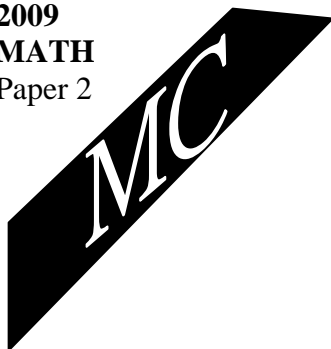


2009
MATH
Paper 2



Beacon College

Pre-mock 3

11.15 am – 12.45 pm (1 ½ hours)

Subject Code 180

By Oscar Tam

1. Read carefully the instructions on the Answer Sheet and insert the information required (including the Subject Code) in the spaces provided.
2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF PAPER**' after the last question.
3. All questions carry equal marks.
4. **ANSWER ALL QUESTIONS.** You should mark all your answers on the Answer Sheet.
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
6. No marks will be deducted for wrong answers.

FORMULAS FOR REFERENCE

參考公式

SPHERE 球體	Surface area 表面積	$= 4\pi r^2$ $= 4\pi r^2$
	Volume 體積	$= \frac{4}{3}\pi r^3$ $= \frac{4}{3}\pi r^3$
CYLINDER 圓柱	Area of curved surface 側面積	$= 2\pi rh$ $= 2\pi rh$
	Volume 體積	$= \pi r^2 h$ $= \pi r^2 h$
CONE 圓錐	Area of curved surface 側面積	$= \pi rl$ $= \pi rl$
	Volume 體積	$= \frac{1}{3}\pi r^2 h$ $= \frac{1}{3}\pi r^2 h$
PRISM 角柱	Volume 體積	$= \text{base area} \times \text{height}$ $= \text{底面積} \times \text{高}$
PYRAMID 角錐	Volume 體積	$= \frac{1}{3} \times \text{base area} \times \text{height}$ $= \frac{1}{3} \times \text{底面積} \times \text{高}$

There are 36 questions in Section A and 18 questions in Section B.

甲部共 36 題，乙部共 18 題。

The diagrams in this paper are not necessarily drawn to scale.

本試卷的附圖不一定依比例繪成。

Choose the best answer for each question.

選出每題最佳的答案。

Section A

甲部

(1) If m and n are positive integers, then $\frac{(m+n)^n}{(n+m)^m} =$

若 m 及 n 為正整數，則 $\frac{(m+n)^n}{(n+m)^m} =$

- A. $\frac{m}{n}$
- B. $(m+n)^{n-m}$
- C. $(m+n)^{\frac{n}{m}}$
- D. 1

(2) $\frac{\frac{1}{x}}{1-\frac{1}{x}} =$

- A. $-\frac{x}{1+x}$
- B. $\frac{x}{1-x}$
- C. $\frac{1}{x-1}$
- D. $\frac{x}{x+1}$

(3) If $y = \frac{x+2}{x+3}$, then $x =$

若 $y = \frac{x+2}{x+3}$ ，則 $x =$

A. $-\frac{1}{y+2}$

B. $\frac{3y-2}{y-1}$

C. $\frac{2-3y}{y-1}$

D. $\frac{2-3y}{y+1}$

(4) Solve $x+3 > \frac{3x+4}{2}$, where x is a positive integer.

解 $x+3 > \frac{3x+4}{2}$ ，其中 x 為一正整數。

A. 1 only
只有 1

B. 2 only
只有 2

C. 0, 1

D. 0, 1, 2

- (5) Let x km/h be the speed of the current. The speed of a boat in still water is 12 km/h. The boat travels 51 km upstream and 25 km downstream in a total time of 7 hours. Then
設河流的水流速度為 x km/h。一艘船在靜止的水中航行的速率是 12 km/h。這艘船在河流中逆流航行 51 km 及順流航行 25 km 共需 7 小時。則

A. $\frac{51}{12-x} - \frac{25}{12+x} = 7$

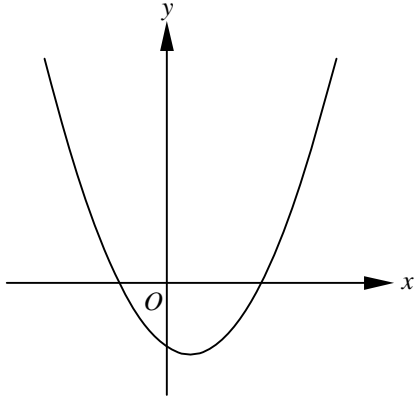
B. $\frac{51}{12-x} + \frac{25}{12+x} = 7$

C. $\frac{51}{12+x} - \frac{25}{12-x} = 7$

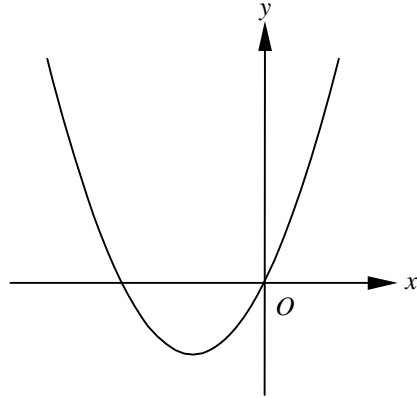
D. $\frac{51}{12+x} + \frac{25}{12-x} = 7$

- (6) Which of the following may represent the graph of $y = x^2 + ax - a^2$, where $a > 0$?
 下列哪個圖表示 $y = x^2 + ax - a^2$ 的圖像，其中 $a > 0$?

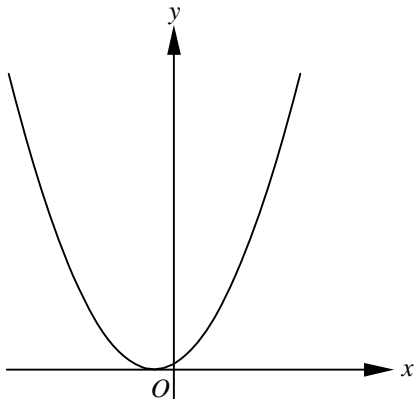
A.



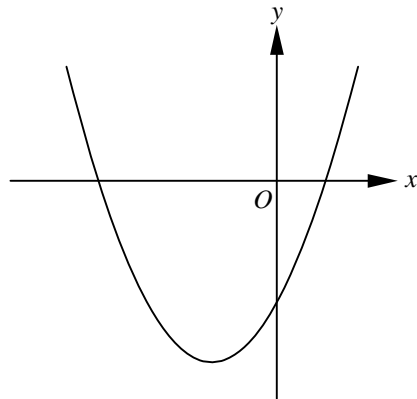
B.



C.



D.



- (7) The length of a rectangle is 4 times its width. If the perimeter of the rectangle is 30 cm, find its area.
 長方形的長為它的闊的 4 倍。若該長方形的周界為 30 cm，求它的面積。

- A. 24 cm^2
- B. 28 cm^2
- C. 36 cm^2
- D. 64 cm^2

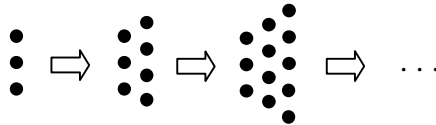
(8) If $f(x) = \frac{1}{2}(x^2 + x)$, then $f(x-1) =$

若 $f(x) = \frac{1}{2}(x^2 + x)$ ，則 $f(x-1) =$

- A. $\frac{x^2 - x}{2}$
- B. $\frac{x^2 - x - 1}{2}$
- C. $\frac{x^2 + x - 1}{2}$
- D. $\frac{x^2 + x + 1}{2}$

(9) In the figure, the 1st pattern consists of 3 dots. For any positive integer n , the $(n + 1)$ th pattern is formed by adding $(n + 3)$ dots the n th pattern. Find the number of dots in the 8th pattern.

