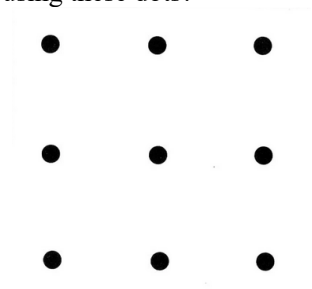


1. Find the value of  $100 \times (1 - \frac{1}{2}) \times (1 + \frac{1}{3}) \times (1 - \frac{1}{4}) \times (1 + \frac{1}{5}) \times \dots \times (1 - \frac{1}{100}) \times (1 + \frac{1}{101}) \times (1 - \frac{1}{102})$

2. The total of the ages of four people, Amy, Bill, Calvin and Danny, is exactly 100 this year. If Amy's age is increased by 4 years old, Bill's age is doubled, Calvin's age is halved, and Danny's age becomes only one-third of his current age, all four people will be of the same age. What is Danny's current age?

3. Originally 25% of the students in the room were boys. Later, two boys enter this room and currently 28% of the students in the room are boys. How many girls are there in this room?

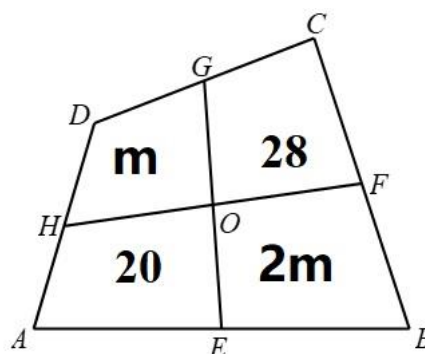
4. The following nine dots form a  $2 \times 2$  grid. How many triangles can be formed using these dots?



5. A project can be done by team A alone in 20 days. It can also be done by team B alone in 15 days. If team A works on this project for several days and then leaves it to team B, from start to finish the completion of this project takes a total of 16 days. During these 16 days, how many days are done by team B?

6. Car A, B and C all start out at the same time from place X towards place Y. Meanwhile, a truck starts out from place Y heading towards place X. All four vehicles have constant speed. After 5 hours, 6 hours and 8 hours, the truck meets car A, B and C respectively. If car A's speed is 60 km/h and car B's speed is 48 km/h, find out car C's speed in km/h.

7. As shown below, point  $E$ ,  $F$ ,  $G$  and  $H$  are the midpoints on the four sides of the quadrilateral  $ABCD$ .  $EG$  and  $FH$  divide the quadrilateral into 4 regions, whose areas are known to be  $m$ , 28, 20 and  $2m$ . Find the value of  $m$ .

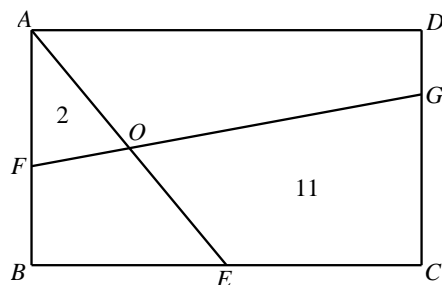


8. The teacher bought some candies and planned to give them all out to A, B, C in the ratio of 3:4:5. However, on the actual day, the teacher gave all the candies out to A, B, C in the ratio of 5:6:7 instead. As a result, one child has received 2 more candies than planned. How many candies did the teacher buy in total?

9. A 7-digit number  $2023\overline{ab}0$  is divisible by 99, where  $a$  and  $b$  represent different digit. Find the product of  $a$  and  $b$ .

10. Given that  $x$  and  $y$  are whole numbers such that  $\frac{1}{x} - \frac{1}{2y} = \frac{1}{10}$ , find the largest value of  $x + y$ .

11. As shown below, the line segments  $AE$ ,  $FG$  divide the rectangle  $ABCD$  into 4 regions. Two of the areas are known to be 2 and 11.  $E$  is the midpoint of  $BC$ . The ratio of  $AO:OE$  is 2:3. Find the area of the rectangle  $ABCD$ .



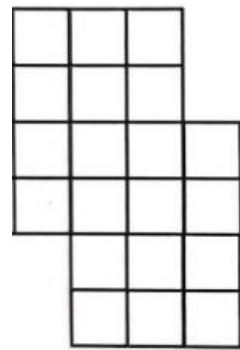
12. There are in total 252 bars of chocolate. A natural number  $n$  needs to be chosen such that if Melvin eats  $n$  bars every day, the chocolate will be finished in a whole number of days. If  $n$  must be a prime number, there are  $a$  different choices of  $n$ . If  $n$  must be odd, there are  $b$  different choices of  $n$ . Find the value of  $a + b$ .

13. In the following  $3 \times 3$  square grid, all rows, columns and the two diagonals will sum to the same value. Find the value of number M.

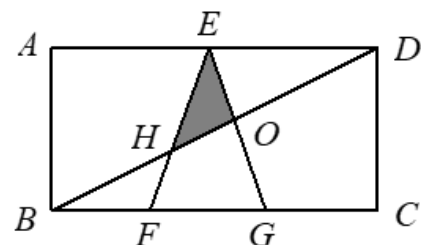
	M	
		2
11	40	

14. Within one hour, there are two instances between 6 o'clock and 7 o'clock when the minute hand and the hour hand of the clock make an angle of 110 degrees. What is the time difference, in minutes, between these two timings?

15. How many rectangles (squares are included) are there in the figure below?



16. Rectangle  $ABCD$  has an area of 70. Point  $E$  is the midpoint of  $AD$ . Point  $F$  and  $G$  divides the side  $BC$  into three equal parts. Find the area of  $\triangle EHO$ .



17. The password to a suitcase is a 3-digit number.

A says: "It is 954." B says: "It is 214." C says: "It is 358."

The owner of the suitcase comments: "Each of you have got exactly one digit right, and the digits you guys guessed correctly are different from each other." What is the real password?

18. The table below is filled with numbers following a certain pattern. If this table contains exactly 400 numbers, find the number located in the 14<sup>th</sup> row, 14<sup>th</sup> column.

...	...	...	...	...	...
...	91	78	66	55	...
...	105	6	3	45	...
...	120	10	1	36	...
...	136	15	21	28	...
...	...	...	...	...	...

19. Find the total number of natural numbers from 1 to 2023 that is either a multiple of 7 or is not a multiple of 3.

20. In the grid paper below, the side of each unit square is 1. If the ratio of  $BE$  to  $DE$  is  $\frac{a}{b}$ , which is a fraction in the simplest form, find the value of  $a + b$ .

