HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

# MATHEMATICS Compulsory Part
# PAPER 2 (Sample Paper)

Time allowed: 1 hour 15 minutes

1. Read carefully the instructions on the Answer Sheet. Stick a barcode label and insert the information required 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 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.

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. $(3a)^2 \cdot a^3 =$

   A. $3a^5$.

   B. $6a^6$.

   C. $9a^5$.

   D. $9a^6$.

2. If $5 - 3m = 2n$, then $m =$

   A. $n$.

   B. $\frac{2n-5}{3}$.

   C. $\frac{-2n+5}{3}$.

   D. $\frac{-2n+15}{3}$.

3. $a^2 - b^2 + 2b - 1 =$

   A. $(a-b-1)(a+b-1)$.

   B. $(a-b-1)(a+b+1)$.

   C. $(a-b+1)(a+b-1)$.

   D. $(a-b+1)(a-b-1)$.

4. Let $p$ and $q$ be constants. If $x^2 + p(x+5) + q \equiv (x-2)(x+5)$, then $q =$

A. $-25$.

B. $-10$.

C. $3$.

D. $5$.

5. Let $\mathrm{f}(x) = x^3 + 2x^2 - 7x + 3$. When $\mathrm{f}(x)$ is divided by $x+2$, the remainder is

A. $3$.

B. $5$.

C. $17$.

D. $33$.

6. Let $a$ be a constant. Solve the equation $(x-a)(x-a-1) = (x-a)$.

A. $x = a+1$

B. $x = a+2$

C. $x = a$ or $x = a+1$

D. $x = a$ or $x = a+2$

7. Find the range of values of $k$ such that the quadratic equation $x^2 - 6x = 2-k$ has no real roots.

A. $k < -7$

B. $k > -7$

C. $k < 11$

D. $k > 11$

8. In the figure, the quadratic graph of $y = \mathrm{f}(x)$ intersects the straight line $L$ at $A(1, k)$ and $B(7, k)$. Which of the following are true?

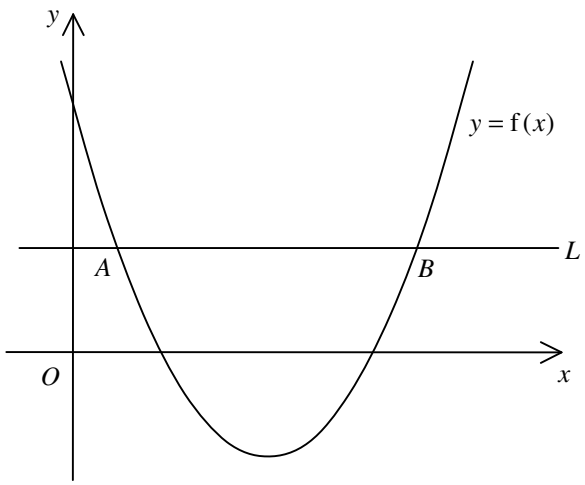
I. The solution of the inequality $\mathrm{f}(x) > k$ is $x < 1$ or $x > 7$.
II. The roots of the equation $\mathrm{f}(x) = k$ are $1$ and $7$.
III. The equation of the axis of symmetry of the quadratic graph of $y = \mathrm{f}(x)$ is $x = 3$.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III




9. The solution of $5 - 2x < 3$ and $4x + 8 > 0$ is

A. $x > -2$.

B. $x > -1$.

C. $x > 1$.

D. $-2 < x < 1$.

10. Mary sold two bags for $\$ 240$ each. She gained $20\%$ on one and lost $20\%$ on the other. After the two transactions, Mary

A. lost $\$ 20$.

B. gained $\$ 10$.

C. gained $\$ 60$.

D. had no gain and no loss.

11. Let $a_n$ be the $n$th term of a sequence. If $a_1 = 4$ , $a_2 = 5$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer $n$ , then $a_{10} =$