圖中，第 1 個圖案包含三個黑點。對任意正整數 n ，第 $(n + 1)$ 個圖案是由第 n 個圖案加上 $(n + 3)$ 個黑點所組成。求第 8 個圖案黑點的數目。



- A. 42
- B. 52
- C. 53
- D. 63

(10) The dimensions of a study room are $6.7 \text{ m} \times 9.2 \text{ m}$ corrected to 1 decimal place. Let $A \text{ m}^2$ be the actual area of the study room. Then

某間溫習室的尺寸為 $6.7 \text{ m} \times 9.2 \text{ m}$ 準確至 1 位小數。設 $A \text{ m}^2$ 為溫習室的實際面積。則

- A. $6.65 \times 9.15 \leq A < 6.75 \times 9.25$
- B. $6.68 \times 9.18 \leq A < 6.72 \times 9.22$
- C. $6.65 \times 9.25 \leq A < 6.75 \times 9.15$
- D. $7 \times 9 \leq A < 8 \times 9$

- (11) P sold an article to Q at a profit of 20%. Q sold it to R at a profit of 15%. R paid \$38000 more than it cost P . How much did P gain?
 P 將某物品售給 Q ，獲利 20%。 Q 將這物品轉售給 R ，獲利 15%。若 R 付出的金錢比 P 的成本多 \$38000，問 P 獲利多少？
- A. \$14000
 B. \$16000
 C. \$18000
 D. \$20000
- (12) A sum of money is deposited at a rate of 4% per annum for 2 years. If the difference between the compound interest (compounded annually) and simple interest is \$4650, find the sum of money correct to the nearest ten.
 以年利率 4% 存放一筆款項兩年。若複利息 (每年一結) 與單利息的差為 \$4650，求該筆款項，準確至最接近的十元。
- A. \$2817750
 B. \$2906250
 C. \$2975400
 D. \$3185250
- (13) If $2x^2 + px + 4 \equiv (1-x)(2+qx) + 2$, then
 若 $2x^2 + px + 4 \equiv (1-x)(2+qx) + 2$ ，則
- A. $p = -4, q = -2$
 B. $p = -4, q = 2$
 C. $p = 4, q = -2$
 D. $p = 4, q = 2$
- (14) If $ab < 0$ and $5a^2 + 28ab - 12b^2 = 0$, then $a : b =$
 若 $ab < 0$ 及 $5a^2 + 28ab - 12b^2 = 0$ ，則 $a : b =$
- A. 1 : -6
 B. -6 : 1
 C. 2 : -5
 D. -5 : 2

- (15) x and y are two variables. The table below shows some values of x and their corresponding values of y .

x 、 y 為兩變數，下表所示為 x 的某些值及其對應的 y 值。

x	4	6	12	24
y	36	16	4	1

Which of the following may be a relation between x and y ?

下列何者可能是 x 及 y 的關係？

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

- (16) A boat sailed 730 km due east from P to Q , and then sailed 520 km due south to R . Find the bearing of P from R , correct to the nearest 0.1° .

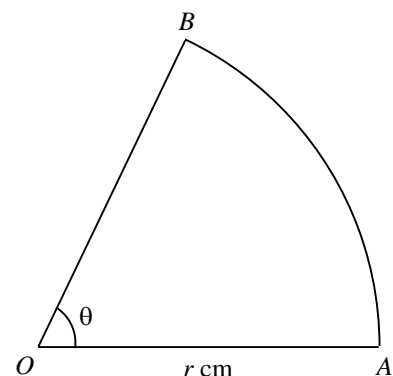
一艘船從 P 向東航行 730 km 至 Q ，然後向南航行 520 km 至 R 。求從 R 測 P 的方位角，準確至最接近的 0.1° 。

- A. N54.5°W
 B. N35.5°W
 C. S54.5°E
 D. S35.5°E

- (17) In the figure, OAB is a sector with centre O . Given that the radius of the sector is r cm and the perimeter of the sector is $3r$ cm, find θ correct to the nearest degree.

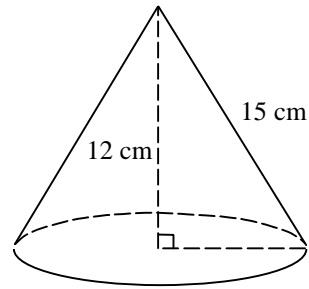
圖中， OAB 是一個以 O 為圓心的扇形。已知扇形的半徑為 r cm 而扇形的周界為 $3r$ cm。求 θ 準確至最接近的度。

- A. 29°
 B. 30°
 C. 57°
 D. 60°



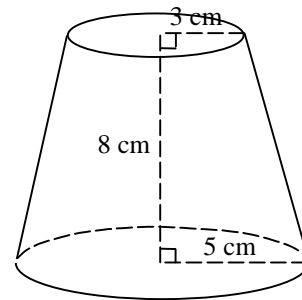
- (18) In the figure, the total surface area of the right circular cone is
圖中，直立圓錐體的總表面面積為

- A. $135\pi \text{ cm}^2$
B. $180\pi \text{ cm}^2$
C. $216\pi \text{ cm}^2$
D. $261\pi \text{ cm}^2$



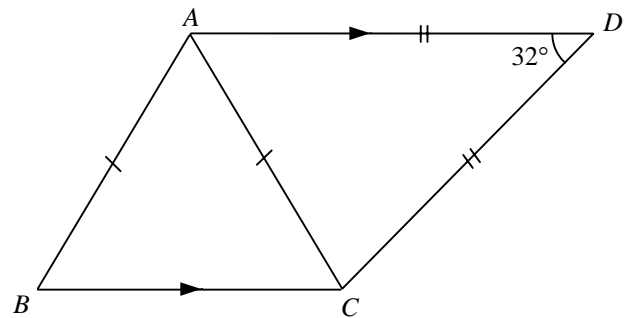
- (19) The figure shows a frustum of a right circular cone. The radii of the upper face and the base are 3 cm and 5 cm respectively. If the height is 8 cm, find the volume.
圖中所示為一直立圓錐體的平截頭體。上底及下底的半徑分別為 3 cm 及 5 cm。若它的高為 8 cm，求它的體積。

- A. $\frac{1384\pi}{15} \text{ cm}^3$
B. $128\pi \text{ cm}^3$
C. $\frac{392\pi}{3} \text{ cm}^3$
D. $136\pi \text{ cm}^3$



- (20) In the figure, $\angle BAC =$
圖中， $\angle BAC =$

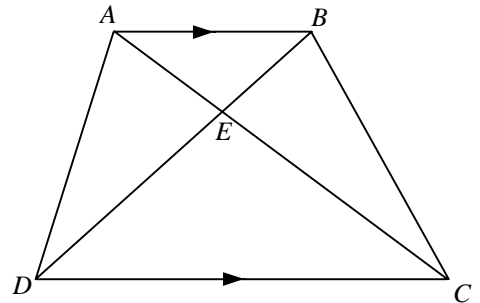
- A. 32°
B. 60°
C. 74°
D. 116°



- (21) In the figure, $AB \parallel DC$. Which of the following must be true?
圖中， $AB \parallel DC$ 。下列何者必為正確？

- I. Area of $\triangle ABE = \text{Area of } \triangle CBE$
 $\triangle ABE$ 的面積 = $\triangle CBE$ 的面積
II. $\triangle ABE \sim \triangle CDE$
III. $\angle DAE = \angle CBE$

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



(22) $\frac{1}{\sin A} - \frac{\cos A}{\tan A} =$

- A. $1 - \sin A$
B. $\sin A$
C. $\cos A$
D. $-\sin A$

- (23) For $0^\circ \leq \theta \leq 90^\circ$, the greatest value of $\frac{1}{3^{1+\sin^2 \theta}}$ is

