HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2019

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.

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. $(a-b)(a^2+ab-b^2)=$

   A. $(a-b)^3$.

   B. a^3-b^3 .

   C. $a^3-2ab^2+b^3$.

   D. $a^3-2a^2b+2ab^2+b^3$.

2. $\dfrac{(6x^7)^2}{4x^5}=$

   A. $3x^4$.

   B. $9x^4$.

   C. $3x^9$.

   D. $9x^9$.

3. If $6x-7y=40=2x+11y$, then $y=$

   A. -4 .

   B. 2 .

   C. 4 .

   D. 9 .

4. If α and β are constants such that $(x-8)(x+\alpha)-6\equiv(x-9)^2+\beta$, then $\beta=$

   A. -26 .

   B. -10 .

   C. -7 .

   D. -6 .

5. If $h=3-\frac{5}{k+4}$, then $k=$

A. $\frac{4h-7}{3-h}$.

B. $\frac{4h-17}{3-h}$.

C. $\frac{4h-7}{3+h}$.

D. $\frac{4h-17}{3+h}$.

6. If $0.06557 < x < 0.06564$, which of the following is true?

A. $x = 0.065$ (correct to 2 decimal places)

B. $x = 0.065$ (correct to 2 significant figures)

C. $x = 0.0656$ (correct to 3 decimal places)

D. $x = 0.0656$ (correct to 3 significant figures)

7. The least integer satisfying the compound inequality $-2(x-5)+5<21$ or $\frac{3x-5}{7}>1$ is

A. -3.

B. -2.

C. 4.

D. 5.

8. Let c be a constant. If $f(x)=x^3+cx^2+c$, then $f(c)+f(-c)=$

A. 0.

B. $2c$.

C. $2c^3+2c$.

D. $-2c^3+2c$.

9. Let k be a constant such that $2x^4+kx^3-4x-16$ is divisible by $2x+k$. Find k.

A. -2

B. 2

C. 4

D. 8

10. Which of the following statements about the graph of $y=(3-x)(x+2)+6$ is/are true?

I. The graph opens downwards.
II. The graph passes through the point $(1, 10)$.
III. The x-intercepts of the graph are -2 and 3.

A. I only

B. II only

C. I and III only

D. II and III only

11. A sum of \$65 000 is deposited at an interest rate of 7% per annum for 8 years, compounded quarterly. Find the amount correct to the nearest dollar.

A. \$101 400

B. \$111 682

C. \$113 244

D. \$113 609

12. The costs of tea of brand A and brand B are \$140/kg and \$315/kg respectively. If x kg of tea of brand A and y kg of tea of brand B are mixed so that the cost of the mixture is \$210/kg, then $x:y=$

A. $2:3$.

B. $3:2$.

C. $4:9$.

D. $9:4$.

13. It is given that z varies directly as the square of x and inversely as the square root of y. If x is decreased by 40% and y is increased by 44%, then z

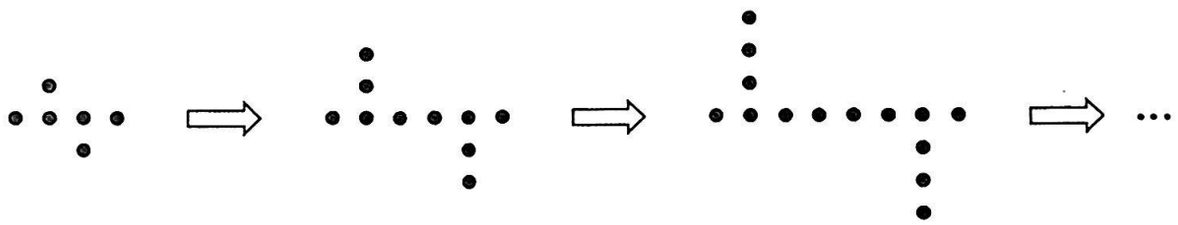
A. is decreased by 70%.

