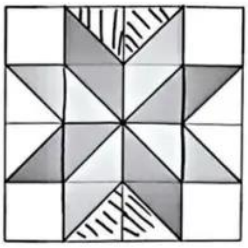
1. The eight-pointed star, shown in the figure below, is a popular quilting pattern. What percent of the entire 4-by-4 grid is covered by the star?

   下图所示的八角星是一种流行的拼布图案。请问这个星形图案的面积占整个 4×4 网格的百分之多少？



   (A) 40 **(B)** 50 **(C)** 60 **(D)** 75 **(E)** 80

2. The table below shows the ancient Egyptian hieroglyphs that were used to represent different numbers.

   下表列出了古埃及象形文字中用来表示不同数字的符号。

					𓏺
100,000	10,000	1,000	100	10	1

   For example, the number 32 was represented by 𓎆𓎆𓎆𓏺𓏺. What number was represented by the following combination of hieroglyphs?

   例如，数字 32 用 𓎆𓎆𓎆𓏺𓏺 表示。请问以下这组象形文字表示的是哪个数字？

   (A) 1,423 **(B)** 10,423 **(C)** 14,023 **(D)** 14,203 **(E)** 14,230

3. *Buffalo Shuffle-o* is a card game in which all the cards are distributed evenly among all players at the start of the game. When Annika and 3 of her friends play *Buffalo Shuffle-o*, each player is dealt 15 cards. Suppose 2 more friends join the next game. How many cards will be dealt to each player?

   Buffalo Shuffle-o 是一款卡牌游戏。游戏开始时，所有卡牌会平均分配给所有玩家。Annika 和她的三位朋友一起玩 *Buffalo Shuffle-o* 时，每位玩家会得到 15 张卡牌。假设下一局又有 2 位朋友加入，请问每位玩家将会得到多少张卡牌？

   (A) 8 **(B)** 9 **(C)** 10 **(D)** 11 **(E)** 12

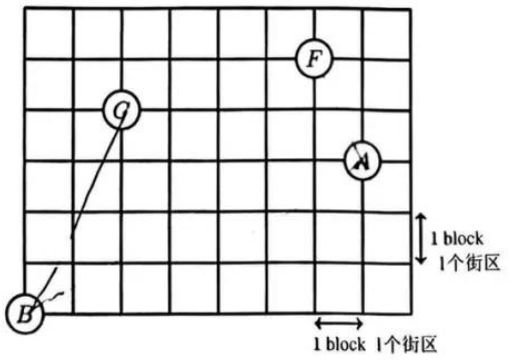
4. Lucius is counting backward by 7s. His first three numbers are 100, 93, and 86. What is his 10th number?

   Lucius 正在以 7 为间隔进行倒数。他倒数的前三个数是 100、93、86。请问倒数的第 10 个数是多少？

   (A) 30 **(B)** 37 **(C)** 42 **(D)** 44 **(E)** 47

5. Betty drives a truck to deliver packages in a neighborhood whose street map is shown below. Betty starts at the factory (labeled F) and drives to location A, then B, then C, before returning to F. What is the shortest distance, in blocks, she can drive to complete the route?

   Betty 驾驶卡车在一个社区送货，该社区的街道地图如下所示。Betty 从工厂（标记为 F）出发，依次到达 A 地、B 地、C 地，最后返回 F 地。请问她驾车走完这条路线的最短距离是多少？以街区为单位。



   (A) 20 **(B)** 22 **(C)** 24 **(D)** 26 **(E)** 28

6. Sekou writes the numbers 15, 16, 17, 18, 19. After he erases one of the numbers, the sum of the remaining four numbers is a multiple of 4. Which number did he erase?

