Part A
甲部

1. 除非特別聲明，答案須用數字表達，並化至最簡。
   Unless otherwise stated, all answers should be expressed in numerals in their simplest form.

2. 本部各題佔分相等，每題 1 分。
   All questions in this section are of equal marks, each question carries 1 mark.

1. 整數 x 減去 12 後是一個整數的平方。將 x 加上 19 後則是另一個整數的平方。求 x 的值。
   An integer x minus 12 is the square of an integer. x plus 19 is the square of another integer. Find the value of x. (2010/11 Heat Event (Individual) Qu. 5)

2. 已知 $\left(10^{2015}\right)^{-10^2} = 0.\underbrace{000\cdots01}_{n \text{ 個} 0}$，求 n 的值。

   Given that $\left(10^{2015}\right)^{-10^2} = 0.\underbrace{000\cdots01}_{n \text{ times}}$. Find the value of n. (2014/15 Heat Event (Individual) Qu. 2)

3. 如圖一所示，$ABCD$ 為圓內接四邊形，其中 $AD = 5$、$DC = 14$、$BC = 10$ 及 $AB = 11$。求四邊形 $ABCD$ 的面積。

   As shown in Figure 1, $ABCD$ is a cyclic quadrilateral, where $AD = 5$, $DC = 14$, $BC = 10$ and $AB = 11$. Find the area of quadrilateral $ABCD$.

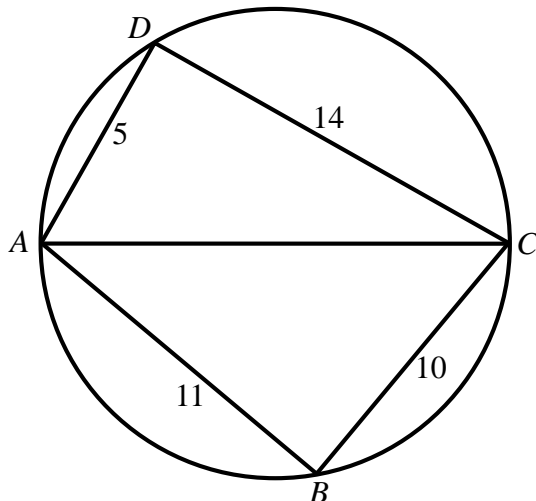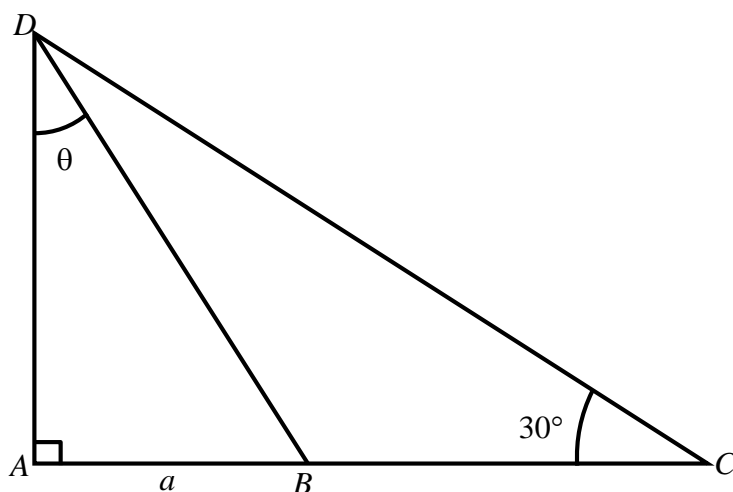   (Modified from 2013/14 Heat Event (Individual) Qu. 5)

Figure 1
圖一

4. 圖二所示為一直角三角形 *ACD*，其中 *B* 是 *AC* 上的點且 *BC* = 2*AB*。已知 *AB* = *a* 及 ∠*ACD* = 30°，求 θ 的值。

   Figure 2 shows a right-angled triangle *ACD* where *B* is a point on *AC* and *BC* = 2*AB*. Given that *AB* = *a* and ∠*ACD* = 30°, find the value of θ.

   (Modified from 2012/13 Heat Event (Individual) Qu. 3)

圖二
Figure 2

5. 學校推出每張面值為 $10、$15、$25 及 $40 的四種賣物券。甲班用若干張 $100 紙幣買了 30 張賣物券，包括其中兩種賣物券各 5 張及另外兩種賣物券各 10 張。問甲班共用了多少張 $100 紙幣購買賣物券？

   A school issues 4 types of raffle tickets with face values $10, $15, $25 and $40. Class A uses several one-hundred dollar notes to buy 30 raffle tickets, including 5 tickets each for two of the types and 10 tickets each for the other two types. How many one-hundred dollar notes does Class A use to buy the raffle tickets? (2010/11 Heat Event (Individual) Qu. 8)

6. 求 2^{2011} 除以 13 的餘數。

   Find the remainder when 2^{2011} is divided by 13. (2010/11 Heat Event (Individual) Qu. 1)

7. $2^{20} \times 25^{12}$ 是一個多少個位的數？

   Find the number of places of the number $2^{20} \times 25^{12}$. (2011/12 Heat Event (Individual) Qu. 4)

8. 甲、乙及丙三人互相傳球。甲首先將球傳出。有多少不同方案使得經過 5 次傳球後，球會回傳給甲？

   A, *B* and *C* pass a ball among themselves. *A* is the first one to pass the ball to the other one. In how many ways will the ball be passed back to *A* after 5 passes?

