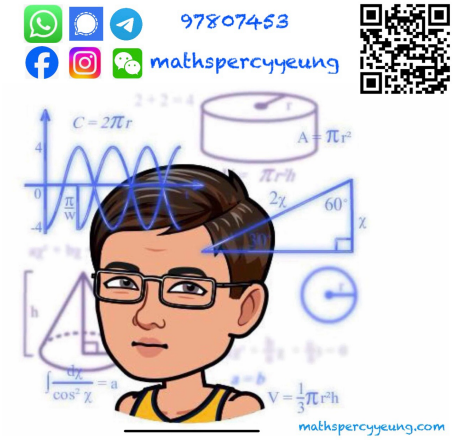
SY F4 2022-2023 Final Paper two

2022-2023

FINAL EXAMINATION

MATH CP



(1 hour)

INSTRUCTIONS

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. $\dfrac{81^{3n}}{3^{4n}} =$

A. $\dfrac{1}{3^n}$. B. 3^{2n}. C. 3^{4n}. D. 3^{8n}.

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

A. $(a-b)(a+b-3)$. B. $(a+b)(a-b-3)$.

C. $(a-b)(a+b+3)$. D. $(a+b)(a-b+3)$.

3. If $\dfrac{x+m}{x-2n} = 3$, then $x =$

A. $\dfrac{m+6n}{2}$. B. $\dfrac{m-6n}{2}$. C. $\dfrac{m+2n}{2}$. D. $\dfrac{m-2n}{2}$.

4. It is given that $\mathrm{f}(x) = x^3 + 4x^2 - x + 1$. $\mathrm{f}(-1) =$

A. 5. B. 3. C. -3. D. -5.

5. Which of the following is irrational?

A. $\log_8 32$ B. $0.\dot{1}\dot{9}$ C. $3\sqrt{18}$ D. $\dfrac{\sqrt{8}}{\sqrt{242}}$

6. Let $i = \sqrt{-1}$. $\dfrac{1}{2+3i} =$

A. $\dfrac{-2-3i}{5}$. B. $\dfrac{-2+3i}{5}$. C. $\dfrac{2+3i}{13}$. D. $\dfrac{2-3i}{13}$.

7. Solve $x(x-k) = x$.

A. $x = k$ B. $x = k+1$

C. $x = k$ or $x = 0$ D. $x = k+1$ or $x = 0$

8. Let m and n be constants. If $x^2 + m(x+3) + n \equiv (x-2)(x+3)$, then $m+n =$

A. 9. B. 8. C. –9. D. –8.

9. $\dfrac{1}{x+7}-\dfrac{1}{x-7}=$

A. $\dfrac{-2x}{x^2-49}$. B. $\dfrac{2x}{x^2-49}$.

C. $\dfrac{-14}{x^2-49}$. D. $\dfrac{14}{x^2-49}$.

10. If α and β are the roots of the equation $x^2-2x-5=0$, then $(\alpha-1)(\beta-1)=$

A. -8. B. -6. C. -2. D. 4.

11. Find the range of values of k if the equation $x^2+4x+k=1$ has no real roots.

A. $k>4$ B. $k<4$ C. $k>5$ D. $k<5$

12. If $\log_2 3 = a$ and $\log_2 5 = b$, then $\log_2 150 =$

A. $a + b + 1$. B. $a + 2b + 1$.

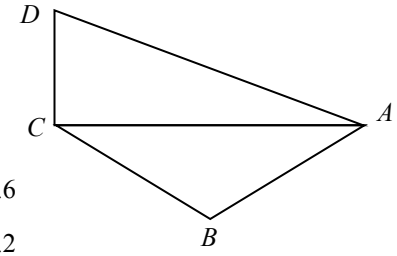
C. $2a + b + 1$. D. $2a + 2b + 1$.

13. The straight line $2x-3y-5=0$ is parallel to the straight line

A. $-2x+3y-4=0$. B. $3x-2y-4=0$.

C. $2x+3y-4=0$. D. $3x+2y-4=0$.

14. In the figure, $ABCD$ is a quadrilateral. $AB = BC = 7$, $AD = 13$, $CD = 5$ and $\angle ACD = 90°$. Find the area of $ABCD$ correct to 3 significant figures.



