2024-2025 中三
下學期考試
數學

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2024 – 2025

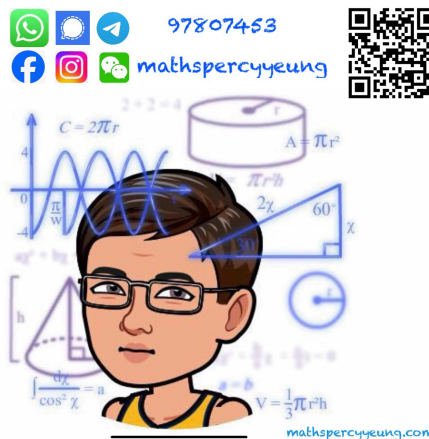中三級下學期考試

數學

試題答題簿

本試卷中文試題必須用中文作答

英文試題必須用英文作答

二零二五年六月九日
一小時四十五分完卷

(上午八時十五分至上午十時)

考生須知

(一) 宣布開考後,考生須首先在封面的適當位置填寫學生姓名、班別及學號。

(二) 本試卷分甲、乙及丙三部分,考生**必須全部作答**。甲部須用 HB 鉛筆作答在多項選擇題答題紙上,否則可被扣分。
注意:每題只可**填畫一個答案**;若填畫兩個或多個答案,則該題**不給分**。

(三) 乙部及丙部各題的答案須寫在**本試題答題簿中預留空位內**,並須清楚列明計算步驟。

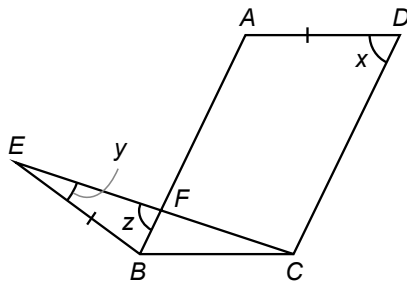(四) 除特別指明外,須詳細列出所有算式;答案須以真確值或取近似值的三位有效數字表示。

(五) 本試卷的附圖不一定依比例繪成。

部 份	分 數
甲部	/30
乙（31 – 33）	
乙（34 – 41）	
乙部	/40
丙部	/30
全卷	/100

甲部 (30 分)

本部各題全答，選擇最佳答案並須寫在多項選擇題答題紙上。

1. 一杯橙汁的容量為 450 mL，準確至最接近的 5 mL。 求百分誤差，答案準確至 2 位有效數字。
   A. 0.28%
   B. 0.56%
   C. 1.1%
   D. 2.2%

2. 若 $(x+2)(x+A)-4 \equiv x^2+B$, 則 $B=$
   A. -8。
   B. -4。
   C. -2。
   D. 0。

3. 若 $x-2y+7=2x+7y=3$, 則 $x=$
   A. -6。
   B. -2。
   C. -1。
   D. 1。

4. 以科學記數法表示 $\dfrac{7.336\times10^{-3}}{1.4\times10^{-7}}$ 。
   A. 5.24×10^{-10}
   B. 5.24×10^{-4}
   C. 5.24×10^{4}
   D. 5.24×10^{10}

5. 以二進數表示 $1\times2^8+1\times2^6+1\times2^5+22$。
   A. 10111011_2
   B. 11110110_2
   C. 101100110_2
   D. 101110110_2

6. 下列哪個數式的其中一個因式是 $3x-1$？
   A. $9x^2+1$
   B. $3x^2-23x-8$
   C. $12x^2+x-1$
   D. $(9x^2-6x+1)-21x+7$

7. 若 $p>q>0$, 下列哪項必為正確？
   I. $\dfrac{q}{p}>1$
   II. $pq>q^2$
   III. $-p<-q$

   A. 只有 I
   B. 只有 III
   C. 只有 I 及 II
   D. 只有 II 及 III

8. 解不等式 $3(x+8)\geq8(x-2)$。
   A. $x\geq-8$
   B. $x\leq-8$
   C. $x\geq8$
   D. $x\leq8$

