

Assam Academy of Mathematics
Assam Mathematics Olympiad 2026
Category I (Classes V - VI)
30th August 2026

Full marks : 100

Time : 3 hours

There are 18 questions. Questions 1 to 5 carry 2 marks each. Questions 6 to 13 carry 5 marks each. Questions 14 to 18 carry 10 marks each. Calculators or any other electronic or digital devices are strictly prohibited.

ইয়াত 18 টা প্ৰশ্ন আছে। 1 ৰ পৰা 5 লৈ প্ৰতিটো প্ৰশ্নত 2 নম্বৰকৈ আছে। 6 ৰ পৰা 13 লৈ প্ৰতিটো প্ৰশ্নত 5 নম্বৰকৈ আছে। আৰু 14 ৰ পৰা 18 লৈ প্ৰতিটো প্ৰশ্নত 10 নম্বৰকৈ আছে। কেলকুলেটৰ বা অন্য কোনো বৈদ্যুতিক বা ডিজিটেল সঁজুলি সম্পূৰ্ণৰূপে নিষিদ্ধ।

There may be various other ways of solutions than those shown here. Queries or suggestions regarding the solutions can be mailed to mail@aamonline.in

ইয়াত দেখুওৱা ধৰণবিলাকৰ বাহিৰেও প্ৰশ্নবোৰৰ সমাধানৰ আন বিভিন্ন উপায় থাকিব পাৰে। সমাধানবোৰৰ বিষয়ে কিবা প্ৰশ্ন বা পৰামৰ্শ থাকিলে mail@aamonline.in লৈ মেইল কৰিব পাৰে।

1. Find the missing terms in the sequence by observing the pattern :

তলত দিয়া অনুক্ৰমটোৰ চানেকিটো নিৰীক্ষণ কৰি খালী ঠাইত হ'বলগীয়া পদকেইটা নিৰ্ণয় কৰা:

234	***	456	567	***	***
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Ans : 234, 345, 456, 567, 678, 789.

2. Arrange the numbers in increasing order :

তলত দিয়া সংখ্যাসমূহক উৰ্ধ্বক্ৰমত সজোৱা :

3082026, 2026308, 8302026, 2026830

Assamese version :

Ans : $2026308 < 2026830 < 3082026 < 8302026$.

3. If the secret code for *EDGE* is 7697 and that for *FACE* is 8357 what is the secret code for *DECADE* ?

যদি *EDGE* ৰ বাবে গুপ্ত সংকেত 7697 হয় আৰু *FACE* ৰ বাবে গুপ্ত সংকেত 8357 হয়, তেন্তে *DECADE* ৰ বাবে গুপ্ত সংকেত কি হ'ব?

Ans : Observe the codes for *EDGE* and *FACE*. A careful observation gives $E \rightarrow 7, D \rightarrow 6, G \rightarrow 9, F \rightarrow 8, A \rightarrow 3, C \rightarrow 5$. But the natural positions of E, D, G, F, A, C in the English alphabet are 5, 4, 7, 6, 1, 3. So, 2 is added to the natural positions of each letter to create the code. So, $D \rightarrow 6, E \rightarrow 7, C \rightarrow 5$ and $A \rightarrow 3$. So, the secret code for *DECADE* is 675367.

4. Anup has three rolls of ribbon of lengths 30m, 42m and 66m. He wants to cut all three rolls into pieces of equal length, without leaving any ribbon unused. What is the greatest possible length of each piece and how many pieces does he get all together ?

অনুপৰ ওচৰত 30 মিটাৰ, 42 মিটাৰ আৰু 66 মিটাৰ দৈৰ্ঘ্যৰ তিনিটা ৰিবনৰ নুৰা আছে। সি তিনিওটা নুৰাত থকা ৰিবনখিনি এনেভাৱে সমান সমান দৈৰ্ঘ্যৰ টুকুৰা কৰি কাটিব বিচাৰে যাতে ৰিবনৰ কোনো অংশ ব্যৱহাৰ নোহোৱাকৈ থাকি নাযায়। সি কাটি উলিওৱা ৰিবনৰ প্ৰতিটো টুকুৰাৰ সৰ্বোচ্চ সম্ভৱপৰ দৈৰ্ঘ্য কিমান হ'ব আৰু সি মুঠ কিমান টুকুৰা ৰিবন কাটি উলিয়াব পাৰিব নিৰ্ণয় কৰা।

Ans : Required greatest length is the HCF (or GCD) of 30, 42, 66. We have $30 = 2 \times 3 \times 5$, $42 = 2 \times 3 \times 7$ and $66 = 2 \times 3 \times 11$. So HCF is $2 \times 3 = 6$. The number of cut pieces of ribbons is $\frac{30}{6} + \frac{42}{6} + \frac{66}{6} = 5 + 7 + 11 = 23$.

