SAMPLE QUESTIONS - MATHEMATICS, CATEGORY 4

1. Solve $4^4 \cdot 9^4 \cdot 4^9 \cdot 9^9 = ?$

   (A) 13^{13} (B) 13^{36} (C) 36^{13} (D) 36^{36} (E) 1296^{26}

2. Simplify the expression $\dfrac{\left(\frac{1}{6}+0,1+\frac{1}{15}\right):\left(\frac{1}{6}+0,1-\frac{1}{15}\right)\cdot 2,52}{\left(0,5-\frac{1}{3}+0,25-\frac{1}{5}\right):\left(0,25-\frac{1}{6}\right)\cdot\frac{7}{13}}$

   (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

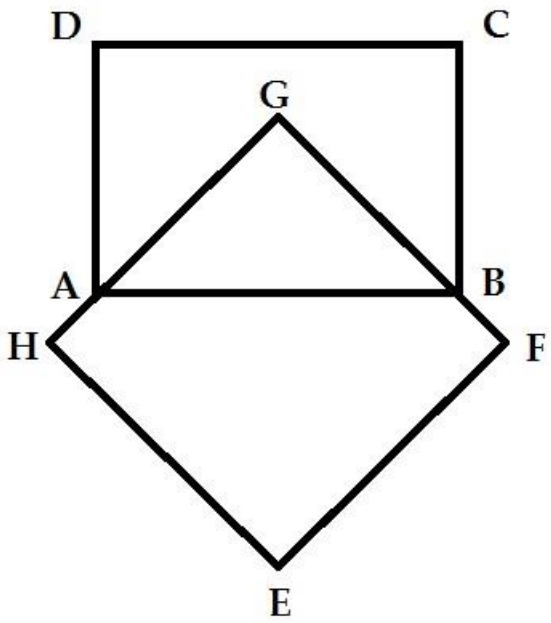
3. In the xy-plane, the segment with endpoints $(-1,0)$ and $(25,0)$ is the diameter of a circle. If the point (x, 13) is on the circle, then find x.

   (A) 10.5 (B) 12 (C) 15.5 (D) 17 (E) 20

4. In the given system $\begin{cases} x+y+xy=19 \\ y+z+yz=11 \\ z+x+zx=14 \end{cases}$, find $x+y+z=?$

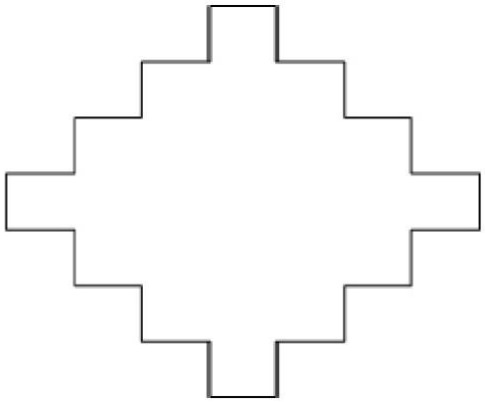
   (A) 12 ; 9 (B) -20 ; -10 (C) 15 ; 3 (D) 17 ; 5 (E) 8 ; 0

5. Squares ABCD and EFGH are congruent, AB = 10, and G is the center of square ABCD. Find the area of the region in the plane covered by these squares.



(A) 75 (B) 100 (C) 125 (D) 150 (E) 175

6. In the polygon shown, each side is perpendicular to its adjacent side, and all 28 of the sides are congruent. The perimeter of the polygon is 56. Find the area of the region bounded by the polygon.



(A) 84 (B) 96 (C) 100 (D) 112 (E) 196

7. Three cubes of volume 1, 8 and 27 are glued together at their faces. What is

the smallest possible surface area of the resulting configuration?

(A) 36 (B) 56 (C) 70 (D) 72 (E) 74

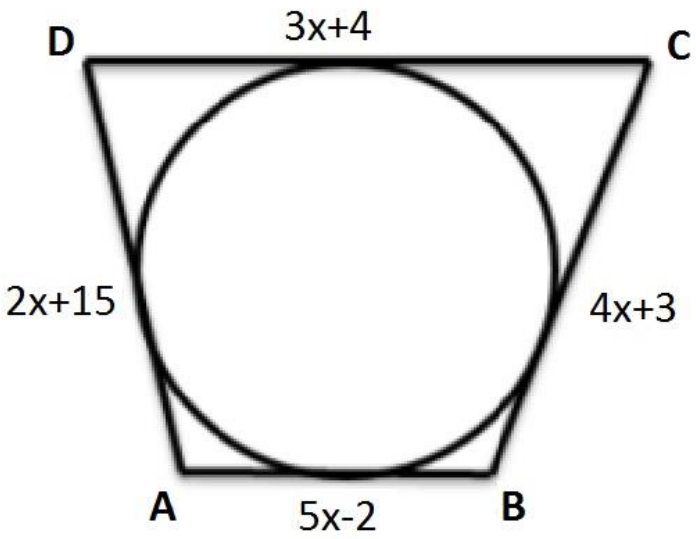
8. Find the perimeter of ABCD

If $|AB| = 5x - 2$;

$|BC| = 4x + 3$;

$|CD| = 3x + 4$;

$|AD| = 2x + 15$



A) 62 B) 92 C) 112 D) 122 E) 132

9. The temperature on the shady side of a certain planet is −253°C. The temperature on its sunny side is −223°C. Which of the following statements is an accurate description of the relation between the temperatures on the shady side and on the sunny side?