對於 $0^\circ \leq \theta \leq 90^\circ$ ， $\frac{1}{3^{1+\sin^2 \theta}}$ 的最大值為

- A. $\frac{1}{3}$
B. $\frac{1}{9}$
C. 1
D. 3

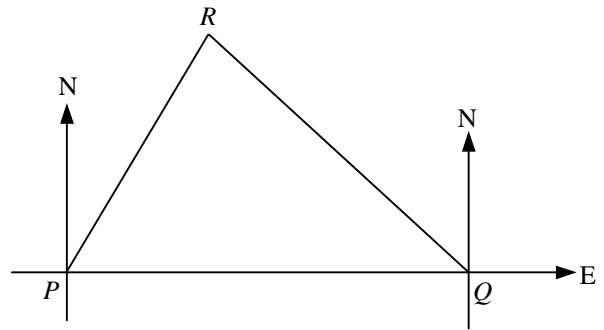
- (24) For $0^\circ \leq \theta \leq 90^\circ$, how many roots does the equation $\tan \theta = -\tan^3 \theta$ have?
對於 $0^\circ \leq \theta \leq 90^\circ$ ，方程 $\tan \theta = -\tan^3 \theta$ 有多少個根？

- A. 0
B. 1
C. 2
D. 3

- (25) In the figure, P and Q are two houses along a straight road running east to west. R is another house such that the true bearing of R from P and Q are 028° and 298° respectively. Find the distance from R to the road.

圖中， P 及 Q 為位於一條東西走向的道路旁的屋子。 R 為另一所屋子，其中從 P 及 Q 測得 R 的真方位角分別為 028° 及 298° 。求 R 與道路的距離。

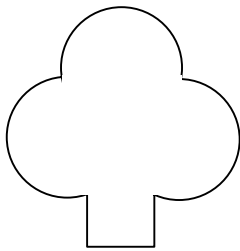
- A. $PQ \cos 28^\circ \sin 62^\circ$
- B. $PQ \cos 28^\circ \sin 28^\circ$
- C. $PQ \tan 62^\circ \sin 62^\circ$
- D. $PQ \tan 62^\circ \cos 62^\circ$



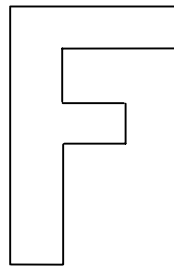
- (26) Which of the following plane figures does NOT have rotational symmetry?

下列哪一個圖形沒有旋轉對稱？

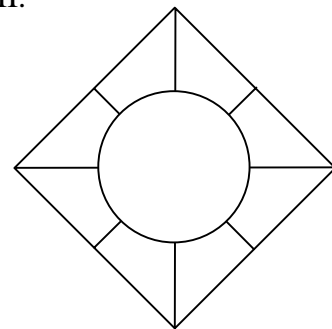
I.



II.

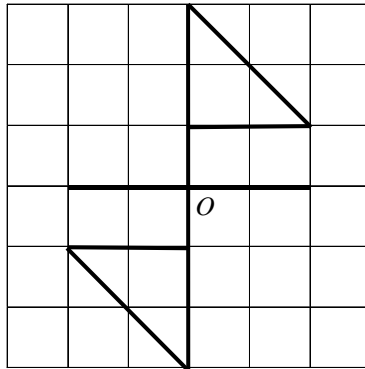


III.



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

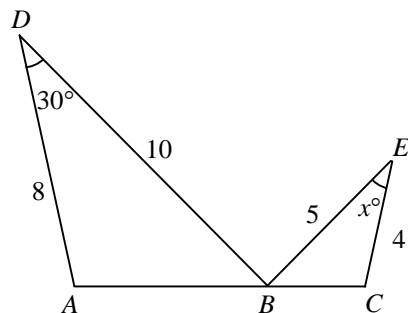
- (27) In the figure, which of the following must be true?
圖中，下列何者必為正確？



- I. The area bounded by the figure remain unchanged after rotating 90° clockwise through O .
圖形所圍的面積經過繞 O 順時針旋轉 90° 後不變。
- II. The figure has reflectional symmetry.
圖形有反射對稱。
- III. The figure has 2-fold rotational symmetry.
圖形有 2 重旋轉對稱。
- A. I only
只有 I
- B. II only
只有 II
- C. I and III only
只有 I 及 III
- D. I, II and III
I、II 及 III

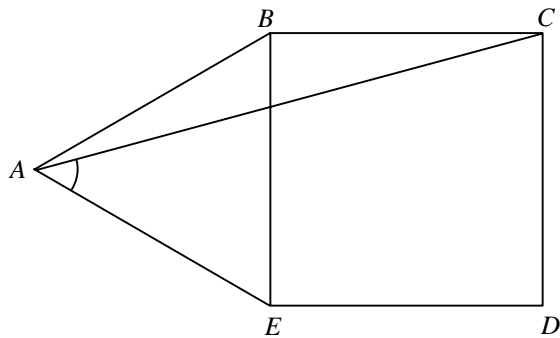
- (28) In the figure, ABC is a straight line. If $BC : AC = 1 : 3$, then $x =$
圖中， ABC 為一直線。若 $BC : AC = 1 : 3$ ，則 $x =$

- A. 15
B. 30
C. 45
D. 60



- (29) In the figure, $BCDE$ is a square and ABE is an equilateral triangle. Find $\angle EAC$.
 圖中， $BCDE$ 為一正方形而 ABE 為一等邊三角形。求 $\angle EAC$ 。

- A. 35°
 B. 40°
 C. 45°
 D. 60°

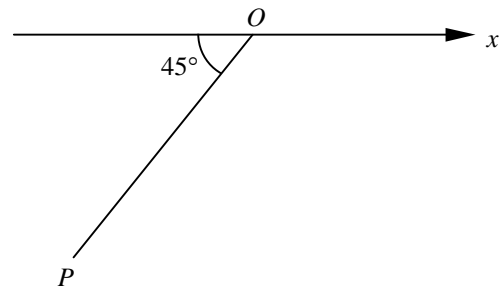


- (30) If the point $(3, -4)$ is rotated anti-clockwisely about the origin through 270° , then the coordinates of its image are
 若 $(3, -4)$ 繞原點逆時針旋轉 270° ，則它的影像的坐標為

- A. $(-4, -3)$
 B. $(-4, 3)$
 C. $(4, -3)$
 D. $(4, 3)$

- (31) In the figure, O is the pole. If $OP = 5$, then the polar coordinates of P are
 圖中， O 為極點。若 $OP = 5$ ，則 P 的極坐標為

- A. $(5, 45^\circ)$
 B. $(5, 135^\circ)$
 C. $(-5, 225^\circ)$
 D. $(5, 225^\circ)$



(32) Which of the following straight lines will cut with $3x - 2y + 7 = 0$?

下列哪條直線必與 $3x - 2y + 7 = 0$ 相交?

I. $6x + 4y - 5 = 0$

II. $\frac{2}{3}x + y = 1$

III. $6y = 9x + 1$

A. I only

只有 I

B. II only

只有 II

C. I and II only

只有 I 及 II

D. II and III only

只有 II 及 III

(33) Let $A = (-5, 10)$ and $B = (16, -5)$. If the line joining A and B cuts the x -axis at C , then $C =$

設 $A = (-5, 10)$ 及 $B = (16, -5)$ 。若連接 A 及 B 的直線與 x 軸相交於 C ，則 $C =$

A. $(8, 0)$

B. $(0, 8)$

C. $(9, 0)$

D. $(0, 9)$

(34) Two fair dice are thrown. What is the probability of getting a total of 10 or 12?

投擲兩顆勻稱的骰子。問總和為 10 或 12 的概率是多少?

A. $\frac{1}{6}$

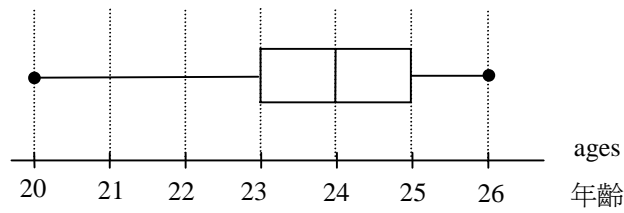
B. $\frac{1}{9}$

C. $\frac{1}{12}$

D. $\frac{1}{15}$

(35) The box-and-whisker diagram shows the distributions of ages of a group of teenagers joining a swimming class.

