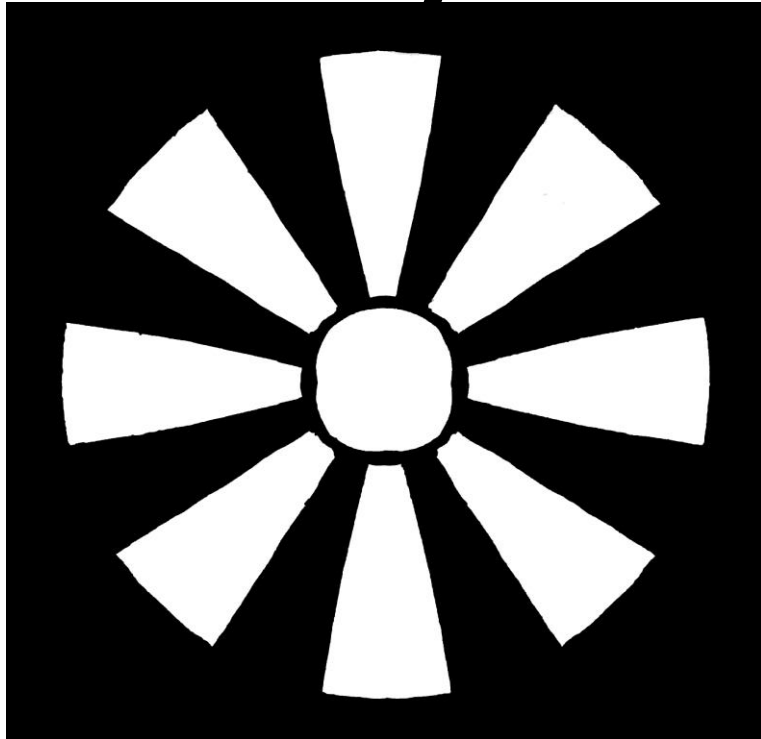


LET'S IMAGINE ABOUT SPACE!

LET'S THINK ABOUT SPACE!

**~Learning about space and
symmetry with crest cutting~**



Presented by

**Okayama Prefectural
TAMANO High School**

Physics teacher

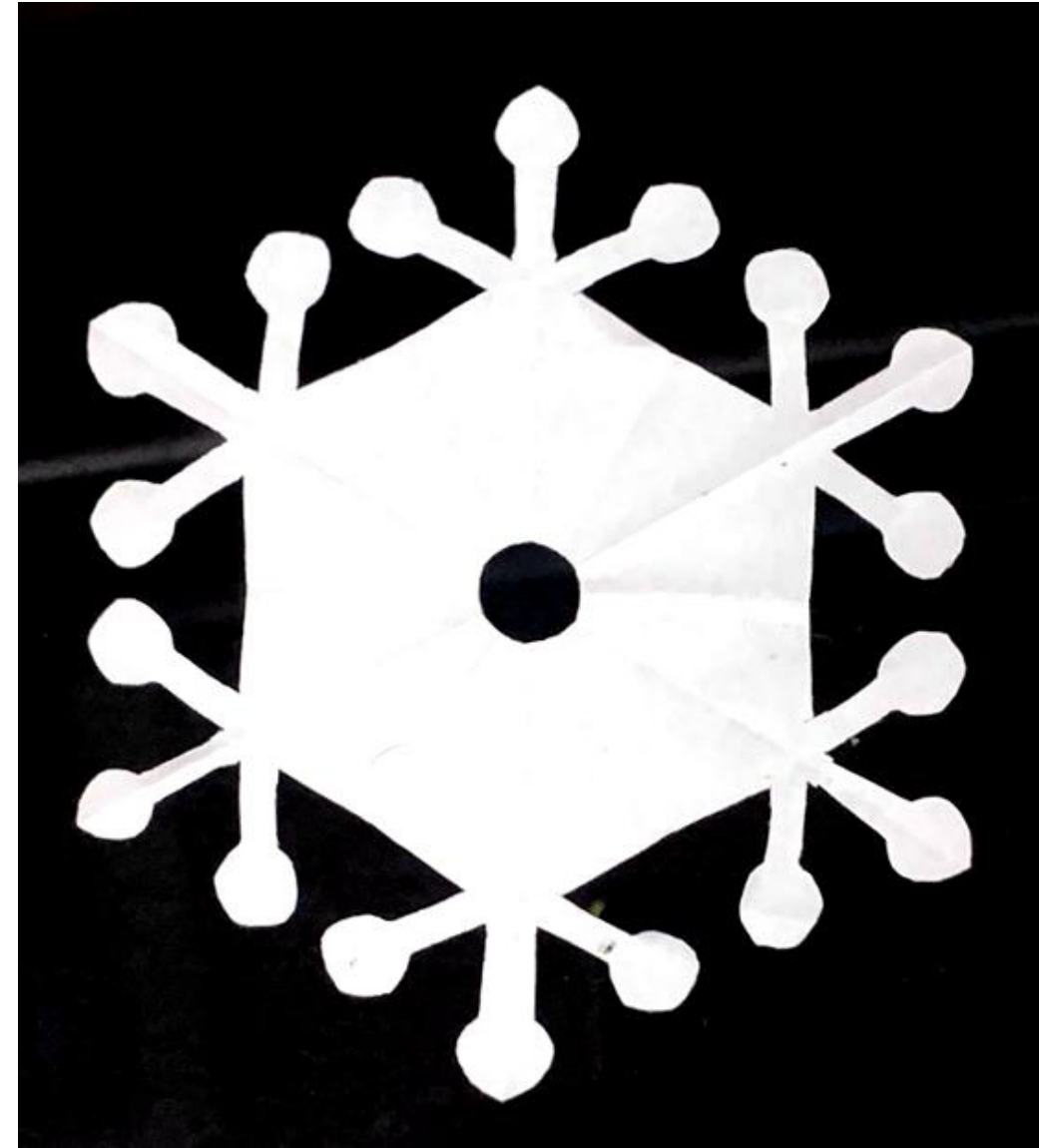
MANABU FUJITA

1 - Introduction

1A - What's crest cutting?

Crest cutting is a Japanese tradition that has been going on since the days when samurais were walking around Japan.

Crest cutting is a tradition of folding and cutting paper to make various family crests.

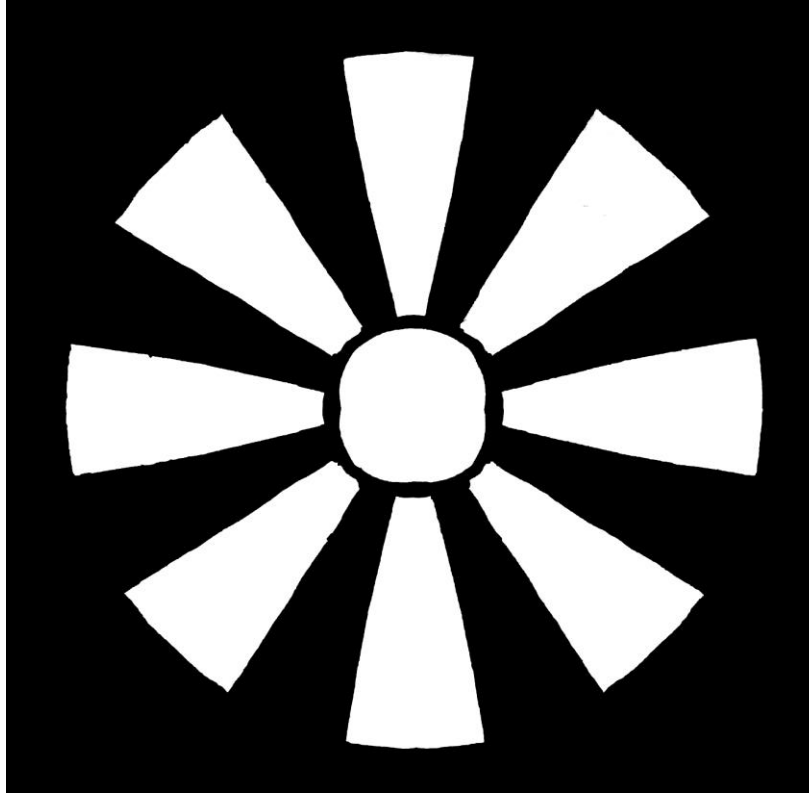


Let me introduce crest cutting
with the theme of space.

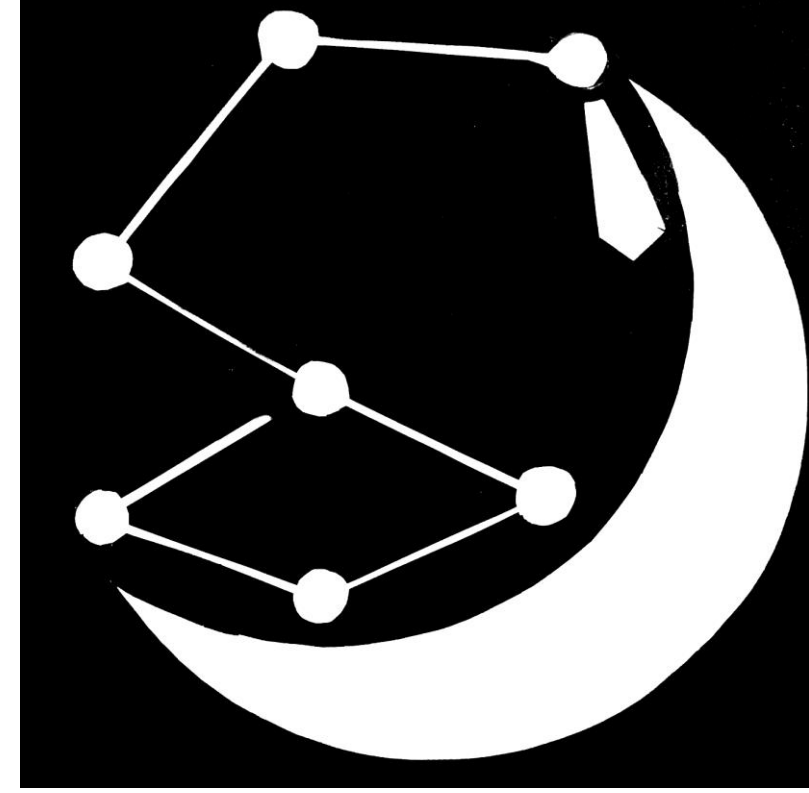
What do you think these crest represent?



Silver star



**The sun with
eight rays of
light**



**Crescent
moon and the
Big Dipper**

1 - Introduction

1B - What's symmetry?

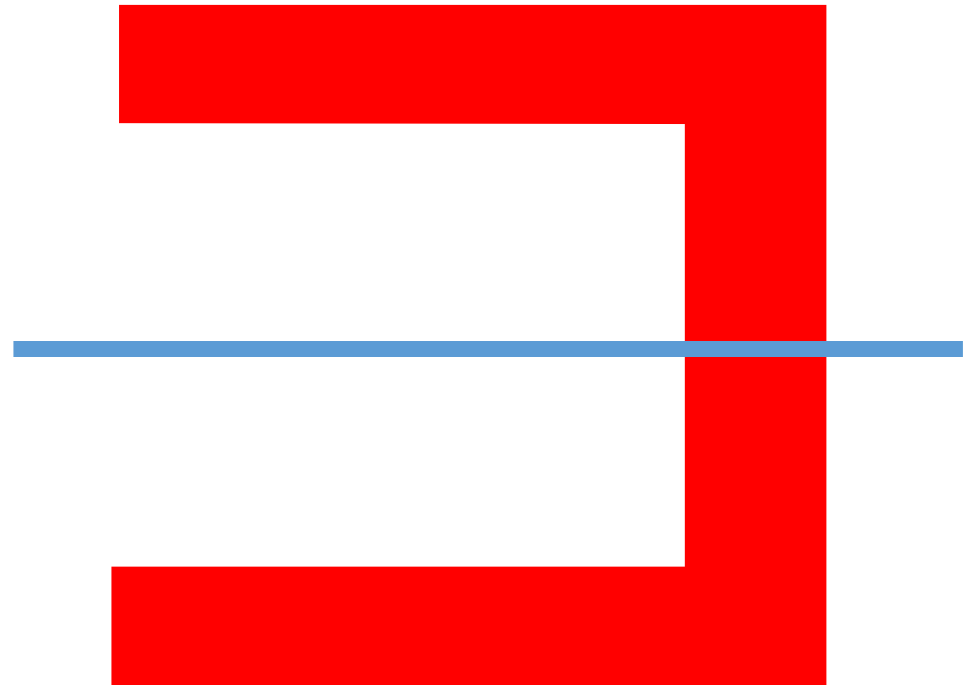
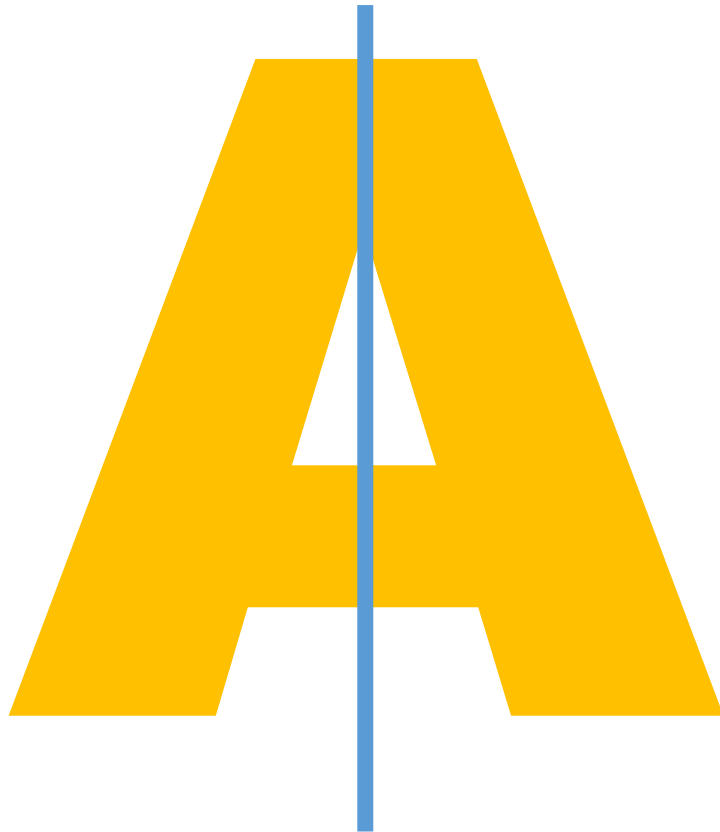
Symmetry is a property that is invariant to some transformations.

The main types of symmetry are...

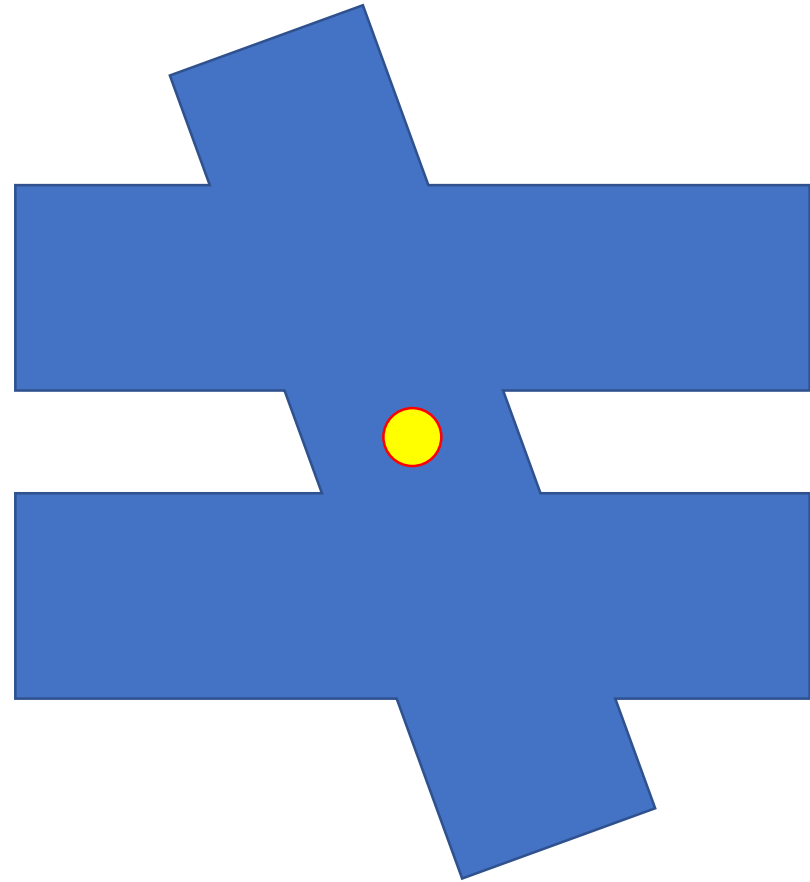
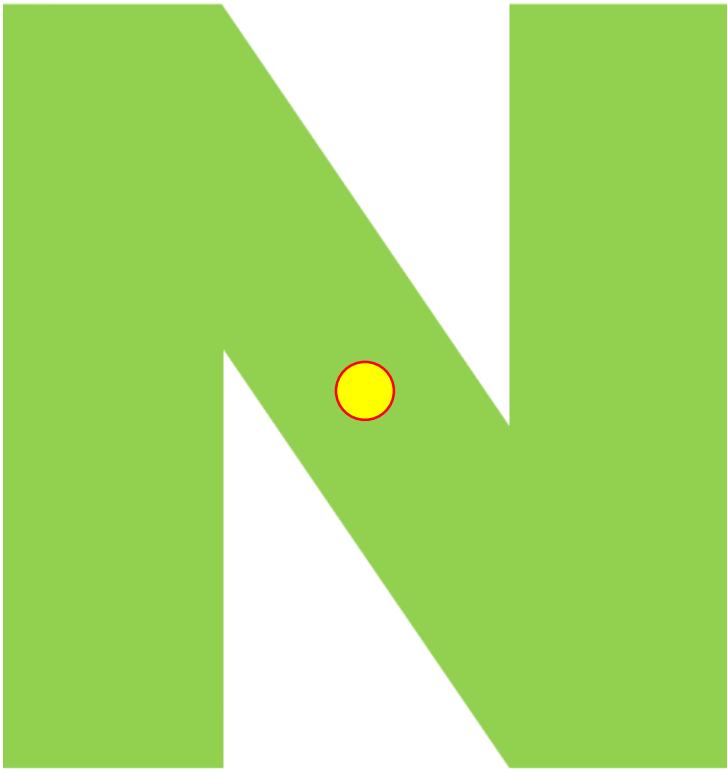
- **Reflectional symmetry**
- **Rotational symmetry**
- **Transrational symmetry**

Reflectional symmetry (Line symmetry or Mirror symmetry)

Reflectional symmetric axis



Rotational symmetry



Translational symmetry

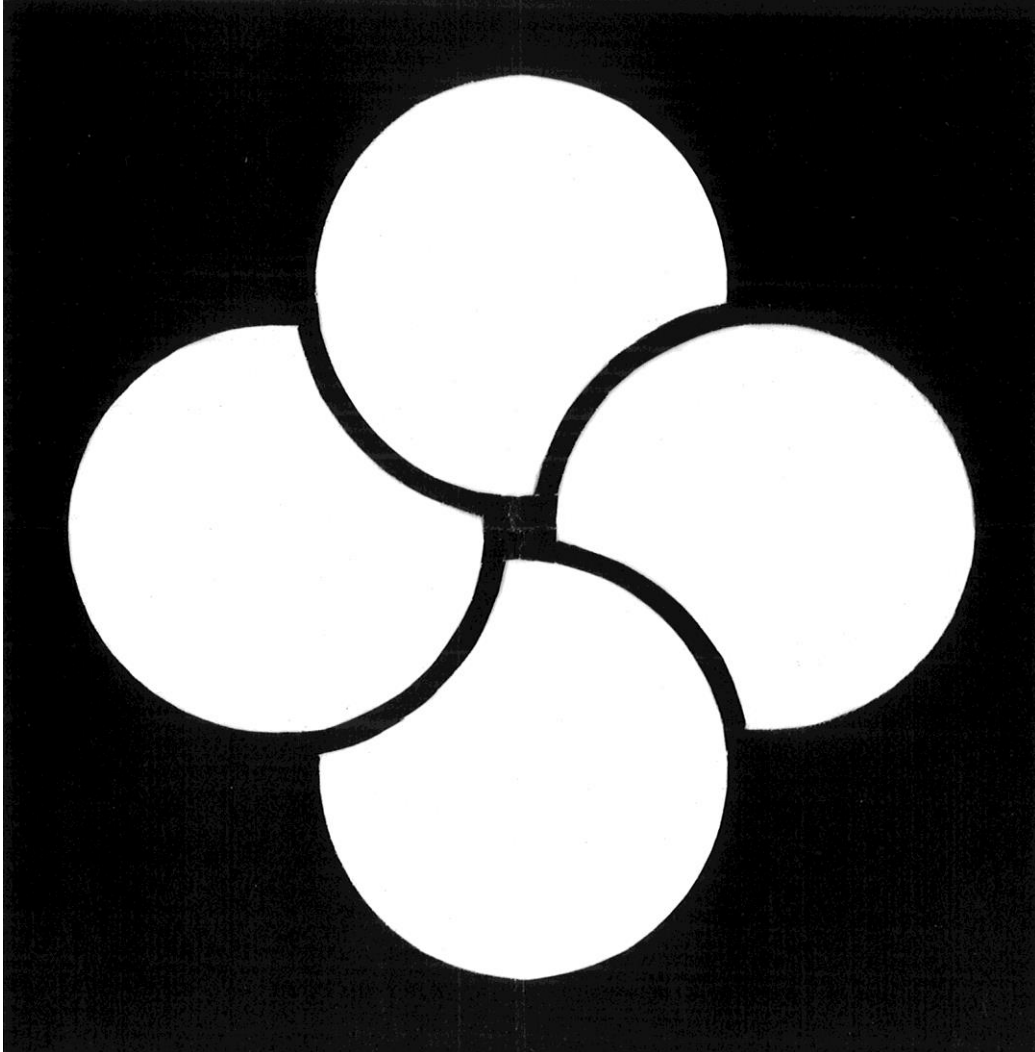


2 - Questions

Question 1

2A - Four overlapping stars ①

What is the symmetry of this crest?



