the formula . Plugging in and , we can solve for . (C) [The solid is a pentagonal prism; that is, a prism with pentagons as its bases.]
11. We can simply plug in to the given formula. We get . (C)
12. The last page gives the formula for the volume of a cylinder: . We’re given the values and so we calculate . (B)
13. Half of 24 miles is 12 miles. You were able to travel the first half of the trip in 1 hour, but the second half takes hours. In total, you travelled 24 miles in 4 hours for an average speed of miles per hour. (A)
14. A “magic square” is a square where the rows, columns, and diagonals all add up to the same number. If we test answer choice D, we find that each column, row, and diagonal adds up to 15. Thus, that square is a “magic square”. (D)
15. We can say for sure that Tim wears polo shirts. If he didn’t wear polo shirts, he would not be cool. However, since he is cool, we know that he does wear polo shirts since there aren’t other options. (A) [Make sure you read answers C and D! This will come in handy later.]
16. A complex number is a number with both a real and imaginary part. (Complex numbers are mentioned in question 4.) Hyperbolas are a type of conic section, and show up in Tim’s notes. The paragraphs on page 6 assure us that Row-Echelon Form is a valid mathematical term. By process of elimination and process of elimination, we know that Hashtag is the non-mathematical term. (B)
17. Note that , which has 5 digits. (C)
18. Let us simplify . We first divide and by to get and respectively. now becomes . Thus, we have . (B)
19. Be careful in this problem! We do addition and subtraction first: . Now we can do multiplication and division to get the answer of . (B)
20. We simply plug in and and evaluate: . (D)
21. This is the famous Fibonacci sequence. (E)
22. Yes, this is a geometric sequence! We can multiply by each time to get the next term. For example, then , and and so on. (A)
23. Refer to question 10 answer choice D for the formula for hexagonal numbers: . We can plug in the first few values of to find the first few hexagonal numbers. . . . . We see that our answer choices are all hexagonal numbers, so the correct answer to this problem is (E).
24. Refer to the instructions: “If a question does not exist, and is labeled as such, please bubble D.” Thus, our answer is (D).
25. Let’s calculate each probability:
26. There are 13 hearts, and only 1 Ace of spades. Thus, our probability is
27. There are 13 total clubs, but remember that there are no replacements.
28. There are 3 face cards in each suit, and 9 number cards in each suit.
29. There are 13 of each type, so the probability is

Clearly, the highest probability here is (D).

1. We can use the difference of squares: . Letting and , we have . (B)
2. If we have two numbers and , then the GCF of and multiplied by the LCM of and will simply be . , so our answer is (D). [Alternatively, we can find the GCF and LCM: the GCF is and the LCM is . The product of these is still .]
3. If you double the number of workers but also double the amount of work, the amount of time needed will not change, so they will still finish in 3 days. You can also think of it this way: If we have 3 painters then they can paint 6 houses in 6 days (since more work means longer time). However, we can then double the number of painters to get that 6 painters will paint 6 houses in 3 days (since more workers means less time). Either way, we still get that they finish in 3 days. (E)
4. X appears on the first page, in the instructions, where the number 6 should be, so X = 6. Y appears at the top of page 3 in the date, so Y = 13. The bottom of the fifth page is numbered with a Z instead of a 5, so Z = 5. X + Y + Z = 24. (C)
5. Notice that some of the words in instructions and other texts are **bolded**. If you take only the bolded words, you get: **What is the theme of Mini Mu this year**. The answer to this question is Games. (B)

*This test was written by Nicholas Yang.*

*Be sure to check out the other Mystery Tests given at National Mu Alpha Theta Conventions: they can be found at* [*http://www.mualphatheta.org/National\_Convention/PastTests.aspx*](http://www.mualphatheta.org/National_Convention/PastTests.aspx)*.*