International Online Math Challenge

Only challengers can make a change!

PAST PAPERS 2023

Category 4

+66 63 951 1535 +66 (0) 21148057 register@mathchallenge.in.th www.mathchallenge.in.th

EXAM 4

1. A train 300 meter long is traveling at a speed of 80 km/h. How long will it take the train to go completely through a tunnel which is 1.7 km long?

A) 1.5 minutes B) 2.5 minutes C) 7.5 minutes D) 5.5 minutes

2. In an airplane, the passengers are asked which languages they can speak. 41 passengers can speak only Russian, 67 can speak only English, 72 can speak only Chinese, 15 can speak English and Russian, 12 can speak Russian and Chinese, 35 can speak English and Chinese, and 5 can speak English, Russian and Chinese. Find the number of passengers in the airplane.

A) 247 B) 242 C) 180 D) 232

3. Calculate.

$$3+\cfrac{1-\cfrac{1}{3}}{1+\cfrac{1+\cfrac{1}{3}}{1-\cfrac{1+\cfrac{1}{4}}{1-\cfrac{1}{4}}}}$$

A) 7.5 B) 2.5 C) -1 D) -1.5

4. Calculate.

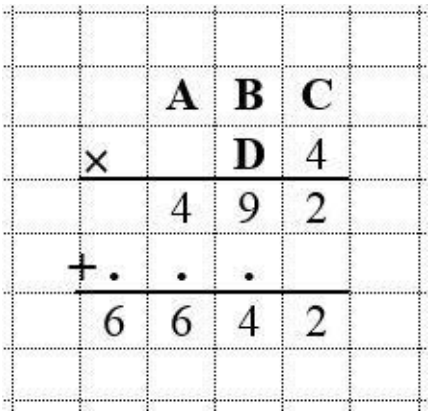
$$\frac{3^{2023}+3^{2022}}{3^{2023}-3^{2022}}$$

A) 2 B) 3^{2022} C) 3 D) 3^{2023}

5. Calculate. $\frac{1}{1\times 2}+\frac{1}{2\times 3}+\frac{1}{3\times 4}+\ldots+\frac{1}{99\times 100}$.

A) $\frac{1}{99}$ B) $\frac{1}{100}$ C) $\frac{99}{100}$ D) $\frac{101}{99\times 100}$

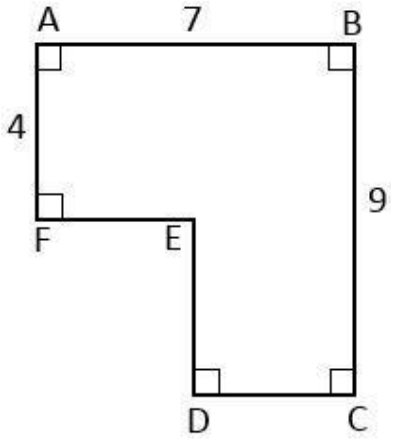
6. Find the sum of the **A**+**B**+**C**+**D**.



A) 11 B) 8 C) 21 D) 6

7. The area of polygon ABCDEF is 43 with |AB|=7, |BC|=9 and |FA|=4.

Find |DE|+|EF|.



A) 8 B) 9 C) 8.5 D) 7

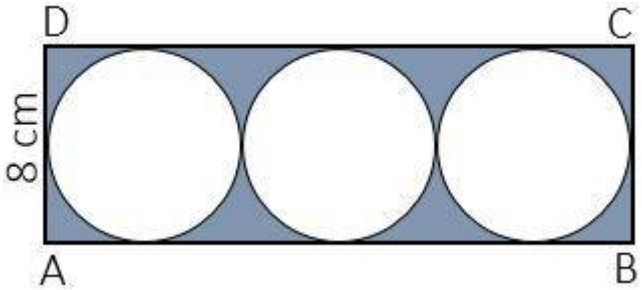
8. If $6^x = 2^{x+1}$, then find 27^x.

