2015-DSE
MATH CP
PAPER 2

MC

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2015

MATHEMATICS Compulsory Part
PAPER 2

11.30 am – 12.45 pm (1¼ hours)

INSTRUCTIONS

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 on 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.

©香港考試及評核局 保留版權
Hong Kong Examinations and Assessment Authority
All Rights Reserved 2015

Not to be taken away before the end of the examination session

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.

Section A

1. $(x+1)(x^2+x+1)=$

   A. x^3+1 .

   B. $(x+1)^3$.

   C. x^3+x^2+x+1 .

   D. x^3+2x^2+2x+1 .

2. $\dfrac{(3y^6)^4}{3y^2}=$

   A. $4y^5$.

   B. $4y^8$.

   C. $27y^{12}$.

   D. $27y^{22}$.

3. If $p+3q=4$ and $5p+9q=2$, then $p=$

   A. -5 .

   B. -3 .

   C. 3 .

   D. 5 .

4. $0.0023456789 =$

A. 0.00235 (correct to 6 decimal places).

B. 0.002345 (correct to 6 decimal places).

C. 0.002346 (correct to 6 significant figures).

D. 0.00234568 (correct to 6 significant figures).

5. If m and n are constants such that $x^2 + mx + n \equiv (x+4)(x-m) + 6$, then $n =$

A. -8 .

B. -2 .

C. 2 .

D. 6 .

6. The solution of $18 + 7x > 4$ or $5 - 2x < 3$ is

A. $x > -2$.

B. $x > -1$.

C. $x > 1$.

D. $-2 < x < 1$.

7. If β is a root of the equation $4x^2 - 5x - 1 = 0$, then $7 + 10\beta - 8\beta^2 =$

A. 5 .

B. 7 .

C. 9 .

D. 11 .

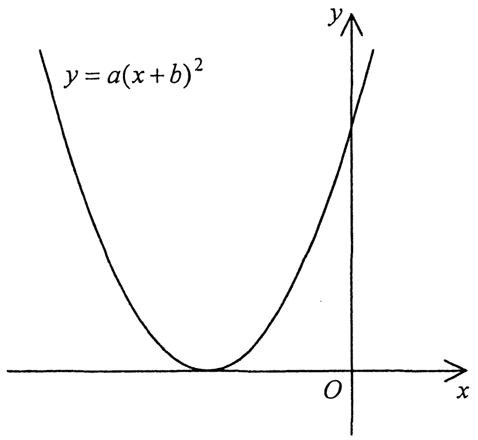
8. The figure shows the graph of $y = a(x+b)^2$, where a and b are constants. Which of the following is true?

A. $a < 0$ and $b < 0$

B. $a < 0$ and $b > 0$

C. $a > 0$ and $b < 0$

D. $a > 0$ and $b > 0$



9. If the price of a souvenir is increased by 70% and then decreased by 60% , find the percentage change in the price of the souvenir.

A. -58%

B. -32%

C. 2%

D. 10%

10. A sum of \$50 000 is deposited at an interest rate of 6% per annum for 3 years, compounded quarterly. Find the amount correct to the nearest dollar.

A. \$59 000

B. \$59 551

C. \$59 755

D. \$59 781

11. Let a , b and c be non-zero numbers. If $a : c = 5 : 3$ and $b : c = 3 : 2$, then $(a+c):(b+c) =$

A. $7 : 5$.

B. $8 : 5$.

C. $16 : 15$.

D. $19 : 15$.

12. It is given that z varies as x^3 and y^2. When $x=2$ and $y=1$, $z=14$. When $x=3$ and $y=-2$, $z=$

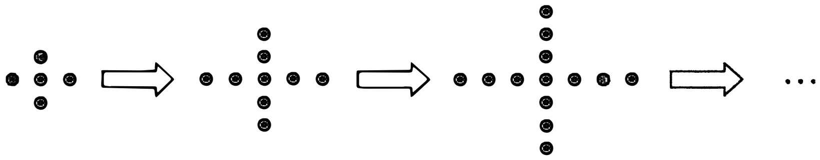
A. -189 .

B. -126 .

C. 126 .

D. 189 .

13. In the figure, the 1st pattern consists of 5 dots. For any positive integer n, the $(n+1)$ th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 6th pattern.



A. 21

B. 25

C. 29

D. 33

14. There is a bag of white sugar. The weight of white sugar in the bag is measured as 5 kg correct to the nearest kg. If the bag of white sugar is packed into n packets such that the weight of white sugar in each packet is measured as 10 g correct to the nearest g, find the greatest possible value of n.

