

## Rules and Regulations

### 2018 L1 Competition #1

(Please read these rules and regulations carefully)

1. Please fill in your FULL name, grade, campus and student ID clearly on the answer sheet, and on the top of this page.
2. Do not open the question booklet until you are told to do so. You may only use a pencil when answering the questions.
3. No calculators or unauthorised electronic devices (including mobile phones) are allowed during the contest.
4. Strict silence must be observed at all times in the examination hall and please be reminded that you MAY NOT leave your seat without permission.
5. If you have any request or enquiry, please raise your hand and wait for an invigilator.
6. Only one candidate is allowed to leave the hall at a time. You are required to return to the hall within 10 minutes or else you will automatically be disqualified from the contest.
7. Each question in the contest has been verified by experienced trainers, thus no further explanation will be given.
8. The time allowed for the paper is 45 minutes. You must stop writing when you are told to do so.
9. You MUST fill in your answer in the answer sheet provided as you walked into the contest room. You will not be awarded marks for any answer written in the question booklet.

### Scoring System

1. The correct answers to problems 1 to 10 will be awarded 1 point each. The correct answers to problems 11 to 15 will be awarded 2 points each. The total number of marks is 20 points. You will not be penalized for each incorrect answer.
2. The organizer reserves the right to call for a re-sit in the event of malpractice and to differentiate between those outstanding students.
3. Contestants who are disqualified from the contest will not be awarded any certificates and will be forfeited any right to re-sit this year.

## **Part I Questions 1-10, 1 point each**

1. The Olympic flags of the top 7 countries with the highest medal count are to be placed along the ice rink at the Olympic Plaza. If the Canadian flag must be in the middle, how many different ways can the flags be ordered? (1 mark)
- A) 49      B) 120      C) 5040      D) 720

**Answer:** D

**Solution:** Since the Canadian flag has to be in the middle, there are 6 other flags that need to be arranged. There are 6 choices for the first position, 5 choices for the second position, 4 choices for the third position, 3 choices for the fifth position, 2 choices for the sixth position and 1 choice for the seventh position. This is expressed as a factorial:  $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

**Type:** Arrangement **Source:** WMO 7<sup>th</sup>, q. 6

2. Mr. Arbour planted Aspen trees every 1.5 metres along the sides and back of his yard for privacy. His yard measures 9 x 12 metres but his house is along one of the 12 metre side so he does not plant trees there. How many trees did Mr. Arbour plant?
- A) 21      B) 20      C) 19      D) 22

**Answer:** A

**Solution:** Find the length Mr. Arbour will need to plant the trees along, which is:  $9 + 12 + 9 = 30$ . To find the number of intervals calculate  $30 \div 1.5 = 20$ . 20 intervals will give 21 trees.

**Type:** Cuts and Pieces **Source:** WMO 7<sup>th</sup>, q. 10

3. Joy is 36 years old and she has 3 children. Jaxon is 9, Piper is 7, and Maddie is 4. In how many years will Joy's age equal the sum of her children's ages?
- A) 8      B) 6      C) 10      D) 4

**Answer:** A

**Solution:** Make a chart. In 8 years, Joy will be 44. Jaxon will be 17 + 15 (Piper) + 12 (Maddie) = 42

**Type:** Ages **Source:** WMO 8<sup>th</sup>, q. 4

4. Each letter in the word OLYMPIAD is assigned one of eight consecutive whole numbers. If the sum of the letters is 52, what is the consecutive number range assigned to the letters?
- A) 4 – 11      B) 2 – 9      C) 3 – 10      D) 5 - 12

**Answer:** C

**Solution:** There are 8 letters in the word Olympiad. Find the average of 52 to find the middle number:  $52 \div 8 = 6.5$ . Since it is a decimal number, there would be 6 and 7. Since you are finding consecutive numbers, find the three numbers above 7 and below 6.  $3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 4 \times 13 = 52$

**Type:** Handshakes and Hugs **Source:** WMO 8<sup>th</sup>, q. 3

5. The Roman Numeral system has 7 basic symbols.

<u>Symbol</u>	<u>Value</u>
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

Numbers are formed by the following rules:

- Repeated symbols show how many times that number is multiplied. The same symbol cannot be repeated more than 3 times.
- When a smaller value is placed to the right of a larger value, the smaller value is added to the larger value. you cannot use more than 3 of the same symbols to add.
- When a smaller value is placed to the left of a larger value, the smaller value is subtracted from the larger value. You cannot use more than 1 symbol to subtract from a larger value. As well, only 1 can be subtracted from V or X, only X can be subtracted from L and C and only C can be subtracted from D and M.

