



APSMO
2023 MATHS EXPLORER

IMPORTANT

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2023 MATHS EXPLORER

ORGANISATION AND PROCEDURES

For full details, see the Members' Area

- Each Maths Explorer **paper** will contain 5 questions.
- The first two questions (A and B) are compulsory for ALL students. Questions C, D and E are included for those students who would benefit from attempting additional problems. Please submit the results for all questions attempted in papers 1 to 4.
- Organise students into small groups of 3 or 4 to work on the papers.

DO

- Supervise students at all times.
- Encourage students to discuss their reasoning within their group.
- Provide blank working paper.
- Collect, mark and retain the papers.

DO NOT

- Print the contest papers prior to the scheduled date.
- Interpret the questions for students.
- Permit the use of calculators or other electronic devices.

- Papers are to be scored by the PICO using the *Solutions and Answers* sheet provided.
- Results must be submitted within 7 days of completing the paper.

ABSENT STUDENTS

- Students who are absent on the scheduled date of the Maths Explorer paper, may sit the paper together (or independently) on their return to school.
- If an absent student does not sit the paper on their return to school they can be marked as 'absent'.



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WEDNESDAY 26 JULY 2023

MATHS
EXPLORER
3

Suggested Time: 30 Minutes

3A. Grandma's Purse

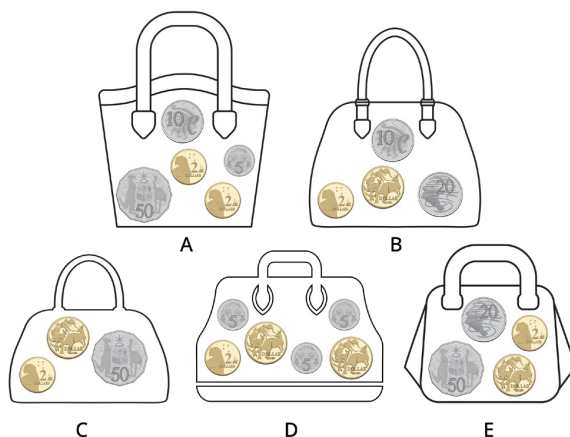
My Grandma has lost her purse. Can you find which one it is?

She has a \$1 coin.

She has more than
\$3.40.

She has an even number
of coins.

Two of her coins are the
same.



*Write your
answers in
the boxes on
the back.*

←
*Keep your
answers
hidden by
folding
backwards
on this line.*

3B. Nita's Party Game

17 children were lined up at Nita's party, waiting to play "Pin the Tail on the Donkey".

Nita's mum looked at the long line and decided to split the children into two groups.

She chose the first child in the line, and then every third child after that.

These children became the first group to play.

How many children had to wait to play in the second group?



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3A.

Student Name:

Fold here. Keep your answers hidden.

3B.



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3C. Pocket Money Difference

Piper, Artie, Zaria and Digby get either \$2.50, \$3.50, \$5.00 or \$6.50 pocket money each week.

Piper gets more pocket money than Zaria.

Digby doesn't get the most pocket money.

Zaria gets half as much pocket money as Digby.

The difference between Piper and Zaria's pocket money is \$1.00.

Altogether, how much pocket money are Zaria and Artie given?

3D. Egg Carton Challenge

Hector has 7 egg cartons in his trolley.

Each carton holds either 12 or 6 eggs.

Altogether he has 66 eggs.

How many of the 6-egg cartons does Hector have?

3E. Playing Card Shuffle

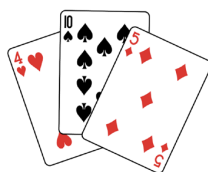
Four children each have some playing cards.

Scott gave Nita his lowest value card.

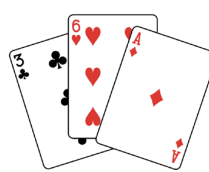
Grayson gave his odd numbered card to Scott.

Nita swapped her 4 of Clubs for Madeleine's 9 of Clubs.

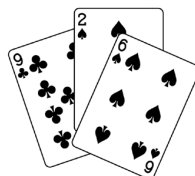
Which children now have at least one card with an odd number?



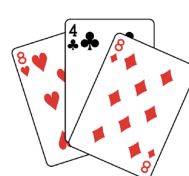
Grayson



Nita



Madeleine



Scott



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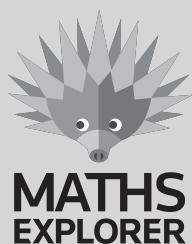
3C.

