

Nassau County Interscholastic Mathematics League

9

Grade 9

TEAM #

Mathematics Tournament 2014

No calculators may be used on this part.
All answers will be integers from 0 to 999 inclusive.
One (1) point for each correct answer.

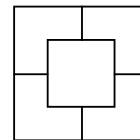
Name _____ School _____ Score _____

Time Limit: 45 minutes

Lower Division

Answer Column

1. The number midway between $\frac{1}{6}$ and $\frac{1}{4}$ can be expressed as the fraction $\frac{a}{b}$, in reduced form. Compute $a + b$.	1.
2. The $\sqrt[3]{320}$ can be written in simplest radical form, $a\sqrt{b}$. Find $a + b$.	2.
3. One full priced ticket to a show costs \$20. Susan buys 4 tickets using a coupon that gives her a 25% discount per ticket. Partha buys 5 tickets using a coupon that gives her a 30% discount per ticket. How many more dollars does Partha pay than Susan?	3.
4. A set of 3 points is chosen at random from the given grid. Each 3-point set is equally likely to be chosen. The probability that the 3 chosen points lie on a straight line can be expressed as a fraction a/b , in lowest terms. Determine $a + b$.	4.
5. A teacher says to the class, "Think of a number, add 3, double the result, and then subtract 5. Pass your final result to your partner. Each partner should subtract 1 from the number received, find $1/3$ of your result, then double that answer to get the final result". If Akash started with the number 6 and gave his partner, Sibyl, his answer, what would be Sibyl's final answer?	5.
6. A small square is surrounded by 4 congruent L-shaped regions to form a larger square. The area of each L-shaped region is $3/16$ of the area of the larger square whose side is 100 inches. Find the number of inches in the length of a side of the smaller square.	6.
7. If p and q are the two solutions to $2x^2 + 3x - 5 = 0$, find the value of $(p - 1)(q - 1)$.	7.
8. Kyle rode his bicycle for 30 minutes at 16 mph. He then walked for 90 minutes at 4 mph. Find his overall average rate in miles per hour.	8.



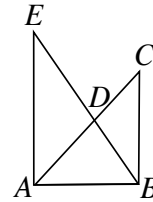
Turn Over

Time Limit: 45 minutes

Lower Division

Answer Column

9. If the letters N , M , and T represent different prime integers and $N \times M \times T = 2014$, find the value of $N + M + T$.	9.
10. Find the units digit of the expansion of 43^{2014} .	10.
11. In the diagram, $\angle EAB$ and $\angle ABC$ are both right angles and \overline{AC} intersects \overline{BE} at D . If $AB = 4$, $BC = 7$, and $AE = 10$, compute the difference between the area of $\triangle ADE$ and the area of $\triangle BDC$.	11.
12. If S_e represents the sum of the even integers from 1 to 100 inclusive, and S_o represents the sum of all the odd integers from 1 to 100 inclusive, find $ S_e - S_o $.	12.
13. How many ordered pairs of positive integers (x, y) , satisfy the equation $x^2 - y^2 = 140$?	13.
14. A point $P(x, y)$, is randomly selected from inside a rectangle with vertices at $(0, 0)$, $(6, 0)$, $(6, 2)$, and $(0, 2)$. When the probability that $x < y$ is expressed as a/b in reduced form, what is the value of $ a - b $?	14.
15. A piece of cheese is located on a coordinate plane at the point whose coordinates are $(12, 10)$. A mouse is at a point whose coordinates are $(4, -2)$ and is running along the line $y = -5x + 18$. When the mouse gets to the point (a, b) he is closest to the cheese. Find $a + b$.	15.



Nassau County Interscholastic Mathematics League

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Grade 10

TEAM #

Mathematics Tournament 2014

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Name _____ School _____ Score _____

Time Limit: 45 minutes

Lower Division

Answer Column

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Turn Over

Time Limit: 45 minutes

Lower Division

Answer Column

9.	9.
10.	10.
11.	11.
12.	12.
13.	13.
14.	14.
15.	15.

Nassau County Interscholastic Mathematics League

11

Grade 11

 TEAM #

Mathematics Tournament 2014

No calculators may be used on this part.
 All answers will be integers from 0 to 999 inclusive.
 One (1) point for each correct answer.

