



2022 Team Up Challenge

Instructions for Teachers

The Team Up Challenge is designed to encourage student participation and maximize flexibility for teachers. Working in teams of four, students flex their mathematical problem-solving skills through fun and engaging activities. The following instructions should be used as a suggestion only. Teachers should feel free to make modifications in order to suit their class.

Preparing Materials

In advance of running the Team Up Challenge, we recommend teachers prepare each part as indicated below, depending on whether students are participating in person or virtually. Students may want to use scrap paper and calculators as well.

In Person	
Team Paper	Print one copy of the problems per student and one answer sheet per team.
Crossnumber Puzzle	Print one copy of the puzzle sheet and clue sheets per team.
Logic Puzzle	Print one clue sheet and one answer sheet per student.
Relay	Print one copy of the problems and one answer sheet per team. Cut the problem sheets on the dotted lines.

Virtual	
Answer Sheets	<p>We have Answer Sheet Slides that teams can use to enter their answers for all four parts of the challenge. Note that teachers will need a Google account to set up the slides, but students will <i>not</i> need a Google account to use them. The Answer Sheet Slides can be found here: Answer Sheet Slides.</p> <p>Make a copy of the Answer Sheet Slides for each team. If you do not make a copy, you will not be able to edit the slides. To make a copy, select File > Make a Copy > Entire Presentation. Adjust the name as desired and click 'OK'.</p> <p>Share each team's Answer Sheet Slides with each team member so they can edit the slides. To do this, click 'Share' and then 'Change to anyone with the link'. Then change 'Viewer' to 'Editor' and click 'OK'. Then send the link for each team's slides to all team members. This can all be done in advance as there are no questions on the Answer Sheet Slides.</p>
Team Paper	Send the team paper file to all students when it is time to start.
Crossnumber Puzzle	Send the crossnumber puzzle file to all students when it is time to start.
Logic Puzzle	Send the logic puzzle file to all students when it is time to start. Note that the Answer Sheet Slides contain extra answer sheets for the logic puzzle.
Relay	<p>We have Relay Question Slides that can be used for students to view their relay questions. The slides can be found here: Relay Question Slides.</p> <p>Make a copy of the Relay Question Slides and then share it with each student so they can view (but not edit) the slides. See Answer Sheets instructions for how to make a copy and share it (but <i>do not</i> change 'Viewer' to 'Editor' this time). This can all be done in advance as the questions are initially covered up.</p>



Team Paper: Approximately 30 - 40 minutes

1. The paper contains 15 problems of increasing difficulty. Team members are encouraged to collaborate when solving the problems and should decide on a strategy for sharing the work. It is unlikely that there will be enough time for everyone to do every question.
2. Final answers are to be written on the Team Paper Answer Sheet.

Crossnumber Puzzle: Approximately 20 - 30 minutes

1. The team should divide themselves into two pairs; one pair will take the across clues and the other pair will take the down clues. The team will write their answers on the shared Crossnumber Puzzle Sheet as they work through the puzzle.
2. The crossnumber puzzle is designed so that some clues make it possible to find a number directly, some clues rely on an answer from another clue, and other clues require a partially completed puzzle board. Since each pair within a team is working on a different set of clues, the pairs will need to work together to completely solve the puzzle.
3. If teams are struggling to start the puzzle, teachers can direct them to Across Clues 15, 16, 18, and 23, or Down Clues 9, 11, and 14.

Logic Puzzle: Approximately 20 - 30 minutes

1. Students use the clues to solve the puzzle. Note that the clues are not given in a specific order, and at times students will need to combine the information given in several different clues.
2. Students can work through the puzzle individually, in pairs, or as a team. Answer sheets are provided for all students so team members can work individually and then compare their work in order to find a solution they all agree with.
3. Students are encouraged to use the answer sheet to write any information they know from the clues. This could include putting more than one name in a box, or indicating that two particular boxes must or must not contain the same name. This will help them reach the final answer.
4. If students are struggling to start the puzzle, teachers can direct them to Clues 2, 5, and 6.
5. Teams hand in only one Logic Puzzle Answer Sheet.

Relay: Approximately 5 - 10 minutes per relay

1. The “Practice Relay” is intended to be used as a practice round so students can understand the way the relay works. The questions in the Practice Relay are easier than the rest of the relay questions. Also, Player 1’s questions are the easiest in all relays.