**A Reflectional
symmetry**

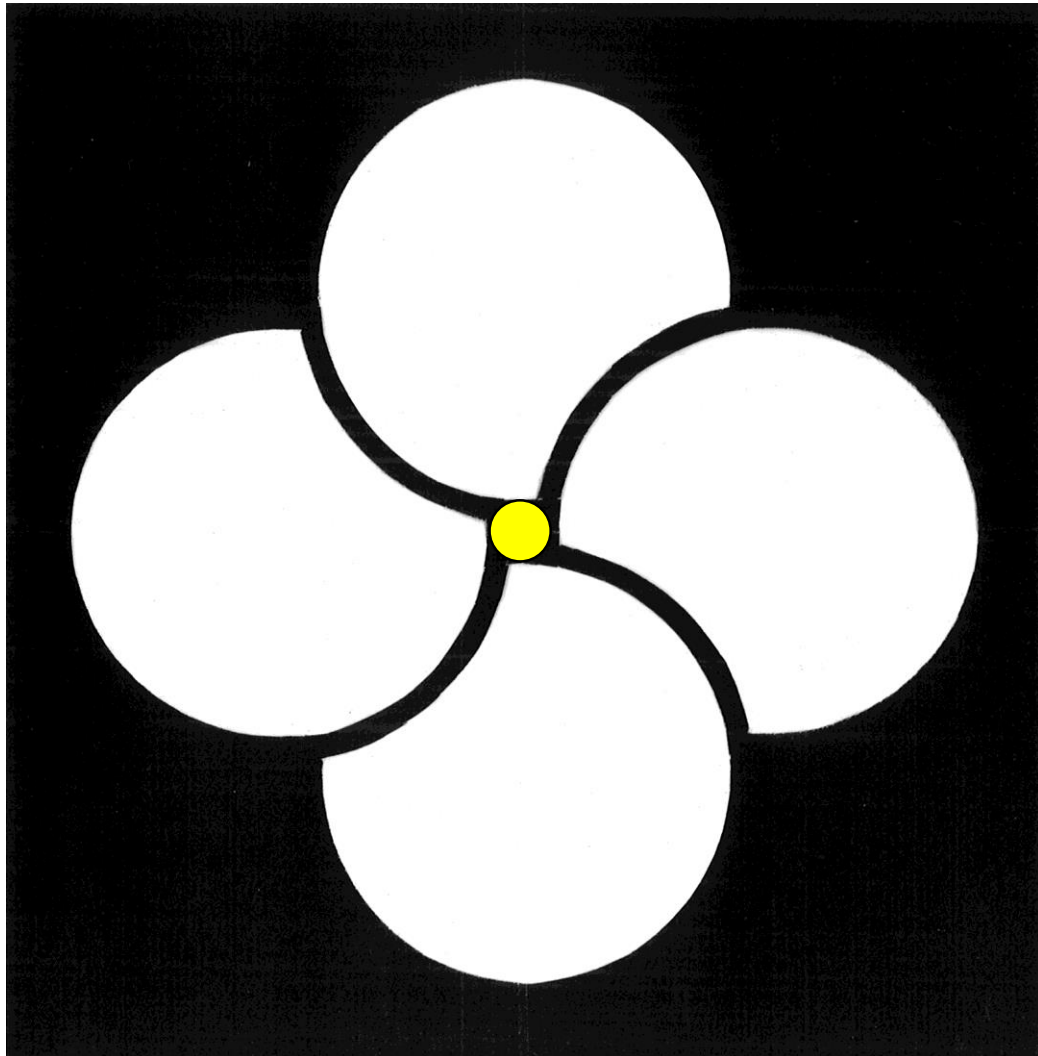
**B Rotational
symmetry**

**C Translational
symmetry**

Question 1

2A - Four overlapping stars ②

What is the symmetry of this crest?



**A Reflectional
symmetry**

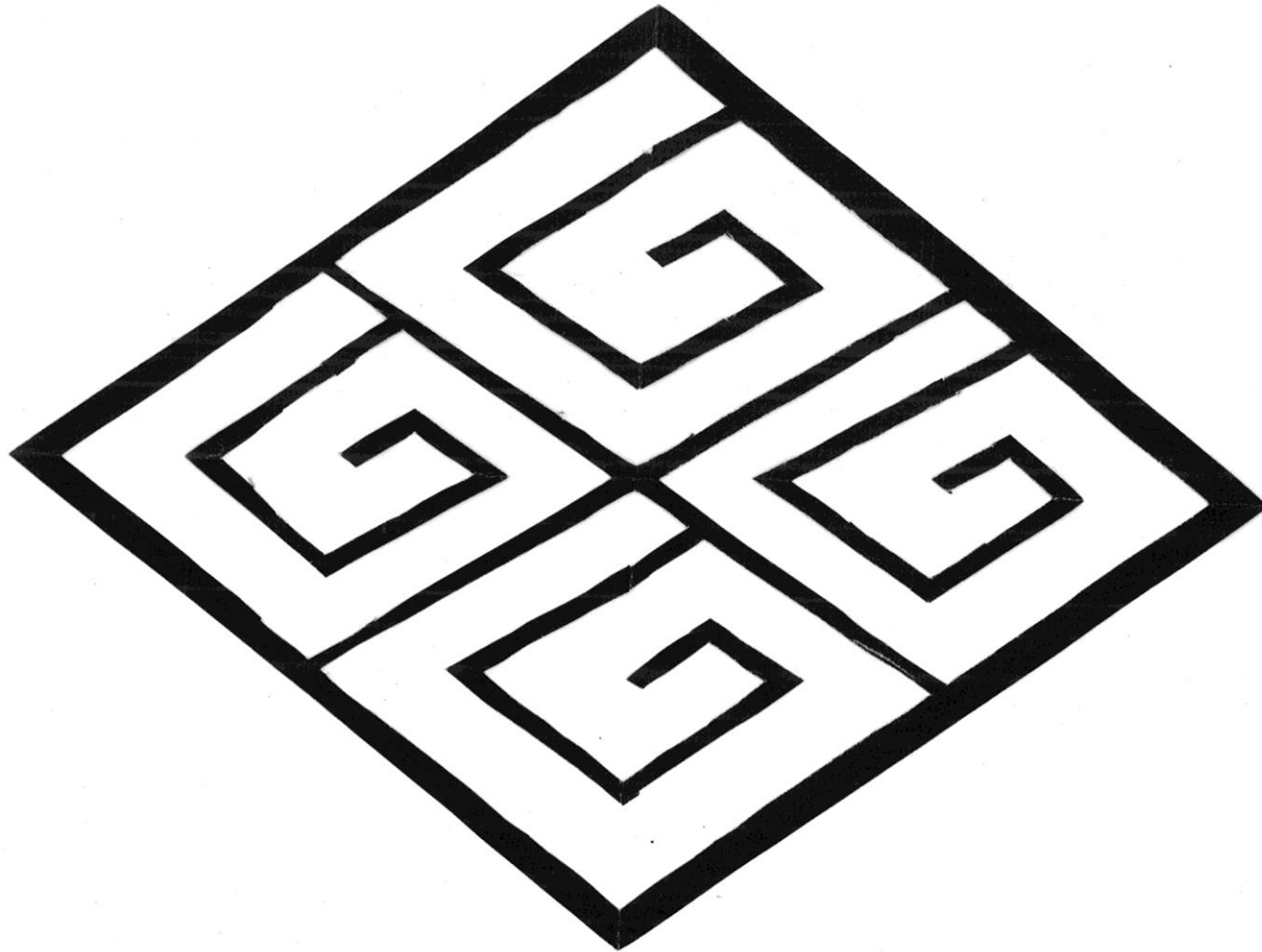
**B Rotational
symmetry**

**C Translational
symmetry**

Question 2

2B - Four lightning bolts in a diamond ①

What is the symmetry of this crest?

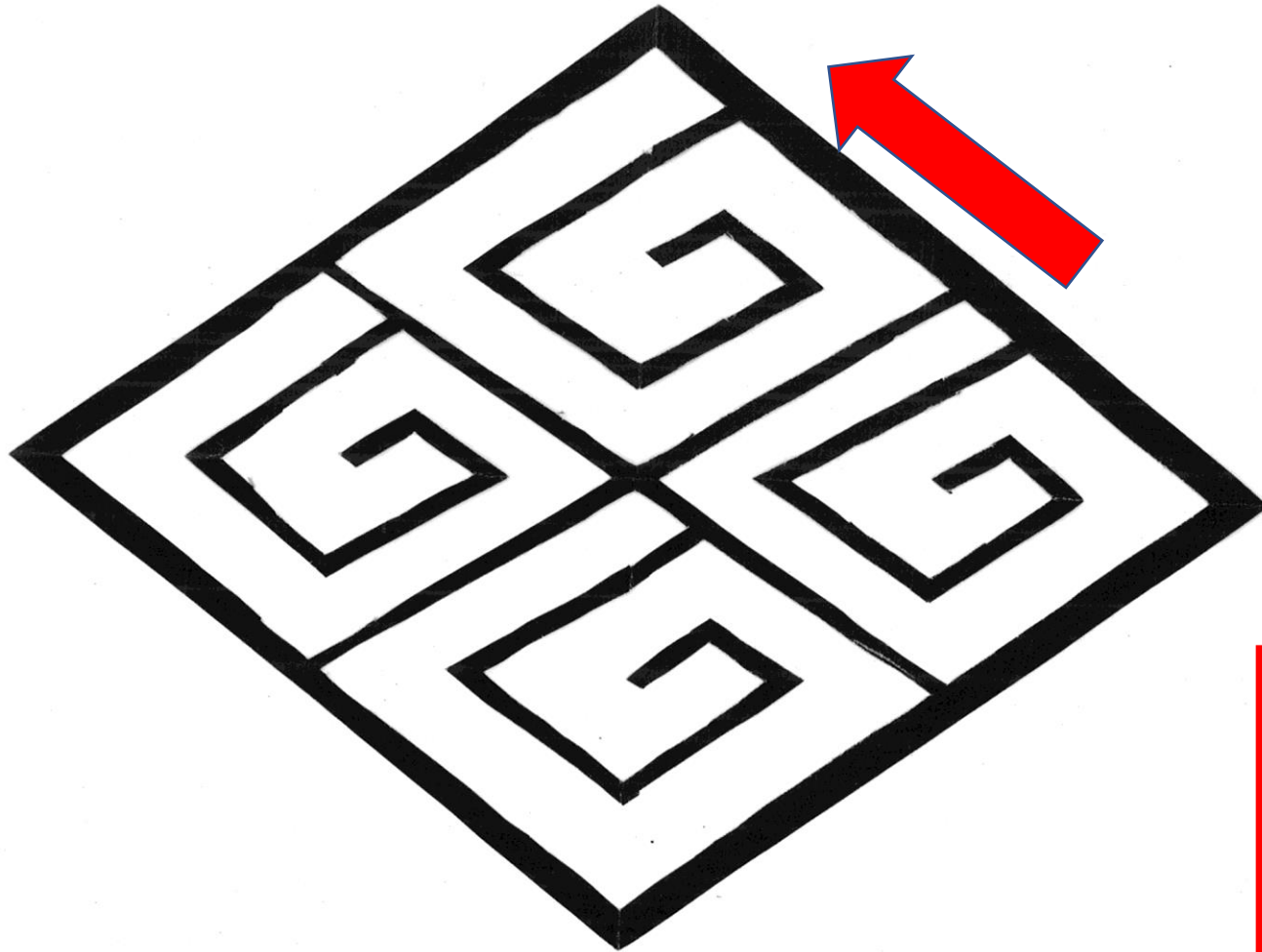


- A Reflectional symmetry**
- B Rotational symmetry**
- C Translational symmetry**

Question 2

2B - Four lightning bolts in a diamond ②

What is the symmetry of this crest?



A Reflectional symmetry

B Rotational symmetry

C Translational symmetry

Question 3

What is the symmetry of this crest?



A Reflectional symmetry

B Rotational symmetry

C Translational symmetry

Question 3

2C - Waves, moon and rabbit ②

What is the symmetry of this crest?



**A Reflectional
symmetry**

**B Rotational
symmetry**

**C Translational
symmetry**

Question 3

2C - Waves, moon and rabbit ③

What is the symmetry of this crest?



**A Reflectional
symmetry**

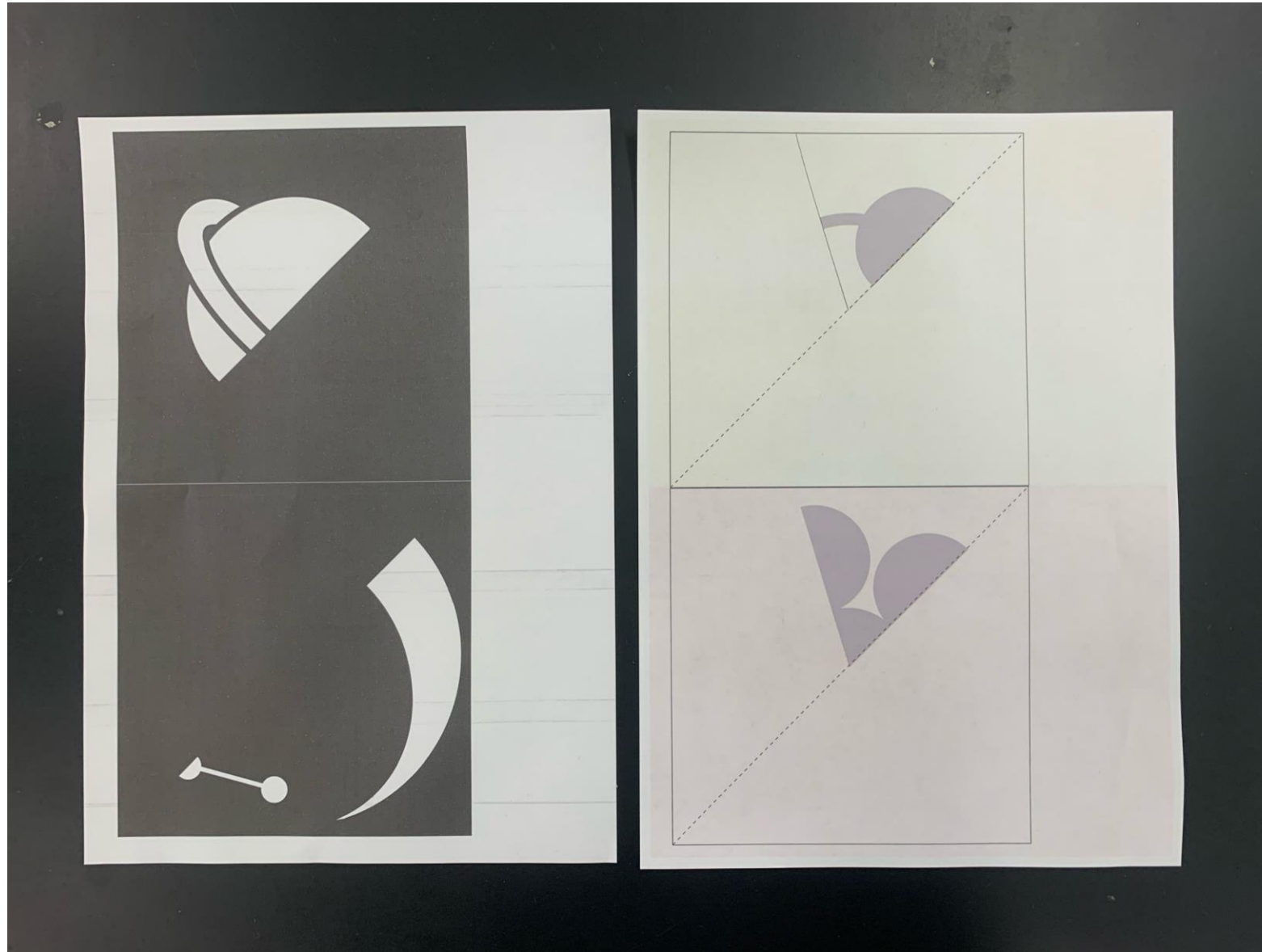
**B Rotational
symmetry**

**C Translational
symmetry**

3 - Let's practice crest cutting!

Today we will practice 3 types of crest cutting.

Today we use these types of patterns.



Cut the paper into 4 squares.

3A - Practice 1 ②

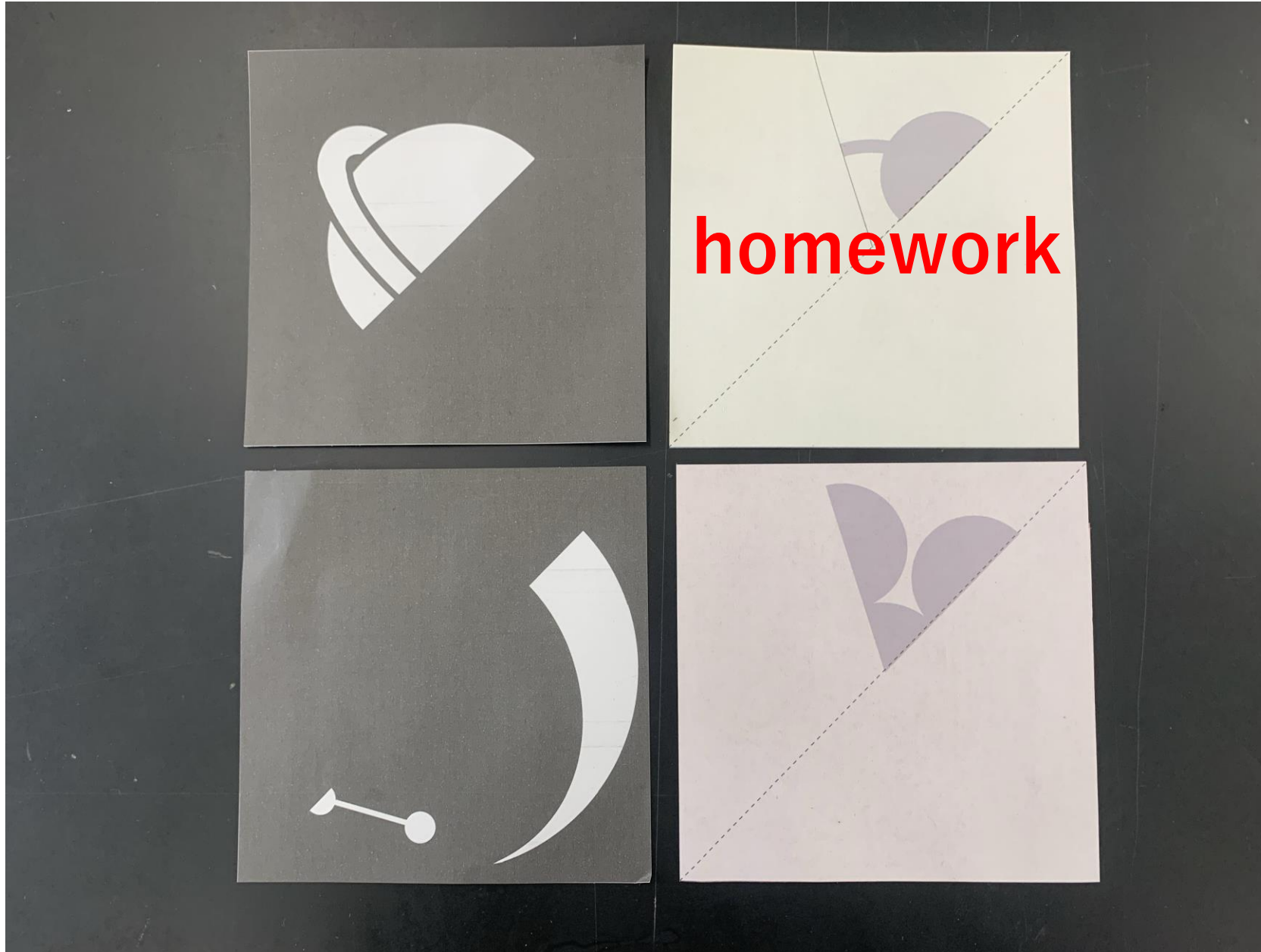




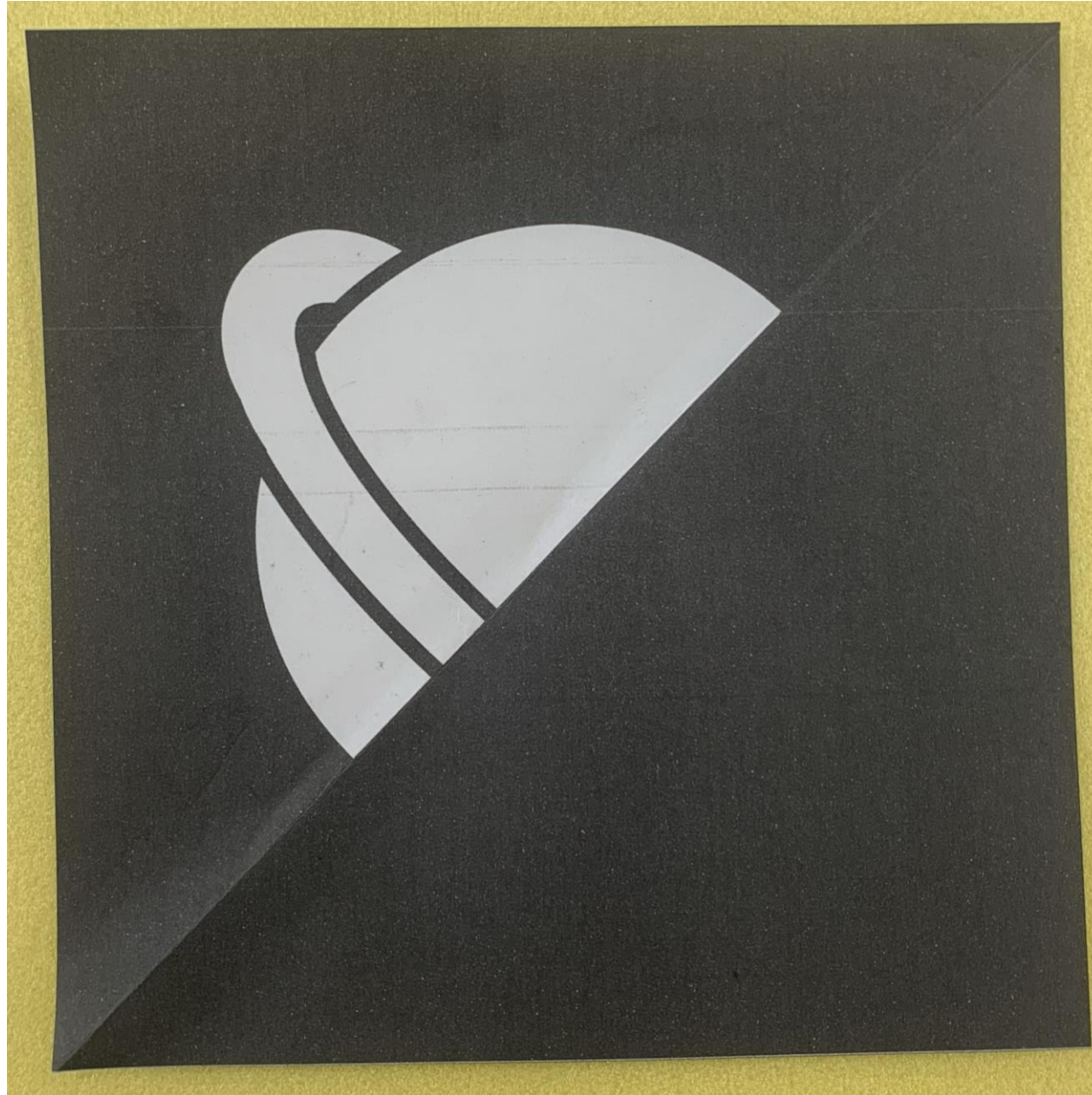


Cut the paper into 4 squares.