A) 8 B) 2 C) 9 D) 16

9. Calculate. $\frac{3}{3+\sqrt{3}}+\frac{3}{2\sqrt{3}}$.

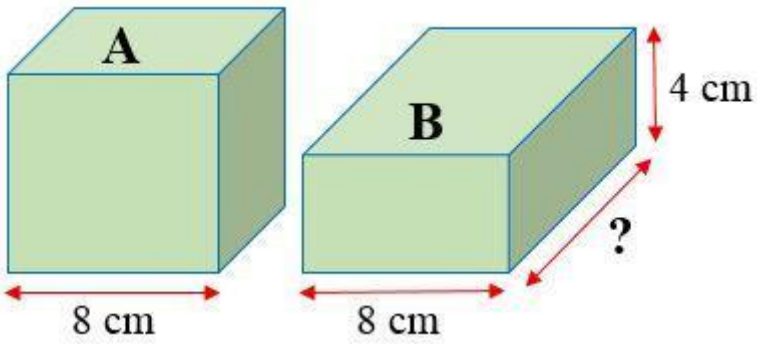
A) $2\sqrt{3}$ B) $\sqrt{3}$ C) 3 D) 1.5

10. ABCD is a rectangle, three identical circles touch each other and |AD|=8 cm. Find the area of shaded region (π=3).



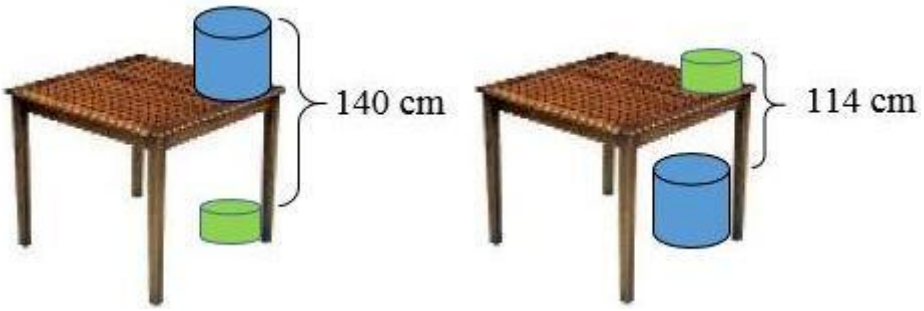
A) 48 cm^2 B) 3610 cm^2 C) 60 cm^2 D) 58 cm^2

11. The volume of the cube A and cuboid B are equal. Find the length of the cuboid.



A) 7 cm B) 8 cm C) 16 cm D) 12 cm

12. Find the height of the table.



A) 54 cm B) 81 cm C) 127 cm D) 254 cm

13. The equation of a circle in the xy-plane $x^2+y^2+2x-6y=-1$ is given. Find the coordinate of the center of a circle.

A) (-1, 3) B) (1, -3) C) (2, 6) D) (1, 3)

14. If $0 < pt < 1$, p is a negative integer and t is a real number, which of the following must be less than -1 ?

A) p
B) $p - t$
C) $t + p$
D) It can't be determined from the information given.

15. A $3\times4\times5$ solid block is made up of $1\times1\times1$ unit cubes. The outside surface of the block is painted black. How many unit cubes have exactly one face painted black?

A) 16 B) 18 C) 20 D) 22

16. A cube has a volume of 125 cubic centimeters. What is the surface area of the cube?

A) 150 cm^2 B) 120 cm^2 C) 115.5 cm^2 D) 110 cm^2

17. The sum of a finite arithmetic series is 385. The first term is 10 and the common difference is 5. How many terms are in the series?

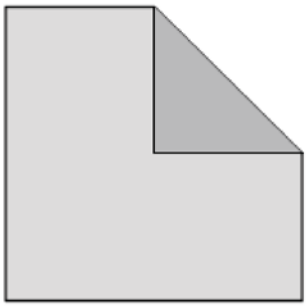
A) 10 B) 11 C) 12 D) 13

18. Calculate.

$0.3+0.03+0.003+...$

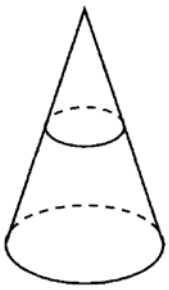
A) $\frac{2}{3}$ B) $\frac{4}{9}$ C) 1 D) $\frac{1}{3}$

19. One corner of a square is folded to its centre to form an pentagon as shown in the diagram. The area of the square is 1 square unit greater than the area of the pentagon. What is the area of the square?



A) 2 B) 4 C) 8 D) 16 16

20. In the figure below, the base of a cone has a radius of 6. The cone is sliced horizontally so that the top piece is a smaller cone with a height of 1 and a base radius of 2. What is the height of the bottom piece?



