International Vedic Maths Olympiad 2024
Open
Time allowed - 1 Hour

This Olympiad consists of 40 multiple choice questions.

2 marks are awarded for correct answers for questions 1 - 25

3 marks are awarded for correct answers for questions 26 - 35 and -1 mark for each incorrect answer.

4 marks are awarded for correct answers for questions 36 - 40 and -2 marks for each incorrect answer.

Negative marks for incorrect answers for questions 26 - 40 are to discourage guessing.

Answers, A, B, C, D or E, must be written on the answer sheet provided.

Rules

Rough workings can be done on plain paper.

Electronic devices such as computers, calculators, smart watches and mobile phones are not allowed.

Measuring or drawing instruments are not allowed.

Questions 1 - 25: Score 2 marks for each correct answer.

1. 107×106

A 10462 **B** 11342 **C** 11432 **D** 11742 **E** 11642

2. Which of the following is divisible by 18?

A 11274 **B** 11282 **C** 11286 **D** 11296 **E** 11312

3. What is the digit showing as A in the calculation, $83 \times 87 = 7A21$?

A 1 **B** 2 **C** 3 **D** 4 **E** 5

4. For 24581×9483, one of the following answers is correct. Which one?

A 233102622 **B** 233101724 **C** 233101715 **D** 233101427 **E** 233101623

5. 9988^2

A 99880284 **B** 98981164 **C** 99760144 **D** 99440164 **E** 99844154

6. What is the remainder for $256379 \div 12101$?

A 2258 **B** 3644 **C** 2735 **D** 6434 **E** 5363

7. Which is the most suitable sutra for the calculation in the previous question?

A All from 9 and the last from 10 **B** By the last digits **C** Vertically and crosswise

D Transpose and Apply **E** By Addition and Subtraction

8. $30266 \div 96$

A 315/26 **B** 314/14 **C** 316/11 **D** 315/114 **E** 314/15

9. 478 X 994

A 475332 **B** 472132 **C** 476132 **D** 475132 **E** 4723132

10. When using the Vertically and Crosswise method to multiply 6734×2963 what is the result of the fourth step before any carry digits have been added?

A 65 **B** 75 **C** 85 **D** 95 **E** 105

11. $6\overline{2}\overline{7}\overline{3}\overline{4} + 1\overline{3}\overline{2}\overline{6}\overline{5}$

A 75999 **B** 85511 **C** 64001 **D** 64400 **E** 65401

12. What is the remainder when $2^2 \times 4^4 \times 6^6 \times 8^8$ is divided by 9?

A 0 **B** 2 **C** 4 **D** 6 **E** 8

13. After the decimal point, how many digits are in the decimal equivalent of $\frac{1}{6250}$?

A 4 **B** 5 **C** 6 **D** 7 **E** 8

14. In the *Proportionately* method for finding the cube of 32, what are the missing values, *A* and *B*?

27	18	12	8
	A	*B*	

A 18 12 **B** 54 36 **C** 36 24 **D** 12 18 **E** 24 36

15. What is the last digit of 3^{2024}?

A 1 **B** 3 **C** 5 **D** 7 **E** 9

16. Michael used a working base of 250 to calculate 246×232, but came up with the wrong answer (912288) at the final step. What should the working for the final step have been?

$$\begin{array}{r} 246 - 004 \\ \times\ 232 - 018 \\ \hline 4)228\ \ 072 \\ \hline 912\ \ 288 \end{array}$$

A Divide 072 by 4 but leave 228 alone

B Divide 228 by 4 but leave 072 alone

C Divide 228072 by 4

D Multiply 228 by 4 but leave 072 alone

E Multiply 072 by 4 but leave 228 alone

17. A truncated icosahedron has 12 pentagon faces and 20 hexagon faces. Faces are joined along their edges. How many edges are there?

A 20 **B** 32 **C** 60

D 90 **E** 120

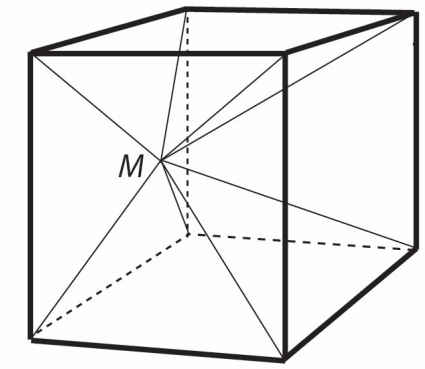
18. Given that $x^2-6x+3=0$, what is the value of $x+\dfrac{3}{x}$?

