MC

HOK YAU CLUB
HONG KONG MOCK EXAMINATION 2020/21

MATHEMATICS Compulsory Part
PAPER 2

12:00 nn — 1:15 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. $\dfrac{(6x^{-5})^{-2}}{4x} =$

   A. $3x^{9}$.

   B. $\dfrac{x^{9}}{144}$.

   C. $\dfrac{3}{x^{8}}$.

   D. $\dfrac{1}{144x^{8}}$.

2. If $\dfrac{3a+b}{3a} = 2 - \dfrac{b}{a}$, then $b =$

   A. $\dfrac{2a}{3}$.

   B. $\dfrac{3a}{2}$.

   C. $\dfrac{3a}{4}$.

   D. $\dfrac{4a}{3}$.

3. $\dfrac{1}{5+3x} - \dfrac{1}{5-3x} =$

   A. $\dfrac{10}{25-9x^{2}}$.

   B. $\dfrac{10}{9x^{2}-25}$.

   C. $\dfrac{6x}{25-9x^{2}}$.

   D. $\dfrac{6x}{9x^{2}-25}$.

4. $m^2-2m-9n^2+6n=$

A. $(m-3n)(m-3n+2)$.

B. $(m-3n)(m+3n-2)$.

C. $(m+3n)(m-3n+2)$.

D. $(m+3n)(m-3n-2)$.

5. Let k be a constant . If $\mathrm{f}(x)=3x^2+x+2k$, then $\mathrm{f}(k+1)-\mathrm{f}(k-1)=$

A. $6k+2$.

B. $6k+6$.

C. $12k+2$.

D. $12k+6$.

6. Let $\mathrm{g}(x)=x^2+ax+b$, where a , b are constants . If $\mathrm{g}(x)=\mathrm{g}(-x)$ and the remainder is -3 when $\mathrm{g}(x)$ is divided by $x+1$, then when $\mathrm{g}(x)$ is divided by $x+2$, the remainder is

A. 0 .

B. 1 .

C. 2 .

D. 4 .

7. If a and b are constants such that $x^2+(a+b)x\equiv(x+2)(x-3)+b$, then $a=$

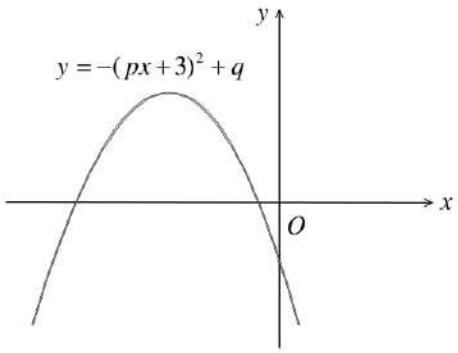
A. -7 .

B. -5 .

C. 5 .

D. 6 .

8. The figure shows the graph of $y=-(px+3)^2+q$, where p and q are constants. Which of the following is true?



A. $p<0$ and $q<0$

B. $p<0$ and $q>0$

C. $p>0$ and $q<0$

D. $p>0$ and $q>0$

9. The marked price of a piece of clothing is \$160. If it is sold at a discount of 15%, the percentage profit is 8.8%. If it is sold without any discount, find the percentage profit.

A. 8.8%

B. 15%

C. 22%

D. 28%

10. The scale of a map is 1:25000. If the area of a park on the map is $4\ cm^2$, then the actual area of the park is

A. $1\times10^5\ m^2$.

B. $2.5\times10^5\ m^2$.

C. $4\times10^5\ m^2$.

D. $1\times10^6\ m^2$.

11. It is given that t varies directly as p and inversely as the square root of q. When p is decreased by 35% and q is increased by 69%, then t is decreased by

A. 22.8%.

B. 38.5%.

C. 50%.

D. 100%.

12. The solution of the inequality $-5 < 3 - 2x < x + 6$ is

A. $x > 4$.

B. $-4 < x < -1$.

C. $-1 < x < 4$.

D. $x < -1$ or $x > 4$.

13. Let a_n be the n th term of a sequence . If $a_3 = 11$, $a_6 = 85$ and $a_{n+2} = 2a_n + a_{n+1}$ for any positive integer n , then $a_1 =$