A. 429

B. 500

C. 578

D. 579

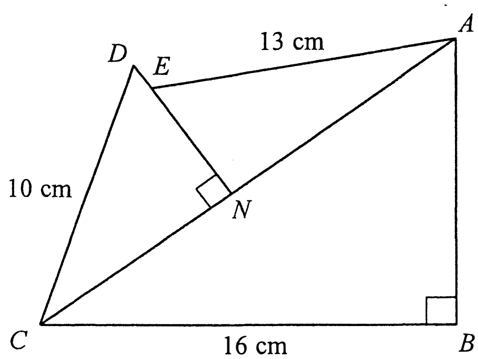
15. In the figure, N is a point lying on AC and E is a point lying on DN. If $DN = 6\text{ cm}$ and $EN = 5\text{ cm}$, then the area of ΔABC is

A. 24 cm^2 .

B. 30 cm^2 .

C. 96 cm^2 .

D. 192 cm^2 .



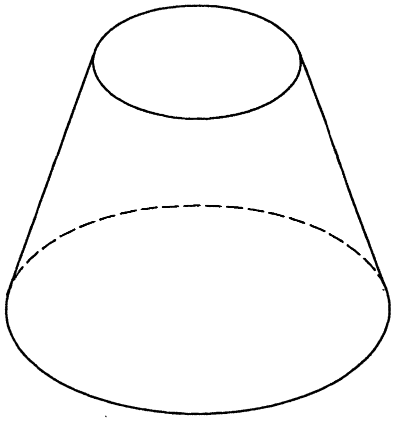
16. The height and the base radius of a right circular cone are 12 cm and 9 cm respectively. The figure shows a frustum which is made by cutting off the upper part of the circular cone. The height of the frustum is 8 cm . Find the volume of the frustum.

A. $210\pi\ \text{cm}^3$

B. $312\pi\ \text{cm}^3$

C. $324\pi\ \text{cm}^3$

D. $936\pi\ \text{cm}^3$



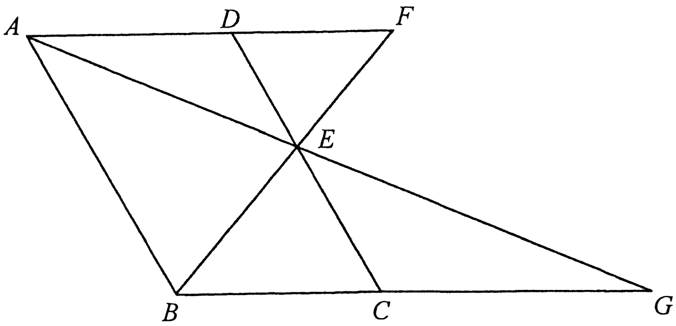
17. In the figure, $ABCD$ is a parallelogram. E is a point lying on CD such that $DE : EC = 2 : 3$. AD produced and BE produced meet at F while AE produced and BC produced meet at G . If the area of ΔDEF is $8\ \text{cm}^2$, then the area of ΔCEG is

A. $12\ \text{cm}^2$.

B. $18\ \text{cm}^2$.

C. $20\ \text{cm}^2$.

D. $27\ \text{cm}^2$.



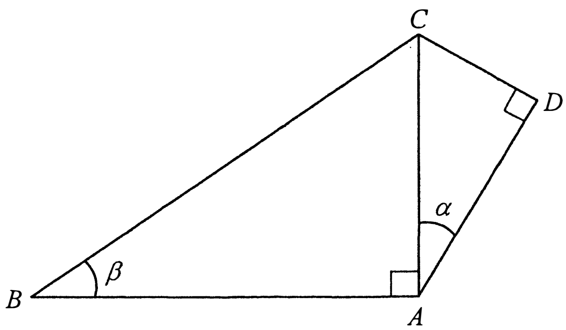
18. In the figure, $\frac{AD}{AB} =$

A. $\cos\alpha \tan\beta$.

B. $\sin\alpha \tan\beta$.

C. $\frac{\cos\alpha}{\tan\beta}$.

D. $\frac{\sin\alpha}{\tan\beta}$.



19. $\dfrac{\cos 180^\circ}{1+\sin(90^\circ+\theta)}+\dfrac{\cos 360^\circ}{1+\sin(270^\circ+\theta)}=$