A) The temperature on sunny side is 30°C higher than on shady side;

B) The temperature on sunny side is 30°C lower than on shady side;

C) The temperature on sunny side is 476°C higher than on shady side;

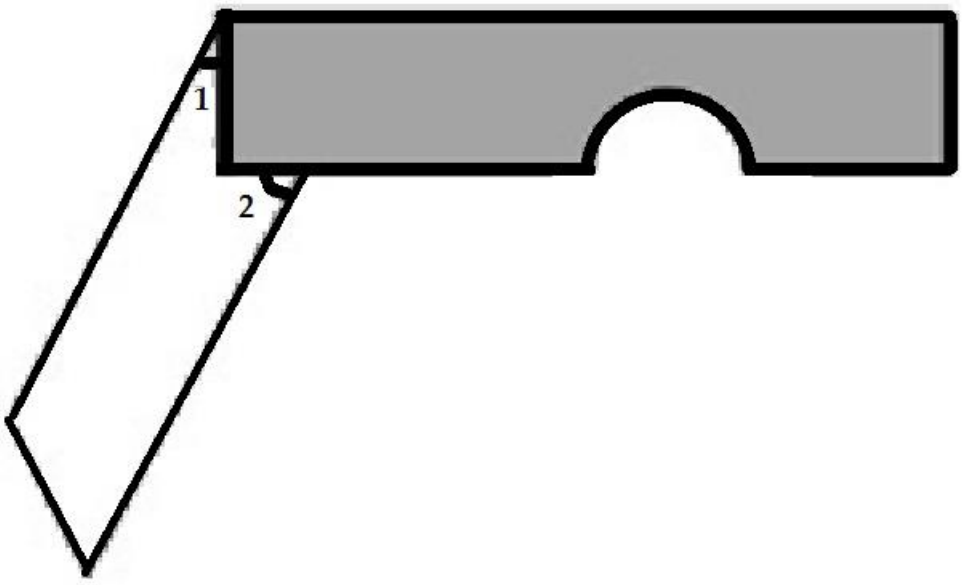
D) The temperature on sunny side is 476°C lower than on shady side;

E) The temperature on sunny side is the same as on shady side.

10. Around 550 BC, the Greek mathematician Pythagoras discovered and proved a theorem, which now bears his name. To celebrate this achievement, he had 100 cows killed for a feast. Thus, the result is also known as the One Hundred Cows Theorem. What is the anniversary of this result in 2011? (There is no Year 0.)

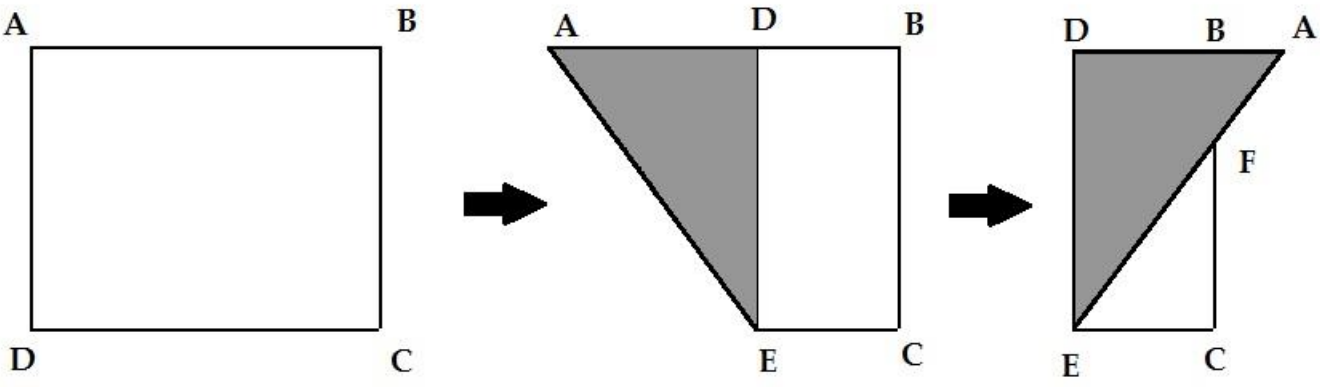
(A) 2562 (B) 2560 (C) 2561 (D) 1460 (E) 1461

11. The given diagram shows a pocketknife. The shaded part is a rectangle with a small semicircular indentation. The two edges of the blade are parallel, forming angles 1 and 2 with the shaft as shown. What is the measure of angles $\angle 1 + \angle 2$ in degrees?