   (2010/11 Heat Event (Individual) Qu. 6)

9. 已知 a 及 b 為不相同質數，且 $a^2 - 19a + m = 0$ 及 $b^2 - 19b + m = 0$，求 $\dfrac{a}{b} + \dfrac{b}{a}$ 的值。

Given that a and b are distinct prime numbers, $a^2 - 19a + m = 0$ and $b^2 - 19b + m = 0$. Find the value of $\dfrac{a}{b} + \dfrac{b}{a}$. (2011/12 Heat Event (Individual) Qu. 6)

10. 已知 $a_1, a_2, \ldots, a_n, \ldots$ 為一正實數序列，其中 $a_1 = 1$ 及 $a_{n+1} = a_n + \sqrt{a_n} + \dfrac{1}{4}$。求 a_{2015} 的值。

It is given that $a_1, a_2, \ldots, a_n, \ldots$ is a sequence of positive real numbers such that $a_1 = 1$ and $a_{n+1} = a_n + \sqrt{a_n} + \dfrac{1}{4}$. Find the value of a_{2015}. (2014/15 Heat Event (Individual) Qu. 5)

Part B
乙部

11. 若方程 $\left(k^2-4\right)x^2-(14k+4)x+48=0$ 有兩個相異的正整數根，求 k 的值。

    If the quadratic equation $\left(k^2-4\right)x^2-(14k+4)x+48=0$ has two distinct positive integral roots, find the value(s) of k. (2011/12 Heat Event (Individual) Qu. 8)

12. 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.
    (2012/13 Heat Event (Individual) Qu. 5)

13. 在 1 至 2015 之間（包括 1 及 2015 在內）有多少對相異整數的積是 5 的倍數？
    How many pairs of distinct integers between 1 and 2015 inclusively have their products as multiples of 5? (2014/15 Heat Event (Individual) Qu. 1)
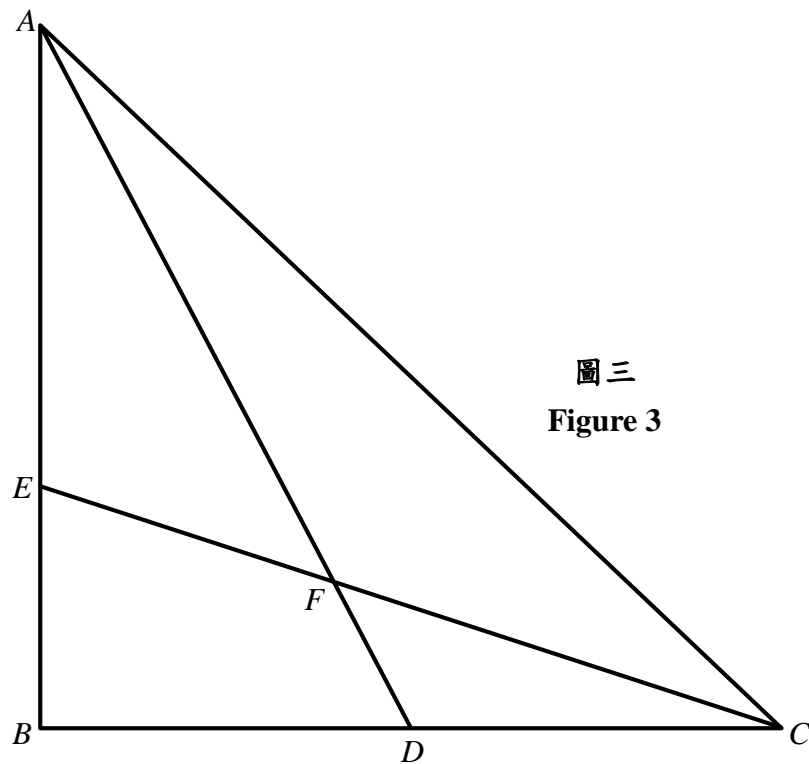
14. 設 x 為實數。求 $\sqrt{x^2-4x+13}+\sqrt{x^2-14x+130}$ 的最小值。

    Let x be a real number. Find the minimum value of $\sqrt{x^2-4x+13}+\sqrt{x^2-14x+130}$.
    (2014/15 Heat Event (Individual) Qu. 9)

15. 如圖三，$AE = 14$，$EB = 7$，$AC = 29$ and $BD = DC = 10$。求 BF^2。

In Figure 3, $AE = 14$，$EB = 7$，$AC = 29$ and $BD = DC = 10$. Find BF^2.

(Modified from 2011/12 Heat Event (Individual) Qu. 10)

圖三
Figure 3

完
END