

BML Senior Math League Tournament - December 14, 2015

Team Round

Team # \_\_\_\_\_

**Question 1:**

An arithmetic sequence is formed so that the difference between consecutive terms is a constant. If the first four terms of this increasing arithmetic sequence are  $x$ ,  $y$ ,  $4x + y - 7$ ,  $2y + x - 1$ , find the value of  $x + y$ .

Une suite arithmétique est formée de sorte que la différence entre les termes consécutifs soit une constante. Si les quatre premiers termes de cette suite croissante sont  $x$ ,  $y$ ,  $4x + y - 7$ ,  $2y + x - 1$ , trouver la valeur de  $x + y$ .

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**Question 2:**

There is a box with lots of socks. There are 6 black socks, 4 white socks, 2 red socks and 1 brown sock. Two socks are randomly selected one at a time from the box, without replacement.

A is the probability of selecting two black socks.

B is the probability of selecting a red sock first and then a white sock second.

Find  $\frac{A}{B}$  as a simplified fraction.

Dans une boîte, il y a 6 chaussettes noires, 4 chaussettes blanches, 2 chaussettes rouges, et une chaussette brune. De la boîte, deux chaussettes sont choisies, une à la fois, sans remettre.

A est la probabilité de choisir deux bas noirs.

B est la probabilité de choisir un bas rouge en premier et un bas blanc en deuxième.

Trouver  $\frac{A}{B}$  comme une fraction simplifiée.

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**Question 3:**

3 gophers can eat 5 carrots in 2 hours. Assuming infinitely hungry gophers, same size carrots, constant eating rates and no predators, how many carrots can 4 gophers eat in 9 hours?

3 marmottes peuvent manger 5 carottes en 2 heures. En supposant que les marmottes auront toujours faim, que les carottes sont toutes de la même grosseur, que les marmottes continueront de manger à la même vitesse et qu'il n'y aura pas de prédateurs, combien de carottes est-ce que 4 marmottes pourront manger en 9 heures?

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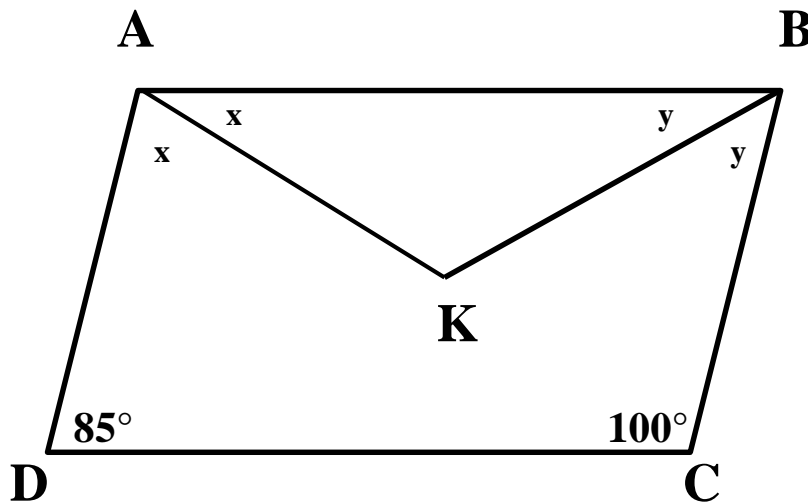
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**Question 4:**

Dans le diagramme, deux angles consécutifs d'un quadrilatère ont des mesures de  $85^\circ$  et  $100^\circ$ . Détermine la mesure de  $\angle AKB$  en degrés.

Using the diagram, two consecutive angles of a quadrilateral are  $85^\circ$  and  $100^\circ$ . Find the degree measure of  $\angle AKB$ .



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**Question 5:**

Given that  $xy = 1$  and that  $x + y = 1$ , find the value of  $x^3 + y^3$ .