(A) 30 (B) 45 (C) 60 (D) 90 (E) Could not be determined

12. The given diagram shows a rectangle ABCD being folded along a straight segment AE with E on CD, so that the new position of D is on AB. Triangle ADE is then folded along DE so that the new position of A is on the extension of DB. The new position of AE intersects BC at F. If AB = 10 centimeters and AD = 6 centimeters, what is the area of triangle ABF, in square centimeters?

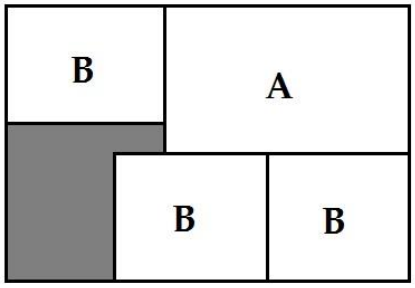


(A) 2 (B) 4 (C) 6 (D) 8 (E) 10

13. A dice is rolled twice, what is the probability of getting the sum of faces of each through is 10?

A) 1⁄4 B) 1/12 C) 1/36 D)10/36

14. As shown in the diagram, a square floor has been paved partially with two types of square tiles, A and B, of respective areas 1600 cm^2 and 900 cm^2. How many square tiles of area 100 cm^2 are required to pave the remaining (shaded) part of the floor?



(A) 6 (B) 7 (C) 8 (D) 9 (E) 10

15. The website of a company sends out an advertisement to the email boxes of its clients every 500 hours. Alex received an advertisement from this website at 9am last Tuesday. On which day will Alex receive the next advertisement?

(A) Monday (B) Tuesday (C) Wednesday (D) Thursday (E) Friday

16. When a bus left the depot, one-half of the seats were empty. At the first stop, a number of passengers got on, but nobody got off. Now one-sixth of the seats are empty. At the second stop, 7 passengers got on and 2 got off. Then there were no empty seats and each passenger had a seat. How many seats did this bus have?

(A) 30 (B) 50 (C) 10 (D) 120 (E) 20

17. If $f\left(x-\frac{1}{x}\right)=x^3-\frac{1}{x^3}$, then find the value of $f(-x)$

(A) 0 (B) $-x^3-3x$ (C) x^3-3 (D) $-x-3x^3$ (E) $-3x-\frac{1}{x^3}$

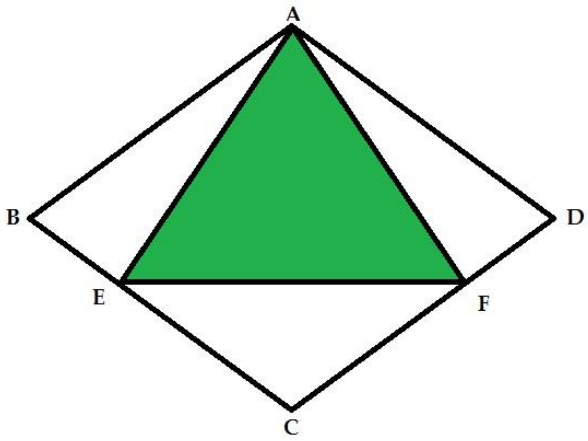
18. The tariff of Taxi is comprised of a fixed price of $7 and per km rate. Alex hires a taxi and paid $263 for 32 km. On any other day he wants to travel 80 km, what amount he needs to pay for a taxi?

A) $467 B) $746 C) $647 D) $640

19. In a certain coding, if RAT = 39, DOG = 26, and CAT = 24, then what is the meaning of FOX?

A) 47 B) 46 C) 45 D) 42

20. The side of an equilateral triangle AEF and that of a rhombus ABCD are equal in length and E and F lie on BC and CD respectively. Find the size of ∠BAE.



(A) 10° (B) 20° (C) 36° (D) 48° (E) 15°

21. If $A = 28+35+42+...+112$, $B = 7+14+21+...+112$, then find the value of $B-A=?$

(A) 7 (B) 35 (C) 42 (D) 70 (E) 105

22. Find $\frac{333^2+444^2-555^2}{(333+444-555)^2}$

A) 0 B) 1 C)2 D)3 E)4

23. If $x\ \Delta\ y=(xy)^{yx}$ *and* $x\ \Theta\ y=\left(\frac{y}{x}\right)^x$. What is the value of $1\ \Theta\ (2\ \Delta 3)=?$

(A) 3^6 (B) 3^9 (C) 2^3 (D) 6^6 (E) 2^6

24. Simplify $\frac{(x-y)^3(x^2+2xy+y^2)}{(x^2-y^2)^2}$

A) $x-y$ B) $y-x$ C) $x+y$ D) (x^2-y^2) E) (x^2+y^2)

25. Alex and Taylor are cousins. Their combined age is 50, and Taylor is 8 years older than Alex. What is the age of Taylor?

A) 21 B) 23 C) 25 D) 27 E) 29