5. Strike out 10 digits from the number 12345123451234512345 so that the remaining number is as large as possible.

12345123451234512345 সংখ্যাটোৰ পৰা 10টা অংক এনেভাৱে কাটি পেলোৱা যাতে অৱশিষ্ট সংখ্যাটোৰ মান সৰ্বোচ্চ হয়।

Ans : We have to keep 10 digits. To make the remaining number as large as possible, we choose each digit as large as possible while leaving enough digits to complete a 10-digit number. The first digit must be chosen from the first 11 digits, and the largest available digit is 5, so we retain the first 5. Applying the same idea again, we retain the next 5. The largest possible third digit, while leaving seven more digits to the right, is 3; after choosing it, the remaining seven digits must be 4512345. Hence, the largest possible number is 5534512345.

6. A car had 33 litres of fuel when it started its journey. It travelled 120 kms and stopped at a petrol pump. After refuelling 10 litres of petrol, the fuel meter indicated 35 litres. Find the mileage of the car i.e. the distance travelled per litre.

যাত্ৰা আৰম্ভ কৰাৰ সময়ত এখন গাড়ীত 33 লিটাৰ ইন্ধন আছিল। গাড়ী খনে 120 কিঃমিঃ অতিক্ৰম কৰাৰ পাছত এটা পেট্ৰ'ল পাম্পত ব'ল। নতুনকৈ 10 লিটাৰ ইন্ধন ভৰোৱাৰ পাছত গাড়ীখনৰ ইন্ধনৰ মিটাৰটোত 35 লিটাৰ দেখুৱালে। গাড়ীখনৰ মাইলেজ অৰ্থাৎ প্ৰতিলিটাৰ ইন্ধন সাপেক্ষে অতিক্ৰম কৰা দূৰত্ব নিৰ্ণয় কৰা।

Ans : Fuel left in the car after travelling 120 kms, i.e. just before re-fuelling, is $35 - 10 = 25$ litres. Thus, fuel used in travelling 120 kms is $33 - 25 = 8$ litres. So, mileage is $120/8 = 15$ kms per litre.

Alternatively, fuel used for travelling 120 kms is $33 + 10 - 35 = 8$ litres. So, mileage is $120/8 = 15$ kms per litre.

7. Numbers that read the same when read from left to right or from right to left are called palindrome numbers. For example, 1221, 2772 etc. Find all the four digit palindrome numbers that are divisible by 9.

যিবোৰ সংখ্যাৰ অংকসমূহ বাওঁফালৰ পৰা সোঁফাললৈ অথবা সোঁফালৰ পৰা বাওঁফাললৈ একেই হয়, সেই সংখ্যাবোৰক পেলিনড্ৰ'ম সংখ্যা বুলি কোৱা হয়। উদাহৰণস্বৰূপে, 1221, 2772 আদি। চাৰিটা অংকবিশিষ্ট এনেকুৱা আটাইবোৰ পেলিনড্ৰ'ম সংখ্যা নিৰ্ণয় কৰা যিবোৰ 9 ৰে সম্পূৰ্ণৰূপে বিভাজ্য হয়।

Ans : Four digit palindrome numbers are of the form $abba$ where $a \neq 0$. Since the numbers are divisible by 9, so the sum of the digits $a + b + b + a = 2(a + b)$ is divisible by 9. So, $a + b$ should be divisible by 9. Hence, $a + b = 9$ or 18 . Thus, all such numbers are 9009, 8118, 7227, 6336, 5445, 4554, 3663, 2772, 1881 and 9999.

