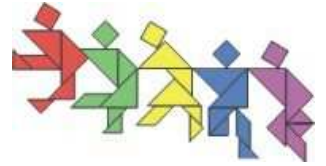




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World Conference on the Mathematically Gifted Students
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Invitational World Youth Mathematics Intercity Competition

队际赛试题

25th July 2012 Taipei, Taiwan

队名: _____ 得分: _____

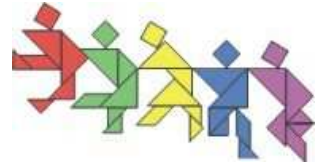
1. 我们对给定的一个正数进行操作，每一步骤可做以下的其中一个运算：加上 3，减去 3，乘以 3，除以 3。如果一个正数恰好经过三步骤操作后得到的数与原来的数相同，我们称这个正数为“好数”。请求出所有的“好数”。

Answer: _____



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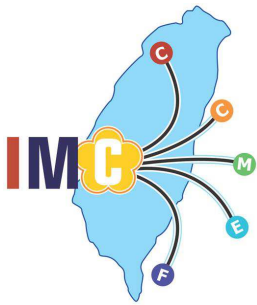
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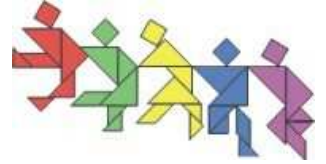
2. 已知八个人的平均年龄是 15 岁，且每个人的年龄都是质数。其中，年龄为 19 岁的人数比任何其他岁数的人数多。如果他们按年龄的大小顺序排成一排，那么排在中间的两个人的平均年龄为 11 岁。请问年龄最大的那个人最多为多少岁？

Answer: _____



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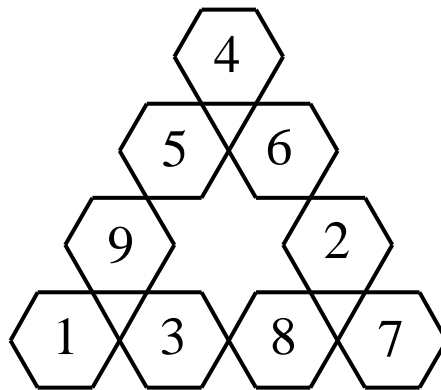
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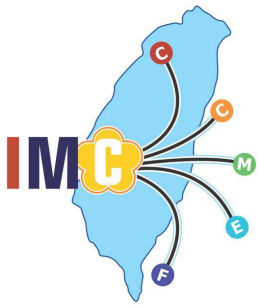
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3. 在下图中，将数 1、2、3、4、5、6、7、8 和 9 分别不重复地填入一个六边形内，使得三角形每条边上的四个六边形内的数之和都为 19。现重新填入这些数，依然要求每条边上的数之和相等，请问这个和数可以取到的最大值和最小值分别是多少？

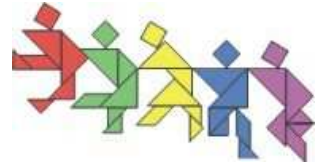


Answer: 最小值為 _____
最大值為 _____



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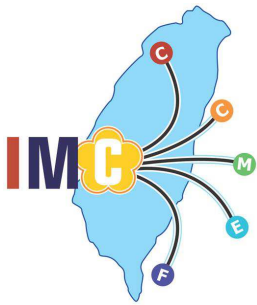
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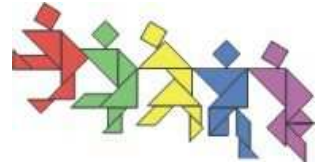
4. 给定 2012 个点在一条直线上，任何两个相邻点的距离都相等。现在把这些点染成黄色或绿色。如果相异三个点 A 、 B 和 C 满足 $AB = BC$ 且 A 和 C 的颜色相同，那么 B 也染成同一种颜色。请问共有多少种染色方式？