A. 3 .

B. 5 .

C. 21 .

D. 43 .

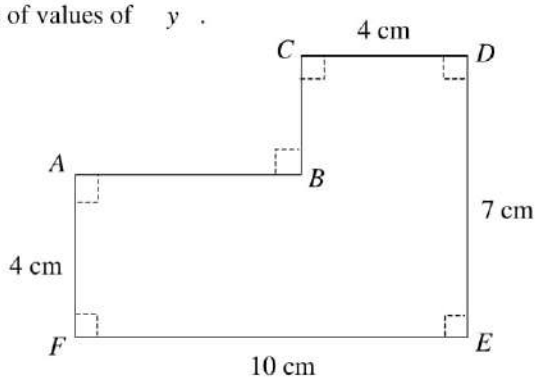
14. In the figure , $ABCDEF$ is a hexagon , where all the measurements are correct to the nearest cm . Let $y\ \text{cm}^2$ be the actual area of the hexagon . Find the range of values of y .

A. $39 \le y < 65$

B. $42 \le y < 63$

C. $42 \le y < 65.25$

D. $43.75 \le y < 60.75$



15. The radius of a sector is increased by 25 % and its angle at the centre is decreased by k % . If the area of the sector remains unchanged, find the value of k .

A. 20 %

B. 25 %

C. 36 %

D. 50 %

16. The base of a solid right pyramid is a rectangle , the length is $32\,\text{cm}$ and the width is $10\,\text{cm}$. If the height of the pyramid is $12\,\text{cm}$, then the total surface area of the pyramid is

A. $616\,\text{cm}^2$.

B. $720\,\text{cm}^2$.

C. $824\,\text{cm}^2$.

D. $936\,\text{cm}^2$.

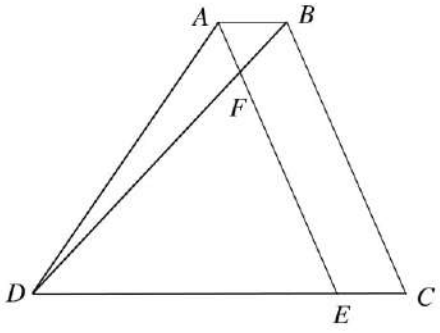
17. In the figure , $ABCD$ is a trapezium , where $AB // DC$. E is a point lying on DC such that $AE // BC$. It is given that $AB : DC = 2 : 9$ and the area of the quadrilateral $BCEF$ is $32\,\text{cm}^2$. Find the area of the trapezium $ABCD$.

A. $81\,\text{cm}^2$

B. $85\,\text{cm}^2$

C. $99\,\text{cm}^2$

D. $128\,\text{cm}^2$



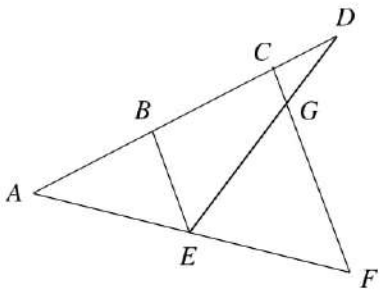
18. In the figure , B and C are points lying on AD such that $AB = BC = 2CD$. E is a point lying on AF such that $BE // CF$. DE and CF intersect at the point G . The ratio of the area of the trapezium $BCGE$ to the area of ΔEGF is

A. $4 : 5$.

B. $5 : 4$.

C. $5 : 8$.

D. $8 : 5$.

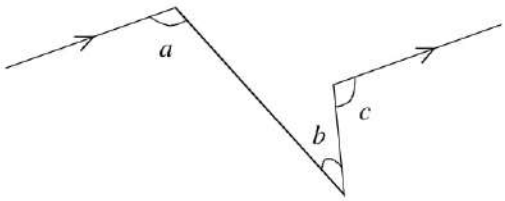


19. According to the figure, which of the following must be true ?

I. $a-b+c=180°$

II. $a+b-c=180°$

III. $a+b+c=270°$



A. I only

B. II only

C. I and III only

D. II and III only

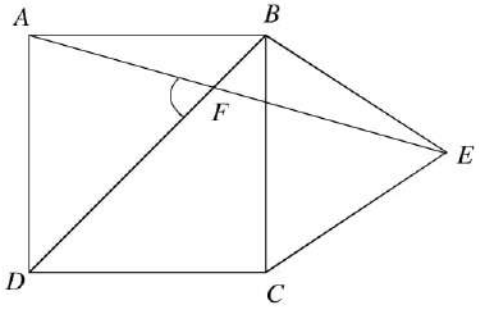
20. In the figure , $ABCD$ is a square and BEC is an isosceles triangle with $BC=BE$. The straight lines AE and BD intersect at the point F . If $\angle BEC=56°$, then $\angle AFD=$