- Each team member is assigned a number: 1, 2, 3, or 4. Each number corresponds to a specific problem in each relay. Players 2, 3, and 4 require the answer from Players 1, 2, and 3, respectively, to solve their problem. This is indicated in the problem with the phrase “Replace N below with the number you receive.” However, Players 2, 3, and 4 should be able to do some work on their problem while they’re waiting for the answer from their teammate.
- The four team members should not see any of the relay problems in advance and should not talk to each other during the relay. The remaining instructions will differ for in-person and virtual classrooms, as shown below.

In Person

- Before the relay starts, each student should have their relay problem face down in front of them.
- Once the relay starts, all players can flip over their paper and start working on their problem. *Even Players 2, 3 and 4 should be able to do some work on their problem right away.*
- When Player 1, Player 2, or Player 3 thinks they have the correct answer to their problem, they record their answer on the answer sheet and pass the sheet to the next player. Students should write only the numeric part of their answer and **not** include any units. When Player 4 thinks they have the correct answer to their problem, they record their answer on the answer sheet and wait for their teacher to check it.
- If all four answers are correct, the relay is complete! Otherwise, the teacher will mark the relay as incorrect and pass the answer sheet back to Player 1 so the team can try again. The answer sheet has space for two attempts for each relay.

Virtual

- Before the relay starts, all students should have the Relay Question Slides open to their relay problem and the Answer Sheet Slides open to the Relay Answer Sheet. *The problems in the Relay Question Slides are covered by boxes that only the teacher can remove.*
- Once the relay starts, the teacher quickly removes the four boxes covering each problem in that relay. At this time, all players can start working on their problem. *Even Players 2, 3 and 4 should be able to do some work on their problem right away.*
- When players think they have the correct answer to their problem, they record their answer on the Answer Sheet Slide so their teammates can see. Students should write only the numeric part of their answer and **not** include any units. After a team has put all four answers on their Answer Sheet Slide, the teacher can check their answers.
- If all four answers are correct, the relay is complete! Otherwise, the teacher will mark the relay as incorrect so the team can try again. The answer sheet has space for two attempts for each relay.



2022 Team Up Challenge

Team Paper



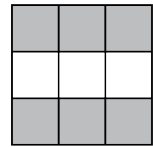
Tips to Get Started

- The questions in this paper increase in difficulty as you move through the paper. The last few questions require some careful thought.
- Each team member doesn't need to do every question. You can split the questions up, work together, or do a combination of both. Come up with a strategy that works for your team.

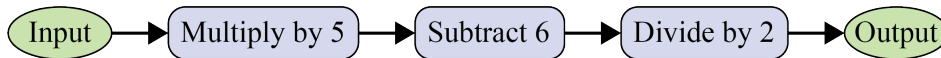
1. When the numbers 3.1, 3.001, 3.0001, 3.01, and 3.0000001 are arranged from least to greatest, what is the middle number?

2. A *line of symmetry* passes through the centre of a shape and divides the shape into two halves so that one half is the reflection of the other half.

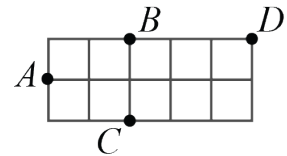
In the diagram, a square is divided into nine identical smaller squares, and six of these smaller squares are shaded. How many lines of symmetry does the diagram have?



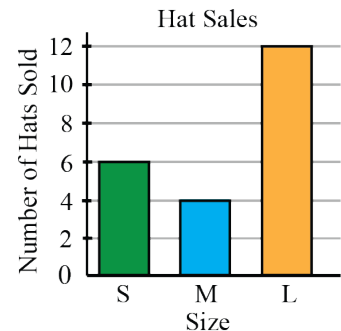
3. Consider the following flowchart. Rosa inputs a number and gets an output of 17. What number did she input?



4. Four points are placed on a grid, as shown. If each small square in the grid has an area of 1 square unit, which three points are the vertices of a triangle with an area of 3 square units?



5. Toby sold hats for a school fundraiser. The hats came in four sizes: S, M, L, and XL, which stand for small, medium, large, and extra large, respectively. Toby's sales for sizes S, M, and L are shown in the bar graph. If half of the total number of hats Toby sold were size L, how many size XL hats did Toby sell?



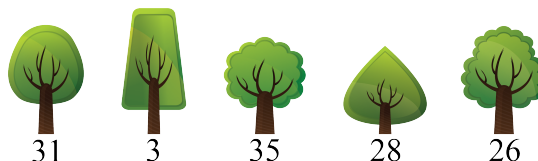


6. Seth has seven potted plants on his windowsill, three of which have flowers. The plants are initially in the following order:



Seth rearranges the plants by swapping the positions of two adjacent plants. He does several swaps until the three flowering plants are next to each other. What is the fewest number of swaps that Seth could have done?

