

Assam Academy of Mathematics
Assam Mathematics Olympiad 2025
Category I (Classes V - VI)

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.

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।

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. A person buys a piece of cloth of length 2 m 50 cm at the rate of Rs 250 per metre. What is the total cost of the cloth ?

এজন মানুহে 2 মিটাৰ 50 চেণ্টিমিটাৰ দৈৰ্ঘ্যৰ এটুকুৰা কাপোৰ 250 টকা প্ৰতি মিটাৰ হাৰত ক্ৰয় কৰিলে কাপোৰ টুকুৰাৰ মুঠ মূল্য কিমান হ'ব ?

Ans : 2 m 50 cm = 2 m + 0.5 m = 2.5 m. Hence, total cost is Rs $250 \times 2.5 = 625$.

2. Find the largest prime number that divides 111111.

111111 সংখ্যাটোক হৰণ কৰিব পৰা আটাইতকৈ ডাঙৰ মৌলিক সংখ্যাটো নিৰ্ণয় কৰা।

Ans : Observe that 111111 is divisible by 3. $111111 = 3 \times 37037 = 3 \times 37 \times 1001 = 3 \times 37 \times 7 \times 11 \times 13$. So, the largest prime factor is 37.

3. A usual black and white chess board is taken and 11 white squares are recoloured black. What fraction of the chess board is now covered with black squares ?

এখন সাধাৰণ বগা - ক'লা দৰা বোৰ্ডৰ 11 টা বগা বৰ্গক্ষেত্ৰত যদি ক'লা ৰঙ লগোৱা হয় তেন্তে সম্পূৰ্ণ দৰা বোৰ্ডখনৰ কিমান ভগ্নাংশ ক'লা ৰঙেৰে আঙুৰি থাকিব ?

Ans : A chess board contains $8 \times 8 = 64$ squares out of which 32 are white and 32 are black. Now, 11 white squares are coloured black. So, the number of black squares is $32 + 11 = 43$. Thus, $\frac{43}{64}$ part of the board is covered with black squares.

4. Nita plucked 365 oranges from the trees in her garden and placed them in baskets with 25 oranges in each basket. How many baskets of 25 oranges each can she fill ? How many oranges will be left out after filling up all these baskets ?

নীতাই তেওঁলোকৰ বাগিচাৰ গছবোৰৰ পৰা 365 টা কমলা চিঙি 25 টাকৈ কিছুমান খৰাহীত ভৰালে। তেওঁক কিমানটা খৰাহীৰ প্ৰয়োজন হ'ল ? খৰাহীবোৰ পূৰ্ণ হোৱাৰ পিছত কিমানটা কমলা বাকী থাকিল ?

Ans : $365 = 25 \times 14 + 15$. Thus, she will need 14 baskets and 15 oranges will be left out.

5. A jumping race was organized among a monkey, a rabbit and a kangaroo. The monkey can jump 4 metres at once, the rabbit can jump 2 metres at once and the kangaroo can jump 9 metres at once. They start together and assume that all three of them finish together at the finishing mark making jumps of above lengths only. What is the minimum length of the racing track ?

এটা বান্দৰ, এটা শহাপহু আৰু এটা কেঙ্গৰুৰ মাজত জঁপিয়াই দৌৰা প্ৰতিযোগিতা এখন অনুষ্ঠিত কৰা হ'ল। বান্দৰে এজাঁপত 4 মিটাৰ, শহাপহুৱে এজাঁপত 2 মিটাৰ আৰু কেঙ্গৰুৱে এজাঁপত 9 মিটাৰ আগবাঢ়ে। সিহঁতে এঠাইৰ পৰা

একেলগে দৌৰা আৰম্ভ কৰি একেসময়তে আৰু এক নিৰ্দিষ্ট স্থানত দৌৰা শেষ কৰিলে আটায়ে দৌৰা পথছোৱাৰ নূন্যতম দূৰত্ব কিমান হ'ব ?

Ans : Minimum length should be the LCM of 4, 2, 9 i.e. 36 metres.

