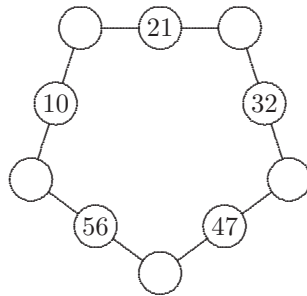


## GAUSS STUDENT SAMPLE PROBLEMS

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### PROBLEM 1

Complete the magic pentagon by putting numbers in the empty circles so that the sum of the three numbers along each of the sides of the pentagon equals 100. Show that there is only one solution to this problem.



### PROBLEM 2

$ABCD$  is a parallelogram.  $G$  is the midpoint of  $AD$  and  $F$  is the midpoint of  $AG$ . The area of the parallelogram  $ABCD$  is  $200 \text{ cm}^2$ . Find the area of the quadrilateral  $BCGF$ .

### PROBLEM 3

In a triangle  $ABC$ ,  $X$  is a point on  $AC$  such that  $\frac{AX}{XC} = 3$  and  $\angle AXB = 70^\circ$ . Find the length of  $AC$  if  $\angle ABC = 110^\circ$  and  $BC = 6 \text{ cm}$ .

### PROBLEM 4

Find all three digit numbers  $N$  such that  $N - 14$  is divisible by 7,  $N - 24$  is divisible by 8 and  $N - 36$  is divisible by 9.

**PROBLEM 5**

In a parallelogram  $ABCD$ ,  $AB = 15$  cm and  $BC = 14$  cm. The foot  $H$  of the perpendicular dropped from  $B$  to  $AD$  is between  $A$  and  $D$ . Find the length of the diagonal  $BD$  if  $BH = 12$  cm.

**PROBLEM 6**

$X$ ,  $Y$  and  $Z$  are positive integers such that  $X^2 + Y^2 + Z^2 = 390$ . What is the value of  $X + Y + Z$ ? Find all possible solutions.

**PROBLEM 7**

A carpenter has a long rod of length 4 m 83 cm. He needs to cut this rod into lengths of 161 cm, 23 cm and 7 cm so that he would get at least one rod of each length and have nothing left over. After a while, the carpenter managed to solve this problem. How many rods of each length did he get? Find all possible solutions.

**PROBLEM 8**

Points  $A$  and  $B$  are on the banks of a river. It takes a motorboat 1 hour to go down-stream from  $A$  to  $B$  and 1 hour 30 min to go up-stream from  $B$  to  $A$ . How long would it take the motorboat to go from  $C$  to  $D$  and back, if  $C$  and  $D$  are on the shores of a lake and the distance between  $C$  and  $D$  is the same as that between  $A$  and  $B$ ?

**PROBLEM 9**

The Executive Director of the “Smart Solutions” company wishes to employ 9 new staff members. There are 14 applicants: 4 mathematicians and 10 accountants. In how many ways can the Executive Director select 9 people if he wants to employ at least one mathematician?

**PROBLEM 10**

Show that  $29 \times 20^{99} + 71 \times 56^{64} + 24 \times 37^{55}$  is divisible by 19.

**PROBLEM 11**

For the Pan Australian Games the three states at the top of the medals table (Victoria, S.A. and W.A.) had won a total of 186 medals. Victoria had won the most gold medals and S.A. had as many gold medals as bronze medals. Victoria and S.A. won the same number of silver medals. W.A. had two more silver medals than bronze medals and their gold medals numbered one more than Victoria's bronze medals. Victoria had as many gold medals as the bronze medals of S.A. and W.A. combined and this number was also three quarters of the total number of medals won by S.A. The number of gold medals won by the three states was one less than the total number of medals won by Victoria. How many of each medal did each state win?

**PROBLEM 12**

A number is written on a whiteboard. Jim writes 221 to the right of this number thus obtaining a new number which turns out to be a multiple of the original one. What is the original number? Find all possible solutions.