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E Mathematics Olympiad System

Malaysia International Mathematics Olympiad Competition 2016



Saturday 26th of November, 2016

9.30 am – 11.00 am

- Upper Primary Paper -

Jointly Organised by :

Persatuan Matematik Olimpiad Malaysia (PERMATO)
Sekolah Jenis Kebangsaan (Cina) Lai Meng Bukit Jalil, Kuala Lumpur
Sekolah Jenis Kebangsaan (Cina) Lick Hung Subang Jaya
E Mathematics Olympiad System

马来西亚数学奥林匹克学会
黎明华文小学
力行国民型华文学校
数学奥林匹克学研中心
联合主办

Instructions:

- Do not turn to the first page until you are told to do so.
- Write down your name, your contestant number and your school's name on the answer sheet.
- Write down all answers on the answer sheet. Only Arabic NUMERICAL answers are needed.
- Answer all 25 problems. The total is 120 points. For problems involving more than one answer, full credit will be given only if ALL answers are correct, no partial credit will be given. There is no penalty for a wrong answer.
- Diagrams shown may not be drawn to scale.
- No calculator or calculating device is allowed.
- Answer the problems with pencil, blue or black ball pen.
- All papers shall be collected at the end of this test.

Section A (4 marks each)

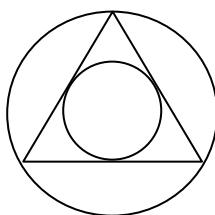
A 组 (每题 4 分)

1. Compute : $2017 \times 0.25 - 217 \div 4 = ?$

计算: $2017 \times 0.25 - 217 \div 4 = ?$

2. In the figure below, an equilateral triangle has been wedged in between two circles. What is the ratio of the diameter of the small circle to the diameter of the large circle?

如图所示, 一正三角形在两圆之间。小圆的直径与大圆的直径的比是多少?



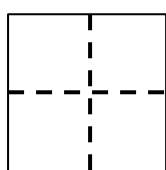
3. Find the next term in the following numbers pattern:

下一个数应该是多少?

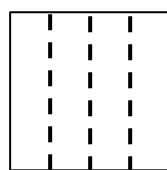


4. As shown below, the squares are cut along dashed line into four. Which of the squares can be re-arranged into two smaller squares?

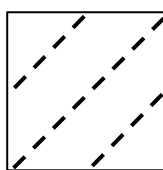
下列哪一个正方形依虚线剪为四份后, 可拼成两个较小的正方形?



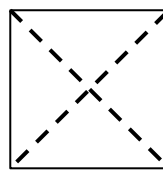
(A)



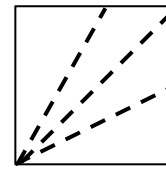
(B)



(C)



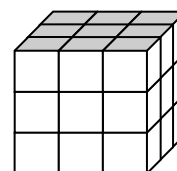
(D)



(E)

5. Each side of a cube is divided into 3×3 small squares. Paint these squares with either black, red or blue color; squares of shared side must be painted different color. There will be at most how many squares with blue color?

一个白色的正立方体, 每面都画成九宫格, 现在有黑、红、蓝三种颜色, 每个小正方形选一种颜色涂上去, 但共用边长的正方形要涂不同的颜色, 请问蓝色最多可以涂几个小正方形?

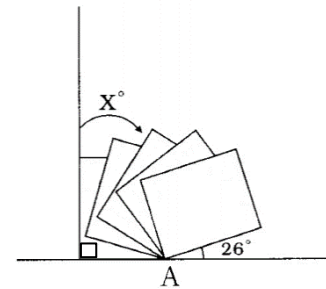


6. Moody has 150 equal size of ball packed in a number of small boxes, Sammy found that if the balls required is 150 or less, they can be made up by few of these boxes, without having to open and break up the balls in these boxes. How many number of boxes will Moody use at least?