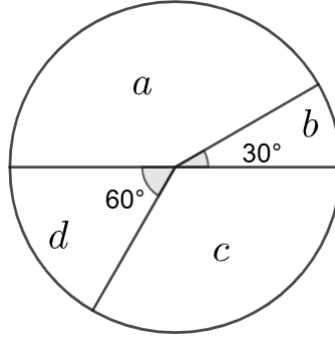
8. A school has 151 girls and 139 boys. What is the minimum number of buses needed for all of them to go on a trip if each bus can carry at most 25 students ?

এখন স্কুলত 151 জনী ছোৱালী আৰু 139 জন ল'ৰা আছে। এটা ভ্ৰমণলৈ যাবলৈ তেওঁলোকক সৰ্বনিম্ন কিমানখন বাছৰ প্ৰয়োজন হ'ব যদিহে প্ৰতিখন বাছত অতি বেছি 25 গৰাকী শিক্ষাৰ্থীয়ে যাত্ৰা কৰিব পাৰে?

Ans : Total number of students is $151 + 139 = 290$. We divide it by 25 and see that the quotient is 11 and remainder is 15. Thus, $25 \times 11 = 275$ students are accommodated in 11 buses and one more bus is required to accommodate 15 students. Hence, 12 buses are required.

9. What fractions of the circle are represented by the portions $a, b, c, d, a + c$ and $b + d$?

$a, b, c, d, a + c$ আৰু $b + d$ খণ্ডকেইটাই তলত দিয়া বৃত্তটোৰ কিমান কিমান অংশক প্ৰতিনিধিত্ব কৰি আছে নিৰ্ণয় কৰা।



Ans : $b = \frac{30^\circ}{360^\circ} = \frac{1}{12}$, $a = \frac{1}{2} - \frac{1}{12} = \frac{12}{24} - \frac{2}{24} = \frac{10}{24} = \frac{5}{12}$. Alternatively, $a = \frac{(180 - 30)^\circ}{360^\circ} = \frac{5}{12}$.
Further, $d = \frac{60^\circ}{360^\circ} = \frac{1}{6}$ and $c = \frac{1}{2} - \frac{1}{6} = \frac{1}{3}$. Also, $a + c = \frac{5}{12} + \frac{1}{3} = \frac{9}{12} = \frac{3}{4}$. Again,
 $b + d = \frac{1}{12} + \frac{1}{6} = \frac{3}{12} = \frac{1}{4}$.

10. A milkman usually mixes milk and water in the ratio 5:3 but because of shortage he added an extra one litre water to 16 litres of his mixture before supplying. What is the ratio of milk and water in the new mixture ?

এজন গুৱালে সাধাৰণতে 5 : 3 অনুপাতত গাখীৰ আৰু পানী মিহলি কৰে। কিন্তু গাখীৰৰ নাটনিৰ বাবে তেওঁ আগৰ 16 লিটাৰৰ মিশ্ৰণ এটাত 1 লিটাৰ অতিৰিক্ত পানী যোগ দিলে। এই নতুন মিশ্ৰণটোত গাখীৰ আৰু পানীৰ অনুপাত কিমান হ'ব নিৰ্ণয় কৰা।

Ans : Amount of milk in 16 litres of mixture is $\frac{5}{8} \times 16 = 10$ and amount of water is $\frac{3}{8} \times 16 = 6$. After adding one more litre water, the amount of water is $6 + 1 = 7$ litres. So, ratio of milk and water is 10 : 7.

11. Write a 9-digit number such that interchanging the places of any two digits results in a bigger number. How many such numbers exist ?

9-অংকবিশিষ্ট এনেকুৱা এটা সংখ্যা লিখি উলিওৱা যিটোৰ যিকোনো দুটা অংকৰ স্থান সাল-সলনি কৰি পোৱা সংখ্যাটো আগৰ সংখ্যাটোতকৈ ডাঙৰ হয়। এনেকুৱা সংখ্যা মুঠ কিমানটা থাকিব?

Ans : The required number must have its digits in strictly increasing order, because if any digit on the left is bigger than a digit on the right, then interchanging their places will make the number smaller. Also, no two digits can be equal, because exchanging equal digits will not change the number. Since it is a 9-digit number and the digit 0 cannot occur in a strictly increasing 9-digit number, the only possible number is 123456789. Hence, there is only 1 such number.

