There are 30 questions in Section A and 15 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.
甲部共 30 題，乙部共 15 題。
本試卷的附圖不一定依比例繪成。
選出每題最佳的答案

Section A 甲部

1. $(3m^3)^3 m^3 =$

A. $3m^9$
B. $9m^{12}$
C. $27m^9$
D. $27m^{12}$

2. If $ax+y=1$ and $by+x=1$, then $x=$
若$ax+y=1$及$by+x=1$，則$x=$

A. $\dfrac{1-b}{1-ab}$
B. $\dfrac{1+b}{1-ab}$
C. $\dfrac{1-ab}{1-b}$
D. $\dfrac{1-ab}{1+b}$

3. $m^2-n^2-mp+np+mq-nq=$

A. $(m-n)(m+n-p+q)$
B. $(m-n)(m+n+p-q)$
C. $(m+n)(m-n-p+q)$
D. $(m+n)(m-n+p-q)$

4. Let m and n be constants. If $m(x-3)^2+n(x+1)^2 \equiv x^2-38x+41$, then
設 m 及 n 均為常數。若 $m(x-3)^2+n(x+1)^2 \equiv x^2-38x+41$，則

A. $m=-4,\ n=5$
B. $m=-1,\ n=4$
C. $m=5,\ n=-4$
D. $m=5,\ n=-1$

5. When $2023x^{2023}+2022x^{2022}+\cdots+2x^2+x$ is divided by $x+1$, the remainder is
當 $2023x^{2023}+2022x^{2022}+\cdots+2x^2+x$ 除以 $x+1$ 時，餘數為

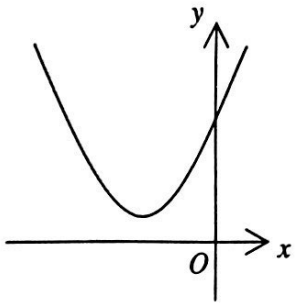
A. -1012
B. -1
C. 1
D. 1012

6. Let k be a constant. If the quadratic equation $5x^2+2kx-k=0$ has non-real roots, find the range of k
設 k 為一常數。若二次方程 $5x^2+2kx-k=0$ 有非實數根，求 k 的範圍。

A. $k<-5$
B. $k>0$
C. $-5<k<0$
D. $k<-5$ or $k>0$ [$k<-5$ 或 $k>0$]

7. The figure shows the graph of $y = ax^2 + 2x - b$ has no x-intercepts, where a and b are constants. Which of the following is/are true?
圖中顯示 $y = ax^2 + 2x - b$ 的圖像沒有 x 截距，其中 a 及 b 為常數。以下哪項是正確的？

I. $a > 0$
II. $b < 0$
III. $ab < -1$



A. I and II only [只有 I 及 II]
B. I and III only [只有 I 及 III]
C. II and III only [只有 II 及 III]
D. I, II and III [I、II 及 III]

8. The smallest integer that satisfies both inequalities $-5x \geq -9$ and $4x + 10 > -6$ is
能同時滿足不等式 $-5x \geq -9$ 及 $4x + 10 > -6$ 的最小整數為

A. -5.
B. -4.
C. -3.
D. -2.

9. There are 782 students in a school. If the number of boys is 30% less than that of girls, then the number of boys in the school is
某學校有 782 名學生。若男生的數目比女生少 30%，則該學校裡有男生的數目為

A. 322
B. 340.
C. 442.
D. 460.

10. A sum of $20000 is deposited at 5% p.a. compounded yearly. Find the interest earned in the second year.
把一筆 $20000 的款項存入銀行，年利率為 5%，每年一結。求於第二年所得的利息。

A. $1000
B. $1050
C. $2000
D. $2050

11. The area of a city on the map is 400 cm^2. If the actual area of the city is 1 km^2, then the scale of the map is $1:n$. $n=$
於地圖上，某城市的面積為 400 cm^2。若該城市的實際面積為 1 km^2，則該地圖的比例尺為 $1:n$。$n=$