B. is increased by 70%.

C. is decreased by 76%.

D. is increased by 76%.

14. In the figure, the 1st pattern consists of 6 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 9th pattern.



A. 30

B. 34

C. 38

D. 42

15. The base of a solid right pyramid is a square of side 18 cm. If the height of the pyramid is 12 cm, then the total surface area of the pyramid is

A. $432\ \text{cm}^2$.

B. $540\ \text{cm}^2$.

C. $756\ \text{cm}^2$.

D. $864\ \text{cm}^2$.

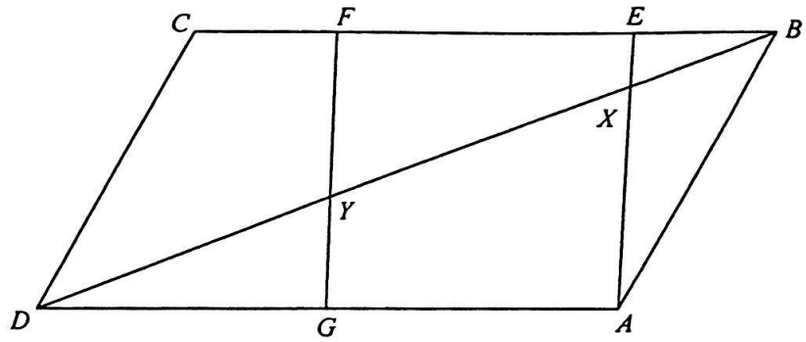
16. In the figure, $ABCD$ is a parallelogram and $AEFG$ is a square. It is given that $BE:EF:FC=2:7:3$. BD cuts AE and FG at the points X and Y respectively. If the area of ΔABX is 24 cm^2, then the area of the quadrilateral $CDYF$ is

A. 54 cm^2.

B. 77 cm^2.

C. 81 cm^2.

D. 87 cm^2.



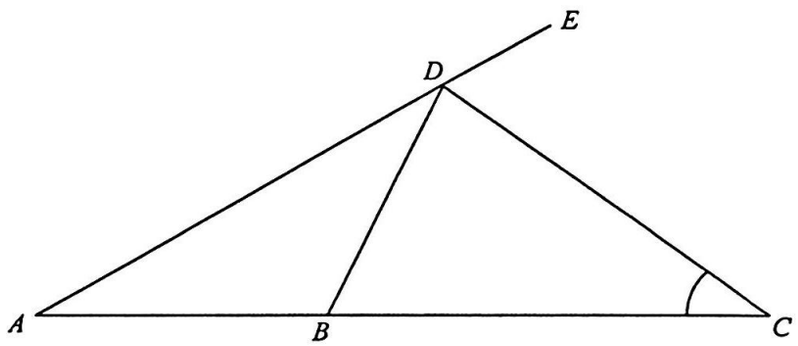
17. In the figure, ABC and ADE are straight lines. It is given that $AB=BD$ and $BC=CD$. If $\angle CDE=66°$, then $\angle ACD=$

A. $28°$.

B. $33°$.

C. $36°$.

D. $38°$.



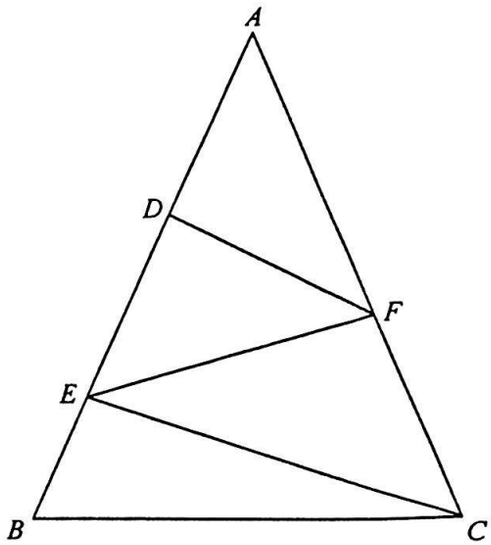
18. In the figure, ABC is an isosceles triangle with $AB=AC$. D and E are points lying on AB such that $AD=DE=2EB$ while F is a point lying on AC such that $DF//EC$. If $\angle ADF=90°$ and $CE=60\text{ cm}$, then $EF=$

