

MATHEMATICS PAPER 2

11.15 am – 12.45 pm (1½ hours)

Subject Code 180

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking the barcode label after the 'Time is up' announcement.
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 are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
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

SPHERE	Surface area	$= 4\pi r^2$
	Volume	$= \frac{4}{3}\pi r^3$
CYLINDER	Area of curved surface	$= 2\pi rh$
	Volume	$= \pi r^2 h$
CONE	Area of curved surface	$= \pi rl$
	Volume	$= \frac{1}{3}\pi r^2 h$
PRISM	Volume	$= \text{base area} \times \text{height}$
PYRAMID	Volume	$= \frac{1}{3} \times \text{base area} \times \text{height}$

There are 36 questions in Section A and 18 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. If $x = \frac{3a}{a+2b}$, then $a =$

A. $\frac{2b}{3-x}$

B. $\frac{2b}{x-3}$

C. $\frac{2bx}{3-x}$

D. $\frac{2bx}{x-3}$

2. $\left(\frac{1}{9}\right)^{500} (3^{500})^3 =$

A. 0

B. 3^{500}

C. 6^{500}

D. 18^{500}

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

A. $\frac{6}{2x^2-3}$

B. $\frac{4x}{2x^2-3}$

C. $\frac{6}{4x^2-9}$

D. $\frac{4x}{4x^2-9}$

4. $ab + ac - a^2 - bc =$

A. $(a - b)(b + c)$.

B. $(a - b)(c - a)$.

C. $(a - c)(b + c)$.

D. $(a + b)(c - a)$.

5. If h and k are constants such that $hx + (x - 3)^2 \equiv x^2 + 10x + k$, then

A. $h = 10$ and $k = -9$.

B. $h = 10$ and $k = 9$.

C. $h = 16$ and $k = -9$.

D. $h = 16$ and $k = 9$.

6. If $f(x) = x^2 - 3x + 17$, then $3f(2) - 1 =$

A. 27 .

B. 34 .

C. 44 .

D. 70 .

7. Let x be the larger one of two consecutive odd numbers. If the sum of the squares of the two odd numbers is less than four times the product of the two odd numbers by 2 , then

A. $x^2 + (x - 1)^2 = 4x(x - 1) + 2$.

B. $x^2 + (x - 1)^2 = 4x(x - 1) - 2$.

C. $x^2 + (x - 2)^2 = 4x(x - 2) + 2$.

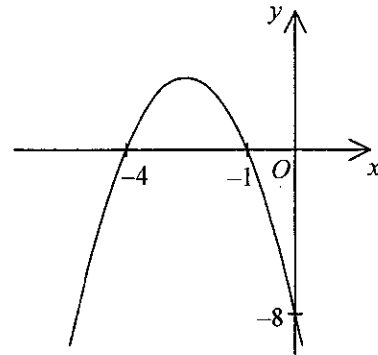
D. $x^2 + (x - 2)^2 = 4x(x - 2) - 2$.

8. If $2p + q = p - q = 3$, then $q =$

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

9. The equation of the quadratic graph shown in the figure is

- A. $y = (x - 1)(x - 4)$.
- B. $y = -(x + 1)(x + 4)$.
- C. $y = -2(x + 1)(x + 4)$.
- D. $y = -2(x - 1)(x - 4)$.



10. Let k be a constant. Find the range of values of k such that the quadratic equation $x^2 + 6x + k = 3$ has no real roots.

- A. $k < 9$
- B. $k > 9$
- C. $k < 12$
- D. $k > 12$

11. If a and b are real numbers such that $ab > 0$, which of the following must be true?

- I. $\frac{a}{b} > 0$
 - II. $a + b > 0$
 - III. $a^2 + b^2 > 0$
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

12. Which of the following may represent the n th term of the sequence $0, \frac{-1}{4}, \frac{2}{5}, \frac{-3}{6}, \frac{4}{7}, \dots$?