框線圖顯示參加一游泳班的青年年齡的分佈。



Which of the following must be true?

下列何者必為正確？

- I. Range = 6
分佈域 = 6
 - II. Mean = 24
平均 = 24
 - III. 50% of the teenagers are above 25.
50% 的青年大於 25 歲。
- A. I only
只有 I
 - B. II only
只有 II
 - C. I and II only
只有 I 及 II
 - D. I and III only
只有 I 及 III

- (36) The stem-and-leaf diagram below shows the time spent by 50 students on study last week.
 以下的幹葉圖顯示上星期 50 名學生花在學習上的時間。

Boys (男孩) Leaf (1 hour) 葉 (1 小時)	Stem (10 hours) 幹 (10 小時)	Girls (女孩) Leaf (1 hour) 葉 (1 小時)
7 5 4 3 1 1 1	0	3 5 6 6 7 9
9 7 7 4 2	1	2 4 6 8 8
9 8 7 3	2	1 3 5 6 8
9 7 3	3	2 4 5 5
6 6 4 4 2 2	4	6 6 7 7 8

Which interval has the highest frequency spent on studying?

下列那個區間於學習上的時間有最高的頻數？

- A. 0 – 9 hours
0 – 9 小時
- B. 10 – 19 hours
10 – 19 小時
- C. 20 – 29 hours
20 – 29 小時
- D. 30 – 39 hours
30 – 39 小時

Section B
乙部

(37) Which of the following is a factor of $x^3 + x^2 - 14x - 24$?
下列哪一個為 $x^3 + x^2 - 14x - 24$ 的因子？

- A. $(x+3)(x-2)$
- B. $(x-3)(x-4)$
- C. $(x+3)(x-4)$
- D. $(x+3)(x+4)$

(38) Let $f(x) = x^2 - 2x + 9$ and $g(x) = -2x^2 - 8x + 3$. Find the maximum value of $f(x) + 2g(x)$.

設 $f(x) = x^2 - 2x + 9$ 及 $g(x) = -2x^2 - 8x + 3$ 。求 $f(x) + 2g(x)$ 的極大值。

- A. -14
- B. 24
- C. 30
- D. 42

(39) If the graph of $y = 3x^2 + 7x + 2$ is given, which of the following straight line should be added on the graph in order to solve the equation $3x^2 + 7x - 8 = 0$?

若已給 $y = 3x^2 + 7x + 2$ 的圖像，應在圖中加上以下哪一條直線來解方程 $3x^2 + 7x - 8 = 0$?

- A. $y = -10$
- B. $y = -6$
- C. $y = 6$
- D. $y = 10$

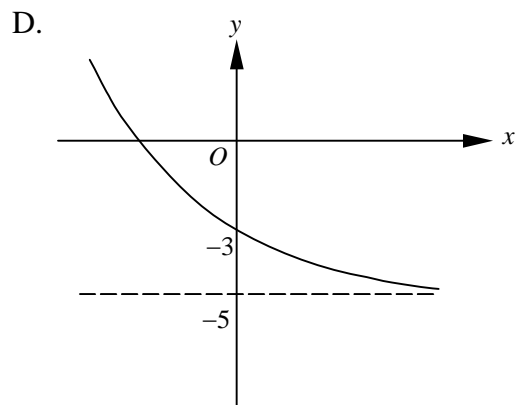
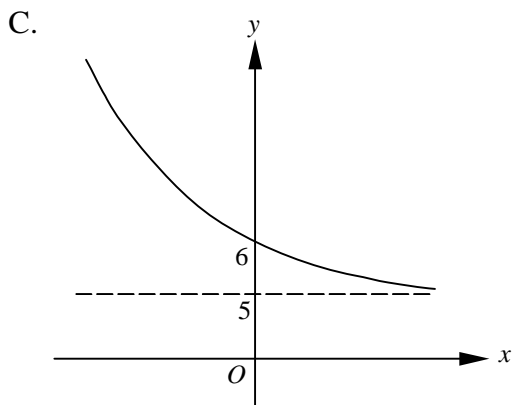
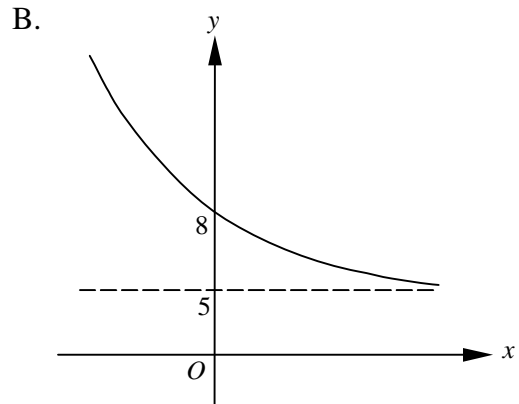
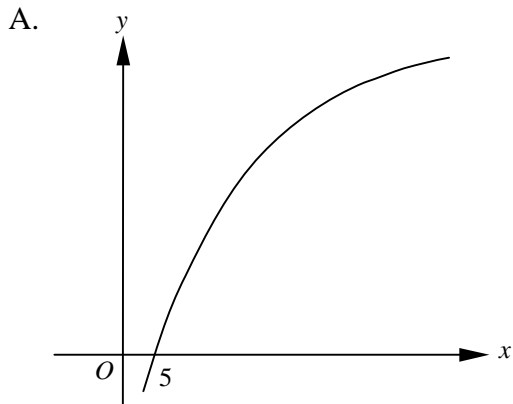
(40) Solve $\log x^2 = 2\log 6$.

解 $\log x^2 = 2\log 6$

- A. 6
- B. -6
- C. 0 or 6
0 或 6
- D. 6 or -6
6 或 -6

(41) Which of the following can be the graph of $y = 3^{-x} + 5$?

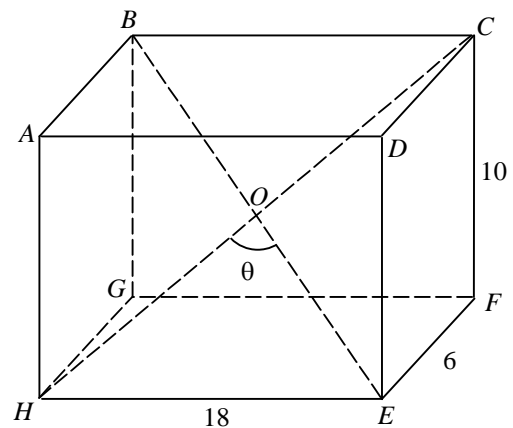
下列哪個圖可能為 $y = 3^{-x} + 5$ 的圖像？



(42) In the figure, θ is the angle between the diagonals BE and CH of the rectangular block. Find θ correct to the nearest degree.

圖中， θ 為長方體對角線 BE 及 CH 的交角。求 θ 準確至最接近的度。

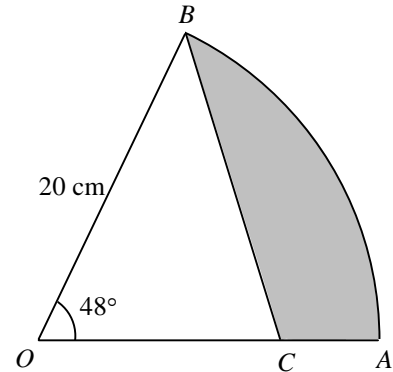
- A. 60°
- B. 90°
- C. 114°
- D. 120°



(43) In the figure, OAB is a sector of a circle with radius 20 cm. If the area of the shaded region is 40.8 cm^2 , find the length of AC correct to 2 significant figures.