Sekou 写下数字 15、16、17、18、19 。他擦去其中一个数字后，剩下的四个数字之和是 4 的倍数。请问他擦去了哪个数字？

(A) 15 **(B)** 16 **(C)** 17 **(D)** 18 **(E)** 19

7. On the most recent exam in Prof. Xochi's class,

在 Xochi 教授班上最近的一次考试中，

5 students earned a score of at least 95%,

有 5 名学生的得分率至少达到了 95%，

13 students earned a score of at least 90%,

有 13 名学生的得分率至少达到了 90%，

27 students earned a score of at least 85%, and

有 27 名学生的得分率至少达到了 85%，以及

50 students earned a score of at least 80%.

有 50 名学生的得分率至少达到了 80%。

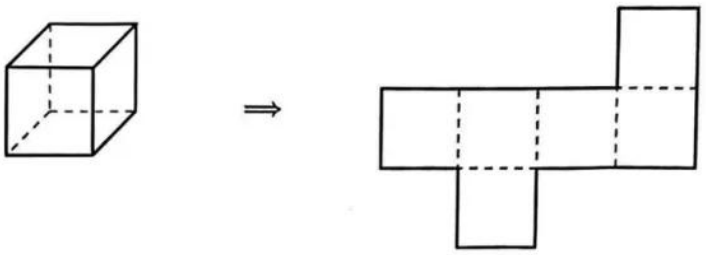
How many students earned a score of at least 80% and less than 90%?

请问有多少名学生的得分率至少达到了 80%，但小于 90%？

(A) 8 **(B)** 14 **(C)** 22 **(D)** 37 **(E)** 45

8. Isaiah cuts open a cardboard cube along some of its edges to form the flat shape shown on the right, which has an area of 18 square centimeters. What was the volume of the cube in cubic centimeters?

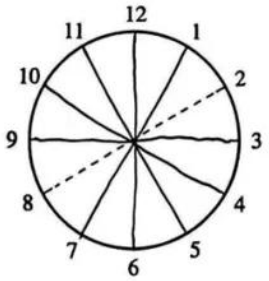
Isaiah 沿着一个硬纸板立方体的部分边缘将其剪开，形成右下图所示的平面图形，该图形的面积为 18 平方厘米。请问这个立方体的体积是多少立方厘米？



(A) $3\sqrt{3}$ **(B)** 6 **(C)** 9 **(D)** $6\sqrt{3}$ **(E)** $9\sqrt{3}$

9. Ningli looks at the 6 pairs of numbers directly across from each other on a clock. She takes the average of each pair of numbers. What is the average of the resulting 6 numbers?

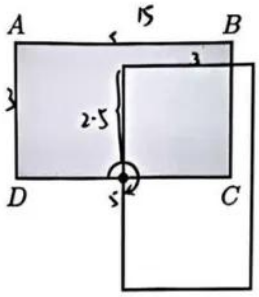
Ningli 观察时钟上 6 对正对着的数字，并计算每对数字的平均值。请问经过计算后得到的 6 个数的平均值是多少？



(A) 5 **(B)** 6.5 **(C)** 8 **(D)** 9.5 **(E)** 12

10. In the figure below, $ABCD$ is a rectangle with sides of length $AB = 5$ in and $AD = 3$ in. Rectangle $ABCD$ is rotated 90° clockwise around the midpoint of side $\overline{DC}$ to give a second rectangle. What is the total area, in square inches, covered by the two overlapping rectangles?

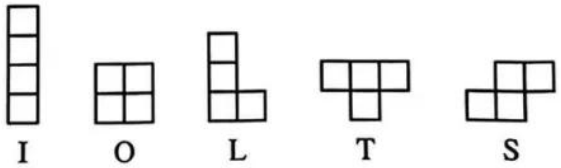
如图所示，$ABCD$ 是一个长方形，其边长 $AB = 5$ 英寸，$AD = 3$ 英寸。长方形 $ABCD$ 绕 $\overline{DC}$ 边的中点顺时针旋转 90°，得到第二个长方形。请问这两个重叠长方形覆盖的总面积是多少平方英寸？



(A) 21 **(B)** 22.25 **(C)** 23 **(D)** 23.75 **(E)** 25

11. A *tetromino* consists of four squares connected along their edges. There are five possible tetromino shapes, I, O, L, T, and S, shown below, which can be rotated or flipped over. Three tetrominoes are used to completely cover a 3×4 rectangle. At least one of the tiles is an S tile. What are the other two tiles?