Name _____ School _____ Score _____

Time Limit: 45 minutes
Upper Division
Answer Column

1. The table below states the results of a survey regarding the number of honors classes each student in Dr. Erdos's class is taking this year. The average number of honors classes per student in this class is three. Find the value of x in the table.

Number of honors classes	0	1	2	3	4	5
Number of students	2	4	4	6	x	4

1.

2. Find the total number of different arrangements that can be formed using each of the six letters in the word KANSAS exactly once in each arrangement.

2.

3. If $|4a + 6| + 2a = 18$, what is the absolute value of the difference of the roots?

3.

4. A college lecture hall has nineteen rows of seats. The first row has twelve seats and each row after the first row has three more seats than that of the previous row. How many seats are in the lecture hall?

4.

5. What is the length of the radius of the circle whose equation is $x^2 - 6x + y^2 + 8y - 504 = 0$?

5.

6. A single fair die is rolled six times. If the probability, in simplest form, that each of the six faces appears exactly once is $\frac{p}{q}$, find $p + q$.

6.

7. Two concentric circles have radii 10 and 26. Find the length of a chord of the larger circle that is tangent to the smaller circle.

7.

8. Find the sum of the values of x in the interval $0^\circ \leq x \leq 450^\circ$ that satisfy $\sin(3x)^\circ = 1$.

8.

Turn Over

Time Limit: 45 minutes

Upper Division

Answer Column

9. If $\log_3 7 = a$ and $\log_3 b = 2a + 1$, compute b .	9.
10. If the roots of $4 + x^{-4} = 5x^{-2}$ are r_1, r_2, r_3 and r_4 , find $15 \cdot \sum_{k=1}^4 r_k $.	10.
11. In $\triangle ABC$, $AC = 6$, $BC = 8$, and $AB = 10$. If the difference of the area of the inscribed circle from the area of the circumscribed circle is $k\pi$, find k .	11.
12. Points A and B are on circle O with center at the origin. The coordinates of point A are $(8, 0)$, point B is in quadrant II, and the $m\angle AOB = 120^\circ$. If point M is the midpoint of \overline{AB} and the coordinates of point M are (x, y) , compute x .	12.
13. Two roots of $ax^3 + bx^2 + cx + d = 0$ are $3 + 4i$ and 2 . If $a = 1$ and the coefficients b , c , and d are real, compute $c - b - d$.	13.
14. If $\log_{243} x + \log_{81} x + \log_{27} x + \log_9 x + \log_3 x = \frac{a}{b} \log_3 x$, where $\frac{a}{b}$ is in simplest form, find $a + b$.	14.
15. The line $y = 2x$ is tangent to the parabola $y = ax^2 + 1$ for some real number a . Find a . [Note: a line is tangent to a parabola if it is not parallel to the axis of symmetry and intersects the curve in exactly one point.]	15.

Nassau County Interscholastic Mathematics League

12

Grade 12

TEAM #

Mathematics Tournament 2014

No calculators may be used on this part.
All answers will be integers from 0 to 999 inclusive.
One (1) point for each correct answer.

Name _____ School _____ Score _____

Time Limit: 45 minutes

Upper Division

Answer Column

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Turn Over

Time Limit: 45 minutes

Upper Division

Answer Column

9.	9.
10.	10.
11.	11.
12.	12.
13.	13.
14.	14.
15.	15.

Nassau County Interscholastic Mathematics League

M

Mathletics

TEAM #

Mathematics Tournament 2014

Calculators may be used on this part.
All answers will be integers from 0 to 999 inclusive.
One (1) point for each correct answer.

Name _____ School _____ Score _____

Time Limit: 30 minutes

Answer Column

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Turn Over

M

Mathematics Tournament 2014

Mathletics

Time Limit: 30 minutes

Answer Column

6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Nassau County Interscholastic Mathematics League

T

Team Problem Solving

TEAM #

Mathematics Tournament 2014

HAND IN ONLY **ONE** ANSWER SHEET PER TEAM
 Calculators may be used on this part.
 All answers will be integers from 0 to 999 inclusive.
 Three (3) points per correct answer.