A. 40 cm.

B. 45 cm.

C. 48 cm.

D. 50 cm.



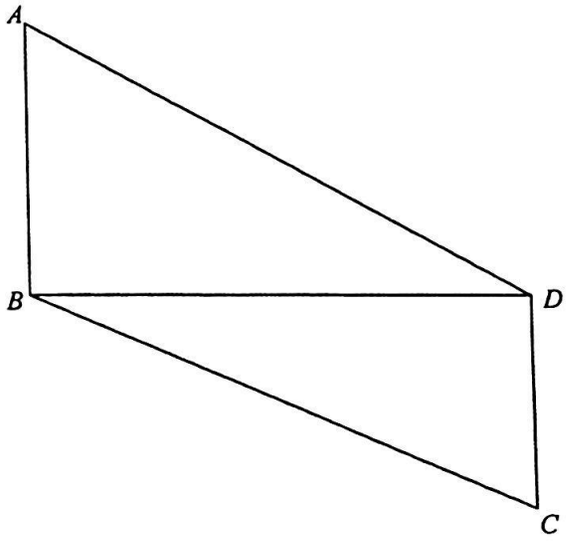
19. In the figure, $ABCD$ is a trapezium with $AB//DC$ and $\angle ABD = 90°$. If $AB = 18$ cm, $BC = 26$ cm and $AD = 30$ cm, find the area of the trapezium $ABCD$.

A. $336\ cm^2$

B. $400\ cm^2$

C. $504\ cm^2$

D. $552\ cm^2$



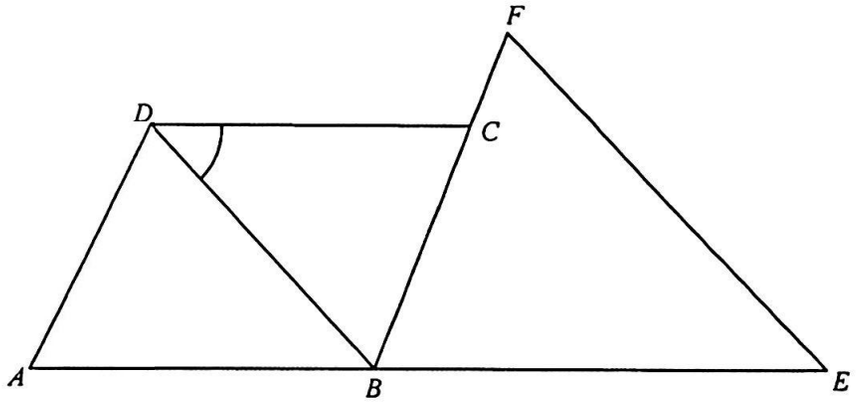
20. In the figure, $ABCD$ is a rhombus. ABE and BCF are straight lines such that $BE = EF$. If $\angle BEF = 56°$, then $\angle BDC =$

A. $48°$.

B. $56°$.

C. $59°$.

D. $62°$.



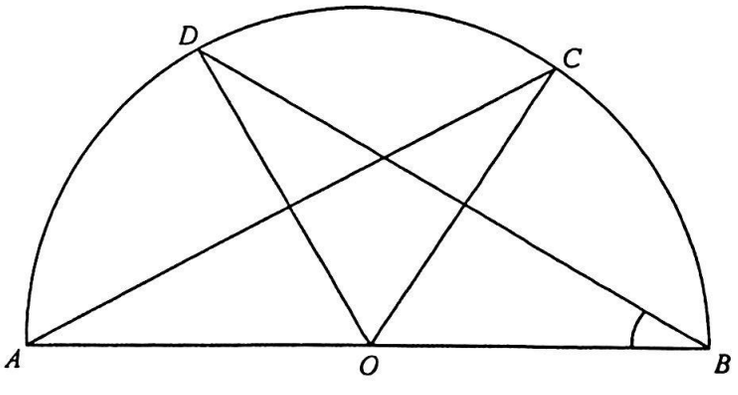
21. In the figure, O is the centre of the semi-circle $ABCD$. If $AC = BD$ and $\angle COD = 48°$, then $\angle ABD =$