12. A box contains crayons of four different colours: red, blue, green, and yellow. Without looking, what is the smallest number of crayons that must be taken from the box to be certain that at least two of them have the same colour?

এটা বাকচত ৰঙা, নীলা, সেউজীয়া আৰু হালধীয়া এই চাৰিটা ৰঙৰ ৰঙপেঞ্চিল আছে। বাকচটোৰ ফালে নোচোৱাকৈ আটাইতকৈ কম কিমানডাল ৰঙপেঞ্চিল উলিয়াই আনিলে আমি এনেকুৱা এটা পৰিস্থিতিত উপনীত হ'ম য'ত আমাৰ হাতত অতি কমেও দুডাল একে ৰঙৰ ৰঙপেঞ্চিল থাকিব?

Ans : It is possible that the first four crayons drawn have four different colours, one of each colour. Therefore, drawing four crayons does not guarantee a matching pair. The fifth crayon must have one of these four colours, so it will have the same colour as at least one of the first four crayons. Hence, the smallest required number is 5.

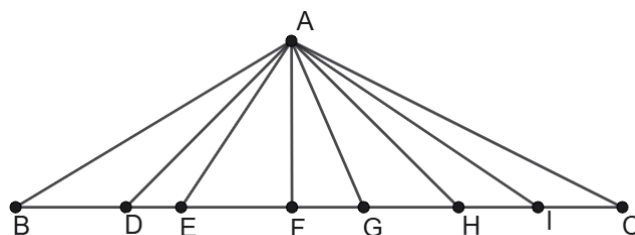
13. How many six digit numbers of the type $5x89y1$ can you form such that the sum of the digits is 30 ? Write all such numbers.

$5x89y1$ এই আৰ্হিৰ এনেকুৱা কিমানটা ছয় অংকবিশিষ্ট সংখ্যা থাকিব যাতে ইয়াৰ অংকসমূহৰ যোগফল 30 হয়? এনেকুৱা আটাইবোৰ সংখ্যা লিখি উলিওৱা।

Ans : $5 + x + 8 + 9 + y + 1 = 30$ i.e. $23 + x + y = 30$ i.e. $x + y = 7$. All possible values of x and y are $x = 0, y = 7$; $x = 1, y = 6$; $x = 2, y = 5$; $x = 3, y = 4$; $x = 4, y = 3$; $x = 5, y = 2$; $x = 6, y = 1$ and $x = 7, y = 0$. Thus there are 8 such numbers. They are 508971, 518961, 528951, 538941, 548931, 558921, 568911 and 578901.

14. How many triangles are there in the following figure ?

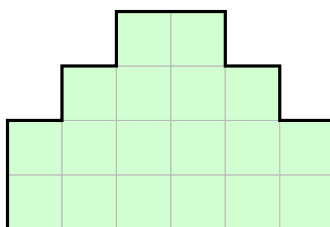
তলত দিয়া চিত্ৰটোত কিমানটা ত্ৰিভুজ আছে নিৰ্ণয় কৰা।



Ans : Of course one can start naming all possible triangles and count the number of triangles ! But that's quite difficult actually. Instead we try a smarter way out. Observe that there are 8 points on the base and all the triangles have a common vertex A . Start counting all possible triangles of the form ABx where x is a point from among the points on the base other than B . There are 7 such points. Hence, there are 7 such triangles of the type ABx . Next, count triangles of the type ADx . There are 6 such triangles. Note that ADB was already counted as ABD . So, we can just continue the counting process from left to right. There are 5 triangles of the form AEx , 4 of the type AFx , 3 of the type AGx , 2 of the type AHx and 1 of the type AIx . Hence there are $7 + 6 + 5 + 4 + 3 + 2 + 1 = 28$ triangles.