7. The number of even integers between 1 and 53 is the same as the number of odd integers between 12 and n , where n is a positive even integer. What is the value of n ?
8. Chance the chipmunk is collecting acorns. On each trip, he can visit one tree and collect up to 11 acorns before returning to his burrow. He may return to the same tree more than once. The initial number of acorns below each tree is given.

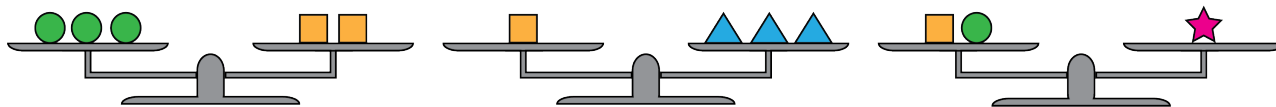


What is the maximum number of acorns that Chance can collect in 10 trips?

9. In the diagram, a 4×4 grid is to be filled so that each of the digits 1, 2, 3, and 4 appears exactly once in each row and each column. The 4×4 grid is divided into four smaller 2×2 squares. Each of these 2×2 squares is also to contain each of the digits 1, 2, 3, and 4. What digit replaces D ?

2		4	
	3		
	D		
			1

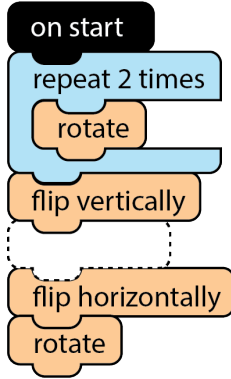
10. The three equal-arm scales shown are balanced, meaning the left side and the right side of each scale have equal mass.









If \star has a mass of 10 grams, what is the mass, in grams, of \triangle ?



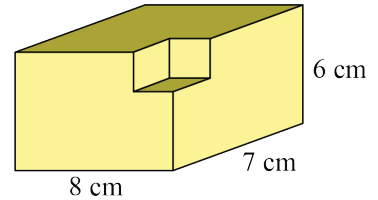
11. Suraj wrote a program, using block coding, to change the orientation of a square face. One block in Suraj’s code is missing. His code, as well as the actions performed by three of the blocks he used, are shown.



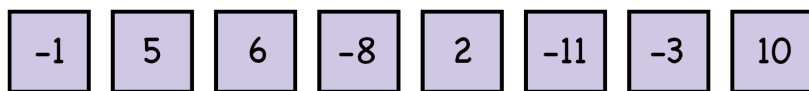
Block Name	Action Performed
flip vertically	 → 
flip horizontally	 → 
rotate	 → 

If Suraj wants his square face to end up in the same orientation that it started in, which block should he put in the blank spot?

12. A block of cheese is in the shape of a rectangular prism with side lengths of 6 cm, 7 cm, and 8 cm. Raissa cuts a cube out of one corner of the block of cheese. If the volume of the remaining cheese is 309 cm^3 , what is the side length, in centimeters, of the cube Raissa cut out?



13. Anil has a lock that requires a four-digit code to open it, but Anil has forgotten his code! He remembers that the digits in his code are 1, 4, 8, and 8, but he can’t remember the order that they go in. It takes Anil 5 seconds to try one code and he keeps trying different codes until he gets the right one. What is the longest amount of time, in seconds, it could possibly take Anil to open the lock?
14. Mirela and Kumara make and sell friendship bracelets. In total they have made 390 bracelets, and 90% of them have been sold. If 207 of Kumara’s bracelets have been sold and 80% of Mirela’s bracelets have been sold, how many bracelets has Mirela made in total?
15. When the sum of a set of integers equals zero, we call that set a *nada set*. A nada set must contain at least one integer. For example, the integers -2 and 2 form a nada set because $(-2) + 2 = 0$. Also, the integers -6 , -3 , and 9 form a nada set because $(-6) + (-3) + 9 = 0$.
Elise has eight cards, each with a different integer on it, as shown.



Using the integers on these cards, how many different nada sets can Elise make?



2022 Team Up Challenge Team Paper Answer Sheet

Team: _____

Question	Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	



2022 Team Up Challenge

Crossnumber Puzzle

Team: _____

1				3		4		5
6				7	8			
			9				10	
	11					12		
13				14			15	
16				17				
18			19					20
		21		22		23		
24				25				



Tips to Get Started

- This puzzle is like a crossword puzzle, except that the answers are numbers instead of words. Each empty square in the puzzle is to be filled with one positive digit.
- Your team will work together, with some of you solving the across clues and some solving the down clues. Start by looking for clues that can be solved right away. Then move on to the clues that rely on an answer from another clue.