A. $56°$.

B. $58°$.

C. $59°$.

D. $62°$.



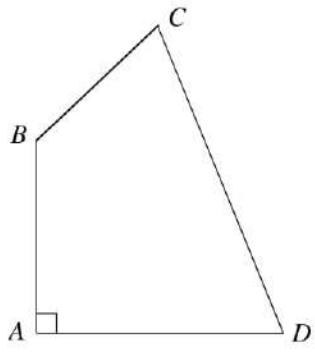
21. In the figure , $ABCD$ is a quadrilateral , where $\angle BAD=90°$. It is given that $AB=9\text{ cm}$, $BC=8\text{ cm}$, $CD=17\text{ cm}$ and $AD=12\text{ cm}$. Find $\angle ADC$ correct to the nearest degree .

A. $64°$.

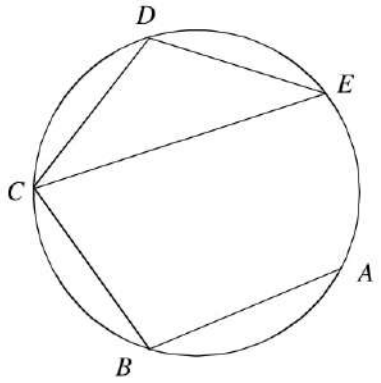
B. $65°$.

C. $67°$.

D. $69°$.



22. In the figure , $ABCDE$ is a circle . If $\angle ABC = 90°$, $\angle CED = 36°$ and $CD = 6\text{ cm}$, find the area of the circle correct to the nearest cm^2 .



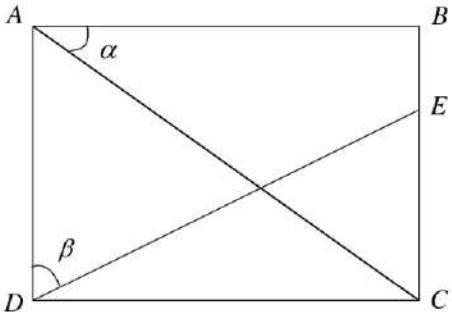
A. 32

B. 54

C. 82

D. 113

23. In the figure , $ABCD$ is a rectangle . E is a point lying on BC . Find $\dfrac{EC}{AC}$.



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

B. $\dfrac{\cos\alpha}{\tan\beta}$

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

D. $\dfrac{1}{\cos\alpha \tan\beta}$

24. The polar coordinates of the points P , Q and R are $(5, 110°)$, $(3, 290°)$ and $(6, 350°)$ respectively . The area of ΔPQR is

A. 12 .

B. 24 .

C. $12\sqrt{3}$.

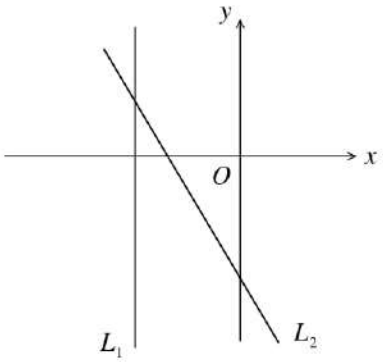
D. $24\sqrt{3}$.

25. In the figure , the equations of the straight lines L_1 and L_2 are $x=\frac{1}{a}$ and $\frac{x}{b}+\frac{y}{c}=1$ respectively . Which of the following are true ?

I. $a<0$

II. $c<0$

III. $0<ab<1$



A. I and II only

B. I and III only

C. II and III only

D. I , II and III

26. The coordinates of the points A and B are $(-1,2)$ and $(3,5)$ respectively . If P is a moving point in the rectangular coordinate plane such that the area of ΔPAB is equal to 20 , then the locus of P is

A. a straight line .

B. a pair of parallel lines .

C. a circle .

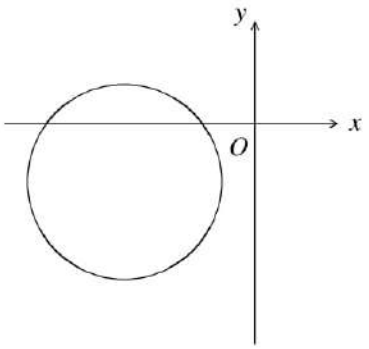
D. a square .

