TEAM CONTEST

Time：60 minutes

Instructions:

- Do not turn to the first page until you are told to do so.
- Remember to write down your team name in the space indicated on every page.
- There are 10 problems in the Team Contest, arranged in increasing order of difficulty. Each question is printed on a separate sheet of paper. Each problem is worth 40 points. For Problems 1, 3, 5, 7 and 9, only answers are required. Partial credits will not be given. For Problems 2, 4, 6, 8 and 10, full solutions are required. Partial credits may be given.
- The four team members are allowed 10 minutes to discuss and distribute the first 8 problems among themselves. Each student must attempt at least one problem. Each will then have 35 minutes to write the solutions of their allotted problem independently with no further discussion or exchange of problems. The four team members are allowed 15 minutes to solve the last 2 problems together.
- No calculator or calculating device or electronic devices are allowed.
- Answer must be in pencil or in blue or black ball point pen.
- All papers shall be collected at the end of this test.

English Version

For Juries Use Only

No.	1	2	3	4	5	6	7	8	9	10	Total	Sign by Jury
Score												
Score												

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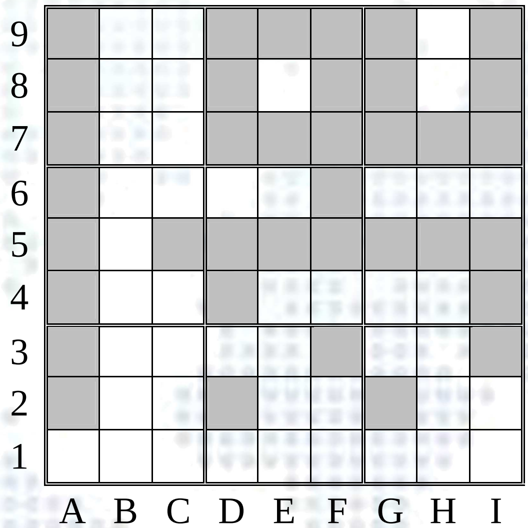
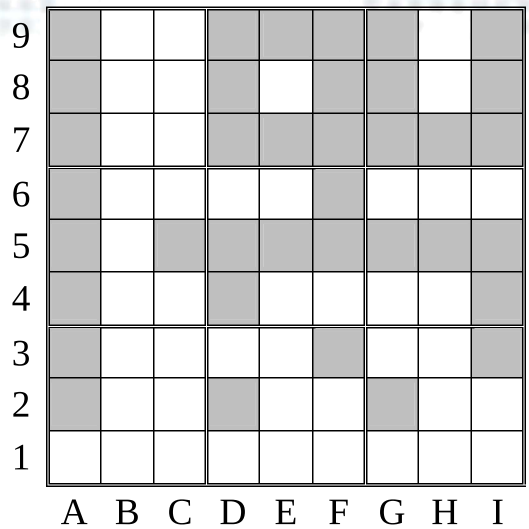
1. In the 9×9 table in the following diagram, some squares are shaded. Mark 9 of the squares with “X” so that there is a marked square in each row, each column and each of the nine 3×3 subtables defined by the double lines. Shaded squares may not be marked.





Answer: ______________________________

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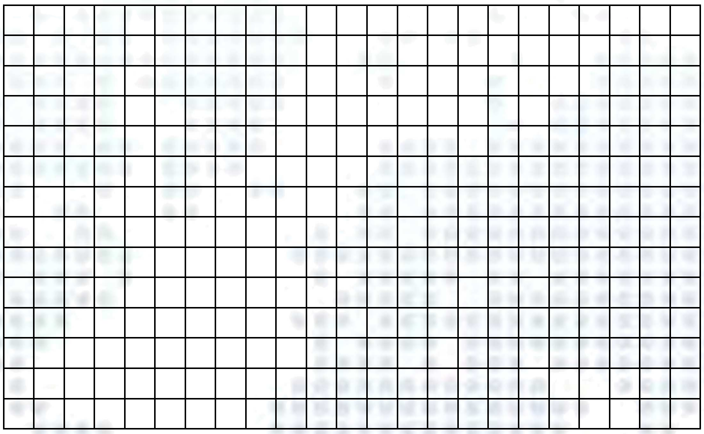
2. A 14×23 piece of paper is divided by grid lines into 1×1 squares. We wish to cut out square pieces of paper of different sizes along the grid lines. What is the largest number of pieces we can get? Prove that no larger value can work, and give an example to show that your answer can be realized.