Student Name:

3D.

3E.

Fold here. Keep your answers hidden.

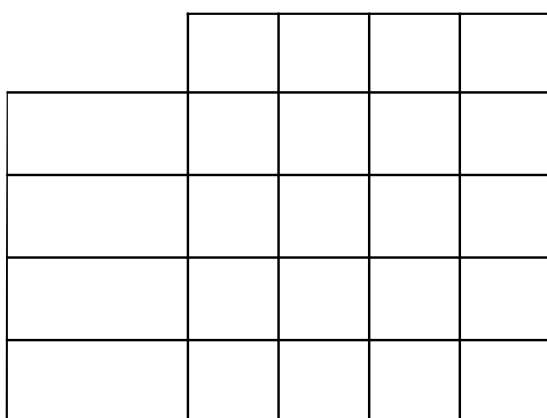
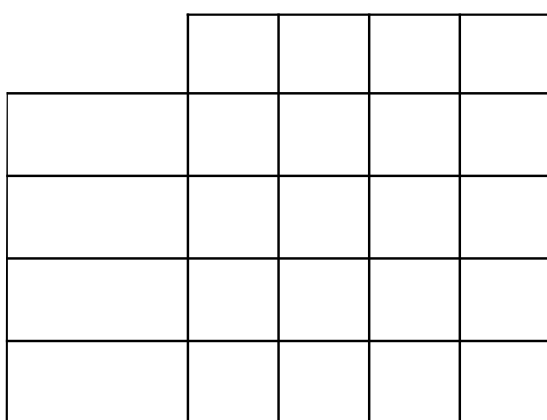


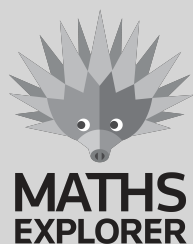
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For **3C**.

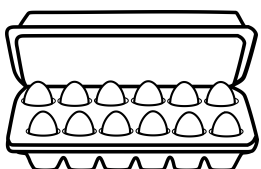
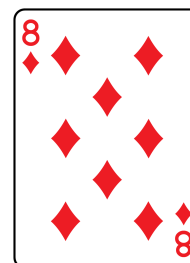
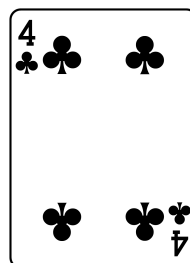
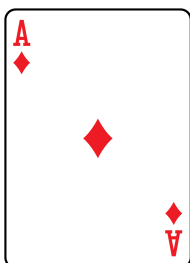
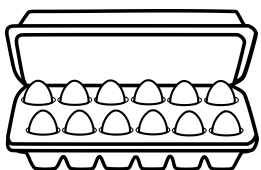
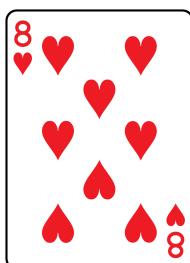
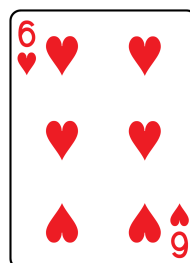
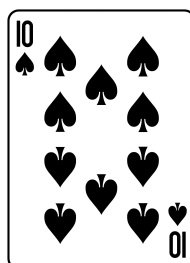
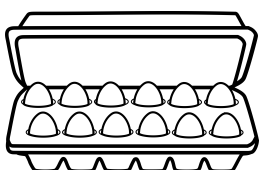
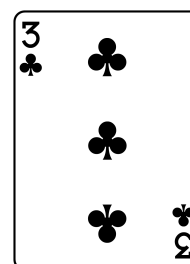
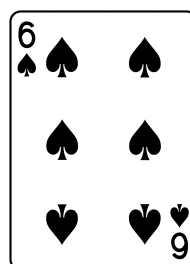
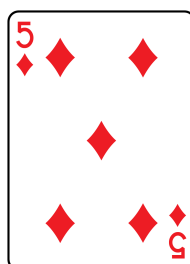
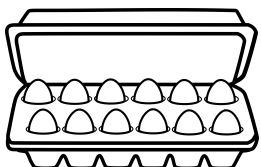
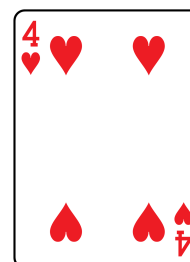
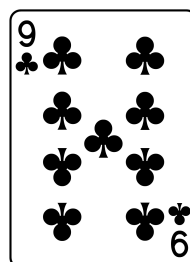
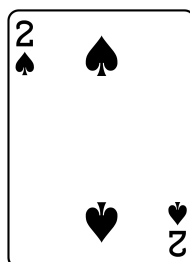
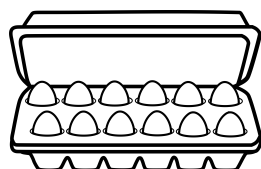




