International Online Math Challenge

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Past Papers 2022

Category 4

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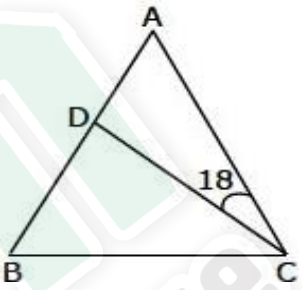
Category-4 IMC 2022

1. If $a=\left(2-\frac{1}{2}\right)\left(2-\frac{1}{3}\right)\left(2-\frac{1}{4}\right)\ldots\left(2-\frac{1}{15}\right)$ and $b=\left(1+\frac{1}{3}\right)\left(1+\frac{1}{5}\right)\left(1+\frac{1}{7}\right)\ldots\left(1+\frac{1}{29}\right)$.

Find the product of a and b.

A) $\frac{29}{30}$ B) $\frac{1}{2}$ C) 4^7 D) 2

2. In the figure, |AB|=|AC|, |BC|=|DC| and m(∠DCA)=18^0. Find m(∠BCD).



A) 18^0 B) 72^0 C) 48^0 D) 36^0

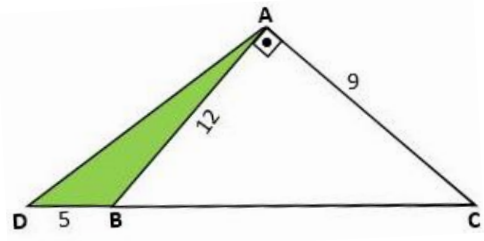
3. If $x,y\in Z$ and $2^{x+1}+2^x=3^{y+2}-3^y$, then find $x+y$.

A) 2 B) 4 C) 3 D) 5

4. If $\frac{a}{2}=\frac{b}{3}=\frac{c}{4}$ and $3a-b+2c=66$, then find $a+b+c$.

A) 36 B) 24 C) 30 D) 54

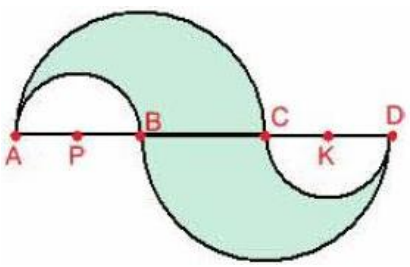
5. In the figure AB⊥AC, |AC|=9 cm, |AB|=12 cm and |DB|=5 cm. Find the area of triangle ADB.



A) 18 cm^2 B) 72 cm^2

C) 69 cm^2 D) 28 cm^2

6. B, C, P, and K are the centers of four circles in the given figure. If |AB|=|BC|=|CD|=6 cm, find the area of the shaded region.



A) 18π B) 36π

C) 27π D) 9π

7. If $x+y=3,\ y+z=7$ and $x+z=6$, find the value of $x\times y\times z$.

A) 10 B) 20 C) 100 D) 50

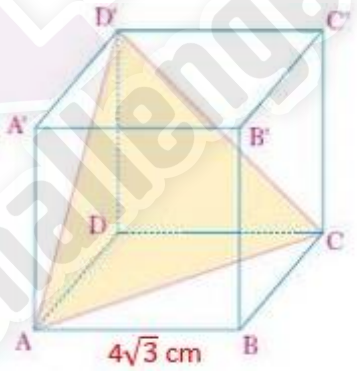
8. Ricardo needs 75% on a final test to receive a C for a course. If the exam has 180 questions, how many questions must he answer correctly to get C?

A) 150 B) 93 C) 105 D) 135

9. Mr. Tito is 2 years more than 3 times as old as his son. If the difference between their ages is 24, how old is Mr. Tito?

A) 35 B) 12 C) 24 D) 29

10. Find the area of triangle *ACD´* in the cube if the edge length of the cube is $4\sqrt{3}$ cm.



A) $24\sqrt{3}$ cm² B) $24\sqrt{2}$ cm²

C) $6\sqrt{12}$ cm² D) $6\sqrt{2}$ cm²

11. Given that $f(x)=\begin{cases} x-2 & if \quad x>3 \\ x^2+3x-2 & if \quad 1<x\le 3 \\ x+6 & if \quad x\le 1 \end{cases}$, find $f(-2)+f(0)-f(1)+f(5)$.

A) 6 B) 12 C) 4 D) -10

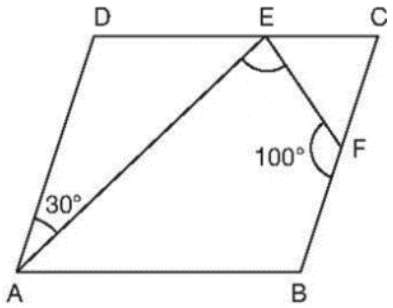
12. If $a = 2000$ and $b = |3a^2 - a + 3| - 3|a^2 + 1| + 11a + 1$,
find the value of b.