Answer: ________ pieces,

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3. There is a machine with five slots. Each slots can receive two cards as input and in most cases will produce a new card as output. All cards have positive integers on them. The output from the $+$, $-$, $\times$ or $\div$ slots is the sum, the difference, the product or the quotient. If the difference or the quotient is not a positive integer, there is no output. The output from the $\sim$ slot is a number obtained by writing the second input immediately after the first input. For example, we get 102 if we input 10 and 2, or 210 if we input 2 and 10. All input cards are returned. Starting with two cards with the numbers 1 and 2, find a way of getting a card with the number 2015, using the machine only five times. Every time we use a slot it counts as a separate operation.

Answer:

1st time:Input cards	and	insert into the slot	,then get card
2nd time:Input cards	and	insert into the slot	,then get card
3rd time:Input cards	and	insert into the slot	,then get card
4th time:Input cards	and	insert into the slot	,then get card
5th time:Input cards	and	insert into the slot	,then get card

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4. Twenty rabbits are hopping along the same path in the same direction, each at a different constant speed. The first rabbit leaves the starting point at noon. Each of the other rabbits leaves one minute after the preceding one. The second rabbit catches up with the first rabbit two minutes after it starts hopping. The third rabbit catches up with the second rabbit three minutes after it starts hopping. The pattern continues, so that the twentieth rabbit catches up with the nineteenth rabbit twenty minutes after it starts hopping. How many minutes past noon does the twentieth rabbit catch up with the first rabbit?

Answer: ____________ minutes past noon

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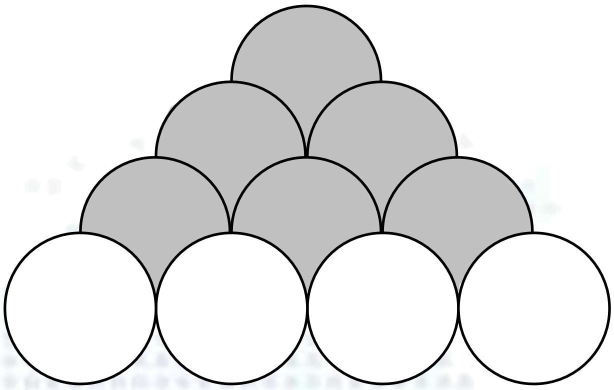
5. The diagram below shows ten circles each of radius 1 cm long. The four circles in the front row are tangent to their neighbours and their centres lie on the same line. For each of the six circles behind, the top semicircle runs between the highest points of two circles in the row in front. Calculate the area, in cm^2, of the figure excluding the four circles in the front row. You may make take π to be 3.14.



Answer: ____________________ cm^2

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6. A tennis club has six players numbered 1 to 6. Two of them are to be chosen to represent the club in a tournament. Five assistant coaches make the following recommendations: "#4 and #5", "#3 and #6", "#5 and #6", "#2 and #5" and "#1 and #3". The head coach ignores both players recommended by one of the assistant coaches, and chooses exactly one player from the recommendation of each of the other four. Which are the two chosen players?

Answer: # and #

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7. The numbers 2, 3, 4, 5, 6, 7, 8 and 9 are to be put into four pairs such that the sum of the two numbers in each pair is a prime. How many different ways are there to split these numbers into four pairs?

Answer: ____________________ ways

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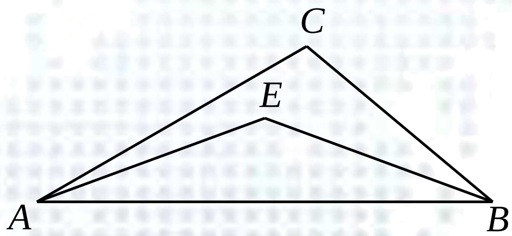
8. E is a point inside triangle ABC such that $AE = BE = BC$ and $\angle ABE = \angle CBE = 20°$. Find the measure, in degrees, of $\angle CAE$.



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Answer: ________________

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9. Find the largest number consisting of one copy of each of the digits 1 to 9, such that the sum of any two adjacent digits is a multiple of 5, 7 or 11.

Answer: ____________________

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10. A three-digit number does not contain the digit 9. When each digit is increased by 1, the product of the digits of the new number is three times the product of the digits of the original number. How many such numbers are there?

Answer: ________________