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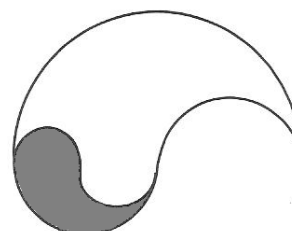
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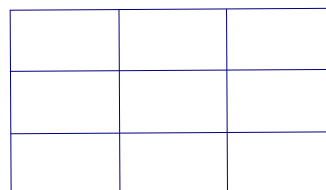
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**Math Short Answer Problems****IMSO 2011**

1. The sum of the three smallest prime numbers and another prime number  $n$  is 2021. Find the value of  $n$ .
2. The average of  $x$  and  $y$  is 19. The average of  $a$ ,  $b$  and  $c$  is 14. Find the average of  $x$ ,  $y$ ,  $a$ ,  $b$  and  $c$ .
3. The figure is made up of semicircles of diameter 2 cm, 4 cm and 8 cm.  
What fraction of the figure is shaded?



4. The sum of the numbers  $A$ ,  $B$  and  $C$  is 390. Given  $A$  is 3 times of  $B$  and  $A$  is one third of  $C$ , find the value of  $C$ .
5. What is the smallest number that can be expressed as the sum of two squares in two different ways?
6. How many rectangles are there in the  $3 \times 3$  grid shown?



7. Find the smallest positive integer with exactly 30 factors.
8. Find the value of

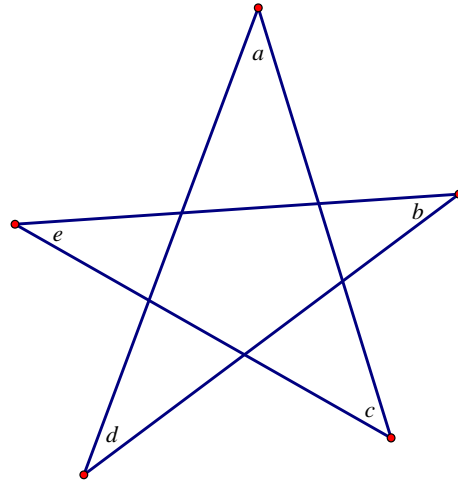
$$\left(\frac{2009}{2010} + \frac{2010}{2011} + \frac{6}{7}\right)\left(\frac{1}{2} + \frac{2009}{2010} + \frac{2010}{2011} + \frac{2}{5}\right) - \left(\frac{1}{2} + \frac{2009}{2010} + \frac{2010}{2011} + \frac{6}{7}\right)\left(\frac{2009}{2010} + \frac{2010}{2011} + \frac{2}{5}\right)$$

9. The number 119 is very amazing. When divided by 2, it leaves a remainder of 1. When divided by 3, it leaves a remainder of 2. When divided by 4, it leaves a remainder of 3. When divided by 5, it leaves a remainder of 4. When divided by 6, it leaves a remainder of 5. Find the smallest three-digit number, larger than 119, which has this property.

10. Pedro can finish a job in 14 minutes while his younger brother Juan can finish the same job in 7 minutes. How long will it take the two of them to finish the job together?

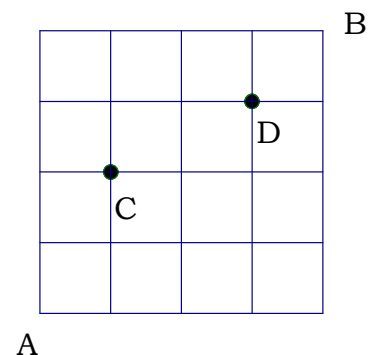
11. In the diagram shown,  
find the measure of

$$\angle a + \angle b + \angle c + \angle d + \angle e .$$

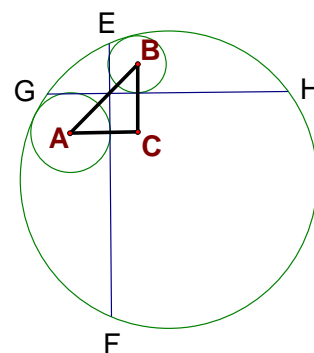


12. The sum of the two digits of Emma's age this year is 5. Seven years from now, her age will be 2 less than the reverse of the digits of her age this year. How old is Emma now?
13. Half of the punch in the bowl is pure mango juice. When 6 more cups of pure mango juice are added to the bowl,  $\frac{2}{3}$  of the resulting punch in the bowl is pure mango juice. How many cups of punch were in the bowl to start with?
14. Five test scores have a mean (average score) of 88, a median (middle score) of 89, and a mode (most frequent score) of 93. What is the sum of the two lowest test scores?
15. The area of a rectangle with integer sides is  $2011 \text{ cm}^2$ . Find its largest possible perimeter, in cm.

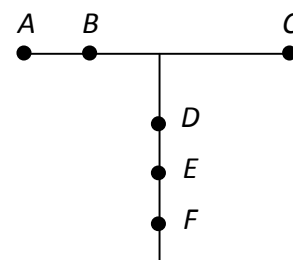
16. In the grid shown, how many paths are there from corner A to corner B that only have steps to the right or up and do not pass through neither C nor D?



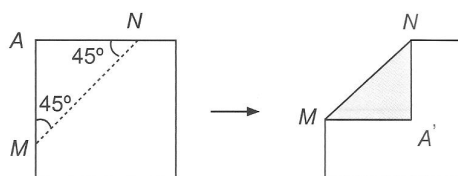
17. Chords EF and GH are perpendicular to each other. **A** and **B** are centers of circle A and circle B respectively. Circle A and circle B are tangent to the chords, as shown in the diagram. If the radius of circle A is 12 and the radius of circle B is 5, find the length of line segment AB.



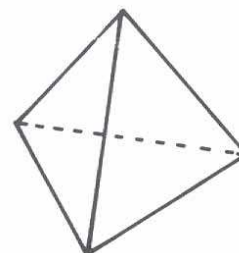
18. Six points A, B, C, D, E and F are arranged as shown. How many triangles can be formed with any 3 of the 6 points as vertices?



19. A square piece of paper has area  $96 \text{ cm}^2$ . It is folded along the dotted line MN. The shaded area in the resulting figure is one-half of the total visible area. Find the length of MN.



20. What is the maximum number of circles of radius 2 that can be packed without overlap into a circle of radius 6?
21. What is the total surface area, in  $\text{cm}^2$ , of a regular tetrahedron with edge length 5 cm?



22. A 6-digit number,  $\overline{8ab8ab}$  is divisible by 12 where  $a$  and  $b$  are distinct. Find the last two digits of the 6-digit number for it to be as small as possible.
23. Of 100 students in a certain school, 17 like math, 80 like MTV and 4 neither like math nor MTV. How many students like math and MTV?
24. Lani's mother promised to give her a call between 2:30 p.m. and 4:00 p.m. Sometime during this period, Lani left her cell phone inside her locker for 40 minutes. What is the probability that Lani missed her mother's call?
25. Mother gave Greg a recipe of a mixture of juice with 2 parts juice and 5 parts water. However, Greg squared both numbers in the recipe. How many ounces of juice need to be added to correct a 29-ounce mixture prepared by Greg?