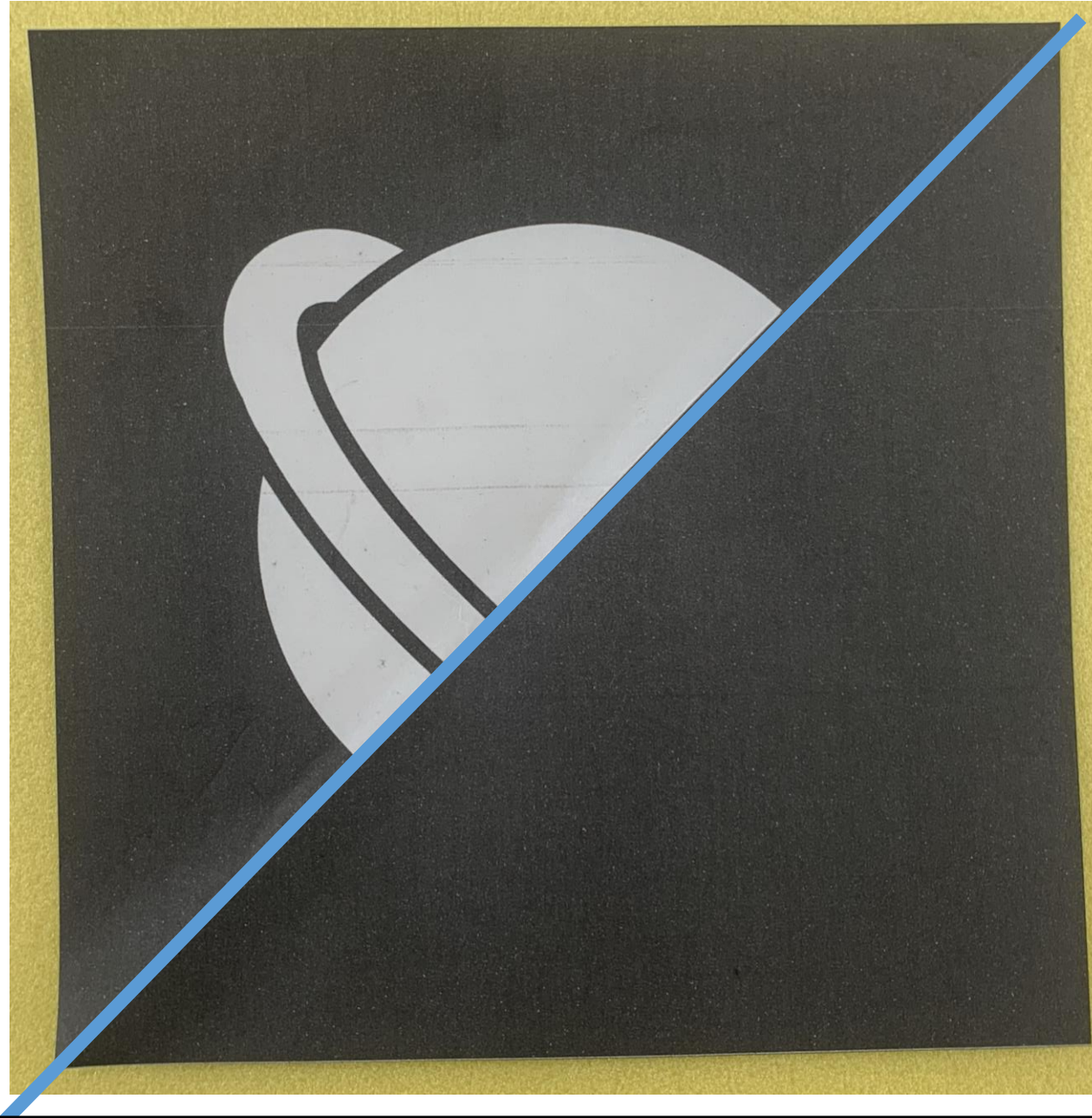
3A - Practice 1 ②



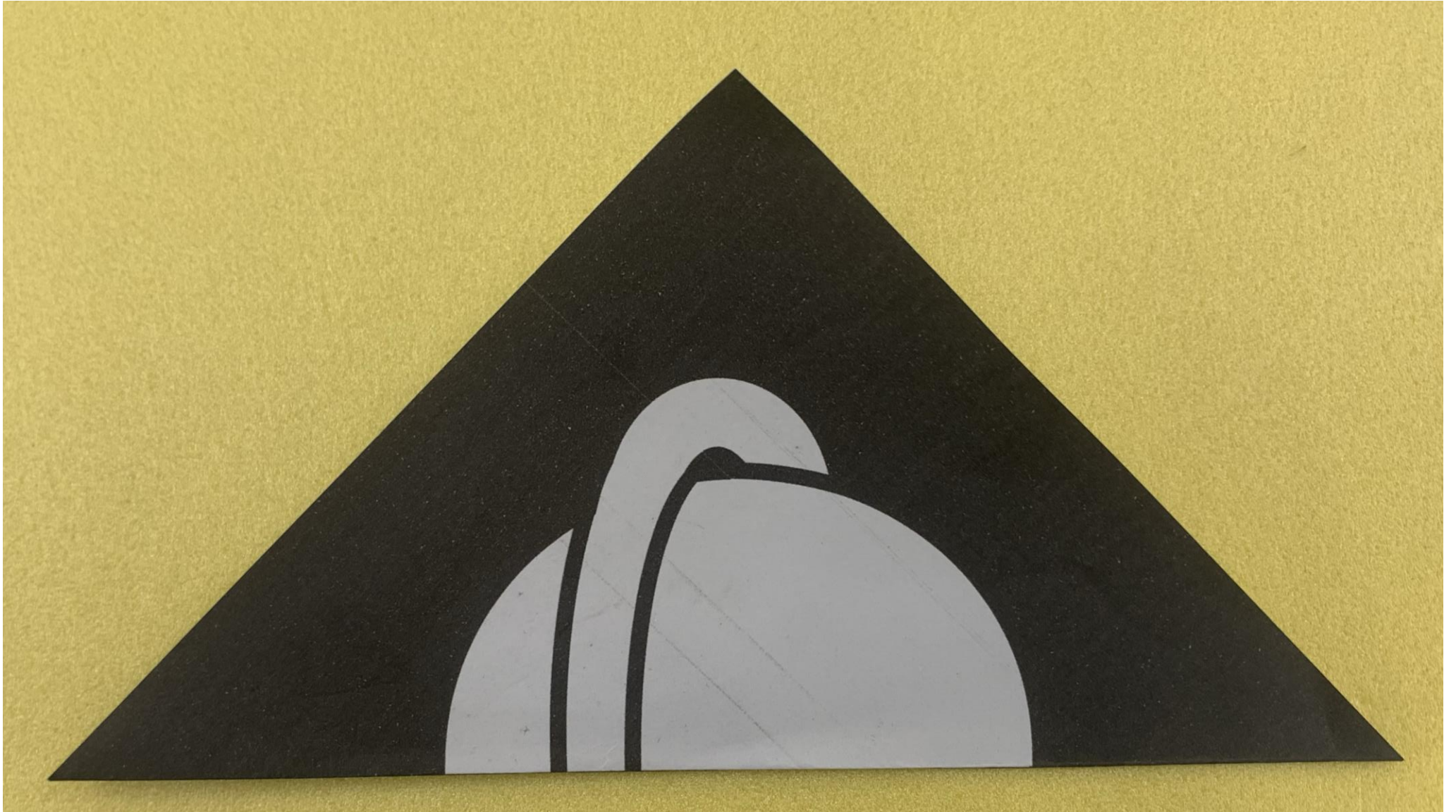
**First, let's use this crest
pattern.**



**Fold along this line to make
a triangle.**

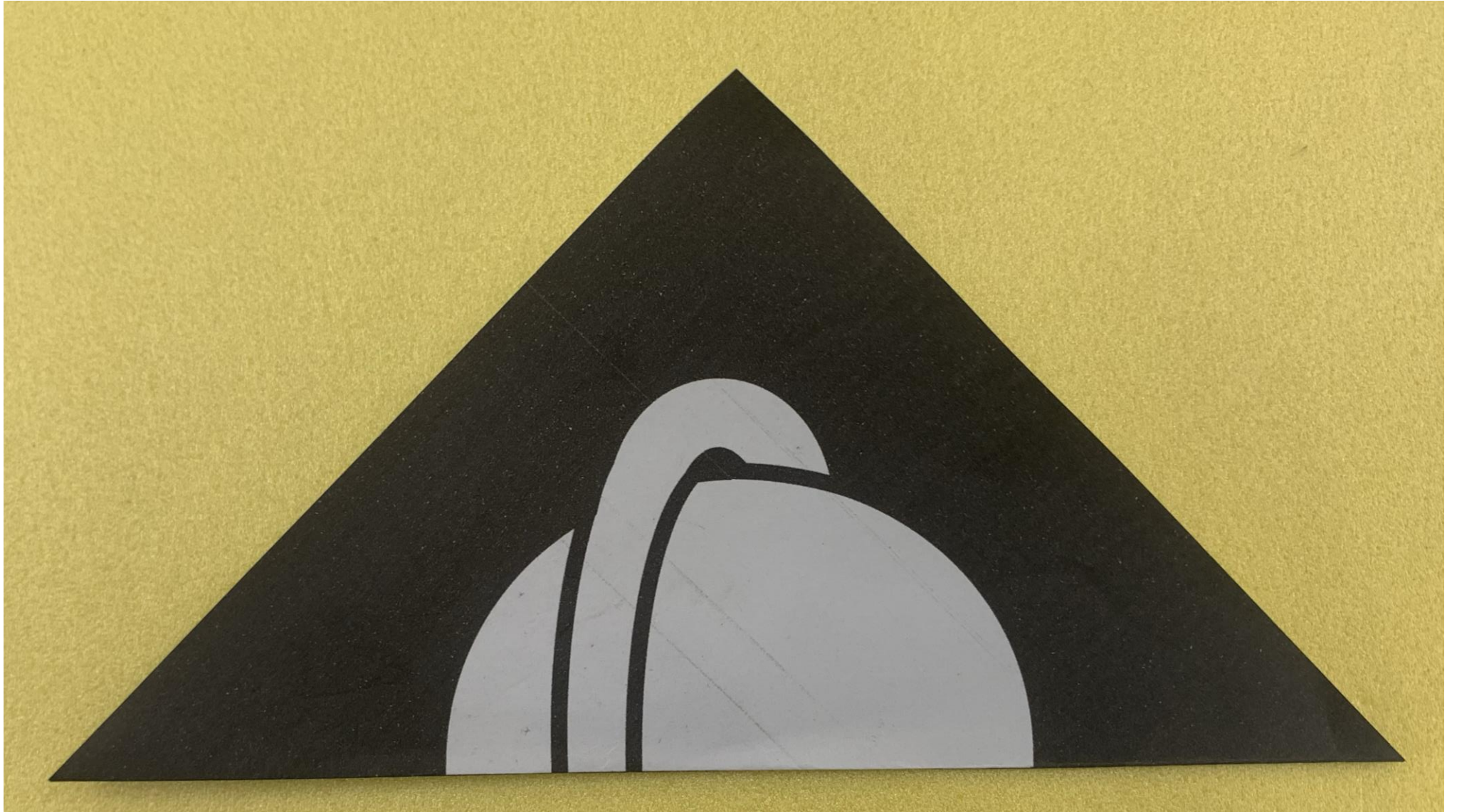


**Fold along this line to make
a triangle.**

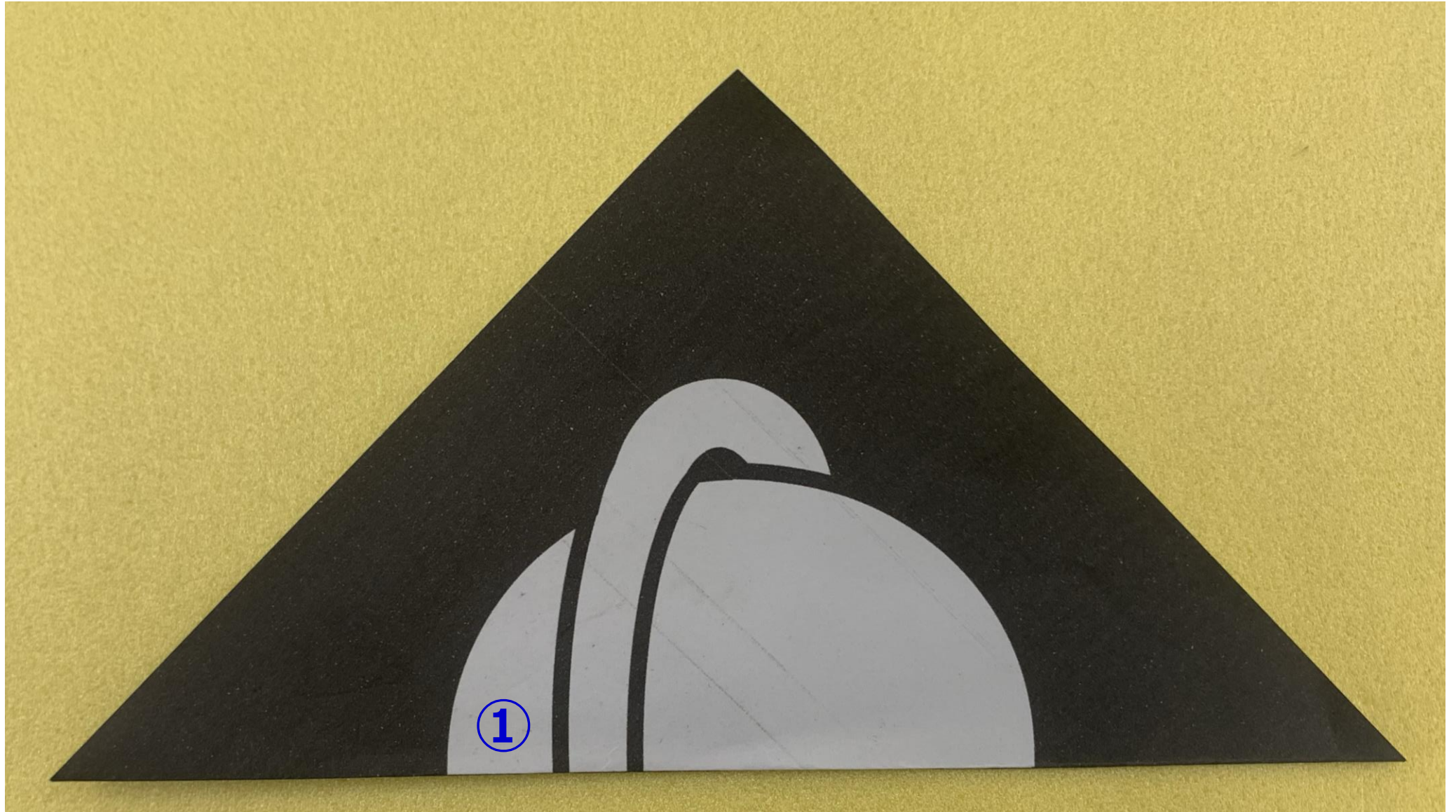


**Cut out the white part in this
order.**

3A - Practice 1 ⑥

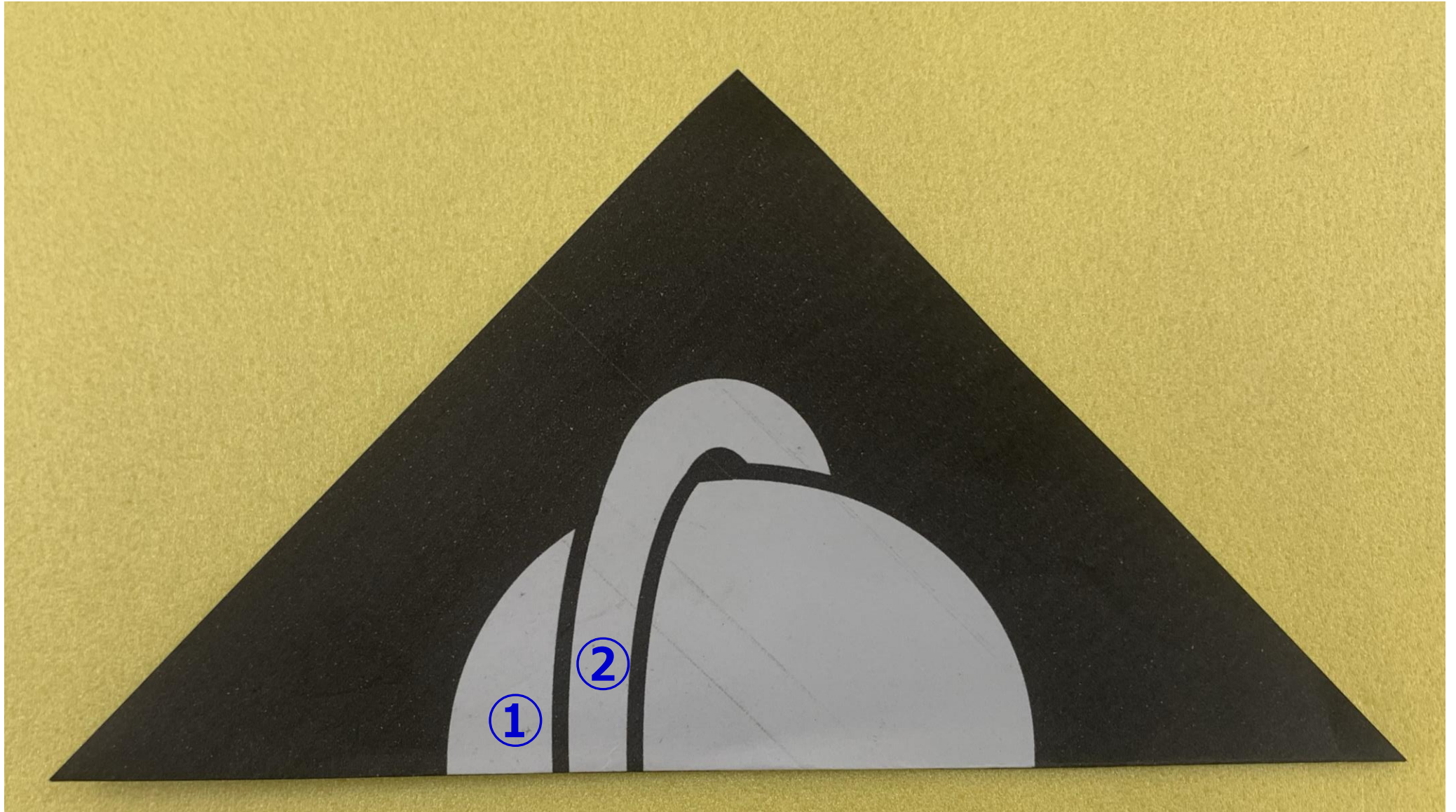


Cut out the white part in this order.



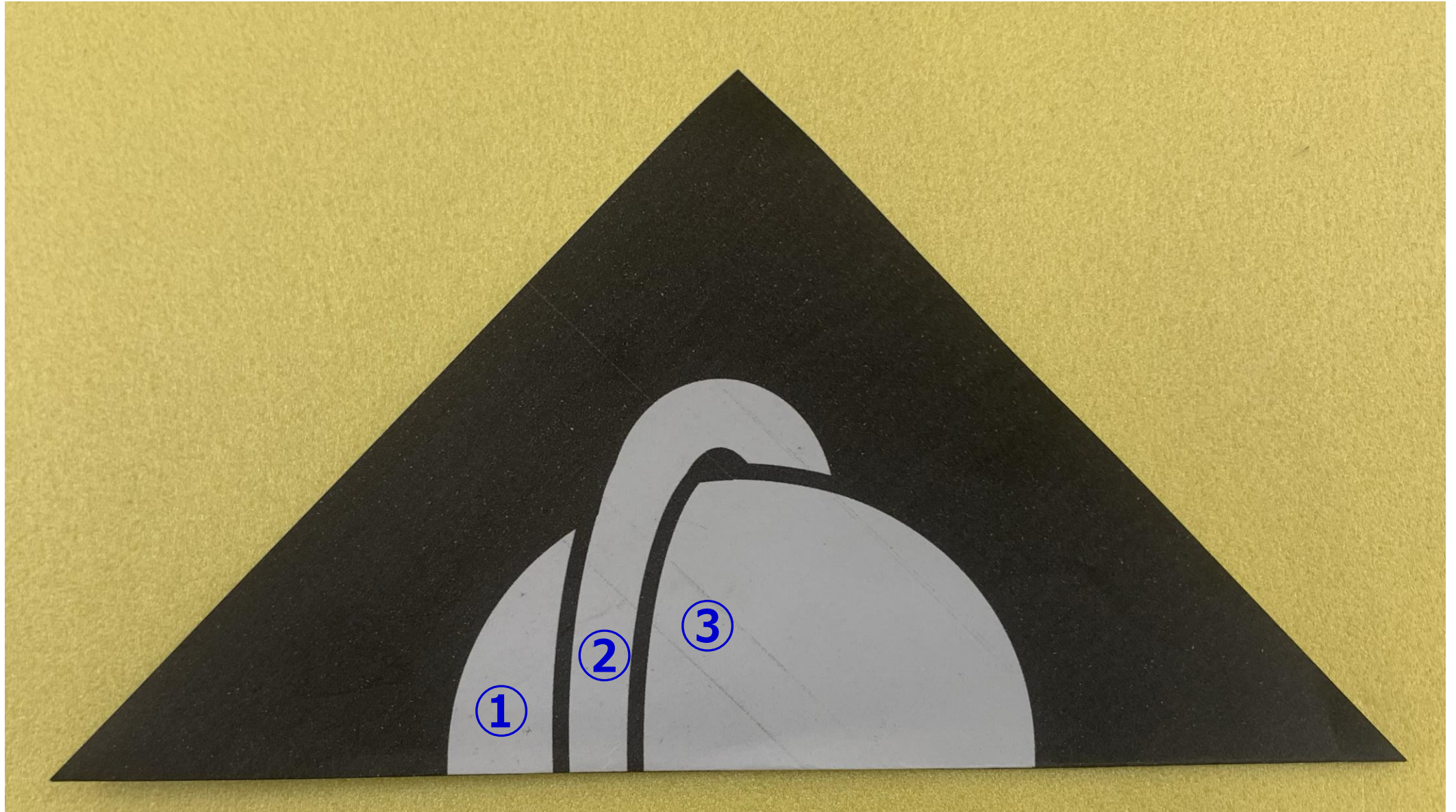
**Cut out the white part in this
order.**