6. Complete the following multiplication where each * represents some digit from 0 to 9 :

তলৰ পূৰণ অঙ্কটোৰ * চিহ্নিত স্থান সমূহত যথাবিহিত মান বহুৱাই ইয়াক সম্পূৰ্ণ কৰা । ‘*’ 0 ৰ পৰা 9 ৰ ভিতৰত থকা অঙ্ক ।

$$\begin{array}{r} \quad \quad * \quad * \quad 4 \\ \times 1 \quad * \quad * \\ \hline \quad \quad * \quad * \quad 4 \\ * \quad * \quad 2 \quad 0 \quad 0 \\ * \quad * \quad 4 \quad 0 \quad 0 \\ \hline * \quad * \quad 9 \quad 2 \quad * \end{array}$$

Ans : The unit digit of the second number must be either 1 or 6. It can be checked that putting 6, we won't get the other values as given. The student is encouraged to try with unit digit 1. As the tens digit in the product is 2, the only option for the tens digit of the first number is 2 because it will be multiplied by 1 only. Proceeding this way, the following can be obtained :

$$\begin{array}{r} \quad \quad 3 \quad 2 \quad 4 \\ \times 1 \quad 5 \quad 1 \\ \hline \quad \quad 3 \quad 2 \quad 4 \\ 1 \quad 6 \quad 2 \quad 0 \quad 0 \\ 3 \quad 2 \quad 4 \quad 0 \quad 0 \\ \hline 4 \quad 8 \quad 9 \quad 2 \quad 4 \end{array}$$

7. A packet of fruits containing 5 mangoes, 3 apples and 7 oranges costs Rs. 350. Also, a packet of fruits containing 2 mangoes, 1 apple and 3 oranges costs Rs. 170. How much does a packet containing 16 mangoes, 9 apples and 23 oranges cost ?

5 টা আম, 3 টা আপেল আৰু 7 টা সুমথিৰাৰে গঠিত এটা ফলৰ পেকেটৰ মূল্য 350 টকা । আনহাতে, 2 টা আম, 1 টা আপেল আৰু 3 টা সুমথিৰাৰে গঠিত এটা ফলৰ পেকেটৰ মূল্য 170 টকা । তেন্তে 16 টা আম, 9 টা আপেল আৰু 23 টা সুমথিৰাৰে গঠিত এটা পেকেটৰ মূল্য কিমান হ'ব ?

Ans : There are two types of packets whose costs are known. If we take two packets costing Rs 350, then we get 10 mangoes, 6 apples and 14 oranges. Thus we need 6 more mangoes, 3 more apples and 9 more oranges. It's easy to see that we can get these by taking 3 packets of Rs 170. Thus, total cost is $2 \times 350 + 3 \times 170 = 1210$. Alternatively, we can solve it using equations :

Let the cost of one mango, one apple and one orange be x, y, z respectively. Then, $5x + 3y + 7z = 350$ and $2x + y + 3z = 170$. Thus,

$$16x + 9y + 23z = (10x + 6y + 14z) + (6x + 3y + 9z) = 2(5x + 3y + 7z) + 3(2x + y + 3z) = 2 \times 350 + 3 \times 170 = 1210.$$

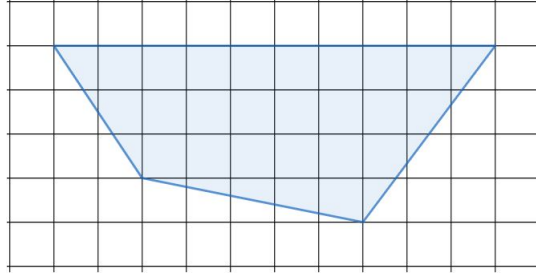
8. Anil runs around a square field of side 150 m, Lina runs around a rectangular field with length 160 m and breadth 105 m. Who covers more distance and by how much ?

অনিলে 150 মিটাৰ দৈৰ্ঘ্যৰ বৰ্গ আকৃতিৰ পথাৰ এখন আৰু লীনাই 160 মিটাৰ দীঘল আৰু 105 মিটাৰ বহল আয়তাকাৰ পথাৰ এখনৰ চাৰিওফালে দৌৰিলে কোনে কিমান বেছি দূৰত্ব অতিক্রম কৰিব ?

