1. How many different even factors does 2012 have?

   (A) 1 (B) 2 (C) 4 (D) 8 (E) 16

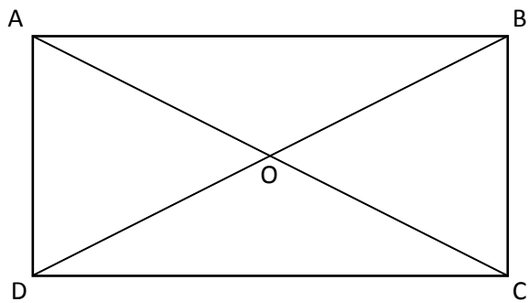
2. In how many different ways can 2012 be written in the form $x + y$ where x and y are positive integers, if $x + y$ and $y + x$ are considered the same?

   (A) 2012 (B) 2006 (C) 1007 (D) 1006 (E) 1005

3. On the first day Abdul painted $\frac{1}{2}$ of his fence, and on the second day he painted $\frac{1}{3}$ of the remaining part. On the third day he painted $\frac{1}{2}$ as much of the fence as he had painted during the first two days taken together. At the end of the third day, what part of the fence is painted?

   (A) $\frac{7}{12}$ (B) $\frac{2}{3}$ (C) $\frac{5}{6}$ (D) $\frac{11}{12}$ (E) The whole fence

4. $ABCD$ is a rectangle such that $AB > BC$. Let area of $OAB = a$ and area of $OBC = b$. Which of the following is true?



   (A) $a = b$ (B) $a = 2b$ (C) $b = 2a$ (D) $a = 3b$ (E) $b = 3a$

5. How many pairs (x, y) are there where x and y satisfy $x^2y^2 = xy$?

   (A) 1 (B) 2 (C) 4 (D) 8 (E) None of the above

27. In a standard analog clock (numbered 1 to 12) how many times does the hour hand stand perpendicular to the minute hand during a single day?

   (A) 4 (B) 20 (C) 26 (D) 44 (E) 48

28. Isuru thinks of constructing a pattern using circles. He starts off with Figure – 1 and in the first step draws circles as indicated, to obtain Figure – 2. In the next step he adds circles to Figure – 2 as indicated to obtain Figure – 3.

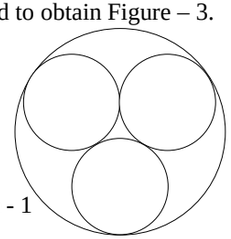


Figure - 1

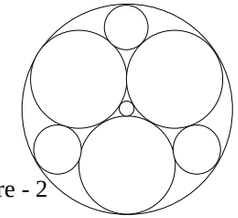


Figure - 2

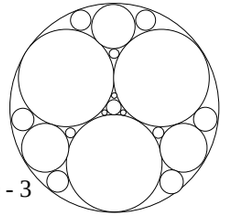


Figure - 3

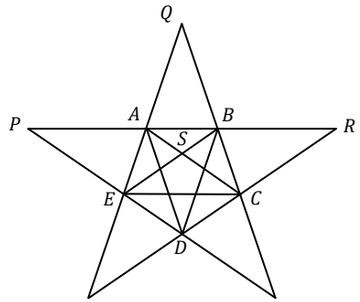
   If he continues likewise, what is the least value of n such that the Figure – n will have at least 2012 circles?

   (A) 5 (B) 6 (C) 7 (D) 8 (E) 9

29. In the *Land of Liars*, citizens belong to either the *Red Clan* or the *White Clan* but not to both. Members of the *Red Clan* always lie whereas members of the *White Clan* always tell the truth. A little boy *Crypto* in the *Land of Liars* is told a story by his grandmother, which commences as follows, "Son, this is a story written by a famous writer in the *Land of Liars*, 'Once upon a time there lived in the *Land of Liars* a king called *Pseudo* who had three advisors *Algo*, *Decrypto* and *Encrypto*. One day the king called the three advisors for a meeting and asked them about the state of affairs of the kingdom. Much to the king's surprise, the three advisors gave three different answers. When enquired who was telling the truth, *Algo* said *Decrypto* is a liar, *Decrypto* said *Encrypto is* a liar and *Encrypto* said *Algo* is a liar. …' " Using this information alone, what can be concluded?

   (A) Only one of the advisors is Red
   (B) Only one of the advisors is white
   (C) All the advisors are white
   (D) Grandmother belongs to the *Red* clan
   (E) None of the above.

30. $ABCDE$ is a regular pentagon. Which of the following is/are true?