3A - Practice 1 ⑧

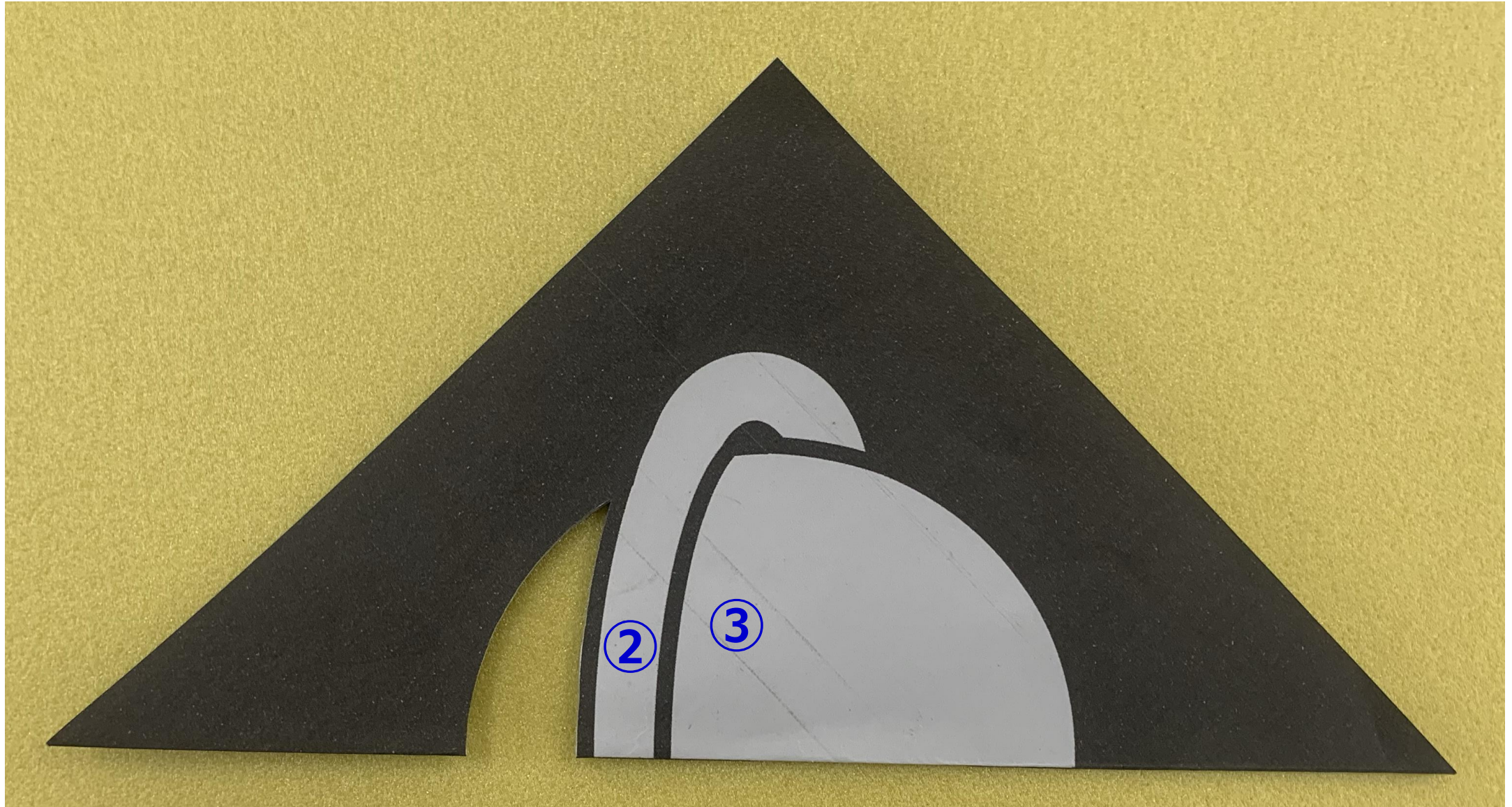


**Cut out the white part in this
order.**

3A - Practice 1 ⑨

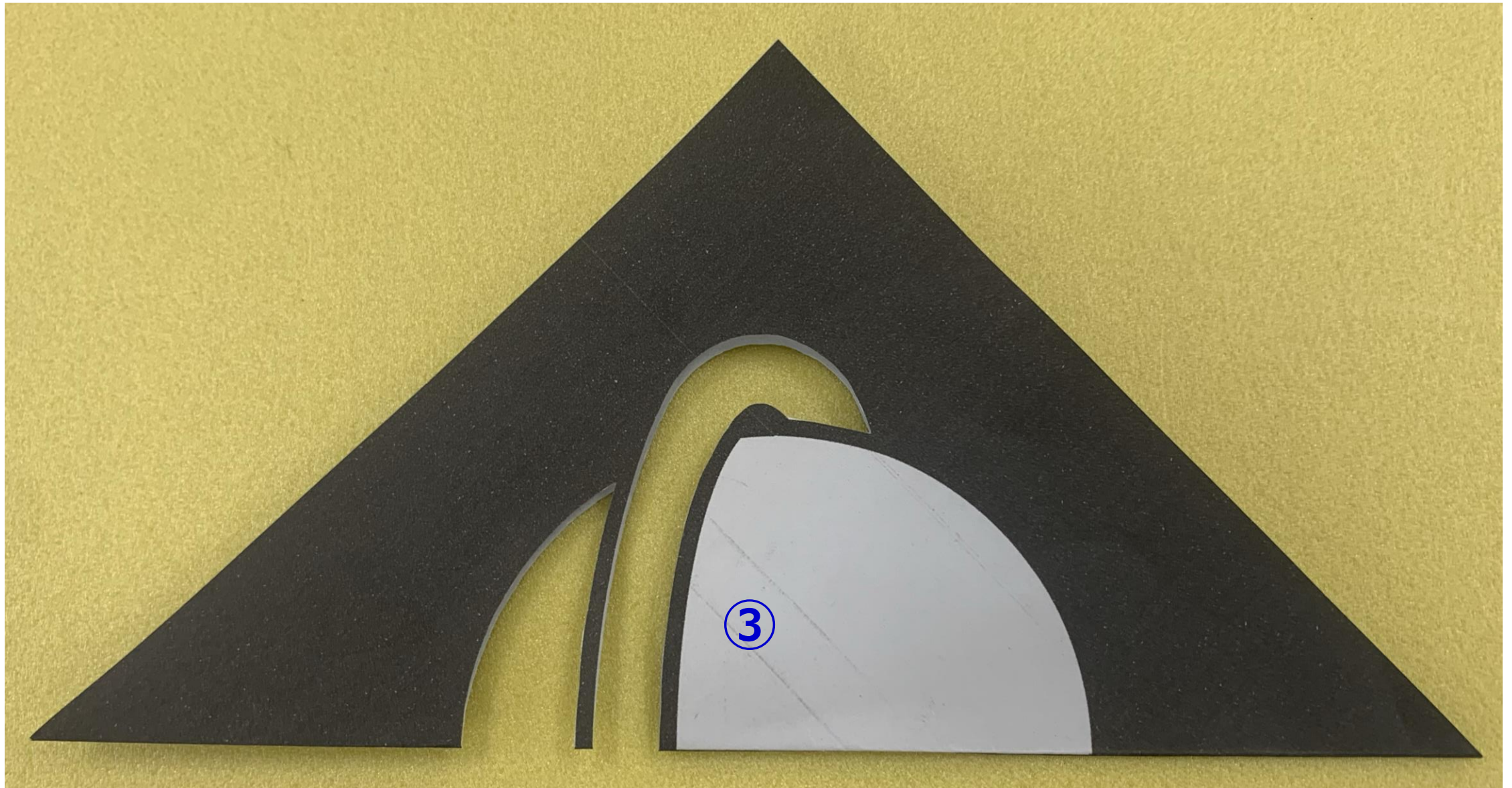


Cut out the white part in this order.

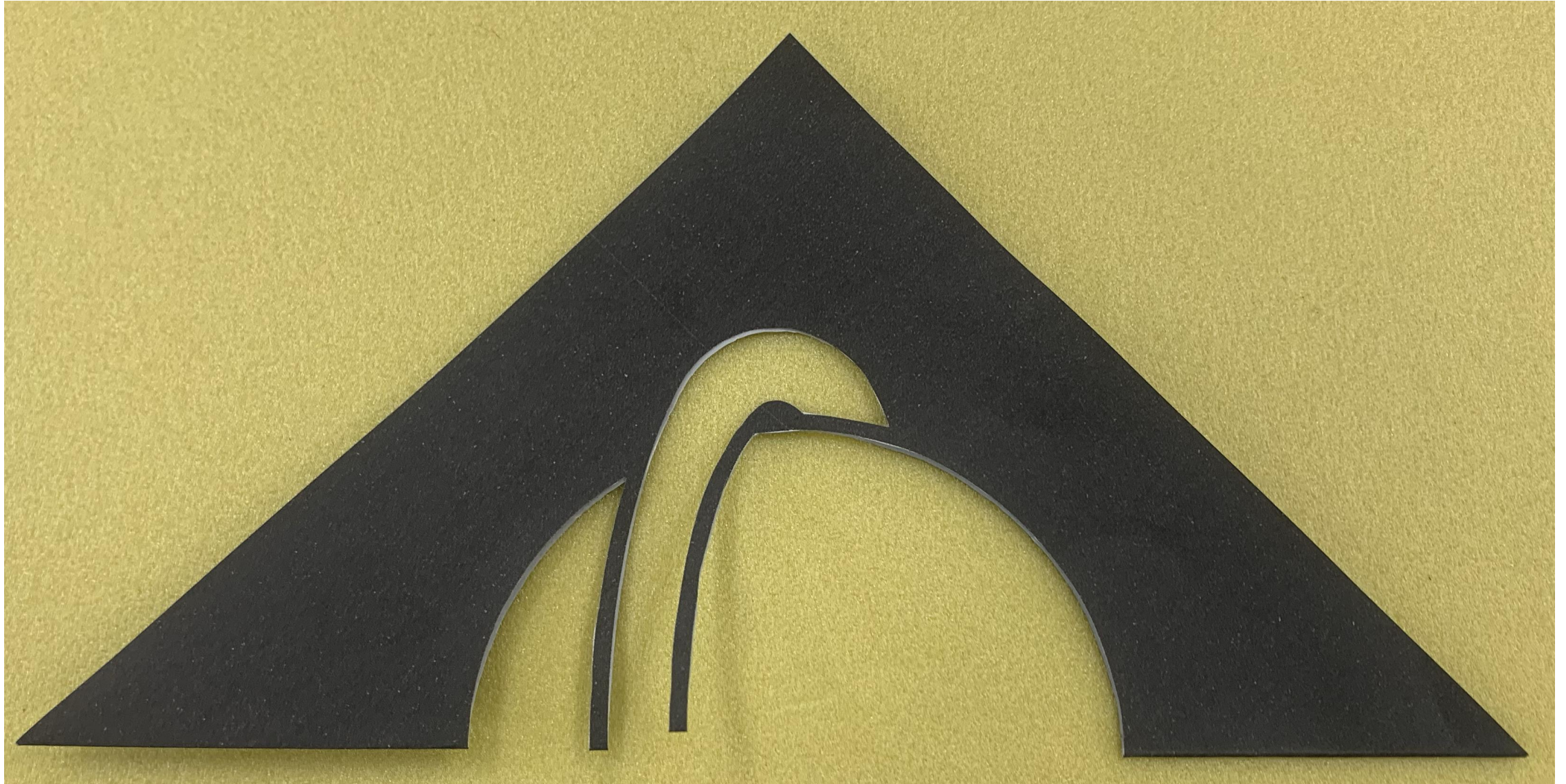


**Cut out the white part in this
order.**

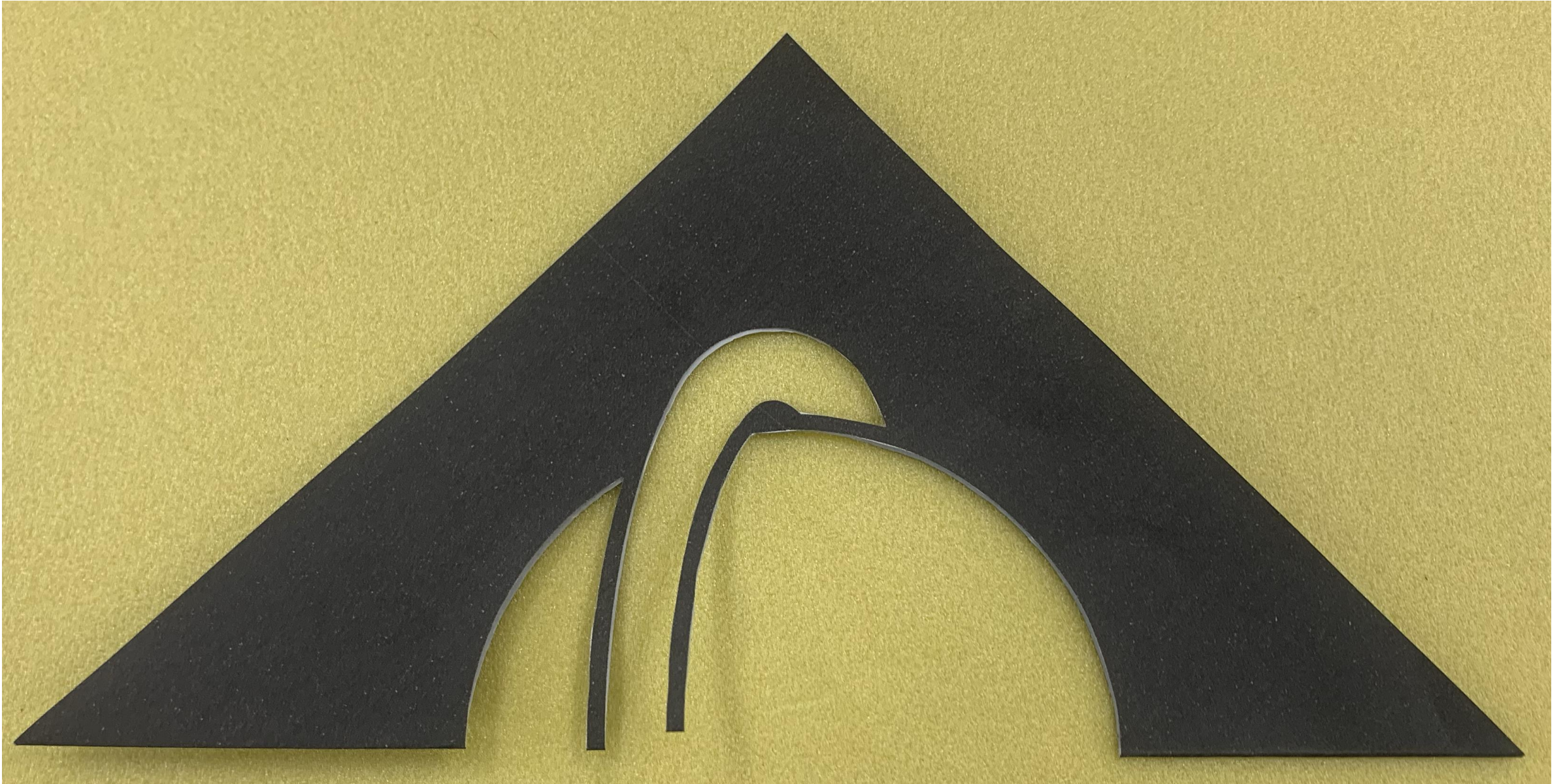
3A - Practice 1 ⑪

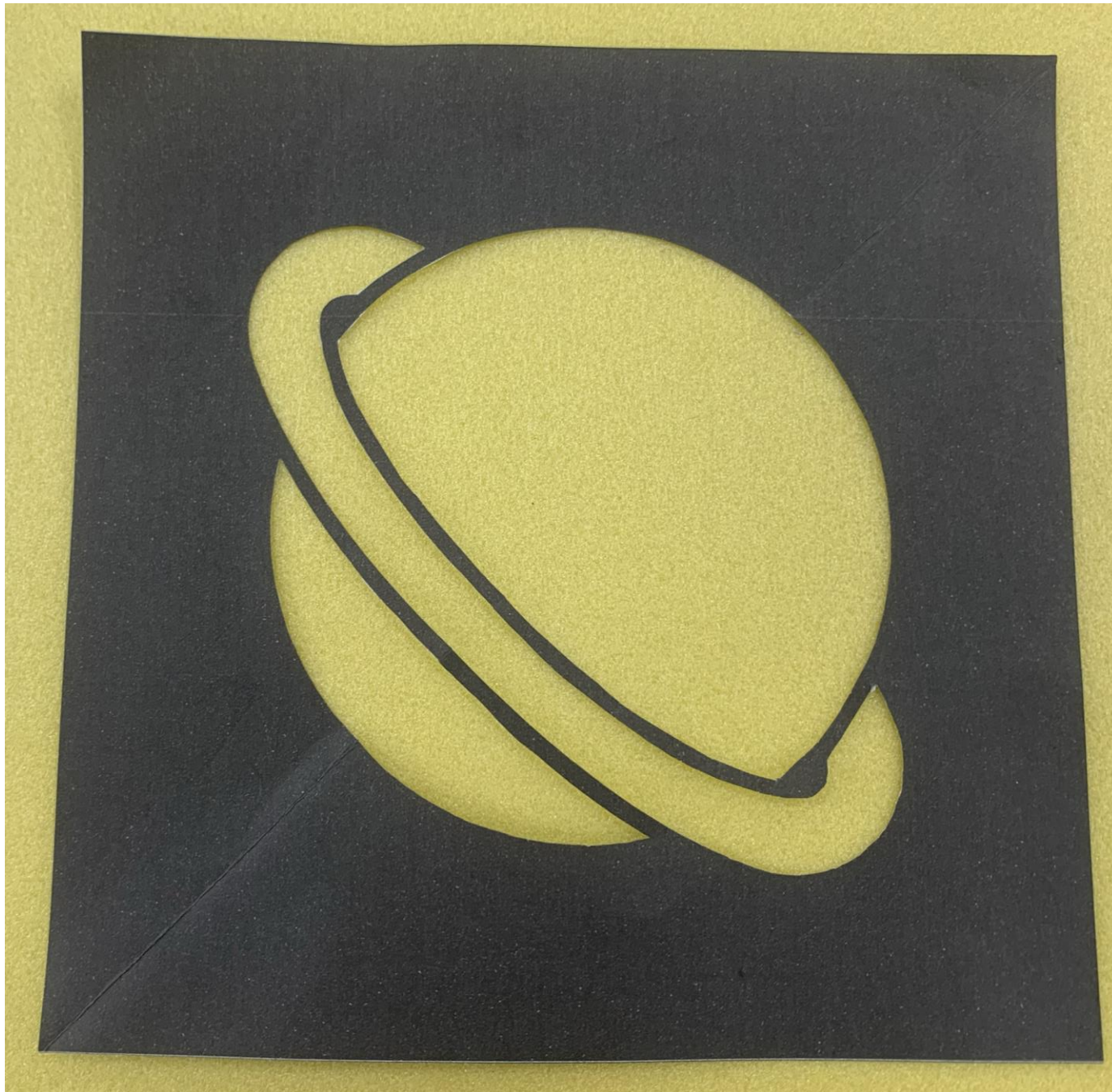


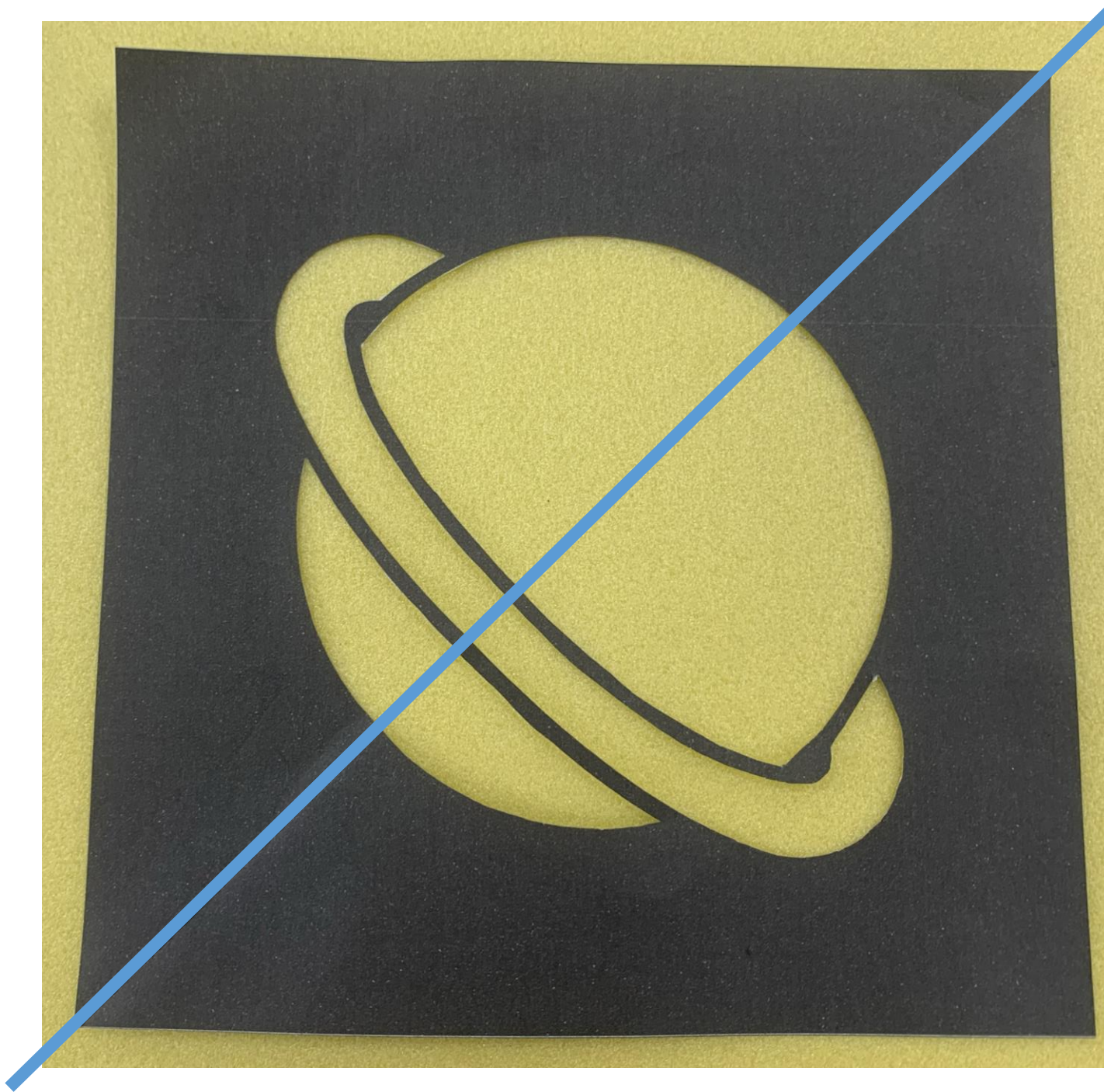
Cut out the white part in this order.