A. 0 .

B. $\dfrac{2}{\cos\theta}$.

C. $\dfrac{2\cos\theta}{\sin^2\theta}$.

D. $\dfrac{2\sin\theta}{\cos^2\theta}$.

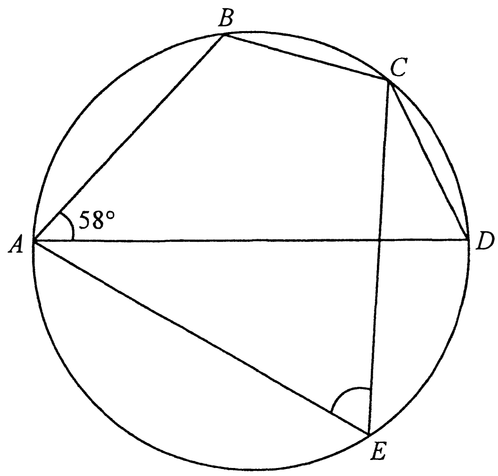
20. In the figure, AD is a diameter of the circle $ABCDE$. If $\angle BAD = 58^\circ$ and $BC = CD$, then $\angle AEC =$

A. 32° .

B. 58° .

C. 61° .

D. 64° .



21. The diameters AC and BD of the circle $ABCD$ intersect at the point E. If $\angle AEB = 90^\circ$ and $AC = 24$ cm, then the area of ΔAEB is

A. 41 cm^2 .

B. 72 cm^2 .

C. 144 cm^2 .

D. 288 cm^2 .

22. If an interior angle of a regular polygon is 5 times an exterior angle of the polygon, which of the following is/are true?

I. Each interior angle of the polygon is 150° .
II. The number of diagonals of the polygon is 6 .
III. The number of folds of rotational symmetry of the polygon is 6 .

A. I only

B. II only

C. I and III only

D. II and III only

23. The rectangular coordinates of the point A are $(\sqrt{3}, -1)$. If A is reflected with respect to the y-axis, then the polar coordinates of its image are

A. $(1, 210^\circ)$.

B. $(1, 240^\circ)$.

C. $(2, 210^\circ)$.

D. $(2, 240^\circ)$.

24. The coordinates of the points A and B are $(2, 0)$ and $(1, 5)$ respectively. If P is a moving point in the rectangular coordinate plane such that P is equidistant from A and B, then the locus of P is

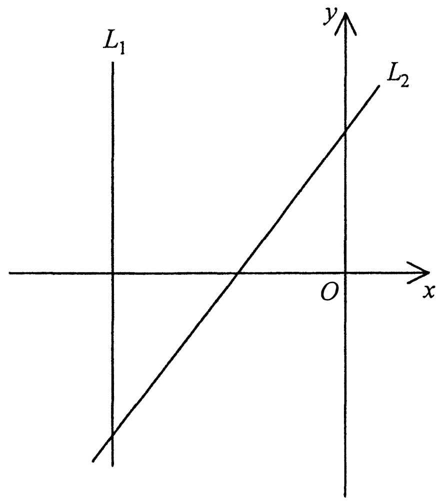
A. the perpendicular bisector of AB .

B. the circle with AB as a diameter.

C. the straight line which passes through A and B .

D. the angle bisector of $\angle AOB$, where O is the origin.

25. In the figure, the equations of the straight lines L_1 and L_2 are $ax = 1$ and $bx + cy = 1$ respectively. Which of the following are true?



I. $a < 0$
II. $a < b$
III. $c > 0$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

26. A circle C passes through the point $(0, 3)$. If the coordinates of the centre of C are $(-4, 3)$, then the equation of C is

A. $x^2 + y^2 - 8x + 6y + 9 = 0$.

B. $x^2 + y^2 - 8x + 6y + 16 = 0$.

C. $x^2 + y^2 + 8x - 6y + 9 = 0$.

D. $x^2 + y^2 + 8x - 6y + 16 = 0$.

27. Two fair dice are thrown in a game. If the sum of the two numbers thrown is 7, \$36 will be gained; otherwise, \$6 will be gained. Find the expected gain of the game.

A. \$11

B. \$12

C. \$30

D. \$31

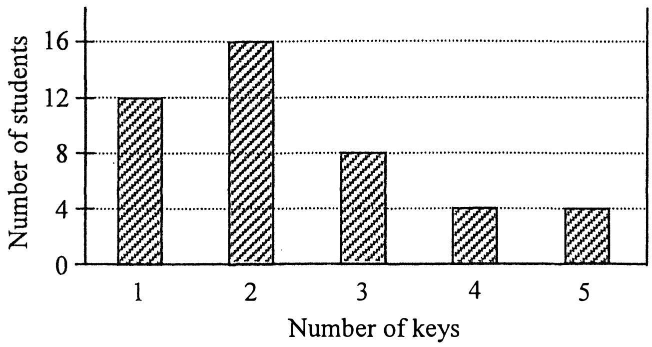
28. The bar chart below shows the distribution of the numbers of keys owned by the students in a class. Find the probability that a randomly selected student from the class owns 3 keys.