Team Copy **School** _____ **Score** _____

Time Limit: 60 minutes

Answer Column

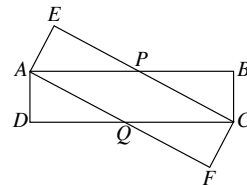
1. Twenty-eight students are in a special class that offers 3 courses of study: art, music, and math. Each of the 3 courses contains the same number of students. Four students take only music, one student takes only art, and six students take only math. Some students take 2 of the subjects and some take all 3. The numbers of students who take 2 or 3 subjects are all different and none of these groups contain more than 7 students. How many students take all 3 subjects?	1.
2. The base five number 243_5 equals $2 \cdot 5^2 + 4 \cdot 5 + 3 \cdot 1 = 73$ in base ten. In what base, b , will the following statement be true: $5_b \cdot 43_b = 236_b$?	2.
3. In circle O , chord \overline{PQ} is drawn. If $OP = \sqrt{x^2 - 111}$ and $OQ = \sqrt{110 + 4x}$, compute x .	3.
4. The number 11 can be written as the sum of 11 consecutive integers. Find the product of those 11 integers.	4.
5. Compute $ a - a - a $ when $a = -123$.	5.
6. Compute the number of square units in the area of a square inscribed in an equilateral triangle whose side is $8(2\sqrt{3} + 3)$ units. {All vertices of the square are on the triangle.}	6.
7. Find the sum of the digits of the square of the largest prime factor of 2014.	7.
8. Find the sum of all the real roots for the equation: $x(x-1)(x-2)(x-3) = 6 \cdot 7 \cdot 8 \cdot 9$.	8.
9. Jose wrote the integers from 1 to n in 12 minutes and 6 seconds. He was able to write 1 digit every second. Find the value of n .	9.

Turn Over

Time Limit: 60 minutes

Answer Column

10. Compute the area enclosed by the graph of the equation $ x + y = 3\sqrt{5}$.	10.
11. Given $p:q:r = 3:4:5$ and that $\frac{2p+3q}{5q+7r} = \frac{a}{b}$ where a and b are relatively prime (no positive common factor other than 1), compute $a + b$.	11.
12. In right $\triangle ABC$, with hypotenuse \overline{BC} , $AB = 30$ and $AC = 40$. The foot of the altitude to \overline{BC} is point Q and the median to \overline{BC} intersects it at point M . Compute MQ .	12.
13. Compute the value of $a^3 + b^3$ when $a + b = 7$ and $ab = 4$.	13.
14. Determine the number of diagonals in a regular decagon (10 sides).	14.
15. The sum of 3 integers is 2014. The ratio of the first to the second is $\frac{3}{5}$ and the ratio of the first to the third is $\frac{4}{7}$. Compute the second number.	15.
16. The sum of a number and its reciprocal is 12. Compute the square of the difference between the original number and its reciprocal.	16.
17. Compute the number of lattice points in the first quadrant that satisfy $20x + 14y = 2014$. A lattice point is a point (a, b) where a and b are both integers.	17.
18. The perpendicular bisector of one of the two congruent legs of an isosceles triangle bisects the base of the triangle. If the lengths of the legs of the triangle are each $17\sqrt{2}$, compute the length of the base.	18.
19. Congruent rectangles $ABCD$ and $AECF$ have sides of length 8 and 32. They intersect at points P and Q . Find the area of quadrilateral $APCQ$.	19.
20. If $f(x) = x^2 + 9x + w$ and $f(w) = -25$, compute $f(10)$.	20.



Nassau County Interscholastic Mathematics League

T

Team Problem Solving

TEAM #

Mathematics Tournament 2014

DO NOT HAND THIS COPY IN. HAND IN THE ONE TEAM COPY.

Calculators may be used on this part.

All answers will be integers from 0 to 999 inclusive.

Three (3) points per correct answer.

Individual Copy

Time Limit: 60 minutes

Answer Column

Turn Over

T

Mathematics Tournament 2014

Team Problems

Time Limit: 60 minutes

Answer Column

Nassau County Interscholastic Mathematics League

Tie Breakers

Mathematics Tournament 2014

No calculators may be used on this part.
All answers will be integers from 0 to 999 inclusive.
One (1) point for correct answer.

Name _____ School _____ Score _____

Time Limit:

Answer Column

1.	1.
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Name _____ School _____ Score _____

Time Limit:

Answer Column

2.	2.
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Name _____ School _____ Score _____

Time Limit:

Answer Column

3.	3.
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