15. During a school exhibition, the Eco-Club wants to have the following display stage using square mats, each measuring $1\text{ m} \times 1\text{ m}$:

স্কুলৰ প্ৰদৰ্শনী এখনৰ সময়ত স্কুলখনৰ ইকো ক্লাবটোৱে তলত দিয়াধৰণে মঞ্চৰ মজিয়াখন বৰ্গাকৃতিৰ দলিচাৰে ঢাকি পেলাব খুজিছে যাৰ প্ৰতিখনৰ আকাৰ 1 মিটাৰ $\times$ 1 মিটাৰ।



Answer the following questions, showing your reasoning:

- Find the area and the perimeter of the display stage. 3
- The whole stage is to be covered with a decorative sheet costing Rs. 35 per square metre. A ribbon costing Rs. 18 per metre is to be placed along the outer boundary. Find the total cost of the sheet and the ribbon. 2
- Construct all possible rectangular stages that can be designed using all the above mats. 3

- (d) Do all the designs require the same cost of decorative sheet ? Which design requires the least cost for placing the ribbon on the outer boundary ? 2

সঠিক যুক্তি প্রদর্শন কৰি তলৰ প্ৰশ্ন সমূহৰ উত্তৰ দিয়া:

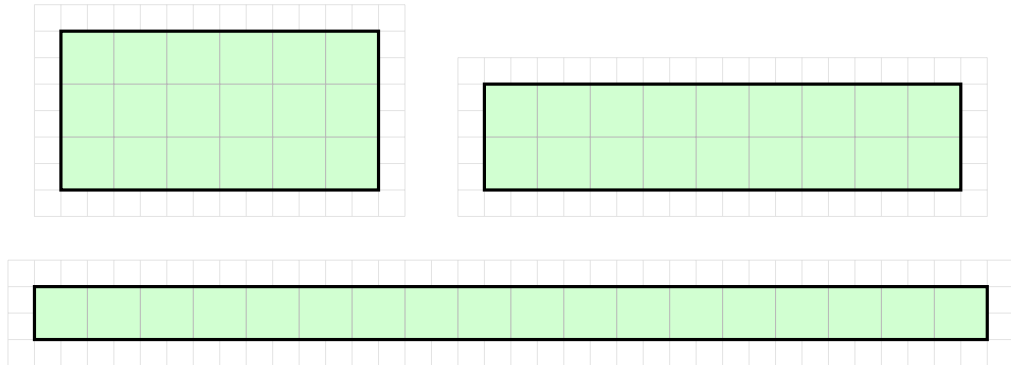
- (a) মঞ্চৰ মজিয়া খনৰ কালি আৰু পৰিসীমা নিৰ্ণয় কৰা। 3
- (b) গোটেই মঞ্চখন এখন সৌন্দৰ্যবৰ্ধক চাদৰেৰে ঢাকি পেলোৱা হ'ব যাৰ প্ৰতি বৰ্গমিটাৰৰ খৰচ 35 টকা। ইয়াৰ বাহিৰৰ চাৰিসীমাতো এডাল ৰিবন লগোৱা হ'ব যাৰ প্ৰতি মিটাৰৰ খৰচ 18 টকা। চাদৰখন আৰু ৰিবনডালৰ মুঠ খৰচ কিমান হ'ব নিৰ্ণয় কৰা। 2
- (c) ওপৰত দিয়া দলিচাকেইখনেৰে ঢাকিব পৰা আটাইবোৰ সম্ভৱপৰ আয়তাকাৰ মঞ্চৰ নক্সা অংকন কৰা। 3
- (d) এই আটাইবোৰ নক্সাৰ মজিয়াবোৰ সৌন্দৰ্যবৰ্ধক চাদৰেৰে ঢাকিব বিচাৰিলে আগৰ নিচিনা সেই একে খৰচ পৰিবনে? কোনটো নক্সাৰ বাবে চাদৰখনৰ বাহিৰৰ চাৰিসীমাত লগোৱা ৰিবনৰ খৰচ আটাইতকৈ কম হ'ব ? 2

Ans : The number of mats can be counted row-wise. The bottom two rows contain 6 mats each, the next row contains 4 mats, and the top row contains 2 mats. Therefore, the total number of mats is $6 + 6 + 4 + 2 = 18$. Since each mat has area $1 \times 1 = 1$ square metre, the total area of the stage is $18 \times 1 = 18$ sq m.

Beginning at the bottom-left corner and moving once around the stage, the successive boundary lengths are 6, 2, 1, 1, 1, 1, 2, 1, 1, 1, 1, and 2 metres. Hence, the perimeter is $6 + 2 + 1 + 1 + 1 + 1 + 2 + 1 + 1 + 1 + 1 + 2 = 20$ m. The faint lines between neighbouring mats are not included because they lie inside the stage. They are common sides of two mats and do not form any part of the outside boundary.