A. $\frac{1}{5}$

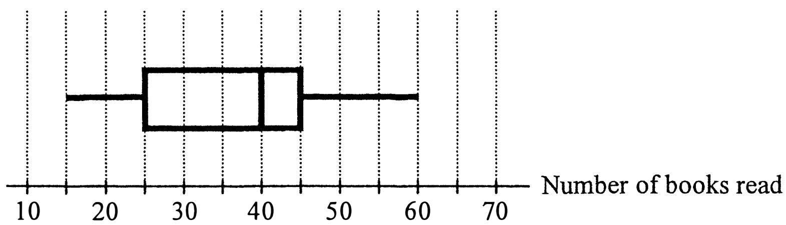
B. $\frac{2}{11}$

C. $\frac{4}{11}$

D. $\frac{9}{11}$



29. The box-and-whisker diagram below shows the distribution of the numbers of books read by some teachers in a term. Find the inter-quartile range of the distribution.



A. 20

B. 35

C. 40

D. 45

30. Consider the following integers:

2 2 3 3 3 3 3 5 5 6 8 8 9 10 m

Let p , q and r be the mean, the median and the mode of the above integers respectively. If $3 \leq m \leq 5$, which of the following must be true?

I. $p > q$
II. $p > r$
III. $q > r$

A. I only

B. II only

C. I and III only

D. II and III only

Section B

31. $\dfrac{1}{x^2-2x+1}-\dfrac{1}{x^2+x\quad 2}=$

A. $\dfrac{1}{(x-1)(x+2)}$.

B. $\dfrac{1}{(x-1)^2(x+2)}$.

C. $\dfrac{3}{(x-1)^2(x+2)}$.

D. $\dfrac{2x+1}{(x\quad 1)^2(x+2)}$.

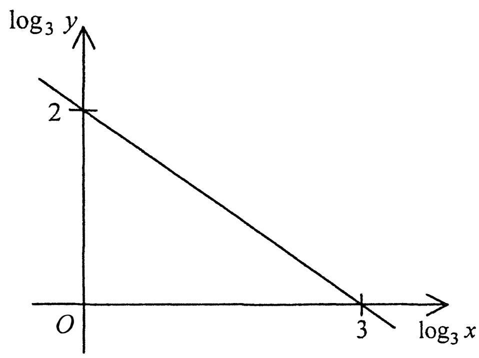
32. The graph in the figure shows the linear relation between $\log_3 x$ and $\log_3 y$. Which of the following must be true?

A. $x^2y^3=729$

B. $x^3y^2=729$

C. $x^2+y^3=729$

D. $x^3+y^2=729$



33. $11+2^6+2^{10}+2^{11}=$

A. 110001001011_2 .

B. 110100100011_2 .

C. 1100001001011_2 .

D. 1101001000011_2 .

34. Let k be a constant. If the roots of the quadratic equation $x^2 + kx - 2 = 0$ are α and β, then $\alpha^2 + \beta^2 =$

A. k^2 .

B. $k^2 + 4$.

C. $k^2 - 4$.

D. $k^2 - 8$.

35. Let $z = (a+5)i^6 + (a-3)i^7$, where a is a real number. If z is a real number, then $a =$

A. -5 .

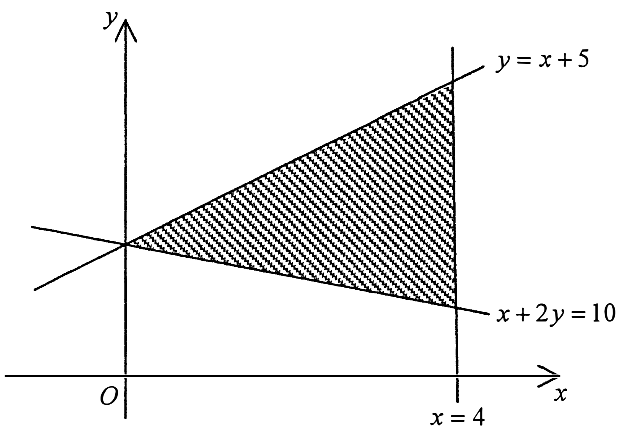
B. 3 .