Sachant que  $xy = 1$  et que  $x + y = 1$ , détermine la valeur de:  
 $x^3 + y^3$

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**Question 6:**

What is the sum of the x-intercepts and y-intercept of

$$f(x) = (x - 3)(x - 4)(x - 5) - (x - 4)(x - 5)(x - 6) ?$$

Quelle est la somme des abscisses à l'origine et de l'ordonnée à l'origine de

$$f(x) = (x - 3)(x - 4)(x - 5) - (x - 4)(x - 5)(x - 6) ?$$

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### Relay 1:

1. The graphs of  $f(x) = x^2 + 2$  and  $g(x) = 10x - 23$  meet exactly once at point P. A is the sum of the coordinates of P.

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

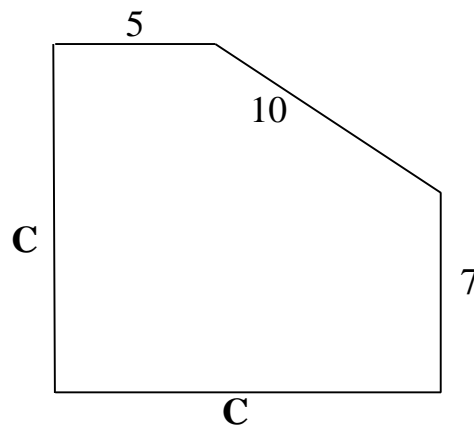
2. B is the sum of the next two terms in the sequence: 50, 40, **A**, 26, . . .

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

3. **C** is the number of prime numbers less than **B**.

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

4. **D** is the area of the figure.



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

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### Relay 2:

1. Solve for  $x$  over real numbers:  $\sqrt{x + 13} = x - 7$ . **A** is the sum of the roots.

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

2. **B** is the least positive number that must be added to 1056, so that the sum is completely divisible by  $(\mathbf{A}+8)$ .

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

3. **C** is a **B** digit number that is a perfect square and has exactly nine positive integral factors.

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

4. The point  $(15, \mathbf{D})$  is on the line  $3x - y = \mathbf{C}$ .

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



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**Relay 3:**

1. If  $f(x) = x^3 - 4x - 5$  and  $g(x) = 5x^4 - 3x^2 + 2$  then **A** is  $f(g(-1))$ .

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

2. For the series  $1 + 2 + 3 + 4 + \dots$  **B** is the number of terms needed for the sum to exceed **A**.

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

3. Using all the integers -1, 1, 2, and **B** for  $a$ ,  $b$ ,  $c$ , and  $d$ . **C** is the numerator of the fraction/integer of the lowest value of  $a^b + c^d$ .

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

4.  $9^{3-D} = 81^C$

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

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### Relay # 1 - Answers

<b>A</b>	<b>32</b>
<b>B</b>	<b>42</b>
<b>C</b>	<b>13</b>
<b>D</b>	<b>145</b>

### Relay # 1 - Answer Sheet

**TEAM #** \_\_\_\_\_ **School:** \_\_\_\_\_

<b>A</b>	
<b>B</b>	
<b>C</b>	
<b>D</b>	

<b>Regular points (max. 5)</b>	<b>+</b>	<b>Bonus Points (max. 6)</b>	<b>=</b>	<b>Total Points</b>

**Proctors Initials:** \_\_\_\_\_

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### Relay # 2 - Answers

<b>A</b>	<b>15</b>
<b>B</b>	<b>2</b>
<b>C</b>	<b>36</b>
<b>D</b>	<b>9</b>

### Relay # 2 - Answer Sheet

TEAM # \_\_\_\_\_ School: \_\_\_\_\_

<b>A</b>	
<b>B</b>	
<b>C</b>	
<b>D</b>	

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

Proctors Initials: \_\_\_\_\_

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### Relay # 3 - Answers

<b>A</b>	<b>43</b>
<b>B</b>	<b>9</b>
<b>C</b>	<b>0</b>
<b>D</b>	<b>3</b>

### Relay # 3 - Answer Sheet

TEAM # \_\_\_\_\_ School: \_\_\_\_\_

<b>A</b>	
<b>B</b>	
<b>C</b>	
<b>D</b>	

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

Proctors Initials: \_\_\_\_\_

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**Answers**

**1. 11**

**2. 15/4**

**3. 30**

**4. 92.5**

**5. - 2**

**6. 69**