A. 500.
B. 5000.
C. 250000.
D. 25000000.

12. The following table shows the values of x and y.
下表顯示 x 及 y 的值。

x	2	4	6	7
y	18	72	162	220.5

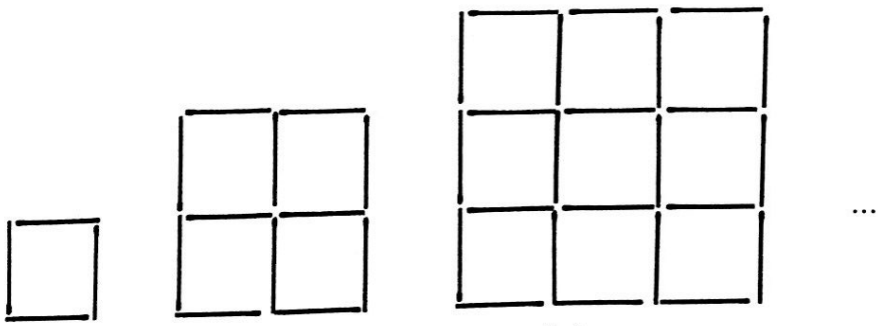
Which of the following can represent the relation between x and y?
以下哪項能表示 x 與 y 之間的關係？

A. $y \propto \frac{1}{x^2}$
B. $y \propto x$
C. $y \propto x^2$
D. $y^2 \propto x$

13. If $3.4485 \le x < 3.4545$, which of the following must be true?
若$3.4485 \le x < 3.4545$，以下哪項必為正確？

A. $x = 3.5$ (correct to nearest 0.1) [準確至最接近 0.1]
B. $x = 3.44$ (correct to 2 decimal places) [準確至 2 位小數]
C. $x = 3.45$ (correct to 3 significant figures) [準確至 3 位有效數字]
D. $x = 3.450$ (correct to 4 significant figures) [準確至 4 位有效數字]

14. In the figure, the 1st pattern consists of 4 matches. For any positive integer n, the $(n+1)$th pattern is formed by adding $4n+4$ matches to the nth pattern. Find the number of matches in the 7th pattern.
圖中，第 1 個圖案有四支火柴。對於任何正整數 n，於第 n 個圖案加上 $4n+4$ 支火柴去組成第 $(n+1)$ 個圖案。求第 7 個圖案的火柴數目。

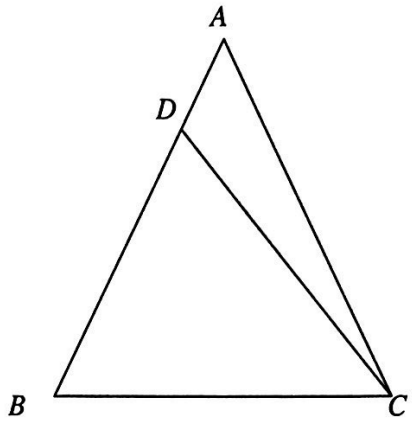


1st pattern 2nd pattern 3rd pattern

A. 49
B. 70
C. 84
D. 112

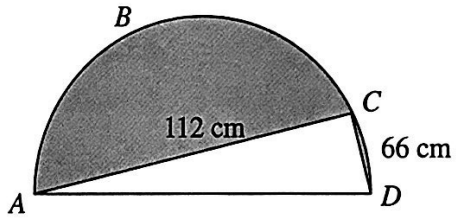
15. In the figure, $AB = AC$ and $BC = BD$. If $\angle ACD = 24°$, find $\angle BAC$.
圖中，$AB = AC$ 及 $BC = BD$。若 $\angle ACD = 24°$，求 $\angle BAC$。

A. 28°
B. 30°
C. 52°
D. 76°



16. In the figure, $ABCD$ is a semi-circle. It is given that $AC = 112\,\text{cm}$ and $CD = 66\,\text{cm}$. Find the shaded area correct to the nearest cm^2.
圖中，$ABCD$ 為半圓。已知 $AC = 112\,\text{cm}$ 及 $CD = 66\,\text{cm}$。求陰影面積至最接近 cm^2。

