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E Mathematics Olympiad System

Malaysia International Mathematics Olympiad Competition 2015



Saturday 21st of November, 2015

9.30 am – 11.00 am

- Upper Primary Paper -

Jointly Organised by :

Persatuan Matematik Olympiad Malaysia (PERMATO)
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E Mathematics Olympiad System

马来西亚数学奥林匹克学会
力行国民型华文学校
黎明华文小学
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, partial credit will be given for any correct answer. 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. Which of the following is the sum of two prime numbers ?

下面哪一个数是两个质数之和?

- (A) 11 (B) 17 (C) 23 (D) 31

2. Count : $97 \times 96 - 95 \times 98 = ?$

计算: $97 \times 96 - 95 \times 98 = ?$

3. Find the missing number which replaces the (?) in the following.

问号处应该填什么数?



4. As known $\frac{1}{6} \blacktriangle 2 = \frac{1}{6} \times \frac{1}{7}$; $\frac{1}{4} \blacktriangle 3 = \frac{1}{4} \times \frac{1}{5} \times \frac{1}{6}$; $\frac{1}{5} \blacktriangle 4 = \frac{1}{5} \times \frac{1}{6} \times \frac{1}{7} \times \frac{1}{8}$.

If $\frac{1}{n} \blacktriangle 4 = \frac{1}{1680}$, find n

已知 $\frac{1}{6} \blacktriangle 2 = \frac{1}{6} \times \frac{1}{7}$; $\frac{1}{4} \blacktriangle 3 = \frac{1}{4} \times \frac{1}{5} \times \frac{1}{6}$; $\frac{1}{5} \blacktriangle 4 = \frac{1}{5} \times \frac{1}{6} \times \frac{1}{7} \times \frac{1}{8}$.

若 $\frac{1}{n} \blacktriangle 4 = \frac{1}{1680}$, 求 n

5. As known $\frac{1}{1 + \frac{1}{2 + \frac{1}{A + \frac{1}{2}}}} = \frac{8}{11}$, then : $A =$ _____ .

已知 $\frac{1}{1 + \frac{1}{2 + \frac{1}{A + \frac{1}{2}}}} = \frac{8}{11}$, 则: $A =$ _____ .

6. For a train to pass by a 1260 m long iron bridge, it takes 60 seconds (the time is judged by the front of the train reaches the bridge and till the rear left the axle). The same train to cross a 2010 m long tunnel, needs 90 seconds. What is the speed and the length of the train?

一列火车通过一条长 1260 公尺的铁桥(车头碰上桥直至车尾离开桥)用了 60 秒, 火车穿越长 2010 公尺的隧道用了 90 秒。问: 这列火车的车速和车身长各是多少?

7. A factory had ordered the materials to produce 30 t-shirts and 48 skirts. However, the customer changed the order to produce only 20 t-shirts. How many skirts can be sewed with the remaining materials?

有一工厂原本订了可以生产 30 件上衣和 48 件裙子的原料, 现客户临时改先缝制 20 件上衣。请问剩下的原料还可以做多少件裙子?

8. Team A can complete a project in 10 days, while the same project, team B needs 30 days. In order to complete this project before the opening ceremony, both team A and team B are working together. During the tasks completion, team A rests for 2 days while team B rests for 8 days. In the period of project execution, both teams do not rest at the same time. What is the total number of days using to complete this project?

有一工程, A 队单独做 10 天完成, B 队单独做 30 天完成。现在要赶在开幕前完工, 两队合作, 期间 A 队休息了 2 天, B 队休息了 8 天, 这期间两队不能同时休息。问: 开始到完工共用了多少天?

9. The teacher wishes to select a class leader from a class of 49 students. Dawn, Lee and Hua are the candidates. At vote's calculation of 37 votes, it is found that Dawn has 15 votes, Lee has 10 votes while Hua has 12 votes. At least how many votes count more is needed from the remaining votes for Dawn to win in the class leader selection as majority?

老师从 49 名学生中选一名班长, 每人投一票。天明、小李和大华为候选人。初期统计 37 张票后发现: 天明 15 票, 小李 10 票, 大华 12 票。在余下的票中, 天明至少再得几票才能保证以最多票数当选班长?

10. At a dancing performance in sport carnival, the students need to form 16 circles, encircling from inner ring to outer ring. In every circle, moving from the outer ring, towards the inner ring, successively 6 students are removed from each circle. If there are 912 students in the performance, what is the total number of students for the outmost ring? And, what is the total number of students for the innermost ring?