Examples:  $15 = 10 + 5 = X + V = XV$

$$51 = 50 + 1 = L + I = LI$$

$$151 = 100 + 50 + 1 = C + L + I = CLI$$

$$345 = 300 + 40 + 5 = \dots\dots$$

Calculate:  $XXXIX + LVI + XXIV =$

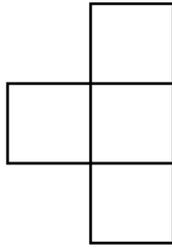
- A) CIXIII      B) DXIX      C) CXIV      D) CXIX

**Answer:** D

**Solution:**  $39 + 56 + 24 = 119$  (CXIX)

**Type:** Roman Numerals, **Source:** WMO 11<sup>th</sup>, q. 14

6. The figure shows 4 identical squares joined together. If the area is  $144 \text{ cm}^2$ , what is the perimeter?



- A) 60 cm      B) 48 cm      C) 144 cm      D) 96 cm

**Answer:** A

**Solution:** If the area is  $144 \text{ cm}^2$ , then each square has an area of  $144/4 = 36 \text{ cm}^2$ . This means that the side length of each square is 6 cm. There are 10 edges on the figure, thus the perimeter is  $6 \times 10 = 60 \text{ cm}$ .

**Type:** Geometry    **Source:** WMO 11<sup>th</sup>, q. 8

7. Mark is 44 years old. What is the sum of his kids' ages if the sum is 2 less, 12 less, 6 more, 5 less, 2 less, 11 more, 8 less, 24 more, 3 less, 11 less than Mark's age?

- A) 40      B) 42      C) 41      D) 45

**Answer:** B

**Solution:**  $44 - 2 - 12 + 6 - 5 - 2 + 11 - 8 + 24 - 3 - 11 = 42$

**Type:** Relocation    **Source:** SoM

8. How many more edges does a rectangular prism have than a triangular-based pyramid?

- A) 6      B) 2      C) 4      D) 3

**Answer:** A

**Solution:**  $12 - 6 = 6$

**Type:** Geometry    **Source:** SoM

9. Jodi and her Mom were both born in March. Jodi's birthday is three days before, two days after, one week prior, two days before that last day of March. If Jodi's Mom was born on March 21<sup>st</sup>, when is Jodi's birthday in relation to her Mom's?

- A) one day after      B) one day before      C) the same day      D) 2 days before

**Answer:** C

**Solution:**  $31 - 2 - 7 + 2 - 3 = 21$

**Type:** Date **Source:** SoM

10. In one roll of 2 fair dice, what is the probability that the outcome will be two 5's?

- A)  $1/18$       B)  $2/5$       C)  $1/36$       D)  $1/6$

**Answer:** C

**Solution:** numerator has only 1 way (roll a 5 and a 5), denominator is  $6^2 = 36$  so  $1/36$

**Type:** Probability **Source:** SoM

**Part II Questions 11 – 15, 2 points each**

11. You need 3000 mL of Coke for a party, but want to spend the least money possible. A refundable charge is added on to your purchase at the following rates: \$0.10 per bottle under 1 litre and \$0.25 per 2L bottle. The best value is:

- A) 6 x 710 mL at \$4.48 per case      B) 12 x 355 mL at \$3.79 per case  
C) 1 x 2 L at \$1.97 per bottle      D) 24 x 355 mL at \$10.48 per case

**Answer:** B

**Solution:** A) \$5.08 for 4260 mL ( $\$4.48 \div (6 \times 710) = 0.105/100\text{mL} + (6 \times \$0.10)$ )

B) \$4.99 for 4260 mL ( $\$3.79 \div (12 \times 355) = 0.089/100\text{mL} + (12 \times \$0.10)$ )