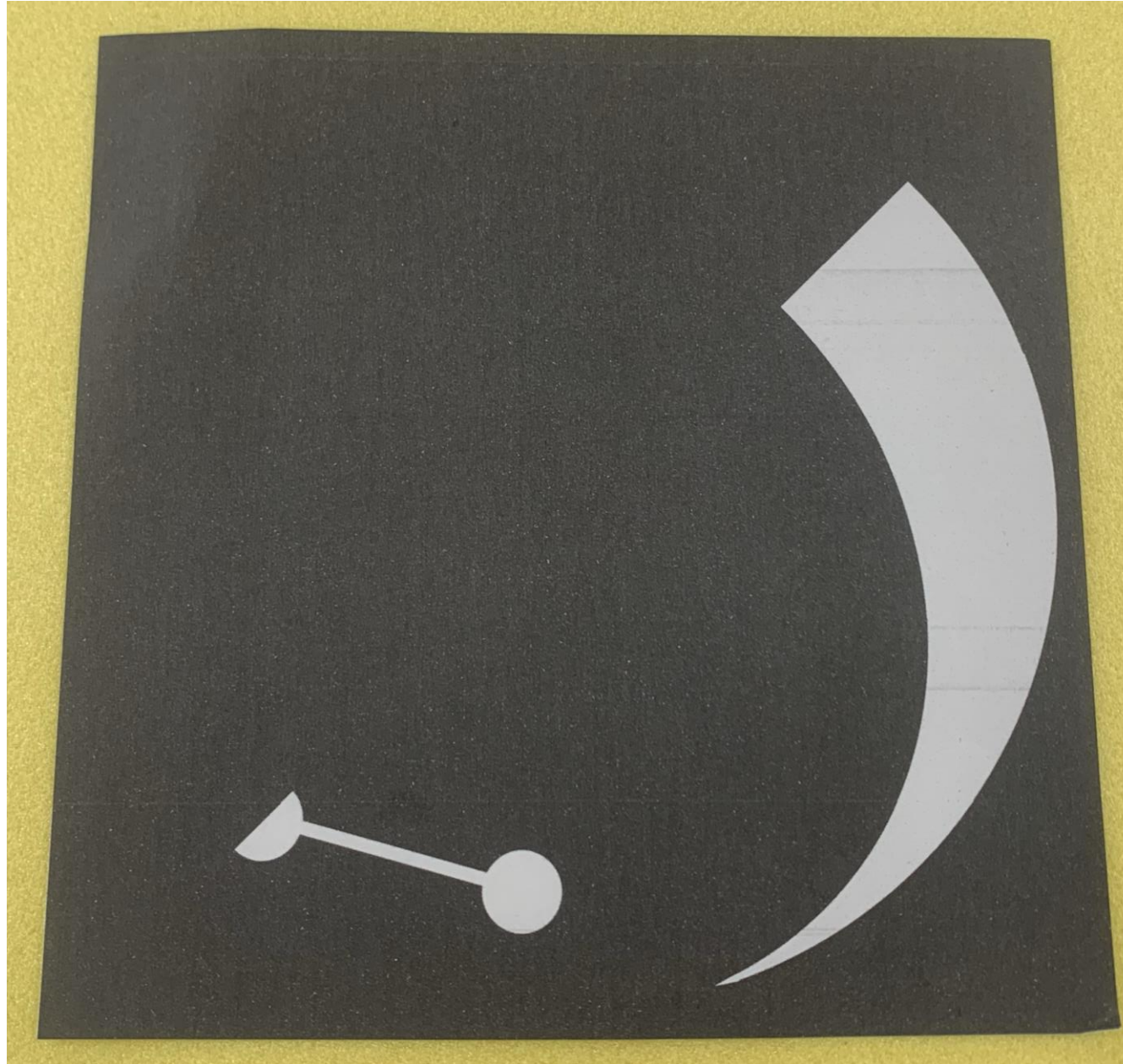
Now unfold the paper.





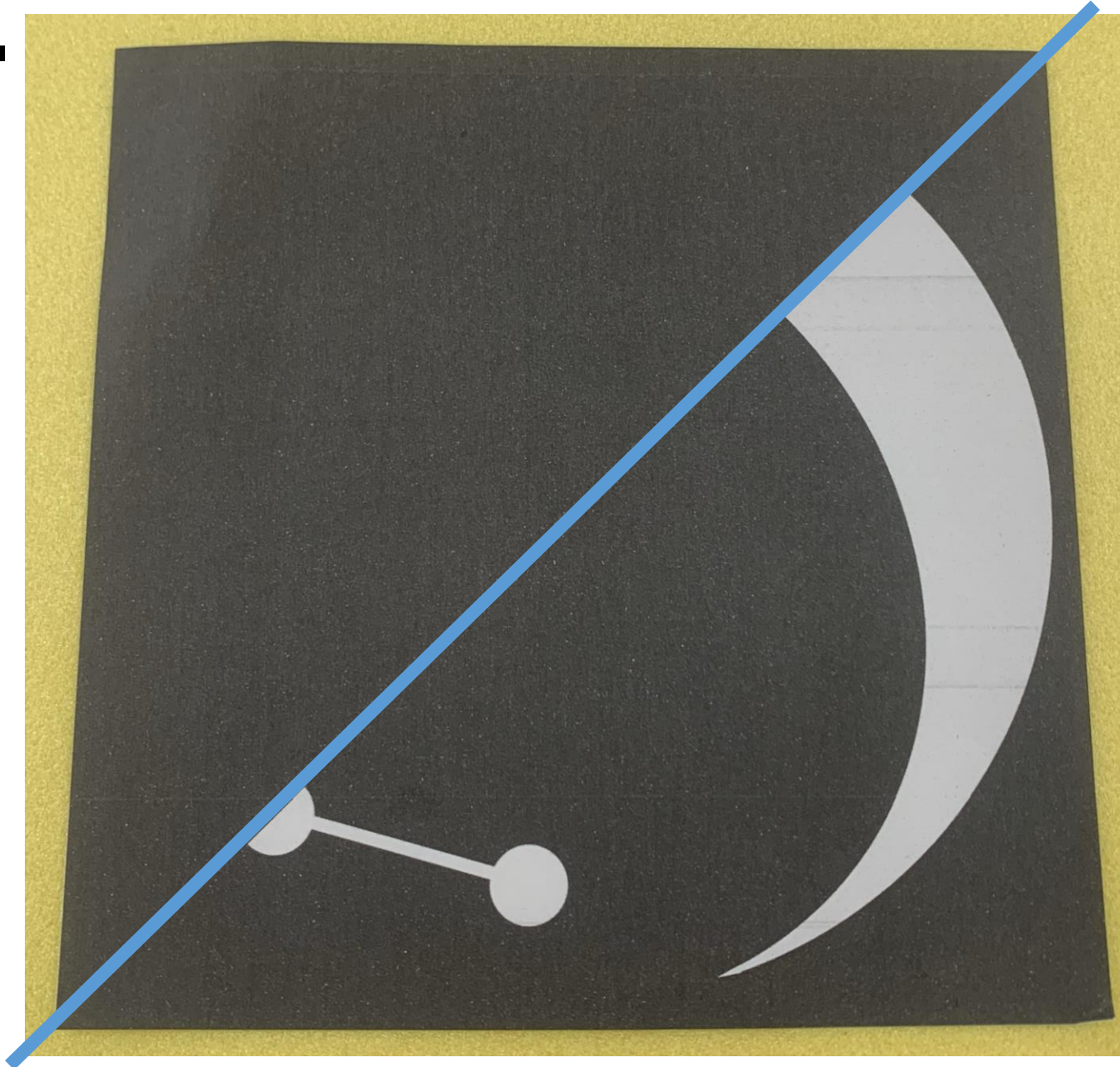


**Next, let's use this crest
pattern.**



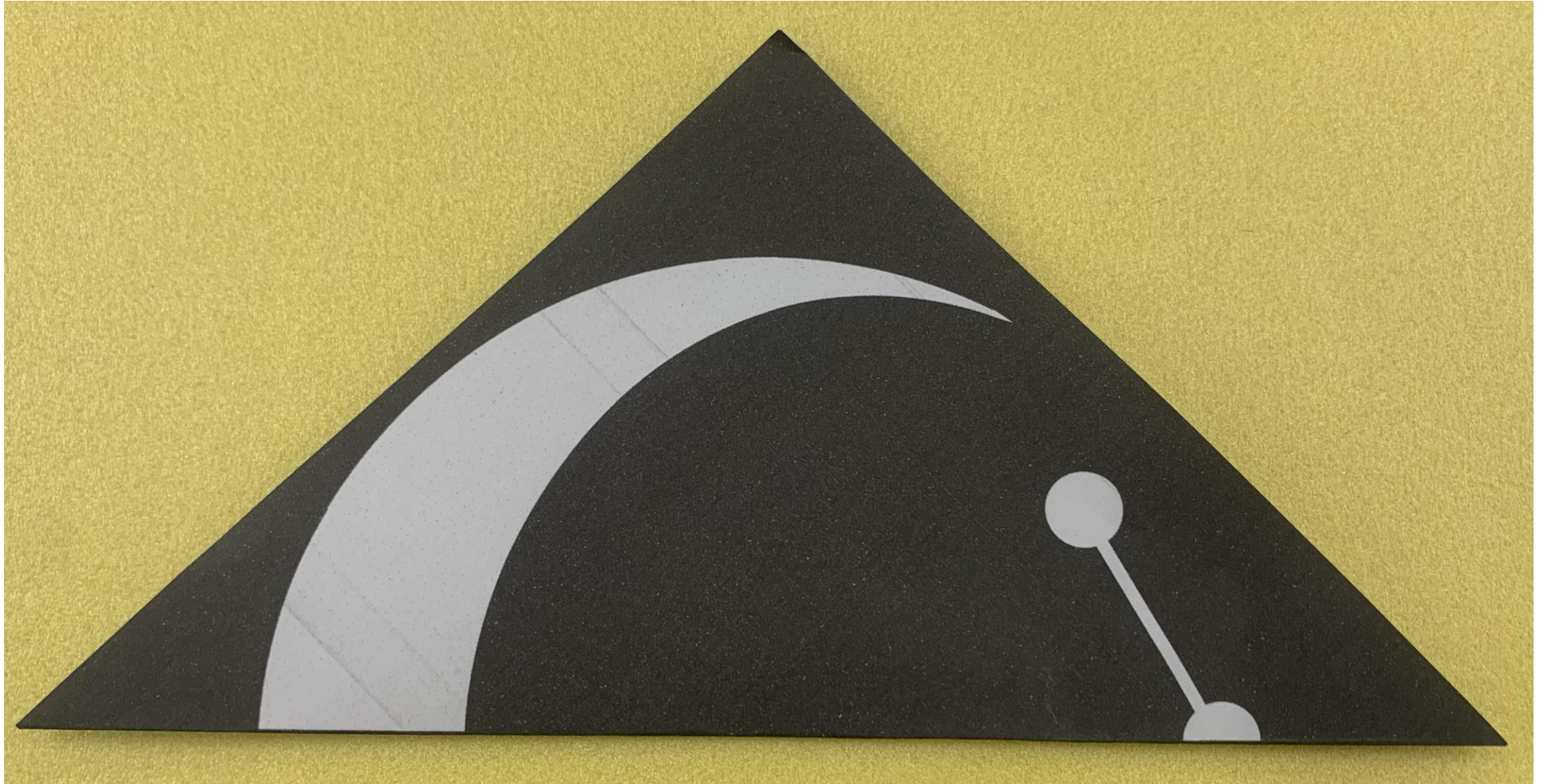
**Fold along this line to make
a triangle.**

3B - Practice 2 ②



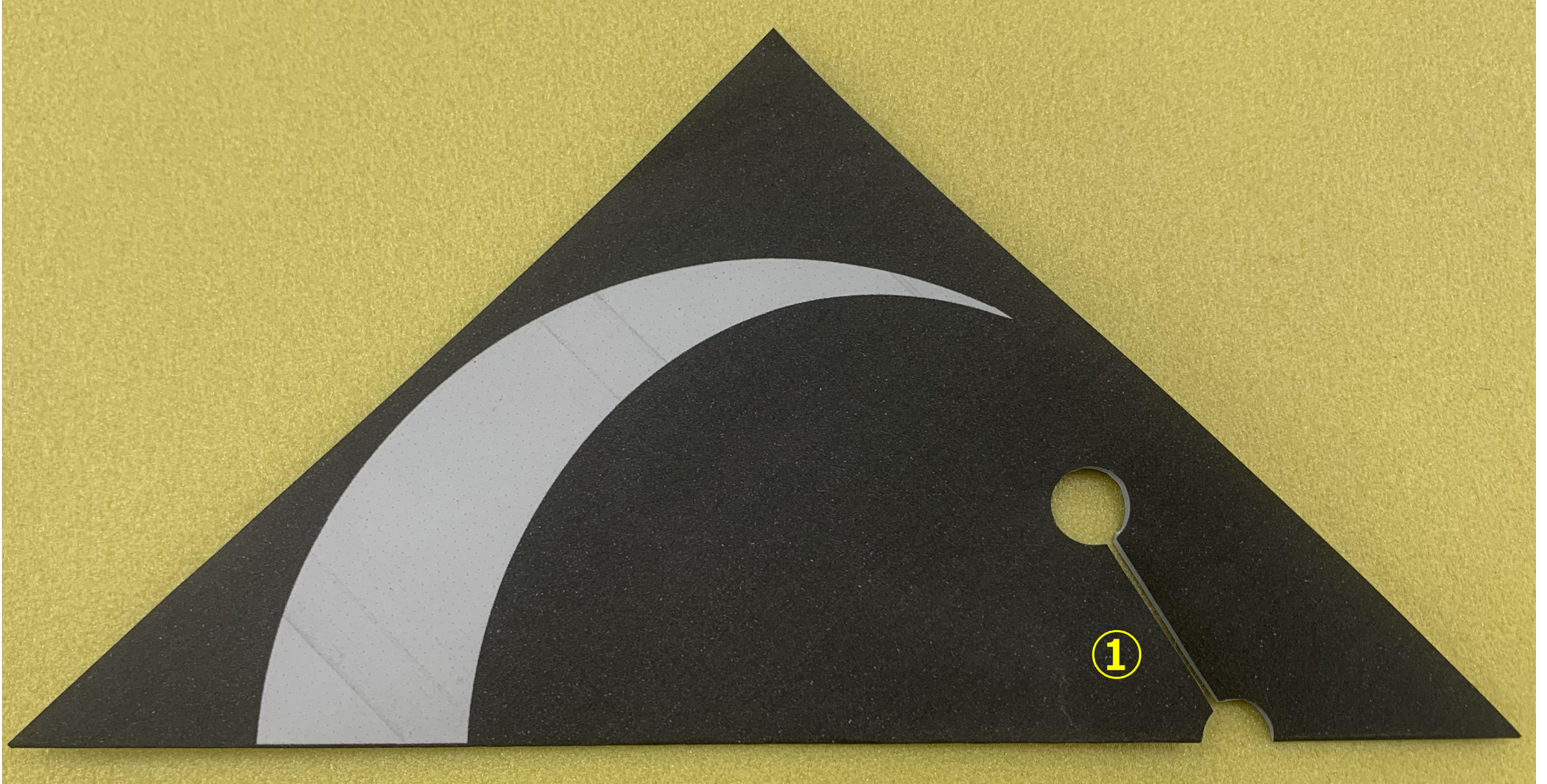
**Fold along this line to make
a triangle.**

3B - Practice 2 ③

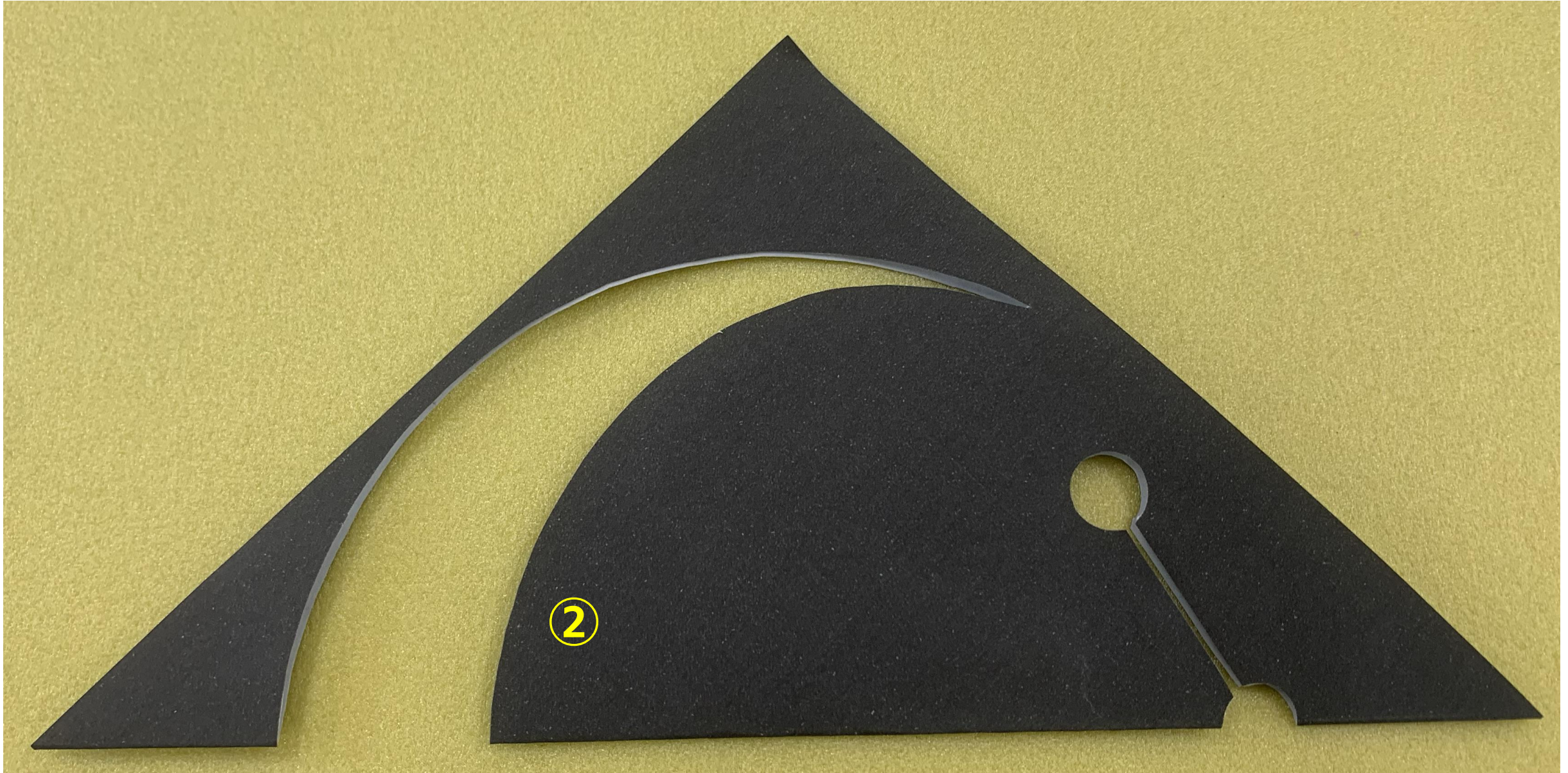


Then cut out the white part.

