Directions: No calculators allowed.

(1) 2025 - [2025 - (2027 - 2028)] = ?

(a) -2026 (b) -1 (c) 0 (d) 1 (e) 2

(2) What is $(2-5+9)^0 - 2^6 - 3! - (-1)^{99}$?

(a) -68 (b) -70 (c) -36 (d) -63 (e) 0

(3) Greg put \$1000 in a checking account ten years ago. If he earns 12% simple interest, how much money (in dollars) will he have earned 20 years from now?

(a) 2400 (b) 2200 (c) 4800 (d) 3400 (e) **3600**

(4) How many gallons of 25% acid-solution must be added to 20 gallons of pure acid-solution to make a 60% acid-solution?

(a) 25 (b) $\frac{170}{9}$ (c) $\frac{170}{7}$ (d) $\frac{160}{7}$ (e) $\frac{49}{2}$

(5) If $\frac{a}{b} = \frac{c}{d} = 3$, find $\frac{a+7c}{b+7d}$

(a) 3 (b) 5 (c)7 (d) 9 (e) 11

(6) When $a > 0, b > 0, c < 0$, which of the following is equivalent to $\sqrt{a^4b^2c^6}$?

(a) $abc^2\sqrt{c}$ (b) $-a^2bc^2$ (c) $a^2b^2c^3$ (d) a^2bc^3 (e) $-a^2bc^3$

(7) A two-digit prime number is randomly selected. What is the probability that the sum of its digits is 11?

(a) $\frac{2}{21}$ (b) $\frac{2}{25}$ (c) $\frac{1}{7}$ (d) $\frac{4}{25}$ (e) $\frac{4}{21}$

(8) What is the sum of the first 26 positive odd integers subtracted by the sum of the first 25 positive odd integers?

(a) 1 (b) 3 (c) 49 (d) 51 (e) 53

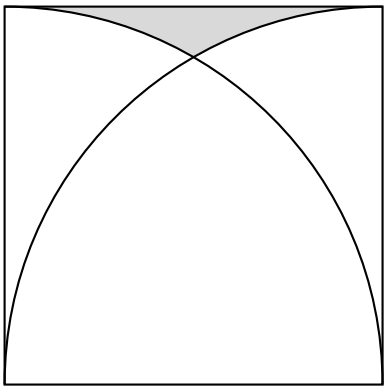
(9) When the temperature is 0 $^{\circ}C$ (Celsius), it is 32 $^{\circ}F$ (Fahrenheit). When the temperature is 5 degree $^{\circ}C$ (Celsius), it is 41 $^{\circ}F$ (Fahrenheit). There is a linear relation between the temperature F, in Fahrenheit, and C, in Celsius. For what degree of C are the temperatures in Fahrenheit and Celsius the same?

(a) -40 $^{\circ}C$ (b) -30 $^{\circ}C$ (c) 40 $^{\circ}C$ (d) 30 $^{\circ}C$ (e) never the same

(10) A can finish a job in 5 hours. B first works on the job alone for one hour, and then A joins B to finish the rest of the job in 3 hours. How long would it take B to finish the job alone?

(a) 5 hours (b) 10 hours (c) 15 hours (d) 20 hours (e) 18 hours

(11) Find the area of the shaded region, where the length of the square is 2.



(a) $\frac{3}{2}$ (b) $4-\sqrt{3}$ (c) $4-\sqrt{3}-\frac{2}{3}\pi$ (d) $2-\frac{2}{3}\pi$ (e) $4-\frac{\sqrt{3}}{2}-\frac{2}{3}\pi$

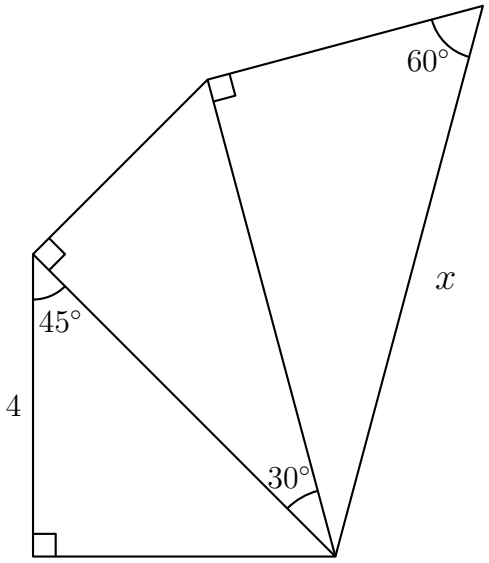
(12) Given a rectangle with length b and width a where $a < b$. Cut off a square with length a to get a new rectangle. If the new rectangle is similar to the older one, what is the ratio of a to b?

