
Problems 3 points each

1. For which of the following numbers is the value of the expression $\frac{x^2}{x^3}$ the smallest?

- A) 100 B) 1 C) -1 D) -2 E) -3

2. How many numbers from 2 to 100 are equal to the cube of an integer?

- A) 99 B) 9 C) 3 D) 4 E) 2

3. If $888 \cdot 111 = 2 \cdot (2 \cdot n)^2$, and n is a positive integer, then n equals:

- A) 8 B) 11 C) 22 D) 111 E) 444

4. If the radius of a circle is increased by 25%, the area of the circle will increase by:

- A) 25% B) 50% C) 55.5% D) 56.25% E) 75%

5. The ones digit of the sum $1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 + 8^2 + 9^2 + 10^2$ is:

- A) 0 B) 1 C) 2 D) 5 E) 6

6. Points P and Q exist on a plane and $|PQ| = 5$. How many triangles are there on this plane such that one of their sides is segment PQ and their sides are of lengths: 3, 4 and 5?

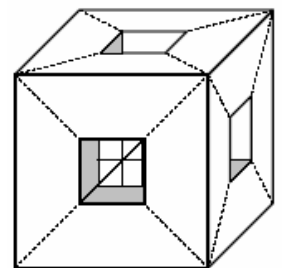
- A) 4 B) 3 C) 2 D) 1 E) Infinitely many.

7. Which of the following is an irrational number?

- A) $1024^{0.1}$ B) $27^{2/3}$ C) $\sqrt{0.25}$ D) $100^{0.5}$ E) $100^{0.1}$

8. A uniform $3 \times 3 \times 3$ cube weighs 810g. Three holes, each measuring $1 \times 1 \times 3$, have been drilled in the cube. How much does the remainder of the cube weigh?

- A) 540g B) 570g C) 600g D) 630g E) 660g



9. The sum of four consecutive whole numbers **cannot** equal:

- A) 2002 B) 22 C) 202 D) 222 E) 220

10. Mother kangaroo and her son Jumpy are jumping around a stadium with perimeter of 330m. They each make one jump per second. The mother's jumps are 5m long and Jumpy's jumps are 2m long. Both kangaroos started at the same time, and both are moving in the same direction. After 25 seconds, Jumpy becomes tired and stops, while his mother continues the race. From this point, how long will it take the mother to get to the place where her son is resting?

- A) 15sec B) 24sec C) 40sec D) 51sec E) 66sec

Problems 4 points each

11. Let $\sqrt{2005} + \sqrt{1995} = a$. Which of the following expressions is equal to $\sqrt{2005} - \sqrt{1995}$

- A) $10 - a$ B) $\frac{1}{a}$ C) $\frac{10}{a}$ D) $\frac{a}{10}$ E) $10 + a$

12. A square piece of paper was cut into three pieces. Two of the pieces are shown in the picture to the right. What is the shape of the third piece?

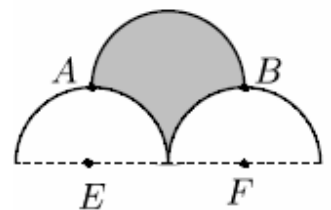


- A) B) C) D) E)

13. Let M be the set of all real numbers x which satisfy $2^{4^x} < 4^{2^x}$. M equals:

- A) $(0, 1)$ B) $(-\infty, 1)$ C) $(-\infty, 1) \cup (1, \infty)$ D) $(0, \infty)$ E) \mathbb{R}

14. There are three semi-circles as shown in the picture. The quadrilateral ABFE is a rectangle and the radius of each circle is 2cm. Points E and F are the centers of the bottom semi-circles. The area of the shaded region, in cm^2 is:

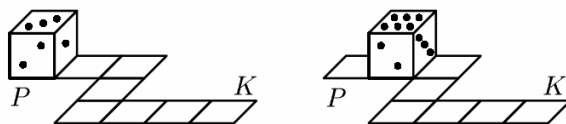


- A) 8 B) $2\pi - 1$ C) 2π D) $2\pi + 1$ E) $2\pi + 2$

15. Let f be a function, such that $f(2005) = 2008$ and $f(x + 1) = 2f(x) - 2002$, and x is an integer. Then $f(2004)$ equals:

- A) 2004 B) 2005 C) 2008 D) 2010 E) 2016

16. The sum of the dots on opposite sides of a die always equals 7. A die rolls as shown below. At the starting point P, there are 3 dots on the top face. How many dots will there be on the top face when the die reaches the end point K?



- A) 2 B) 3 C) 4 D) 5 E) 6

17. How many different cubes with a side of length 1 are there with at least one side colored white and at least one side colored black, and with each side being either black or white?