The cost of the decorative sheet is $18 \times 35 = \text{Rs. } 630$. The length of ribbon required is equal to the perimeter, which is 20 m. Therefore, the cost of the ribbon is $20 \times 18 = \text{Rs. } 360$. Hence, the total cost is $630 + 360 = \boxed{\text{Rs. } 990}$.

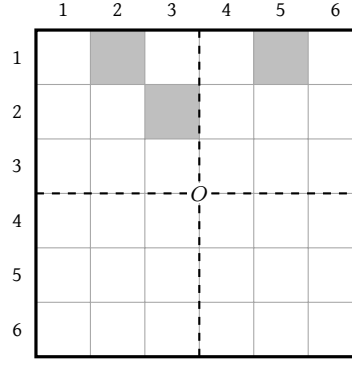
Since $18 = 3 \times 6 = 2 \times 9 = 1 \times 18$, so the following rectangular stages are possible : (d)



All the four designs have the same carpet area i.e. 18. However, the perimeters are different. For the 3×6 rectangular stage, perimeter is $2 \times (3 + 6) = 18$. For the 2×9 rectangular stage, perimeter is $2 \times (2 + 9) = 22$. For the 1×18 rectangular stage, perimeter is $2 \times (1 + 18) = 38$. Hence, the 3×6 rectangular stage requires the least cost for placing the ribbon on the outer boundary.

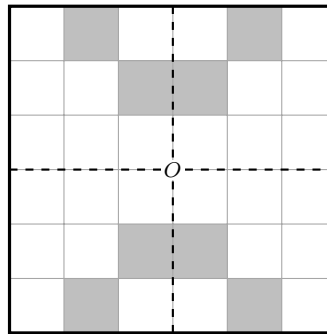
16. A student is shading the small squares in a 6×6 square grid. The dashed lines pass through the centre O of the grid. Three small squares have already been shaded, as shown in the figure.

এগৰাকী ছাত্ৰই 6×6 আকাৰৰ বৰ্গাকৃতিৰ সজ্জা এটাত থকা সৰু বৰ্গবোৰত ৰঙ কৰি আছে। ফুট ফুটকৈ দিয়া ৰেখাখণ্ডবোৰ এই সজ্জাটোৰ কেন্দ্ৰ O ৰে পাৰ হৈ গৈছে। তলত দেখুওৱাধৰণে তিনিটা সৰু বৰ্গ ইতিমধ্যে ৰঙ কৰা হৈছে।



- (a) What is the smallest possible number of additional squares that are to be shaded so that the dashed lines become the lines of symmetry of the shaded design ? Draw the completed pattern. 3
- (b) What fraction of the whole 6×6 grid is shaded in the completed design ? 1
- (c) Find the smallest angle by which the figure can be rotated to get the same figure. 2
- (d) What is the smallest number of shaded squares that must be erased so that the new design has exactly one line of symmetry ? Draw two such designs. 4
- (a) আটাইতকৈ কম কিমানসংখ্যক অতিৰিক্ত বৰ্গত ৰঙ কৰিলে এই ফুট ফুটকৈ দিয়া ৰেখাখণ্ডবোৰ ৰঙীণ সজ্জাটোৰ সমমিতি ৰেখা হৈ পৰিব? এই নতুনকৈ সম্পূৰ্ণ কৰা নক্সাটো অংকন কৰা । 3
- (b) এনেদৰে সম্পূৰ্ণ কৰা নক্সাটোত গোটেই 6×6 আকাৰৰ সজ্জাটোৰ কিমান অংশ ৰঙ কৰা হৈছে? 1
- (c) এই নক্সাটো আটাইতকৈ সৰু কিমান কোণত ঘূৰালে আমি আকৌ সেই আগৰ নক্সাটো পাম নিৰ্ণয় কৰা । 2
- (d) ইয়াৰ পৰা আটাইতকৈ কম সংখ্যক কিমানটা ৰঙীণ বৰ্গ মচি পেলালে এই নতুন নক্সাটোত মাত্ৰ এডাল সমমিতি ৰেখা থাকিব? এনেকুৱা দুটা নক্সা অংকন কৰা । 4