   (I) $\frac{PQ}{PA} = \frac{PR}{PQ}$

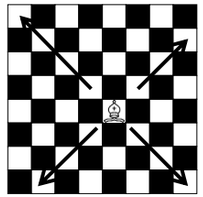
   (II) $\frac{PA}{AR} = \frac{1+\sqrt{5}}{2}$

   (III) $\frac{PA}{AR} = \frac{AS}{SC}$

   (A) I only (B) II only (C) I and II only (D) I and III only (E) All

21. 2012 can be written as a sum of n consecutive integers. What value can n take?
(A) 2 (B) 3 (C) 5 (D) 8 (E) 11

22. What is the maximum number of bishops that can be placed on a standard chess board such that no two of them will be in each other's way? A standard chess board is an 8×8 board (as shown in the figure). The bishops can move any distance diagonally as shown by the arrows and may be placed on either a black or a white square.
(A) 7 (B) 8 (C) 14 (D) 15 (E) 16



23. Eight **identical** spheres, each of radius $\frac{1}{2}$ a unit, are placed in such a way that the centres of the spheres coincide with the vertices of a unit cube. What is the radius of the sphere that can be inscribed in the compound figure so that it touches each of the eight spheres?
(A) $\sqrt{2}-1$ (B) $\frac{1}{\sqrt{2}}-\frac{1}{2}$ (C) $\sqrt{3}-1$ (D) $\frac{\sqrt{3}}{2}-\frac{1}{2}$ (E) $\frac{1}{\sqrt{2}}+\frac{1}{2}-\sqrt{\frac{1}{\sqrt{2}}-\frac{1}{4}}$

For 24, 25:
For any positive integer n, let $f(n)$ = sum of the distinct divisors of n including 1 and n. Let's call n *abundant* if $f(n) > 2n$, *deficient* if $f(n) < 2n$, and *perfect* if $f(n) = 2n$.

24. Which of the following is/are true?
I. 6 is perfect.
II. 12 is abundant
III. 1212121212 is abundant
(A) I only (B) II only (C) I and II only (D) I and III only (E) All

25. Which of the following is/are true?
I. If m and n are perfect then $m + n$ is perfect.
II. If n is not deficient then kn is not deficient for any positive integer k.
III. If n is deficient then every divisor of n is deficient.
(A) I only (B) II only (C) I and II only (D) II and III only (E) All

26. Consider the following statements about dividing a triangle into a certain number of right angled triangles.
I. The number of different ways to divide a given acute triangle into 3 right angled triangles is 6.
II. The number of different ways to divide a given obtuse triangle into 3 right angled triangles is 2.
III. Every triangle can be divided to any number of right angled triangles.
Which of the above statements is/are true?
(A) I and II only (B) I and III only (C) III only (D) II and III only (E) All

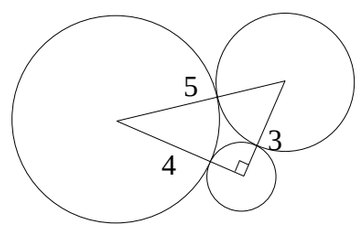
6. A farm has sheep and chickens. If 4 times the total number of heads of sheep and chickens is 200 more than the total number of their legs, how many chickens are there in the farm?
(A) 800 (B) 400 (C) 200 (D) 100 (E) Cannot be determined

7. Meena has 5 blouses, 3 skirts and 4 accessories (a bangle, a necklace, a wrist watch and a pair of ear rings) to select from for a party. If she can choose any number of accessories including nothing or all, to be worn with a skirt and a blouse, in how many different ways can she dress for the party?
(A) 240 (B) 120 (C) 60 (D) 30 (E) 15

8. Meena's grandmother puts cooked leftover rice in the sun to dry to make *Aggala*. Suppose the water content of the cooked rice is 55% of its weight and that after being dried in the sun for three days**,** the water content reduces to 10% of the weight. If the initial weight of the rice was 100g, what is its weight after 3 days?
(A) 90g (B) 50g (C) 45g (D) 40g (E) 35g

9. How many rational numbers are there that are greater than $\frac{1}{2012}$ and less than $\frac{1}{2011}$ with numerator 1000?
(A) 1000 (B) 999 (C) 998 (D) 997 (E) infinitely many

10. The vertices of a right triangle with sides of lengths 3, 4, and 5 units are the centers of three mutually externally tangent circles, as shown in the figure. What is the sum of the areas of the circles in square units?



(A) 12π (B) $\frac{25}{2}\pi$ (C) 13π (D) $\frac{27}{2}\pi$ (E) 14π

11. How many distinct pairs (a, b) are there such that a and b are positive integers, $gcf(a, b) = 2012$ and $lcm(a, b) = 2011^2 \times 2012^2$? Note that $(a, b) \neq (b, a)$ if a and b are distinct, $2012 = 2^2 \times 503$, and 503 and 2011 are prime numbers.

