

Kingston Math League Senior Tournament
December 14, 2018

Sprint Round

Team # _____

Question 1:

How many combinations (order does not matter) of two positive prime numbers add to 24?

Combien de combinaisons de deux nombres premiers ont une somme de 24? (Dans une combinaison, l'ordre n'a pas d'importance.) (Les nombres premiers sont toujours positifs.)

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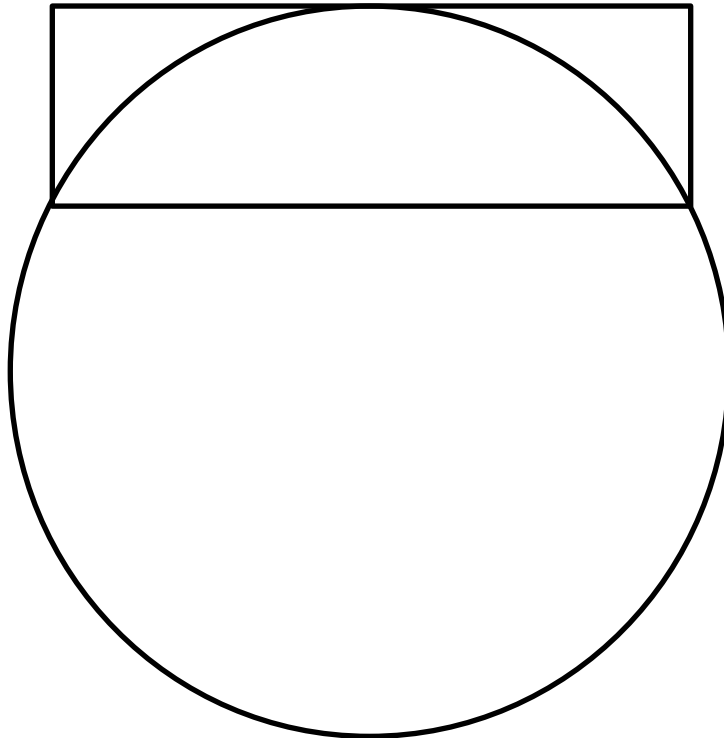
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Question 2:

The diagram below shows a rectangle and a circle with the center of the circle below the rectangle, one side of the rectangle tangent to the circle, and two vertices of the rectangle on the circle. The longest side of the rectangle is 16, and the radius of the circle is 10. Find the area of the rectangle.

Le diagramme ci-dessous illustre un rectangle et un cercle dont le centre est situé en bas du rectangle. Un des côtés du rectangle est tangent au cercle et deux des sommets du rectangle sont sur le cercle. Le rectangle a une longueur de 16 et le cercle a un rayon de 10. Détermine l'aire du rectangle.



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Question 3:

Consider all the positive integers up to 1000 inclusively.
What is the total number of 0's and 2's among their digits?

Considérez tous les entiers positifs jusqu'à 1000 inclusivement.
Combien de numéros de 0 et de 2 se trouvent parmi leurs chiffres?

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Question 4:

Simplifier cela :

Evaluate this:

$$(1234567899 \times 1234567894 \times 1234567892) - (1234567891 \times 1234567896 \times 1234567898)$$

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Question 5:

Si $\frac{a}{b} = 12$ et $\frac{b}{c} = 20$, quelle est la valeur de $\frac{b+c}{a}$?

If $\frac{a}{b} = 12$ and $\frac{b}{c} = 20$, what is the value of $\frac{b+c}{a}$?

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Team # _____

Question 6:

A building has 50 storeys, 25 of which are painted black and the other 25 of which are painted gold. If the number of gold storeys in the top half of the building is added to the number of black storeys in the bottom half of the building, the sum is 28. How many gold storeys are there in the top half of the building?

Un bâtiment compte 50 étages, dont 25 sont peints en noir et les 25 autres en or. Si le nombre d'étages dorés dans la moitié supérieure du bâtiment est additionné au nombre d'étages noirs dans la moitié inférieure du bâtiment, la somme est de 28. Combien y a-t-il d'étages en or dans la moitié supérieure du bâtiment?

5	3	2	1

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Question 7:

Two different integers are chosen at random from the interval $[1, 25]$. Find the probability their sum is even. There is no replacement during the selection of the two integers.

Deux nombres entiers différents sont choisis au hasard dans l'intervalle $[1, 25]$. Trouve la probabilité que leur somme soit pair. Il n'y a pas de remplacement lors de la sélection des deux entiers.

