

Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 1:

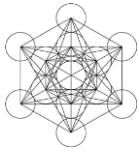
If the radius of a circle is increased by 100%, the area is increased by how many percent?

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 2:

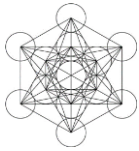
What is the last digit of 2^{51} ?

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 3:

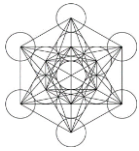
Three positive integers sum to 10. What is the minimum possible value for the sum of their squares?

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 4:

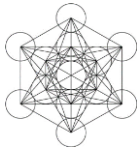
What is the coefficient of c^2d^2 in the expansion $(\sqrt{c} + \sqrt{d})^8$?

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 5:

Solve the following system of linear equations and determine the value of x.

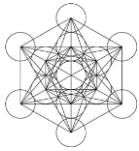
$$\begin{aligned}x + y &= 7 \\x - 2z &= 8 \\y + 3z &= 5\end{aligned}$$

5

3

2

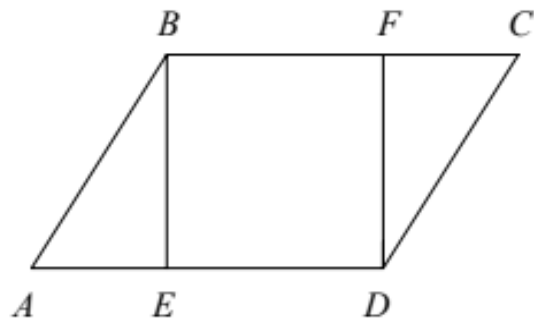
1



Team # _____

Question 6:

In the diagram, $ABCD$ is a parallelogram, and $BFDE$ is a square. If $AB = 20$ cm and $CF = 12$ cm, what is the perimeter of the parallelogram $ABCD$? The diagram is not to scale.

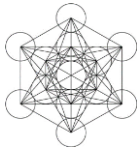


5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 7:

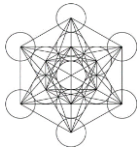
A palindromic number is a number that does not change if its digits are reversed. How many different 3-digit palindromic numbers exist if zero is not used?

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 8:

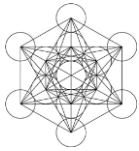
Let $\frac{x-3}{(x-1)(x+2)} = \frac{A}{x-1} + \frac{B}{x+2}$. What is the value of $A + B$?

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Question 9:

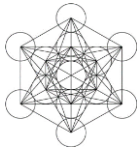
The line $y = 12 - 2x$ intersects the parabola $y = 5 + 6x - x^2$ at two points. Find the distance between these two points in simplest radical form.

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay 2:

1. If $20 \cdot 12 = 2^a \cdot 3^b \cdot 5^c \cdot 7^d$, then $\mathbf{A} = a^2 + b^0 + c^1 + d^2$

Write the value of **A** in Box # 1 of the Relay Answer Sheet.

2. In a 3-way election, Ellen received 225 votes, Rachel received 50 more votes than Ellen, and Kim received $(\mathbf{A}+2)\%$ of the total votes. **B** is the percentage of the total votes that Rachel received.

Write the value of **B** in Box # 2 of the Relay Answer Sheet.

3. A rectangular field is partitioned into four rectangular parcels. The areas of three of these parcels are as shown. **C** is the missing area.

C	B ×10
375	600

Write the value of **C** in Box # 3 of the Relay Answer Sheet.

4. There are 3 numbers in the prime factorization of **C**. **D** is the sum of these numbers.

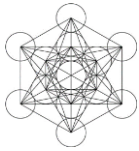
Write the value of **D** in Box # 4 of the Relay Answer Sheet.

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay 2:

1. Une colonie martienne considère un nouveau calendrier de 40 jours par mois qui utilise les 7 mêmes jours de la semaine. Si lundi est le premier jour de leur troisième mois, **A** est la date du dernier lundi de ce troisième mois.

Write the value of **A** in Box # 1 of the Relay Answer Sheet.

2. Si x et y sont des nombres naturels non-nuls et $3x + 5y = \mathbf{A}$, alors **B** est la valeur minimum de $x + y$.

Write the value of **B** in Box # 2 of the Relay Answer Sheet.

3. La factorisation de $(42 \times \mathbf{B})$ en nombres premiers peut être exprimée comme $a^x \cdot b^y \cdot c^z$. **C** est la somme de a, b, c, x, y , et z . (Remarque: a, b, c, x, y et z ne sont pas nécessairement différents)

Write the value of **C** in Box # 3 of the Relay Answer Sheet.

4. Pour quelle valeur de **D**, le binôme $(x + 3)$ est-il un facteur de:
 $2x^3 - 5x^2 + \mathbf{D}x + \mathbf{C} + 9$?

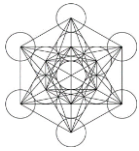
Write the value of **D** in Box # 4 of the Relay Answer Sheet.

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay 1:

1. Mr. Tan has \$3.75 in dimes and quarters. **A** is the number of coins he has if he has one more quarter than dime.

Write the value of **A** in Box # 1 of the Relay Answer Sheet.

2. If $f(x) = 3 - 2x$, $\mathbf{B} = f^{-1}(\mathbf{A})$

Write the value of **B** in Box # 2 of the Relay Answer Sheet.

3. Given that $g(\mathbf{B}) = 5$. **C** is the sum of the coordinates after a reflection across the x-axis, followed by a shift 3 units to the right and 5 units up.

