Hong Kong Mathematics Olympiad 2000-2001
Heat Event (Group)

除非特別聲明，答案須精確且用數字表達，並化至最簡。
Unless otherwise stated, all answers should be exact and expressed in numerals in their simplest form.

1. 現在鐘面上的時間是一時正。$p$ 分鐘後，分針與時針剛好重疊，求 $p$ 的最小值。

   The time on the clock face is now one o’clock. After $p$ minutes, the minute hand overlaps with the hour hand, find the minimum value of $p$.

2. 把 10 個完全相同的球放入 3 個不同的盒子裏，使得沒有一個盒子是空的，共有多少種放法?

   In how many ways can 10 identical balls be distributed into 3 different boxes such that no box is to be empty?

3. 設 $x = \sqrt{3-\sqrt{5}} + \sqrt{3+\sqrt{5}}$ 及 $y = x^3$，求 $y$ 的值。

   Let $x = \sqrt{3-\sqrt{5}} + \sqrt{3+\sqrt{5}}$ and $y = x^3$, find the value of $y$.

4. 如果 $\frac{4a}{1-x^{16}} \equiv \frac{2}{1-x} + \frac{2}{1+x} + \frac{4}{1+x^2} + \frac{8}{1+x^4} + \frac{16}{1+x^5}$，求 $a$ 的值。

   If $\frac{4a}{1-x^{16}} \equiv \frac{2}{1-x} + \frac{2}{1+x} + \frac{4}{1+x^2} + \frac{8}{1+x^4} + \frac{16}{1+x^5}$, find the value of $a$. 

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5. In figure 1, $ADE$ is a right circular cone. Suppose the cone is divided into two parts by a cut running parallel to the base and made $\frac{1}{4}$ of the way up, the ratio of the slant surface of the small cone $ABC$ to that of the truncated base $BCDE$ is $1: k$, find the value of $k$.

![Diagram of a right circular cone with a cut making $\frac{1}{4}$ of the way up](image)

6. If a ten-digit number $2468m2468m$ is divisible by 3, find the maximum value of $m$.

7. Find the area enclosed by the x-axis and the straight lines $x - 3y = 0$, $x + y - 4 = 0$.

Find the area enclosed by the x-axis and the straight lines $x - 3y = 0$, $x + y - 4 = 0$. 
8. In figure 2, PQR is a triangle, S is the mid-point of PQ, RQ = PS = SQ, and \( \angle RQS = 2 \angle RPS \). Let \( \angle PSR = x \), find the value of \( x \).

\[ \angle RQS = 2 \angle RPS \]

\[ \triangle PQR \]

\[ P \quad S \quad Q \]

9. If \( x \) satisfies the equation \( |x - 3| + |x - 5| = 2 \), find the minimum value of \( x \).

10. 3 shoes are chosen randomly from 6 pairs of shoes with different models, find the probability that exactly two out of the three shoes are of the same model.