

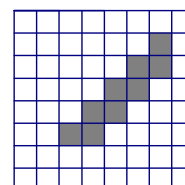
**Student: Class (11-12)**



**3-Point-Problems**

- Which of the following numbers is greatest?  
 A)  $2006 \times 2006$       B)  $2005 \times 2007$       C)  $2004 \times 2008$   
 D)  $2003 \times 2009$       E)  $2002 \times 2010$
- How many zeroes does the product of the first 2006 prime numbers end with?  
 A) 0      B) 1      C) 2      D) 9      E) 26

- We consider the perimeter and the area of the region corresponding to the grey squares. How many more squares can we colour grey for the grey area to increase without increasing its perimeter?  
 A) 0      B) 7      C) 18      D) 12      E) 16

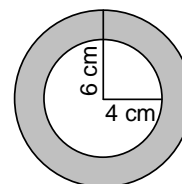


- There are four cards on the table as in the figure. Every card has a letter on one side and a number on the other side. Raza said: "For every card on the table it is true that if there is a vowel on one side, there is an even number on the other side." What is the smallest number of cards Sara must turn in order to check whether Raza said the truth?  
 A) none      B) 1      C) 2      D) 3      E) 4



- Two trains with the same length are travelling in opposite directions. The first is travelling at 100 km/h and the second at 120 km/h. A passenger on the second train observes that it takes exactly 6 sec first train to pass completely in front of him. How long does it take for a passenger on the first train to see the second train pass completely?  
 A) 5 sec      B) 6 sec      C) between 6 and 7 sec  
 D) 7 sec      E) more than 7 sec

- Ahmad has two pendants made of the same material. They are equally thick and weigh the same. One of them has the shape of an annulus created from two concentric circles with the radii 6 cm and 4 cm (see the diagram). The second has the shape of a solid circle. What is the radius of the second pendant?



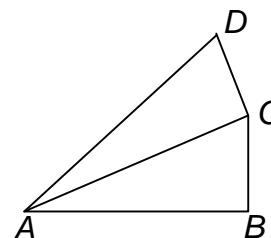
- A) 4 cm      B)  $2\sqrt{6}$  cm      C) 5 cm      D)  $2\sqrt{5}$  cm      E)  $\sqrt{10}$  cm
- The difference between any two consecutive numbers on the list a, b, c, d, e is the same. If  $b=5.5$  and  $e=10$ , what is the value of a?  
 A) 0.5      B) 3      C) 4      D) 4.5      E) 5
  - If  $4^x=9$  and  $9^y=256$ , then  $xy$  equals  
 A) 2      B) 4      C) 10      D) 36      E) 48

9. Consider all 9-digit integers made by using all the digits 1,2,...,9. Write each such number on a separate sheet and put all the resulting sheets in a box. What is the minimum number of sheets that you must extract from the box if you want to be certain that there are at least two numbers with the same digit in the first place among the chosen numbers?

A) 9!                      B) 8!                      C) 72                      D) 10                      E) 9

10. In the diagram,  $AB$  has length 1;  $\angle ABC = \angle ACD = 90^\circ$ ;  $\angle CAB = \angle DAC = \theta$ . What is the length of  $AD$ ?

A)  $\cos\theta + \tan\theta$                       B)  $\frac{1}{\cos 2\theta}$                       C)  $\cos^2\theta$   
 D)  $\cos 2\theta$                       E)  $\frac{1}{\cos^2 \theta}$



4-Point-Problems

11. Which of the following gives the formula of a function whose graph has the y-axis as an axis of symmetry?

A)  $y = x^2 + x$                       B)  $y = x^2 \sin x$                       C)  $y = x \cos x$                       D)  $y = x \sin x$                       E)  $y = x^3$

12. On a fair roulette wheel there are 37 numbers: 0 and the positive integers from 1 to 36. What is the probability that the ball lands on a prime number?

