Paper Engineering – Lesson 2

Bringing paper to life, from 2-Dimensional to 3-Dimensional

Project Learning Objectives:

To create a 3D pop-up book suitable for a small child.

Week 1	Week 2	Week 3
Analysis of Pop-up books. Have a go at some basic pop-up techniques.	Explore the essential techniques for accurate pop-up. Continue to have a go. Introduce variations of pop-ups	Using knowledge learnt so far, introduce mechanisms. Know the difference between them.
Week 4	Week 5/6	Week 7/8
Discuss key criteria for a good story or pop-up book. Plan the story using a storyboard.	Evaluate the story plan so far. Start to make the pop-ups and mechanisms for all the pages.	Finish the pages, with text and decoration. Create the cover and assemble the finished book.

Success criteria:

► (SC1) I can explain advantages and disadvantages of pop-up books

► (SC2) I can identify advantages and disadvantages of making 3D shapes from flat sheets.

► (SC3) I can describe how folding a flat (2D) sheet of paper makes it a 3D object.

► (SC4) I can describe how different cuts and folds can make different 3D shapes.

► (SC5) I can make a pop-up designs following instructions.

► (SC6) I can make a pop-up designs from a blank piece of paper.

► (SC7) I can identify the difference between pop-ups and mechanisms

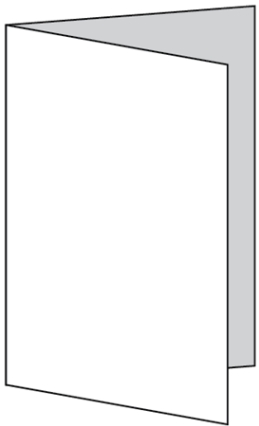► (SC8) I can create a short, fun story and make it into a pop-up book.

Introduction

Last lesson we looked at some basic pop-ups, one of the 'tips' given was about folding the paper to create a crease:
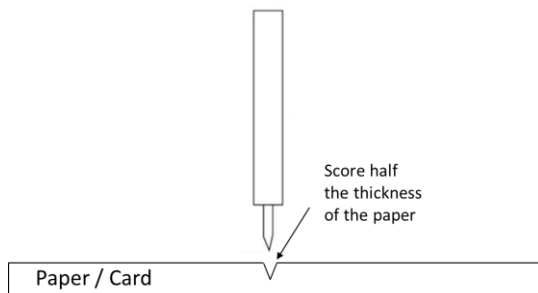
TIPS: Open the paper up again and fold the other way along the same crease. Repeat up to three times. This breaks the fibres of the paper or card, and makes the fold smooth and flexible

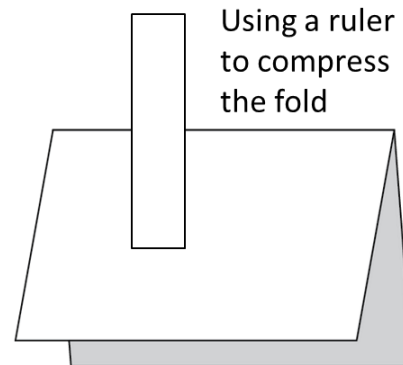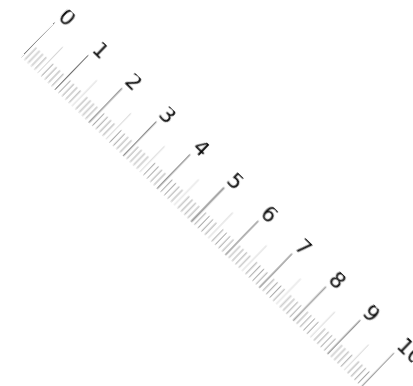We will look at the essential techniques for accurate pop-up making:
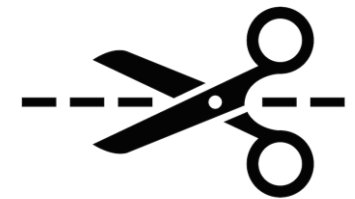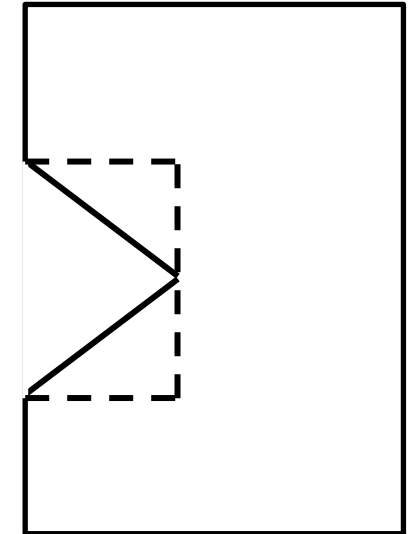
FOLDING   SCORING   CREASING   MEASURING   CUTTING