A) 0 B) 20001 C) 1 D) 2000

13. Given $a^2 + b^2 = 43$ and $a\times b=9$. Find the positive value of $(a - b)$.

A) 12 B) 9 C) 34 D) 5

14. According to the following parallelogram, find the sum of angles ∠AED and ∠FEC.



A) 70^0 B) 80^0
C) 90^0 D) 110^0

15. Given that f(x) = 5 – x and g(x) = x + 4, find the area enclosed by f(x), g(x) and x-axis.

A) 20 square unit B) 20.25 square unit
C) 20.50 square unit D) 20.75 square unit

16. Given that $\frac{6^m+6^m+6^m}{3^m+3^m+3^m+3^m+3^m+3^m} = 32$, find the value of m.

A) 6 B) 7 C) 8 D) 9

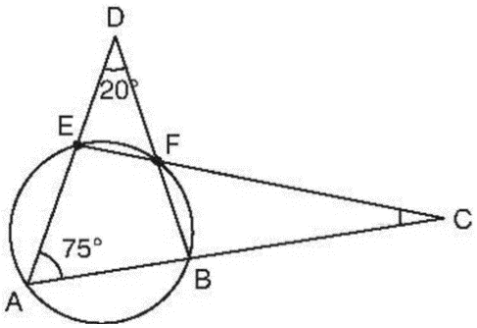
17. Given a and n are natural numbers where $(a \times 10^n)$ is the scientific notation of a 20-digit natural number, find the maximum difference of $n - a$.

A) 19 B) 18 C) 30 D) 40

18. Given that $2^a = 40$, $3^b = 230$, $5^c = 620$, which of the following is correct?

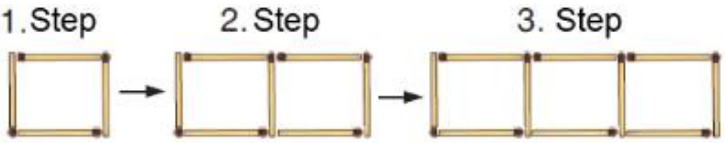
A) b<a<c B) a<b<c C) c<b<a D) b<c<a

19. The following figure shows that points A, B, E, and F are on the circle. Find the sum of angles ∠CBF and ∠CFB.



A) 170^0 B) 180^0
C) 90^0 D) 110^0

20. According to the following progression, how many matchsticks will be at the 100^{th} step?

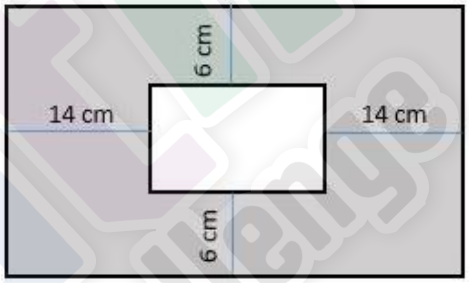


A) 300 B) 301
C) 302 D) 400

21. How many numbers between 80 and 320 are exactly divisible by 2, 3, and 10?

A) 7 B) 8 C) 9 D) 10

22. The figure shows two rectangles. The length of the bigger rectangle is 36 cm, and the perimeter of the smaller rectangle is 22 cm. Find the area of the shaded region.



A) 540 cm^2 B) 564 cm^2
C) 516 cm^2 D) 534 cm^2

23. If $\frac{1}{a^b} = 2$, then find the value of $a^{-6b} - 11$.

A) 53 B) 19 C) 51 D) 3

24. If $\cos\theta = \frac{3}{5}$ and $0 < \theta < 90^0$, find $\tan\theta - \frac{1}{\sin\theta}$.

A) $\frac{8}{15}$ B) $-\frac{8}{15}$ C) $-\frac{1}{12}$ D) $\frac{1}{12}$

25. If $\sqrt[5]{4^n} = 64$, then find the value of n.

A) 10 B) 13 C) 15 D) 18

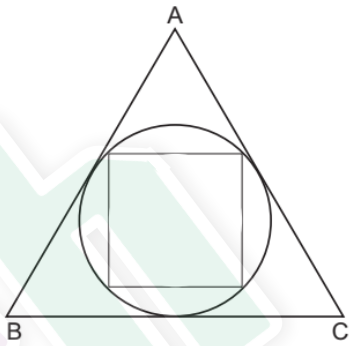
26. If $a - b + c = 0$, then find the value of $a^2 - b^2 + ac + bc$.