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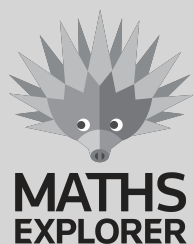
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For **3D**. Different coloured counters can also be used to represent cartons of eggs.

For **3E**. Sticky notes with numbers on them can also be used to represent playing cards.



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MATHS EXPLORER 3

A: D

B: 11

C: \$9

D: 3

E: Nita & Scott

3A. The question is:

My Grandma has lost her purse. Can you find which one it is?

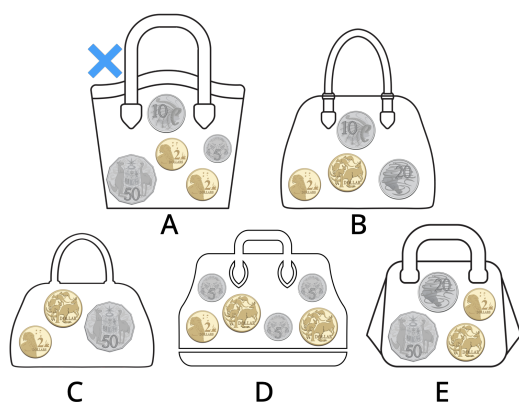
She has a \$1 coin.

She has more than \$3.40.

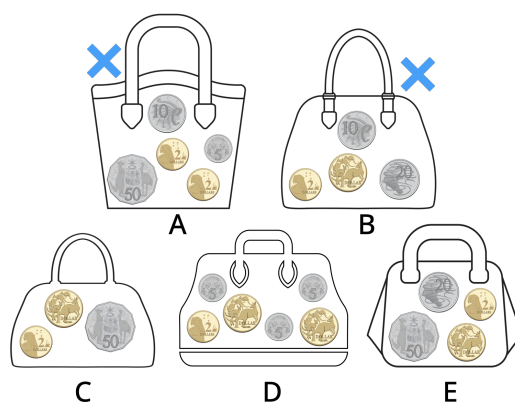
She has an even number of coins.

Two of her coins are the same.

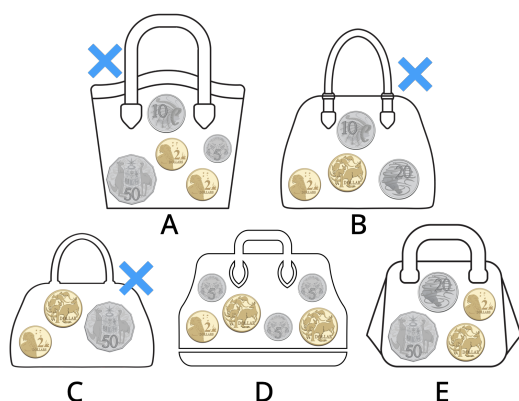
Strategy: Eliminate all but One Possibility



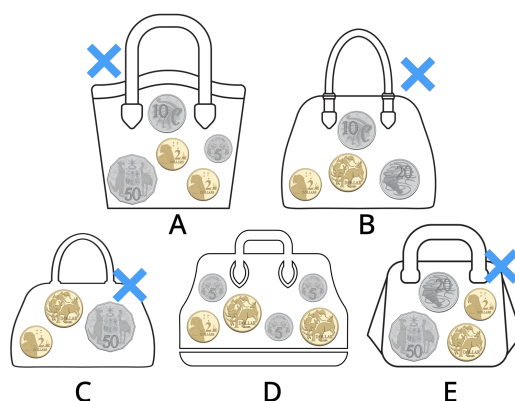
She has a \$1 coin. Eliminate A.



She has more than \$3.40. Eliminate B.

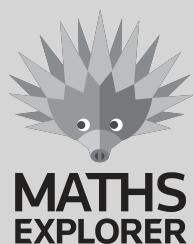


She has an even number of coins. Eliminate C.



Two of her coins are the same. Eliminate E.

All possibilities have been eliminated except for D.