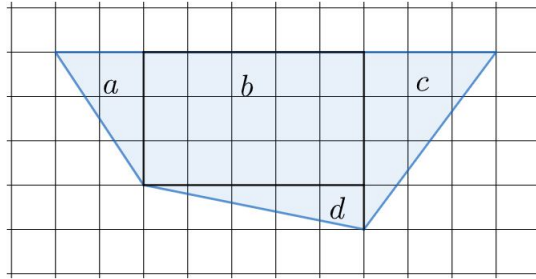
Ans : Distance covered by Anil in one round = Perimeter of the square = $4 \times 150 = 600$ m.
Distance covered by Lina in one round = Perimeter of the rectangle = $2(160 + 105) = 530$ m.
Thus, Anil covers more distance i.e. $600 - 530 = 70$ m more distance.

9. Each small square in the following diagram is of side 1 cm. Find the area of the shaded shape in sq. cm.

তলৰ চিত্ৰটোত প্ৰতিটো সৰু বৰ্গৰ দীঘ 1 চে.মি হ'লে ছায়াযুক্ত অংশৰ কালি উলিওৱা।



Ans : We can split the entire area into parts a, b, c, d and count the number of small squares in each part. Area a is half of 6 squares i.e. 3 sq. cm. Area b is 15 sq. cm. Area c is half of 12 squares i.e. 6 sq. cm. Area d is half of 5 squares i.e. 2.5 sq. cm. Thus, the required area is $3 + 15 + 6 + 2.5 = 26.5$ sq. cm.



10. Forty students of Class V are selected for a program. They belong to sections A, B, C and D as per the following distribution :

কোনো এক কাৰ্যসূচীৰ বাবে পঞ্চম শ্ৰেণীৰ 40 গৰাকী শিক্ষাৰ্থীক বাছনি কৰা হ'ল আৰু নিম্নোক্ত বণ্টন অনুসৰি তেওঁলোক A, B, C, D শাখাৰ অন্তৰ্ভুক্ত।

A B A A C C D D A D
B B A C C B A D C A
A C C A B B D A D C
D D A A C C D D A A

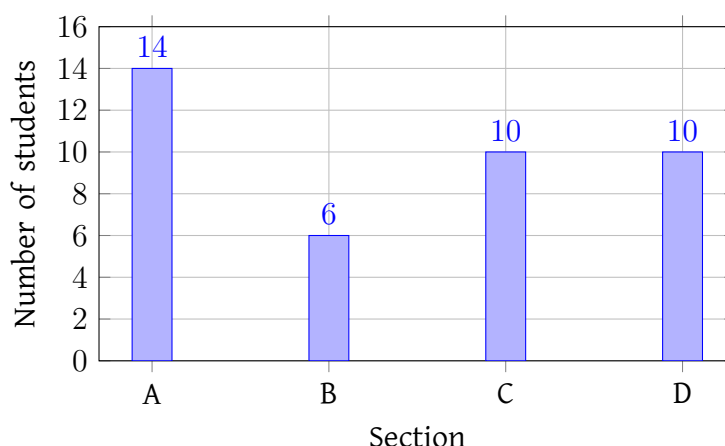
Draw a bar graph in plain paper to represent the number of students that belong to each section. Which section are the maximum number of students from ? (Graph paper is not necessary.)

প্ৰতিটো শাখাৰ পৰা কিমানজন শিক্ষাৰ্থী বাছনি কৰা হ'ল দেখুৱাবলৈ উকা কাগজত এডাল দণ্ডলেখ আঁকা। কোনটো শাখাৰ শিক্ষাৰ্থী সৰ্বোচ্চ সংখ্যক অন্তৰ্ভুক্ত হৈছে ?

Ans : We first organize the data with tally marks to get the number of students from each section.

A		14
B		6
C		10
D		10

For drawing the bar graph, we mark the sections A, B, C, D on the X-axis and the number of students on the Y-axis. The bar graph is drawn as under :



The maximum number of students is from section A.

11. A girl was asked by her teacher to subtract 3 from a certain number and then divide the result by 9 but by mistake she subtracted 9 and then divided the result by 3. She got 43 as the answer. What would have been her answer if she had solved the problem correctly?