A. 13 .

B. 157 .

C. 254 .

D. 411 .

12. If the length and the width of a rectangle are increased by $20\%$ and $x\%$ respectively so that its area is increased by $50\%$ , then $x =$

A. 20 .

B. 25 .

C. 30 .

D. 35 .

13. If $x$ , $y$ and $z$ are non-zero numbers such that $2x = 3y$ and $x = 2z$ , then $(x+z):(x+y) =$

A. $3:5$ .

B. $6:7$ .

C. $9:7$ .

D. $9:10$ .

14. It is given that $z$ varies directly as $x$ and inversely as $y$ . When $x = 3$ and $y = 4$ , $z = 18$ . When $x = 2$ and $z = 8$ , $y =$

A. 1 .

B. 3 .

C. 6 .

D. 9 .

15. The lengths of the three sides of a triangle are measured as $15\text{ cm}$, $24\text{ cm}$ and $25\text{ cm}$ respectively. If the three measurements are correct to the nearest $\text{cm}$, find the percentage error in calculating the perimeter of the triangle correct to the nearest $0.1\%$.

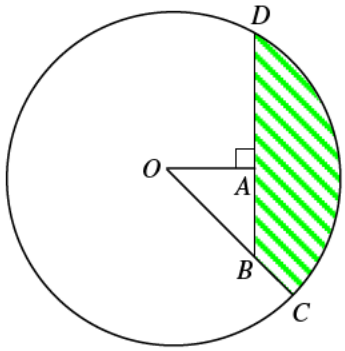
A. $0.8\%$

B. $2.3\%$

C. $4.7\%$

D. $6.3\%$

16. In the figure, $O$ is the centre of the circle. $C$ and $D$ are points lying on the circle. $OBC$ and $BAD$ are straight lines. If $OC = 20\text{ cm}$ and $OA = AB = 10\text{ cm}$, find the area of the shaded region $BCD$ correct to the nearest $\text{cm}^2$.



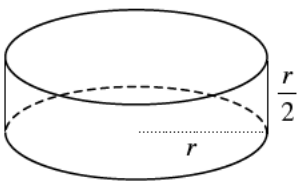

A. $214\text{ cm}^2$

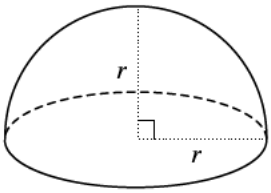
B. $230\text{ cm}^2$

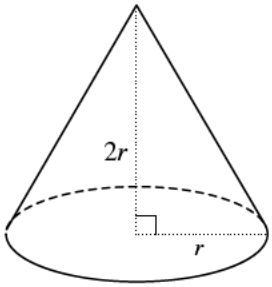
C. $246\text{ cm}^2$

D. $270\text{ cm}^2$

17. The figure shows a right circular cylinder, a hemisphere and a right circular cone with equal base radii. Their curved surface areas are $a\text{ cm}^2$, $b\text{ cm}^2$ and $c\text{ cm}^2$ respectively.




Which of the following is true?

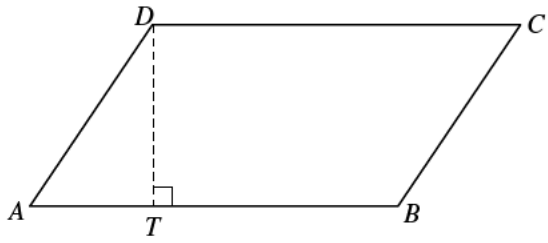
A. $a < b < c$

B. $a < c < b$

C. $c < a < b$

D. $c < b < a$

18. In the figure, $ABCD$ is a parallelogram. $T$ is a point lying on $AB$ such that $DT$ is perpendicular to $AB$. It is given that $CD = 9\text{ cm}$ and $AT : TB = 1 : 2$. If the area of the parallelogram $ABCD$ is $36\text{ cm}^2$, then the perimeter of the parallelogram $ABCD$ is




A. $26\text{ cm}$.

B. $28\text{ cm}$.

C. $30\text{ cm}$.

D. $32\text{ cm}$.

19. $\dfrac{\sin\theta}{\cos 60°} + \dfrac{\cos(270° - \theta)}{\tan 45°} =$

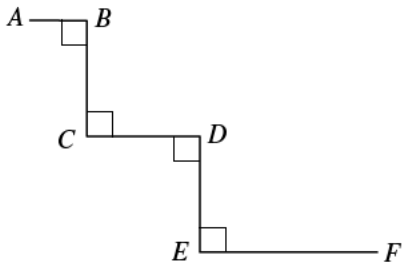
A. $\sin\theta$.