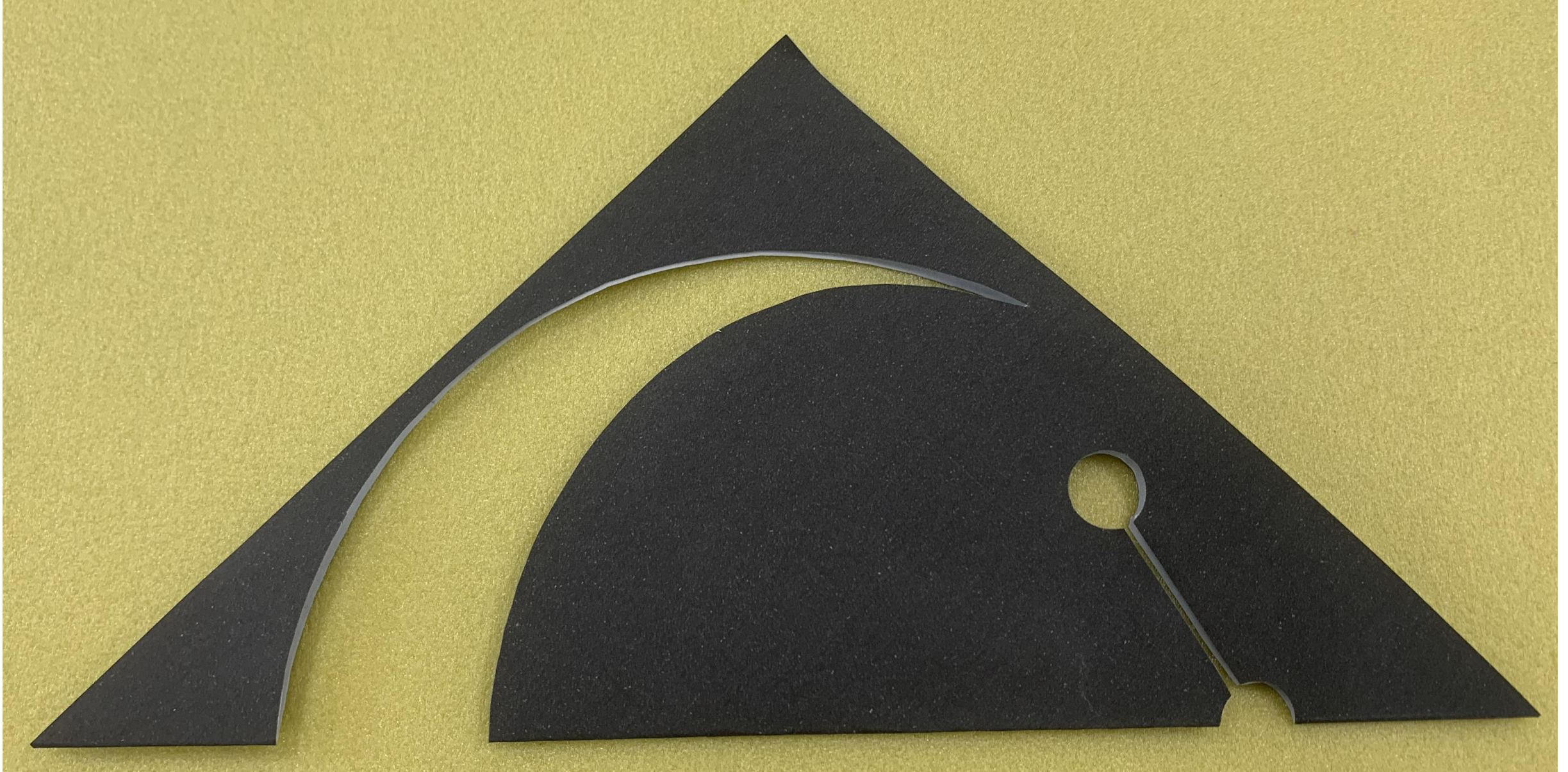
3B - Practice 2 ④

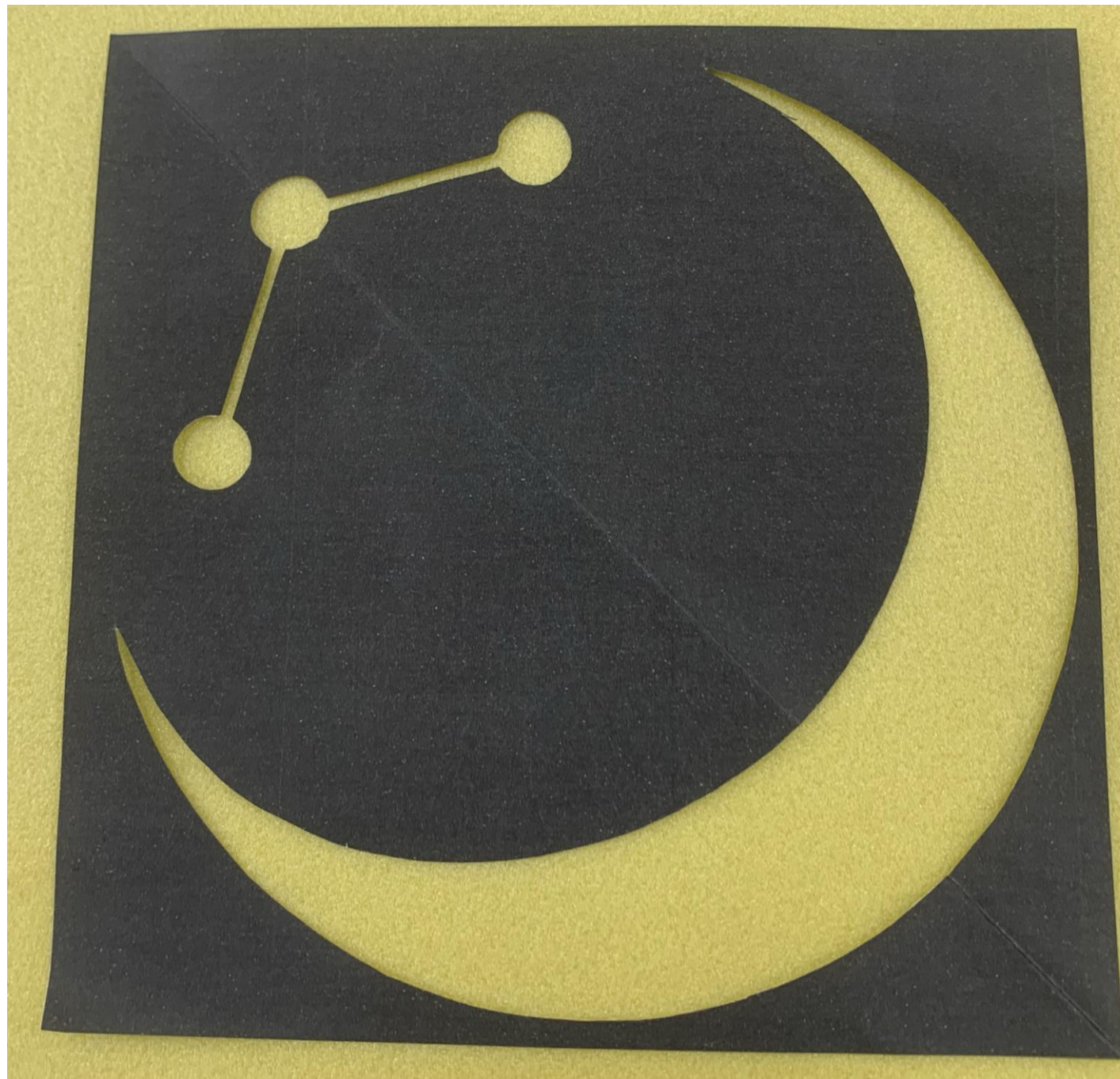


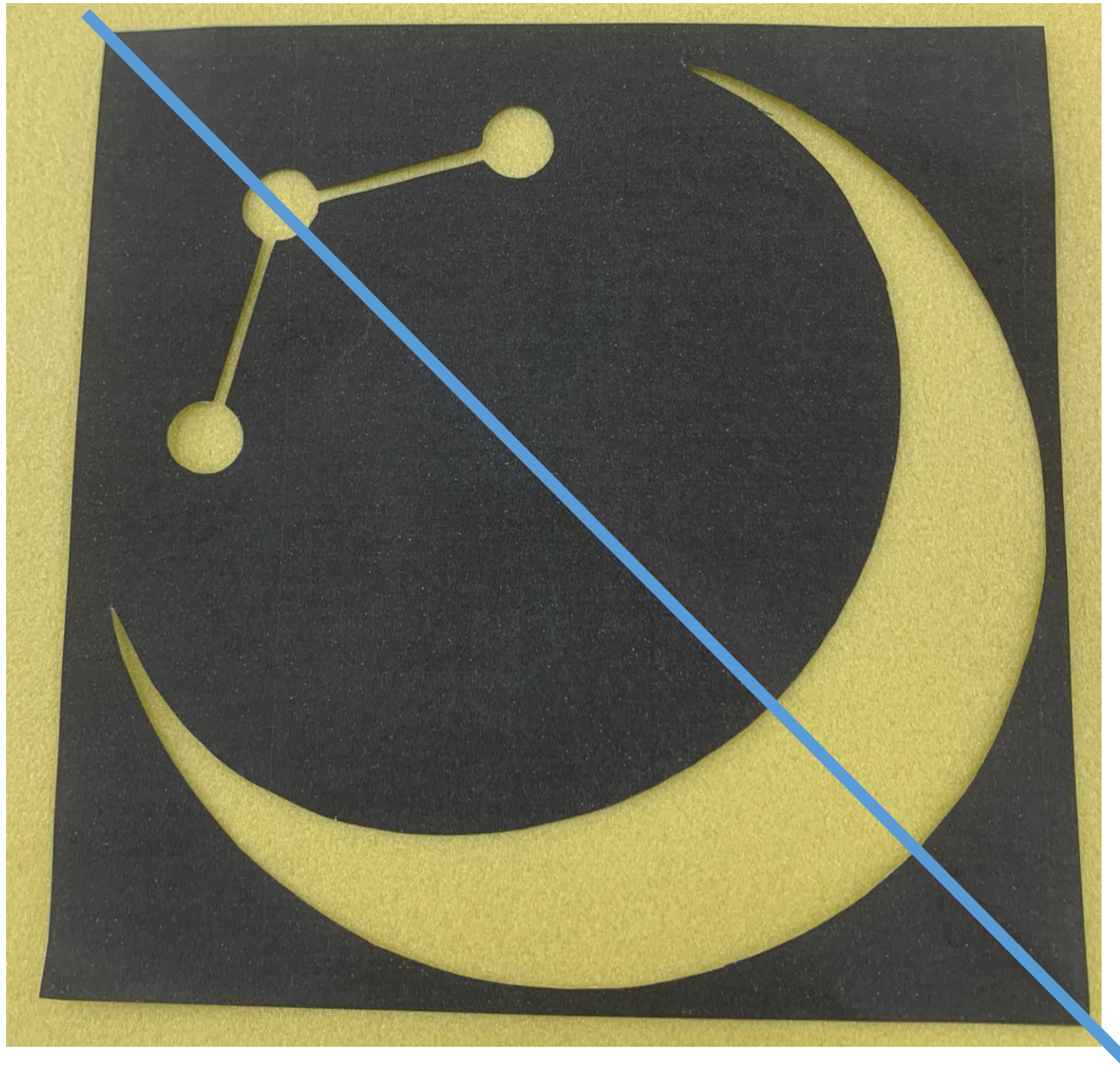
Cut out this white part too.



Now unfold the crest.

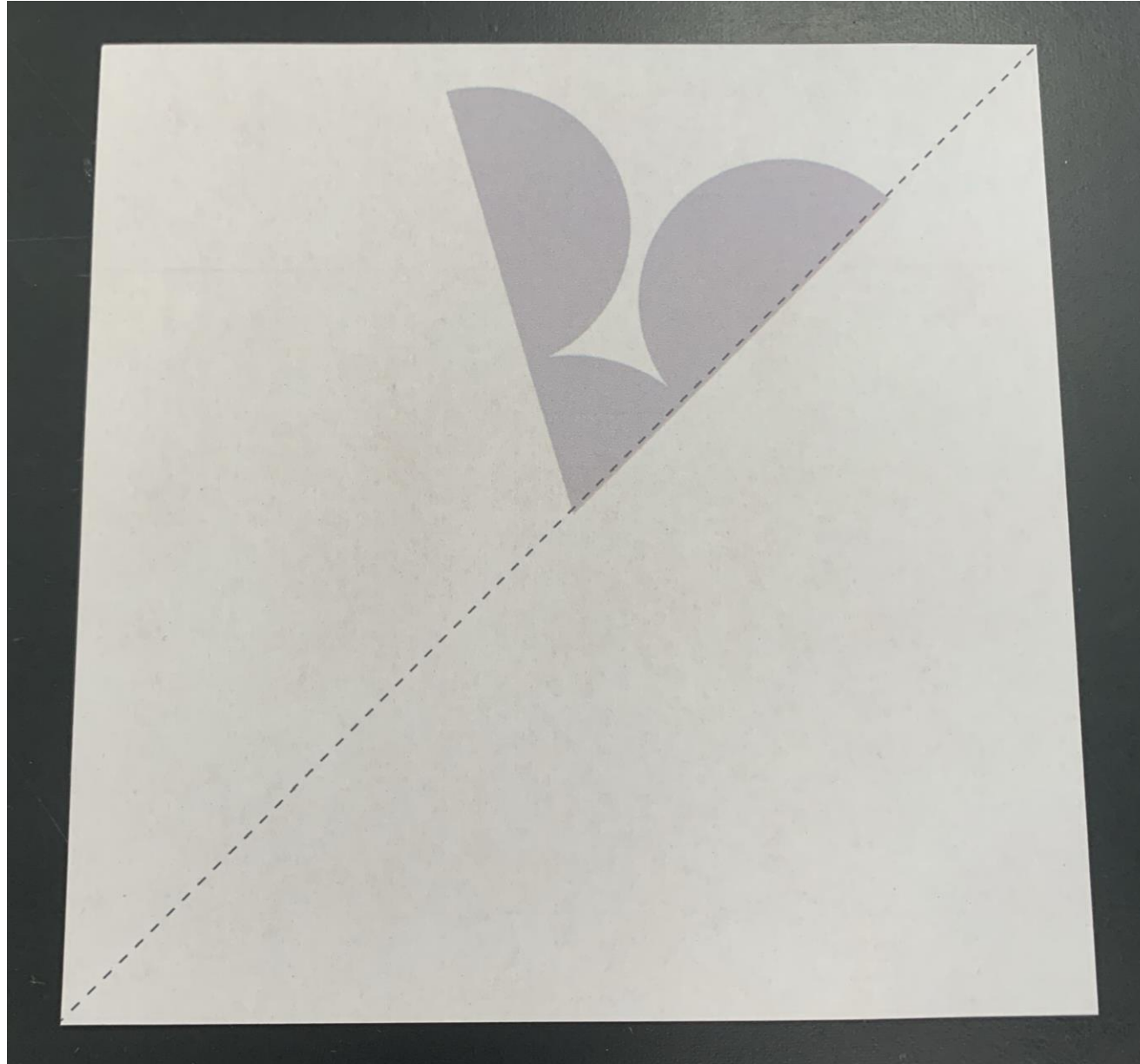




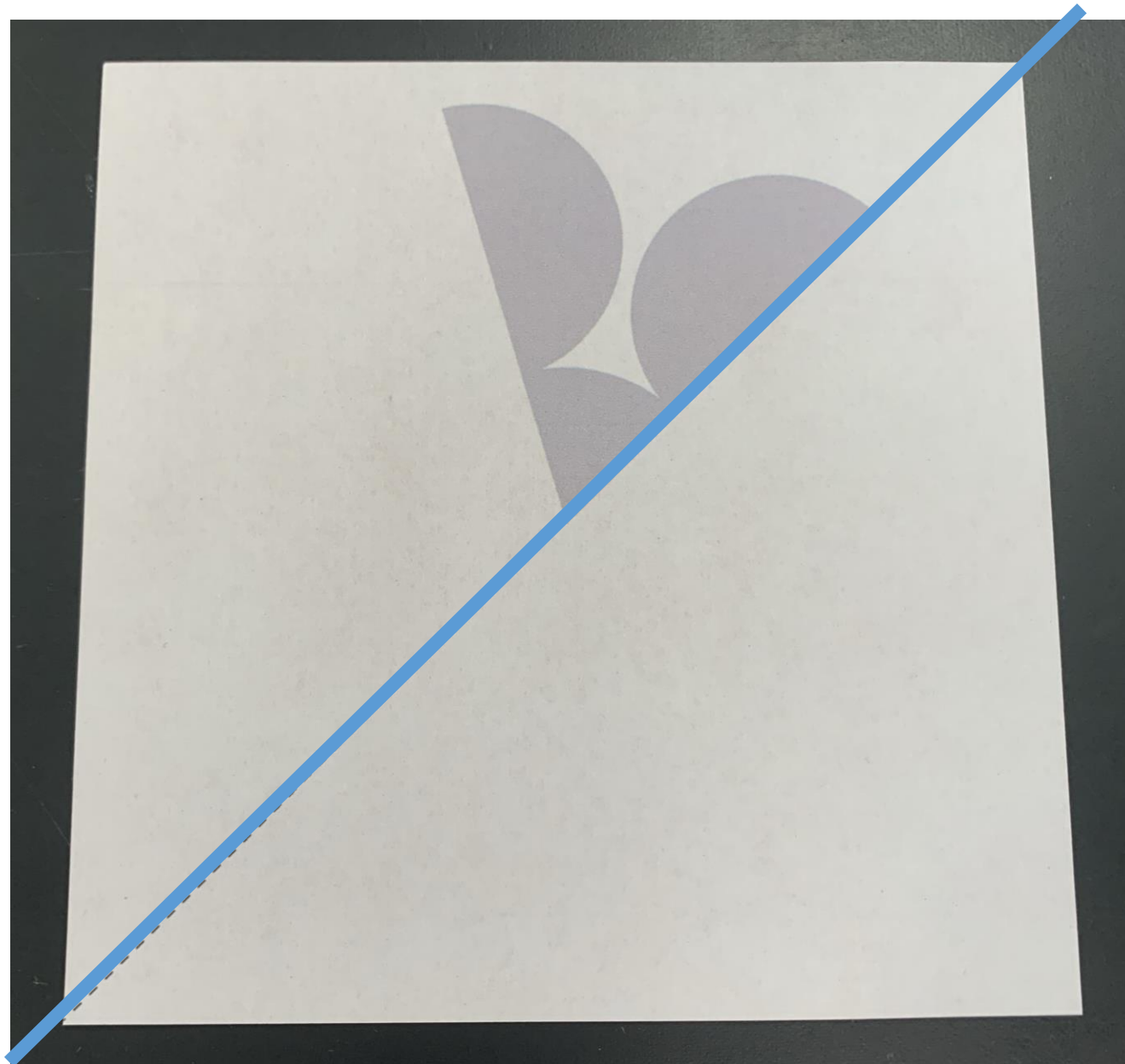


**Next, let's use this crest
pattern.**

3C - Practice 3 ①



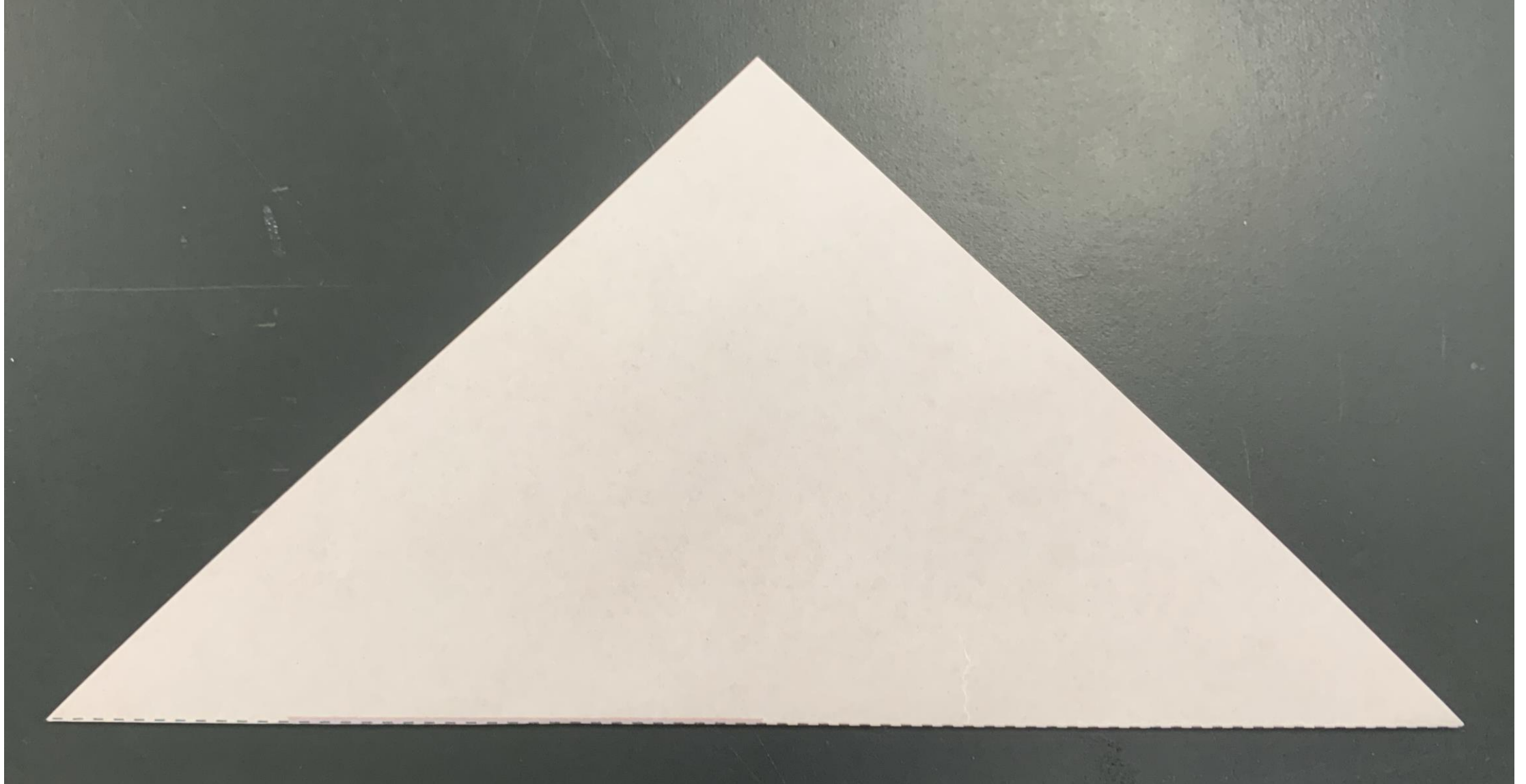
**Fold along this line to make
a triangle.**



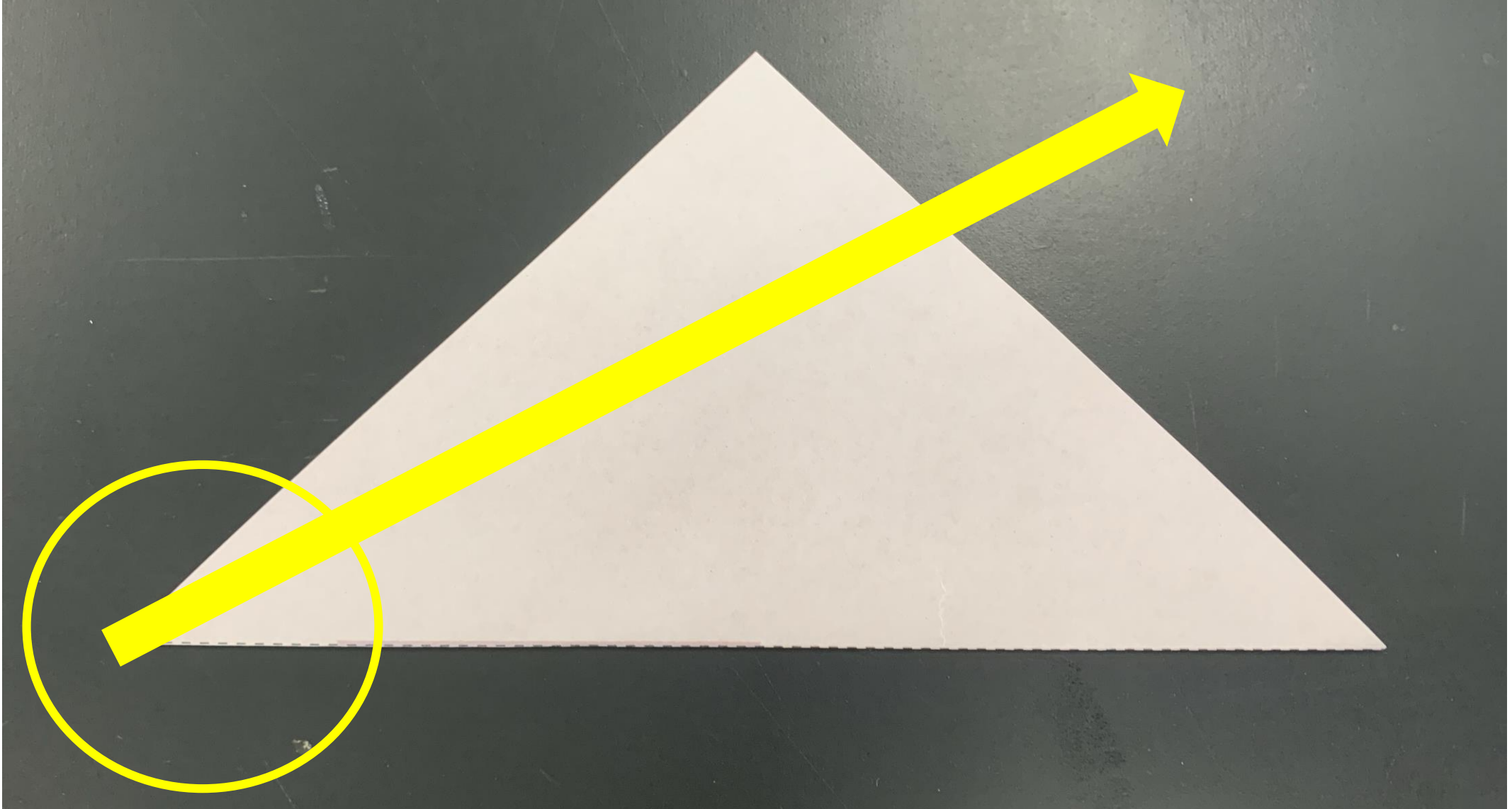
**Fold along this line to make
a triangle.**



Turn it over.