A. 21.6 B. 51.6

C. 54.1 D. 73.2

15. Gordon sold two hats for \$90 each. He gained 25% on one and lost 25% on the other. After the two transactions, Gordon

A. lost \$8. B. lost \$12.

C. gained \$12. D. had no gain and no loss.

16. If $\mathrm{f}\left(\frac{1}{x}\right)=\frac{x+1}{x}$, then $\mathrm{f}(x+1)-\mathrm{f}(x-1)=$

A. 2. B. $2x$. C. $2x-1$. D. $2x-2$.

17. The straight lines $x+2y=3$ and $ax+by=4$ are perpendicular to each other. Find the value of $\frac{5a+3b}{2b}$.

A. $\frac{7}{2}$ B. $-\frac{7}{2}$ C. $\frac{2}{7}$ D. $-\frac{2}{7}$

18. Find the remainder when $x^{2023}+2024x+2025$ is divided by $x+1$.

A. 4050 B. 2 C. 0 D. -1

19. The points $A(1, m)$, $B(2, n)$ and $C(3, 4)$ are collinear. Find m in terms of n.

A. $m=4-2n$ B. $m=2n+4$ C. $m=-4-2n$ D. $m=2n-4$

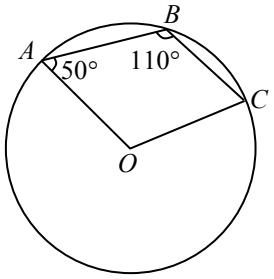
20. The graph of $y=(b-2x)^2+c$ intersects the x–axis at two distinct points. Which of the following must be true?

I. The graph opens upward. II. $b>0$ III. $c<0$

A. I and II only B. I and III only
C. II and III only D. I, II and III

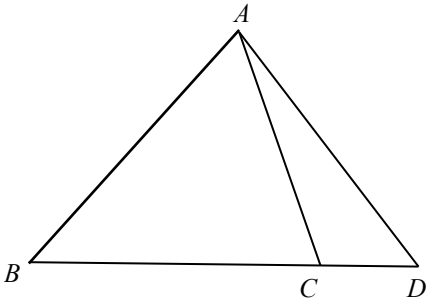
21. In the figure, O is the centre of the circle. It is given that $\angle OAB = 50°$ and $\angle ABC = 110°$.

Find $\overset{\frown}{AB} : \overset{\frown}{BC}$.



A. 3 : 4 B. 4 : 3
C. 5 : 6 D. 4 : 7

22. In the figure, BCD is a straight line. It is given that $\angle ACD = 120°$, $BC = AD = 10$ cm and $CD = 3$ cm. Find AB correct to 3 significant figures.



A. 8.16 cm B. 8.84 cm
C. 9.22 cm D. 11.7 cm

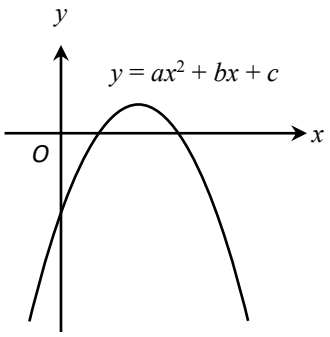
23. The scientific notation of 2023^{2023} is $p \times 10^n$. Find the value of n.

A. 6688 B. 6689 C. 6690 D. 6691

24. For $0° \le \theta < 180°$, how many distinct roots does the equation $3\sin^2\theta - 5\sin\theta - 2 = 0$ have?

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

25. The figure shows the graph of $y = ax^2 + bx + c$, where a, b and c are constants.

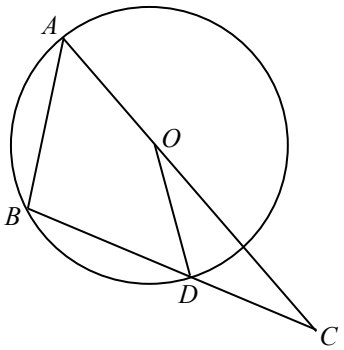


Which of the following is true?