穆迪将 150 个相同的小球分装在若干个盒子里。三美发现，如果穆迪指定的小球的数量是 150 个或以下，可以直接拿一些盒子来凑齐，而不必打开盒子拆散盒子中的小球。请问穆迪最少使用了多少个盒子？

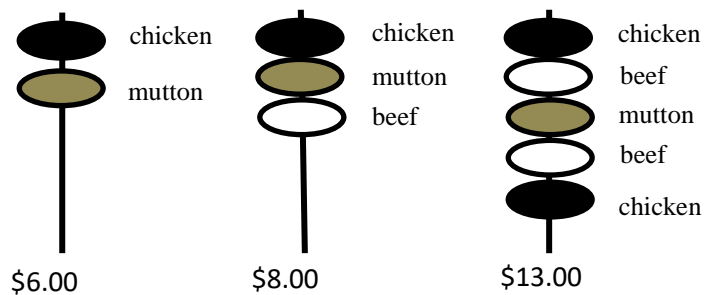
7. As shown in the figure, stacked 5 pieces of paper along the edge of a table, then pinned the papers at point A. All the paper were opened with the same size of angle. What will be the value of angle for 'X', which is the angle between the first paper and 3rd paper ?

如图，沿着桌边把 5 张相同大小的长方形纸片重叠排列后，固定纸片的右下方顶点（如图中的 A 点）并张开相同大小的角度时，试求第一张纸片到第三张纸片的角度（如图中的“X”）



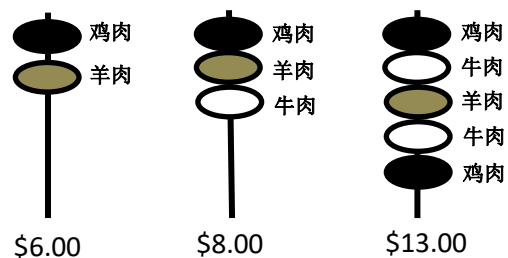
8. Malaysian satay (meat) is favourable for all. Abdullah decided to use 3 kinds of meat from chicken, beef and mutton skewered together in a stick to form three new types of satay. The selling price are \$6.00, \$8.00, \$13.00 as shown below. A purchase was made consisted different numbers of the three satay sticks combination as mentioned. After counting, it was concluded that there were 58 pcs of chicken, 51 pieces of beef and 40 pcs of mutton.

How many sticks of satay with the stick combination of price \$13.00?



马来西亚的烧肉串 (Satay) 很有名，很多人喜欢吃，阿都拉老板用鸡肉、牛肉、羊肉三种肉类串成如图的三种新式烧肉串，售价分别为每串\$6.00, \$8.00, \$13.00。三种烧肉串各买了一些后（串数不相同），算一算共有 58 块鸡肉、51 块牛肉、40 块羊肉。

请问这三种烧肉串中买了多少串\$13.00 的烧肉串？



9. A mystic has been summoned to a haunted house to discover a spirit dwelling there. She can sense that it must be present behind one of four doors, but each door is inscribed with a riddle written by the spirit :

Door A : I'm behind B or C.

Door B : I'm behind A or D.

Door C : I'm in here.

Door D : I'm not in here.

The mystic knows that just one of these inscriptions tells the truth. Where is the spirit ?

一个通灵者被传唤到鬼屋去找一个精灵。她能感觉到它躲在四扇门其中的一个门后面，但是每个门上面刻有这个精灵的标语：

门 A：我在门 B 或门 C 的后面

门 B：我在门 A 或门 D 的后面。

门 C：我在这里。

门 D：我不在这里。

通灵者知道，这些标语中只有一道是说出了实情。那么，精灵躲在哪一个门的后面？

10. John and Anne participated in the same tour to visit Malaysia. The number of the tour group members is between 20 to 30 persons, and each person's date of birth are not the same. John said: "In the tour group, people elder than me is 2 times the people younger than me". Anne said: " In this tour, people elder than me is 3 times people younger than me." How many people joined this tour?

约翰和安妮参加同一个旅游团到马来西亚观光。该团人数介于 20 到 30 人之间，且每个人的出生日期均不相同。约翰说：“旅游团中，比我大的人数是比我小的人数的 2 倍”，安妮说：“旅游团中，比我大的人数是比我小的人数的 3 倍”。问，这个旅游团有多少人？

Section B (5 marks each)

B 组 (每题 5 分)

11. In the occurrences of 2018 number 4, fill in with the general order of "+, -, ×, ÷" as below, what will be the calculation results?

$$4 + 4 - 4 \times 4 \div 4 + 4 - 4 \times 4 \div 4 + \dots$$

在 2018 个数字 4 之间，如下面一般依序填入 “+、-、×、÷” 时，计算结果会等于多少？

$$4 + 4 - 4 \times 4 \div 4 + 4 - 4 \times 4 \div 4 + \dots$$

12. During a math training camp, Anwar washed five pairs of different colored socks, and he found two socks missing. The missing socks might or might not from the same pair. What is the ratio of the best situation (just a pair) and the worst case scenario (not a pair)?

