

# 基北區臺北市立西松高級中學

## 111 學年度高級中等學校特色招生考試分發入學測驗

### 「資料判讀」測驗評分向度及參考答案

2022 Taipei Municipal XiSong High School Special Enrollment Program Examination for Taipei and Keelung Area  
Assessment Criteria and Solutions– Source Analysis

#### 社會科 Individuals and Societies

向度 A：認識與理解	
1-3	運用了有限的相關術語；用極少的描述和 / 或例證，展示出對內容和概念基本的認識和理解。 Uses limited relevant terminology; demonstrates basic knowledge and understanding of content and concepts with minimal descriptions and/or examples.
4-6	準確和恰當地運用了一些術語；通過尚令人滿意的描述、解釋和例證，展示出對內容和概念尚充分的認識和理解。 Uses some terminology accurately and appropriately; demonstrates adequate knowledge and understanding of content and concepts through satisfactory descriptions, explanations and examples.
7-9	準確和恰當地運用了一系列術語；通過準確的描述、解釋和例證，展示出對內容和概念充實的認識與理解。 Uses a range of terminology accurately and appropriately; demonstrates substantial knowledge and understanding of content and concepts through accurate descriptions, explanations and examples.
10-12	一貫有效地運用了廣泛的術語；通過準確的描述、解釋和例證，展示出對內容和概念有出色的認識和理解。 Consistently uses a wide range of terminology effectively; demonstrates excellent knowledge and understanding of content and concepts through thorough, accurate descriptions, explanations and examples.
13-15	優秀地運用了廣泛的術語；通過非常準確的描述、解釋和例證，展示出對內容和概念有卓越的認識和理解。 Excellently uses a wide range of terminology effectively; demonstrates extraordinary knowledge and understanding of content and concepts through thorough, accurate descriptions, explanations and examples.

向度 B：交流	
1-3	<p>在運用適當受眾和意圖的方式交流信息和思想觀點方面僅做了有限的嘗試；根據具體的交流形式，採用有限的方法組織編排了信息和思想觀點。</p> <p>Communicates information and ideas in a limited way, using a style that is limited in its appropriateness to the audience and purpose; structures information and ideas according to the specified format in a limited way.</p>
4-6	<p>採用基本適合受眾和意圖的方式，尚令人滿意地交流了信息和思想觀點；根據具體的交流形式，採用了基本適當的方法編排信息和思想觀點。</p> <p>Communicates information and ideas satisfactorily by using a style that is somewhat appropriate to the audience and purpose; structures information and ideas in a way that is somewhat appropriate to the specified format</p>
7-9	<p>採用通常適合受眾和意圖的方式，準確地交流了信息和思想觀點；根據具體的交流形式，通常採用了適當的方法編排信息和思想觀點。</p> <p>Communicates information and ideas accurately by using a style that is mostly appropriate to the audience and purpose; structures information and ideas in a way that is mostly appropriate to the specified format.</p>
10-12	<p>採用通常適合受眾和意圖的方式，準確地交流了信息和思想觀點；根據具體的交流形式，通常採用了適當的方法編排信息和思想觀點。</p> <p>Communicates information and ideas effectively and accurately by using a style that is completely appropriate to the audience and purpose; structures information and ideas in a way that is completely appropriate to the specified format.</p>
13-15	<p>採用通常適合受眾和意圖的方式，優秀地交流了信息和思想觀點；根據具體的交流形式，總是採用適當的方法編排信息和思想觀點。</p> <p>Communicates information and ideas excellently and accurately by using a style that is completely appropriate to the audience and purpose; structures information and ideas in a way that is completely appropriate to the specified format.</p>

向度 C：批判性思考	
1-4	<p>根據資料之來源和目的，描述了為數不多的原始資料 / 數據，認識到了其表面價值和局限性；識別了各種不同的觀點，及其非常有限的內涵。</p> <p>Describes a limited number of sources/data in terms of origin and purpose and recognises nominal value and limitations; identifies different perspectives and minimal implications.</p>

向度 C：批判性思考	
5-8	<p>根據資料之來源和目的, 對原始資料 / 數據進行了分析和 / 或評價, 認識到了它們的一些價值和局限性; 解讀了不同的觀點, 及其某些內涵。</p> <p>Analyses and/or evaluates sources/data in terms of origin and purpose, recognising some value and limitations; interprets different perspectives and some of their implications.</p>
9-12	<p>根據資料之來源和目的, 有效地分析和評價了一系列原始資料 / 數據, 通常認識到了它們的價值和局限性; 解讀了不同的觀點及其內涵。</p> <p>Effectively analyses and/or evaluates sources/data in terms of origin and purpose, recognising value and limitations; interprets different perspectives and some of their implications.</p>
13-16	<p>根據資料之來源和目的, 有效地分析和評價了原始資料 / 數據, 一貫認識到了它們的價值和局限性; 透徹地解讀了一系列不同的觀點及其內涵。</p> <p>Effectively analyses and evaluates a range of sources/data in terms of origin and purpose, usually recognising value and limitations; interprets different perspectives and their implications.</p>
17-20	<p>根據資料之來源和目的, 優秀地分析和評價了原始資料 / 數據, 自始至終認識到了它們的價值和局限性; 優秀地解讀了全方面的觀點及其內涵。</p> <p>Excellently analyses and evaluates a range of sources/data in terms of origin and purpose, thoroughly recognising value and limitations; thoroughly interprets a range of different perspectives and their implications.</p>

