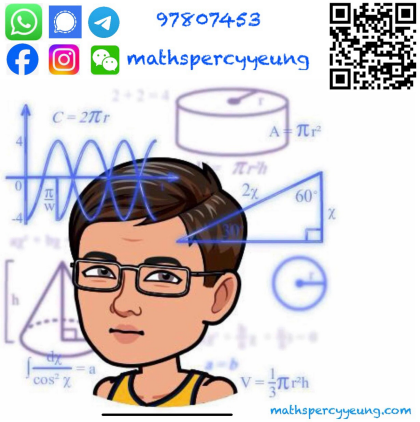
2021-2022
FINAL EXAM
MATH CP
PAPER 2
F.4

SY F4 2021-2022 Final Paper two

F.4 MATHEMATICS Compulsory Part
PAPER 2

Time allowed: 1 hour

1. 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.
2. All questions carry equal marks.
3. **ANSWER ALL QUESTIONS**. You should mark all your answers on the Answer Sheet.
4. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
5. No marks will be deducted for wrong answers.



The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

1. $\frac{6^{3n}}{9^n} =$

   A. 24^n . B. $\frac{2^n}{3^n}$. C. $\frac{8^n}{3^n}$. D. $\frac{8^n}{27^n}$.

2. Round up $\sqrt[3]{13}$ to 4 significant figures.

   A. 2.351 B. 2.352 C. 46.87 D. 46.88

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

   A. $\frac{ab}{a-2b}$. B. $\frac{2ab}{a-2b}$. C. $\frac{ab}{b-2a}$. D. $\frac{2ab}{b-2a}$.

4. If $4x^2 = 9x$, then $x =$

   A. 0 or $\frac{3}{2}$. B. $\pm\frac{3}{2}$. C. $\frac{9}{4}$. D. 0 or $\frac{9}{4}$.

5. If k is a constant such that the equation $x^2 = k(x+4)$ has two equal roots, then $k =$

   A. -16 . B. 16 . C. 0 or -16 . D. 0 or 16 .

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

   A. x^4+1 . B. x^4-x^2+1 .
   C. x^4+x^2+1 . D. x^4+2x^2+1 .

7. Let $f(x) = x^2 + kx$, where k is a constant. $f(2x)+2f(-x) =$

   A. 0 . B. $4kx$. C. $2x^2$. D. $6x^2$.

8. The number of rational roots of $2x^3 - 15x^2 + 5x = 0$ is

A. 0 . B. 1 . C. 2 . D. 3 .

9. If A, B and C are constants such that $A(x^2 - 4) + B(2x^2 + 4x) \equiv Cx + 24$, then $B + C =$

A. 3 . B. 9 . C. 12 . D. 15 .

10. Let p be a constant. The quadratic equation with roots 2 and p is

A. $x^2 - (2 + p)x + 2p = 0$. B. $x^2 + (2 + p)x + 2p = 0$.
C. $x^2 - 2px + 2 + p = 0$. D. $x^2 + 2px + 2 + p = 0$.

11. The perimeter and diagonal of a rectangle are 80 cm and 30 cm respectively. Find the area of the rectangle.

A. 350 cm^2 B. 520 cm^2 C. 700 cm^2 D. 2750 cm^2

12. Let $\text{f}(x) = x^3 + 3x^2 + 6x + k$, where k is a constant. If $\text{f}(x)$ is divisible by $x + 1$, find the remainder when $\text{f}(x)$ is divided by $2x - 4$.

A. 18 B. 22 C. 36 D. 140

13. The equation of the straight line passing through the point $(4, -5)$ and perpendicular to $x + 2y = 3$ is

A. $2x + y = -6$. B. $2x + y = 3$.
C. $2x - y = -14$. D. $2x - y = 13$.

14. The graph of $y = (x - 4)^2 - 49$ cuts the axes at points P, Q and R. Find the area of ΔPQR .

A. 132 B. 231 C. 343 D. 462

15. If the straight lines $6x + sy + 12 = 0$ and $2x - 3y + t = 0$ have no intersection, then

A. $s \neq -9$.
B. $s = -9$ and $t = 4$.
C. $s = -9$ and $t \neq 4$.
D. $s = -9$ and t can be any real number.

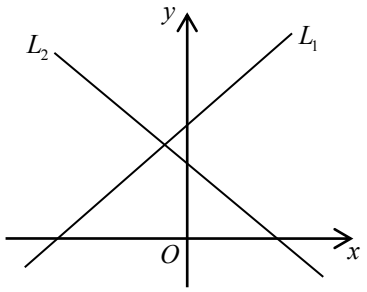
16. The orthocentre of the triangle with vertices $(3,1)$, $(3,-2)$ and $(-12,16)$ lies in

A. the first quadrant. B. the second quadrant.
C. the third quadrant. D. the fourth quadrant.

17. In the figure, the equations of the straight lines L_1 and L_2 are $ax + by = 1$ and $cx + dy = 1$ respectively. Which of the following must be true?