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3B. The question is:

17 children were lined up at Nita's party, waiting to play pin the tail on the donkey.

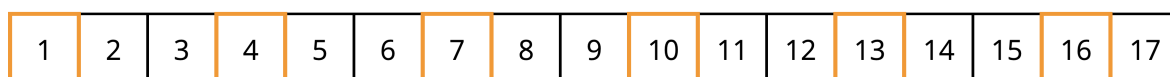
Nita's Mum looked at the long line and decided to split the children into two groups.

She chose the first child in the line, and then every third child after that.

These children became the first group to play.

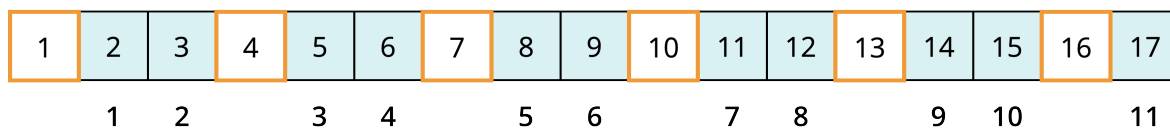
How many children are waiting to play in the second group?

Strategy: Draw a Diagram



Draw a diagram that represents 17 children standing in line.

Use a colour pencil (we've used orange) to mark the first child in the line, and then every third child after that.



Highlight and then count the children who were not selected. We highlighted in blue.

There are **11** children waiting to play in the second group.

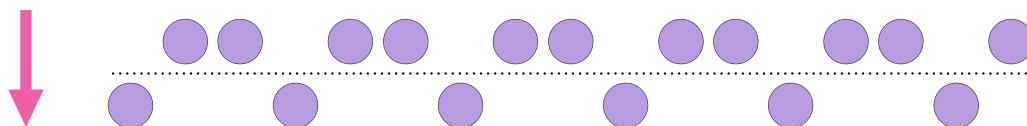
Strategy: Use Concrete Materials

Use a line of counters or buttons to represent the 17 children.

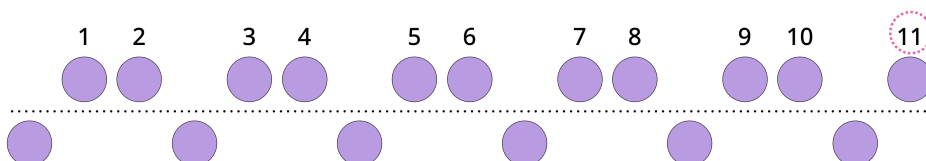


Slide the first counter forward, and every third counter after that.

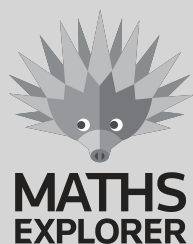
The pink arrow shows the direction the counters have moved.



Add up the number of counters or buttons that *didn't* move to make the first group to play.



There are **11** children waiting to play in the second group.



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3C. The question is:

Piper, Artie, Zaria and Digby get either \$2.50, \$3.50, \$5 or \$6.50 pocket money each week.

1. Piper gets more pocket money than Zaria.
2. Digby doesn't get the most pocket money.
3. Zaria gets half as much pocket money as Digby.
4. The difference between Piper and Zaria's pocket money is \$1.

Altogether, how much pocket money are Zaria and Artie given?

Strategy: Build a Table - Draw an Array

1) Draw an array and include the names of the children and the amounts of pocket money.

	\$2.50	\$3.50	\$5	\$6.50
Piper				
Artie				
Zaria				
Digby				

2) From the first clue we know that Piper doesn't get the smallest amount and Zaria doesn't get the most.

	\$2.50	\$3.50	\$5	\$6.50
Piper	X			
Artie				
Zaria				X
Digby				

3) The second clue let's us eliminate \$6.50 for Digby.

4) With the third clue, we can lock in \$2.50 for Zaria and \$5 for Digby. \$5 is the only amount that is double another.

	\$2.50	\$3.50	\$5	\$6.50
Piper	X			
Artie				
Zaria				X
Digby				X

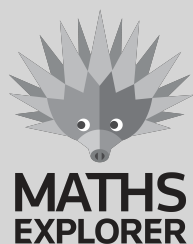
	\$2.50	\$3.50	\$5	\$6.50
Piper	X		X	
Artie	X		X	
Zaria	✓	X	X	X
Digby	X	X	✓	X

5) We know Zaria gets \$2.50. This means Piper is given \$3.50. We can lock these amounts in and then block.