**第 1 題：共 10 分**

- (1) (i)  $1 \leq m \leq 12$  且  $24 \leq d \leq 31$ ，其中  $m$ 、 $d$  皆為正整數。

首先，因為 24 不是直角三角形的斜邊，且  $1 \leq m \leq 12$ ，所以  $d > 24$ ，

且  $d^2 = m^2 + 24^2$ ，其中  $m$ 、 $d$  皆為正整數。 (M1)

因此  $24^2 + 1^2 \leq d^2 \leq 24^2 + 12^2$ ，即  $24^2 < d^2 \leq 720$ ，

故  $24 < d \leq \sqrt{720} = 12\sqrt{5} < 27$ 。 (A2)

- (ii) 因為  $1 \leq m \leq 12$ ，所以  $d > 24$ ，其中  $m$ 、 $d$  皆為正整數，

所以只需要在關係式  $d^2 = m^2 + 24^2$  中檢驗  $d = 25, 26$  兩種情況。 (M2)

當  $d = 25$  時， $m = 7$ 。

當  $d = 26$  時， $m = 10$ 。

故 2024 年存在兩天畢氏定理日，分別為 7 月 25 日以及 10 月 26 日。 (A2)

- (2) 由問題(1)我們得知兩組畢氏數組，分別為 (7,24,25)、(10,24,26)。 (M1)

因此 2025 年的畢氏定理日為 7 月 24 日， (A1)

2026 年的畢氏定理日為 10 月 24 日。 (A1)

**第 2 題：共 15 分**

- (1)  $120^\circ$  (A1)

- (2) (i) 因為正六邊形的每個內角皆為  $120^\circ$ ，所以 3 個正六邊形可以完全密合，

以達成完整鋪設平面的目的。 (M1A1)

- (ii) 已知正  $n$  多邊形的內角為  $\frac{(n-2)}{n} \times 180^\circ = 180^\circ - \frac{360^\circ}{n}$  度。

若正整數  $k$  滿足  $(180^\circ - \frac{360^\circ}{n}) \times k = 360^\circ$ ，則可達到完整鋪設的要求。 (M1A2)

- (iii) 考慮以下三種正多邊形：

① 當  $n = 3$  時，

因為正三邊形每個內角皆為  $60^\circ$ ，所以 6 塊正三邊形可以完全密合，

以達成完整鋪設平面的目的。 (M1A1)

② 當  $n=4$  時，

因為正四邊形每個內角皆為  $90^\circ$ ，所以 4 塊正四邊形可以完全密合，  
以達成完整鋪設平面的目的。

(M1A1)

③ 當  $n=5$  時，

因為正五邊形每個內角皆為  $108^\circ$ ，但  $\frac{360}{108}$  不是整數，因此正五邊形無法達成  
完整鋪設。

(M1A1)

(3) 設等腰直角三角形的短邊為  $x$ 。

則正八邊形的邊長，也是等腰直角三角形的斜邊，為  $16-2x$ 。

由等腰直角三角形邊長比可得  $x:(16-2x)=1:\sqrt{2}$ ，

(M1)

因此  $x=16-8\sqrt{2}$ ，所求  $16-2x=16\sqrt{2}-16$ 。

(A2)

### 第 3 題：共 25 分

- (1) 根據文本，非金屬燃燒後質量變輕、金屬燃燒後質量變重，表示可能存在不同的燃素（質量為正或質量為負）。
- (2) 拉瓦節的實驗發現，燃燒並不是釋放出某些物質，而是和空氣中的物質結合，故在密閉容器裡燃燒後，可發現空氣的體積減少了五分之一。且在真空密封容器加熱的鉛，在打開容器後質量才迅速增加，也證明燃燒必須要跟空氣中的物質結合，而不是釋出燃素。
- (3) 熱質說將熱視為一種物質，不會憑空出現或消失，但在摩擦後卻會生成熱，表示熱可以在運動中被產生，而且還是無限量的。
- (4) 熱質說將熱視為一種物質，不會憑空出現或消失；但在熱動說中，熱可經由運動生成，而且還是無限量的。在焦耳的熱功當量實驗中，找到運動與熱互相轉換的數據，正式確定熱質說被捨棄。
- (5) 在物質達到狀態改變前，物質的溫度並不會改變，表示溫度其實並不直接等於熱，所以答案應為固液共存或液氣共存的線段。
- (6) (i)  $T_1$  為固液共存的點，應為熔點、 $T_2$  為液氣共存的點，應為沸點。  
(ii) K 的物理變化為凝結。  
(iii) 定壓下降低溫度後、再降低壓力；定溫下降低壓力後、再降低溫度。
- (7) 當砧碼落下時，會釋放出位能轉動扇葉，轉換成動能，在摩擦的過程中，再轉換成熱能。