C. 3 .

D. 5 .

36. The figure shows a shaded region (including the boundary). If (a, b) is a point lying in the shaded region, which of the following are true?

I. $a \leq 4$
II. $a \geq b - 5$
III. $a \geq 10 - 2b$



A. I and II only

B. I and III only

C. II and III only

D. I , II and III

37. Let x_n be the nth term of a geometric sequence. If $x_6 = 216$ and $x_8 = 96$, which of the following must be true?

I. $x_3 = 729$

II. $\frac{x_5}{x_7} > 1$

III. $x_2 + x_4 + x_6 + \cdots + x_{2n} < 2\,015$

A. I only

B. II only

C. I and III only

D. II and III only

38. For $0° \le x < 360°$, how many roots does the equation $\cos^2 x - \sin x = 1$ have?

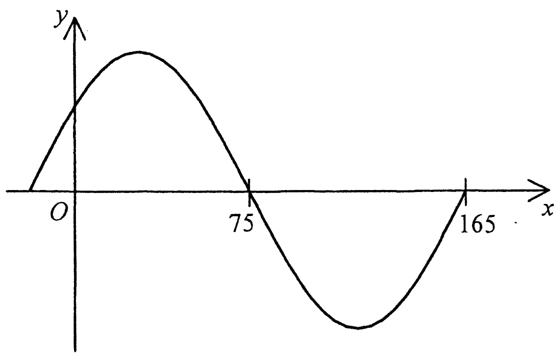
A. 2

B. 3

C. 4

D. 5

39. Let k be a positive constant and $-180° < \theta < 180°$. If the figure shows the graph of $y = \sin(kx° + \theta)$, then



A. $k = \frac{1}{2}$ and $\theta = -30°$.

B. $k = \frac{1}{2}$ and $\theta = 30°$.

C. $k = 2$ and $\theta = -30°$.

D. $k = 2$ and $\theta = 30°$.

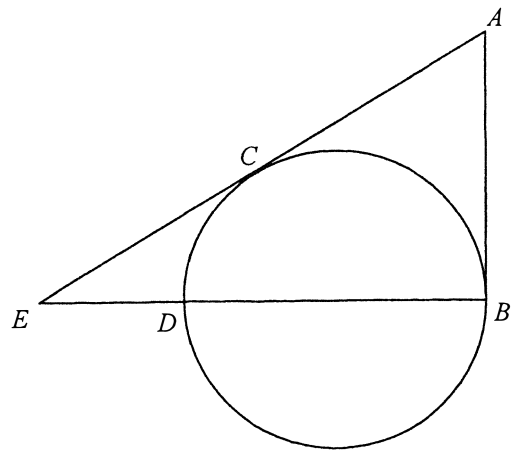
40. In the figure, AB and AC are the tangents to the circle at B and C respectively. BD is a diameter of the circle. AC produced and BD produced meet at E. If $AB = 6$ cm and $AE = 10$ cm , then $BD =$

A. 3 cm .

B. 5 cm .

C. 6 cm .

D. 8 cm .



41. Find the constant k such that the circle $x^2 + y^2 + 2x - 6y + k = 0$ and the straight line $x + y + 4 = 0$ intersect at only one point.

A. -16

B. -8

C. 8

D. 16

42. Let O be the origin. The coordinates of the points P and Q are $(0, 60)$ and $(96, 48)$ respectively. The x-coordinate of the orthocentre of ΔOPQ is

A. 6 .

B. 32 .

C. 45 .

D. 48 .

43. A queue is formed by 6 boys and 2 girls. If no girls are next to each other, how many different queues can be formed?

A. 1 440

B. 10 080

C. 30 240

D. 35 280

44. Bag P contains 2 red balls and 4 green balls while bag Q contains 1 red ball and 3 green balls. If a bag is randomly chosen and then a ball is randomly drawn from the bag, find the probability that a green ball is drawn.

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

B. $\frac{7}{10}$

C. $\frac{7}{24}$

D. $\frac{17}{24}$

45. Let x_1 , y_1 and z_1 be the mean, the median and the variance of a group of numbers $\{ a_1, a_2, a_3, \ldots, a_{50} \}$ respectively while x_2 , y_2 and z_2 be the mean, the median and the variance of the group of numbers $\{ a_1, a_2, a_3, \ldots, a_{49} \}$ respectively. If $x_1 = a_{50}$, which of the following must be true?

I. $x_1 = x_2$
II. $y_1 \geq y_2$
III. $z_1 \leq z_2$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

END OF PAPER