一个*四格拼板*由四个正方形沿边相连组成。下图展示了五种可能的四格拼板形状：I、O、L、T 和 S，这些形状可以旋转或翻转。用三个四格拼板可以完全覆盖一个 3×4 的矩形，其中至少有一个是 S 形拼板。请问另外两个拼板的形状是什么？



(A) I and L
I 和 L

(B) I and T
I 和 T

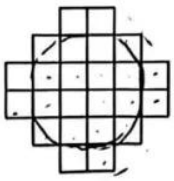
(C) L and L
L 和 L

(D) L and S
L 和 S

(E) O and T
O 和 T

12. The region shown below consists of 24 squares, each with side length 1 centimeter. What is the area, in square centimeters, of the largest circle that can fit inside the region, possibly touching the boundaries?

下图所示区域由 24 个边长为 1 厘米的正方形组成。请问该区域内正好能够容纳的最大圆的面积是多少平方厘米？（最大圆可能会接触到边界）

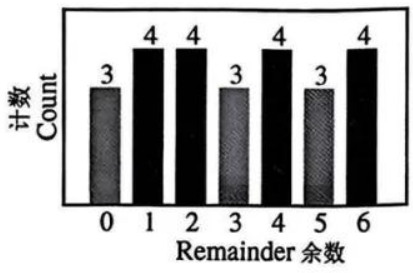


(A) 3π **(B)** 4π **(C)** 5π **(D)** 6π **(E)** 8π

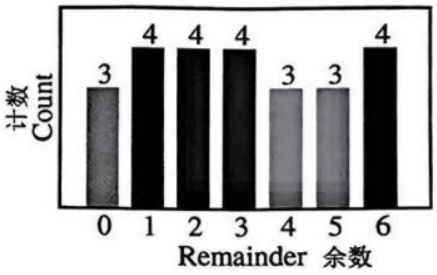
13. Each of the even numbers 2, 4, 6,..., 50 is divided by 7. The remainders are recorded. Which histogram displays the number of times each remainder occurs?

将偶数 2, 4, 6, ..., 50 分别除以 7，并记录下余数。请问下方哪个直方图显示了每个余数出现的次数？

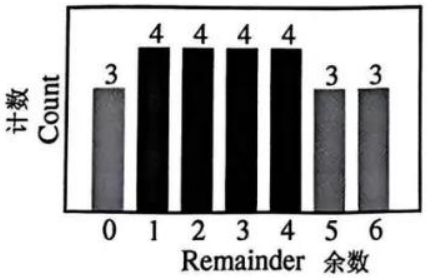
(A)



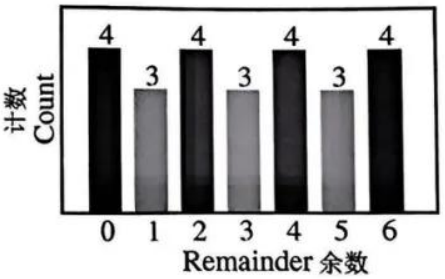
(B)



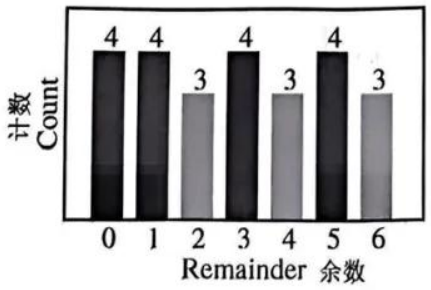
(C)



(D)



(E)



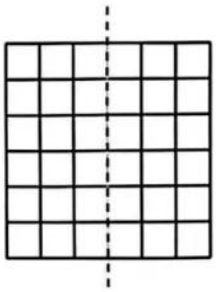
14. A number N is inserted into the list 2, 6, 7, 7, 28. The mean is now twice as great as the median. What is N?