A. $(-1)^n \frac{n-1}{n+1}$

B. $(-1)^n \frac{n-1}{n+2}$

C. $(-1)^{n+1} \frac{n}{n+3}$

D. $(-1)^{n+1} \frac{n-1}{n+2}$

13. If the price of a magazine is 60% higher than the price of a newspaper, then the price of the newspaper is

A. 37.5% lower than the price of the magazine.

B. 40% lower than the price of the magazine.

C. 60% lower than the price of the magazine.

D. 62.5% lower than the price of the magazine.

14. A sum of \$40 000 is deposited at an interest rate of 4% per annum for 3 years, compounded quarterly. Find the amount correct to the nearest dollar.

A. \$44 800

B. \$44 995

C. \$45 046

D. \$45 073

15. If tea of brand A costs \$80/kg and tea of brand B costs \$40/kg, then a mixture of 4 kg of tea of brand A and 6 kg of tea of brand B costs

A. \$52/kg .

B. \$56/kg .

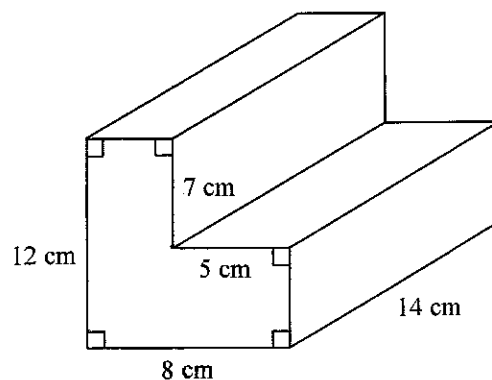
C. \$60/kg .

D. \$64/kg .

16. It is given that z varies directly as x and directly as y^2 . If x is decreased by 20% and y is increased by 15%, then z
- is increased by 5.8% .
 - is decreased by 5.8% .
 - is increased by 8% .
 - is decreased by 8% .
17. If the length and the breadth of a rectangle are measured as 12 cm and 10 cm respectively and all the measurements are correct to the nearest cm, then the least possible area of the rectangle is
- 99 cm^2 .
 - 109.25 cm^2 .
 - 120 cm^2 .
 - 131.25 cm^2 .
18. The volume of a right circular cylinder of radius R is twice the volume of another right circular cylinder of radius r . If the heights of these two circular cylinders are the same, then $R:r =$
- 2:1 .
 - 4:1 .
 - $\sqrt{2}:1$.
 - $\sqrt{3}:1$.

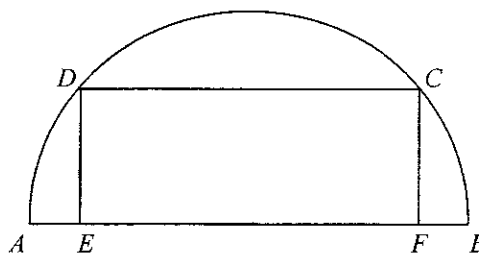
19. In the figure, the total surface area of the solid right prism is

- 560 cm^2 .
- 621 cm^2 .
- 682 cm^2 .
- 854 cm^2 .



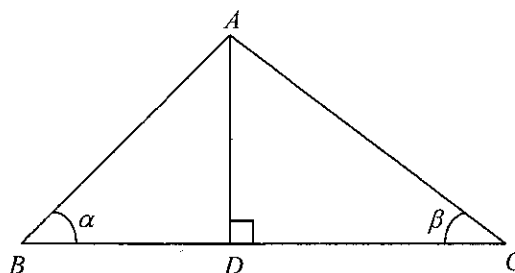
20. In the figure, $ABCD$ is a semicircle of diameter 26 cm . It is given that $CDEF$ is a rectangle such that E and F are points lying on AB . If $AE = 1$ cm , find the area of the rectangle $CDEF$.