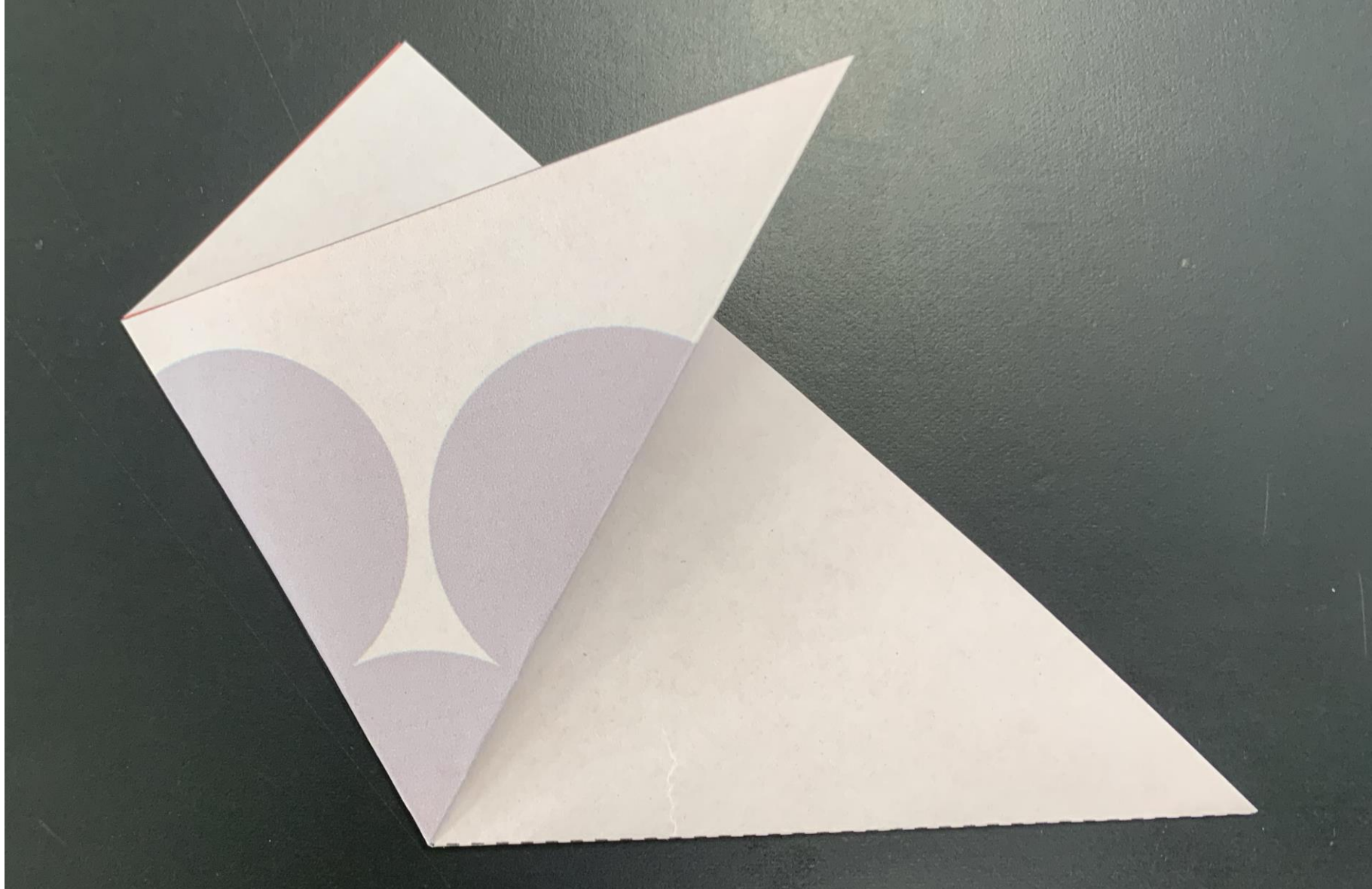


**Fold it along the line drawn on
the back.**

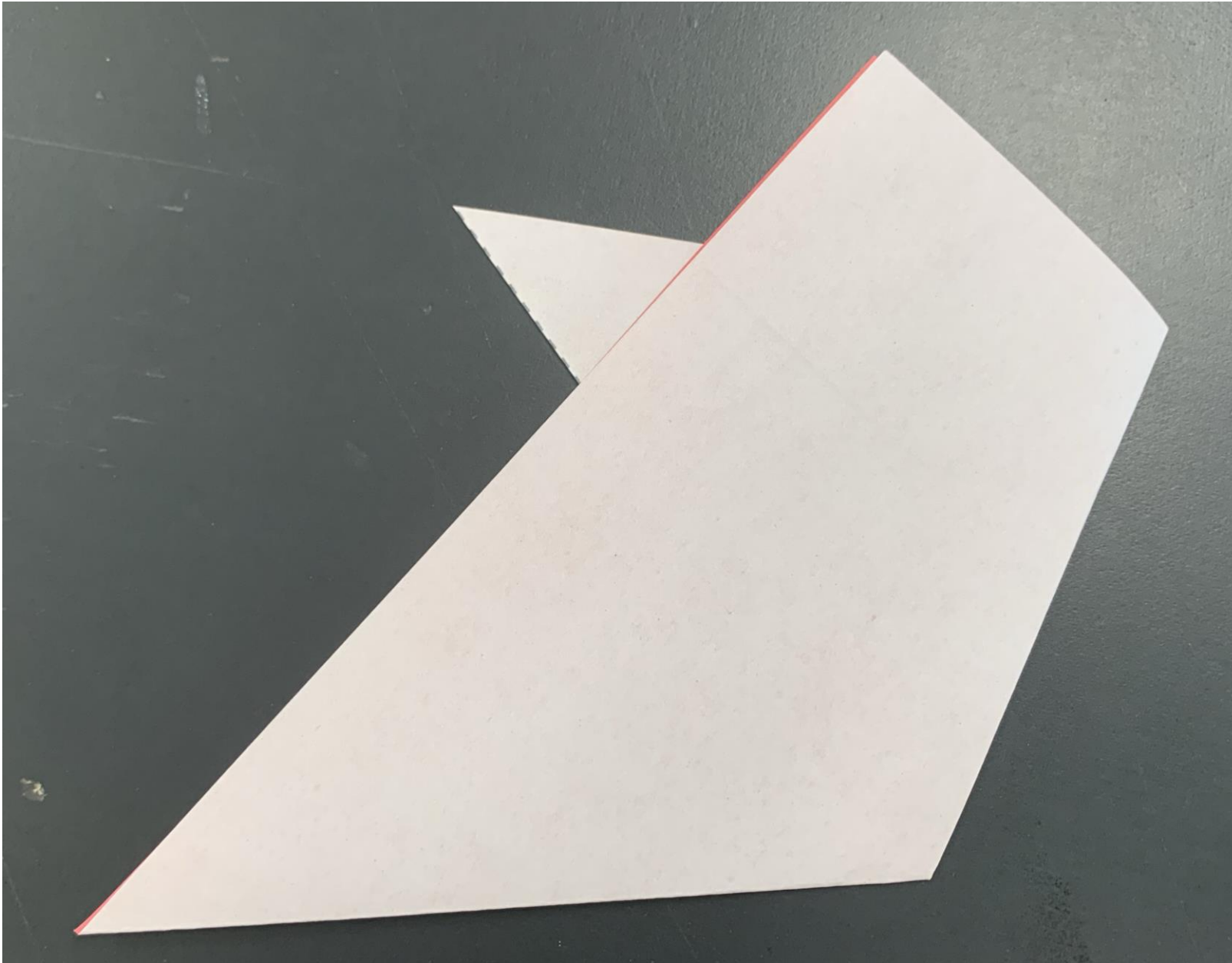


**Fold it along the line drawn on
the back.**

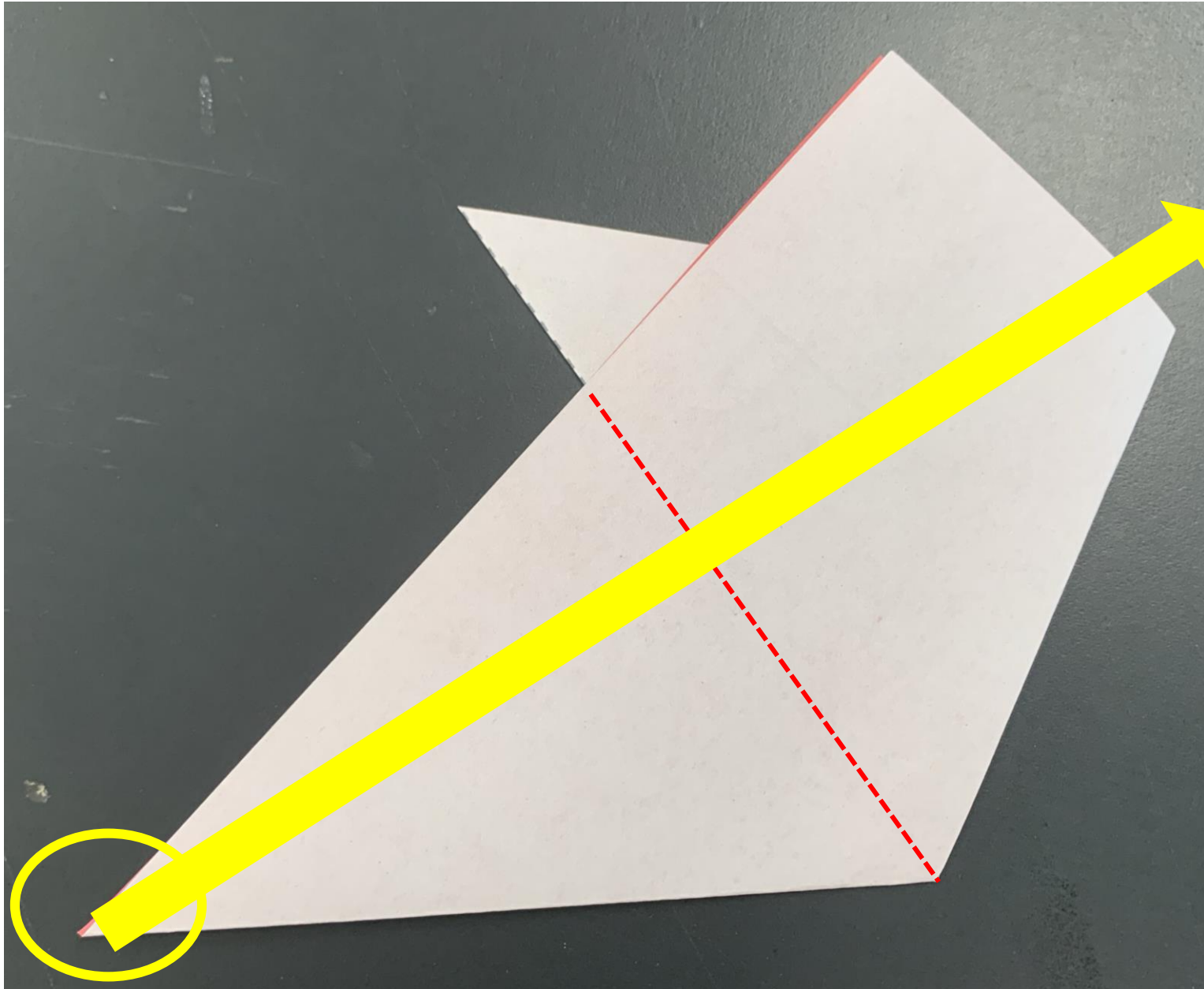
3C - Practice 3 ⑥



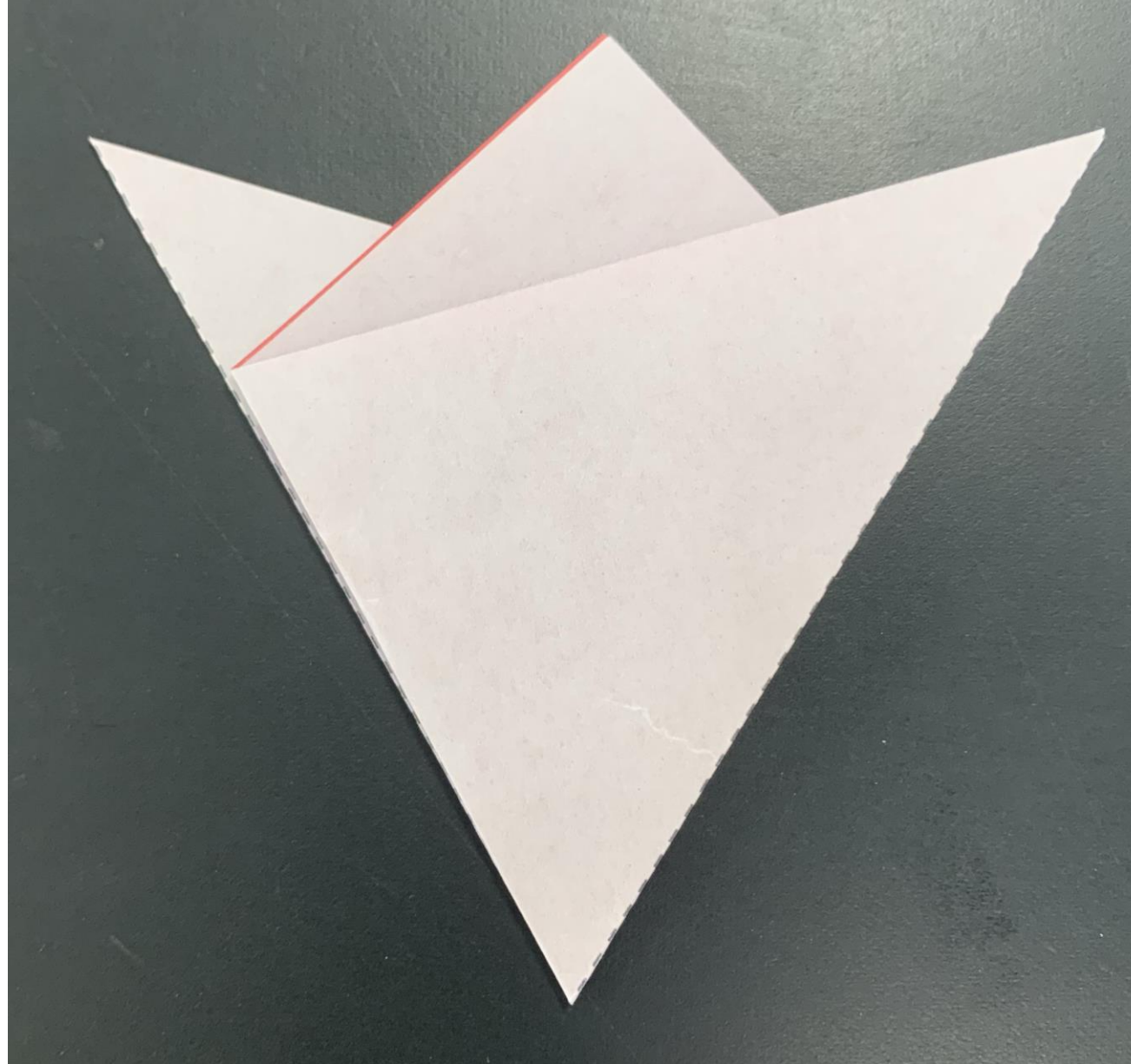
Turn it over.



Fold it along this line.



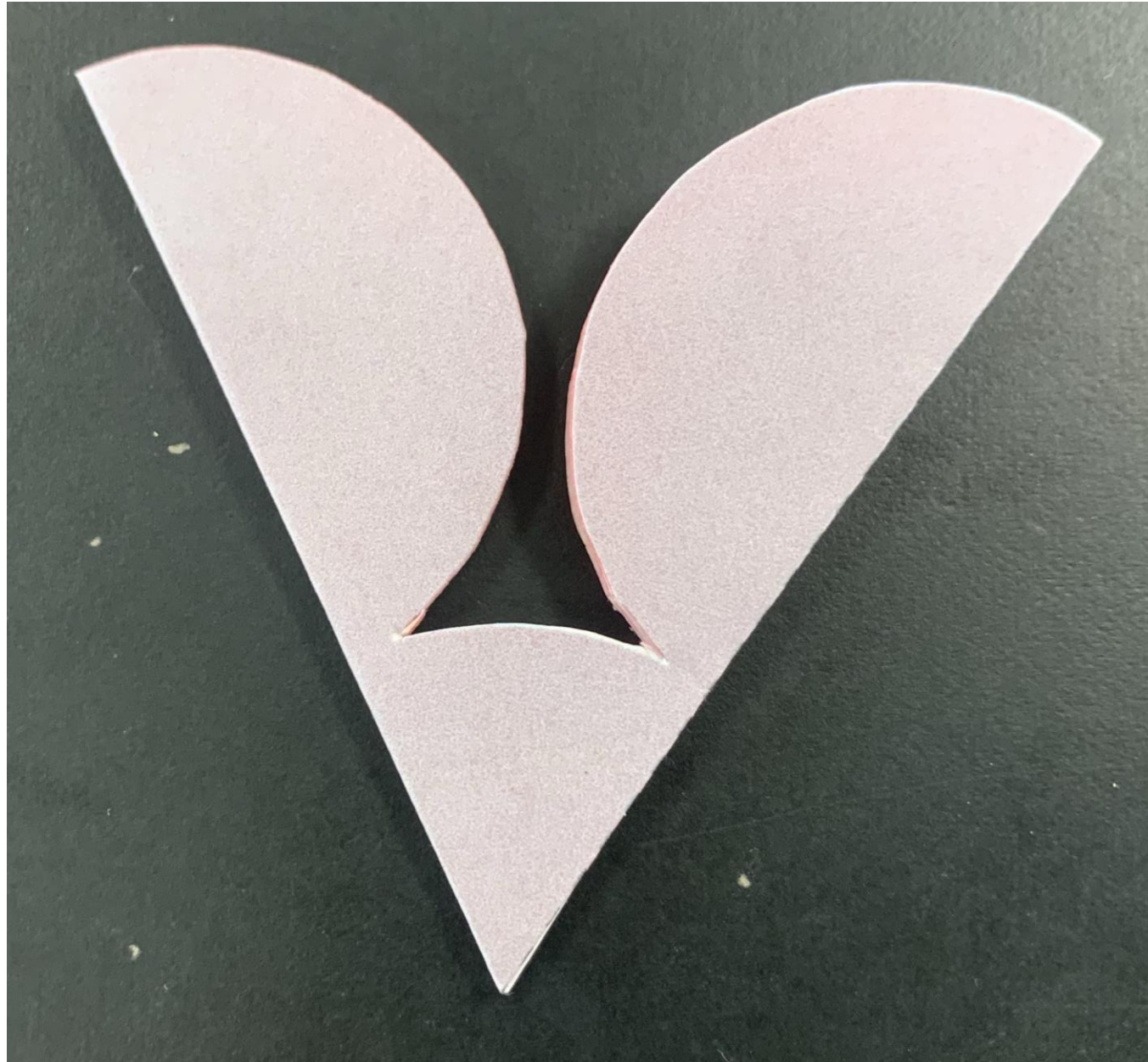
Fold it along this line.