B. $3\sin\theta$.

C. $2\sin\theta - \cos\theta$.

D. $2\sin\theta + \cos\theta$.

20. In the figure, $AB = 1\text{ cm}$, $BC = CD = DE = 2\text{ cm}$ and $EF = 3\text{ cm}$. Find the distance between $A$ and $F$ correct to the nearest $0.1\text{ cm}$.



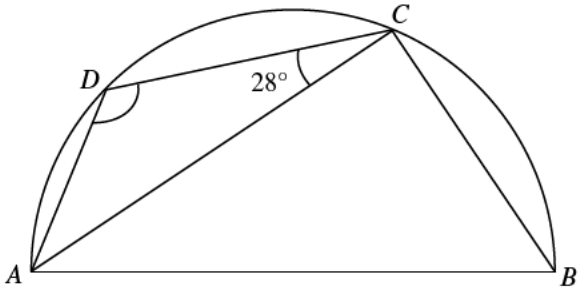

A. $7.2\text{ cm}$

B. $7.4\text{ cm}$

C. $8.0\text{ cm}$

D. $8.1\text{ cm}$

21. In the figure, $ABCD$ is a semi-circle. If $BC = CD$, then $\angle ADC =$




A. $118°$.

B. $121°$.

C. $124°$.

D. $126°$.

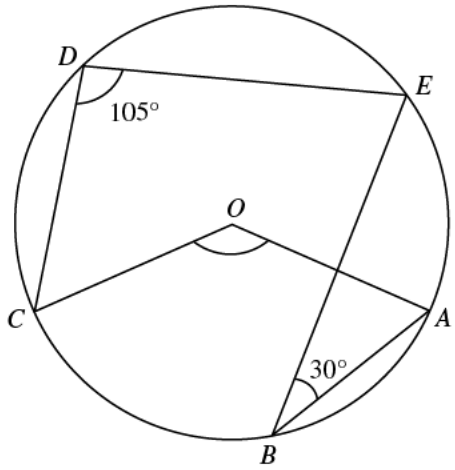
22. In the figure, $O$ is the centre of the circle $ABCDE$. If $\angle ABE = 30°$ and $\angle CDE = 105°$, then $\angle AOC =$

A. $120°$.

B. $135°$.

C. $150°$.

D. $165°$.



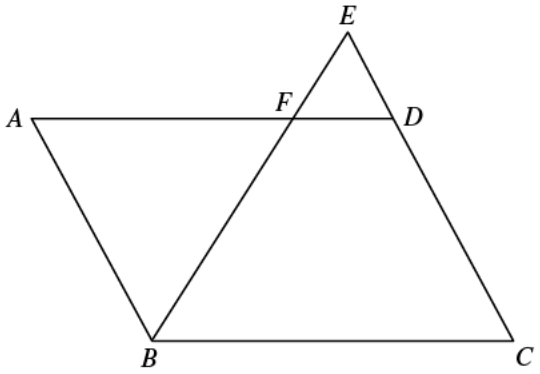

23. In the figure, $ABCD$ is a parallelogram. $F$ is a point lying on $AD$. $BF$ produced and $CD$ produced meet at $E$. If $CD : DE = 2 : 1$, then $AF : BC =$