9. In the figure, *ABCD* is a parallelogram. *AFB* and *EFC* are straight lines. It is given that $AD = EB$.
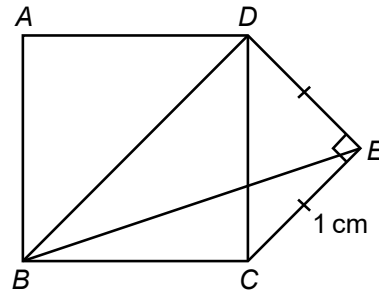

Which of the following must be correct?
A. $x + y = z$
B. $y + z = x$
C. $x + y + z = 180°$
D. $x + 2y + z = 180°$

10. Ken deposits $6 000 in a bank at an interest rate of 6% p.a. for 2 years, compounded half-yearly. Find the interest obtained correct to the nearest dollar.

A. $365
B. $742
C. $753
D. $1 506

11. If Mr. Wong's salaries tax charged at progressive rates is $5 040, consider the salaries tax rates as follows, find his net chargeable income.

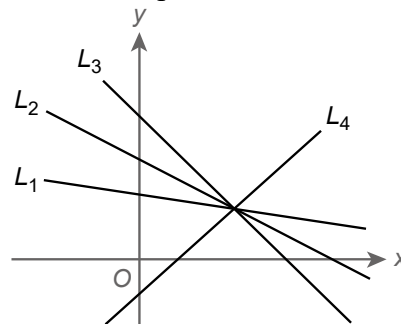| Net chargeable income	Tax rates
On the first $40 000	2%
On the next $40 000	7%
On the next $40 000	12%
Remainder	17%

A. $42 000
B. $92 000
C. $102 000
D. $252 000

12. In the figure, *ABCD* is a square and $\triangle CDE$ is a right-angled isosceles triangle. Find *BE*.

A. $\sqrt{3}$ cm
B. 2 cm
C. $\sqrt{5}$ cm
D. $(\sqrt{2} + 1)$ cm

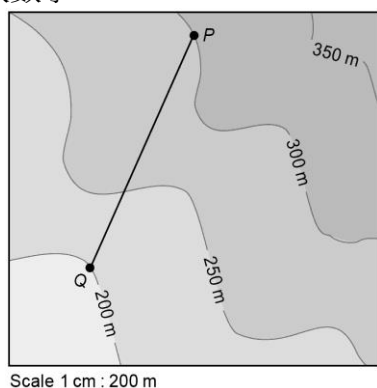13. In the figure, which straight line has the smallest slope?

A. L_1
B. L_2
C. L_3
D. L_4

14. Find the coordinates of the intersection of the *y*-axis and the straight line passing through points $P(-3, -14)$ and $Q(2, 6)$.
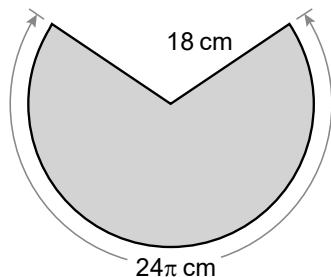A. $(0, -4)$
B. $(0, -2)$
C. $(0, -1)$
D. $(0, 2)$

15. $\dfrac{1}{\tan^2(90°-\theta)}+\dfrac{\sin^2\theta}{\sin^2(90°-\theta)}=$

    A. $2\cos^2\theta$。

    B. $2\tan^2\theta$。

    C. 1。

    D. 0。

16. 圖中地圖的比例尺為 $1\,\text{cm}:200\,\text{m}$。已知 $PQ=4\,\text{cm}$。求 PQ 的傾角，準確至 3 位有效數字。

Scale 1 cm : 200 m

    A. $82.9°$

    B. $26.6°$

    C. $14.0°$

    D. $7.13°$

17. The sector in the figure is rolled up into a right circular cone. Find the volume of the circular cone correct to 3 significant figures.
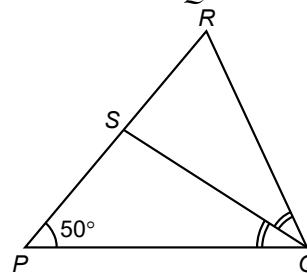

18 cm

24π cm

    A. $2\,020\,\text{cm}^3$

    B. $2\,710\,\text{cm}^3$

    C. $4\,070\,\text{cm}^3$

    D. $6\,070\,\text{cm}^3$

18. Two fair dice are rolled. Find the probability that the sum of numbers obtained from the two dice is a multiple of 6.