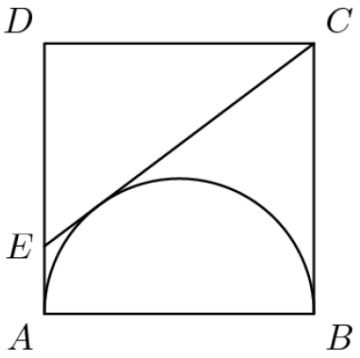
Note: Figure not drawn to scale.

A) 1 B) 2 C) 3 D) 4

21. If $4a = 2b + 1$, what is the value of $\frac{81^a}{9^b}$?

A) 3 B) 9 C) 27 D) 81

22. Square ABCD has side length 2. A semicircle with diameter AB is constructed inside the square, and the tangent to the semicircle from C intersects side AD at E. What is the length of CE?



A) $\sqrt{6}$ B) $5 - \sqrt{5}$ C) 5/2 D) $\sqrt{5}$

23. Solve the system inequality.

$\{2(x - 1) - 3(x - 4) > x + 5 \frac{3x-4}{x^2+4x+4} \geq 0$

A) $(-\infty, \frac{4}{3}] \cup [2.5, +\infty)$ B) $[\frac{4}{3}, 2.5]$

C) $(-\infty, \frac{4}{3}] \cup (2.5, +\infty)$ D) $[\frac{4}{3}, 2.5)$

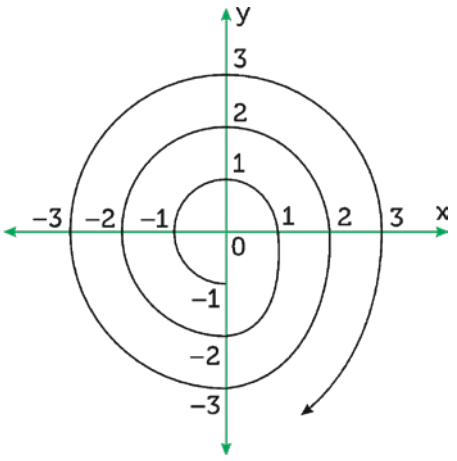
24. Find the sum of all positive even two-digit numbers which are divisible by 3.

A) 806 B) 816 C) 826 D) 810

25. Solve the equation $x^{-\frac{2}{3}} = 0.04$.

A) 250 B) ± 125 C) ± 120 D) -129

26. Below is a spiral curve that intersects the x and y axes. If first point has $(0, \ -1)$ coordinate and fifth point has $(0, \ -2)$ coordinate, then determine the coordinate of 109th point.



A) $(0, -27)$ B) $(-27, \ 0)$

C) $(0, \ -28)$ D) $(-28, \ 0)$

27. Vertices of triangle ABC are $A(5, \ -7)$, $B(1, \ 3)$ and $C(-1, \ 9)$. Write the equations of the median BM of the triangle where M is the midpoint of side AC.

A) $y = 2x + 1$ B) $y = -2x + 5$ C) $y = 5x - 2$ D) $y = -5x + 8$

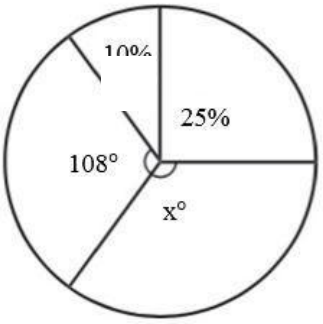
28. Simplify $\left[\left(\frac{0.025}{0.05}\right) \div \left(\frac{1}{2} - 1\right)\right]^{-\frac{1}{3}}$