A. 2539 cm^2
B. 2941 cm^2
C. 3696 cm^2
D. 4387 cm^2

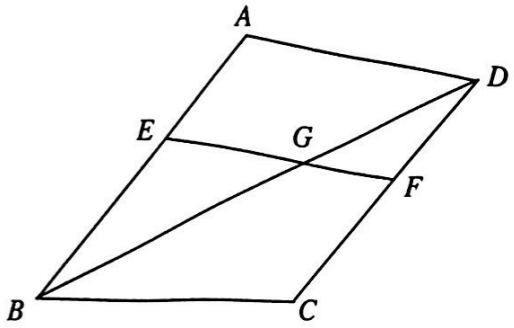


17. When a sphere is melted and recast into 27 equal smaller spheres, the increase in total surface area is
當一個球體溶解再鑄造成 27 個較小而相等的圓球，那麼總表面面積的增加為

A. 0%
B. 20%
C. 100%
D. 200%

18. In the figure, $AB \parallel DC$ and $AB : DC = 5 : 4$. F is the mid point of DC. If $AEFD$ is a parallelogram and the area of ΔDFG is $36\ \text{cm}^2$, find the area of $BCFG$.

圖中，$AB \parallel DC$ 及 $AB : DC = 5 : 4$。F 為 DC 的中點。若 $AEFD$ 為一平行四邊形而 ΔDFG 的面積為 $36\ \text{cm}^2$，求 $BCFG$ 的面積。



A. $81\ \text{cm}^2$
B. $144\ \text{cm}^2$
C. $189\ \text{cm}^2$
D. $225\ \text{cm}^2$

19. For $0° \le \theta \le 180°$, the minimum value of $\dfrac{120}{(-\cos\theta - 3)^2 - 1}$ is

於 $0° \le \theta \le 180°$，$\dfrac{120}{(-\cos\theta - 3)^2 - 1}$ 的最小值為

A. -12.
B. 8.
C. 15.
D. 40.

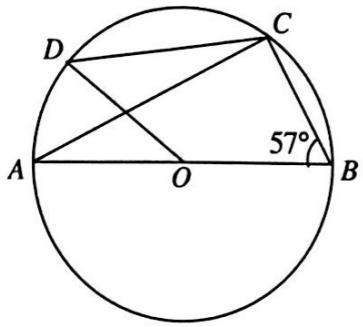
20. If $\tan\theta = \dfrac{5}{13}$ and $180° < \theta < 270°$, find $\sin\theta$.

若 $\tan\theta = \dfrac{5}{13}$ 及 $180° < \theta < 270°$，求 $\sin\theta$。

A. $-\dfrac{12}{13}$
B. $-\dfrac{13}{\sqrt{194}}$
C. $-\dfrac{5}{\sqrt{194}}$
D. $\dfrac{5}{12}$

21. In the figure, AB is the diameter of the circle and O is the centre. If $\angle ABC = 57°$ and $\overset{\frown}{AD} : \overset{\frown}{DC} = 1:2$, find $\angle CDO$.
圖中，AB 為圓的直徑而 O 為圓心。若 $\angle ABC = 57°$ 及 $\overset{\frown}{AD} : \overset{\frown}{DC} = 1:2$，求 $\angle CDO$。

A. 38°
B. 52°
C. 57°
D. 76°



22. If a regular n-sided polygon has 16 axes of reflectional symmetry, which of the following must be true?
若某正 n 邊形有 16 條反射對稱軸，以下哪項必為正確？

I. The value of n is 16.
n 的值為 16。

II. The number of diagonals of the polygon is 104.
該多邊形有 104 條對角線。

III. The interior angle of the polygon is 7 times the exterior angle of the polygon.
該多邊形的內角為其外角的七倍。

A. I and II only [只有 I 及 II]
B. I and III only [只有 I 及 III]
C. II and III only [只有 II 及 III]
D. I, II and III [I、II 及 III]