- A. 120 cm^2
 B. 130 cm^2
 C. 288 cm^2
 D. 312 cm^2



21. In the figure, D is a point lying on BC such that AD is perpendicular to BC . Find $\frac{AC}{BD}$.

- A. $\frac{\tan \beta}{\tan \alpha}$
 B. $\frac{\tan \alpha}{\sin \beta}$
 C. $\tan \alpha \tan \beta$
 D. $\tan \alpha \sin \beta$



22. If θ is an acute angle, then $\tan \theta + \tan(90^\circ - \theta) =$

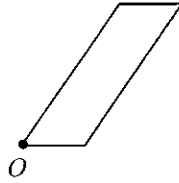
- A. $2 \tan \theta$.
 B. $\sin \theta + \cos \theta$.
 C. $\frac{1}{\tan \theta}$.
 D. $\frac{1}{\sin \theta \cos \theta}$.

23. Which of the following statements about a cube must be true?

- I. The number of planes of reflection is 9 .
 II. All the axes of rotational symmetry intersect at the same point.
 III. The angle between any two intersecting axes of rotational symmetry is 90° .

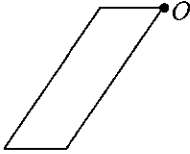
- A. I and II only
 B. I and III only
 C. II and III only
 D. I, II and III

24.

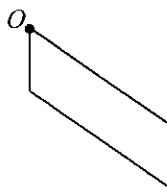


If the plane figure above is rotated anticlockwise about the point O through 270° , which of the following is its image?

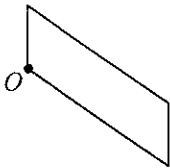
A.



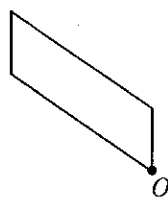
B.



C.

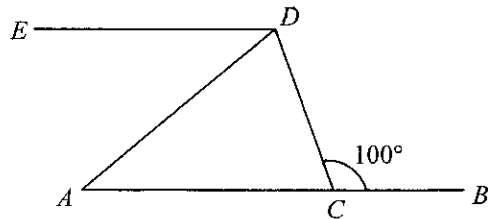


D.



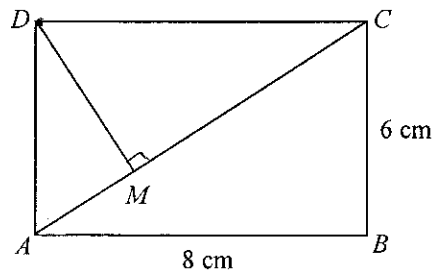
25. In the figure, C is a point lying on AB such that $AC = AD$. If $AB \parallel ED$, find $\angle ADE$.

- A. 20°
- B. 30°
- C. 40°
- D. 50°



26. In the figure, $ABCD$ is a rectangle. If M is a point lying on AC such that DM is perpendicular to AC , then $AM : MC =$

- A. $3 : 4$
- B. $4 : 3$
- C. $9 : 16$
- D. $16 : 9$

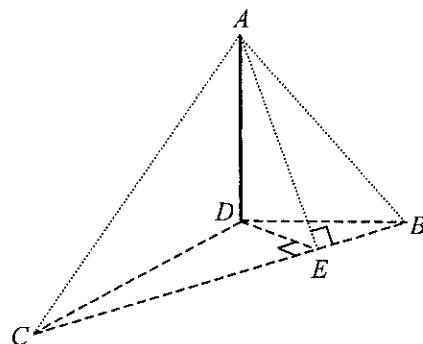


27. Each interior angle of a regular 24-sided polygon is

- A. 144° .
- B. 160° .
- C. 165° .
- D. 171° .

28. In the figure, AD is a vertical pole standing on the horizontal ground BCD . If E is a point lying on BC such that DE and AE are perpendicular to BC , then the angle between the plane ABC and the horizontal ground is

- A. $\angle ABD$.
- B. $\angle ABE$.
- C. $\angle ACD$.
- D. $\angle AED$.



29. If the point $R(-4, -3)$ is reflected with respect to the straight line $y+7=0$ to the point S , then the coordinates of S are

- A. $(-4, -10)$.
- B. $(-4, -11)$.
- C. $(-10, -3)$.
- D. $(-11, -3)$.