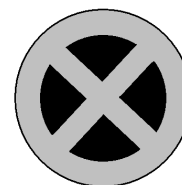
A) 5/18                      B) 11/37                      C) 11/36                      D) 12/37                      E) 1/3

13. The remainder of the division of the number 1001 by some one-digit number is equal to 5. What is the remainder of the division of the number 2006 by the same one-digit number?

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

14. The radius of the traffic sign is 20 cm. Each of the dark pieces is a quarter of a circle. The area of all 4 quarters equals that of the light part of the sign. What is the radius of this circle?

A)  $10\sqrt{2}$  cm                      B)  $4\sqrt{5}$  cm                      C) 20/3 cm                      D) 12,5 cm                      E) 10 cm

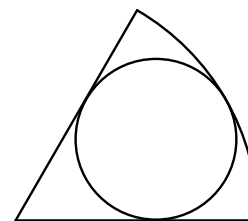


15. You are given three prime numbers  $a, b, c$  with  $a > b > c$ . If  $a + b + c = 78$  and  $a - b - c = 40$  then  $abc =$

A) 438                      B) 590                      C) 1062                      D) 1239                      E) 2006

16. The ratio of the radii of the sector and the incircle in the picture is 3:1. Than the ratio of their areas is:

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



17. Sixteen teams play in a volleyball league. Each team plays one game against each other team. For each game the winning team gets 1 point and the losing team 0 points. There are no draws. After all games have been played the team scores form an arithmetic sequence. How many points has the team in last place received?  
 A) 3                      B) 2                      C) 1                      D) 0                      E) none of this
18. Last year there were 30 more boys than girls in the school singing team. This year the members of singing team have increased by 10%: the number of girls has increased by 20% and the number of boys by 5%. How many members the singing team has this year?  
 A) 88                      B) 99                      C) 110                      D) 121                      E) 132
19. The cells of a  $4 \times 4$  table are coloured black and white as shown in Fig. 1. One move allows us to exchange any two cells positioned in the same row or in the same column. What is the least number of moves necessary to obtain Fig. 2?  
 A) this is not possible                      B) 2                      C) 3                      D) 4                      E) 5

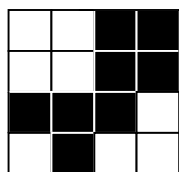


Fig. 1

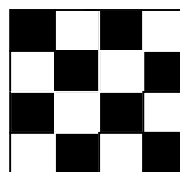
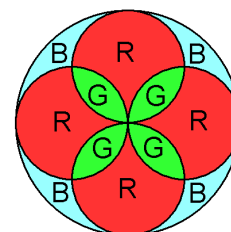


Fig. 2

20. In a certain home there is a rose window as in the figure, where the letters R, G and B represent glass of red colour, green colour and blue colour, respectively. Knowing that  $400 \text{ cm}^2$  of green glass have been used, how many  $\text{cm}^2$  of blue glass are necessary?



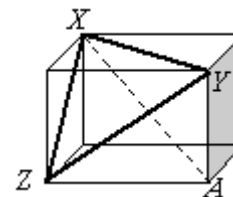
- A) 396                      B) 400                      C)  $120\pi$                       D)  $90\sqrt{2}\pi$                       E) 382

### 5-Point-Problems

21. Given that  $a$  and  $b$  are both numbers greater than 1, which of the following fractions has the greatest value?

- A)  $\frac{a}{b-1}$                       B)  $\frac{a}{b+1}$                       C)  $\frac{2a}{2b+1}$                       D)  $\frac{2a}{2b-1}$                       E)  $\frac{3a}{3b+1}$

22. The lengths of the sides of triangle  $XYZ$  are 8 cm, 9 cm and  $\sqrt{55}$  cm. Find the length of the diagonal  $XA$  of the rectangular parallelepiped in the figure.



- A)  $\sqrt{90}$  cm                      B) 10 cm                      C)  $\sqrt{120}$  cm  
 D) 11 cm                      E)  $\sqrt{200}$  cm