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

29. If $\frac{a-1}{2} = \frac{b-3}{3} = \frac{c+1}{4}$ and $b = 2c - a$, then find $a + b + c$.

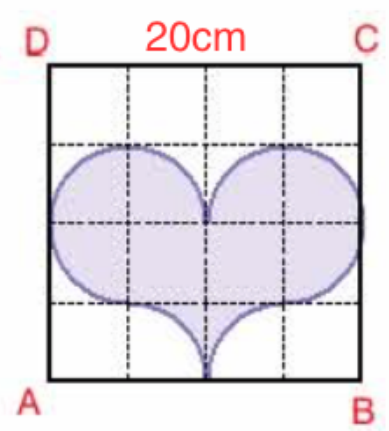
A) 19 B) 20 C) 21 D) 22

30. Find x°.



A) 126° B) 136° C) 144° D) 152°

31. Find the area of the "heart" in square centimeters.

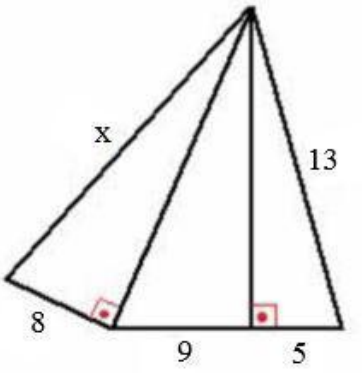


A) $50 + 15\pi$
B) $150 + 40\pi$
C) $100 + 25\pi$
D) $75 + 55\pi$

32. If five men can dig 100 pits over four days, how many men would be needed to dig 150 pits in one day?

A) 20 B) 25 C) 30 D) 35

33. Find the value of x.



A) 13 B) 15 C) 17 D) 19

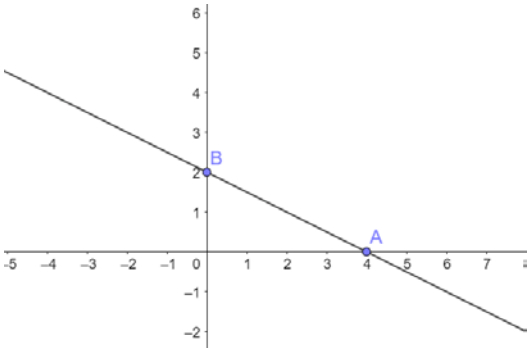
34. If $2^x = a$ and $3^x = b$, then find 48^x.

A) ab B) a^2b C) a^3b^2 D) a^4b

35. In the figure below, the graph of $y = f(x)$ is shown. Which of the following could be the equation of $f(x)$?

A) $f(x) = -\frac{x}{2} - 2$

B) $f(x) = -\frac{x}{2} + 2$



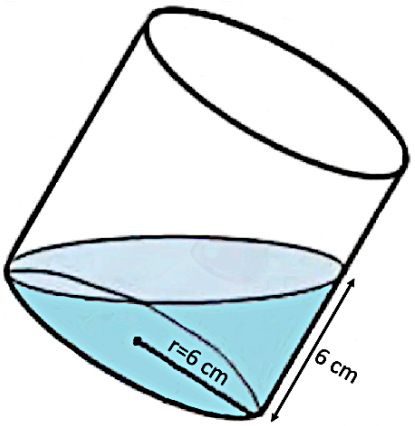
C) $f(x) = \frac{x}{2} - 2$

D) $f(x) = \frac{x}{2} + 2$

36. In the quadratic equation $y = a(x - 3)(x - k)$, where a and k are constant. If the graph of the equation in the xy −plane is a parabola with vertex $(5, \ -32)$, then what is the value of a?

A) 8 B) 7 C) 6 D) 5

37. Find the volume of the water.



A) $108\pi\ cm^3$

B) $144\pi\ cm^3$

C) $72\pi\ cm^3$

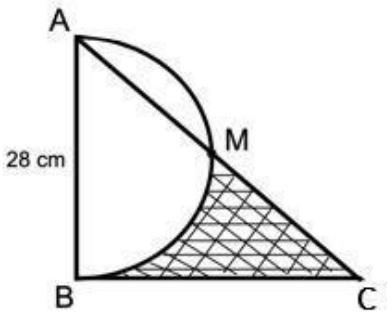
D) $84\pi\ cm^3$

38. ABC is a right triangle and |AB|=28 cm. AMB is a semicircle where M is the midpoint of the arc AMB. What is the shaded area in the figure?

(Take = $\frac{22}{7}$.)

A) 130 cm^2 B) 140 cm^2

C) 150 cm^2 D) 160 cm^2



39. In the addition table below, the letters a, b and c each stand for a positive number. Accordingly, what is the value of a?

A) 6 B) 8 C) 9 D) 10

+	a	b	c
a			13
b	17		
c		3a	

40. Kevin found a cubic box with an open top. Each side is 8 cm long. If he fills this box with identical cubes with $2cm \times 2cm \times 2cm$, how many of these cubes will be touching the box?

A) 40 B) 48 C) 52 D) 56