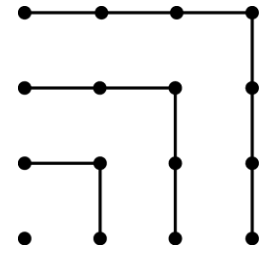




3 points

1. Using the picture we conclude that $1 + 3 + 5 + 7 = 4 \times 4$.
How much is $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$?

- A) 14×14 B) 9×9 C) $4 \times 4 \times 4$ D) 16×16 E) 4×9



2. If both rows have the same sum, what is the value of *?

1	2	3	4	5	6	7	8	9	10	2010
11	12	13	14	15	16	17	18	19	20	*

- A) 1010 B) 1020 C) 1910 D) 1990 E) 2020

3. Two empty cubes have base areas of 1 dm^2 and 4 dm^2 respectively. Erkki wants to fill the bigger cube with spring water. He does this by using the smaller cube. How many times does Erkki have to go to the spring?

- A) 2 times B) 4 times C) 6 times D) 8 times E) 16 times

4. How many four-digit numbers exist that are divisible by five and only have odd digits?

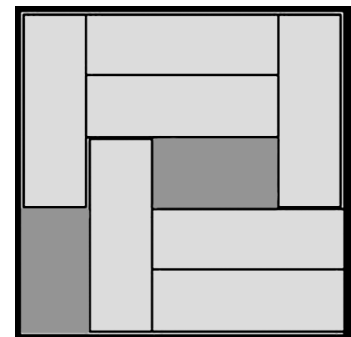
- A) 900 B) 625 C) 250 D) 125 E) 100

5. The director of a company said: "Each of our employees is at least 25 years old." Later it turned out that he was not correct. This means that

- A) all employees in the company are exactly 25 years old
 B) all employees in the company are more than 26 years old
 C) none of the employees in the company is 25 years old yet
 D) some employee in the company is less than 25 years old
 E) some employee in the company is exactly 26 years old

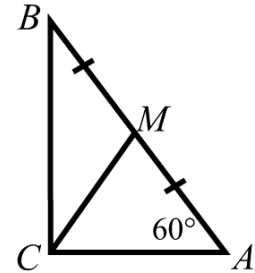
6. There are seven 3×1 bars in a box as shown in the figure. We wish to slide some bars in the box to create room for one more bar. At least how many bars must be moved in order to achieve this?

- A) 2 B) 3 C) 4
 D) 5 E) it is impossible





7. Triangle ABC has a right angle C . M is the midpoint of AB and angle $A = 60^\circ$. Find $\angle BMC$.



- A) 105° B) 108° C) 110° D) 120° E) 125°

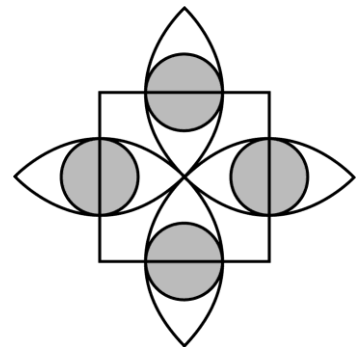
8. Choose a number which could be equal to the number of edges of a prism.

- A) 100 B) 200 C) 2008 D) 2009 E) 2010

9. How many two-digit numbers exist where the first digit x and the second digit y that satisfy the following: $(x-3)^2 + (y-2)^2 = 0$?

- A) 1 B) 2 C) 6 D) 32 E) none

10. In the picture, the side of the square has a length of two. The semicircles go through the center of the square. They have centers on the vertices of the square. The shaded circles have centers on the sides of the squares and are tangent to the semicircles. How large is the shaded area in total?



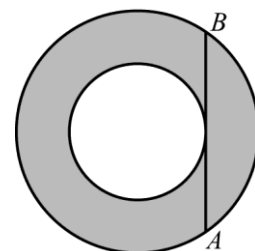
- A) $4(3-2\sqrt{2})\pi$ B) $\sqrt{2}\pi$ C) $\frac{\sqrt{3}}{4}\pi$ D) π E) $\frac{1}{4}\pi$

4 points

11. The three numbers $\sqrt[2]{7}$, $\sqrt[3]{7}$ and $\sqrt[4]{7}$ are consecutive terms of a geometric sequence. What is the next term of the sequence?

- A) $\sqrt[5]{7}$ B) $\sqrt[6]{7}$ C) $\sqrt[7]{7}$ D) $\sqrt[8]{7}$ E) 1

12. The chord AB is tangent to the smaller of the concentric circles. If $AB = 16$, what is the area of the shaded region?