圖中， OAB 為一半徑為 20 cm 的扇形。若陰影部份的面積為 40.8 cm^2 ，求 AC 的長度準確至 2 位有效數字。

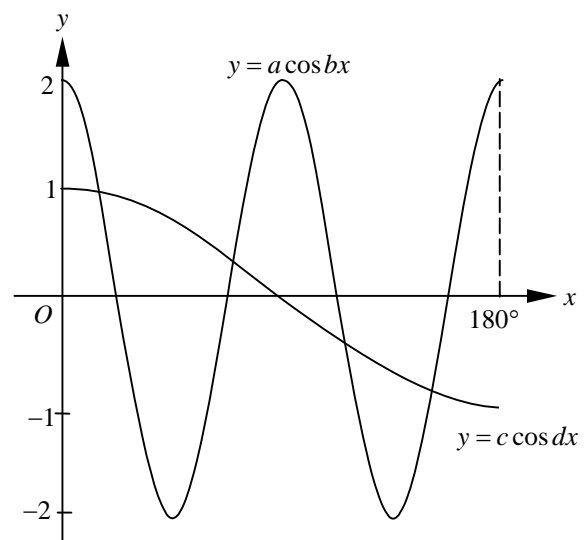
- A. 2.9 cm
- B. 8.5 cm
- C. 11 cm
- D. 17 cm



(44) The figure shows the graphs of $y = a \cos bx$ and $y = c \cos dx$, where a, b, c and d are positive constants. $a - b + c + d =$

圖中所示為 $y = a \cos bx$ 及 $y = c \cos dx$ 的圖像，其中 a, b, c 及 d 為正常數。
 $a - b + c + d =$

- A. 0
- B. $\frac{3}{2}$
- C. $-\frac{3}{2}$
- D. $\frac{15}{4}$



(45) Convert the decimal number $2^7 + 2^5 + 2^4 + 1$ to binary number.

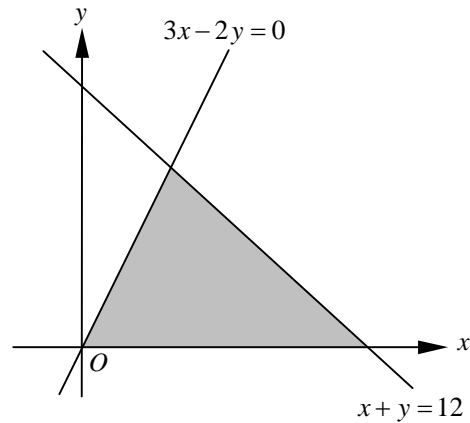
將十進數 $2^7 + 2^5 + 2^4 + 1$ 轉換為二進數。

- A. 1011001_2
- B. 10110000_2
- C. 10110001_2
- D. 10110011_2

(46) Which of the following systems of inequalities has its solution represented by the shaded region in the figure?

下列哪個不等式組的解由圖中的陰影部份為表示？

- A. $\begin{cases} 3x - 2y \geq 0 \\ x + y \leq 12 \\ x \geq 0 \end{cases}$
- B. $\begin{cases} 3x - 2y \leq 0 \\ x + y \leq 12 \\ y \geq 0 \end{cases}$
- C. $\begin{cases} 3x - 2y \geq 0 \\ x + y \leq 12 \\ y \geq 0 \end{cases}$
- D. $\begin{cases} 3x - 2y \geq 0 \\ x + y \geq 12 \\ y \geq 0 \end{cases}$



(47) Three numbers are in arithmetic sequence. It is known that their sum is 69 and their product is 11339. What is the value of the smallest number?

三個數為等差數列。已知它們的和為 69 而它們的積為 11339。問最小的數的值是多少？

- A. 17
B. 21
C. 23
D. 27

(48) $\sqrt{7\sqrt{7\sqrt{7\Lambda}}} =$

- A. $7^{\frac{2}{3}}$
B. 7
C. $7^{\frac{3}{2}}$
D. 49.

(49) Two dices are thrown, and the sum of the numbers shown is 8. What is the probability that these two numbers are both odd?

若投擲兩顆骰子一次。已知兩顆骰子點數的和等於 8。求兩顆骰子的點數皆奇數的概率。

- A. $\frac{1}{18}$
- B. $\frac{5}{36}$
- C. $\frac{2}{5}$
- D. $\frac{1}{4}$

(50) Which of the following changes can not affect the value of the inter-quartile range of a group of data?

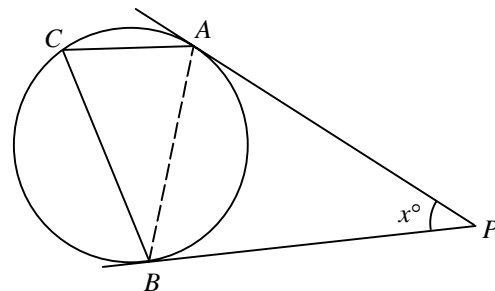
下列哪項改變一定不會改變一組數據的四分位數間距？

- A. Dividing each datum of the group by 3.
將每個數據除以 3。
- B. Subtracting each datum of the group by 2.
將每個數據減去 2。
- C. Deleting one of the data in the group.
將其中一個數據捨去。
- D. Adding the datum '0' to the group.
加上 '0' 這個數據。

(51) In the figure, PA and PB touch the circle at A and B respectively. C is a point on the circumference. If $\angle APB = x^\circ$, then $\angle ACB =$

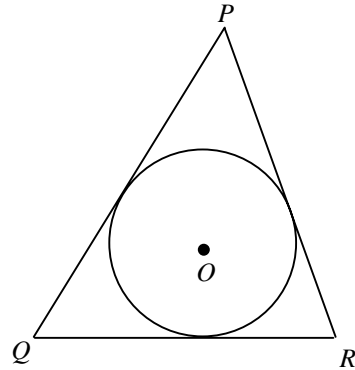
圖中， PA 及 PB 分別與圓相切於 A 及 B 。 C 為圓周上的一點。若 $\angle APB = x^\circ$ ，則 $\angle ACB =$

- A. x°
- B. $2x^\circ$
- C. $90^\circ - \frac{x^\circ}{2}$
- D. $180^\circ - x^\circ$



(52) In the figure, O is the in-centre of ΔPQR . Which of the following must be true?
 圖中， O 為 ΔPQR 的內心。下列何者必為正確？

- I. OQ bisects $\angle Q$.
 OQ 平分 $\angle Q$ 。
 - II. PO produced bisects QR .
 PO 的延長線平分 QR 。
 - III. Area of $\Delta PQR = 2 \times$ Area of the circle.
 ΔPQR 的面積 = $2 \times$ 圓的面積。
- A. I only
 只有 I
 - B. I and II only
 只有 I 及 II
 - C. I and III only
 只有 I 及 III
 - D. II and III only
 只有 II 及 III



(53) The equation of a circle is $2x^2 + 2y^2 + 4x - 6y - 15 = 0$. Which of the following must be true?

某圓的方程為 $2x^2 + 2y^2 + 4x - 6y - 15 = 0$ 。下列何者必為正確？

- I. The circle cuts the y -axis at two distinct points.
 圓與 y 軸相交於兩相異點。
 - II. The centre lies in the fourth quadrant.
 圓心位於第四象限。
 - III. The origin lies outside the circle.
 原點位於圓外。
- A. I only
 只有 I
 - B. I and II only
 只有 I 及 II
 - C. I and III only
 只有 I 及 III
 - D. I, II and III
 I、II 及 III

(54) M and N are two fixed points in a coordinate plane. P is a variable point such that the area of $\triangle PMN$ is 7. What is the locus of P ?