A) 0 B) a C) ab D) $c + a$

27. Given that $\frac{1}{a}-\frac{1}{b}=\frac{4}{a-b}$, find $\frac{a}{b}+\frac{b}{a}$.

A) -2 B) -1 C) 1 D) 0

28. A circle is inscribed in an equilateral triangle ΔABC of side 6 cm . What is the area of any square inscribed in the circle?



A) $3\ cm^2$ B) $6\ cm^2$

C) $9\ cm^2$ D) $12\ cm^2$

29. Calculate $\left(\frac{\sqrt{561^2-459^2}}{4\frac{2}{7}\times 0.15+4\frac{2}{7}\div\frac{20}{3}}+4\sqrt{10}\right)\div\frac{\sqrt{40}}{3}$.

A) 131 B) 250 C) 242 D) 125

30. How tall is the house?

A) 230 B) 20 C) 540 D) 270 cm

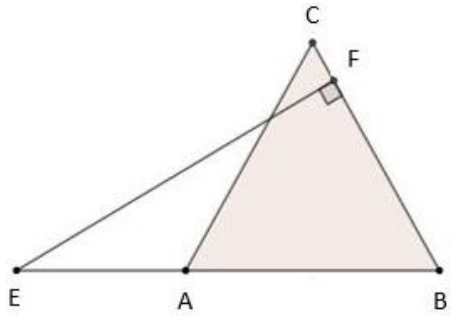
31. What is the following number in this sequence 12, 11, 10, 14, 8, 17, 6, … .

A) 21 B) 20 C) 7 D) 5

32. Solve the equation $3x-(2-x)-4(3-2x)=34$.

A) 60 B) 36 C) 4 D) 2

33. In the triangle below $|AB| = |AC| = |BC| = 12cm$, $|EA| = 8cm$ and $EF \perp BC$. Find $|CF|$.



A) 1 cm B) 1.5 cm
C) 2 cm D) 2.5 cm

34. The operation is defined on the set $A = \{1, 2, 3, 4, 5\}$ as shown in the table. Find x if $[(2 \bigstar x) \bigstar 4] \bigstar 2 = 6$

★	1	2	3	4	5
1	0	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9

A) 1 B) 3
C) 5 D) 2

35. Calculate $\frac{1}{\sqrt{0.01}} + \frac{2}{\sqrt{0.04}} + \frac{3}{\sqrt{0.09}}$.

A) 0.3 B) 30 C) 10 D) 20

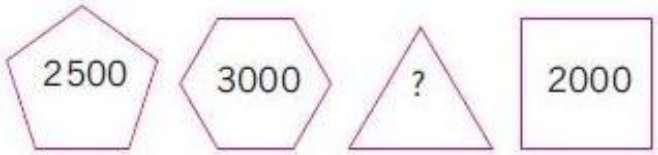
36. Calculate $\sqrt[4]{78 + \sqrt[3]{25 + \sqrt[3]{10 - \sqrt{4}}}}$.

A) 5 B) 2 C) 9 D) 3

37. Find the 25% of 4^{60}.

A) 4^{61} B) 2^{10} C) 2^{59} D) 2^{118}

38. Which number should be in the triangle?



A) 1000 B) 1500 C) 3500 D) 500

39. Calculate $(18+3)\div 7\times 3-5+1$.

A) 7 B) 3 C) -3 D) 5

40. Given that x and y are integers with $-3 < x \leq 7$ and $-1 \leq y \leq 13$, find the biggest possible value of 3x + 2y.

A) 100 B) 50 C) 27 D) 47

Answers:

1. C) 4^7 **2.** C) 48^0 **3.** B) 4 **4.** D) 54 **5.** A) 18 cm^2 **6.** C) 27π **7.** A) 10 **8.** D) 135
9. A) 35 **10.** A) $24\sqrt{3}$ cm^2 **11.** A) 6 **12.** B) 20001 **13.** D) 5 **14.** A) 70^0
15. B) 20.25 square unit **16.** A) 6 **17.** B) 18 **18.** C) c<b<a **19.** A) 170^0 **20.** B) 301
21. B) 8 **22.** C) 516 cm^2 **23.** A) 53 **24.** D) $\frac{1}{12}$ **25.** C) 15 **26.** A) 0 **27.** A) -2
28. B) $6\ cm^2$ **29.** D) 125 **30.** D) 270 cm **31.** B) 20 **32.** C) 4 **33.** C) 2 cm
34. A) 1 **35.** B) 30 **36.** D) 3 **37.** D) 2^{118} **38.** B) 1500 **39.** D) 5 **40.** D) 47