    A. $\dfrac{1}{36}$

    B. $\dfrac{5}{36}$

    C. $\dfrac{1}{6}$

    D. $\dfrac{2}{9}$

19. In the figure, PSR is a straight line. QS is the angle bisector of $\angle PQR$, $PQ = PR$ and $\angle QPR = 50°$. Find $\angle QSR$.
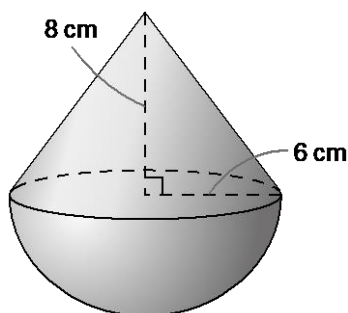

    A. $32.5°$

    B. $65°$

    C. $82.5°$

    D. $115°$

20. 以下表格為 80 個直角棱柱體的體積分佈。求直角棱柱體體積的中位數。

體積 (cm^3)	898	899	900	901	902
頻數	26	15	16	15	8

    A. $898\,\text{cm}^3$

    B. $899\,\text{cm}^3$

    C. $899.5\,\text{cm}^3$

    D. $899.55\,\text{cm}^3$

21. The figure shows a solid formed by a right circular cone and a hemisphere. The radius of the hemisphere is 6 cm and the height of the circular cone is 8 cm. Find the total surface area of the solid.

    A. $132\pi \, \text{cm}^2$
    B. $168\pi \, \text{cm}^2$
    C. $204\pi \, \text{cm}^2$
    D. $240\pi \, \text{cm}^2$

22. 若由 B 測得 A 的真方位角為$108°$，則由 A 測得 B 的真方位角為
    A. $018°$。
    B. $162°$。
    C. $288°$。
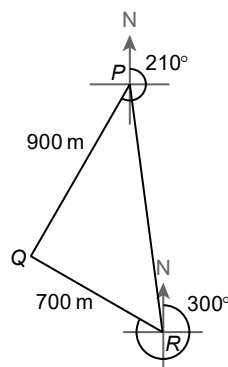   D. $338°$。

23. 若 $2^{x+2}=\left(\dfrac{1}{4}\right)^{-2x-7}$，求 x 的值。
    A. -4
    B. -3
    C. -2
    D. 4

24. The weight of Winnie increased by 2% from January to February, and then decreased by 5% from February to March. Find the percentage change in the weight of Winnie from January to March.
    A. -3.1%
    B. -3%
    C. -0.999%
    D. -0.969%

25. 圖中，由 P 及由 R 測得 Q 的真方位角分別為 $210°$ 及 $300°$。 $PQ=900$ m 及 $QR=700$ m。求由 R 測得 P 的真方位角，準確至最接近的度。
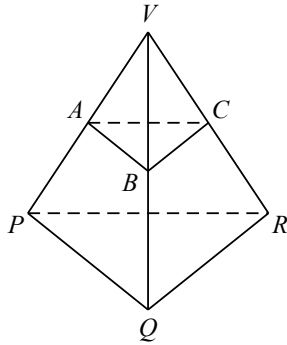

    A. $171°$
    B. $172°$
    C. $351°$
    D. $352°$

26. A copper sphere of volume $276\pi \, \text{cm}^2$ is melted and recast into three smaller spheres, where the ratio of their radii is $1 : 3 : 4$. Find the volume of the largest sphere among them.
    A. $192\pi \, \text{cm}^3$
    B. $81\pi \, \text{cm}^3$
    C. $27\pi \, \text{cm}^3$
    D. $3\pi \, \text{cm}^3$

27. In the figure, the volumes of the pyramids *VABC* and *VPQR* are 27 cm³ and 64 cm³ respectively. Planes *ABC* and *PQR* are parallel.
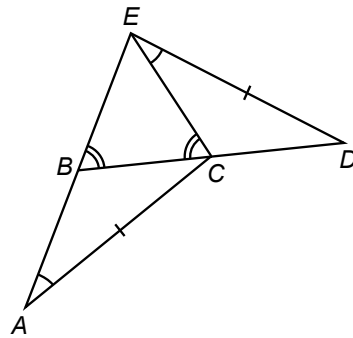