A 1.5 **B** 3 **C** 6 **D** $\dfrac{6+\sqrt{24}}{2}$ **E** $4+\frac{2}{3}\sqrt{6}$

19. One of the following is divisible by 47. Which is it?

A $2024+3$ **B** $2024+1$ **C** 2024 **D** $2024-1$ **E** $2024-3$

20. The point *M* lies inside a cube. Lines drawn from *M* to each vertex form six pyramids where the faces of the cube are the square bases of the pyramids.
Volumes of five of the pyramids are 150, 250, 300, 500 and 600 cubic units.
What is the volume of the sixth pyramid?



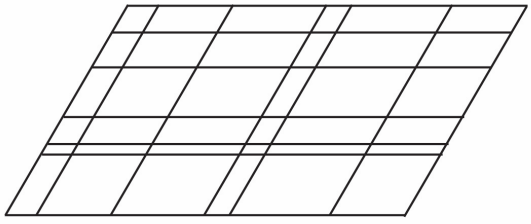
A 100 **B** 200 **C** 350

D 450 **E** 550

21. What is the largest prime factor of 5^6-1?

A 13 **B** 17 **C** 23 **D** 31 **E** 43

22. How many parallelograms are in the figure?



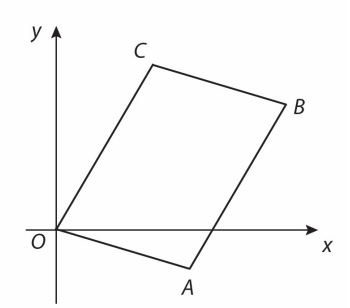
A 441 B 225 C 196

D 37 E 36

23. Which of the following is equivalent to $2^{22}\times3^{33}$?

A 6^{55} **B** 27^{11} **C** 108^{11} **D** 18^{11} **E** 6^{66}

24. The parallelogram, OABC, has area 50 square units.
The vertex *C* lies at (4, 6). The *y*-coordinate of *A* is -2.
What is the *x*-coordinate of *A*?



A 5.5 **B** 6 **C** 6.5 **D** 7 **E** 7.5

25. Given that, $a=75$ $b=36\sqrt{5}$ $c=72$ $d=32\sqrt{5}$, which of the following is true?

A $a>b>c>d$ **B** $a>c>b>d$ **C** $b>a>c>d$ **D** $b>a>d>c$ **E** $a>b>d>c$

Questions 26 - 35: Score 3 marks for each correct answer. -1 mark for each incorrect answer.

26. What is the smallest value of *k* for which *k!* is divisible by 2024?

A 11 **B** 18 **C** 21 **D** 23 **E** 26

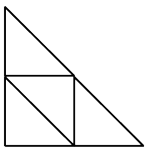
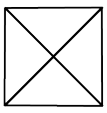
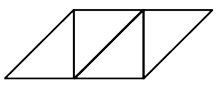
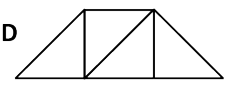
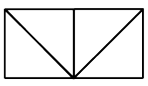
27. Which digit occurs most frequently in the answer to 2144989 ÷ 979?

A 1 **B** 2 **C** 3 **D** 4 **E** 5

28. After the decimal point, what is the 7th digit in the decimal equivalent of 7/79?

A 1 **B** 3 **C** 5 **D** 7 **E** 9

29. Each shape is made of four identical right-angled isosceles triangles. Which shape has the smallest perimeter?

A  **B**  **C**  **D**  **E** 

30. $P=\sqrt{(2024\times2024)-(2024-2024)+(2024+2024)+(2024\div2024)}$

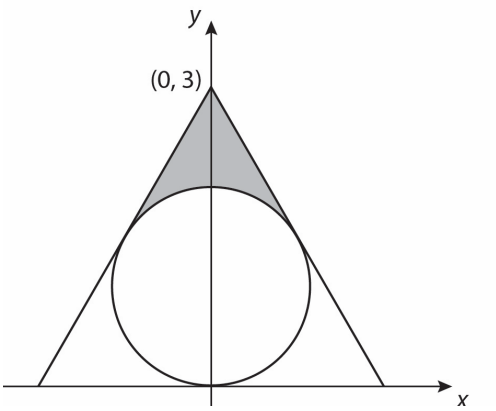
What is the largest prime factor of P?

A 3 **B** 5 **C** 7 **D** 11 **E** 13

31. A circle has equation, $x^2+y^2-2y=0$.

Tangents to the circle intersect at (0, 3).

What is the area of the shaded region?