A. $31°$.

B. $33°$.

C. $42°$.

D. $48°$.



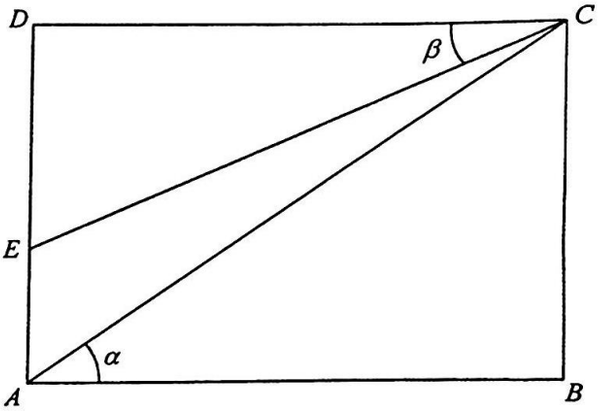
22. In the figure, $ABCD$ is a rectangle. E is a point lying on AD. Find $\frac{CE}{AC}$.

A. $\frac{\sin\alpha}{\sin\beta}$

B. $\frac{\cos\alpha}{\cos\beta}$

C. $\sin\alpha\sin\beta$

D. $\cos\alpha\cos\beta$



23. In the figure, the equation of the straight line L is $ax+by+15=0$. Which of the following are true?

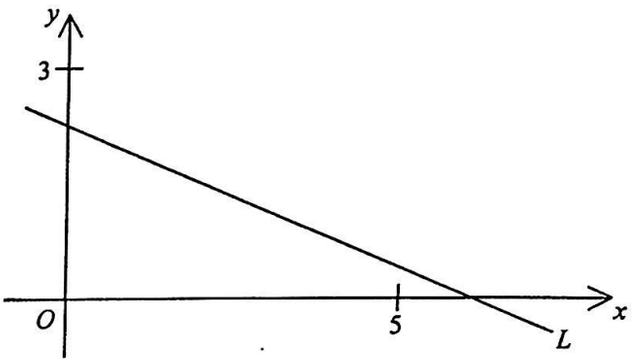
I. $a>b$
II. $a>-3$
III. $b>-5$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



24. Find the constant k such that the straight lines $3x+2y+k=0$ and $kx+12y-6=0$ are perpendicular to each other.

A. −8

B. −4

C. 4

D. 8

25. The coordinates of the point A are $(-5,-2)$. A is translated rightwards by 9 units to the point B. B is then rotated anticlockwise about the origin through $90°$ to the point C. Find the y-coordinate of C.

A. -4

B. -2

C. 2

D. 4

26. The equation of the straight line L is $5x-7y-14=0$. If P is a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L is equal to 3, then the locus of P is

A. a sector.

B. a square.

C. a parabola.

D. a pair of straight lines.

27. Denote the circle $2x^2+2y^2+4x-12y+15=0$ by C. Which of the following is/are true?

I. The area of C is 25π.

II. The point $(-3,3)$ lies outside C.

III. The centre of C lies in the fourth quadrant.

A. I only

B. II only

C. I and III only

D. II and III only

28. Two numbers are randomly drawn at the same time from nine balls numbered 1, 2, 3, 4, 5, 6, 7, 8 and 9 respectively. Find the probability that the two numbers drawn are consecutive integers.

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

B. $\frac{1}{4}$

C. $\frac{2}{9}$

D. $\frac{7}{9}$

29. Which of the following can be obtained from any box-and-whisker diagram?

I. Range
II. Standard deviation
III. Inter-quartile range

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

30. The table below shows the distribution of the numbers of merits obtained by some students in a year.

Number of merits obtained	6	7	8	9	10
Number of students	32	36	28	18	2

Which of the following is true?