A. $1 : 2$.

B. $2 : 3$.

C. $3 : 4$.

D. $8 : 9$.



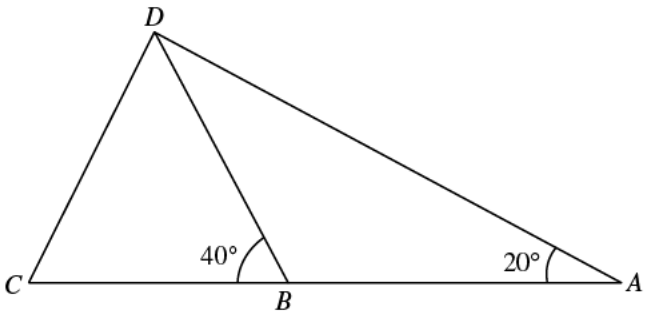

24. In the figure, $ABC$ is a straight line. If $BD = CD$ and $AB = 10\,\text{cm}$, find $BC$ correct to the nearest cm.

A. 8 cm

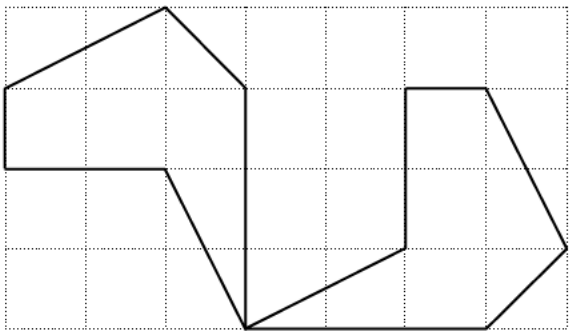
B. 13 cm

C. 14 cm

D. 15 cm



25. In the figure, the two 6-sided polygons show



A. a rotation transformation.

B. a reflection transformation.

C. a translation transformation.

D. a dilation transformation.

26. If the point $(-4,3)$ is rotated anti-clockwise about the origin through $180°$, then the coordinates of its image are

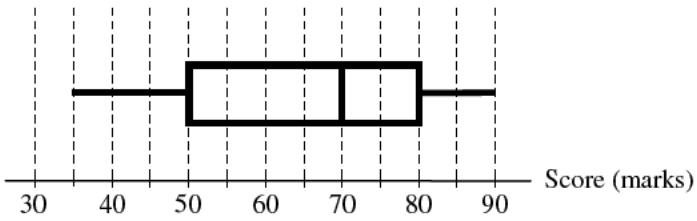
A. $(-3,-4)$.

B. $(3,4)$.

C. $(-4,-3)$.

D. $(4,-3)$.

27. The box-and-whisker diagram below shows the distribution of the scores (in marks) of the students of a class in a test.




If the passing score of the test is $50$ marks, then the passing percentage of the class is

A. 25%.

B. 50%.

C. 70%.

D. 75%.

28. The stem-and-leaf diagram below shows the distribution of heights (in cm) of $23$ staff members in an office.

| Stem (tens) | Leaf (units) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 15 | 3 | 3 | 4 | 5 | 6 | 7 | 9 | |
| 16 | 1 | 2 | 2 | 3 | 5 | 6 | 6 | 8 |
| 17 | 1 | 2 | 6 | 7 | 9 | | | |
| 18 | 2 | 6 | 7 | | | | | |

Find the median of the distribution.

A. 164 cm

B. 165 cm

C. 165.5 cm

D. 166 cm

29. $\{ a-7 , a-1 , a , a+2 , a+4 , a+8 \}$ and $\{ a-9 , a-2 , a-1 , a+3 , a+4 , a+6 \}$ are two groups of numbers. Which of the following is/are true?

I. The two groups of numbers have the same mean.
II. The two groups of numbers have the same median.
III. The two groups of numbers have the same range.

A. I only

B. II only

C. I and III only

D. II and III only

30. The students' union of a school of $950$ students wants to investigate the opinions of students in the school on the services provided by the tuck shop. A questionnaire is designed by the students' union and only the chairperson and vice-chairperson of the students' union are selected as a sample to fill in the questionnaire. Which of the following are the disadvantages of this sampling method?