Area of ΔABC : Area of ΔPQR =

A. $\sqrt{27} : \sqrt{64}$.

B. $\sqrt{37} : \sqrt{64}$.

C. 3 : 4.

D. 9 : 16.

28. A card is drawn randomly from a deck of 52 playing cards. The probability of drawing a face card(i.e. J, Q or K) is

A. $\dfrac{1}{52}$.

B. $\dfrac{1}{13}$.

C. $\dfrac{3}{13}$.

D. 1.

29. 中二級男學生智商的平均數、中位數及眾數分別為 x 、 y 及 z 。 若中二級女學生智商的平均數、中位數及眾數也分別為 x 、 y 及 z，以下哪項必為正確？

   I.   中二級學生智商的平均數為 x。

   II. 中二級學生智商的中位數為 y。

   III. 中二級學生智商的眾數為 z。

A. I only

B. I and II only

C. II and III only

D. I, II and III

30. In the figure, *ABE* and *BCD* are straight lines.

Which of the following must be true?

   I.   *EC* is a median of ΔBED.

   II. *CB* is a median of ΔAEC.

   III. *AE = BD*

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

乙部 (40 分)

31. 把公式 $x = \dfrac{2y}{5+3y}$ 的主項變換為 y。 (3 分)

32. 解聯立方程 $\begin{cases} 2x + 3y = 19 \\ 6x - 5y = 15 \end{cases}$。 (3 分)

33. 大帽山的高度測量為 1 000 m。若量度的百分誤測為 5%，求大帽山最小可能的高度。

(3 分)

34. 化簡 $\dfrac{(2xy^2)^{-4}}{x^3}$，並以正指數表示答案。 (3 分)

35. 因式分解
    (a) $6p^2 + 7pq - 3q^2$，
    (b) $6p^2 + 7pq - 3q^2 - 6p - 9q$。

    (3 分)

36. (a) 解不等式 $\dfrac{4x+1}{5} + 3 \geq x$，並在數線上表示不等式的解。
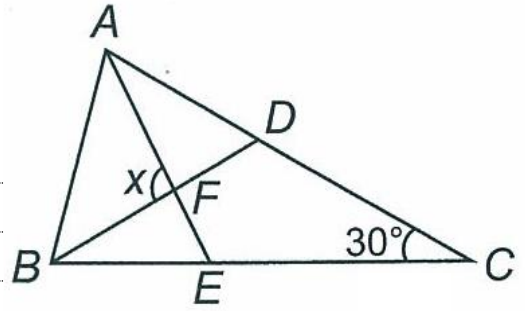
    (b) 有多少個非負整數滿足不等式 $\dfrac{4x+1}{5} + 3 \geq x$？

    (4 分)

37. 溫室中盆栽花的平均高度為 27 cm。若再放入一盆高度為 23 cm 的花，盆栽花的平均高度會減少 0.04 cm。求溫室中原有盆栽花的數量。 (3 分)

38. In the figure, ADC is a straight line. $\angle ABD = 15°$, $\angle BDC = 45°$ and $BC = 10 \text{ cm}$. Find the length of AD in surd form. (4 marks)

39. In the figure, ADC, BEC, AFE and BFD are straight lines. BD and AE are angle bisectors of $\angle ABC$ and $\angle BAC$ respectively. Given that $AC = BC$.
    (a) Find $\angle ABC$.
    (b) Find x.

    (4 marks)

40. Wesley deposits $73 000 in Wealthy Bank for 1 year and he will receive a simple interest of $3 285.
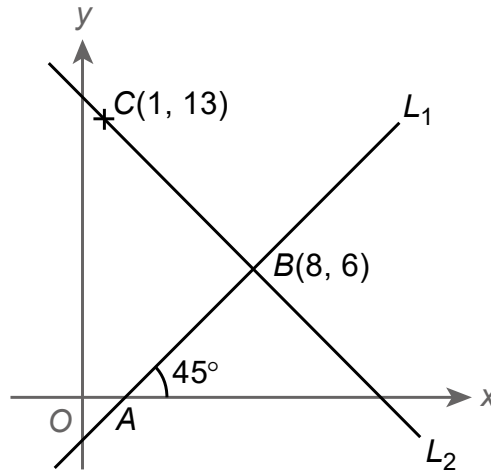   (a) Find the interest rate per annum.
    (b) If Wesley withdraws the amount and deposits it in Fortune Bank at the same interest rate per annum for 3 years but the interest is compounded every 2 months, find the interest obtained in these 3 years. (Give your answer correct to the nearest dollar.)