30. If the polar coordinates of a point are $(6, 210^\circ)$, then the rectangular coordinates of the point are

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

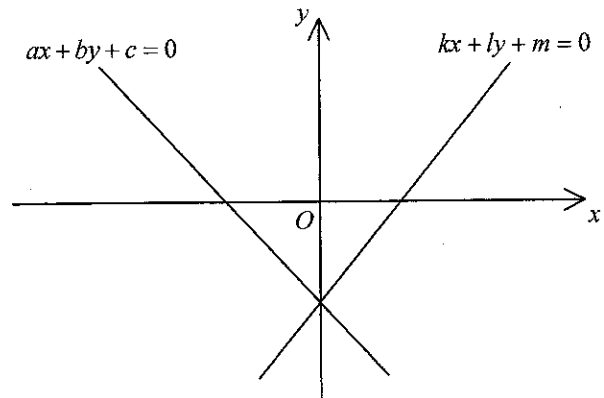
31. The straight line $2x + 7y = 5$ is perpendicular to the straight line

- A. $2x + 7y + 5 = 0$.
- B. $2x - 7y + 5 = 0$.
- C. $7x + 2y + 5 = 0$.
- D. $7x - 2y + 5 = 0$.

32. In the figure, the two straight lines intersect at a point on the negative y -axis. Which of the following must be true?

- I. $ac > 0$
- II. $km > 0$
- III. $am = ck$
- IV. $bm = cl$

- A. I and III only
- B. I and IV only
- C. II and III only
- D. II and IV only



33. A bag contains n white balls and 12 red balls. If a ball is randomly drawn from the bag, then the probability of drawing a red ball is $\frac{1}{4}$. Find the value of n .

- A. 3
- B. 4
- C. 36
- D. 48

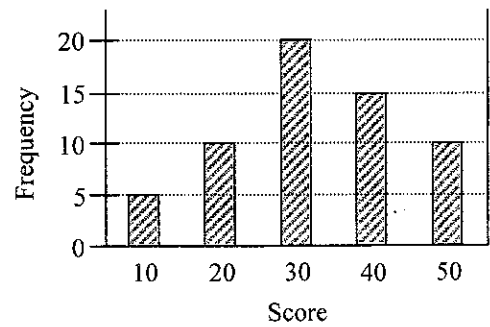
34. Let a , b , c and d be the mean, the median, the mode and the range of the group of numbers $\{x, x, x, x, x, x, x+1, x+1, x+2, x+3\}$ respectively. Which of the following must be true?

- I. $a > b$
- II. $b > c$
- III. $c > d$

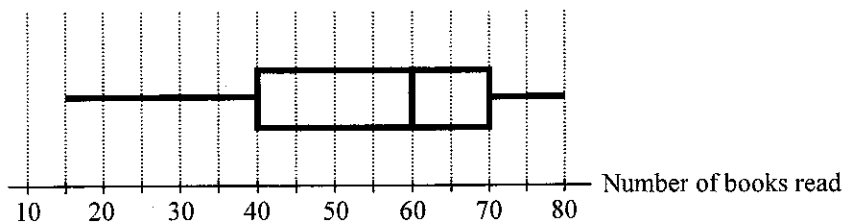
- A. I only
- B. II only
- C. I and III only
- D. II and III only

35. The bar chart shows the distribution of scores obtained by a group of students in a test. Find the standard deviation of the scores correct to the nearest integer.

- A. 12
- B. 14
- C. 23
- D. 33



36. The box-and-whisker diagram below shows the distribution of the numbers of books read by some students in a year. Find the inter-quartile range of the numbers of books read.

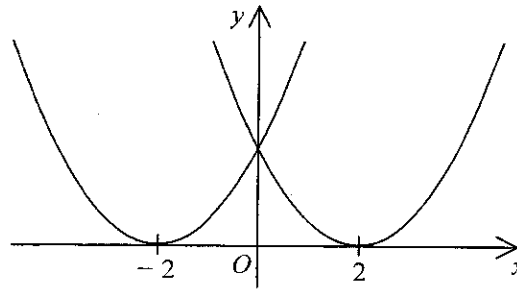


- A. 30
- B. 40
- C. 55
- D. 65

Section B

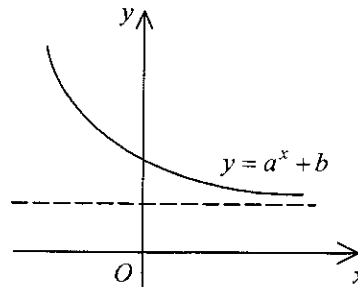
37. Let $f(x)$ be a quadratic function. The figure shows the graph of $y = f(x)$ and