Answer: _____



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5. 我们对 2012 做以下操作：首先用三种方式把它分成两个数，即 $2|012$ ， $20|12$ 和 $201|2$ ；其次把每对数相乘并求出这三个乘积之和，得到 $2 \times 012 + 20 \times 12 + 201 \times 2 = 666$ 。请求出所有其它的四位数使得对它做同样的操作后也得到 666。

Answer: _____



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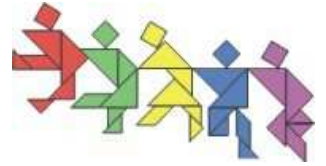
6. 设 n 是正整数, $2n$ 有 8 个正因子, $3n$ 有 12 个正因子。请求出 $12n$ 的正因子个数的所有可能值。

Answer: _____



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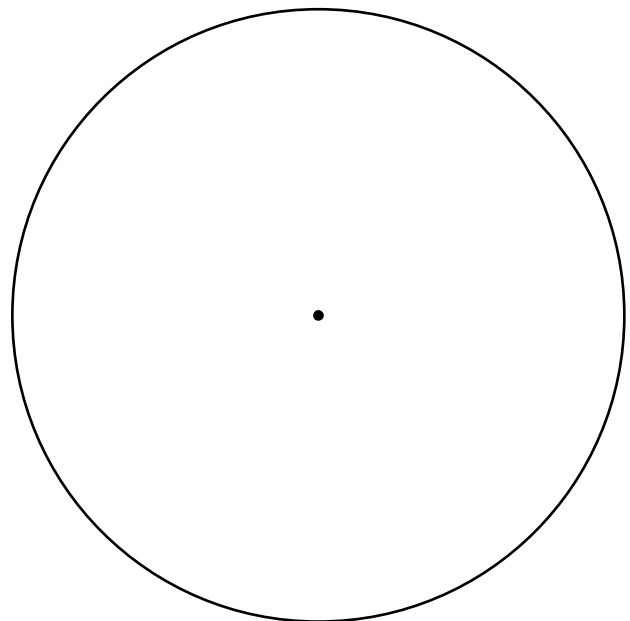
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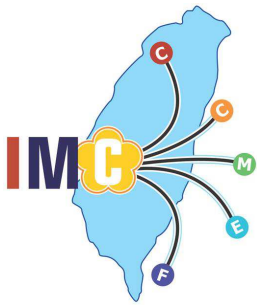
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7. 请用线段和圆弧把一个圆分割成全等的几份，其中至少有一份的内部和边界都不包含圆心。

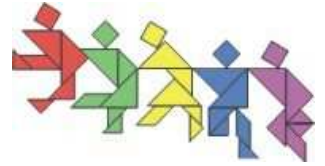


Answer: _____



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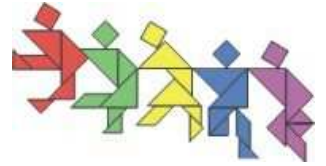
8. 一台机器由三个箱子组成，每个箱子上都有一盏红灯，这些红灯最初是不亮的。当物体放入箱子后，可以使用机器检查每个箱子内物体的总重量。对于每一个箱子，如果这个箱子中的重量比其他每个箱子中的重量都还要小，那么这个箱子的红灯会变亮，否则这个箱子的红灯不亮。现有 7 个球，其中有一个假球比其他六个正常的球重，而所有正常的球重量都相同，请使用这台机器两次从中找出假球。

Answer: _____



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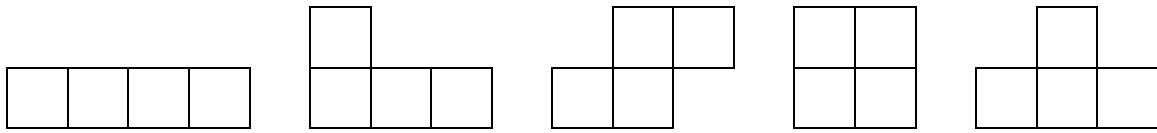
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9. 下图中有五片纸片，每片纸片由 4 个单位正方形构成。