I. $b > d$
II. $ad > bc$

A. I only
B. II only
C. I and II
D. None of them



18. For $0° \le x < 360°$, how many roots does the equation $\tan x \cos x = 1$ have?

A. 0 B. 1 C. 2 D. 3

19. In ΔABC, $AB = 4$ cm, $BC = 5$ cm and $CA = 6$ cm. $\dfrac{\sin A}{\sin B} =$

A. $\dfrac{4}{5}$. B. $\dfrac{5}{4}$. C. $\dfrac{5}{6}$. D. $\dfrac{6}{5}$.

20. The minimum value of $\dfrac{1}{3\sin^2 x + 4\cos^2 x}$ is

A. $\dfrac{1}{3}$. B. $\dfrac{1}{4}$. C. $\dfrac{1}{5}$. D. $\dfrac{1}{7}$.

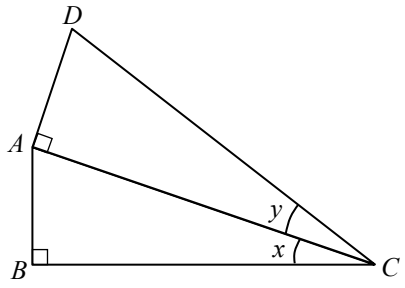
21. In the figure, $\dfrac{AB}{AD} =$

A. $\dfrac{\sin x}{\tan y}$.

B. $\dfrac{\cos x}{\tan y}$.

C. $\sin x \tan y$.

D. $\cos x \tan y$.



22. The cost of a toy is \$120. When the selling price of each toy is \$200, 60 toys would be sold in a week. It is known that the number of toys sold in a week would be increased by $2x$ if the selling price is reduced by $\$x$. Find the maximum profit in a week when the selling price is adjusted.

A. \$3025 B. \$4800 C. \$6050 D. \$7300

23. If $2\log x - \log y = 2$, then

A. $2x - y = 2$. B. $2x - y = 100$.

C. $x^2 = 2y$. D. $x^2 = 100y$.

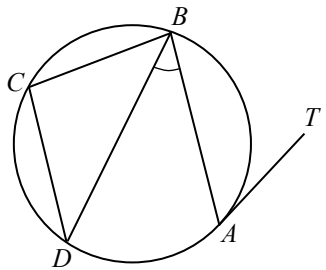
24. In the figure, TA is a tangent to the circle $ABCD$ at A. If $\angle BAT = 52°$, $\angle CBD = 44°$ and $BC = CD$, then $\angle ABD =$

A. 38° .

B. 40° .

C. 42° .

D. 46° .



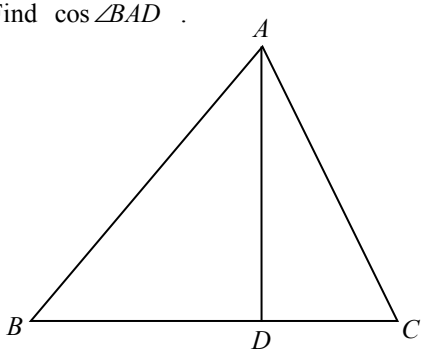
25. In the figure, $AB = BC = 169$ cm and $AC = 130$ cm. D is a point on BC such that AD is perpendicular to BC. Find $\cos \angle BAD$.

A. $\dfrac{5}{13}$

B. $\dfrac{12}{13}$

C. $\dfrac{120}{169}$

D. $\dfrac{144}{169}$



26. Which of the following is true?

A. $10^{6066} < 2022^{2022} < 10^{6067}$ B. $10^{6067} < 2022^{2022} < 10^{6068}$

C. $10^{6684} < 2022^{2022} < 10^{6685}$ D. $10^{6685} < 2022^{2022} < 10^{6686}$

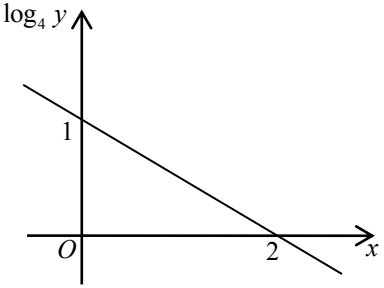
27. The graph in the figure shows the linear relation between $\log_4 y$ and x. Which of the following is true?