23. In a polar coordinate plane, a point P is rotated clockwise 270° about the pole O to the point $(6, 150^\circ)$. The rectangular coordinates of P are
於極坐標平面上，點 P 繞極點 O 順時針旋轉 270° 至點 $(6, 150^\circ)$。P 的直角坐標為

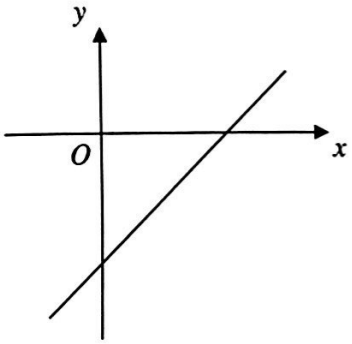
A. $(-3\sqrt{3}, -3)$
B. $(-3, -3\sqrt{3})$
C. $(3, 3\sqrt{3})$
D. $(3\sqrt{3}, 3)$

24. $A(3,6)$ and $B(9,-2)$ are two points in a rectangular coordinate plane. $P(a,b)$ is a moving point in the same coordinate plane such that $AB = BP$. Which of the following is true?
$A(3,6)$ 及 $B(9,-2)$ 為直角坐標平面上的兩點。$P(a,b)$ 為於相同坐標平面上的動點使得 $AB = BP$。以下哪項是正確的？

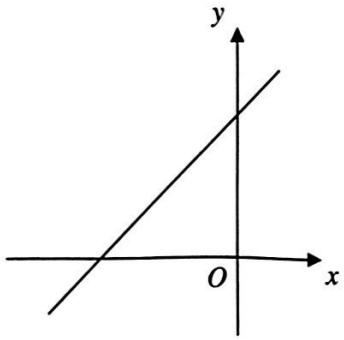
A. $3a - 4b - 10 = 0$
B. $a^2 + b^2 - 6a - 12b - 55 = 0$
C. $a^2 + b^2 - 12a + 4b + 15 = 0$
D. $a^2 + b^2 - 18a + 4b - 15 = 0$

25. If $a > 0$, $b > 0$ and $c < 0$, which of the following may represent the graph of $ax+by+c=0$?
若 $a>0$、$b>0$ 及 $c<0$，以下那個可代表 $ax+by+c=0$ 的圖像？

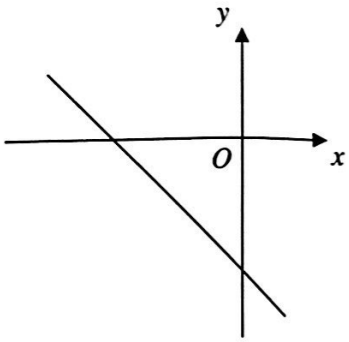
A.



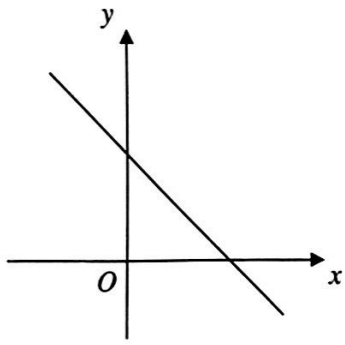
B.



C.



D.



26. The equation of a circle C is $3x^2+3y^2-18x+12y-23=0$. Which of the following are true?
某圓 C 的方程為 $3x^2+3y^2-18x+12y-23=0$。以下哪項是正確的？

I. The coordinates of the center of C are $(3,-2)$.
C 的圓心坐標為 $(3,-2)$。

II. The radius of C is 6.
C 的半徑為 6。

III. The point $(-4,-3)$ lies outside C.
點 $(-4,-3)$ 位於圓外。

A. I and II only [只有 I 及 II]
B. I and III only [只有 I 及 III]
C. II and III only [只有 II 及 III]
D. I, II and III. [I、II 及 III]

27. 56★★ is a 4-digit number, where ★ is an integer from 0 to 9 inclusive. Find the probability that the 4-digit number is divisible by 4.
56★★ 為四位數，其中 ★ 為 0 至 9（包括 0 及 9）內的整數。求該四位數可被 4 整除的概率。