参加数学培训营时，安华洗了五双不同颜色的袜子，发现不见了两只，可能不见了的袜子正好是一双，也可能不是一双，最好的情况（正好是一双）与最坏的情况（不是一双）的比例为何？

13. In a party, the students shared equally a bottle of apple juice. Some students disliked the taste and did not drink the apple juice then left the party. The remaining students opened another bottle of apple juice and shared equally, meanwhile some student left the party after they had their juice. The remaining students opened another bottle to share. After finishing this last round of apple juice, someone said: "I have drunk exactly a bottle of apple juice. If this statement is in line with the actual situation, then, how many students were in the party at the beginning?"

宴会中的一群学生，将一瓶苹果汁平均分给每个人，有一些人认为不好喝，就不喝离开了；于是剩下的人再来一瓶，又平均分给余下的每个人，结果又有一些人喝完了自己分到的果汁后，不再喝离开了；余下的人再来一瓶，平均分给余下的人，结果喝完了这最后一瓶果汁。只听见有人说：“我正好喝了一瓶苹果汁。”如果这句话符合实际情形，那么，一开始这群学生共有多少人？

14. Shan Shan has 180 chocolate candies, Henry has 120 milk candies. After Henry uses more than 10 milk candies to exchange some chocolate candies with Shan Shan, both of them have equal number of candies. How many chocolate candies are equivalent to a milk candy?

珊珊有 180 粒巧克力糖，亨利只有 120 粒牛奶糖。亨利就用十几个牛奶糖与珊珊换了一些巧克力糖，这时，他们的糖果数量就相等了。问，一粒牛奶糖等于多少粒巧克力糖？

15. The sum of 5 different prime numbers is 200. Each of the 5 prime numbers is less than 100. Four of the 5 prime numbers have the same units digit. What is the median of the 5 prime numbers?

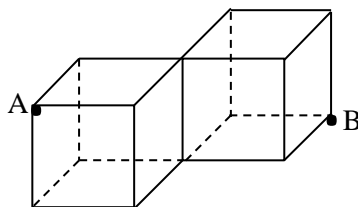
5 个不同的质数之和为 200，而每个质数都小于 100，其中四个质数的个位数都相同，求这五个数的中位数（中间数）。

16. Three persons A, B and C work on a project. The original plan is like this: Person A works alone on the 1st day, Person B on the 2nd day and Person C on the 3rd day and Person A works alone on the 4th day in turns, and so on. They finish the task exactly at the end of Person B's day. If Person B works alone on the 1st day, Person C on the 2nd day, Person A on the 3rd day and Person B on the 4th day..., they spend $\frac{1}{2}$ days more than the original plan in finishing the task. If Person C works alone on the 1st day, Person A on the 2nd day, Person B on the 3rd day and Person C on the 4th day in turns..., they spend $\frac{1}{6}$ days more than the original plan. It is known that Person A spends 2016 days finishing the task alone. How many days will it take the 3 persons to finish the task if they work together?

A、B、C 三人完成一项工程，原计划按第一天 A 单独做，第二天 B 单独做，第三天 C 单独做，第四天 A 单独做，.....的顺序轮流做一天，恰好整数天做完工程，并且结束工作是 B；若按第一天 B 单独做，第二天 C 单独做，第三天 A 单独做，第四天 B 单独做，.....的顺序轮流做，比原计划多用 $\frac{1}{2}$ 天做完工程；若按第一天 C 单独做，第二天 A 单独做，第三天 B 单独做，第四天 C 单独做，.....的顺序轮流做，比原计划多 $\frac{1}{6}$ 天做完工程。已知 A 单独完成这项工程需 2016 天，那么 A、B、C 三人合做这项工程需要多少天？

17. An ant would like to climb from point A to point B. Two cartons of the cube are joined together as shown below. Find the number of shortest paths from point A to point B. It can go only along the edges.