M 及 N 為坐標平面上的兩個固定點。 P 為一可變點使得 $\triangle PMN$ 的面積為 7。問 P 的軌跡是什麼？

- A. a circle
一個圓
- B. a parabola
一條拋物線
- C. a straight line
一條直線
- D. a pair of straight lines
一對直線

END OF PAPER

~ 試卷完 ~

Solution

(1) B. $(m+n)^{n-m}$.

$$\frac{(m+n)^n}{(n+m)^m} = (m+n)^{n-m}.$$

(2) C. $\frac{1}{x-1}$.

$$\begin{aligned}\frac{\frac{1}{x}}{1-\frac{1}{x}} &= \frac{\frac{1}{x}}{\frac{x-1}{x}} \\ &= \frac{1}{x-1}.\end{aligned}$$

(3) C. $\frac{2-3y}{y-1}$.

$$\begin{aligned}y &= \frac{x+2}{x+3} \\ y(x+3) &= x+2 \\ yx+3y &= x+2 \\ x(y-1) &= 2-3y \\ x &= \frac{2-3y}{y-1}.\end{aligned}$$

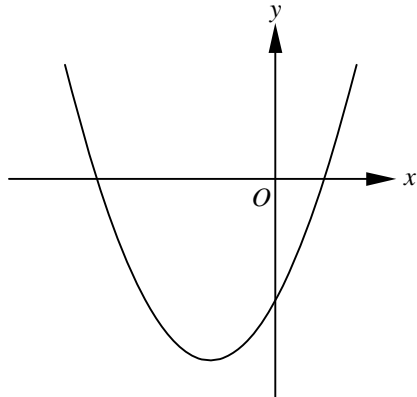
(4) A. 1 only.

$$\begin{aligned}x+3 &> \frac{3x+4}{2} \\ 2(x+3) &> 3x+4 \\ 2x+6 &> 3x+4 \\ x &< 2.\end{aligned}$$

$$\therefore x=1.$$

(5) B. $\frac{51}{12-x} + \frac{25}{12+x} = 7$.

(6) D.



As the graph has a negative y -intercept $-a^2$, the answers (B) and (C) are not true.
由於圖像的 y 軸截距 $-a^2$ 為負數，(B) 及 (C) 並不正確。

Equation of the axis of symmetry:
對稱軸方程：

$$x = -\frac{a}{2} < 0.$$

\therefore (D) is the answer.
(D) 為答案。

(7) C. 36 cm^2 .

Let x cm and y cm be the width and length of the rectangle respectively.
設長方形的闊及長分別為 x cm 及 y cm。

$$\therefore \begin{cases} y = 4x & \text{.....(1)} \\ 2x + 2y = 30 & \text{.....(2)} \end{cases}$$

Put (1) into (2),
把 (1) 代入 (2) ，

$$\begin{aligned} 2x + 2(4x) &= 30 \\ 10x &= 30 \\ x &= 3. \end{aligned}$$

$$\therefore \begin{aligned} y &= 4(3) \\ &= 12. \end{aligned}$$

$$\begin{aligned} \therefore \quad \text{Required area (所求面積)} &= xy \\ &= 3(12) \\ &= 36 \text{ cm}^2. \end{aligned}$$

(8) A. $\frac{x^2 - x}{2}$.

$$\begin{aligned} f(x-1) &= \frac{1}{2}[(x-1)^2 + (x-1)] \\ &= \frac{1}{2}[(x^2 - 2x + 1) + (x-1)] \\ &= \frac{x^2 - x}{2}. \end{aligned}$$

(9) B. 52.

$$\begin{aligned} \text{Required number (所求數目)} &= 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 \\ &= 52. \end{aligned}$$

(10) A. $6.65 \times 9.15 \leq A < 6.75 \times 9.25$.

$$\begin{aligned} \text{Absolute maximum error (最大絕對誤差)} &= \frac{0.1}{2} \text{ m} \\ &= 0.05 \text{ m}. \end{aligned}$$

$$\therefore 6.65 \times 9.15 \leq A < 6.75 \times 9.25.$$

(11) D. \$20000.

Let \$C be the cost of the article of P.
設該物品對 P 的成本為 \$C。

$$\begin{aligned} \therefore \quad \text{Cost of the article of } Q \text{ (該物品對 } Q \text{ 的成本)} &= \$C(1 + 20\%) \\ &= \$1.2C \end{aligned}$$

and

$$\begin{aligned} R \text{ paid (} R \text{ 付出)} &= \$1.2C(1 + 15\%) \\ &= \$1.38C. \end{aligned}$$

$$\begin{aligned} \therefore \quad 1.38C - C &= 38000 \\ C &= 100000. \end{aligned}$$

$$\begin{aligned} \therefore \quad P \text{ gained (} P \text{ 獲利)} &= \$(1.2C - C) \\ &= \$0.2C \end{aligned}$$

$$= \$0.2(100000)$$

$$= \$20000.$$

(12) B. \$2906250.

Let $\$P$ be the principal.
設本金為 $\$P$ 。

$$\text{Compound interest (複利息)} = \$P(1 + 4\%)^2 - \$P$$

$$= \$0.0816P$$

and

$$\text{Simple interest (單利息)} = \$ \frac{P \times 4 \times 2}{100}$$

$$= \$0.08P$$

$$\therefore \quad 0.0816P - 0.08P = 4650$$

$$P = 2906250.$$

(13) A. $p = -4, q = -2$.

$$2x^2 + px + 4 \equiv (1-x)(2+qx) + 2$$

$$\equiv (2 + qx - 2x - qx^2) + 2$$

$$\equiv -qx^2 + (q-2)x + 4.$$

$$\therefore \begin{cases} 2 = -q \\ p = q - 2 \end{cases}$$

$$\therefore p = -4, q = -2.$$

(14) B. $-6:1$.

$$5a^2 + 28ab - 12b^2 = 0$$

$$(5a - 2b)(a + 6b) = 0$$

$$5a = 2b \text{ (rejected) or (或) } a = -6b$$

$$a : b = -6 : 1.$$

(15) B. $x \propto \frac{1}{\sqrt{y}}$.

x	4	6	12	24
y	36	16	4	1
$\frac{x}{\sqrt{y}}$	$\frac{2}{3}$	$\frac{3}{2}$	6	24
$x\sqrt{y}$	24	24	24	24
xy	144	96	48	24
xy^2	5184	1536	192	24

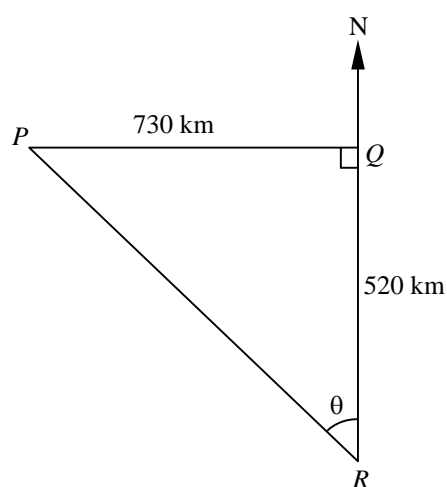
$$\therefore x \propto \frac{1}{\sqrt{y}}.$$

(16) A. N54.5°W.

In $\triangle PQR$,
在 $\triangle PQR$ 中，

$$\begin{aligned}\tan \theta &= \frac{730}{520} \\ \theta &= 54.5^\circ.\end{aligned}$$

\therefore Required bearing (所求方位角) = N54.5°W.



(17) C. 57°.

$$\begin{aligned}\widehat{AB} &= 3r - r - r \\ &= r \text{ cm.}\end{aligned}$$

$$\begin{aligned}\therefore 2\pi r \times \frac{\theta}{360^\circ} &= r \\ \theta &= 57^\circ.\end{aligned}$$

(18) C. $216\pi \text{ cm}^2$.