A. $\frac{3}{10}$

B. $\frac{2}{5}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

28. A fair dice is thrown in a game. If the number thrown is a composite number, \$30 will be gained; otherwise, \$$n$ will be gained. If the expected gain of the game is \$60, find the value of n.
於某遊戲中投擲一枚勻稱的骰子。若擲出的數字為合成數，獲得 \$30；否則，獲得 \$$n$。若該遊戲的期望回報為 \$60，求 n 的值。

A. 60
B. 75
C. 84
D. 90

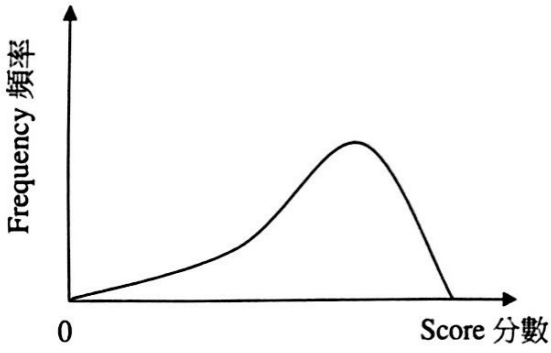
29. The frequency curve below shows the scores of a group of students obtained in a test. Which of the following box-and-whisker diagrams may represent the distribution of their scores?
下面的頻數曲線圖顯示一組學生在一次測驗獲得的分數。以下哪個框線圖可代表他們分數的分佈？

A.

B.

C.

D.



30. The mean of the set of data $\{1, 2, 2, 3, 3, 3, 4, 4, x, x\}$ is 3. Let p, q and r be the median, range and inter-quartile range of the set of data respectively. Which of the following are true?
某組數據 $\{1, 2, 2, 3, 3, 3, 4, 4, x, x\}$ 的平均值為 3。設 p、q 及 r 分別為該數據組的中位數、分佈域及四分位數間距。以下哪項是正確的？

I $p = 3$

II $q = p$

III $r = 3$

A. I and II only [只有 I 及 II]
B. I and III only [只有 I 及 III]
C. II and III only [只有 II 及 III]
D. I, II and III [I、II 及 III]

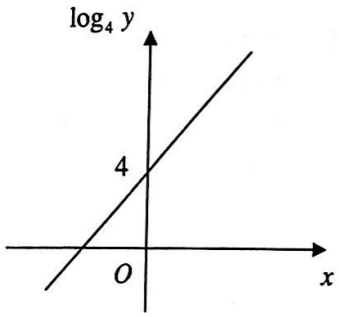
Section B 乙部

31. The H.C.F. and the L.C.M. of three expressions are x^3y and $12x^6y^5z$ respectively. If the first expression and the second expression are $2x^3y^2$ and $3x^4y^5$ respectively, then the third expression is
三個表示式的最大公因式及最小公倍式分別為 x^3y 及 $12x^6y^5z$。若第一個表示式與第二個表示式分別為 $2x^3y^2$ 及 $3x^4y^5$，則第三個表示式為

A. x^2y^5.
B. x^6y.
C. $4x^2y^5z$.
D. $4x^6yz$.

32. The graph in the figure shows the linear relation between x and $\log_4 y$. If $y = 2^{x+k}$, then $k =$
圖中顯示 x 和 $\log_4 y$ 的線性關係。若 $y = 2^{x+k}$，那麼 $k =$

A. 8
B. 6
C. 4
D. 2



33. $10100100001010_2 =$

A. 5253.
B. 5254.
C. 10506.
D. 21012.

34. Let $f(x)=a(x+h)^2+k$. If the vertex of the graph of $y=f(x)$ is 3 units above the vertex of the graph of $y=x^2-6x+3$, then
設 $f(x)=a(x+h)^2+k$。若 $y=f(x)$ 的圖像的頂點於 $y=x^2-6x+3$ 的圖像的頂點上方 3 單位，則