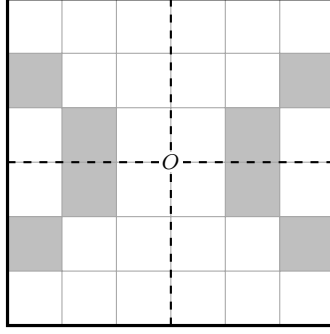
Ans : Since the horizontal and vertical dashed lines are the lines of symmetry, so we need to shade the square of 1st row 5th column. Then, taking mirror image about the horizontal dashed line, we get the following design :



Thus, at least $1 + 4 = 5$ additional squares have to be shaded. Leaving any one of these squares unshaded will disturb the conditions of symmetry. Hence, fewer than 5 squares won't work.

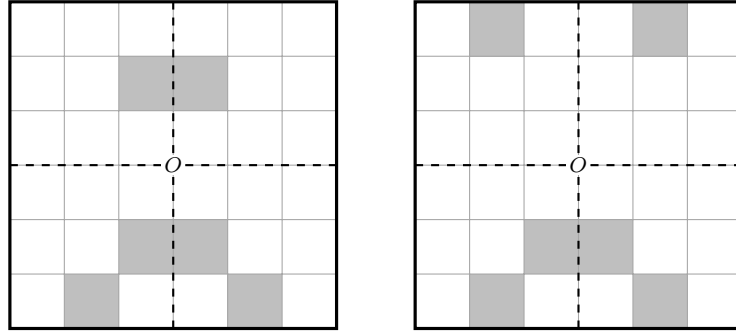
It is easy to see that $\frac{8}{36} = \frac{2}{9}$ of the square grid is shaded.

Rotating by 90° will give the following design which is not same as the original :



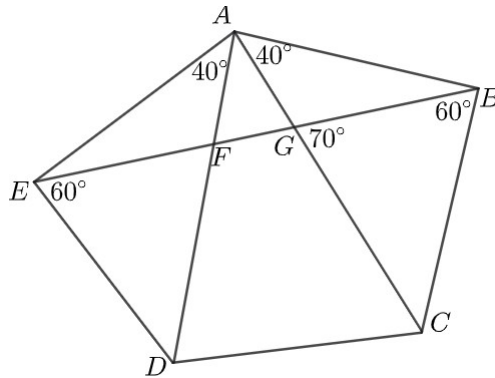
However, rotating by another 90° i.e. by rotating the original figure by 180° ($1/2$ turn), we get back the same design. Rotating by any other angle doesn't give the same design. So, the smallest angle for rotational symmetry is 180° .

If we erase one square, the symmetry about both the lines is disturbed. So, we need to erase one of its corresponding squares as well. The remaining shades will still keep the design symmetrical. So, the minimum number of squares to be erased for keeping exactly one line of symmetry is 2. Two such designs are :



17. Find all the angles $\angle ABC, \angle BCD, \angle CDE, \angle DEA, \angle EAB$ of the pentagon $ABCDE$, given that $AF = AG$ and $AD = AC$.

$ABCDE$ পঞ্চভুজটোৰ $AF = AG$ আৰু $AD = AC$ । তেন্তে $\angle ABC, \angle BCD, \angle CDE, \angle DEA, \angle EAB$ কোণকেইটাৰ মান নিৰ্ণয় কৰা।



Ans : We have $\angle AGF = \angle BGC = 70^\circ$, being vertically opposite angles. Also, $AF = AG$. So, $\angle AFG = \angle AGF = 70^\circ$. Hence, in $\triangle AFG$, $\angle FAG = 180^\circ - (70^\circ + 70^\circ) = 40^\circ$. Thus, $\angle EAB = \angle EAF + \angle FAG + \angle GAB = 40^\circ + 40^\circ + 40^\circ = 120^\circ$.

$\angle AGB$ and $\angle BGC$ form a linear pair. So, $\angle AGB + \angle BGC = 180^\circ$ i.e. $\angle AGB = 180^\circ - 70^\circ = 110^\circ$. Hence, in $\triangle ABG$, $\angle ABG = 180^\circ - (40^\circ + 110^\circ) = 30^\circ$. So, $\angle ABC = 30^\circ + 60^\circ = 90^\circ$.