运动会上舞蹈表演要若干位学生围成 16 圈，一圈套一圈，从外向内圈人数依次少 6 人，如果共有学生 912 人，问最外圈有多少人？最内圈有多少人？

11. In 2015 Olympiad Math World Championship, students were allowed to enroll in the competition either as an individual, team competition or both. It was known that, class 4R has 22 students registered as individual contestant, 13 students registered for team competition and 5 students were not participating. What is the minimum number of students in class 4R?

2015 年世界奥数竞赛公开报名，可报个人赛，团体赛，或两项都报。已知四红班共有 22 位学生报个人赛，13 位学生报团体赛，5 位学生完全不参与。请问 4R 班至少有多少位学生？

12. How many two-digit natural numbers that can divide 490 and have 30 as remainder ?
将两位数的自然数拿来除 492 余 30 。这样两位数共有多少个？

13. Both brothers have some candies. If the elder brother gives away 32 candies to the younger brother, both of them will have the same amount of candies. If the younger brother gives 13 of his candies to his elder brother, it will results in the elder brother is having 3 times more than his younger brother. What is the total number of candies does the elder brother has?

哥哥和弟弟有一些糖果。如果哥哥给弟弟 32 颗，那么两人的糖果一样多。如果弟弟给哥哥 13 颗，那么哥哥的糖果比弟弟多 3 倍。请问哥哥有几颗糖果？

14. There are 3 customer services counters in a bank.
 Counter A requires 3 seconds to serve a customer.
 Counter B requires 5 seconds to serve a customer.
 Counter C requires 7 seconds to serve a customer.
 However, every added transaction from the same customer required additional 2 seconds. Based on the below queuing condition, which counter should Stacy queues in order to be served fast.

(Number in the brackets represents the no. of transactions that are requested by the customer)

一家银行有三个柜台。服务一个顾客，柜台 A 需要 3 秒钟，柜台 B 需要 5 秒钟，柜台 C 需要 7 秒钟。如果同一个顾客有超过一个交易需要，每一个交易附加 2 秒钟。根据以下的图表，柜台排队情况，哪一个柜台队伍可以让小丝尽快办理交易？(括号内的数字代表客户交易数量要求)

COUNTER A. 柜台 A	COUNTER B 柜台 B	COUNTER C 柜台 C
 (2)	 (3)	 (1)
 (1)	 (1)	 (1)
 (2)		

15. Watermelons are sold individually in a certain shop and each customer can only buy 3 watermelons at most. Customers can buy one at the original price, two at a 10% discount and three at a 20% discount. In a day 76 watermelons are sold for 33 customers. The average price for each watermelon is 85% of the original price. How many customers buy only one watermelon that day?

某水果店的西瓜按个卖，规定每位顾客最多只能买 3 个。如果顾客只买一个，按原定价出售；如果买两个那么降价 10%；如果买三个那么降价 20%。结果当天水果店共卖出 76 个西瓜，卖给了 33 位顾客，平均每个西瓜的售价是原定价的 85%，那么这天买一个西瓜的顾客有多少人？

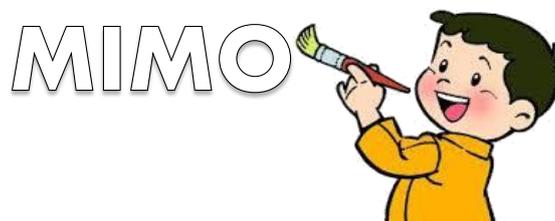


16. There are 3 consecutive even numbers, where the difference between the product of last 2 numbers and the product of biggest and smallest numbers is 104. What is the smallest number in this set of even numbers?

三个连续的偶数，后面两个数的积与最小和最大两个数的积之差是 104，那么这三个数中最小的数是多少？

17. "MIMO" is an abbreviation for Malaysia International Mathematical Olympiad. If 5 different colours are provided to paint the characters below, how many combination of paintings you can have? The colour must not be the same for the character that is next to it.

“MIMO”是马来西亚国际数学奥林匹克竞赛的缩写，如果用 5 种不同颜色的颜色笔来上色，相邻的字母不可以用相同的颜色，问：共有多少种不同的涂法？



18. Xiaoyu has an elder sister and 2 younger brothers. These siblings' ages are only one year apart. This year, their sum of ages are the same as their mother, which in total is 68. What is Xiaoyu's age this year?

