MathConception 2022

S3

Question Booklet 問題簿

Name:
姓名：

Reg. No.:
登記編號：

Time: 1 hour
Calculators are NOT permitted.

Instructions:

1. DO NOT OPEN THIS QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.
2. Write your name and registration number on the cover of this question booklet.
3. If the information printed on your answer sheet is not correct, please inform the invigilator immediately.
4. Please use a pencil and write your answers neatly ONLY on the answer sheet provided. DO NOT write or draw in the circle next to each answer box. No mark will be given if you failed to follow this instruction.
5. Unless otherwise specified, all answers must be in exact value and in its simplest form. Writing the units for the answers is NOT necessary.
6. Rough-work sheets provided will be collected at the end of the contest but they will not be marked.
7. Diagrams in this question booklet are not necessarily drawn to scale.

限時：1 小時
不允許使用計算機。

比賽須知：

1. 未宣布開始前，切勿翻閱此問題簿。
2. 請在此問題簿封面的適當位置寫上你的姓名及登記編號。
3. 請核對答題紙上列出的資料是否與你相符。如有問題，請舉手。
4. 所有答案必須寫在答題紙內，並須用鉛筆作答。請勿填寫或畫花題號後方的圓圈，否則該題答案將會作廢。
5. 除非題目特別表明，所有答案均不需填寫單位，但必須以準確數值及最簡方式表示。
6. 比賽完結時監考員會收回桌上的草稿紙，但草稿紙上所書寫的任何文字或圖表將不獲評閱。
7. 此問題簿的附圖不一定依比例繪成。

1) Find the arithmetic mean of the data set 35, 55, 25, 45, 15, 65, 85, 75. [3%]

求數據組 35, 55, 25, 45, 15, 65, 85, 75 的算術平均數。

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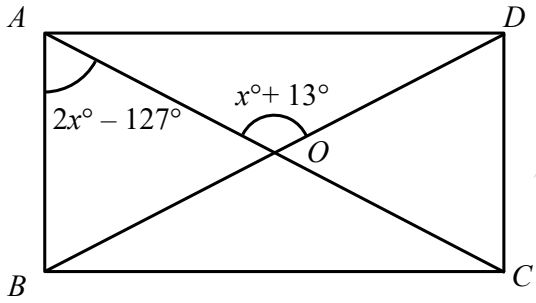
2) If the lengths of two sides of an isosceles triangle are 5 cm and 10 cm, what is the perimeter of the triangle in cm? [3.1%]

如果一個等腰三角形的兩條邊分別長 5 厘米和 10 厘米，這個三角形的周界是多少厘米？

3) *ABCD* is a rectangle where *AOC* and *BOD* are straight lines. Find x. [3.2%]

ABCD 是一個長方形，*AOC* 和 *BOD* 是直線。求 x。



[3.3%]

4) Simplify $\dfrac{17x-6x^2-5}{25-4x^2}$.

化簡 $\dfrac{17x-6x^2-5}{25-4x^2}$。

5) If $\begin{cases} 5x+3y=6 \\ 2x-y=4 \end{cases}$, find $x + y$. [3.4%]

若 $\begin{cases} 5x+3y=6 \\ 2x-y=4 \end{cases}$，求 $x + y$。

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6) If the height of a triangle is increased by 75% and its base is decreased by x%, its area remains unchanged. Find x. [3.5%]

一個三角形的高增加了 75%，底減少了 x%，面積沒有改變。求 x。

7) The lengths of two sides of a right-angled triangle are 12 cm and 13 cm. Find the minimum area of the triangles in cm^2. [3.6%]

一個直角三角形的兩條邊的長度是 12 cm 和 13 cm。該三角形的面積最小是多少 cm^2？

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8) If the base radius of a cylinder and its height are equal in length, and the total surface area of the cylinder is 196π cm^2, find the height of the cylinder in cm. [3.7%]

若圓柱的底半徑與高的長度相等，且圓柱的總表面積為 196π cm^2，圓柱的高是多少 cm？

9) Express $\sqrt{32}+\sqrt{72}$ in the form of $a\sqrt{b}$ where a and b are integers and $b < 7$. [4.8%]

Find $a + b$.

把$\sqrt{32}+\sqrt{72}$寫成$a\sqrt{b}$的形式，其中 a 和 b 都是整數，且 $b < 7$。求 $a + b$。

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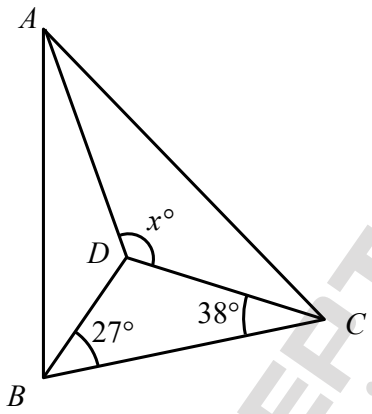
10) If $\frac{1}{2}(2-x) > 8(x-2)$, where x is an integer, find the largest possible value of x. [4.9%]