Also, $\angle AFE = 180^\circ - \angle AFG = 180^\circ - 70^\circ = 110^\circ$. So, in $\triangle AFE$, $\angle AEF = 180^\circ - (40^\circ + 110^\circ) = 30^\circ$. So, $\angle AED = 30^\circ + 60^\circ = 90^\circ$.

Next, in $\triangle ADC$, $AD = AC$ and so $\angle ADC = \angle ACD$. Thus, $\angle ADC + \angle ACD + \angle DAC = 180^\circ$ which gives $2\angle ADC = 180^\circ - 40^\circ$ i.e. $\angle ADC = \angle ACD = 70^\circ$. In $\triangle ADE$, $\angle ADE = 180^\circ - (40^\circ + 90^\circ) = 50^\circ$. Similarly, in $\triangle ABC$, $\angle ACB = 180^\circ - (40^\circ + 90^\circ) = 50^\circ$. We now have, $\angle CDE = \angle ADC + \angle ADE = 70^\circ + 50^\circ = 120^\circ$. Also, $\angle BCD = \angle ACB + \angle ACD = 50^\circ + 70^\circ = 120^\circ$.

18. Consider the lock and key holders as shown in the figure with each lock placed above its own key.

L_1	L_2	L_3
K_1	K_2	K_3

L_1	L_2	L_3	L_4
K_1	K_2	K_3	K_4

- (a) For three pairs of lock and key, write all possible rearrangements of the locks so that no lock is placed above its correct key. How many such rearrangements are possible ? 3
- (b) For four pairs of lock and key, write all possible rearrangements of the locks so that no lock is placed above its correct key. How many such rearrangements are possible ? 7

তলৰ চিত্ৰটোত দেখুওৱাধৰণে তলা আৰু চাবি থোৱা ঠাইৰ সজ্জাটো লক্ষ্য কৰা য'ত প্ৰতি পাট চাবিৰ ঠিক ওপৰত ইয়াৰ সঠিক তলাটো থোৱা আছে।

L_1	L_2	L_3
K_1	K_2	K_3

L_1	L_2	L_3	L_4
K_1	K_2	K_3	K_4

- (a) তিনিযোৰ তলা আৰু চাবিৰ বাবে সম্ভৱপৰ আটাইবোৰ সাজোন লিখি উলিওৱা য'ত কোনোটো তলা ইয়াৰ সঠিক চাবি পাটৰ ওপৰত নাথাকে। এনেকুৱা মুঠ কিমানটা সাজোন থাকিব পাৰে? 3
- (b) চাৰিযোৰ তলা আৰু চাবিৰ বাবে সম্ভৱপৰ আটাইবোৰ সাজোন লিখি উলিওৱা য'ত কোনোটো তলা ইয়াৰ সঠিক চাবি পাটৰ ওপৰত নাথাকে। এনেকুৱা মুঠ কিমানটা সাজোন থাকিব পাৰে? 7

Ans : We see that the following arrangements are possible without any condition

L_1	L_2	L_3
K_1	K_2	K_3

L_1	L_3	L_2
K_1	K_2	K_3

L_2	L_3	L_1
K_1	K_2	K_3

L_2	L_1	L_3
K_1	K_2	K_3

L_3	L_1	L_2
K_1	K_2	K_3

L_1	L_2	L_3
K_1	K_2	K_3

It is easy to see that only two of the arrangements satisfy the condition that no lock is placed above its correct key.

L_2	L_3	L_1
K_1	K_2	K_3

L_3	L_1	L_2
K_1	K_2	K_3

For four locks, we write all the possibilities and see that there are nine arrangements where

L_2	L_1	L_4	L_3
K_1	K_2	K_3	K_4

L_2	L_3	L_4	L_1
K_1	K_2	K_3	K_4

L_2	L_4	L_1	L_3
K_1	K_2	K_3	K_4

L_3	L_1	L_4	L_2
K_1	K_2	K_3	K_4

L_3	L_4	L_1	L_2
K_1	K_2	K_3	K_4

L_3	L_4	L_2	L_1
K_1	K_2	K_3	K_4

L_4	L_1	L_2	L_3
K_1	K_2	K_3	K_4

L_4	L_3	L_2	L_1
K_1	K_2	K_3	K_4

L_4	L_3	L_1	L_2
K_1	K_2	K_3	K_4