Write the value of **C** in Box # 3 of the Relay Answer Sheet.

4. Consider points $A(2, \mathbf{C})$ and $M(1, 4)$ where M is the midpoint of AB . B is $(0, \mathbf{D})$

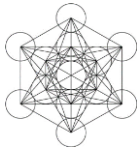
Write the value of **D** in Box # 4 of the Relay Answer Sheet.

5

3

2

1



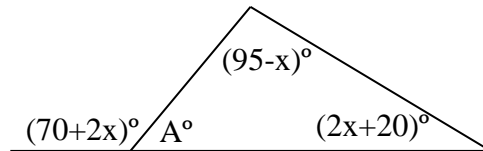
Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay 1:

1. Trouvez **A**



Write the value of **A** in Box # 1 of the Relay Answer Sheet.

2. **B** est la somme des ordonnées (c'est-à-dire des y) des points d'intersections de la droite d'équation $3x + y + (\mathbf{A}/3) = 0$ et de la parabole d'équation $y = x^2 - 2x - 15$.

Write the value of **B** in Box # 2 of the Relay Answer Sheet.

3. La valeur de $\sqrt{9^2 + \mathbf{B} - 5}$ est **C**.

Write the value of **C** in Box # 3 of the Relay Answer Sheet.

4. **D** est le nombre de gallons d'eau qui doivent s'évaporer d'une solution de $(\mathbf{C} \times 10)$ gallons d'eau salée contenant 20% de sel pour obtenir une solution contenant 35% de sel.

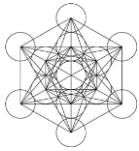
Write the value of **D** in Box # 4 of the Relay Answer Sheet.

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay 3:

1. **A** is the sum of the zeros (roots) to the equation $x^2 - 3x = 10$.

Write the value of **A** in Box # 1 of the Relay Answer Sheet.

2. $m \otimes n = m^2 - mn + n^2$. $B = (2 \otimes A) \otimes 4$.

Write the value of **B** in Box # 2 of the Relay Answer Sheet.

3. **C** is the fourth term in an arithmetic sequence in which the second term is -4 and the eighth term is **B**-5.

Write the value of **C** in Box # 3 of the Relay Answer Sheet.

4. Ahmed gives half of his marbles to his best friend and then a third of those remaining to his sister. If his sister receives **C** marbles, then **D** is the original number of marbles Ahmed had to start with.

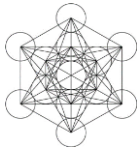
Write the value of **D** in Box # 4 of the Relay Answer Sheet.

5

3

2

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay 3:

1. **A** est la somme des chiffres de la somme: $2 + 11 + 20 + 29 + \dots + 101$.

Write the value of **A** in Box # 1 of the Relay Answer Sheet.

2. Le point (**B**, **A**) est sur la ligne $3x - y - 6 = 0$. Trouvez la valeur de **B**.

Write the value of **B** in Box # 2 of the Relay Answer Sheet.

3. **C** est la valeur maximum de la fonction: $y = -2x^2 - 12x + \mathbf{B}$.

Write the value of **C** in Box # 3 of the Relay Answer Sheet.

4. Un père de famille a fait le lavage et étendu les t-shirts seulement sur la corde à linge. Ensuite il a demandé à ses enfants de séparer chaque t-shirt du précédent par exactement 1 bas. Il y a maintenant **C** articles d'habillement sur la corde à linge, dont **D** t-shirts.

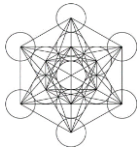
Write the value of **D** in Box # 4 of the Relay Answer Sheet.

5

3

2

1



Kingston Math League Senior Tournament
 November 28, 2019
 Sprint Round



Team # _____

Relay # 2 - Answers

A	18
B	44
C	275
D	21

Relay # 2 - Answer Sheet

TEAM # _____ **School:** _____

A	
B	
C	
D	

Regular points (max. 5)	+	Bonus Points (max. 10)	=	Total Points (max =15)

Proctors Initials: _____

--

5

--

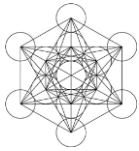
3

--

2

--

1



Kingston Math League Senior Tournament
 November 28, 2019
 Sprint Round



Team # _____

Relay # 1 - Answers

A	21
B	-9
C	-6
D	14

Relay # 1 - Answer Sheet

TEAM # _____ **School:** _____

A	
B	
C	
D	

Regular points (max=5) +	Bonus Points (max= 6) =	Total Points (max = 11)

Proctors Initials: _____

--

5

--

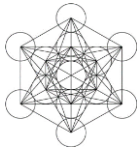
3

--

2

--

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Relay # 3 - Answers

A	3
B	37
C	8
D	48

Relay # 3 - Answer Sheet

TEAM # _____ **School:** _____

A	
B	
C	
D	

Regular points (max. 5)	+	Bonus Points (max. 10)	=	Total Points (max = 15)

Proctors Initials: _____

--

5

--

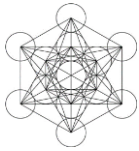
3

--

2

--

1



Kingston Math League Senior Tournament
November 28, 2019
Sprint Round



Team # _____

Answers

1. 300%

2. 8

3. 34 ($=3^2 + 3^2 + 4^2$)

4. 70

5. 20

6. 96

7. 81

8. 1

9. $6\sqrt{5}$

5

3

2

1