- A. the graph of $y = f(x-2)$.
- B. the graph of $y = f(x+2)$.
- C. the graph of $y = f(-x)$.
- D. the graph of $y = -f(x)$.



38. The figure shows the graph of $y = a^x + b$, where a and b are constants. Which of the following must be true?

- A. $0 < a < 1$ and $b > 0$
- B. $0 < a < 1$ and $b < 0$
- C. $a > 1$ and $b > 0$
- D. $a > 1$ and $b < 0$



39. If a and b are positive numbers, then $\frac{1}{\sqrt{a^3}} \div \frac{\sqrt{b}}{a} =$

- A. $\frac{\sqrt{b}}{ab}$.
- B. $\frac{\sqrt{ab}}{b}$.
- C. $\frac{\sqrt{ab}}{ab}$.
- D. $\frac{\sqrt{a^3b}}{b}$.

40. Convert the decimal number $11 \times 16^8 + 4 \times 16^3 + 14 \times 16^1 + 8$ to a hexadecimal number.

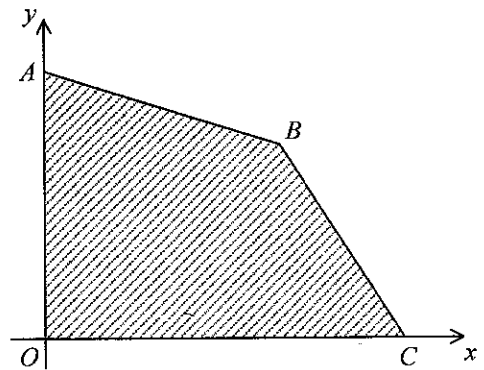
- A. $A00040D8_{16}$
- B. $B00040E8_{16}$
- C. $A000040D8_{16}$
- D. $B000040E8_{16}$

41. Let k be a constant. If $x^3 + 5x^2 + 3kx - k$ is divisible by $x - 1$, find the value of k .

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

42. In the figure, the equations of AB and BC are $x + 3y = 18$ and $2x + y = 16$ respectively. If (x, y) is a point lying in the shaded region $OABC$ (including the boundary), then the greatest value of $3x - y + 16$ is

- A. 10 .
- B. 30 .
- C. 40 .
- D. 70 .

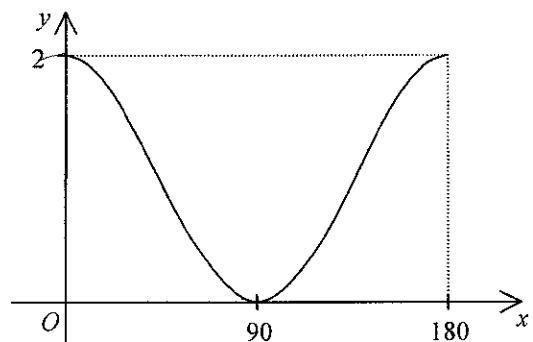


43. If $h, 5, k$ are the first 3 terms of an arithmetic sequence and $h, 4, k$ are the first 3 terms of a geometric sequence, then $h^2 + k^2 =$
- A. 36.
 - B. 68.
 - C. 84.
 - D. 100.

44. The sum of the first 2 terms of a geometric sequence is 8 and the 3rd term of the sequence is 18. Find the 1st term of the sequence.
- A. 2
 - B. 3
 - C. 2 or 32
 - D. 3 or 32

45. The figure shows

- A. the graph of $y = 1 + \cos \frac{x^\circ}{2}$.
- B. the graph of $y = 1 + \cos 2x^\circ$.
- C. the graph of $y = 2 + \sin \frac{x^\circ}{2}$.
- D. the graph of $y = 2 + \sin 2x^\circ$.