A. $h=-3$ and [及] $k=-9$.
B. $h=-3$ and [及] $k=-3$.
C. $h=3$ and [及] $k=-9$.
D. $h=3$ and [及] $k=-3$.

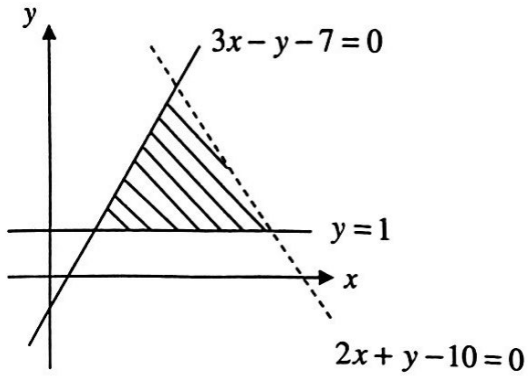
35. $i-i^2+i^3-i^4+\cdots+i^{2021}-i^{2022}+i^{2023}=$

A. -1
B. $-i$
C. 1
D. i

36. In the figure, the shaded region shows the solution to a system of linear inequalities. If $P(h,k)$ is a solution to the system of linear inequalities, which of the following are true?
圖中，陰影部分顯示某線性不等式組的解。若 $P(h,k)$ 為該線性不等式組的一個解，以下哪項是正確的？

I. $h \geq 1$
II. $2h + k < 10$
III. $3h - k \geq 7$

A. I and II only [只有 I 及 II]
B. I and III only [只有 I 及 III]
C. II and III only [只有 II 及 III]
D. I, II and III [I、II 及 III]



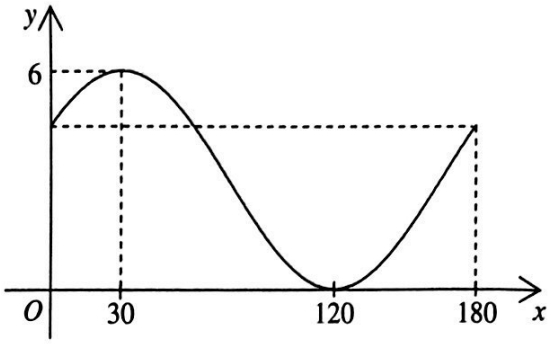
37. If $m > 1$, which of the following is/are arithmetic sequence(s)?
若 $m > 1$，以下哪項為等差數列？

I. $m, 2m^2, 4m^3, 6m^4$
II. $\log 3m, \log 30m, \log 300m, \log 3000m$
III. $\log m, \log m^4, \log m^7, \log m^{10}$

A. I only [只有 I]
B. II only [只有 II]
C. I and III only [只有 I 及 III]
D. II and III only [只有 II 及 III]

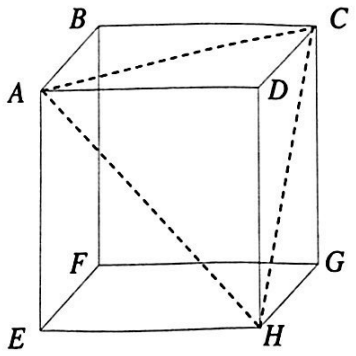
38. Let a and b be constants. If the figure shows the graph of $y = a\sin(2x° + b°) + 3$, then
設 a 及 b 為常數。若下圖顯示 $y = a\sin(2x° + b°) + 3$ 的圖像，則

A. $a = -3$ and [及] $b = -60$
B. $a = -3$ and [及] $b = -30$
C. $a = 3$ and [及] $b = 30$
D. $a = 3$ and [及] $b = 60$

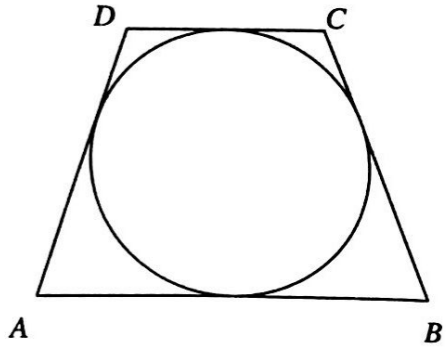


39. In the figure, $ABCDEFGH$ is a cube of side 1 cm. A tetrahedron $DACH$ is cut away along the plane ACH. Find the shortest distance between D and plane ACH.
圖中，$ABCDEFGH$ 為一個邊長為 1 cm 的立方體。一四邊形 $DACH$ 沿平面 ACH 被切去。求 D 與平面 ACH 之間的最短距離。