**Question 1. [Maximum mark: 10]**

- (1) (i) First, the hypotenuse is not 24 and  $1 \leq m \leq 12$ , so we have that  $d > 24$

And  $d^2 = m^2 + 24^2$ , where both  $m$  and  $d$  are positive integers. (M1)

Therefore  $24^2 + 1^2 \leq d^2 \leq 24^2 + 12^2$ ,  $24^2 < d^2 \leq 720$ , so

$$24 < d \leq \sqrt{720} = 12\sqrt{5} < 27. \quad (\text{A2})$$

- (ii) Since  $1 \leq m \leq 12$  and  $d > 24$ , where both  $m$  and  $d$  are positive integers,

we only have to check  $d = 25, 26$  into the equation  $d^2 = m^2 + 24^2$ . (M2)

When  $d = 25$ ,  $m = 7$ .

When  $d = 26$ ,  $m = 10$ .

So there are two Pythagorean Theorem Days in 2024,

as 7/25/2024 and 10/26/2024 respectively. (A2)

- (2) From the question a, we have  $7^2 + 24^2 = 25^2$  and  $10^2 + 24^2 = 26^2$ , (M1)

so the Pythagorean Theorem Day in 2025 is 7/24/2025 and (A1)

the Pythagorean Theorem Day in 2026 is 10/24/2026. (A1)

**Question 2. [Maximum mark: 15]**

- (1)  $120^\circ$  (A1)

- (2) (i) Since each interior angle of a regular hexagon is  $120^\circ$ ,

three regular hexagons would fit together perfectly. (M1A1)

- (ii) Since each interior angle of a regular  $n$ -sided polygon is  $\frac{(n-2)}{n} \times 180^\circ = 180^\circ - \frac{360^\circ}{n}$ .

When  $(180^\circ - \frac{360^\circ}{n}) \times k = 360^\circ$  for  $k$  is positive integer,

then the regular  $n$ -sided polygon can tessellate the wall. (M1A2)

- (iii) Consider the following three cases:

- ① When  $n = 3$ ,

each interior angle of a regular triangle is  $60^\circ$ ,

so 6 pieces regular triangle would fit together perfectly. (M1A1)

- ② When  $n = 4$ ,

each interior angle of a regular quadrilateral is  $90^\circ$ ,

so 4 pieces regular triangle would fit together perfectly. (M1A1)

③ When  $n = 5$ ,

each interior angle of a regular pentagon is  $108^\circ$ ,

however  $\frac{360}{108}$  is not an integer,

so regular pentagon would not fit together perfectly. (M1A1)

(3) Suppose the shorter side of the isosceles right-angled triangle is  $x$ .

Then the length of the regular octagon, also the hypotenuse of the isosceles right-angled triangle, is  $16 - 2x$ .

The ratio of three sides of an isosceles right-angled triangle satisfies  $x : (16 - 2x) = 1 : \sqrt{2}$ . (M1)

Hence  $x = 16 - 8\sqrt{2}$  and the length of a side of an octagon is  $16 - 2x = 16\sqrt{2} - 16$  cm. (A2)

### **Question 3. [Maximum mark 25]**

- (1) According to the article, non-metal becomes lighter after combustion and metal becomes heavier; thus there are different phlogiston.
- (2) From Lavoisier's experiment, combustion is not releasing substance. Combustion is the combination with the substance from air since about one-fifth of the air in the flask was removed during calcination and the mass of heating lead in a closed container increased rapidly until the container was opened.
- (3) In the caloric theory, heat is a substance. In the kinetic theory of heat, friction will generate heat.
- (4) In Joule's experiment, there is a relationship of energy transfer between motion and heat. It was viewed as the overturn of the caloric theory.
- (5) The temperature will not change until the physical states change. This attempts to understand that heat and temperature are seemingly decoupled. The answer is the region of co-exist physical states.
- (6) (i)  $T_1$  is melting point and  $T_2$  is boiling point.  
(ii) K is condensation.  
(iii) Cooling at constant pressure then decreasing the pressure. Decreasing at constant temperature then cooling the system.
- (7) It will release potential energy when the weights are dropping. The turning paddle has kinetic energy and transfer to heat during friction.