- A) 32π B) 63π C) 64π
D) $32\pi^2$ E) Depends on the radii of the circles

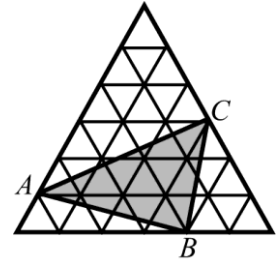
13. The integers x and y satisfy $2x = 5y$. Which of the following could be the value of $x + y$?

- A) 2011 B) 2010 C) 2009 D) 2008 E) 2007



14. The big equilateral triangle consists of 36 smaller equilateral triangles with an area of 1 cm^2 each. Find the area of $\triangle ABC$.

- A) 11 cm^2 B) 12 cm^2 C) 13 cm^2 D) 14 cm^2 E) 15 cm^2



15. A bag contains three different colors of balls: blue, green and red (there is at least one of each color). If one is to draw five balls at random, there will be at least two red ones and at least three will be of the same color. How many blue balls are there in the bag?

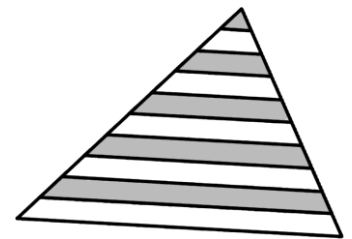
- A) 1 B) 2 C) 3
D) 4 E) impossible to determine without more information

16. A dice is thrown three times. If the number obtained on the third throw is equal to the sum of the numbers in the first two, what is the probability that a 2 appeared at least once?

- A) $\frac{1}{6}$ B) $\frac{91}{216}$ C) $\frac{1}{2}$ D) $\frac{8}{15}$ E) $\frac{7}{12}$

17. In the triangle shown on the right, lines parallel to the base divide each of the other two sides of the triangle into 10 equal segments. Which percentage of the area of the triangle is grey?

- A) 42,5% B) 45% C) 46% D) 47,5% E) 50%



18. Every star in the expression $1*2*3*4*5*6*7*8*9*10$ is replaced with either "+" or "·". Let N be the largest number constructed in this way. What is the largest prime factor of N ?

- A) 2 B) 3 C) 5 D) 7 E) some other number

19. The sides of a triangle are natural numbers 13, x and y . What is the perimeter, if $xy = 105$?

- A) 35 B) 39 C) 51 D) 69 E) 119

20. The natural numbers from 1 to 10 are each written on the blackboard 10 times. The students in the class then play the following game: a student deletes 2 of the numbers and writes on the blackboard their sum decreased by 1. The game continues until only one number remains on the blackboard. The remaining number is:

- A) less than 440 B) 451 C) 460 D) 488 E) over 500

5 points

21. How many right-angled triangles can be formed by joining three vertices of a given regular 14-gon?

- A) 42 B) 84 C) 88 D) 98 E) 168



22. 100 people took part in a race, and no two of them arrived at the same time. Each was asked which place they had finished in and everybody answered with a number from 1 to 100. The sum of all answers equaled 4000. What is the smallest number of false answers the runners could have given?

- A) 9 B) 10 C) 11 D) 12 E) 13

23. What is the value of

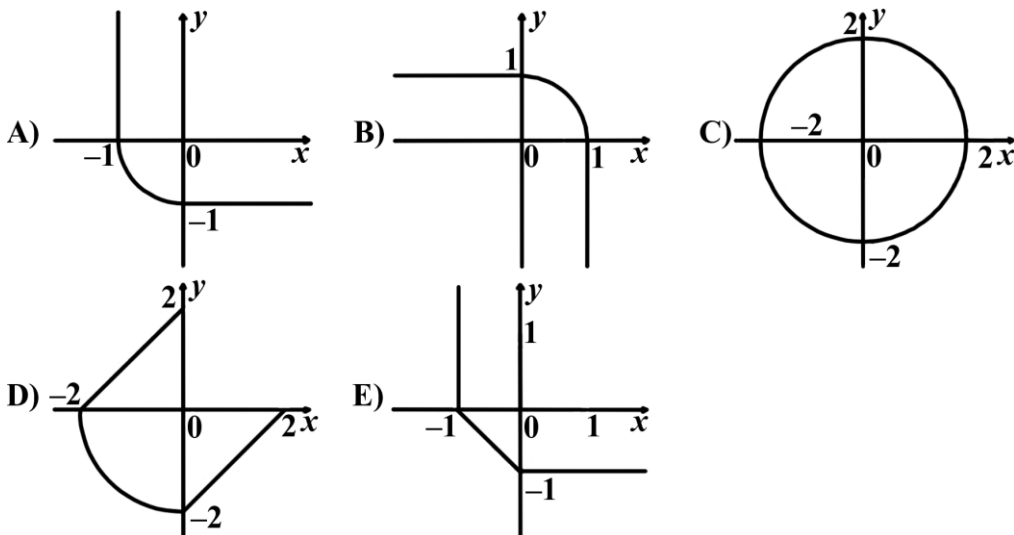
$$\frac{(2+3)(2^2+3^2)\dots(2^{1024}+3^{1024})(2^{2048}+3^{2048})+2^{4096}}{3^{2048}},$$

when $3-2=1$?

