Problem 1

Which number is $\dfrac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{6}}$ equal to?

A 1.2 **B** 2.4 **C** 4.0 **D** 4.8 **E** 5.0

Problem 2

How many of the four numbers 1234, 12345, 123456, and 1234567 are divisible by 3?

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

Problem 3

Nils is going on a trip, and remembers at the last moment that he forgot to pack some socks. In order not to wake up his younger brother, he does not turn on the light, but takes socks from the sock drawer blindly. There are 20 black and 16 white socks in the drawer.
At least how many socks must Nils take from the drawer in order to ensure ending up with at least six socks of each colour?

A 21 **B** 22 **C** 25 **D** 26 **E** 27

Problem 4

What is the square root of 2^{16} ?

A 2^{15} **B** 2^4 **C** 1024 **D** 512 **E** 256

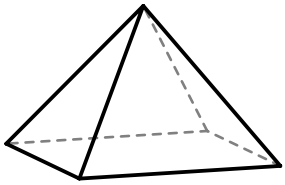
Problem 5

Which one of these numbers is the largest?

A $1/\sqrt{8}$ **B** 0.33 **C** $1/\sqrt{10}$ **D** 0.250 **E** $1/3$

Problem 6

A pyramid is composed of a square base and four equilateral triangles. The height of the pyramid is 10. How large is the surface area of the pyramid (including the base)?



A $100(3+\sqrt{3})$ **B** $200(1+\sqrt{3})$ **C** $400\sqrt{2}$
D 600 **E** $1200(\sqrt{2}-1)$

Problem 7

Kari has three children. The sum of the children's ages is a prime number. Three months ago, the sum was a different prime, and in five months, the sum will be yet another prime. By the age of a child, we mean the number of whole years passed since birth.
What will the sum of the children's ages be in eight months?

A 5 **B** 6 **C** 11 **D** 12 **E** 13

Problem 8

The integers from 1 to 100 (inclusive) are written on separate paper slips. You draw slips at random.
How many slips must you draw to ensure having drawn at least three slips with numbers ending in the same digit?

A 3 **B** 12 **C** 18 **D** 21 **E** 30

Problem 9

Which one of these numbers has the smallest prime factor?

A 1313 **B** 1919 **C** 7357 **D** 7537 **E** 11131

Problem 10

A positive integer n has the property that $12n + 131$ is divisible by $3n + 2$.
What is the sum of the digits of n?

A 4 **B** 5 **C** 8 **D** 11 **E** 23

Problem 11

The hypotenuse of a right triangle has length 10, and the area of the triangle equals its circumference.
What is the sum of the lengths of the two legs of the triangle?

A 12 **B** $10\sqrt{2}$ **C** 14 **D** 16 **E** 24

Problem 12

Triangle ABC has sides of length $AB = 1$, $BC = 2$, and $AC = \sqrt{3}$. Point D is located on AC so that the angles ABD and DBC are equal.
What is the length of AD?

A $\frac{3}{2}$ **B** $\frac{4}{3}$ **C** $\sqrt{2}$ **D** $\frac{\sqrt{3}}{3}$ **E** $\frac{3\sqrt{3}}{4}$

Problem 13

Each of the numbers a, b, c, and d is either 1 or 0, and $a \neq c$ and $b \neq d$.
What is $(a+b)(a+c)(b+c)(b+d)(c+d)$ necessarily equal to?

A 0 **B** 1 **C** $a^2 + b^2$ **D** $c + d$ **E** $2bc$

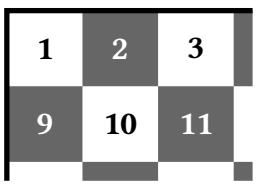
Problem 14

Ingrid paid 430 kroner for cardamom buns and muffins. Each bun cost 13 kroner, and a muffin cost 19 kroner.
How many baked items (buns and muffins) did she buy altogether?

A 24 **B** 25 **C** 26 **D** 27 **E** 28

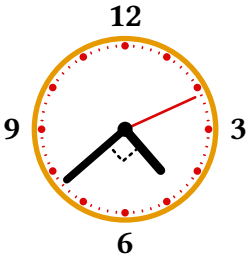
Problem 15

David has a regular chess board with a white square in the top left corner. He writes the numbers 1, 2, ..., 64, one in each square, so the top row is 1–8, the next is 9–16, and so forth. (The figure shows the top left corner of the board.)
What is the sum of the numbers written in the white squares?



A 512 **B** 1024 **C** 1040 **D** 2024 **E** 2048

Problem 16



How many times each 24-hour period, from one midnight to the next, is the minute hand on an analog clock perpendicular to the hour hand, as in the figure?

A 22 **B** 24 **C** 36 **D** 44 **E** 48

Problem 17

For real numbers x, let $\lfloor x \rfloor$ denote the largest integer less than or equal to x. For example, $\lfloor 4 \rfloor = 4$, $\lfloor \pi \rfloor = 3$, and $\lfloor -1.9 \rfloor = -2$.
Which alternative is necessarily true for all real numbers x and y?

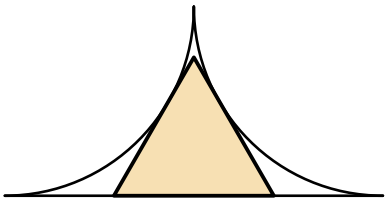
A $\lfloor x \rfloor + \lfloor y \rfloor = \lfloor x + y \rfloor$ **B** $\lfloor x \rfloor + \lfloor y \rfloor < \lfloor x + y \rfloor$ **C** $\lfloor x \rfloor \cdot \lfloor y \rfloor = \lfloor xy \rfloor$
D $\lfloor x \rfloor \cdot \lfloor y \rfloor \leq \lfloor xy \rfloor$ **E** Neither of **A**, **B**, **C**, or **D** needs be true.

Problem 18

All the two digit positive integers 10, 11, ..., 99 are written on a blackboard. Jane erases each number, and replaces it by the product of the digits of that number.
What is the sum of the numbers now on the blackboard?

A 2024 **B** 2025 **C** 4904 **D** 4905 **E** None of these.

Problem 19



A line segment of length 2 and two quarter circles are pairwise tangent, and circumscribe an equilateral triangle as shown in the figure.
How large is the area of the triangle?

A $\frac{\sqrt{3}-1}{2}$ **B** $\frac{4}{3}\sqrt{3}-2$ **C** $\frac{\sqrt{3}}{4}$ **D** $\frac{\pi-2}{6}$ **E** $2-\frac{\pi}{2}$

Problem 20

Niels has one red four-sided die, one green 20-sided die, plus two 12-sided dice, one of them blue, the other black. He throws all four dice simultaneously.
How many different outcomes are there so that the sum of the values shown by the red die and the green one is less than the sum of the values shown by the blue and the black one?

A 3840 **B** 4608 **C** 5146 **D** 5482 **E** 5760