A. $y = \dfrac{4}{2^x}$

B. $y = \dfrac{16}{2^x}$

C. $y = 4 \cdot 2^x$

D. $y = 16 \cdot 2^x$



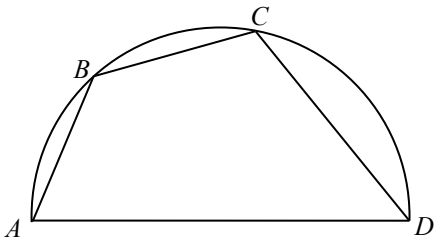
28. The figure shows a semi-circle with $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} = 4 : 5 : 6$. Find $\angle ABC$.

A. 108°

B. 126°

C. 132°

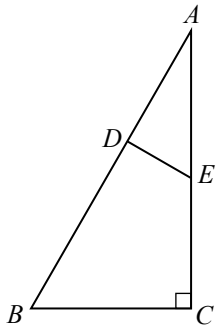
D. 144°



29. Let $i=\sqrt{-1}$. $i+i^2+i^3+\cdots+i^{2023}=$

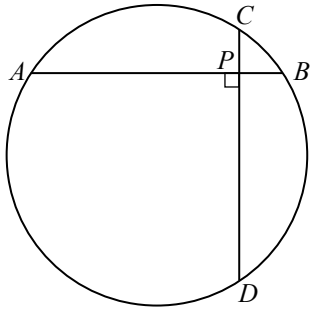
A. -1 . B. 1 . C. $-i$. D. i .

30. In the figure, $\angle ACB=90°$, D and E are points on AB and AC respectively such that B , C , E and D are concyclic. If $AB=90$ cm , $AC=72$ cm and $CE=42$ cm , find DE .



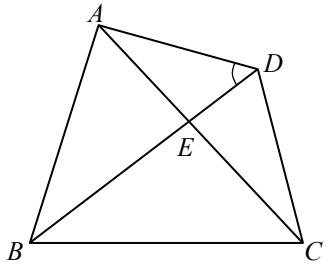
A. 14 cm
B. 15 cm
C. 16 cm
D. 18 cm

31. In the figure, two equal chords AB and CD intersect at P . If $AP=15$ cm , $BP=3$ cm and $AB\perp CD$, then the radius of the circle is



A. 9 cm .
B. $3\sqrt{13}$ cm .
C. 12 cm .
D. 15 cm .

32. In the figure, AC intersects BD at E, BD bisects $\angle ABC$, $\angle BAC=71°$, $\angle ABC=70°$ and $\angle BCD=74°$. Find $\angle ADB$.



A. 35°
B. 36°
C. 38°
D. 39°

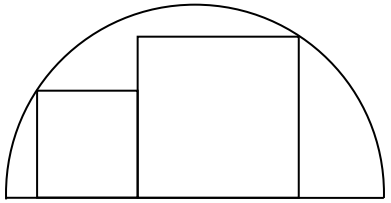
33. The coordinates of points A and B are $(12,9)$ and $(23,11)$ respectively. P and Q are two points on the straight line $y=2x$ such that $AB=AP=AQ$. The coordinates of the mid-point of P and Q are

A. $(2,4)$. B. $(6,12)$. C. $(9,18)$. D. $(10,20)$.

34. If α is a root of $x^2-2x+3=0$, then $\alpha^3=$

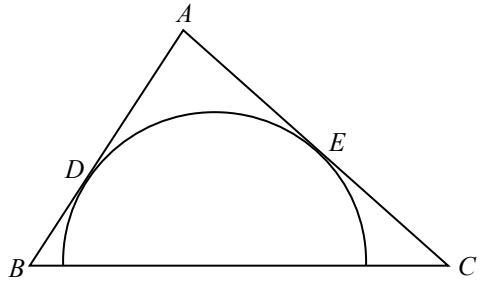
A. $\alpha-6$. B. $2\alpha-3$. C. $4\alpha-3$. D. $4\alpha-9$.

35. In the figure, squares with sides 3 cm and 5 cm are fitted inside the semi-circle. Find the area of the semi-circle.



A. 16π cm^2
B. 17π cm^2
C. 32π cm^2
D. 34π cm^2

36. The figure shows a semi-circle inscribed in ΔABC . If $AB=40$ cm , $AC=50$ cm and $BC=60$ cm , then $BD=$



A. 12 cm .
B. 13.5 cm .
C. 15 cm .
D. 16 cm .

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