(a) $\frac{3}{2}$ (b) 2 (c) $\frac{\sqrt{3}+\sqrt{2}}{2}$ (d) $\frac{\sqrt{5}-1}{2}$ (e) $\frac{\sqrt{5}+1}{2}$

(13) If $x^4 + \frac{16}{x^4} = 73$ and $x > 0$, find $x + \frac{2}{x}$

(a) $\sqrt{13}$ (b) 4 (c) 9 (d) 11 (e) $\sqrt{73}$

(14) Find x in the given diagram.



(a) $\frac{13\sqrt{2}}{3}$ (b) $\frac{16\sqrt{2}}{3}$ (c) $\frac{8\sqrt{6}}{3}$ (d) $\frac{16\sqrt{3}}{3}$ (e) $\frac{3\sqrt{2}}{8}$

(15) What is the remainder when 314^{165} is divided by 7?

(a) 1 (b) 2 (c) 4 (d) 5 (e) 6

(16) Jasmine and Rose are playing a game in which they take turns flipping an unfair coin, where the probability of getting heads is $\frac{1}{3}$. The first one to flip tails wins. Jasmine goes first. What is the probability that Jasmine wins?

(a) $\frac{1}{3}$ (b) $\frac{4}{5}$ (c) $\frac{3}{4}$ (d) $\frac{2}{3}$ (e) $\frac{3}{5}$

(17) What is the sum of the digits of the largest prime factor of 555,555?

(a) 13 (b) 14 (c) 7 (d) 10 (e) 15

(18) Find $\frac{1}{1\cdot 3} + \frac{1}{3\cdot 5} + \cdots + \frac{1}{99\cdot 101}$

(a) $\frac{1}{3}$ (b) $\frac{100}{101}$ (c) $\frac{50}{101}$ (d) $\frac{1}{2}$ (e) $\frac{99}{101}$

(19) In a chess board with 64 squares, 1 grain of rice is put onto the first square, 3 grains onto the second square, 9 on the third, and so on so forth. If this process is continued, how many pieces of rice in total are placed on the chessboard?

(a) $\frac{1}{2}(3^{63}-1)$ (b) $\frac{1}{2}(3^{64}-1)$ (c) $3^{65}-1$ (d) $3^{64}-1$ (e) $3^{65}+1$

(20) At a party, 6 gentlemen check in their hats. In how many ways can their hats be returned so that no gentlemen gets the hat with which he arrived?

(a) 265 (b) 260 (c) 720 (d) 351 (e) 482

(21) What is the length of a diagonal of a regular pentagon with side length 2?

(a) $\sqrt{7}+\sqrt{2}$ (b) 3 (c) $1+\sqrt{5}$ (d) $2(\sqrt{7}-1)$ (e) $2\sqrt{5}-1$

(22) You look up a staircase 10 steps tall. If you can go up one, two, or three steps at a time, how many ways are there to go up the staircase?

(a) 280 (b) 81 (c) 82 (d) 273 (e) 274

(23) If you have a piece of noodle and randomly break it into 5 pieces, what is the probability that the 5 pieces can form a pentagon?

(a) $\frac{5}{16}$ (b) $\frac{11}{16}$ (c) $\frac{3}{8}$ (d) $\frac{1}{32}$ (e) $\frac{31}{32}$

(24) Find the maximum number of regions that 7 intersecting planes in a space can form.

(a) 12 (b) 42 (c) 62 (d) 64 (e) 128

(25) Given a set $S = \{1, 2, 3, \ldots, 9\}$ of integers from 1 to 9, we call a family of subsets an antichain if no subset in the family is a proper subset of another. For example, $A = \{\{1, 2\}, \{1, 3\}, \{2, 3\}\}$ and $B = \{\{1, 2\}, \{3\}\}$ are antichains because no single set within the group fits completely inside another. Additionally, $C = \{\{1, 2\}, \{1, 2, 3\}, \{4\}\}$ is not an antichain as $\{1, 2\}$ is a subset of $\{1, 2, 3\}$. What is the size of a largest antichain of S?

(a) 84 (b) 126 (c) 128 (d) 256 (e) 512