27. In the figure , the equation of the circle is $x^2+y^2-2hx-2ky+h^2+k^2-r^2=0$, where h , k and r are constants with $r>0$. Which of the following must be true ?

I. $r+h<0$

II. $r+k>0$

III. $h-k>0$



A. I and II only

B. I and III only

C. II and III only

D. I , II and III

28. Two balls are randomly drawn at the same time from five balls numbered 2 , 3 , 5 , 6 and 9 . Find the probability that the product of the two numbers drawn is an even number.

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

B. $\frac{3}{5}$

C. $\frac{4}{5}$

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

29. Which of the following can be obtained from any cumulative frequency curve ?

I. Median

II. Mean

III. Range

A. I only

B. I and III only

C. II and III only

D. I , II and III

30. Consider the following positive integers :

4 4 4 4 5 5 6 6 6 7 8 9 k

where $4 \leq k \leq 9$. If the mean , the median and the mode of the data are α , β and γ respectively , which of the following must be true ?

A. $\alpha > \beta$

B. $\alpha > \gamma$

C. $\beta > \gamma$

D. The inter-quartile range of the data < 4

Section B

31. $8^{17}+8^4-8^3=$

A. $2000000000E00_{16}$.

B. 2000000001200_{16} .

C. $8000000000E00_{16}$.

D. 8000000001200_{16} .

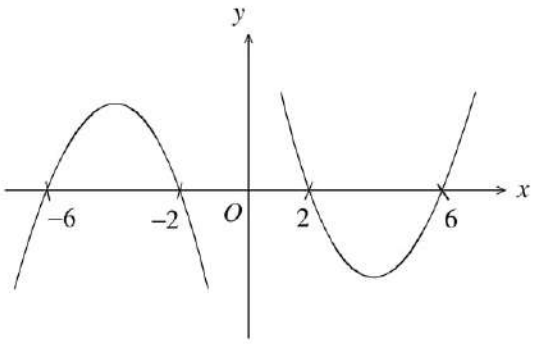
32. Let $f(x)$ be a quadratic function . Which of the following may represent the graph of $y=f(x)$ and

A. the graph of $y=-f(-x)$.

B. the graph of $y=f(x-8)$.

C. the graph of $y=f(-x+8)$.

D. the graph of $y=-f(x-4)$.



33. Let a be a constant and $a>1$. If the roots of the equation $(\log_a x)^2+4\log_a x^2-18=\log_a x$ are m and n , then $mn=$

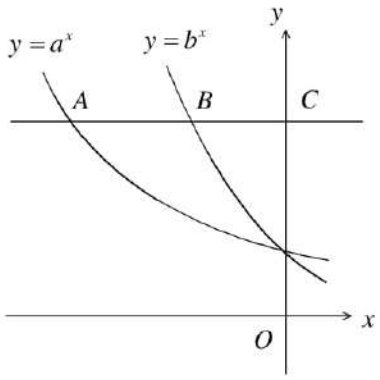
A. a^3 .

B. a^7 .

C. $\frac{1}{a^3}$.

D. $\frac{1}{a^7}$.

34. The figure shows the graph of $y = a^x$ and the graph of $y = b^x$ on the same rectangular coordinate system , where a and b are positive constants . If a horizontal line cuts the graph of $y = a^x$, the graph of $y = b^x$ and the y-axis at the points A , B and C respectively, which of the following must be true ?