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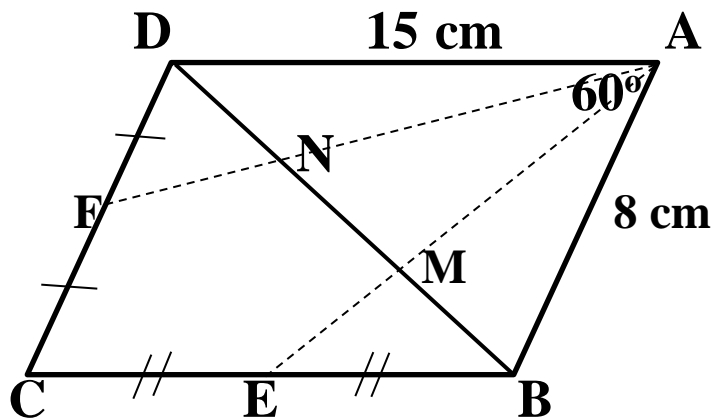
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Question 8:

Dans le parallélogramme $ABCD$, $\angle BAD = 60^\circ$. E est le milieu de BC et F est le milieu de CD . BD croise AE au point M et croise AF au point N . Si $AB = 15$ cm et $AD = 8$ cm, quelle est la longueur exacte de MN en cm?

In the parallelogram $ABCD$, $60^\circ \angle BAD = 60^\circ$. E is the midpoint of BC and F is the midpoint of CD . BD intersects AE at M and AF at N . If $AB = 15$ cm and $AD = 8$ cm, what is the exact length, in cm, of MN ?



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Question 9:

Since a , b , and c form a set of consecutive multiples of 4 such that the product of the two largest minus the product of the two smallest is 256, find $a + b$: (the sum of the two smaller numbers).

Puisque a , b et c forment un ensemble de multiples consécutifs de 4 tel que le produit des deux plus grands moins le produit des deux plus petits soit 256, trouvez $a + b$: (la somme des deux plus petits nombres).

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Relay 2:

1. A Martian colony is considering a new calendar with 40 days using the same 7 days of our week. If Monday is the first day in their third month, **A** is date of the last Monday in this third month.

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

2. If x and y are non-zero natural numbers, and $3x + 5y = \mathbf{A}$, **B** is the lowest possible value of $x + y$.

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

3. The prime factorization of $(42 \times \mathbf{B})$ can be written as $a^x \cdot b^y \cdot c^z$. **C** is the sum of a, b, c, x, y, z . (Note: $a, b, c, x, y,$ and z are not necessarily different)

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

4. For what value of **D** is $(x + 3)$ a factor of $2x^3 - 5x^2 + \mathbf{D}x + \mathbf{C} + 9$?

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

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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.

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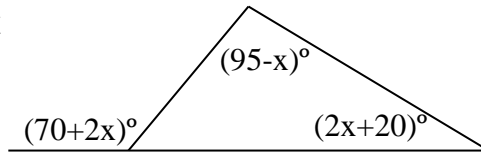
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Relay 1:

1. Find x . $A = x$



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

2. **B** is the sum of the y-coordinates of the points of intersection of the line $3x + y + (A/3) = 0$ and the parabola with equation $y = x^2 - 2x - 15$.

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

3. The value of $\sqrt{9^2 + B - 5}$ is **C**.

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

4. **D** is how many gallons of water must be evaporated from $(C \times 10)$ gallons of a 20% salt solution to leave a 35% salt solution.

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

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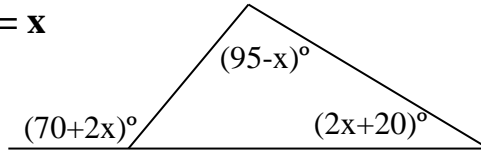
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Relay 1:

1. Trouvez x . $A = x$



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 $3x + y + (A/3) = 0$ 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 $\sqrt{9^2 + B} - 5$ 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 $(C \times 10)$ 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.

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Relay 3:

1. **A** is the sum of the digits of the sum: $2 + 11 + 20 + 29 + \dots + 101$.

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

2. The point (B, A) is on the line $3x - y - 6 = 0$. Find the value of **B**.

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

3. **C** is maximum value of the function: $y = -2x^2 - 12x + B$.

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

4. A father did the laundry and hanged only t-shirts in line on a clothing line. Then he asked his children to put a single sock between any two t-shirts. Now there are **C** pieces of clothing on the line. **D** is the number of t-shirts on the line.

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

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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: $y = -2x^2 - 12x + B$.

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.

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Relay # 2 - Answers

A	36
B	8
C	18
D	-24

Relay # 2 - Answer Sheet

TEAM # _____ **School:** _____

A	
B	
C	
D	

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

Proctors Initials: _____

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Team # _____

Relay # 1 - Answers

A	45
B	-27
C	7
D	30

Relay # 1 - Answer Sheet

TEAM # _____ **School:** _____

A	
B	
C	
D	

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

Proctors Initials: _____

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Team # _____

Relay # 3 - Answers

A	15
B	7
C	25
D	13

Relay # 3 - Answer Sheet

TEAM # _____ **School:** _____

A	
B	
C	
D	

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

Proctors Initials: _____

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Answers

1. 3

2. 64

3. 492

4. 24

5. $7/80$

6. 14

7. $12/25 = 48\%$

8. $13/3$

9. 60

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