Let r cm be the base radius of the circular cone.
設圓錐體的底半徑為 r cm。

$$\begin{aligned}\therefore r^2 + 12^2 &= 15^2 \\ r &= 9.\end{aligned}$$

$$\begin{aligned}\therefore \text{Total surface area (總表面面積)} &= \pi(9)^2 + \pi(9)(15) \\ &= 216\pi \text{ cm}^2.\end{aligned}$$

(19) C. $\frac{392\pi}{3} \text{ cm}^3$.

⊙ $\triangle ACB \sim \triangle AED$ (AAA),

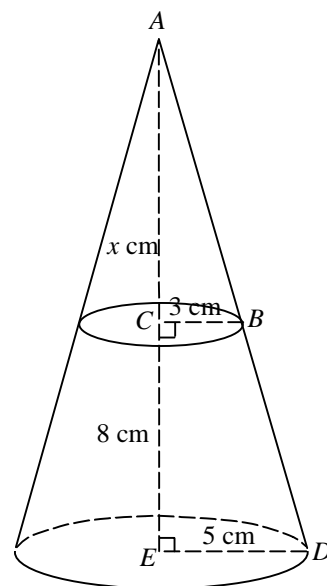
$$\frac{x}{x+8} = \frac{3}{5}$$

$$x = 12.$$

∴ Required volume (所求體積)

$$= \frac{1}{3} \pi (5)^2 (12+8) - \frac{1}{3} \pi (3)^2 (12)$$

$$= \frac{392\pi}{3} \text{ cm}^3$$



(20) A. 32° .

$$\angle DAC = \frac{180^\circ - 32^\circ}{2}$$

$$= 74^\circ.$$

∴ $\angle ACB = 74^\circ$.

∴ $\angle BAC = 180^\circ - 74^\circ - 74^\circ$
 $= 32^\circ$.

(21) A. II only.

$\angle ABE = \angle CDE$	(alt. \angle s, $AB \parallel DC$)	(錯角, $AB \parallel DC$)
$\angle BAE = \angle DCE$	(alt. \angle s, $AB \parallel DC$)	(錯角, $AB \parallel DC$)
$\triangle ABE \sim \triangle CDE$.	(AAA)	

∴ II is true.

I and III are not true in general.

一般地, I 及 III 並不正確。

(22) B. $\sin A$.

$$\frac{1}{\sin A} - \frac{\cos A}{\tan A} = \frac{1}{\sin A} - \frac{\cos A}{\frac{\sin A}{\cos A}}$$

$$= \frac{1}{\sin A} - \frac{\cos^2 A}{\sin A}$$

$$\begin{aligned}
&= \frac{1 - \cos^2 A}{\sin A} \\
&= \frac{\sin^2 A}{\sin A} \\
&= \sin A.
\end{aligned}$$

(23) A. $\frac{1}{3}$.

$$\begin{aligned}
\text{Greatest value (最大值)} &= \frac{1}{3^{1+0}} \\
&= \frac{1}{3}.
\end{aligned}$$

(24) B. 1.

$$\begin{aligned}
\tan \theta &= -\tan^3 \theta \\
\tan^3 \theta + \tan \theta &= 0 \\
\tan \theta \cdot (\tan^2 \theta + 1) &= 0 \\
\tan \theta &= 0 \\
\theta &= 0^\circ.
\end{aligned}$$

\therefore There is only one root.
只有一個根。

(25) B. $PQ \cos 28^\circ \sin 28^\circ$.

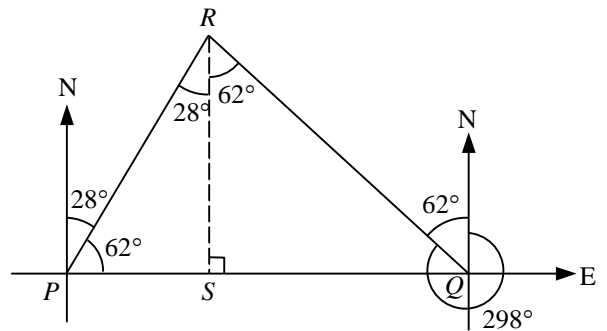
$$\begin{aligned}
\angle PRQ &= 28^\circ + 62^\circ \\
&= 90^\circ.
\end{aligned}$$

In $\triangle PQR$,
在 $\triangle PQR$ 中，

$$\begin{aligned}
\cos 62^\circ &= \frac{PR}{PQ} \\
PR &= PQ \cos 62^\circ.
\end{aligned}$$

In $\triangle PRS$,
在 $\triangle PRS$ 中，

$$\begin{aligned}
\sin 62^\circ &= \frac{RS}{PR} \\
RS &= PQ \cos 62^\circ \sin 62^\circ \\
&= PQ \sin 28^\circ \cos 28^\circ.
\end{aligned}$$



(26) C. I and II only.

(27) C. I and III only.

(28) B. 30.

$$\begin{aligned}BC : AC &= 1 : 3 \\AB : BC &= 1 : 2.\end{aligned}$$

$\therefore \triangle DAB \sim \triangle ECB$. (3 sides prop.) (三邊成比例)

$\therefore x = 30$.

(29) C. 45° .

In $\triangle ABC$,
在 $\triangle ABC$ 中，

$$\begin{aligned}\angle ABC &= 60^\circ + 90^\circ \\ &= 150^\circ.\end{aligned}$$

$$\begin{aligned}\therefore \angle BAC &= \frac{180^\circ - 150^\circ}{2} \\ &= 15^\circ.\end{aligned}$$

$$\begin{aligned}\therefore \angle EAC &= 60^\circ - 15^\circ \\ &= 45^\circ.\end{aligned}$$

(30) A. $(-4, -3)$.

(31) D. $(5, 225^\circ)$

(32) C. I and II only.

$3x - 2y + 7 = 0$ and $6x + 4y - 5 = 0$ are non-parallel. They will cut each other.
 $3x - 2y + 7 = 0$ 與 $6x + 4y - 5 = 0$ 並不平行。它們會相交。

\therefore I is true.

$3x - 2y + 7 = 0$ and $\frac{2}{3}x + y = 1$ are non-parallel. They will cut each other.

$3x - 2y + 7 = 0$ 與 $\frac{2}{3}x + y = 1$ 並不平行。它們會相交。

\therefore II is true.

$3x - 2y + 7 = 0$ and $6y = 9x + 1$ are parallel and non-overlapping. They will not cut each other.

$3x - 2y + 7 = 0$ 與 $6y = 9x + 1$ 平行且並不重疊。它們不會相交。

∴ III is not true.

(33) C. (9, 0).

Let (設) $C = (c, 0)$.

Slope (斜率) of AB = Slope (斜率) of AC

$$\begin{aligned}\frac{10 - (-5)}{-5 - 16} &= \frac{10 - 0}{-5 - c} \\ -\frac{5}{7} &= \frac{10}{-5 - c} \\ c &= 9.\end{aligned}$$

∴ $C = (9, 0)$.

(34) B. $\frac{1}{9}$.

(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

$$\begin{aligned}\text{Required probability (所求概率)} &= \frac{4}{36} \\ &= \frac{1}{9}.\end{aligned}$$

(35) A. I only.

$$\begin{aligned}\text{Range (分佈域)} &= 26 - 20 \\ &= 6.\end{aligned}$$

∴ I is true.

Mean could not be determined from the box-and-whisker diagram.
不能從框線圖求出平均。

∴ II is not true.

Only 25% of the teenagers are above 25.
只有 25% 的青年大於 25 歲。

∴ III is not true.

(36) A. 0 – 9 hours.

(37) C. $(x+3)(x-4)$.

Let (設) $f(x) = x^3 + x^2 - 14x - 24$.

$$\begin{aligned} f(-2) &= (-2)^3 + (-2)^2 - 14(-2) - 24 \\ &= 0. \end{aligned}$$

∴ $x+2$ is a factor (因式) of $f(x)$.