শিক্ষক এজনে তেওঁৰ এগৰাকী ছাত্ৰীক এটি নিৰ্দিষ্ট সংখ্যাৰ পৰা 3 বিয়োগ কৰি পোৱা বিয়োগ ফলটোক 9 ৰে হৰণ কৰিব ক'লে। ভুলবশতঃ ছাত্ৰীগৰাকীয়ে সংখ্যাটোৰ পৰা 9 বিয়োগ কৰি ফলাফলটোক 3 ৰে হৰণ কৰি উত্তৰ 43 পালে। ছাত্ৰীগৰাকীয়ে শিক্ষকে সোধা অনুসৰি সঠিককৈ কৰা হ'লে উত্তৰ কিমান হ'লহেতেন?

Ans : Subtracting 9 and dividing by 3, the result is 43. So, the number must be $43 \times 3 + 9 = 138$. Hence, if she had solved the problem correctly, the result would have been $\frac{138 - 3}{9} = 15$.

12. How many three digit numbers contain exactly one digit 0 ? For example, 205 is a number containing exactly one digit 0 but 400 is not such a number as it contains two digits 0.

শূন্য(0) অঙ্কটো মাথোঁ এবাৰহে ব্যৱহাৰ কৰি কিমানটা তিনি অঙ্কীয়া সংখ্যা লিখিব পাৰি। (উদাহৰণ- 205 হৈছে এনে এটি সংখ্যা য'ত 0 মাথোঁ এবাৰহে ব্যৱহাৰ কৰা হৈছে আনফালে 400 এনে সংখ্যা নহয়, কাৰণ ইয়াত '0' দুই বাৰ ব্যৱহাৰ কৰা হৈছে)

Ans : There are $9 \times 9 = 81$ three digit numbers with only the unit digit 0. There are $9 \times 9 = 81$ three digit numbers with only the tens digit 0. We don't need to consider hundreds digit 0 as such numbers won't be of three digits. Thus, there are $81 + 81 = 162$ three digit numbers contain exactly one digit 0.

13. Line segment AG is of length 100 units, B is the mid-point of AG , C is the mid-point of BG , D is the mid-point of CG , E is the mid-point of DG and F is the mid-point of EG . Find the lengths of the line segments AB , AC , AD , AE and AF .

তলত দিয়া AG ৰেখাখণ্ডৰ দৈৰ্ঘ্য 100 একক। B হ'ল AG ৰ মধ্যবিন্দু, C হ'ল BG ৰ মধ্যবিন্দু, D হ'ল CG ৰ মধ্যবিন্দু, E হ'ল DG ৰ মধ্যবিন্দু আৰু F হ'ল EG ৰ মধ্যবিন্দু। AB , AC , AD , AE আৰু AF ৰ দীঘ নিৰ্ণয় কৰা।



Ans : $AB = \frac{1}{2} \times 100 = 50$ m. $AC = AB + BC = 50 + \frac{1}{2} \times 50 = 50 + 25 = 75$ m.
 $AD = AC + CD = 75 + \frac{1}{2} \times 25 = 75 + 12.5 = 87.5$ m. $AE = AD + DE = 87.5 + \frac{1}{2} \times 12.5 = 87.5 + 6.25 = 93.75$ m. $AF = AE + EF = 93.75 + \frac{1}{2} \times 6.25 = 93.75 + 3.125 = 96.875$ m.

14. The product of six integers is 1. Write all possible values of the sum of these six integers.

ছয়টা অখণ্ড সংখ্যাৰ পূৰণফল 1 হ'লে এনেধৰণৰ অখণ্ড সংখ্যাৰ সম্ভাৱ্য যোগফলবোৰ লিখা ।

Ans : Since the product of six integers is 1, so the integers can be either 1 or -1 . Also, as the product is 1 which is positive, so there can be only even number of -1 , otherwise the product will be negative. There are the following possibilities :

All are 1 - Sum in this case is $1 + 1 + 1 + 1 + 1 + 1 = 6$.