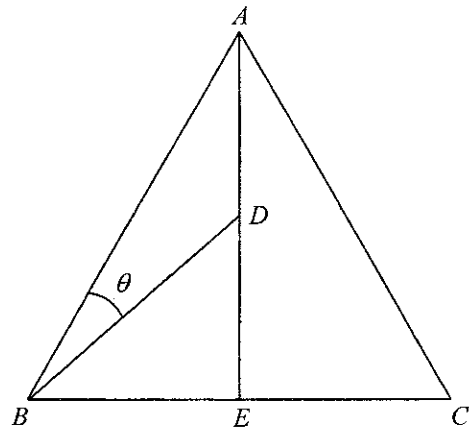


46. $\cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \dots + \cos^2 89^\circ + \cos^2 90^\circ =$

- A. 44 .
- B. 44.5 .
- C. 45 .
- D. 45.5 .

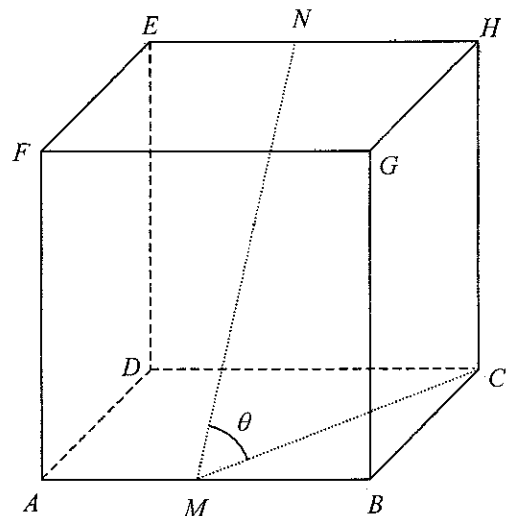
47. In the figure, AD is produced to meet BC at E . If $AB = BC = AC$, $BE = CE$ and $AD = DE$, find $\sin \theta$.

- A. $\frac{\sqrt{3}}{5}$
- B. $\frac{\sqrt{3}}{10}$
- C. $\frac{\sqrt{21}}{7}$
- D. $\frac{\sqrt{21}}{14}$



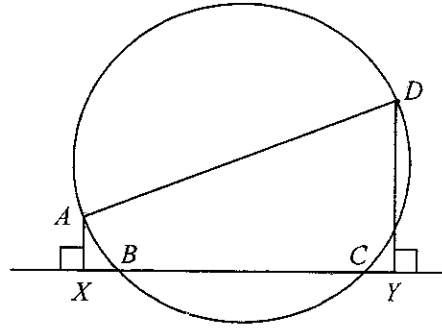
48. In the figure, $ABCDEFGH$ is a cube. If M and N are the mid-points of AB and EH respectively, then $\cos \theta =$

- A. $\frac{\sqrt{6}}{4}$
- B. $\frac{\sqrt{6}}{5}$
- C. $\frac{\sqrt{10}}{4}$
- D. $\frac{\sqrt{10}}{5}$



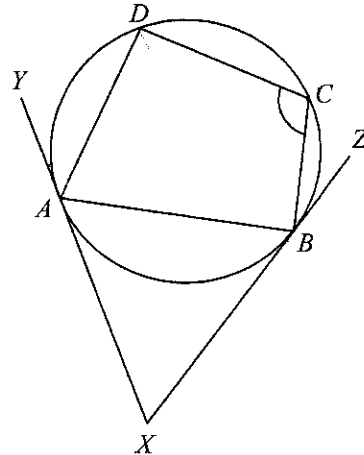
49. In the figure, AD is a diameter of the circle $ABCD$. It is given that $XBCY$ is a straight line. If $AD = 20$ cm and $BC = 12$ cm, then $AX + DY =$

- A. 12 cm .
- B. 16 cm .
- C. 32 cm .
- D. 36 cm .



