1. Find the solution of $1+\sqrt{x+4\sqrt{3(x-1)}}=3+\sqrt{x}$.

2. Evaluate $\dfrac{(3+3i)^{2032}}{324(3-3i)^{2024}}$.

3. Suppose f is a function such that $f(n+2)=f(n)+4f(n-2)$ for all integers n. If $f(9)=185$ and $f(3)=5$, find $f(-1)+f(5)$.

4. Find the value of $\dfrac{\cos 10^\circ \cos 60^\circ - \cos 10^\circ \cos 80^\circ}{\cos 50^\circ}$.

5. Find the value of $\lim\limits_{x\to 0^+}\dfrac{1+8\cdot 3^{\frac{1}{x}}}{5+2\cdot 3^{\frac{1}{x}}}$.

6. Find $\left(\frac{3}{\log_7 6}\right)\left(\frac{3}{\log_8 7}\right)\left(\frac{3}{\log_9 8}\right)\cdots\left(\frac{3}{\log_{7776} 7775}\right)$.

7. Find the value of $\sum_{k=0}^{2024} \frac{2024!}{k!(2024-k)!}\cdot 4^{2024}\cdot\left(-\frac{5}{4}\right)^k$.

8. Find the area of the carpet formed by the overlapping equation $x^2+y^2\le 4$ and $y^2-x^2\le 0$. $\left(\pi=\frac{22}{7}\right)$

9. One single bacterium takes 4 minutes to divide into three complete bacteria and takes 2 hours to fill a bottle. If, initially, Peter puts three bacteria in a bottle, how much time does it take to fill a bottle? (Give your answer in minutes)

10. Two girls stand 400 meters apart, and a tree is between them. If two girls look at the top of the tree at elevation angles of 30 degrees and 40 degrees, respectively, how tall is the tree? (Round your answer to the nearest meter.)

11. A water tank has two identical drain valves. If one drain valve is opened, it takes 6 hours to drain the entire tank water. Anna began draining the full tank water by opening both valves until the tank was $\frac{1}{3}$ full. Then, she drained the water by opening just one valve until the tank was empty. How many total minutes does it take to fully drain the water tank?

12. Gale intends to save money to buy Labuboo within 12 days by saving a total of 2 baht on the first and second days, a total of 4 baht on the second and third days, a total of 8 baht on the third and the fourth days, and continuing like this. Finally, on the eleventh and twelfth days, the total amount collected is 2048 baht. If the total amount collected is 1366 baht on the first and twelfth days, what is the total amount that Gale collected within 12 days?

13. Let f be a function satisfying the following conditions:

(i) A graph f passes through the point $(0,5)$.

(ii) A gradient of curve of f at the origin is zero.

(iii) The second derivative of f at any points is $2x+7$.

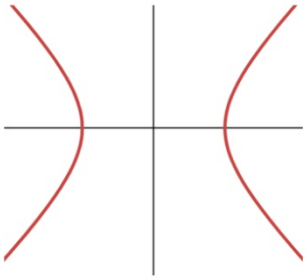
Find the value of $f(6)$.

14. ABC is an isosceles right triangle whose a right angle at C. Let P and Q be points on the side AB such that $AP:PQ:QB=4:5:3$. Determine the angle PCQ.

15. Figure (a) shows the cooling tower at Harris Nuclear Plant in New Hill, North Carolina, and its cross-section, see Figure (b). The cross-section is in the shape of a hyperbola with equation $64x^2 - 25y^2 = 160000$. The tower is 180 meters tall and the distance from the top of the tower to the center of the hyperbola is half of the distance from the center of the hyperbola to the base of the tower. Find the diameter of the top of the tower.



(a)



(b)

16. There are eight cards numbered 1 to 8. Let m be a number on the card drawn at random firstly, then putting it back. Let n be a number on the card drawn at random secondly. If $\frac{a}{b}$ is the probability of m^2+n-1 divisible by 5, where $\gcd(a,b)=1$, then find the value of $a+b$.

17. Judy plays a shooting game. In practice mode, he has to shoot the center of the target at least 3 times to complete the training. Given that he shoots the center of the target with a probability of 60%. Let $0.abcde$ be the probability that Judy will end training after shooting 5 times. Find the value of $a^2+b^2+c^2+d^2+e^2$.

18. The numbers in the data set shown below are arranged in ascending order

$$7, a, 13, 16, 23, b, 31.$$

The average and third decile of the data set are 18 and 11.2, respectively. Find the quartile deviation of this data set.

19. Survey results reported by 8-12-supermarket show that 70% of customers have all-members. Let k be the probability that if 4 customers are randomly selected, there will be less than 2 customers without all-member. Find the multiplication of all digits of $10000k$.

20. Table 1 shows James' grades for each subject

Table 2 shows the grade and score range for mathematics subject

Table 1		
Course	Credit	Grade
Maths	3	?
Physics	2	3
Chemistry	2	3.5
Biology	2	2.5
Thai	2	3
Eng	3	3.5

Table 2	
Grade	Range
4	Score ≥ 80
3.5	$75 \leq$ Score < 80
3	$71 \leq$ Score < 75
2.5	$66 \leq$ Score < 71
2	$60 \leq$ Score < 66
1.5	$54 \leq$ Score < 60
1	$49 \leq$ Score < 54

From Tables 1, 2, and Jame wants to get the GPA that is not less than 3.25. What is the minimum integer score he must get for Maths in order to achieve that GPA?

21. Find the values of $\log_3\left[\sin\left(\tan^{-1}\sqrt{3}\right)+\cos\left(\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)\right)\right]$.

22. The sum of the solutions of the equation $2^{2x^2+5x-3} = 6^{3x+7}$ is $\frac{\ln a}{\ln b}$.
Find the value of ab.

23. A balloon is flying up at a constant velocity. Jack stands $600\sqrt{3}$ meters away from a balloon releasing point. At 8.00 AM., Jack observes that angle of elevation of the balloon is 30°. At 8.40 AM., he observes that angle of elevation of the balloon is 60°. Find the velocity (ms^{-1}) of the balloon.

24. Let $a, b,$ and c are non-negative integers, how many solutions of the equation $a+b+c=6$ exist?

25. The expression below shows the sequence of four-digit numbers in ascending order. In addition, four-digit numbers in this sequence must be in ascending order.

$$1234, 1235, 1236, \ldots, 6789$$

What is the 120^{th} term of this sequence?

GRADE 12 ANSWER KEY

No.	Answer	No.	Answer
1	4.00	14	45.00
2	324.00	15	125.00
3	4.00	16	77.00
4	0.50	17	98.00
5	4.00	18	8.00
6	15.00	19	210.00
7	1.00	20	81.00
8	77.00	21	3.00
9	116.00	22	27.00
10	173.00	23	0.50
11	240.00	24	28.00
12	730.00	25	689.00
13	203.00		