Four are 1, two are -1 - Sum in this case is $1 + 1 + 1 + 1 - 1 - 1 = 2$.

Two are 1, four are -1 - Sum in this case is $1 + 1 - 1 - 1 - 1 - 1 = -2$.

All are -1 - Sum in this case is $-1 - 1 - 1 - 1 - 1 - 1 = -6$.

15. A magic square is a square grid filled with distinct numbers (i.e. without repetition) such that the sum of the numbers in each row, each column, and both the main diagonals is the same. Complete the following 3×3 magic square using the numbers from 42 to 50 only. (Hint : Observe that the sum of the numbers in each row will be $(42 + 43 + \dots + 50)/3$.)

যাদু বৰ্গ (Magic Square) হ'ল এখন বৰ্গাকাৰ জালি যাৰ প্ৰতিটো ঘৰত বেলেগ বেলেগ সংখ্যা এনেদৰে ভৰোৱা থাকে যে, প্ৰতিটো শাৰী, স্তম্ভ আৰু উভয় কৰ্ণত থকা সংখ্যাবোৰ যোগ কৰিলে একেই যোগফল পোৱা যায় । তলত দিয়া যাদু বৰ্গটোৰ খালী ঘৰবোৰ 42 ৰ পৰা 50 লৈ সংখ্যাবোৰ এবাৰকৈ লৈ পূৰ্ণ কৰা । (দৃষ্টি: মন কৰিবা যে প্ৰতিটো শাৰীৰ সংখ্যাবোৰৰ সমষ্টি হ'ব $(42+43 + \dots + 50)/3$)

		47
	50	43

Ans : The sum of all the numbers from 42 to 50 is 414. Thus, the sum in each row or column or diagonal i.e. the magic sum must be $\frac{414}{3} = 138$. Thus, successive computation from existing values in the square gives the following magic square :

49	42	47
44	46	48
45	50	43

16. Rohit and Virat play a game of choosing positive integers. The choice is called *lucky* if the sum is 14. For example, Rohit chooses 2 and Virat chooses 12 or Rohit chooses 8 and Virat chooses 6. How many *lucky* choices are possible in the game ? Next, Siraj also joins the game. So, the choice is *lucky* if the sum of the three numbers chosen by them is 14. How many *lucky* choices are possible now ?

ৰোহিত আৰু বিৰাটে অথগু ধনাত্মক সংখ্যা বাছনি কৰাৰ এবিধ খেল খেলে । এই বাছনিটো ভাগ্যশালী (Lucky) বুলি কোৱা হ'ব যদি সংখ্যা দুটাৰ যোগফল 14 হয় । উদাহৰণ স্বৰূপে, ৰোহিতে যদি 2 বাছে আৰু বিৰাটে 12 নাইবা ৰোহিতে যদি 8 বাছে আৰু বিৰাটে 6 তেন্তে সেই বাছনিবোৰ ভাগ্যশালী । এই খেলটোত কিমানটা ভাগ্যশালী বাছনি সম্ভৱ নিৰ্ণয় কৰা । লগতে যদি চিৰাজেও এই খেলটোত যোগদান কৰে আৰু তিনিওজনে কৰা ভাগ্যশালী বাছনি সংখ্যাৰ যোগফলো 14 হয়, তেন্তে, তিনিওজনৰ ক্ষেত্ৰত কিমানটা ভাগ্যশালী বাছনি সম্ভৱ হ'ব?

Ans : It's easy to see that the lucky choices are Rohit -1, Virat -13; Rohit -2, Virat -12; Rohit -3, Virat -11; Rohit -4, Virat -10; Rohit -5, Virat -9; Rohit -6, Virat -8; Rohit -7, Virat -7; Rohit -8, Virat -6; Rohit -9, Virat -5; Rohit -10, Virat -4; Rohit -11, Virat -3; Rohit -12, Virat -2; Rohit -13, Virat -1. Thus, there are exactly 13 lucky choices which can be obtained by putting Rohit's choices as 1, 2, 3, ..., 13 sequentially.