在一列数字 2, 6, 7, 7, 28 中插入一个数字 N，使得这列数字的平均值是中位数的两倍。请问 N 是多少？

(A) 7 **(B)** 14 **(C)** 20 **(D)** 28 **(E)** 34

15. Kei draws a 6-by-6 grid. He colors 13 of the unit squares silver and the remaining squares gold. Kei then folds the grid in half vertically, forming pairs of overlapping unit squares. Let m and M equal the least and greatest possible number of gold-on-gold pairs, respectively. What is the value of $m + M$?

Kei 画了一个 6×6 的网格，并将其中 13 个单元格涂成银色，其余单元格涂成金色。然后，Kei 将网格垂直对折，形成若干对重叠的单元格。设 m 和 M 分别为两个金色单元格重叠对数的最小和最大可能值。请问 $m + M$ 的值是多少？



(A) 12 **(B)** 14 **(C)** 16 **(D)** 18 **(E)** 20

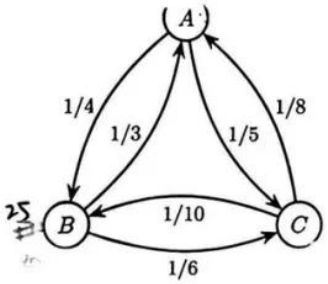
16. Five distinct integers from 1 to 10 are chosen, and five distinct integers from 11 to 20 are chosen. No two numbers differ by exactly 10. What is the sum of the ten chosen numbers?

从 1 到 10 之间选择五个不同的整数，从 11 到 20 之间选择五个不同的整数。其中，没有两个数的差值恰好为 10。请问选出的这十个数之和是多少？

(A) 95 **(B)** 100 **(C)** 105 **(D)** 110 **(E)** 115

17. In the land of Markovia, there are three cities: A, B, and C. There are 100 people who live in A, 120 who live in B, and 160 who live in C. Everyone works in one of the three cities, and a person may work in the same city where they live. In the figure below, an arrow pointing from one city to another is labeled with the fraction of people living in the first city who work in the second city. (For example, $\frac{1}{4}$ of the people who live in A work in B.) How many people work in A?

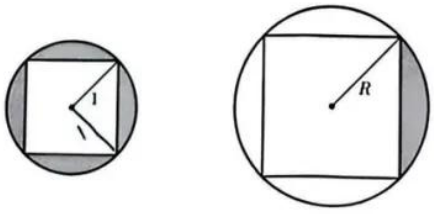
马克维亚大陆有三座城市：A 城、B 城和 C 城。A 城有 100 人居住，B 城有 120 人居住，C 城有 160 人居住。每个人都在 A 城、B 城或 C 城中的一个城市工作，且有的人可能在自己居住的城市工作。下图中，从一座城市指向另一座城市的箭头上，标注了居住在第一座城市的人群中，在第二座城市工作的比例。（例如，有 $\frac{1}{4}$ 居住在 A 城的人在 B 城工作。）请问有多少人在 A 城工作？



(A) 55 **(B)** 60 **(C)** 85 **(D)** 115 **(E)** 160

18. The circle shown below on the left has a radius of 1 unit. The region between the circle and the inscribed square is shaded. In the circle shown on the right, one quarter of the region between the circle and the inscribed square is shaded. The shaded regions in the two circles have the same area. What is the radius R, in units, of the circle on the right?