A. The mode of the distribution is 36.

B. The median of the distribution is 8.

C. The lower quartile of the distribution is 6.

D. The upper quartile of the distribution is 10.

Section B

31. It is given that $\log_9 y$ is a linear function of $\log_3 x$. The intercepts on the vertical axis and on the horizontal axis of the graph of the linear function are 7 and 8 respectively. Which of the following must be true?

A. $x^4 y^7 = 3^{56}$

B. $x^7 y^4 = 3^{56}$

C. $x^7 y^8 = 3^{56}$

D. $x^8 y^7 = 3^{56}$

32. If $\frac{3}{3\log x - 2} + 7 = \frac{2}{2\log x + 1}$, then $\log \frac{1}{x} =$

A. -3 or 2.

B. -2 or 3.

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

D. $\frac{-1}{2}$ or $\frac{1}{3}$.

33. $100110000010110_2 =$

A. $19 \times 2^{10} + 22$.

B. $19 \times 2^{10} + 44$.

C. $19 \times 2^{11} + 22$.

D. $19 \times 2^{11} + 44$.

34. If a is a real number, then the real part of $\frac{4+i^5}{a+i}-i^6$ is

A. $\frac{4a+1}{a^2-1}$.

B. $\frac{4a+1}{a^2+1}$.

C. $\frac{a^2+4a+2}{a^2-1}$.

D. $\frac{a^2+4a+2}{a^2+1}$.

35. Consider the following system of inequalities:

$$\begin{cases} x+2y \le 20 \\ 7x-6y \le 20 \\ 13x+6y \ge 20 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R, then the greatest value of $7x+8y+9$ is

A. 15.

B. 77.

C. 113.

D. 115.

36. The sum of the 2nd term and the 5th term of a geometric sequence is 9 while the sum of the 7th term and the 10th term of the sequence is 288. Find the 20th term of the sequence.

A. 65 536

B. 131 072

C. 262 144

D. 524 288

37. Let k be a constant. The straight line $3x-y-2=0$ and the circle $5x^2+5y^2+kx+4y-20=0$ intersect at the points P and Q. If the x-coordinate of the mid-point of PQ is 2, find k.

A. -152

B. -52

C. 148

D. 248

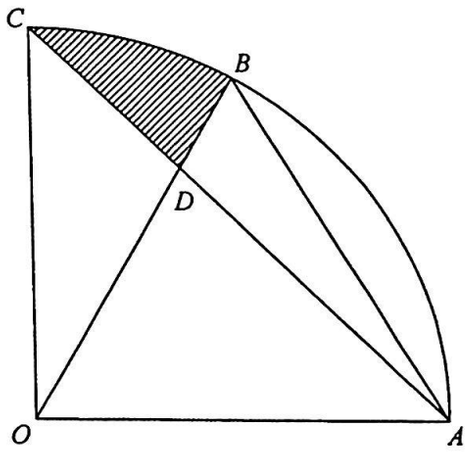
38. In the figure, O is the centre of the sector $OABC$. It is given that ΔOAB is an equilateral triangle. AC and OB intersect at the point D. If $OA=12$ cm and $\angle AOC=90°$, find the area of the shaded region BCD correct to the nearest cm^2.

