Hong Kong Mathematics Olympiad (2012 / 2013)

Heat Event (Individual)

香港数学竞赛 (2012 / 2013)

初赛项目(个人)

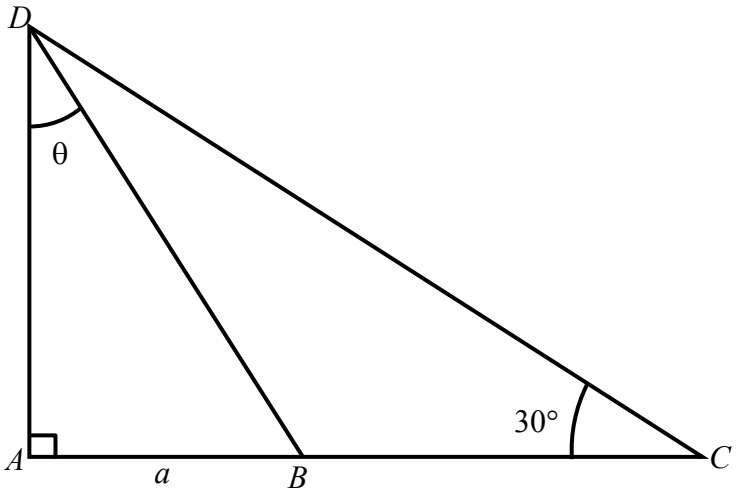
除非特别声明，答案须用数字表达，并化至最简。
Unless otherwise stated, all answers should be expressed in numerals in their simplest form.

1. 化简 $\sqrt{94-2\sqrt{2013}}$ 。

   Simplify $\sqrt{94-2\sqrt{2013}}$.

2. 一个平行四边形可被分成 178 个边长为 1 单位的等边三角形，若该平行四边形的周界为 P 单位，求 P 的最大值。
   A parallelogram is cut into 178 pieces of equilateral triangles with sides 1 unit. If the perimeter of the parallelogram is P units, find the maximum value of P .

3. 图一所示为一直角三角形 ACD，其中 B 是 AC 上的点且 $BC = 2AB$ 。已知 $AB = a$ 及 $\angle ACD = 30°$，求 θ 的值。
   Figure 1 shows a right-angled triangle ACD where B is a point on AC and $BC = 2AB$. Given that $AB = a$ and $\angle ACD = 30°$, find the value of θ .



图一

Figure 1

4. 已知 $x^2+399=2^y$，其中 x、y 为正整数。求 x 的值。

Given that $x^2+399=2^y$, where x, y are positive integers. Find the value of x.

5. 已知 $y=(x+1)(x+2)(x+3)(x+4)+2013$，求 y 的最小值。

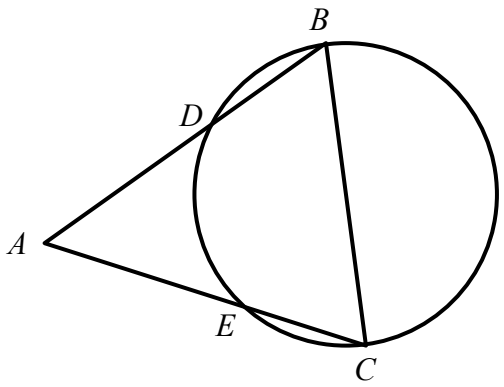
Given that $y=(x+1)(x+2)(x+3)(x+4)+2013$, find the minimum value of y.

6. 从一个有 n 条边的凸多边形中，选取其中一只内角。若余下的 $n-1$ 只内角之和是 $2013°$, 求 n 的值。

In a convex polygon with n sides, one interior angle is selected. If the sum of the remaining $n-1$ interior angles is $2013°$, find the value of n.

7. 图二所示为一通过 B 点及 C 点的圆，而 A 点则位于圆之外。已知 BC 是圆的直径，AB 及 AC 分别与圆相交于 D 点及 E 点，且 $\angle BAC=45°$。求 $\dfrac{\Delta ADE\ \text{的面積}}{BCED\ \text{的面積}}$。

Figure 2 shows a circle passes through two points B and C, and a point A is lying outside the circle. Given that BC is a diameter of the circle, AB and AC intersect the circle at D and E respectively and $\angle BAC=45°$. Find $\dfrac{\text{area of }\Delta ADE}{\text{area of }BCED}$.



图二

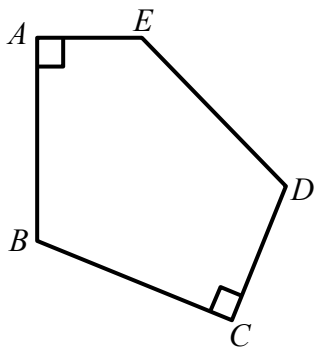
Figure 2

8. 解 $\sqrt{31-\sqrt{31+x}}=x$。

Solve $\sqrt{31-\sqrt{31+x}}=x$.

9. 图三所示为五边形 $ABCDE$。$AB = BC = DE = AE + CD = 3$，且 $\angle A = \angle C = 90°$，求该五边形的面积。

Figure 3 shows a pentagon $ABCDE$. $AB = BC = DE = AE + CD = 3$ and $\angle A = \angle C = 90°$, find the area of the pentagon.



图三

Figure 3

10. 若 a 及 b 为实数，且 $a^2 + b^2 = a + b$ 。求 $a + b$ 的最大值。

If a and b are real numbers, and $a^2 + b^2 = a + b$. Find the maximum value of $a + b$.

完

END