

Math Bowl 2004 Ciphering Questions

1. Simplify (write result in lowest reduced form)  $\sqrt{\frac{1}{25} + \frac{1}{144}}$

Correct Answer:  $\frac{13}{60}$

2.  $(-1)^{5^3} + i^{2^5} = ?$

Correct Answer: 0

3. If five men can paint four houses in three weeks, how many houses could 10 men paint in six weeks?

Correct Answer: 16 houses

4. Simplify (write result in lowest reduced form)  $\left(\sqrt[3]{\sqrt{3} + \sqrt{30}}\right)\left(\sqrt[3]{\sqrt{3} - \sqrt{30}}\right)$

Correct Answer: -3

5. Find the largest number in the set  $\{-\cot(2p/3), \tan(2p/3), e^{-1}, \ln 1, \sin(2p/3)\}$

Correct Answer:  $\sin(2p/3)$

6. If  $yz : zx : xy = 1 : 2 : 3$ , then what is  $\frac{x}{yz} : \frac{y}{zx}$ ?

Correct Answer: 4 : 1

7. In a group of 30 students, 20 take French, 15 take Spanish, and 5 take neither language. How many students take both French and Spanish?

Correct Answer: 10

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8. If  $a + b = 5$  and  $\frac{1}{ab} = \frac{1}{6}$ , then  $\frac{1}{a} + \frac{1}{b} = ?$

Correct Answer:  $\frac{5}{6}$

9. The product of  $2^{21}$  and  $5^{17}$  is an integer. How many digits does it have?

Correct Answer: 19

10. Who am I?



Hint: He was honored by the symbol of the natural log base.

Correct Answer: Leonhard Euler

11. Express as a common fraction in lowest reduced form:

$$\left[ \left( \frac{1}{2} \right)^{-1} + \left( \frac{1}{3} \right)^{-1} + \left( \frac{1}{5} \right)^{-1} + \left( \frac{1}{7} \right)^{-1} \right]^{-1}$$

Correct Answer:  $\frac{1}{17}$

12. How many feet does an auto travel in 1 second if it is moving at the rate of 45 miles per hour?

Correct Answer: 66 feet

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13. If  $f(x) = 2^{x-5}$ , then  $f^{-1}(32) = ?$

Correct Answer: 10

14. How many of the following four numbers in radians are integers?

- $e^{\tan(0)}$
- $\ln(e^2)$
- $\cos^{-1}(0)$
- $\sin^2(\frac{\pi}{6}) + \cos^2(\frac{5\pi}{6})$

Correct Answer: 3

15. If Pat is  $33\frac{1}{3}\%$  taller than Lee, then Lee is what percent shorter than Pat?

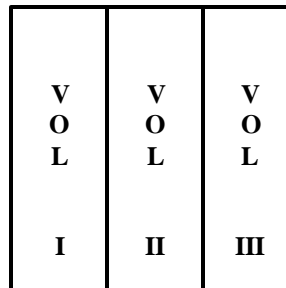
Correct Answer: 25%

16. Factor completely:  $K^3 - L^3 - 3K^2L + 3KL^2$

Correct Answer:  $(K - L)^3$

17. Three volumes of the series Mathematics are on a shelf with no space between the volumes as shown. Each volume is 1 inch thick without its covers. Each cover is  $\frac{1}{8}$  inch thick. A bookworm bores horizontally from the first page of Volume I to the last page of Volume III. How far in inches does the bookworm travel?

Correct Answer:  $1\frac{1}{2}$  inches.



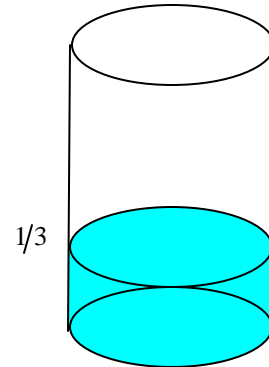
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18. If  $x - y = 5$  and  $xy = 5$ , then  $\frac{1}{x} - \frac{1}{y} = ?$

Correct Answer:  $-1$

19. As shown in the figure, a right cylindrical oil tank is  $\frac{1}{3}$  full. If 3 more gallons are added, the tank will be half-full. What is the capacity, in gallons of the tank?

Correct Answer: 18 gals.



20. Who am I?



Hint: He predicted and realized his own death

Correct Answer: Girolamo Cardano (Cardan)