I. The sample size is very small.
II. Not all students in the school are selected.
III. Not all students in the school have an equal chance of being selected.

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

**Section B**

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

A. $\dfrac{-3}{(2-x)^2}$ .

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

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

D. $\dfrac{2x-3}{(2-x)^2}$ .

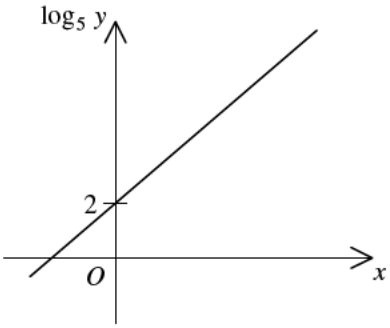
32. The graph in the figure shows the linear relation between $x$ and $\log_5 y$ . If $y=ab^x$ , then $a=$

A. 1 .

B. 2 .

C. 5 .

D. 25 .




33. $1010010001001_2=$

A. $2^{12}+2^{10}+137$ .

B. $2^{12}+2^{10}+273$ .

C. $2^{13}+2^{11}+137$ .

D. $2^{13}+2^{11}+273$ .

34. If $k$ is a real number, then $4k-\dfrac{6+ki}{i}=$

A. $3k+6i$ .

B. $3k-6i$ .

C. $5k+6i$ .

D. $5k-6i$ .

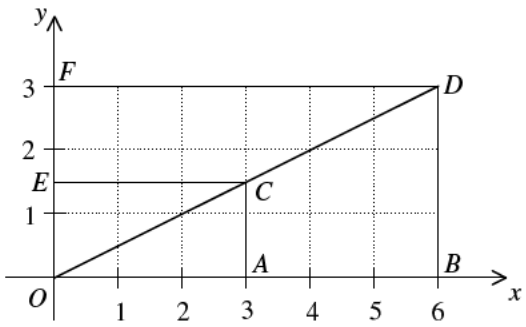
35. Which of the triangular regions in the figure may represent the solution of $\begin{cases} 0 \le x \le 6 \\ 0 \le y \le 3 \\ x \le 2y \end{cases}$ ?

A. $\Delta OAC$

B. $\Delta OBD$

C. $\Delta OCE$

D. $\Delta ODF$




36. If the 3rd term and the 6th term of an arithmetic sequence are $18$ and $-6$ respectively, then the 2nd term of the sequence is

A. $-8$ .

B. $10$ .

C. $26$ .

D. $34$ .

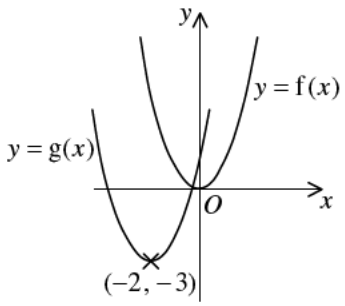
37. If the figure shows the graph of $y = \mathrm{f}(x)$ and the graph of $y = \mathrm{g}(x)$ on the same rectangular coordinate system, then

A. $\mathrm{g}(x) = \mathrm{f}(x-2) - 3$ .

B. $\mathrm{g}(x) = \mathrm{f}(x-2) + 3$ .

C. $\mathrm{g}(x) = \mathrm{f}(x+2) - 3$ .

D. $\mathrm{g}(x) = \mathrm{f}(x+2) + 3$ .



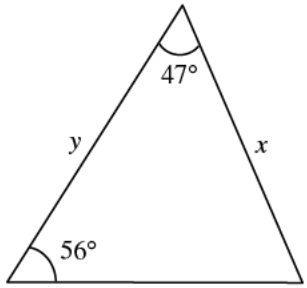

38. In the figure, $y =$

A. $\dfrac{x \sin 77°}{\sin 56°}$ .

B. $\dfrac{x \sin 47°}{\sin 56°}$ .

C. $\dfrac{x \sin 56°}{\sin 77°}$ .

D. $\dfrac{x \sin 77°}{\sin 47°}$ .



39. Peter invests $\$P$ at the beginning of each month in a year at an interest rate of $6\%$ per annum, compounded monthly. If he gets $\$10\,000$ at the end of the year, find $P$ correct to 2 decimal places.