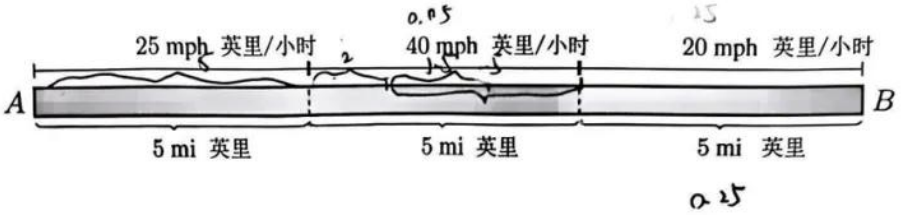
左下图的圆的半径为 1 个单位，阴影部分为圆和其内接正方形之间的区域。在右下图的圆中，阴影部分为圆和其内接正方形之间区域的四分之一。两个圆中的阴影区域面积相同。请问右下图的圆的半径 R 是多少个单位？



(A) $\sqrt{2}$ **(B)** 2 **(C)** $2\sqrt{2}$ **(D)** 4 **(E)** $4\sqrt{2}$

19. Two towns, A and B, are connected by a straight road, 15 miles long. Traveling from town A to town B, the speed limit changes every 5 miles: from 25 to 40 to 20 miles per hour (mph). Two cars, one at town A and one at town B, start moving toward each other at the same time. They drive at exactly the speed limit in each portion of the road. How far from town A, in miles, will the two cars meet?

A 镇和 B 镇之间由一条 15 英里长的笔直公路相连。从 A 镇行驶到 B 镇，限速每 5 英里变化一次：依次为 25 英里/小时、40 英里/小时和 20 英里/小时。两辆汽车，一辆在 A 镇，另一辆在 B 镇，它们同时出发相向而行。两车在各路段上都严格按照限速行驶。请问两车将在距离 A 镇多少英里处相遇？



(A) 7.75 **(B)** 8 **(C)** 8.25 **(D)** 8.5 **(E)** 8.75

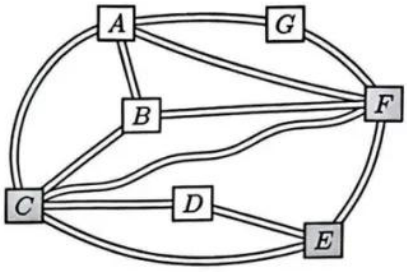
20. Sarika, Dev, and Rajiv are sharing a large block of cheese. They take turns cutting off half of what remains and eating it: first Sarika eats half of the cheese, then Dev eats half of the remaining half, then Rajiv eats half of what remains, then back to Sarika, and so on. They stop when the cheese is too small to see. About what fraction of the original block of cheese does Sarika eat in total?

Sarika、Dev 和 Rajiv 正在分享一大块奶酪。他们轮流切下奶酪剩余部分的一半并吃掉：首先 Sarika 吃掉一半奶酪，接着 Dev 吃掉剩余部分的一半，随后 Rajiv 吃掉剩余部分的一半，然后又轮到 Sarika，如此循环往复，直到奶酪小到看不见为止。请问 Sarika 一共大约吃掉了这块奶酪的几分之几？

(A) $\frac{4}{7}$ **(B)** $\frac{3}{5}$ **(C)** $\frac{2}{3}$ **(D)** $\frac{3}{4}$ **(E)** $\frac{7}{8}$

21. The Konigsberg School has assigned grades 1 through 7 to pods A through G, one grade per pod. Some of the pods are connected by walkways, as shown in the figure below. The school noticed that each pair of connected pods has been assigned grades differing by 2 or more grade levels. (For example, grades 1 and 2 will not be in pods directly connected by a walkway.) What is the sum of the grade levels assigned to pods C, E, and F?