6) This leaves \$6.50 for Artie.
Zaria and Artie's total is $\$2.50 + \$6.50 = \$9$

	\$2.50	\$3.50	\$5	\$6.50
Piper	X	✓	X	X
Artie	X	X	X	
Zaria	✓	X	X	X
Digby	X	X	✓	X

	\$2.50	\$3.50	\$5	\$6.50
Piper	X	✓	X	X
Artie	X	X	X	✓
Zaria	✓	X	X	X
Digby	X	X	✓	X



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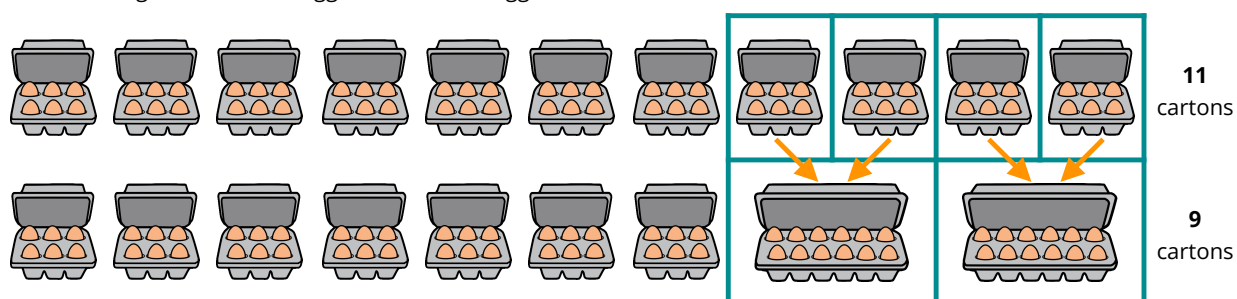
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3D. The question is:

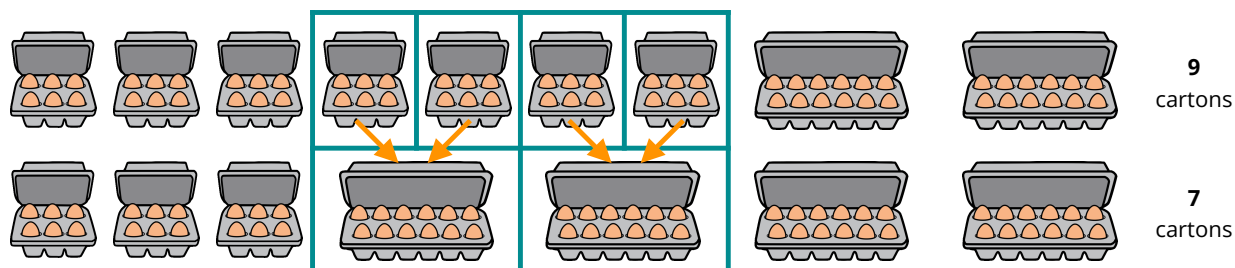
Hector has 7 egg cartons in his trolley.
Each carton holds either 12 or 6 eggs.
Altogether, he has 66 eggs.
How many of the 6 egg cartons does Hector have?

Strategy: Use Concrete Materials

We can make 66 eggs with 11 cartons of 6, but we need fewer cartons in our solution.
Let's exchange four of our 6 egg cartons for 12 egg cartons.



We now have 66 eggs in 9 cartons, but this is still too many cartons.
To fit 66 eggs into 7 cartons, we need to exchange four more of our 6 egg cartons for 12 egg cartons.



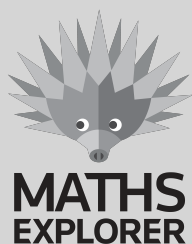
We now have 66 eggs in 7 cartons.
Hector has **three 6 egg cartons**.

Strategy: Build a Table

We can build a table to show the different totals possible when combining cartons of 6 and 12 eggs.

No. 6 egg cartons	1 (6 eggs)	2 (12 eggs)	3 (18 eggs)	4 (24 eggs)	5 (30 eggs)	6 (36 eggs)
No. 12 egg cartons	6 (72 eggs)	5 (60 eggs)	4 (48 eggs)	3 (36 eggs)	2 (24 eggs)	1 (12 eggs)
Total Number of Eggs:	78	72	66	60	54	48

Hector has **three 6 egg cartons**.



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3E. The question is:

Four children each have some playing cards.

