

# Improving Processes: Paper Cups Challenge Student Worksheet

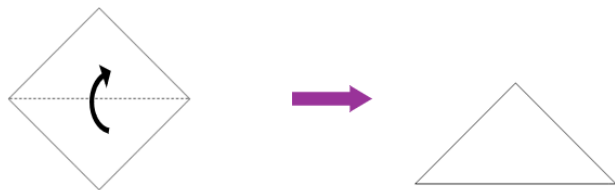
## Task

Help your chosen animal win the animal race!

You are making as many paper cups as possible in 2 minutes. There are four stages to the of creating a paper cup: Folding, Shaping, Moulding and Designing.

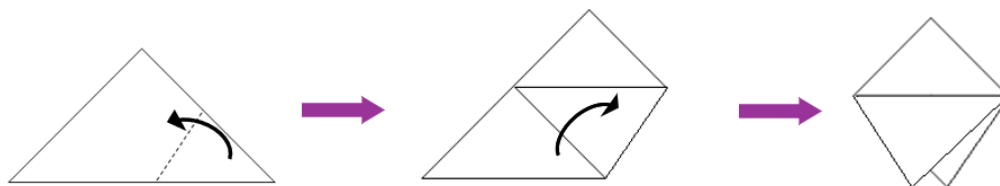
### Stage 1: Folding

Fold the paper in half diagonally.



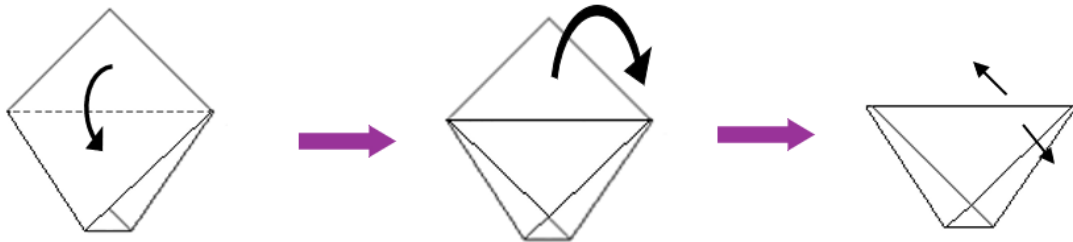
### Stage 2: Shaping

Fold the bottom right-hand corner up, then fold the bottom left-hand corner up to form the sides of the cup.



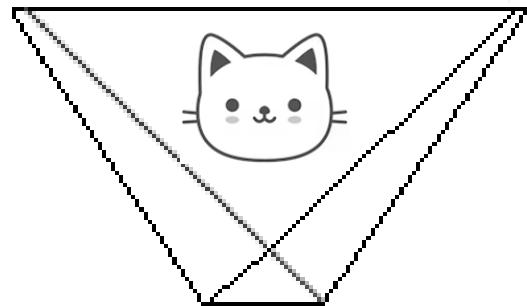
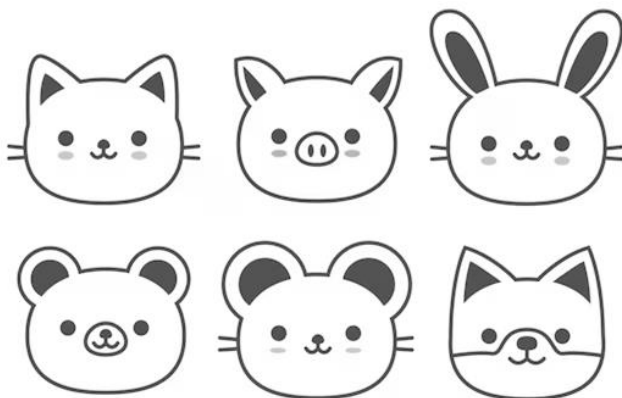
### Stage 3: Moulding

Fold the front flap downwards. Then fold the back top flap backwards in the same manner. Open out the finished cup.



### Stage 4: Designing

Choose the animal that you will be representing for the animal race. Once the cup has been made, draw the animal face you have chosen on the cup.



### Question 1

What did you notice?

- Roughly how long did it take you to make this? Why did it take you this long?
- Had you made paper cups before? Did this make you slower or quicker?
- Did a certain part take longer than others?
- Did you do a very detailed or very simple pattern? How did this affect the time it took you to make it?

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## Paper Cups Challenge – Trial 1

Get into teams of 8. As a team, you are going to make paper cups for an animal race. Arrange the team into 4 sub-groups to complete the different steps - two people are required for each stage - i.e., two people for folding, two people for shaping etc.

### Question 2

How many paper cups was your team able to make in 2 minutes?

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### Question 3

Fill in the table below. Record the number of cups made at each stage in the table below and then the number that passed the entire process at the end.

<u>Trial Number</u>	<b>Folding</b>	<b>Shaping</b>	<b>Moulding</b>	<b>Designing</b>	<b>Entire process</b>
1					

#### Question 4

Now you along with all your team members will work together to complete as many as possible in each stage in 30 seconds. I.e., all 8 students in your team will have one minute to fold as many as you can in 30 seconds. You will then write down in the table below how many each student was able to achieve at the folding stage.

During the next 30 seconds timer, your team will then try to shape as many of the folded papers as possible during that time. Again, you will then write down in the table below how many each student was able to achieve at the shaping stage.

During the next timer, your team will proceed to the moulding stage and record how many each student was able to achieve at this stage. And during the final timer, your team will move on to the designing stage and record how many each student in your team was able to design at this stage.

	Folding	Shaping	Moulding	Designing
Student 1				
Student 2				
Student 3				
Student 4				
Student 5				
Student 6				
Student 7				
Student 8				

#### Question 5:

Fill in the table below using the table above where you recorded what each student was able to do in each stage. Calculate the mean and range achieved across all students for each stage. Below are instructions on how to find the range and mean for each stage.

- Range: to find the range, look at the lowest amount produced in the stage by a student and the highest amount produced by a student e.g., 1 – 15
- Mean: add together the amount produced by each student for that stage and divide that by the number of students who participated in the task.

$$\text{Mean} = \frac{\text{Sum of cups made}}{\text{Number of students}}$$

	Folding	Shaping	Moulding	Designing
Range				
Mean				

## Paper Cups Challenge – Trial 2

Now try it again! This time, you can use the previous results to make changes or re-arrange the number of people at each stage. Try again to make as many paper cups as possible and record the number of cups made at each stage in the table below and then the number that passed the entire process at the end.

### Question 6:

How many paper cups did you make in 2 minutes in Trial 2?

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Fill in the table below:

<u>Trial Number</u>	Folding	Shaping	Moulding	Designing	Entire process
2					

### Question 7:

Fill in the table below:

Calculate the mean of Trial 2 and then calculate the mean between number of cups completed between trial 1 (recorded in question 2) and trial 2 (recorded in question 6). And calculate the percentage change between total cups made in trial 1 and trial 2. Below are instructions on how to find the percentage change and mean for each stage.

- Mean: add together the total number of cups provided and divide that by the number of trials that you have conducted.

Mean = sum of total cups made in Trial 1 and Trial 2 ÷ Number of trials conducted

- Percentage change:

- Calculate final value minus starting value
- Divide that amount by the starting value
- Multiply by 100 to get percent increase
- If the percentage is negative, it means there was a decrease and not an increase.

$$\text{Percentage change} = \frac{\text{Final value} - \text{Starting value}}{\text{Starting value}} \times 100$$

	Entire process
Trial 1	
Trial 2	
Mean	
Percentage change	