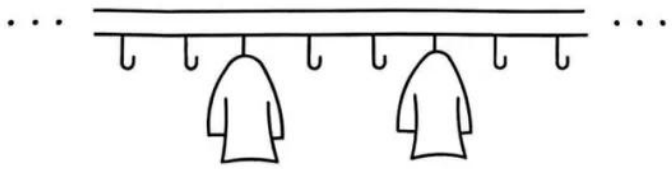
哥尼斯堡学校将 1 至 7 年级的学生分配到 A 至 G 教学区，每个教学区分配一个年级。如下图所示，部分教学区通过走廊相连。学校注意到，每两个相连的教学区分配的年级数之差不低于 2（例如，1 年级和 2 年级的教学区不会直接通过走廊相连）。请问，分配到 C、E 和 F 教学区的年级数总和是多少？



(A) 12 **(B)** 13 **(C)** 14 **(D)** 15 **(E)** 16

22. A classroom has a row of 35 coat hooks. Paulina likes coats to be equally spaced, so that there is the same number of empty hooks before the first coat, after the last coat, and between every coat and the next one. Suppose there is at least 1 coat and at least 1 empty hook. How many different numbers of coats can satisfy Paulina's pattern?

教室里有一排 35 个衣钩。Paulina 希望衣服之间的间隔相等，使得第一件衣服前、最后一件衣服后以及每两件衣服之间的空衣钩数量相同。假设至少有 1 件衣服和 1 个空衣钩。请问有多少种不同的衣服数量可以满足 Paulina 的要求？



(A) 2 **(B)** 4 **(C)** 5 **(D)** 7 **(E)** 9

23. How many four-digit numbers have all three of the following properties?

请问有多少个四位数同时满足以下三个条件？

(I) The tens digit and ones digit are both 9.

十位上的数字和个位上的数字都是 9。

(II) The number is 1 less than a perfect square.

该数比一个完全平方数小 1。

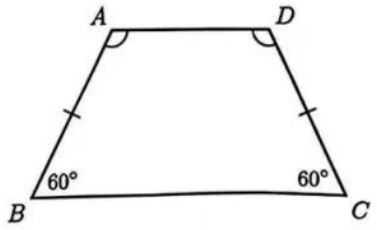
(III) The number is the product of exactly two prime numbers.

该数正好是两个质数的乘积。

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** 4

24. In trapezoid $ABCD$, angles B and C measure $60°$ and $AB = DC$. The side lengths are all positive integers and the perimeter of $ABCD$ is 30 units. How many non-congruent trapezoids satisfy all of these conditions?

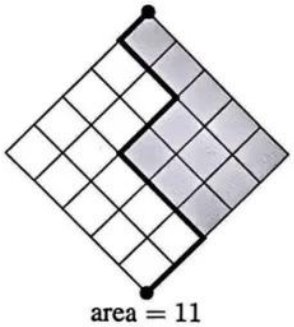
在梯形 $ABCD$ 中，$\angle B = \angle C = 60°$，且 $AB = DC$。该梯形的各边长均为正整数，其周长为 30 个单位。请问一共有多少个满足以上全部条件的非全等梯形？



(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** 4

25. Makayla finds all the possible ways to draw a path in a 5×5 diamond-shaped grid. Each path starts at the bottom of the grid and ends at the top, always moving one unit northeast or northwest. She computes the area of the region between each path and the right side of the grid. Two examples are shown in the figures below. What is the sum of the areas determined by all possible paths?

Makayla 在一个 5×5 的菱形网格中找到了所有可能的绘制路径的方式。每条路径从网格底部开始，到网格的顶部结束，总是朝东北或西北方向移动一个单位。她计算了每条路径与网格右侧边缘之间的区域面积。下图展示了两个示例。请问所有可能路径与网格右侧边缘之间的区域面积之和是多少？



area = 11
面积 = 11

area = 13
面积 = 13

(A) 2520 **(B)** 3150 **(C)** 3840 **(D)** 4730 **(E)** 5050

1. B
2. B
3. C
4. B
5. C
6. C
7. D
8. A
9. B
10. D
11. C
12. C
13. A
14. E
15. C
16. C
17. D
18. B
19. D
20. A
21. A
22. D
23. B
24. E
25. B