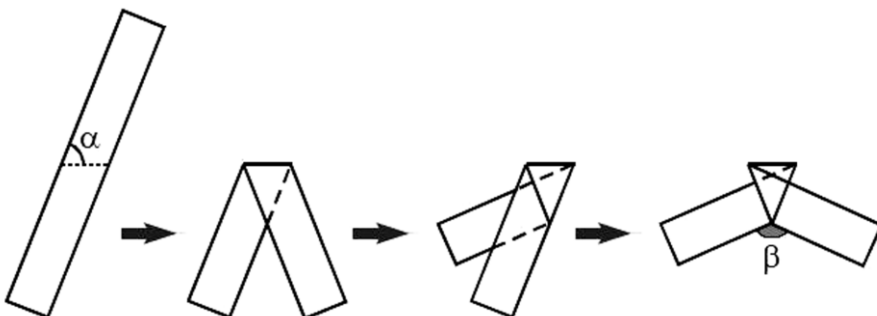
- A) 2^{2048} B) 2^{4096} C) 3^{2048} D) 3^{4096} E) $3^{2048} + 2^{2048}$

24. Which of these graphs corresponds with the set of all solutions of the equation

$$(x-|x|)^2 + (y-|y|)^2 = 4 ?$$



25. A strip of paper is folded as illustrated. Find β , when $\alpha = 70^\circ$.



- A) 140° B) 130° C) 120° D) 110° E) 100°



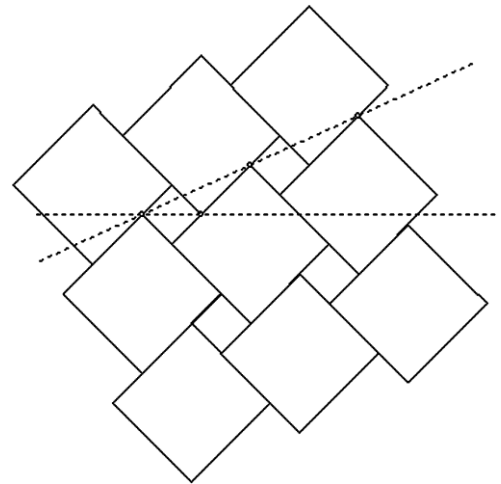
26. Function f is defined in the set of positive real numbers. For every $x > 0$

$$2f(x) + 3f\left(\frac{2010}{x}\right) = 5x.$$

Determine $f(6)$.

- A) 993 B) 1 C) 2009 D) 1013 E) 923

27. A wall is tiled with two sizes of square tile as shown. The larger tile has sides of length a , and the smaller of length b . The dashed lines (horizontal and slanted) form a 30° angle. Determine the ratio $a : b$.



- A) $2\sqrt{3}:1$ B) $(2+\sqrt{3}):1$ C) $(3+\sqrt{2}):1$
 D) $3\sqrt{2}:1$ E) $2:1$

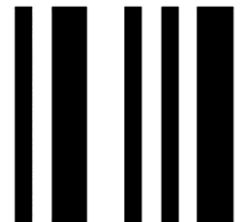
28. The square root $\sqrt{\underbrace{0.44\dots4}_{100 \text{ fours}}}$ is written as a decimal

number.

What is the 100th decimal?

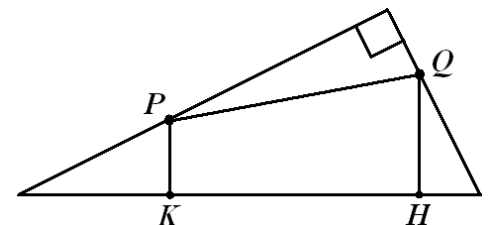
- A) 1 B) 2 C) 4 D) 6 E) 8

29. A bar-code of the type shown is composed of alternate strips of black and white, always beginning and ending with a black strip. Each strip (of either color) has the width of one or two. The total width of the bar code is 12. Always reading from left to right, how many different codes are possible?



- A) 24 B) 132 C) 66 D) 12 E) 116

30. The points P and Q are chosen on two legs (catheti) of a right-angled triangle. The points K and H are projections to the hypotenuse of P and Q respectively. The legs have lengths a and b . What is the least possible value of $KP + PQ + QH$?



- A) $a+b$ B) $\frac{2ab}{a+b}$ C) $\frac{2ab}{\sqrt{a^2+b^2}}$
 D) $\frac{(a+b)^2}{\sqrt{a^2+b^2}}$ E) $\frac{(a+b)^2}{2ab}$