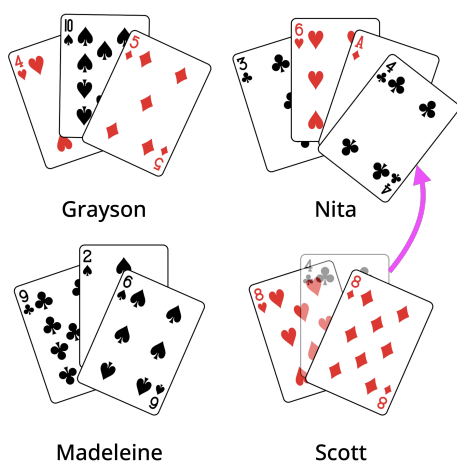
Scott gave Nita his lowest value card.

Grayson gave his odd numbered card to Scott.

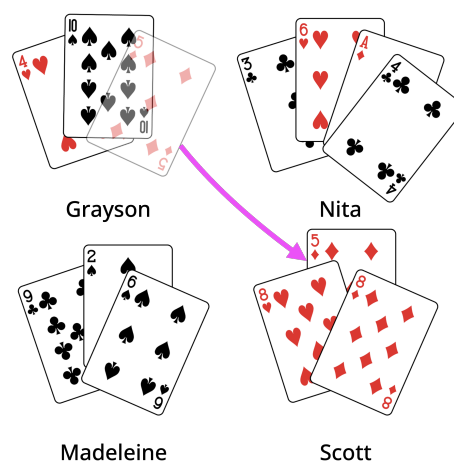
Nita swapped her 4 of clubs for Madeleine's 9 of clubs.

Which children now have at least one card with an odd number?

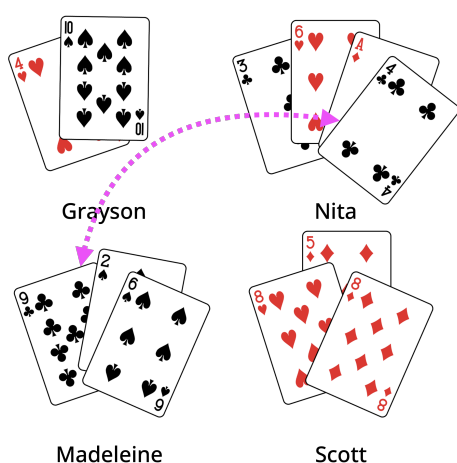
Strategy: Use Concrete Materials



Scott gave Nita his lowest value card.

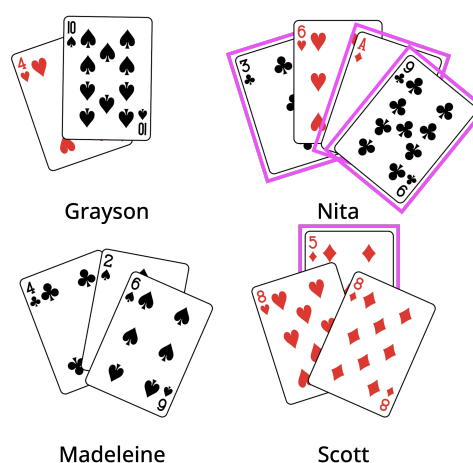


Grayson gave his odd numbered card to Scott.

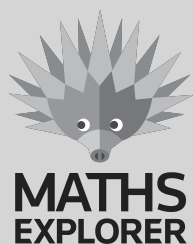


Nita swapped her 4 of clubs for Madeleine's 9 of clubs.

Which children had at least one card with an odd number?



Nita and **Scott** have at least one card with an odd number.



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3E. The question is:

Four children each have some playing cards.

Scott gave Nita his lowest value card.

Grayson gave his odd numbered card to Scott.

Nita swapped her 4 of clubs for Madeleine's 9 of clubs.

Which children now have at least one card with an odd number?

Strategy: Build a Table

Build a table that includes each child's name and record next to their name the number of odd numbered cards they start with.

Include a column for each of the three move.

	Move:	1	2	3
Grayson	1	1	0	0
Nita	2	2	2	3
Madeleine	1	1	0	0
Scott	0	0	1	1

1) Do any odd cards change hands in the first move? No

2) Do any odd cards change hands in the second move? Yes -
Grayson gives his odd card to Scott.

3) Do any odd cards change hands in the third move? Yes -
Madeleine swaps an odd card for one of Nita's even cards .

Nita and **Scott** have at least one card with an odd number.