- A) 8 B) 16 C) 32 D) 52 E) 64

18. There are two bottles containing a hydrochloric acid solution. In the first bottle, the weight ratio of acid to water is 1:2. The second bottle contains the same weight amount of acid solution but the ratio of acid to water is 1:4. Both bottles were emptied into a large container. The weight ratio of acid to water is equal to :

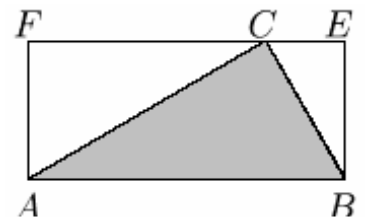
- A) 1 : 3 B) 1 : 6 C) 4 : 11 D) 4 : 15 E) 1 : 8

19. All together, three boxes contain 60 cards. If all the cards from the first box were placed in the second box, then there would be twice the number of cards in the second box as in the third box. If all the cards from the third box were placed in the second box, there would be three times the number of cards in the second box as in the first box. How many cards were in the second box?

- A) 10 B) 15 C) 20 D) 25 E) 30

20. The diagram shows rectangle ABEF and triangle ABC. The measure of angle ACF is equal to the measure of angle CBE. Furthermore, $|CE| = 2$ and $|FC| = 6$. What is the area of triangle ABC?

- A) $8\sqrt{2}$ B) $8\sqrt{3}$ C) 12 D) 16 E) Other.



Problems 5 points each

21. Ada speaks the truth and nothing but the truth every other day; on the other days she always lies. Today she made exactly four of the following five statements. Which statement did she not make today.

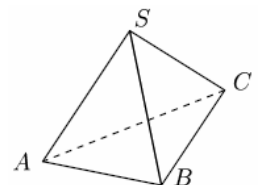
- A) I have a prime number of friends.
 B) Half of my friends are male.
 C) 288 is divisible by 12.
 D) I always speak the truth.
 E) Three of my friends are older than I.

22. Which of the following numbers can be expressed as a product of four different positive numbers, each of them greater than 1?

- A) 625 B) 124 C) 108 D) 2187 E) 2025

23. In pyramid SABC all angles with vertex S are right angles. The areas of lateral faces SAB, SAC, and SBC are 3, 4, and 6, respectively. What is volume of SABC?

- A) 4 B) 5 C) 6 D) 8 E) 12



24. A bag contains 17 balls numbered as follows: $5 + k \cdot 125$, for $k = 0, 1, \dots, 16$, meaning that the numbers are: 5, 130, 255, 380, 505, \dots , 1755, 1880, 2005. What is the smallest number of balls that need to be picked out at random to ensure that there is at least one pair of balls with numbers that add up to 2010?

- A) 2 B) 9 C) 10 D) 11 E) 17

25. If the sum of the digits of a certain natural number m is 30, then the sum of the digits of number $m + 3$ CANNOT equal:

- A) 6 B) 15 C) 21 D) 24 E) 33

26. Natural number A has exactly two divisors. Natural number B has exactly five divisors. How many divisors does number $A \cdot B$ have?

- A) 5 B) 6 C) 7 D) 10 E) Impossible to determine without additional information.

27. Zbyszek needs to travel from city A to city B . He planned to travel at a certain constant speed. Later he determines that he should arrive at B earlier than planned. He calculates that by increasing his speed by 5km/h he would travel 5 hours less and that by increasing his speed by 10km/h he would travel 8 hours less. At what speed did he plan to travel at the very beginning?

- A) 10km/h B) 15km/h C) 20km/h D) 25km/h E) Impossible to calculate.

28. A certain natural number has a k number of even divisors and an n number of odd divisors.

Which of the following numbers is equal to the quotient $\frac{n}{k}$?

- A) $\frac{1}{3}$ B) $\frac{3}{5}$ C) $\frac{2}{3}$ D) 2 E) 4

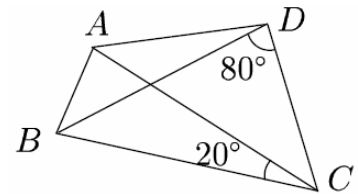
29. We are given a certain number. We double the number and then subtract 1 from the result. We repeat this operation 98 more times. If the end result is $2^{100} + 1$, then what is the number that we started with?

- A) 1 B) 2 C) 4 D) 6 E) 3

30. In quadrilateral $ABCD$, diagonal BD is the bisector of angle ABC .

$$|AC| = |BC|, \angle BDC = 80^\circ, \angle ACB = 20^\circ.$$

The measure of angle BAD is:



- A) 135° B) 120° C) 110° D) 100° E) 90°