2022 Team Up Challenge

Across Clues

2. The mode of the three digits in this number is 7.
4. A number whose factors include 27 and 10 ACROSS.
6. The positive difference between 15 ACROSS and 24 ACROSS.
7. The mean and the median of the three digits in this number are equal.
10. The last two digits of 14 DOWN.
11. A number that is the same when its digits are written in the reverse order.
12. The product of three consecutive integers.
13. A multiple of 9.
15. The total number of sides that six squares have.
16. The number of nickels (worth \$0.05 each) needed to make \$29.35.
17. The volume of a rectangular prism with length 4 DOWN, width 21 DOWN and height 2 DOWN.
18. The largest number that both 120 and 180 are divisible by.
21. A multiple of 49.
23. The number equal to $6 \times 100 + 1 \times 10 + 6$.
24. A number whose digits have the same sum as the digits in 9 DOWN.
25. 16 ACROSS minus an integer multiplied by itself.



2022 Team Up Challenge

Down Clues

1. A number whose digits multiply to 200.
2. A number that is equal to three times the sum of its digits.
3. The number that is 5% of .
4. Two-fifths of .
5. A number whose digits are all different and all even.
8. An odd multiple of 3.
9. The product of 5 and 79.
10. The number that is 56 less than twice .
11. The number of millimetres in 158 centimetres.
13. A number where each digit is one more than the digit before it.
14. The number of hours in 14 days.
19. The smallest prime number greater than .
20. The number that should replace ■ when $\frac{1}{9} = \frac{\text{4 DOWN}}{\text{■}}$.
21. A factor of .
22. The product of two equal integers.
23. The height of a triangle with area and base .



2022 Team Up Challenge

Logic Puzzle

At a farm school there are five different kinds of animals to feed every morning: cows, goats, pigs, sheep, and horses. Aditi, Brigid, Corina, Damien, and Eliel are the students responsible for feeding the animals on weekdays. The students have created a weekly schedule so that each student feeds one kind of animal each day. Use the clues below to determine which student feeds which kind of animal each day. Then complete the weekly schedule with the names of the students.

- (1) The student who feeds the cows on Thursday also feeds the horses on Wednesday.
- (2) Damien feeds the sheep on only Monday and Wednesday.
- (3) The same student feeds the horses on Monday, Tuesday, and Wednesday.
- (4) Eliel feeds all the animals except for the cows.
- (5) Damien feeds only the pigs and the sheep.
- (6) Every day that Damien feeds the pigs, Corina feeds the goats.
- (7) The sheep are fed by four different students each week.
- (8) The student who feeds the cows on Monday also feeds the goats on Tuesday.
- (9) The student who feeds the goats on Monday also feeds the cows on Tuesday.
- (10) Aditi does not feed the same kind of animal more than twice each week.



Tips to Get Started

- You are encouraged to use the answer sheet to write any information you know from the clues. This could include putting more than one name in a box, or indicating that two particular boxes must or must not contain the same name.
- Note that the clues are not given in a specific order, and at times you will need to combine the information given in several different clues.



2022 Team Up Challenge

Logic Puzzle Answer Sheet

Team: _____

Complete the weekly schedule with the name of the student who feeds each kind of animal on each day of the week.

		Day of the Week				
		Monday	Tuesday	Wednesday	Thursday	Friday
Kind of Animal	cows					
	goats					
	pigs					
	sheep					
	horses					

Practice Relay - Player 1

What is the value of $1 + 2 + 3 + 4 + 5$?

Practice Relay - Player 2

Replace N below with the number you receive.

A bowl contains apples, oranges, pears, and bananas. The table shows how many of each type of fruit are in the bowl.

Type of Fruit	Quantity
apples	3
oranges	6
pears	N
bananas	4

How many of the fruits in the bowl are *not* apples?



You can start working on this question while you're waiting for Player 1's answer.

Practice Relay - Player 3

Replace N below with the number you receive.

How many of the following numbers are divisible by 5?

15, 92, 40, N , 105, 140, 19



You can start working on this question while you're waiting for Player 2's answer.

Practice Relay - Player 4

Replace N below with the number you receive.

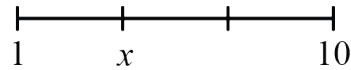
An elevator started on floor N . It went up 2 floors, then down 1 floor, then down 3 more floors. What floor did it end up on?



You can start working on this question while you're waiting for Player 3's answer.