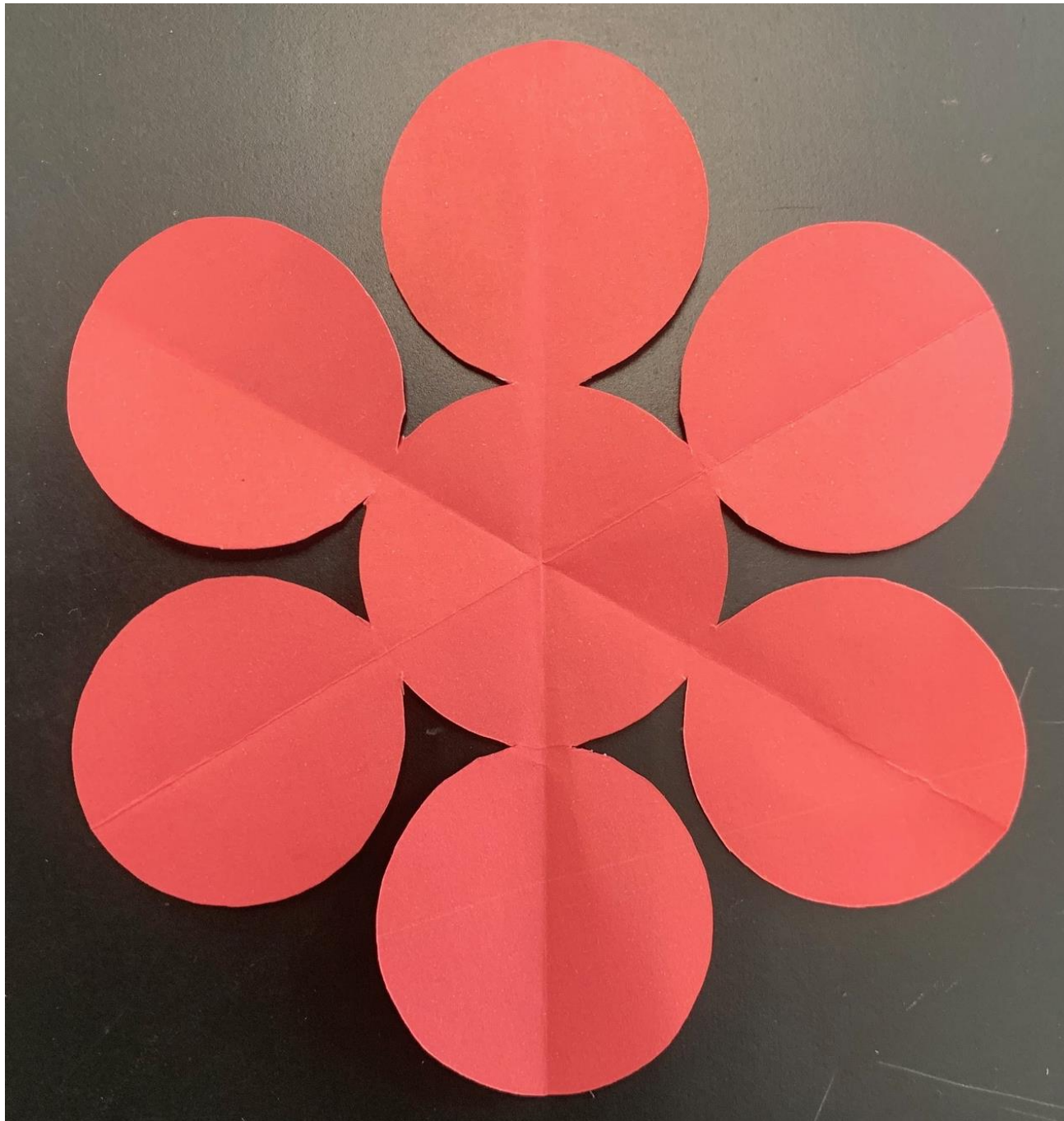


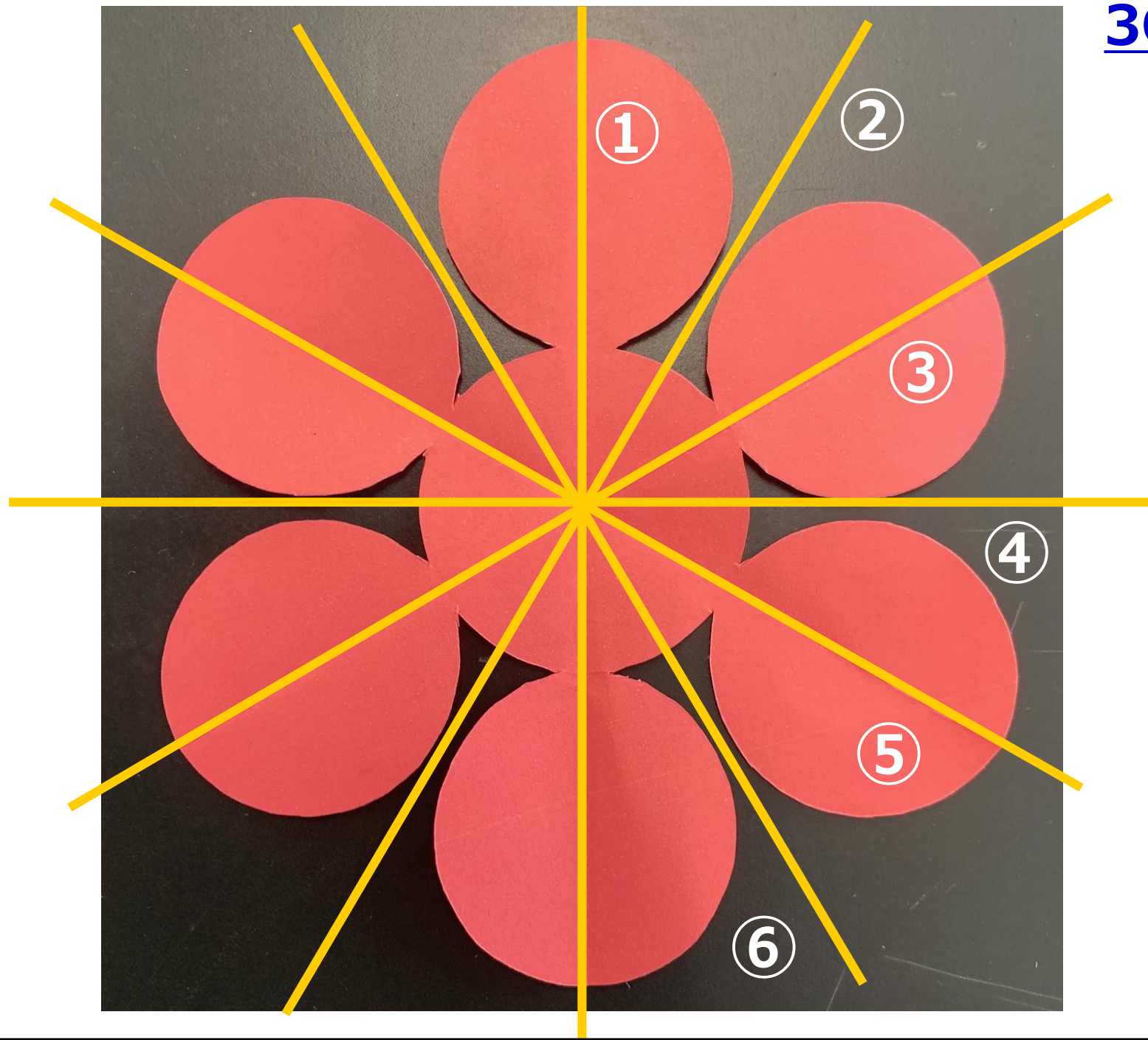
Turn it over.

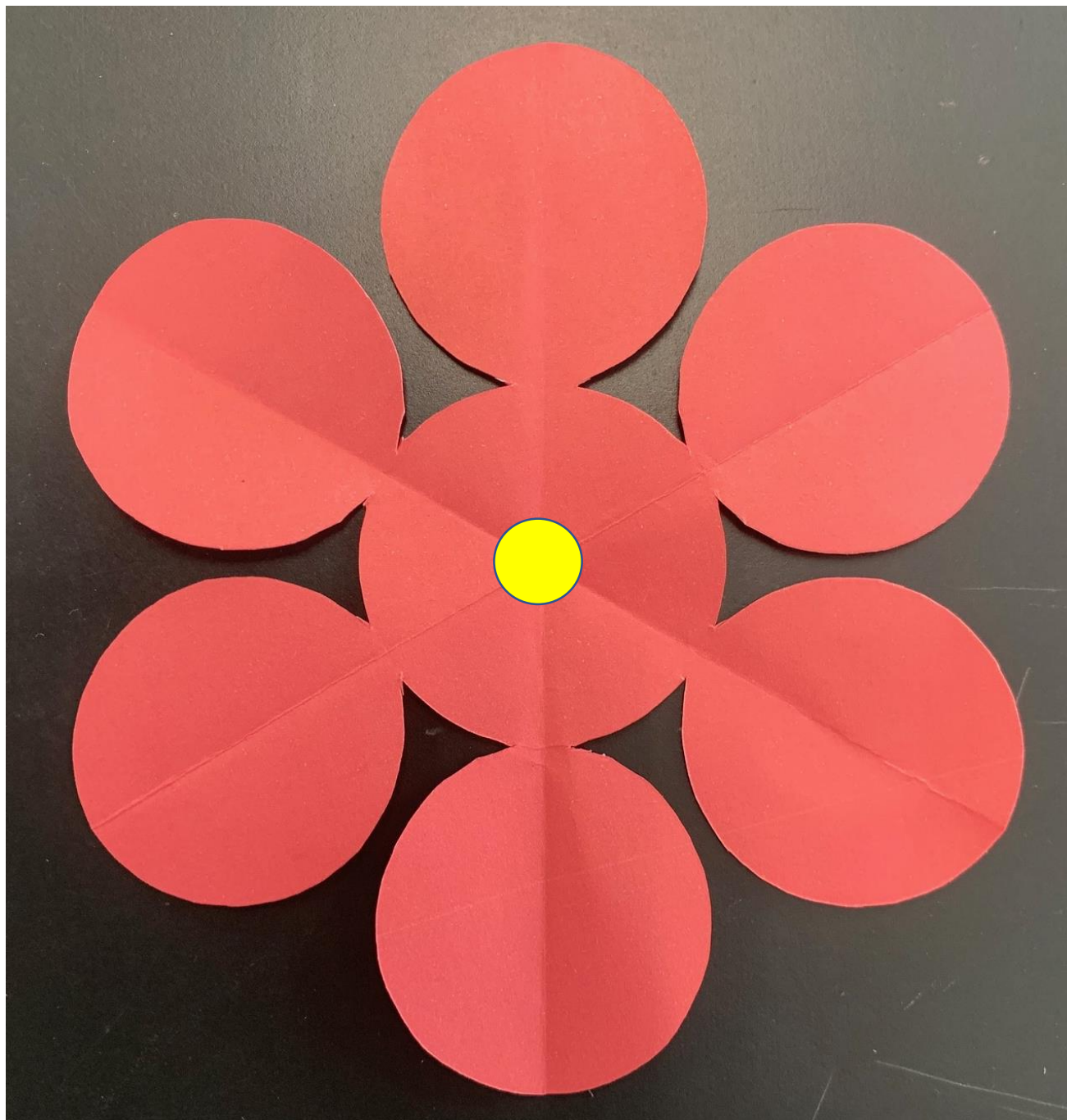


Cut out the dark part.





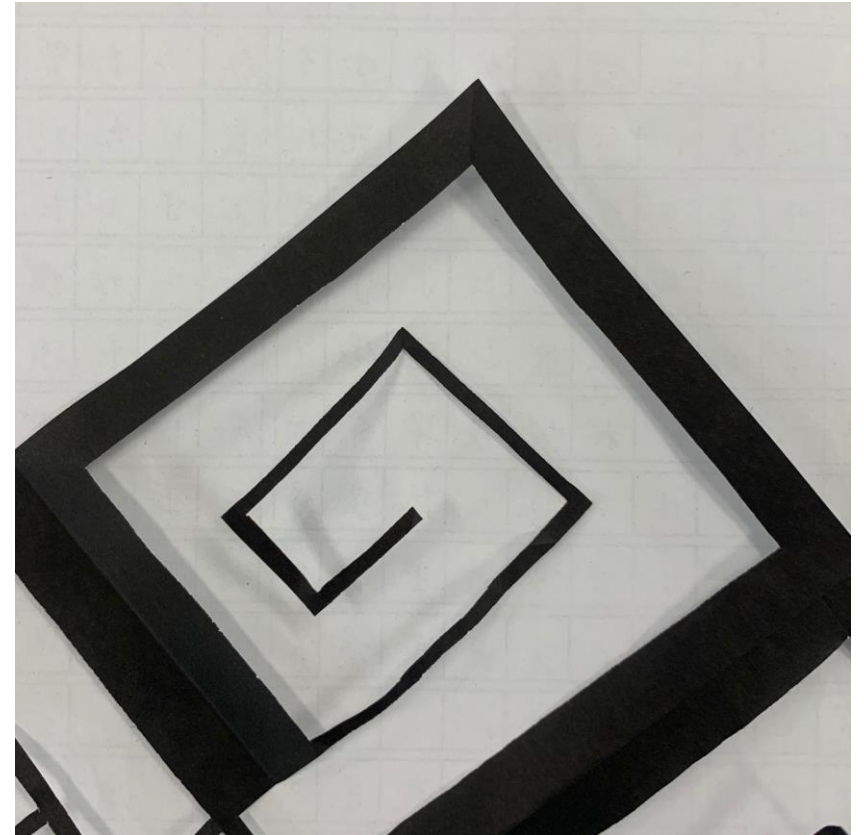
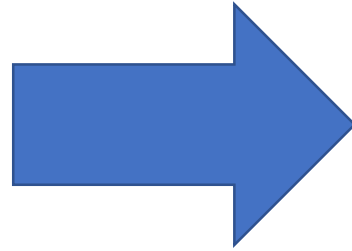
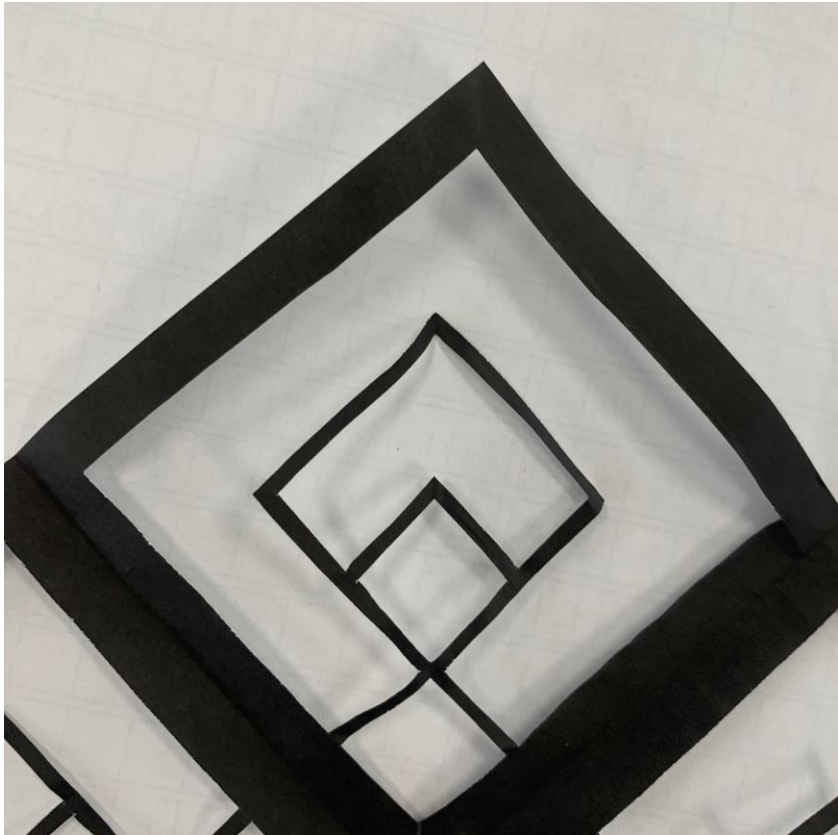




4 - Supplement

4A - Supplement 1

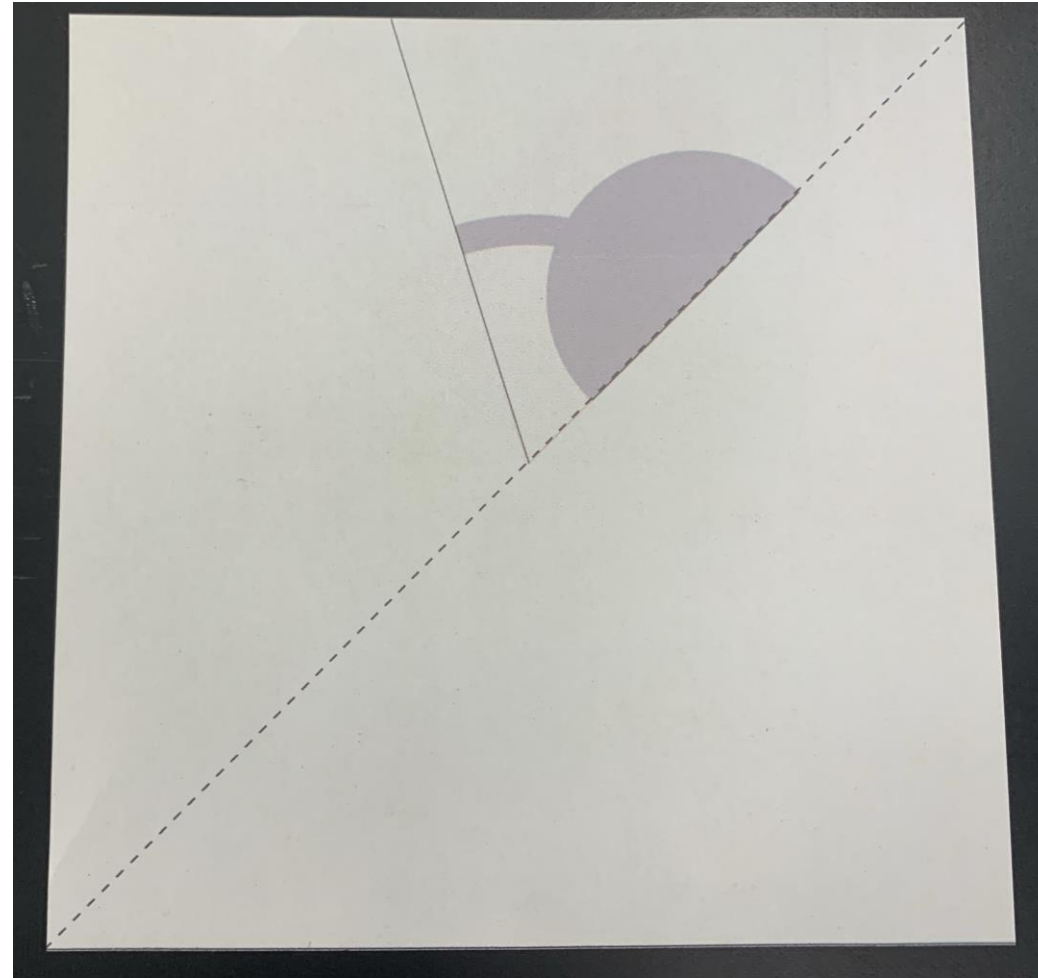
In this crest cutting, the pattern is folded and then cut, so it is always using reflectional symmetry.



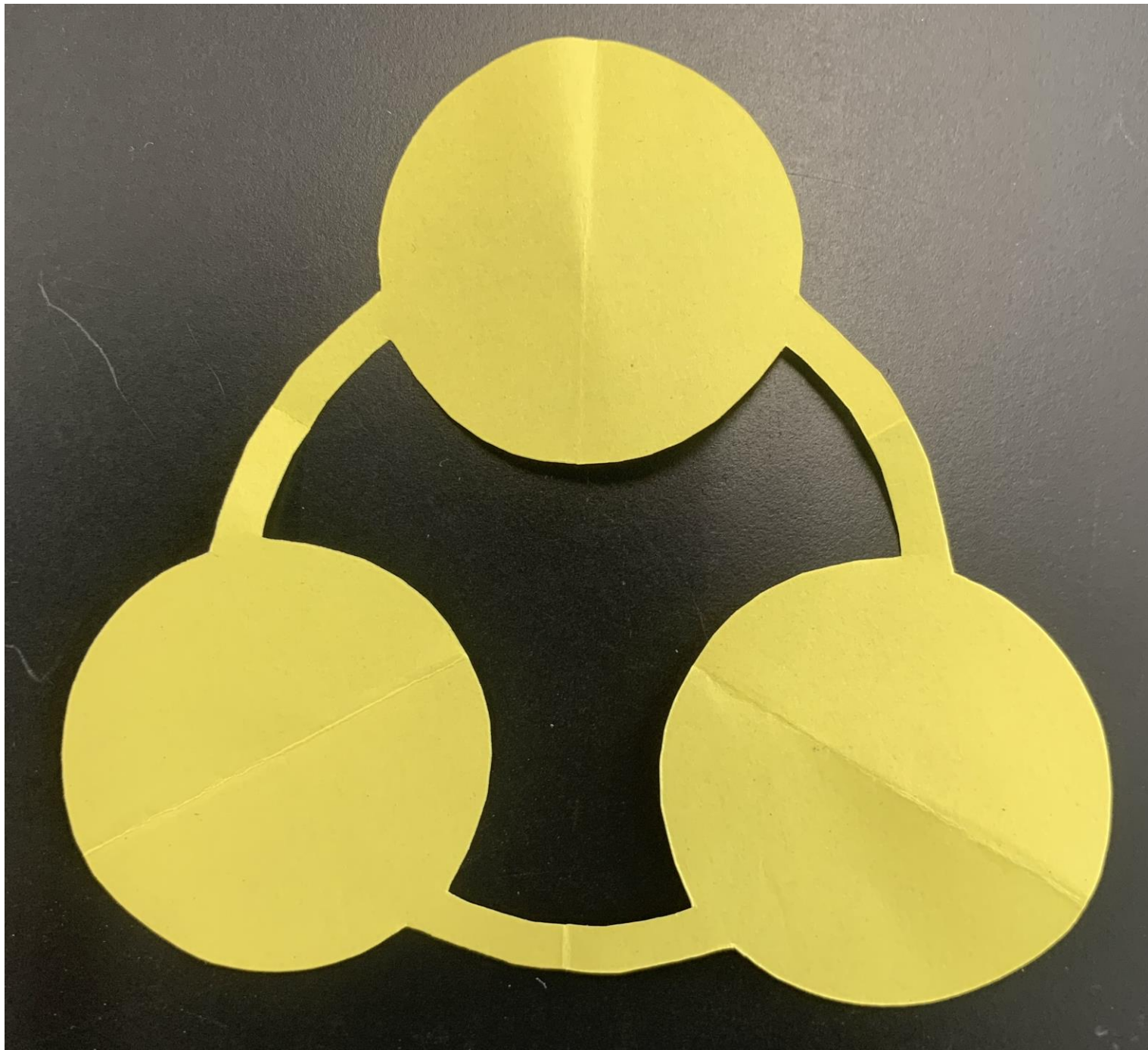
4 - Supplement

4B - Supplement 2

Now think what this crest cutting is of.

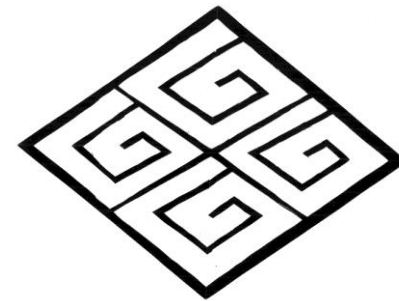
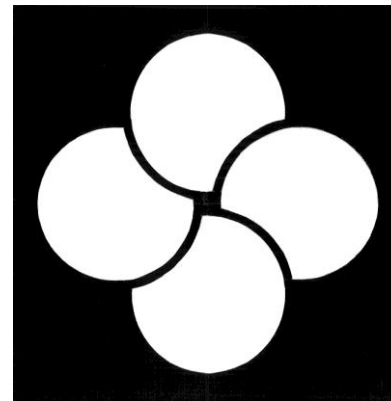
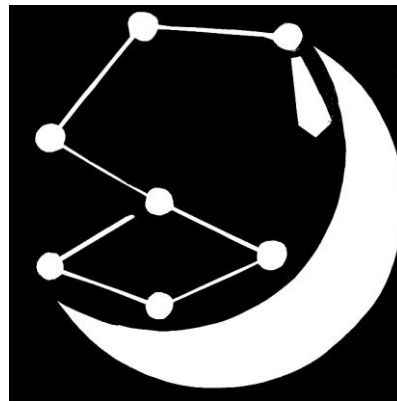
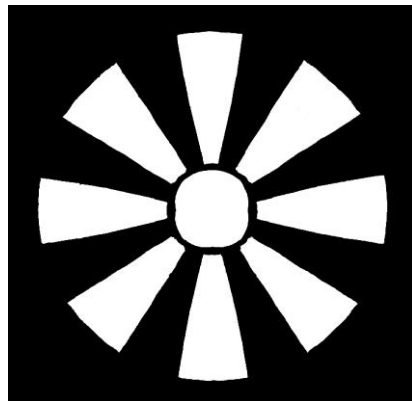
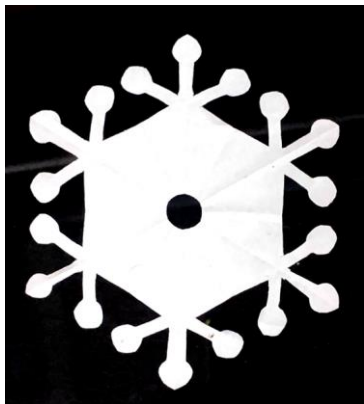


4B - Supplement 2



5 - Review of today

- **The Japanese have long been designing crests based on space and nature, incorporating them into children's games.**
- **By experiencing crest cutting, you can learn about symmetry, which is important in science.**



Thank you for your listening.