50. In the figure, XY and XZ are the tangents to the circle $ABCD$ at A and B respectively. If $\angle AXB = 50^\circ$ and $\angle DAY = 30^\circ$, then $\angle BCD =$

- A. 65° .
- B. 80° .
- C. 95° .
- D. 130° .



51. Let O be the origin. If A and B are points lying on the x -axis and the y -axis respectively such that the equation of the circumcircle of $\triangle OAB$ is $x^2 + y^2 - 16x - 12y = 0$, then the equation of the straight line passing through A and B is

- A. $3x + 4y - 48 = 0$.
- B. $3x + 4y + 48 = 0$.
- C. $4x + 3y - 48 = 0$.
- D. $4x + 3y + 48 = 0$.

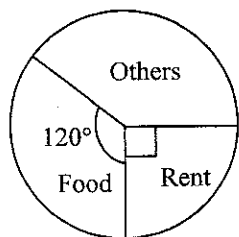
52. A circle cuts the x -axis at P and Q such that $PQ = 6$. If the coordinates of the centre of the circle are $(-5, 2)$, find the equation of the circle.

- A. $x^2 + y^2 - 10x + 4y - 5 = 0$
- B. $x^2 + y^2 - 10x + 4y + 16 = 0$
- C. $x^2 + y^2 + 10x - 4y - 5 = 0$
- D. $x^2 + y^2 + 10x - 4y + 16 = 0$

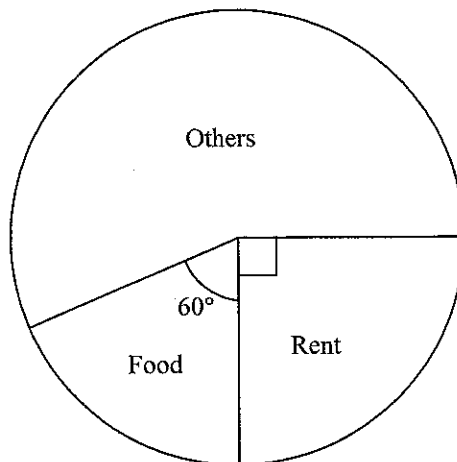
53. In a school, 55% of the students are boys. It is given that 60% of the boys and 30% of the girls live in Kowloon. Find the probability that a randomly selected student from the school is a girl who lives in Kowloon.

- A. 0.135
- B. 0.165
- C. 0.27
- D. 0.33

54. The pie charts below show the expenditures of Albert and Betty in a certain month.



The expenditure of Albert



The expenditure of Betty

Which of the following must be true?

- A. In that month, the expenditure of Albert is less than that of Betty.
- B. In that month, the percentage of rent in the expenditure of Albert is the same as that of Betty.
- C. In that month, the expenditure on rent of Albert is the same as that of Betty.
- D. In that month, the expenditure on food of Albert is twice that of Betty.

END OF PAPER

試卷二
Paper 2

題號 Question No.	答案 Key	題號 Question No.	答案 Key
1.	C (75)	31.	D (59)
2.	B (59)	32.	B (36)
3.	D (80)	33.	C (79)
4.	B (76)	34.	A (60)
5.	D (72)	35.	A (67)
6.	C (85)	36.	A (84)
7.	D (56)	37.	C (44)
8.	A (75)	38.	A (41)
9.	C (60)	39.	C (51)
10.	D (53)	40.	D (57)
11.	B (49)	41.	A (73)
12.	D (52)	42.	C (56)
13.	A (38)	43.	B (61)
14.	D (59)	44.	C (41)
15.	B (85)	45.	B (51)
16.	A (55)	46.	B (37)
17.	B (73)	47.	D (30)
18.	C (47)	48.	D (34)
19.	C (61)	49.	B (41)
20.	A (49)	50.	C (63)
21.	B (66)	51.	A (38)
22.	D (62)	52.	D (44)
23.	A (24)	53.	A (62)
24.	B (65)	54.	B (77)
25.	A (81)		
26.	C (55)		
27.	C (80)		
28.	D (80)		
29.	B (48)		
30.	C (46)		

註：括號內數字為答對百分率。

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.