Problem 1. There are three hats with numbers 1, 2 and 3 written on them, and three balls also numbered 1, 2 and 3. In how many ways can one put the balls in the hats so that no ball gets into a hat with the same number? (One can put more than one ball into hats).
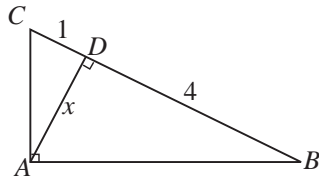
Problem 2. When the volume of a spherical balloon is multiplied by 3, by what factor does its surface area increase?
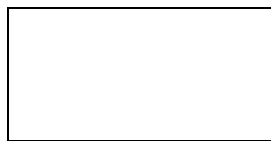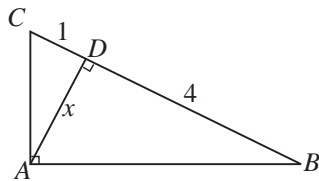
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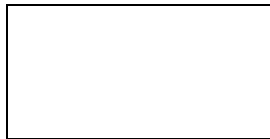
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Problem 4. What is the area of a regular 12-sided polygon (dodecagon) inscribed in a circle with radius 1?

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Problem 5. Find the sum of the prime factors of 1591.

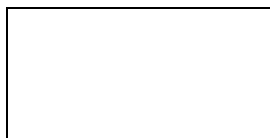**Problem 5.** Find the sum of the prime factors of 1591.

Problem 6.

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \cdots + \frac{1}{24 \cdot 25} =$$

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Problem 7. What is the radius of the smallest sphere containing the spheres with equations

$$x^2 + y^2 + z^2 = 1 \quad \text{and} \quad (x-1)^2 + (y-2)^2 + (z-2)^2 = 4?$$
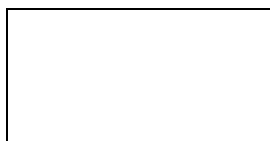
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Problem 8. How many digits are in the base-ten numeral $4^{22} \cdot 5^{40}$?

Problem 9. Determine the missing digit $\diamondsuit$ in the following mystery multiplication problem:

$$
\begin{array}{rrrrrrrrr}
 & 4 & 3 & ? & ? & 8 & ? \\
 & & & \times & & 7 & 5 & 6 \\
\hline
3 & 3 & 1 & \diamondsuit & 6 & 8 & 6 & 1 & 6 \\
\end{array}
$$

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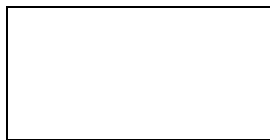
Problem 10. Alice, Bob and Caroline compete who can solve more ciphering problems. In how many different orders can they finish if ties can happen? (For example, for two people there are 3 possible outcomes)

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