I. $0 < a < 1$

II. $b > a$

III. $\frac{AB}{BC} = \log_a \frac{b}{a}$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

35. If $a > 0$, which of the following are arithmetic sequences ?

I. $a\sqrt{a}$, $3a\sqrt{a}$, $5a\sqrt{a}$

II. $(\sqrt{a})^5$, $(\sqrt{a})^{10}$, $(\sqrt{a})^{15}$

III. $\log\frac{1}{\sqrt{a}}$, $3\log\sqrt{a}$, $7\log\sqrt{a}$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

36. If k is a real number , then the real part of $(k-2i)(2+ki)^2$ is

A. $-k^3+12k$.

B. k^3-12k .

C. k^3+4k .

D. k^3+12k .

37. Consider the following system of inequalities :

$$\begin{cases} 0 \le x \le 30 \\ x + 2y \ge 10 \\ x + 3y \le 54 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities . If (x, y) is a point lying on R , then the greatest value of $2x - 3y + 2$ is

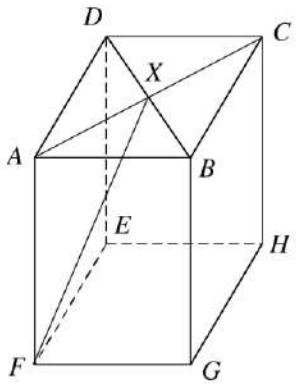
A. -52 .

B. 38 .

C. 92 .

D. 110 .

38. In the figure , $ABCDEFGH$ is a cuboid , where $AF = 2a$ cm , $FG = 2b$ cm and $GH = 2c$ cm . Let AC and DB intersect at the point X . Denote the angle between FX and the plane $ADEF$ by θ , then $\cos\theta =$



A. $\dfrac{b}{\sqrt{4a^2 + c^2}}$.

B. $\dfrac{b}{\sqrt{4a^2 + b^2 + c^2}}$.

C. $\dfrac{\sqrt{b^2 + c^2}}{\sqrt{4a^2 + b^2 + c^2}}$.

D. $\dfrac{\sqrt{4a^2 + c^2}}{\sqrt{4a^2 + b^2 + c^2}}$.

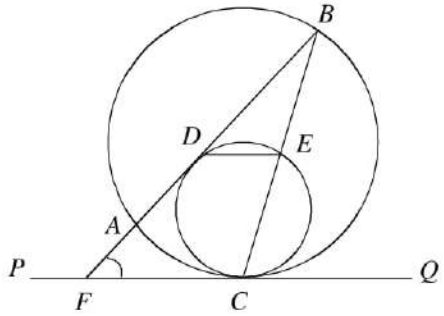
39. In the figure , ABC and CDE are circles such that BEC is a straight line . PQ is the common tangent to the two circles at C . BA is the tangent to the circle CDE at D and BA produced intersects PQ at F . If $\angle BDE = 35°$ and $\angle BCQ = 65°$, then $\angle BFC =$

A. $20°$.

B. $25°$.

C. $30°$.

D. $45°$.



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40. Find the range of values of k such that the circle $x^2+y^2+2x-2y-2=0$ and the straight line $4x+3y+k=0$ do not intersect with each other .

A. $-11<k<9$

B. $-9<k<11$

C. $k<-11$ or $k>9$

D. $k<-9$ or $k>11$

41. The equations of the three sides of a triangle are $4x+3y=24$, $4x-3y=-24$ and $y=b$, where b is a constant . If the y coordinate of the centroid of the triangle is -10 , then $b=$

A. -10 .

B. -19 .

C. -28 .

D. -46 .

42. 5 boys and 4 girls are arranged in a row for chorus . If only two girls stand next to each other, then how many permutations are there ?

A. 28800

B. 172800

C. 241920

D. 259200

43. A game host puts 2 balls randomly into 3 boxes (each box may contain 0 balls , 1 ball or 2 balls) . Participants in the game can choose any 2 boxes to open . If 2 balls are drawn , they can get a prize . Find the probability that the participants can get a prize .

A. $\frac{1}{3}$

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

C. $\frac{4}{9}$

D. $\frac{5}{9}$

44. In an examination , the difference of the test scores of two students is 18 marks . It is given that the standard deviation of the test scores in the test is 6 marks , find the difference of the standard scores of the two students .

A. 3

B. 6

C. 12

D. 24

45. It is given that $\{a_1, a_2, a_3, \cdots, a_{10}\}$ is an arithmetic sequence , where the standard deviation of $\{a_1, a_2, a_3, a_4, a_5\}$ is 2 . Find the variance of $\{2a_6+5, 2a_7+5, 2a_8+5, 2a_9+5, 2a_{10}+5\}$.

A. 4

B. 8

C. 13

D. 16

END OF PAPER