

Mathlete Training Centre  
Round 2 RIPMWC open

2011 RIPMWC open round 2

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1.

How many of the first 2011 positive integers are divisible by both 3 and 5 but not divisible by 4?

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2.

What are the last 5 digits of the sum  $1 + 111 + 11111 + 1111111 + \dots + \underbrace{111\dots111}_{2011 \text{ 1s}}?$

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3.

The ratio of the difference, sum and product of two numbers is  $1 : 7 : 24$ , find the value of the product of these two numbers.

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4.

The current age of Mary's grandmother is a two-digit number. When the two digits are reversed, the current age of Mary's mother is obtained. Given that the difference between the current ages of Mary's grandmother and Mary's mother is 4 times Mary's current age, find Mary's current age.

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5.

There are 2011 identical balls, of which 1001 are red and 802 are yellow and the rest are green. In order to get at least 802 balls of the same colour, what is the minimum number of balls that must be drawn?

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6.

Find the value of the expression

$$\frac{(201120112011 \times 201120112011) - (201120112013)(201120112009)}{}$$

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7. There is a certain amount of money to be shared among 3 classes of pupils. If the money is shared equally among all the pupils from all the 3 classes, each will get \$42; if the amount is shared equally among pupils from class A only, each will get \$105; if the amount is shared equally among pupils from class B only, each will get \$98. Find the amount that each pupil will get if the amount is shared equally among pupils from class C only.

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8. Ivan and Barry travel around a circular track at uniform speeds in opposite directions, starting from diametrically opposite points. If they start at the same time, they meet first after Barry has travelled 100 m, and meet a second time 60 m before Ivan has completed one lap. What is the circumference of the track?

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9. Three different integers from 1 to 11 inclusive are selected. In how many of these combinations of 3 numbers are their sums a multiple of 3?

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10. Palindromes, like 23432, read the same forward and backward. Find the sum of all four-digit positive integer palindromes.

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11.

Find the sum  $\frac{1}{3^6 + 1} + \frac{1}{3^6 + 3} + \frac{1}{3^6 + 3^2} + \frac{1}{3^6 + 3^3} + \dots + \frac{1}{3^6 + 3^{12}}$ .

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12.

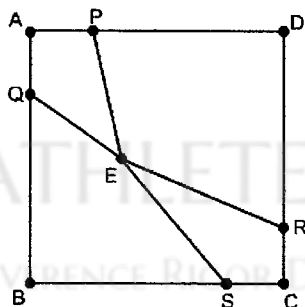
A 24-hour alarm clock is set to beep once when the sum of the digits is 11 (for example 12:26), and twice if the sum of digits is 22 (for example 17:59). How many beeps can be heard in a 24-hour cycle (00:00 – 23:59)?

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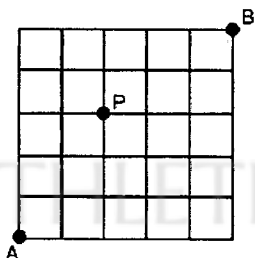
13.

In the figure, ABCD is a square.  $AP = AQ = CR = CS = 2$  cm. E is a point inside the square such that the areas of the quadrilateral APEQ and CRES are  $6 \text{ cm}^2$  and  $8 \text{ cm}^2$  respectively. What is the area of the square ABCD?



14.

The diagram shows a  $5 \times 5$  square grid. If only movement to the right or up are allowed, find the number of different paths from A to B that does not pass through P.



15.

In  $\triangle ABC$ ,  $AB = 8$  cm,  $AC = 9$  cm and  $BC = 10$  cm. Point  $P_0$  is on  $BC$  such that  $BP_0 = 4$  cm. An insect starts from point  $P_0$  and jumps to a point  $P_1$  on  $AC$  such that  $CP_1 = CP_0$ . It then jumps to  $P_2$  on  $AB$  such that  $AP_2 = AP_1$ . After its 3<sup>rd</sup> jump, it lands on a point  $P_3$  on  $BC$  such that  $BP_3 = BP_2$ . It then continues jumping in this manner. After its 2011<sup>th</sup> jump, the insect is at  $P_{2011}$ . If another insect were to travel along the edges of  $\triangle ABC$  from  $P_{2011}$  to  $P_0$ , what is the shortest distance needed to travel from  $P_{2011}$  to  $P_0$ ?