若$\frac{1}{2}(2-x) > 8(x-2)$且 x 為整數，求 x 的最大可能值。

11) In the figure, D is the incentre of ΔABC. If $\angle CBD = 27°$ and $\angle BCD = 38°$, find x. [5.1%]

在圖中，D 是ΔABC 的內心。已知$\angle CBD = 27°$ 和$\angle BCD = 38°$，求 x。



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12) If $2^{2022} + 2^{2023} + ... + 2^{2030} + 2^{2031} = x \cdot 2^{2022}$, find x. [5.2%]

若$2^{2022} + 2^{2023} + ... + 2^{2030} + 2^{2031} = x \cdot 2^{2022}$，求 x。

13) $32(\frac{11}{2501}-\frac{235}{2501})+\frac{8439}{2501}=?$ [6.3%]

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14) If today is Wednesday, which day of the week will it be after 1567^{2022} days? [6.4%]

設今日是星期三，1567^{2022} 天後是星期幾？

15) If $x = 12 - \cfrac{4}{4 - \cfrac{12}{12 - \cfrac{4}{4 - \cfrac{12}{12 - \ldots}}}}$ where $x - 7 > 0$, find x. [6.5%]

若 $x = 12 - \cfrac{4}{4 - \cfrac{12}{12 - \cfrac{4}{4 - \cfrac{12}{12 - \ldots}}}}$，且 $x - 7 > 0$，求 x。

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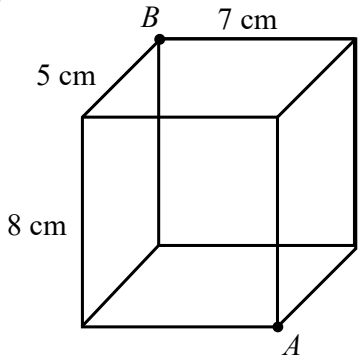
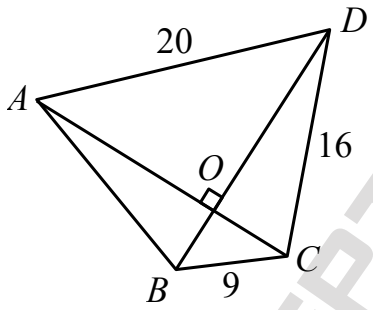
16) An ant crawls inside a sealed cuboid glass box. If it moves from point A to point B through the shortest path, what is the distance travelled by the ant in cm? [6.6%]

一隻螞蟻在長方體密封玻璃盒內爬行。如果螞蟻通過最短路徑從 A 點移動到 B 點，螞蟻爬行的距離是多少厘米？



17) The diagonals AC and BD of a quadrilateral $ABCD$ are perpendicular to each other at O. It is given that $AD = 20$, $BC = 9$ and $CD = 16$. Find the length of AB. [6.7%]

四邊形 $ABCD$ 的對角線 AC 與 BD 互相垂直，並相交於 O。已知 $AD = 20$，$BC = 9$ 及 $CD = 16$。求 AB 的長度。



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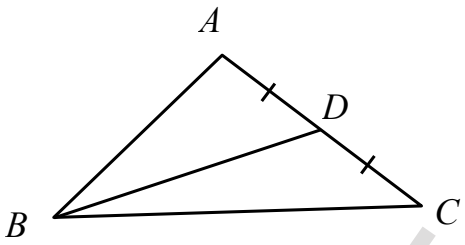
18) Find the smallest positive integer x such that $177x \equiv 1 \pmod{160}$. [6.8%]

已知 $177x \equiv 1 \pmod{160}$，求 x 的最小正整數解。

19) In ΔABC, D is the mid-point of AC. Find $\dfrac{\tan\angle ABC}{\tan\angle CBD}-\dfrac{\tan\angle ABC}{\tan\angle ACB}$. [6.9%]

已知 D 是ΔABC 的邊 AC 的中點，求$\dfrac{\tan\angle ABC}{\tan\angle CBD}-\dfrac{\tan\angle ABC}{\tan\angle ACB}$ 。



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20) If a, b and c are real numbers such that $ab \neq 0$ and $ab-c^2=\dfrac{(a+b)^2}{4}$, find [7%]

$\dfrac{a^2+b^2}{4ab}$.

已知 a、b、和 c 是實數，且 $ab \neq 0$ 及 $ab-c^2=\dfrac{(a+b)^2}{4}$ ，求$\dfrac{a^2+b^2}{4ab}$ 。

End of paper
全卷完

MATH 數學·思維大激鬥 CONCEPTITION

REG NO		S3
NAME		
GROUP		
SEAT		

ANSWER SHEET

	ANSWER			ANSWER	
1	50	○	11	117	○
2	25	○	12	1023	○
3	89	○	13	$\frac{31}{61}$	○
4	$\frac{3x-1}{2x+5}$	○	14	四 / 星期四 / Thursday	○
5	$\frac{10}{11}$ / $0.\dot{9}\dot{0}$	○	15	$\sqrt{13}+7$	○
6	$\frac{300}{7}$ / $42\frac{6}{7}$	○	16	$4\sqrt{13}$	○
7	30	○	17	15	○
8	7	○	18	113	○
9	12	○	19	2	○
10	1	○	20	$\frac{1}{2}$	○