A $2-\frac{2}{3}\pi$ **B** $2\sqrt{3}-\frac{1}{3}\pi$ **C** $\sqrt{3}-\frac{1}{3}\pi$

D $3-\frac{1}{2}\pi$ **E** $\frac{\sqrt{3}}{2}-\frac{2}{3}\pi$

32. Angle *A* is denoted by the triple *A*) 2 1 √5.

Which of the following is a triple for 3*A*?

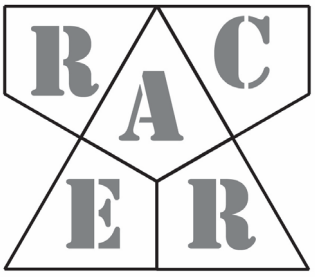
A 2 11 5√5 **B** 3 4 5 **C** 5 4 √41 **D** 2 5 √29 **E** √5 7 2√11

33. Given that, $ax^4+bx^3+cx^2+dx+e = (2x^2+Ax+7)(3x^2+2x+4)$

and that, $a+b+c+d+e = 108$, what is the value of *A*?

A 3 **B** 4 **C** 5 **D** 6 **E** 8

34. A logo for a new car is made from congruent kites and has an area of 5√3. What is its perimeter?

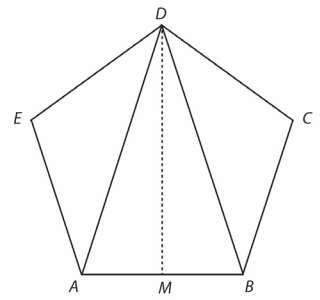


A 5 + 2√3 **B** 2 + 6√3 **C** 6 + 2√3

D 5 + √3 **E** 4 + 6√3

35. The regular pentagon, *ABCDE*, has diagonals *AD* and *DB* and *AC*. *M* is the midpoint of *AB*.

What is the Sine of angle $A\hat{D}M$?

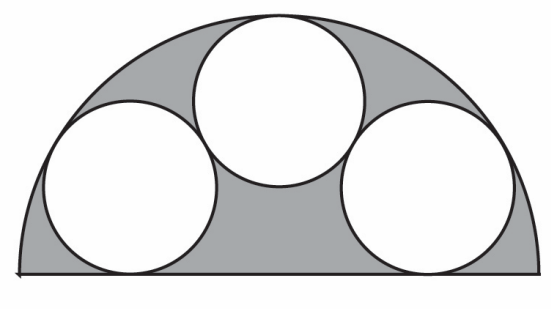


A $\frac{5+\sqrt{5}}{8}$ **B** $\frac{-1+\sqrt{5}}{4}$ **C** $\frac{1+\sqrt{5}}{2}$

D $\frac{1-\sqrt{5}}{2}$ **E** $\frac{2+\sqrt{5}}{5}$

Questions 36 - 40: Score 4 marks for each correct answer. -2 marks for each incorrect answer.

36. Three touching circles, each of radius 1, touch the edge of a semicircle as shown.



What is the area of the shaded region?

A $\frac{1}{2}\pi$ **B** π **C** $\frac{3}{2}\pi$

D 2π **E** $\frac{5}{2}\pi$

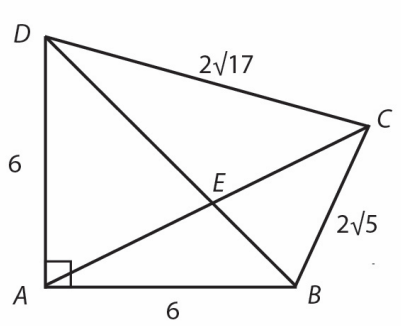
37. In the power series expansion of $\dfrac{2}{1+4x+x^2}$, what is the coefficient of x^3?

A -8 **B** -30 **C** 30 **D** -112 **E** -482

38. Which expression corresponds to $\displaystyle\sum_{r=1}^{n}\frac{2}{(2r+1)(2r+3)}$?

A $\dfrac{3}{6n+4}$ **B** $\dfrac{n}{3n+9}$ **C** $\dfrac{3n}{5n+3}$ **D** $\dfrac{5}{3n+6}$ **E** $\dfrac{2n}{6n+9}$

39. *ABCD* is a quadrilateral with a right angle at *A*. Side lengths as shown are 6, 2√5, 2√17 and 6. The diagonals meet at *E*.
What is the ratio of lengths *AE* : *DE*?



A 1 : 2 B 3 : 5 C √2 : √5

D √5 : 2√2 E √3 : √5

40. A Victorian crown coin is fixed in position and a quarter farthing coin is rolled around the crown without slipping. The diameter of the crown is three times that of the farthing.
How many times will the farthing rotate about its own centre during one revolution around the crown?

A 3 **B** 4 **C** 4.5

D 6 **E** 9