A. $\frac{\sqrt{2}}{2}$ cm
B. $\frac{\sqrt{3}}{2}$ cm
C. $\frac{\sqrt{3}}{3}$ cm
D. $\frac{\sqrt{6}}{6}$ cm



40. In the figure, a circle is inscribed in an isosceles trapezium $ABCD$ with $AD = BC$. Given that $AB // DC$, $AB = 18$ and $DC = 8$. Find the radius of the inscribed circle.
圖中，某圓內接於一等腰梯形 $ABCD$，其中 $AD = BC$。已知 $AB // DC$、$AB = 18$ 及 $DC = 8$。求內接圓的半徑。



A. 6
B. 6.5
C. 7
D. 12

41. Find the range of values of k such that the circle $x^2 + y^2 + 6x - 23 = 0$ and the straight line $x + y + k = 0$ intersect.
求 k 值的範圍使得圓 $x^2 + y^2 + 6x - 23 = 0$ 與直線 $x + y + k = 0$ 相交。

A. $-5 < k < 11$
B. $-5 \le k \le 11$
C. $k < -5$ or [或] $k > 11$
D. $k \le -5$ or [或] $k \ge 11$

42. Let O be the origin. The coordinates of point A and point B are $(6, 0)$ and $(-1, 7)$ respectively. Find the y-coordinate of the circumcenter of ΔOAB.
設 O 為原點。點 A 及點 B 的坐標分別為 $(6, 0)$ 及 $(-1, 7)$。求 ΔOAB 的外心的 y 坐標。

A. 3
B. 4
C. 5
D. 6

43. 5 people are selected from 5 boys and 4 girls to arrange in a row. Find the number of arrangements such that the selected boys and girls are arranged alternatively.
從 5 男 4 女中選出 5 人去排成一列。求所選出的男女相隔的排列方法數目。

A. 1200
B. 1440
C. 2880
D. 5760

44. In bag P, there are 3 pink balls and 5 blue balls. In bag Q, there are 4 white balls and 4 blue balls. Kinen first draws a ball from bag P and put it into bag Q, then draws a ball from bag Q. Find the probability that a blue ball is drawn from bag Q.
袋 P 裝有 3 個粉紅色球及 5 個藍色球。袋 Q 裝有 4 個白色球及 4 個藍色球。乾隆首先從袋 P 抽出一個球放進袋 Q，然後從袋 Q 抽出一個球。求從袋 Q 中所抽出的球為藍色球的概率。

A. $\frac{1}{2}$
B. $\frac{4}{9}$
C. $\frac{35}{72}$
D. $\frac{37}{72}$

45. Let m_1, d_1 and s_1 be the mean, median and the standard deviation of the data $\{a_1, a_2, a_3, a_4, a_5, a_6, a_7\}$. Let m_2, d_2 and s_2 be the mean, median and the standard deviation of the data $\{a_1, a_2, a_3, a_4, a_4, a_5, a_6, a_7\}$. If $a_4 = m_1$, which of the following is/are true?
設 m_1、d_1 及 s_1 分別為數據 $\{a_1, a_2, a_3, a_4, a_5, a_6, a_7\}$ 的平均值、中位數及標準差。設 m_2、d_2 及 s_2 分別為數據 $\{a_1, a_2, a_3, a_4, a_4, a_5, a_6, a_7\}$ 的平均值、中位數及標準差。若 $a_4 = m_1$，以下哪項為正確?

I. $m_2 = m_1$
II. $d_2 = d_1$
III. $s_2 = s_1$

A. I only [只有 I]
B. II only [只有 II]
C. I and III only [只有 I 及 III]
D. II and III only [只有 II 及 III]

END OF PAPER
- 試卷完 -