C) \$4.44 for 4000 mL ( $2 \times (\$1.97 \div 2000) = 0.099/100\text{mL} + (2 \times \$0.25)$ )

D) \$12.88 for 8520 mL ( $\$10.48 \div 8520 = 0.123/100\text{mL} + (24 \times \$0.10)$ )

**Type:** Ratio **Source:** WMO 8<sup>th</sup>, q. 1

12. Which sequence would complete the 7<sup>th</sup> row of this sequence?

1 row 1  
1 1  
1 2 1  
1 3 3 1

- A. 1, 6, 15, 20, 15, 6, 1  
B. 1, 6, 16, 20, 16, 6, 1  
C. 1, 6, 15, 20, 15, 6, 1  
D. 1, 6, 16, 20, 16, 6, 1

**Answer:** A

**Solution:** Continuing Pascal's triangle, in which each row starts and ends with 1 and all numbers are the sum of the 2 numbers above it.

**Type:** Pattern **Source:** WMO 11<sup>th</sup>, q. 2

13. Megan is taking driver's training. She drives 20 km/hour for the first 10 kilometers. Her instructor encourages her to increase her speed for the next 20 kilometers. After driving 30 km in total with an average speed of 40 km/hour, what was Megan's speed for the last 20 km of the trip?

A. 50 km/h

B. 55 km/h

C. 75 km/h

D. 80 km/h

**Answer:** D

**Solution:**  $20 \times 10 = 200$ ,  $30 \times 40 = 1200$

**Type:** Average speed, **Source:** WMO 11<sup>th</sup>

14. The 32 Assistant Teachers that work at Spirit of Math Schools love their apps! 11 have only Snapchat and 16 have both Facebook and Instagram. Altogether, 18 Assistant Teachers have Instagram. 10 Assistant Teachers have all three apps. No one else has Facebook. How many Assistant Teachers do not have any of these apps?

A. 3

B. 0

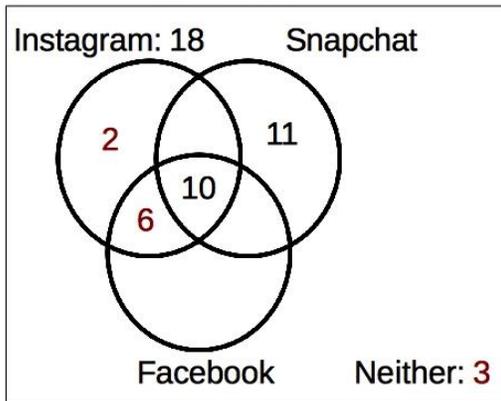
C. 4

D. 2

**Answer:** A

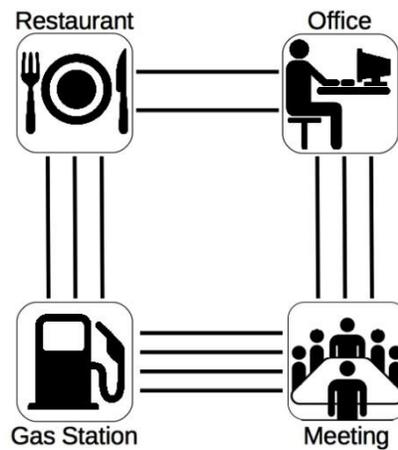
**Solution:**

32 Assistant Teachers



**Type:** Venn Diagram, **Source:** SoM

15. How many different routes can Mr. Langen take, leaving from the Spirit of Math office to get to the WMO meeting? Each line represents a different road he can travel on and once he has travelled between a location, he can no longer travel back.



- A. 12
- B. 27
- C. 3
- D. 72

**Answer:** B

**Solution:** From the office, going to the restaurant and then the gas station will be  $2 \times 3 \times 4 = 24$  different routes. Add 3 ways from the office to the meeting  $24 + 3 = 27$

**Type:** Pathways, **Source:** WMO 8<sup>th</sup>, q. 5