A. $11\ \text{cm}^2$

B. $16\ \text{cm}^2$

C. $26\ \text{cm}^2$

D. $38\ \text{cm}^2$



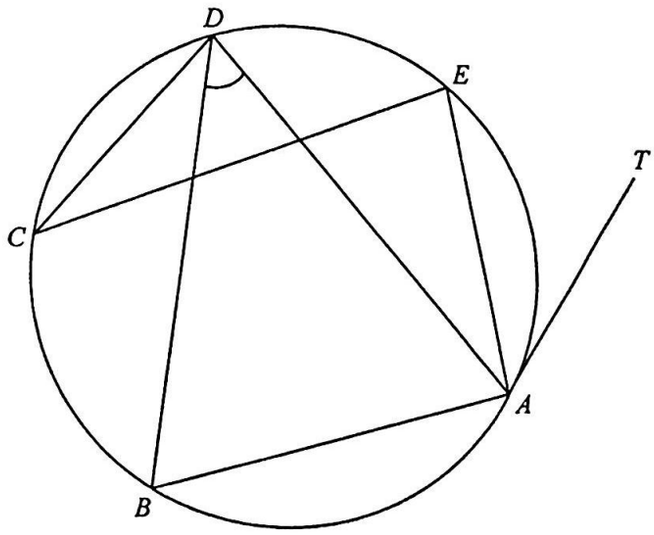
39. In the figure, TA is the tangent to the circle $ABCDE$ at the point A. If $\angle BAD=64°$, $\angle EAT=38°$ and $\angle DCE=22°$, then $\angle ADB=$

A. $52°$.

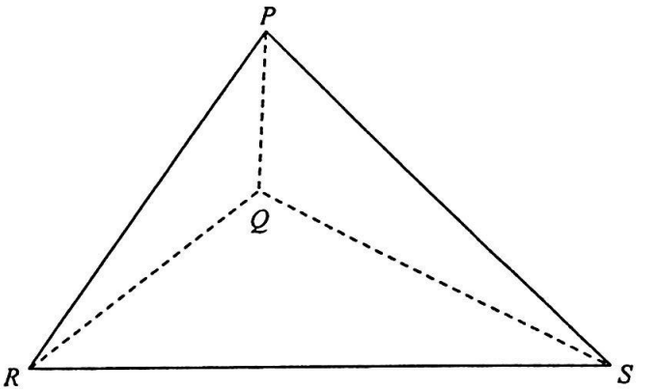
B. $56°$.

C. $60°$.

D. $68°$.



40. The figure shows a tetrahedron $PQRS$ with the base QRS lying on the horizontal ground. It is given that Q is vertically below P. If $\angle PRQ = 47°$, $\angle PSQ = 53°$ and $\angle RQS = 120°$, find $\angle RPS$ correct to the nearest degree.



A. 52°

B. 60°

C. 68°

D. 76°

41. If ΔABC is a right-angled triangle with $\angle ABC = 90°$, which of the following is/are true?

I. The orthocentre of ΔABC lies on AC.

II. The centroid of ΔABC lies inside ΔABC.

III. The in-centre of ΔABC lies outside ΔABC.

A. I only

B. II only

C. I and III only

D. II and III only

42. There are 2 green cups, 8 blue cups and 9 red cups in a bag. If 6 cups are randomly drawn from the bag at the same time, find the probability that at least 1 blue cup is drawn.

A. $\frac{31}{57}$

B. $\frac{44}{323}$

C. $\frac{635}{646}$

D. $\frac{968}{969}$

43. There are three questions in a mathematics competition. The probabilities that Susan answers the first question correctly, the second question correctly and the third question correctly are $\frac{1}{3}$, $\frac{1}{5}$ and $\frac{1}{7}$ respectively. The probability that Susan answers at most 2 questions correctly in the competition is

A. $\frac{1}{105}$.

B. $\frac{13}{105}$.

C. $\frac{92}{105}$.

D. $\frac{104}{105}$.

44. In an examination, the standard deviation of the examination scores is 8 marks. The examination score of Mary is 69 marks and her standard score is 0.5. If the standard score of John in the examination is -1.5, then his examination score is

A. 45 marks.

B. 53 marks.

C. 65 marks.

D. 77 marks.

45. The mean, the range and the variance of a set of numbers are m, r and v respectively. Each number of the set is multiplied by 6 and then 5 is added to each resulting number to form a new set of numbers. Which of the following is/are true?

I. The mean of the new set of numbers is $6m+5$.
II. The range of the new set of numbers is $6r+5$.
III. The variance of the new set of numbers is $6v+5$.

A. I only

B. II only

C. I and III only

D. II and III only

END OF PAPER