A. $b < 0$ and $ac > 0$ B. $b < 0$ and $ac < 0$

C. $b > 0$ and $ac > 0$ D. $b > 0$ and $ac < 0$

26. In the figure, O is the centre of the circle. AOC and BDC are two straight lines.

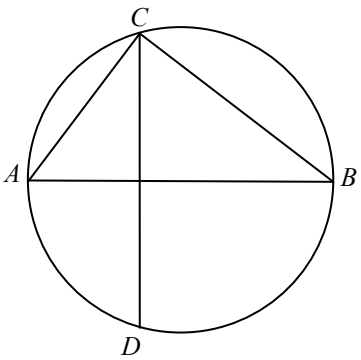


If $\angle BDO = 47°$ and $\angle OCD = 25°$, then $\angle ABD =$

A. 158°. B. 133°.

C. 108° D. 101°.

27. In the figure, AB is a diameter of the circle and CD is perpendicular to AB.



If $BC = 8$ and $AC = 6$, then $CD =$

A. 4.8. B. 7.2.

C. 9.6. D. 10.

28. If $\sin\theta = k\cos\theta$, then $\cos^2\theta =$

A. $\dfrac{k^2-1}{k^2}$. B. $\dfrac{1}{k^2}$. C. $\dfrac{k}{k^2+1}$. D. $\dfrac{1}{k^2+1}$.

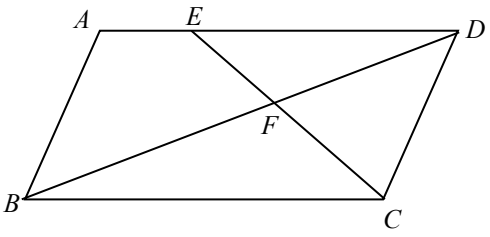
29. If the G.C.D. of the expressions $4x^2y$ and P is $2x^2y$, while the L.C.M. of the expressions $8xy$ and P is $8x^3y^2$, then the expression of P is

A. $2x^2y^2$. B. $2x^3y^2$. C. $8x^2y$. D. $8x^3y^2$.

30. $\dfrac{\sin\theta}{\sin(90°+\theta)} =$

A. -1. B. 1. C. $-\tan\theta$. D. $\tan\theta$.

31. The figure shows a parallelogram $ABCD$ where E is a point on AD and EC intersects BD at F. It is given that $ED : BC = 3 : 4$ and the area of $\Delta DFC = 36$. Find the area of $ABFE$.



A. 41 B. 48

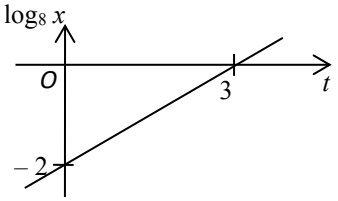
C. 57 D. 62

32. $A(a, b)$ is a point on the straight line $2x - y = 3$. Find the minimum value of $2a^2 + b^2$.

A. 8 B. 3 C. 1 D. -9

33. The graph in the figure shows the linear relation between $\log_8 x$ and t.

If $x = ab^t$, then $b =$



A. 64. B. $\dfrac{1}{64}$.

C. 4. D. $\dfrac{1}{4}$.

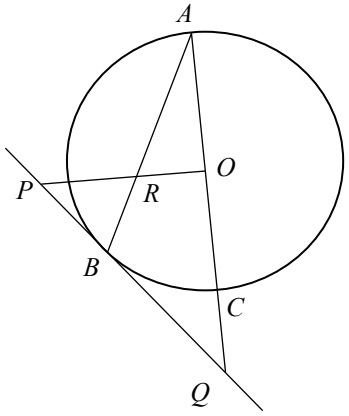
34. In the figure, AC is a diameter of the circle with centre O. P is a point outside the circle where $AC \perp PO$. A tangent from P to the circle touches the circle at B and intersects AC produced at Q. AB intersects PO at R. Which of the following is not always true?

A. $\Delta ABQ \sim \Delta BCQ$

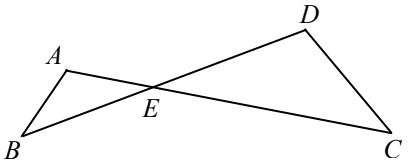
B. $\angle OPB = 2\angle BAO$

C. $2AO^2 = AB \times AR$

D. $BQ < BA$



35. In the figure, A, B, C and D are concyclic and AC intersects BD at E.



It is given that $\angle BDC = 120°$, $\angle DCA = 30°$, $AB = \sqrt{2}$ and $CD = \sqrt{6}$.

Find the area of the circle $ABCD$ in terms of π.

A. 14π B. 15π

C. 16π D. 17π

36. The coordinates of the points A, B and C are $(-15, -2)$, $(1, -10)$ and $(p, 4)$ respectively. If p is positive and the y-coordinate of the circumcentre of ΔABC is -2, find the area of ΔABC.

A. 120 B. 124

C. 128 D. 132

END OF PAPER