小宇有位姐姐和两位弟弟，他们兄弟姐妹的年龄各相差一岁。今年，他们的年龄和与妈妈的年龄相同，而五个人一共是 68 岁，问小宇今年的岁数。

19. Ling Ling was helping the teacher to calculate the average number of pencils brought by 48 students in her class daily. Ling Ling got an average number of 3.273. However, the teacher pointed out that Ling Ling got the wrong answer on the 3rd decimal digit. What is the correct answer?

老师请凌凌计算班上 48 位同学每天平均带多少枝铅笔到校，凌凌计算后得 3.273 枝；老师说凌凌计算的答案的小数点后第三位数错了，问答案应该是多少？

3.27~~3~~



20. Fill in either "+" or "-" in front of 2, 3, ..., 2012, 2013, 2014, till 2015, the final answer for the equation would be:

$$1 \square 2 \square 3 \square 4 \square \dots \square 2013 \square 2014 \square 2015 = ?$$

- A. may be an odd number or even number
 B. must be an odd number.
 C. must be an even number.
 D. answer would be 1 or 2015.

在 1, 2, 3, ..., 2012, 2013, 2014, 2015 之间的 里, 任意添加 "+" 或 "-", 所得的最后答案会是:

$$1 \square 2 \square 3 \square 4 \square \dots \square 2013 \square 2014 \square 2015 = ?$$

- A. 可以是奇数也可以是偶数
 B. 一定是奇数。
 C. 一定是偶数。
 D. 等于 1 或 2015。

21. Heptagon PERMATO with 7 sides, $\angle P = \angle E = \angle R = \angle M = \angle A = \angle T = 149$ degrees.
 How many degree is $\angle O$?

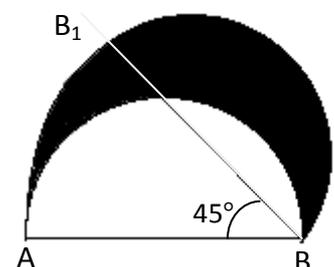
有一个七边形 PERMATO, 已知 $\angle P = \angle E = \angle R = \angle M = \angle A = \angle T = 149^\circ$, 求 $\angle O$ 。

22. There are three different natural numbers. Their sum is 1267. When the greatest common divisor of the three numbers is the largest of all, please list out these three natural numbers.

有 3 个不同的自然数, 它们的和为 1267, 当这三个数的最大公因数是最大时, 求: 这三个数各是多少?

23. As shown in the figure beside, there is a semicircle with diameter of 10cm. The semicircle does a 45 degree clockwise rotation at point A. What is the area of the shaded region?

如右图, 一个直径 10 公分的半圆, 以 A 点为旋转轴顺时针转 45 度, 请问: 阴影部分的面积是多少?



24. Every books in popular bookshop has a barcode printed. Every barcode has 13 digits from 0~9. First 3 digits represent the manufactured country, meanwhile the following 5 digits represent the production company. Then is followed by the 4 digits that represent the product code. The last digit is checksum number.

Example:



Odd bits : 6, 8, 8, 1,

Even bits : 9, 5, 9, 0,

Samy found that, the book that she bought has a special barcode. Reading the barcode from the left, the grand total for the sum of the even bits multiply by 3 and the sum of the odd bits , is a multiple of 10. For example, if the barcode is 690909500151A. A is the checksum number. What is the value of A?

大众书局每一本书的后面，都印有条形码。每个条形码是由一个 13 位数组成。每位数都是从 0~9 的数字。前三位代表生产国家，接下来的五个号码代表生产企业（公司），再接着的四位代表商品名称，最后一位是校验码。

例如：



三美发现所购买的新书的条形码符合这样的规则：将左起偶数位上数的和，乘以 3 后，与奇数位上数的和相加，总和为 10 的倍数。比如一个商品条形码为：

690909500151A。其中 A 表示校验码。则 A = ?

25. Ming was out for dinner and came home in less than 1 hour. He found that the needle position of hour hand and minute hand of the clock is exactly in opposite position, compare to the time when he left the house. How long he had been out for dinner?

小明外出吃饭，离开家時看了墙上的钟确定时间，经过不到 1 小時，回家之后，又看了墙上的钟，发现时针与分针的位置刚好交换，请问：外出多久的时间？