Now, if Siraj chooses 1, the sum of Rohit and Virat's numbers must be 13. So, there are 12 lucky choices in this case. If Siraj chooses 2, the sum of Rohit and Virat's numbers must be 12. So there are 11 lucky choices then. Similarly, if Siraj chooses 3, there are 10 lucky choices. Continuing this way, if Siraj chooses 12, there is 1 lucky choice. Hence, total number of lucky choices is $12 + 11 + 10 + 9 + \dots + 2 + 1 = 78$.

17. Find all the positive integers having at most 10 digits where the digits from left to right either increase or remain same and the product of the digits is equal to 30. For example, 1235 and 11156 are such numbers but 2135 and 61115 are not.

সৰ্বাধিক 10 টা অঙ্ক থকা আৰু এই অঙ্কবোৰ বাঁওফালৰ পৰা সোঁফাললৈ ডাঙৰ হৈ যোৱা নাইবা একেই থকা কিমানটা ধনাত্মক অখণ্ড সংখ্যা লিখিব পাৰি, যিবোৰৰ অঙ্কেইটাৰ পূৰণফল 30 হয় । উদাহৰণস্বৰূপে 1235 আৰু 11156 এনেধৰণৰ সংখ্যা, কিন্তু 2135 আৰু 61115 নহয় ।

Ans : $30 = 2 \times 3 \times 5$. Hence, 2, 3 and 5 are the only prime factors. Thus, the digits in the required numbers can be among 1, 2, 3, 5 and $6 = 2 \times 3$ only. Further, we can use at most 10 digits only. Writing 30 as $30 = 2 \times 3 \times 5$, the required numbers are 235, 1235, 11235, 111235, 1111235, 11111235 and 111111235. Again, writing $30 = 5 \times 6$, the required numbers are 56, 156, 1156, 11156, 111156, 1111156, 11111156 and 111111156.

18. A box contains 2025 cards of 7 different colours - violet, indigo, blue, green, yellow, orange and red. Justify what is the minimum number of cards that should be picked up so as to guarantee that

- at least two cards of the same colour are picked ?
- at least three cards of the same colour are picked ?
- at least four cards of the same colour are picked ?
- at least 290 cards of the same colour are picked ?

এখন বাকচত 7 টা ভিন্ন ৰঙৰ (বেঙুনীয়া, ঘননীলা, নীলা, সেউজীয়া, হালধীয়া, কমলা আৰু ৰঙা) 2025 টা কাৰ্ড থাকিলে বাকচটোৰ পৰা ন্যূনতম কিমানটা কাৰ্ড টানিলে তলত দিয়া চৰ্ত সমূহ নিশ্চিত কৰিব পাৰি ? যদি

- অন্ততঃ দুটা কাৰ্ড একেৰঙৰ হয় ।
- অন্ততঃ তিনিটা কাৰ্ড একেৰঙৰ হয় ।
- অন্ততঃ চাৰিটা কাৰ্ড একেৰঙৰ কাৰ্ড হয় ।
- অন্ততঃ 290 টা কাৰ্ড একেৰঙৰ হয় ।

Ans : Observe that if we just pick two cards, then they might not be of the same colour. Say, they may be violet and blue. Similarly, three cards picked may also be all different, say violet, indigo and blue. This way, we can see that even if seven cards are picked, they all may be of different colours as there are cards of 7 different colours. But if we pick 8 cards, they cannot be all of different colours as there are cards of 7 colours only. So, minimum 8 cards have to be picked so that at least two cards are of the same colour. To ensure at least three cards of the same colour, we see that in the worst possible case, there may be exactly two cards of the same colour. In such a case, we would have picked up $7 \times 2 = 14$ cards. So, minimum $2 \times 7 + 1 = 15$ cards have to be picked so that at least three cards are of the same colour. Similarly, minimum $7 \times 3 + 1 = 22$ cards have to be picked so that at least four cards are of the same colour. Next, to ensure that at least 290 cards are of the same colour, we consider the worst possibility where there are exactly 289 cards of each colour. In that case we would have picked $7 \times 289 = 2023$ cards. So, minimum $7 \times 289 + 1 = 2024$ cards have to be picked so that at least 290 cards are of the same colour. This problem motivates the idea behind Pigeonhole Principle. The student is encouraged to study more about it.