    (5 marks)

41. In the figure, $ABCD$ is a rectangle. E is a point lying on BC such that $\angle AEB = \angle BAC$.

(a) Prove that $\triangle ADC \sim \triangle ABE$.

(b) Given that $BE = 16$ cm and $EC = 9$ cm, find the area of $\triangle AEC$.

(5 marks)

42. In the figure, straight line L_1 with the inclination of 45° cuts the x-axis at A. Straight line L_2 passes through point C(1, 13) and cuts L_1 at B(8, 6).
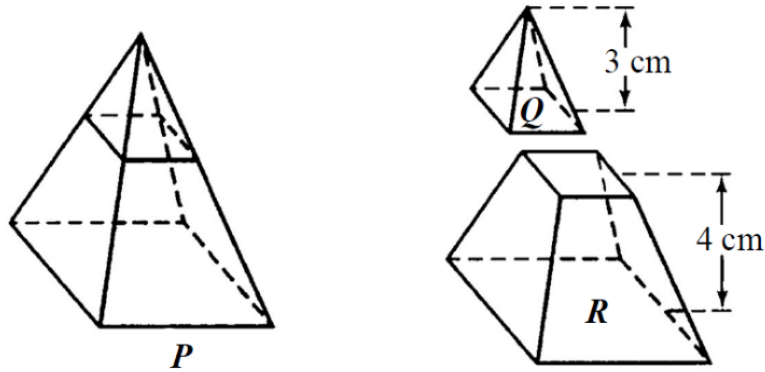

(a) Prove that $L_1 \perp L_2$. (3 marks)

(b) Find the coordinates of A. (2 marks)

(c) (i) If straight line L_3 which is parallel to L_2 passes through the mid-point of AB and cuts the x-axis at point D, find the coordinates of D.

(ii) Find the area of $\triangle ACD$.

(5 marks)

43. In the figure, a pyramid P with a square base is divided into a small pyramid Q similar to P and a frustum R. The heights of Q and R are 3 cm and 4 cm respectively.

(a) Joe claims that $\dfrac{\text{volume of } Q}{\text{volume of } R} = \dfrac{27}{64}$. Do you agree? Explain your answer.　　　(4 marks)

(b) If the total surface area of all lateral faces of Q is 81 cm^2, find the total surface area of all lateral faces of R.　　　(3 marks)

(c) It is given that the length of a side of the base of P is 14 cm. Using the result of (a), or otherwise, find the volume of R.　　　(3 marks)

44. The exam scores of the students in Class A are shown as follows:

$$36 \quad 47 \quad 31 \quad 69 \quad 35 \quad 47 \quad 47 \quad 68 \quad 34 \quad 69$$

(a) (i) Find the mean, median and mode of the exam scores of the students in Class A.

(ii) If a student is selected from Class A, find the probability that the exam score of the student selected is not less than 47.

(4 marks)

(b) The stem-and-leaf diagram below shows the distribution of the exam scores of the students of Class B. It is given that the mean and the median of this distribution is 41 and 38 respectively.

Stem (tens)	Leaf (units)			
2	0	5	6	7
3	3	3	a	
4	3			
5	1	2	9	
6	0	b		

(i) Find a and b.

(ii) The table below shows the values of book coupons teachers will give to the students based on their exam scores.

Exam Scores	60 or higher	greater than 40 but less than 60	40 or below
Values of Book Coupons	$100	$50	$0

If a student is randomly selected from Class B, find the expected value of the book coupons teachers will give to that student.

(iii) The students whose exam scores are greater than 50 can join a mathematics competition. One student is selected from Class A and Class B each respectively to join the competition. Find the probability that the sum of the exam scores of the two selected students is greater than 130.

(6 marks)

試 卷 完