By long division,
利用長除法，

$$\begin{aligned} f(x) &= (x+2)(x^2 - x - 12) \\ &= (x+2)(x+3)(x-4). \end{aligned}$$

∴ (C) is the answer.

(38) D. 42.

$$\begin{aligned} f(x) + 2g(x) &= x^2 - 2x + 9 + 2(-2x^2 - 8x + 3) \\ &= -3x^2 - 18x + 15 \\ &= -3(x^2 + 6x + 3^2) + 15 + 3(3^2) \\ &= -3(x+3)^2 + 42. \end{aligned}$$

∴ Maximum value (極大值) = 42.

(39) D. $y = 10$.

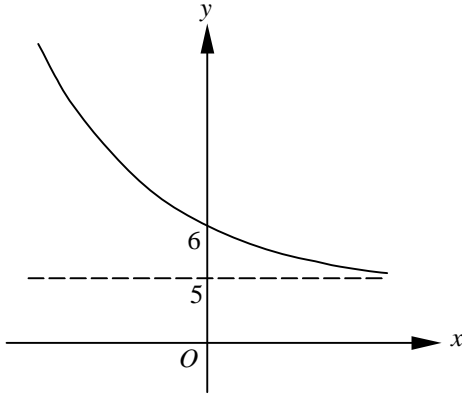
$$\begin{aligned} 3x^2 + 7x - 8 &= 0 \\ 3x^2 + 7x &= 8 \\ 3x^2 + 7x + 2 &= 10. \end{aligned}$$

∴ The straight line $y = 10$ should be added.
應加上直線 $y = 10$ 。

(40) D. 6 or -6.

$$\begin{aligned}\log x^2 &= 2\log 6 \\ \log x^2 &= \log 6^2 \\ x^2 &= 6^2 \\ x &= 6 \text{ or (或) } x = -6.\end{aligned}$$

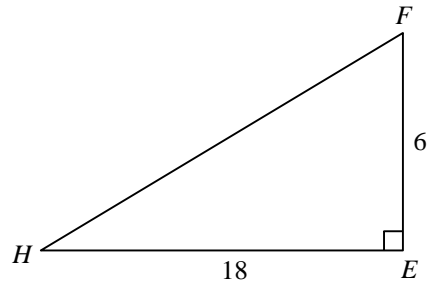
(41) C.



(42) C. 114° .

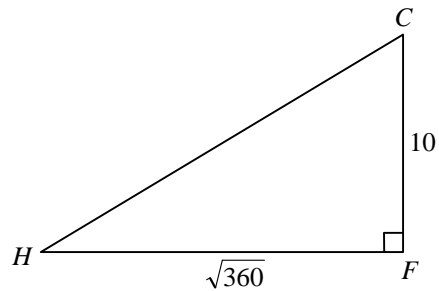
In $\triangle HEF$,
在 $\triangle HEF$ 中，

$$\begin{aligned}HF &= \sqrt{18^2 + 6^2} \\ &= \sqrt{360}.\end{aligned}$$



In $\triangle CHF$,
在 $\triangle CHF$ 中，

$$\begin{aligned}CH &= \sqrt{(\sqrt{360})^2 + 10^2} \\ &= \sqrt{460}.\end{aligned}$$



$$\therefore OH = OE = \frac{\sqrt{460}}{2}.$$

In $\triangle OHE$,
在 $\triangle OHE$ 中，

$$18^2 = \left(\frac{\sqrt{460}}{2}\right)^2 + \left(\frac{\sqrt{460}}{2}\right)^2 - 2\left(\frac{\sqrt{460}}{2}\right)\left(\frac{\sqrt{460}}{2}\right)\cos\theta$$

$$\cos \theta = -\frac{47}{115}$$

$$\theta = 114^\circ.$$

(43) A. 2.9 cm.

$$\pi(20)^2 \times \frac{48^\circ}{360^\circ} - \frac{1}{2}(20)(OC)\sin 48^\circ = 40.8$$

$$167.55 - 7.4314OC = 40.8$$

$$OC = 17.056 \text{ cm.}$$

$$\therefore AC = 20 - 17.056$$

$$= 2.9 \text{ cm.}$$

(44) A. 0.

From the figure,
從圖中，

$$a = 2, b = 4, c = 1 \text{ and } d = 1.$$

$$\therefore a - b + c + d = 2 - 4 + 1 + 1$$

$$= 0.$$

(45) C. 10110001_2 .

$$(46) \text{ C. } \begin{cases} 3x - 2y \geq 0 \\ x + y \leq 12. \\ y \geq 0 \end{cases}$$

(47) A. 17.

Let $a - d$, a and $a + d$ be the three numbers, where $d > 0$.
設該三個數為 $a - d$ 、 a 及 $a + d$ ，其中 $d > 0$ 。

$$\therefore (a - d) + a + (a + d) = 69$$

$$3a = 69$$

$$a = 23$$

and

$$(a - d)(a)(a + d) = 11339$$

$$(23 - d)(23)(23 + d) = 11339$$

$$(23 - d)(23 + d) = 493$$

$$529 - d^2 = 493$$

$$d^2 = 36$$

$$d = 6.$$

$$\therefore \text{Smallest number (最小的數)} = 23 - 6 \\ = 17.$$

(48) B. 7.

$$\begin{aligned} \sqrt{7\sqrt{7\sqrt{7\Lambda}}} &= 7^{\frac{1}{2}} \cdot 7^{\frac{1}{4}} \cdot 7^{\frac{1}{8}} \Lambda \\ &= 7^{\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \Lambda} \\ &= 7^{1 - \frac{1}{2}} \\ &= 7. \end{aligned}$$

(49) C. $\frac{2}{5}$.

Possible outcomes (可能結果): (2, 6), (3, 5), (4, 4), (5, 3), (6, 2).

Favourable outcomes (符合事件結果): (3, 5), (5, 3).

Required probability (所求概率) = $\frac{2}{5}$.

(50) B. Subtracting each datum of the group by 2.

(51) C. $90^\circ - \frac{x^\circ}{2}$.

$PA = PB$. (tangent properties) (切線性質)

$$\begin{aligned} \therefore \angle PAB &= \frac{180^\circ - x^\circ}{2} && (\angle \text{ sum of } \Delta) && (\Delta \text{ 內角和}) \\ &= 90^\circ - \frac{x^\circ}{2}. \end{aligned}$$

$$\therefore \angle ACB = 90^\circ - \frac{x^\circ}{2}. \quad (\angle \text{ in alt. segment}) \quad (\text{交錯弓形內的圓周角})$$

(52) A. I only.

(53) A. I only.

Put $x = 0$ into the circle,
把 $x = 0$ 代入圓內，

$$2y^2 - 6y - 15 = 0.$$

$$\begin{aligned}\Delta &= (-6)^2 - 4(2)(-15) \\ &= 156 \\ &> 0.\end{aligned}$$

∴ The circle cuts the y -axis at two distinct points.
圓與 y 軸相交於兩相異點。

∴ I is true.

$$\begin{aligned}\text{Centre (圓心)} &= \left(-\frac{2}{2}, -\frac{(-3)}{2}\right) \\ &= \left(-1, \frac{3}{2}\right).\end{aligned}$$

∴ II is not true.

$$\begin{aligned}\text{Radius (半徑)} &= \sqrt{(-1)^2 + \left(\frac{3}{2}\right)^2 - \left(-\frac{15}{2}\right)} \\ &= \sqrt{\frac{43}{4}}.\end{aligned}$$

Let d be the distance between the centre of the circle and the origin.
設圓心與原點的距離為 d 。

$$\begin{aligned}\therefore d &= \sqrt{(-1-0)^2 + \left(\frac{3}{2}-0\right)^2} \\ &= \sqrt{\frac{13}{4}} \\ &< \text{Radius (半徑)}\end{aligned}$$

∴ The origin lies inside the circle.
原點位於圓內。

∴ III is not true.

(54) D. a pair of straight lines.