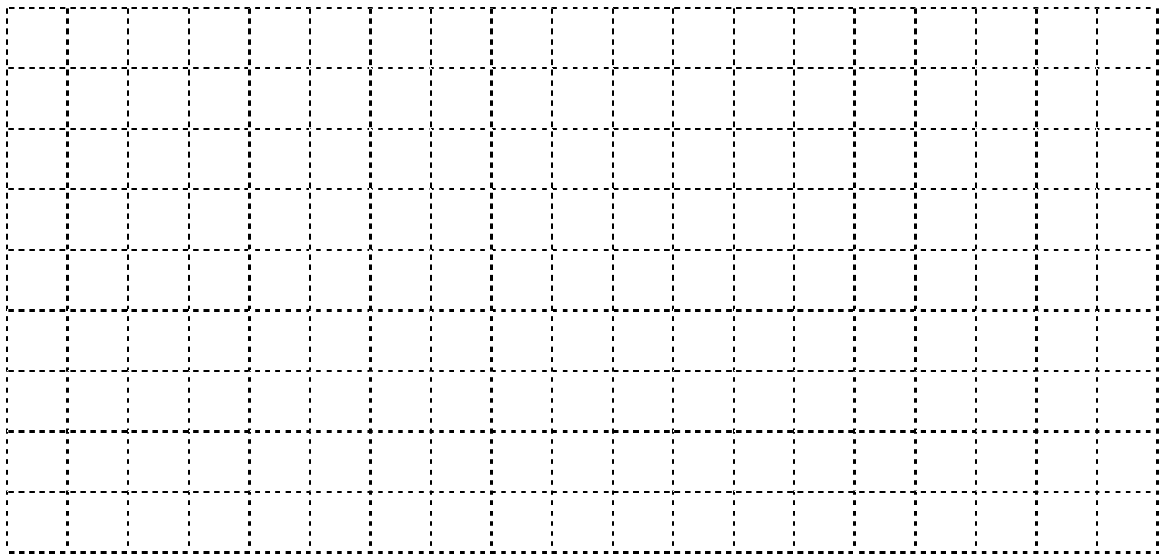


(a) 用三片不同的纸片组成一个轴对称图形，纸片可以旋转或翻转。请画出五个这种图形。

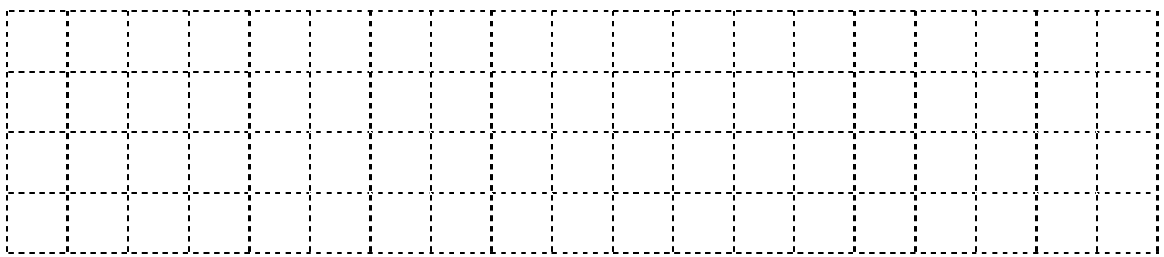
(b) 用三片不同的纸片组成一个中心对称图形，纸片可以旋转或翻转。请画出一个这种图形。

(一个图形是由方格纸上的 12 个相连的单位正方形组成。两个图形若经过旋转或翻转后相同，则视为同一种。)

(a)



(b)

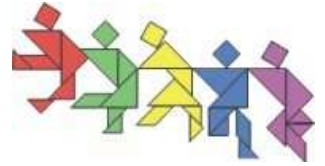


Answer: _____



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10. 十进制的数码按某种顺序分别用字母A、B、C、D、E、F、G、H、I和J代替。已知以下三条提示:

(1) $\overline{AB} = A \times A \times C$,

(2) $\overline{DE} = C \times F$,

(3) $\overline{BG} = H + I + F \times G$,

其中A、B、D都不为0, 请问字母J可能代表哪些数码? (\overline{AB} 表示十位是A和个位是B的两位数)

Answer: _____