Relay A - Player 1

A number line starts at 1, ends at 10, and is divided into three equal parts as shown.



What is the value of x ?

Relay A - Player 2

Replace N below with the number you receive.

Josh has invented a jellybean doubling machine. Whenever he presses a button, the number of jellybeans inside the machine doubles. If the machine starts with N jellybeans, how many jellybeans will be there after Josh presses the button 3 times?



You can start working on this question while you're waiting for Player 1's answer.

Relay A - Player 3

Replace N below with the number you receive.

The list of numbers 1, 39, 24, 16, N is repeated to form the following sequence.

$$1, 39, 24, 16, N, 1, 39, 24, 16, N, 1, \dots$$

What is the sum of the first 16 numbers in the sequence?



You can start working on this question while you're waiting for Player 2's answer.

Relay A - Player 4

Replace N below with the number you receive.

To complete an escape room Miloslav needs to enter a secret code, which is the sum of the following three values.

- The smallest positive integer greater than 99 that doesn't have any repeated digits.
- The largest two-digit positive integer that is divisible by 4.
- The value of $3 \times N$.

What is the secret code?



You can start working on this question while you're waiting for Player 3's answer.

Relay B - Player 1

The symbols \triangle , \circ , and \square each represent a positive integer. Consider the following three equations.

$$\triangle \times \triangle = 9$$

$$\triangle + 5 = \circ$$

$$\circ \times \triangle = \square$$

What is the value of \square ?

Relay B - Player 2

Replace N below with the number you receive.

A small box of cookies has 8 cookies, a medium box has 10 cookies, and a large box has 12 cookies. Stefanie gave 2 small, 3 medium, and 3 large boxes of cookies to a group of N people. If each person took the same number of cookies, what is the maximum integer number of cookies that each person could have taken? Note that there may be leftover cookies in some boxes.



You can start working on this question while you're waiting for Player 1's answer.

Relay B - Player 3

Replace N below with the number you receive.

When plotted on a grid, three corners of a rectangle have coordinates $(N, 5)$, $(10, 5)$, and $(10, 9)$. What is the area of the rectangle?



You can start working on this question while you're waiting for Player 2's answer.

Relay B - Player 4

Replace N below with the number you receive.

There are N marbles in a bag, 3 of which are black. There are twice as many green marbles as black marbles. There are twice as many yellow marbles as green marbles. The remaining marbles are red. How many red marbles are there?



You can start working on this question while you're waiting for Player 3's answer.

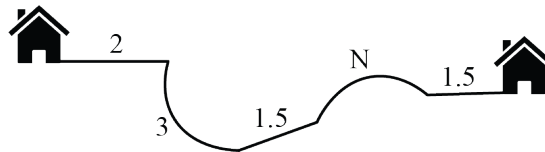
Relay C - Player 1

Ahmed has a jar containing coins that are quarters (worth 25 cents), dimes (worth 10 cents), and nickels (worth 5 cents). If the total value of the coins in the jar is 65 cents, what is the fewest number of coins that could be in the jar?

Relay C - Player 2

Replace N below with the number you receive.

The map shows the route Vivek takes to bike to his friend Nabil's house. All distances shown are in kilometres.



Vivek used this route to bike from his house to Nabil's house, and then from Nabil's house back home. How many kilometres did Vivek bike in total?



You can start working on this question while you're waiting for Player 1's answer.

Relay C - Player 3

Replace N below with the number you receive.

Anar, Bette, and Cleo work as tree planters. Every day Anar plants 12 trees, Bette plants $\frac{2}{3}$ as many trees as Anar, and Cleo plants 3 more trees than Bette. How many trees in total have they planted after N days?



You can start working on this question while you're waiting for Player 2's answer.

Relay C - Player 4

Replace N below with the number you receive.

Alvina weighed six objects and recorded their masses as follows:

0.84 kg, 135 g, 1945 mg, 1765 g, 1.5 kg, N g

What is the mass, in grams, of the heaviest object?



You can start working on this question while you're waiting for Player 3's answer.



2022 Team Up Challenge

Relay Answer Sheet

Team: _____

Practice Relay					
	Player 1	Player 2	Player 3	Player 4	Teacher
1 st Attempt					
2 nd Attempt					

Relay A					
	Player 1	Player 2	Player 3	Player 4	Teacher
1 st Attempt					
2 nd Attempt					

Relay B					
	Player 1	Player 2	Player 3	Player 4	Teacher
1 st Attempt					
2 nd Attempt					

Relay C					
	Player 1	Player 2	Player 3	Player 4	Teacher
1 st Attempt					
2 nd Attempt					