(A) 1 (B) 2 (C) 4 (D) 6 (E) 8

12. Sarath designs a raffle as a fundraising event for his Olympiad mathematics club at school. He comes up with the following idea: every third ticket will receive a Rs. 50 gift certificate, every fourth ticket will receive a Rs. 100 gift certificate and every sixth ticket will receive a Rs. 500 gift certificate. If a ticket qualifies for more than one gift certificate, it will receive only the highest prize. For example, the sixth ticket qualifies for both a Rs. 50 and a Rs. 500 gift certificate, but the holder will receive only the Rs.500 certificate. If 300 tickets are sold at Rs. 300 a ticket, how much money will be earned after paying all the prize money?

(A) Rs. 25, 000 (B) Rs. 56, 250 (C) Rs. 57, 500 (D) Rs. 65, 000 (E) Rs. 82, 500

13. Which of the following is/are true about a sequence having the first four terms 1, 4, 9, 16?

I The first four terms of this sequence can be given as $f(n) = n^2$ when $n = 1, 2, 3$ and 4.

II The first four terms of this sequence can be given as $g(n) = n^2 + (n-1)(n-2)(n-3)(n-4)$ when $n = 1, 2, 3$ and 4.

III The next term of the sequence can be 49.

(A) I only (B) II only (C) I and II only (D) I and III only (E) All

14. A sequence $x_1, x_2, x_3, \ldots$ is written down by traversing the given array of numbers, starting from the left hand top corner and moving along in the order shown by the arrows. ($x_1 = 1, x_2 = 2, x_3 = 1, x_4 = 1, x_5 = 2, \ldots$) What is the smallest n such that $x_n = 2012$?

(A) $\frac{2011 \times 2012}{2}$

(B) $\frac{2011 \times 2012}{2} + 1$

(C) $\frac{2010 \times 2011}{2} + 1$

(D) $\frac{2010 \times 2011}{2}$

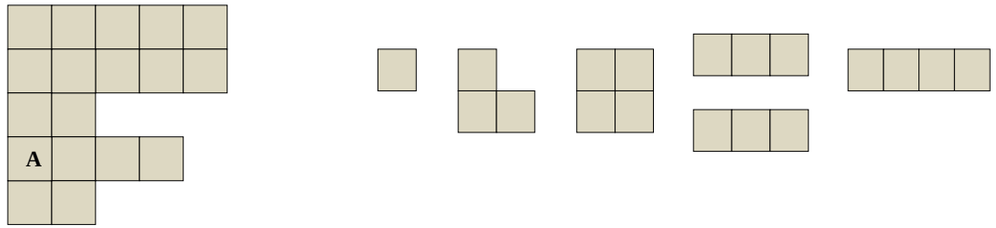
(E) $\frac{2010 \times 2011}{2} - 1$

1	1	1	1	1
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	

15. The length of the repeating part of the decimal representation of $\frac{1}{7}$ is 6, as $\frac{1}{7} = 0.142857\ 142857\ldots$ What is the length of the repeating part of the decimal representation of $\frac{4}{2012}$?

(A) 502 (B) 503 (C) 1005 (D) 1006 (E) 2011

16. The figure given below is made up of unit squares. Nipuna completely covers the figure using only the six tiles given without rotating the tiles.



Which tile will cover the letter A?

(A) (B) (C) (D) (E)

17. In a single-elimination tournament of football consisting of 2^{10} teams, there are no draws. Any team is eliminated at the first defeat. How many games should be played to determine the overall winning team of the tournament?

(A) 2^5 (B) 2^9 (C) $2^9 - 1$ (D) $2^{10} - 1$ (E) 2^{10}

18. Martians use a base different from 10 and they count 1, 2, 3, 4, 5, …. as <, >, # <, < <, > <, … How will Martians denote 6?

(A) # > (B) > # (C) < > (D) # < < (E) # > >

19. A post office has only 3 Rupees stamps and 5 Rupees stamps, but an unlimited supply of stamps from each denomination. Which of the following is/are true about the stamp values in Rupees that can be given as a combination of 3 Rupees stamps and 5 Rupees stamps?

I. 1, 2, 4 and 7 cannot be given as a combination

II. 2011^{2011} can be given as a combination

III. 2012^{2012} can be given as a combination

(A) I only (B) II only (C) I and II only (D) I and III only (E) All

20. *P* is a point inside a triangle *ABC*, such that the areas of the triangles *APB*, *BPC* and *CPA* are equal. *X*, *Y* and *Z* are points on *AP*, *BP* and *CP* respectively such that *AX* : *XP* = 1 : 1, *BY* : *YP* = 1 : 2 and *CZ* : *ZP* = 2 : 1. What is the ratio $\frac{Area\ of\ ABC}{Area\ of\ XYZ}$?

(A) 2 (B) $\frac{54}{13}$

(C) $\frac{9}{4}$ (D) $\frac{23}{7}$

(E) None of the above