A. 806.63

B. 829.19

C. 833.33

D. 882.18

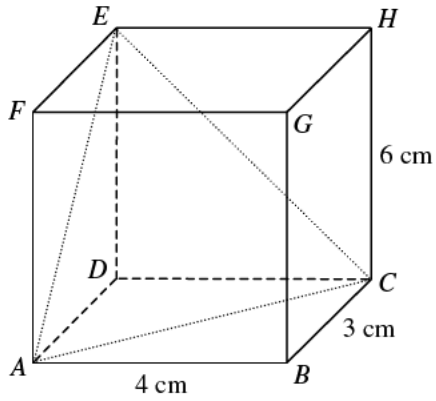
40. The figure shows a cuboid $ABCDEFGH$. If the angle between the triangle $ACE$ and the plane $ABCD$ is $\theta$, then $\tan\theta =$

A. $2$.

B. $\frac{3}{2}$.

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

D. $\frac{12}{5}$.



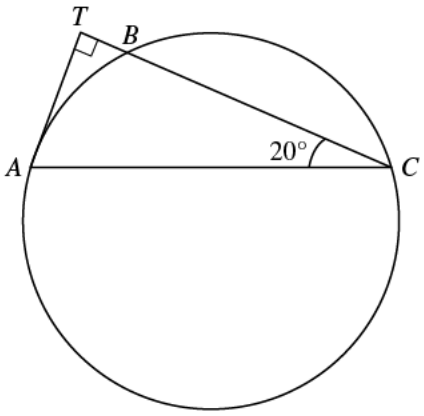

41. In the figure, $A$, $B$ and $C$ are points lying on the circle. $TA$ is the tangent to the circle at $A$. The straight line $CBT$ is perpendicular to $TA$. If $BC = 6\,\text{cm}$, find the radius of the circle correct to the nearest $0.1\,\text{cm}$.

A. 3.2 cm

B. 3.9 cm

C. 4.2 cm

D. 4.7 cm



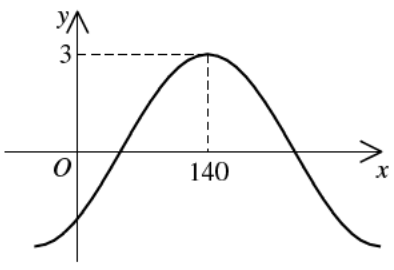

42. Let $a$ be a constant and $-90° < b < 90°$. If the figure shows the graph of $y = a\cos(x° + b)$, then

A. $a = -3$ and $b = -40°$.

B. $a = -3$ and $b = 40°$.

C. $a = 3$ and $b = -40°$.

D. $a = 3$ and $b = 40°$.



43. Bag $A$ contains 2 red balls, 3 green balls and 4 white balls while bag $B$ contains 2 red balls, 3 green balls and 4 yellow balls. If one ball is drawn randomly from each bag, then the probability that the two balls drawn are of different colours is

A. $\frac{13}{81}$.

B. $\frac{29}{81}$.

C. $\frac{52}{81}$.

D. $\frac{68}{81}$.

44. If 2 girls and 5 boys randomly form a queue, find the probability that the two girls are next to each other in the queue.

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{6}{7}$

D. $\frac{1}{21}$

45. A set of numbers has a mode of 32, an inter-quartile range of 27 and a variance of 25. If 3 is added to each number of the set and each resulting number is then doubled to form a new set of numbers, find the mode, the inter-quartile range and the variance of the new set of numbers.

| | Mode | Inter-quartile range | Variance |
|---|---|---|---|
| A. | 64 | 60 | 50 |
| B. | 70 | 60 | 100 |
| C. | 70 | 54 | 50 |
| D. | 70 | 54 | 100 |

**END OF PAPER**