两个正方体的纸盒的一边如图相连在一起，一只蚂蚁想从 A 点爬到 B 点处。沿着纸盒边长，自 A 点到 B 点，有多少条不同的最短途径？



18. When 113744 and 109417 are divided by the 3-digit positive whole number N , the remainders are 119 and 292 respectively. Find N .

将 113744 与 109417 分别除以同一个三位自然数 N ，所得的余数为 119 和 292，求 N 为多少？

19. Tommy always walks down the moving escalator in the railway station. The escalator moves at a constant slow speed. Once he got from top to bottom in 16 seconds taking 28 steps. Another time he got from top to bottom in 24 seconds with 21 steps. How many steps high is the escalator?

汤米在地铁站的电动扶梯由上往下行走，扶梯以均匀的速度缓慢地由上往下进行。有一次他从上到下共走了 28 个阶梯，用了 16 秒。另外一次，他从上到下走了 21 个阶梯，用了 24 秒，试求电动扶梯可见的阶梯有多少个？

20. On 15 December 2005, American mathematicians Professor Curtis Cooper and Professor Steven Boone discovered the 43rd Mersenne Prime Number, which is $2^{30\,402\,457} - 1$.
What are the last two digits of this prime number?

2005 年 12 月 15 日，美国数学家 Curtis Cooper 教授和 Steven Boone 教授，发现了第 43 个梅森素数 $2^{30\,402\,457} - 1$ 。那么，这个数的最后两个数码是多少？

Section C (6 marks each)

C 组 (每题 6 分)

21. There are four 4-digit cards, some numbers on the four cards are not able to be identified, these cards are $4\square\square 8$ 、 $23\square 4$ 、 $\square\square 45$ 、 $\square\square 20$. There is only a card with a perfect square number (perfect square number: 25, 49, 81). What is this number?

有四张 4 位数的卡片，每张卡片都有数字被弄脏看不见了，它们分别是 $4\square\square 8$ 、 $23\square 4$ 、 $\square\square 45$ 、 $\square\square 20$ ，其中只有一个是完全平方数(正方形数，例如：25，49，81)，请问：这个数是多少？

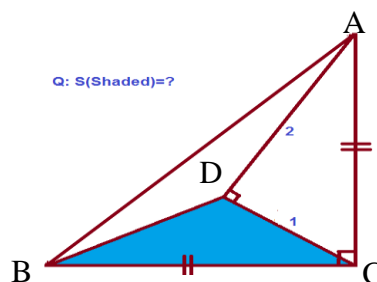
22. Disneyland ticket is \$200 for adults and \$100 for children. On Children's Day, children enjoy free admission. The number of adults increased by 60%, the number of children increased by 90%, and the total number of visitors increased by 2016 pax compared with the previous day. Nonetheless the income remained the same. How many people had visited the Disneyland on Children's Day?

迪士尼乐园的门票是大人\$200，儿童\$100，儿童节那天，儿童入园免费，结果与前一天相比，大人增加了 60%，儿童增加了 90%，共增加了 2016 人，但门票收入与前一天相同，那么儿童节这天共有多少人入园？

23. A 5-digit number minus the sum of its 5 digits is still a 5-digit number, $\overline{2016x}$. What's the possible values of the digit x ?

一个五位数 $\overline{2016x}$ ，减去它各位上数字之和，其差还是一个五位数，那么 x 的取值是多少？

24. ABC is an isosceles right triangle, $\angle ADC = 90^\circ$, $AD = 2$, $CD = 1$. Find the area of shaded part .
ABC 为等腰直角三角形， $\angle ADC = 90^\circ$ ， $AD = 2$ ， $CD = 1$ 求阴影部分的面积。



25. Compute (计算) : $\frac{\frac{1}{2}}{1+\frac{1}{2}} + \frac{\frac{1}{3}}{(1+\frac{1}{2}) \times (1+\frac{1}{3})} + \frac{\frac{1}{4}}{(1+\frac{1}{2}) \times (1+\frac{1}{3}) \times (1+\frac{1}{4})} + \dots$
 $+ \frac{\frac{1}{2016}}{(1+\frac{1}{2}) \times (1+\frac{1}{3}) \times \dots \times (1+\frac{1}{2016})} = ?$