Score half the thickness of the paper
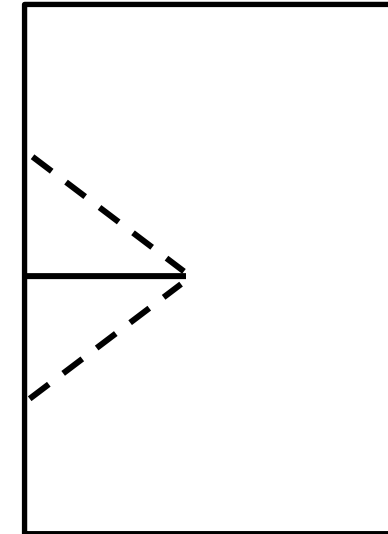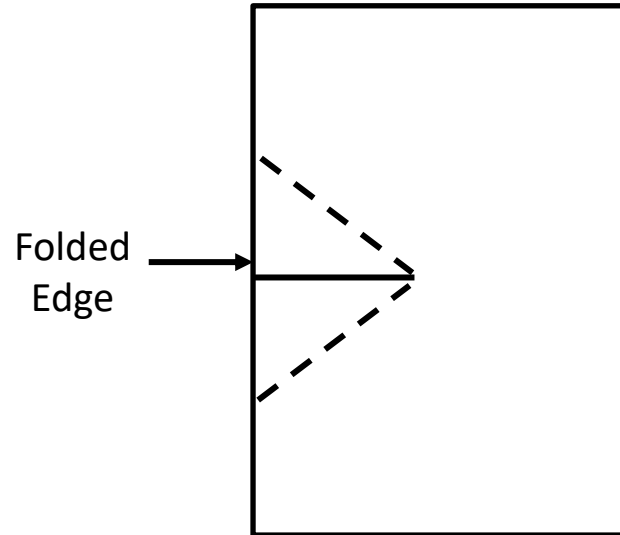
Paper / Card

Using a ruler to compress the fold

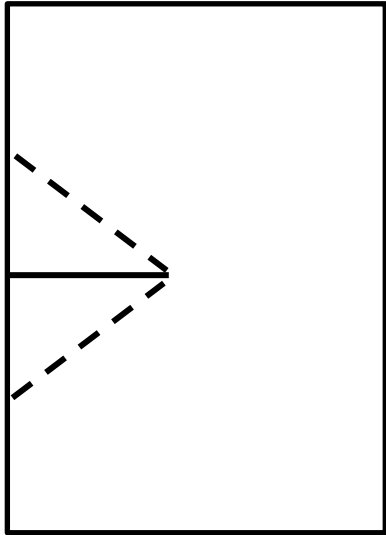# V-Fold: Variations – Mouth Fold

Folded Edge →

1: **Fold** a piece of card in half down the centre. Use a ruler to **crease** along the fold, reinforcing it.
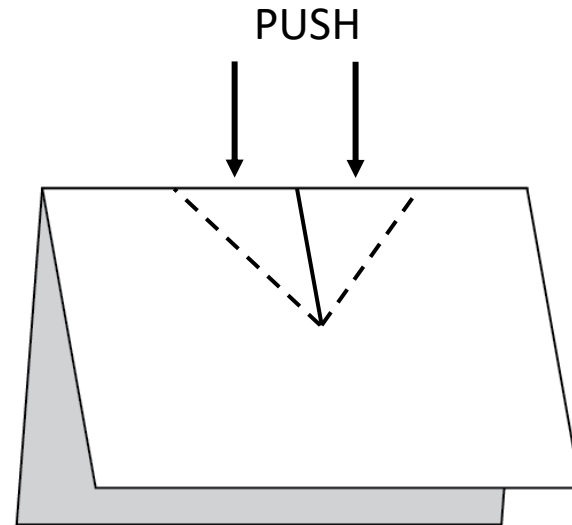
2: With the folded edge on the left, Draw a line at 90 degrees to the folded edge, just under halfway across the card, **cut** along this line.

3: **Fold** the card back along the dotted lines, these will be at 45 degrees to the folded edge.
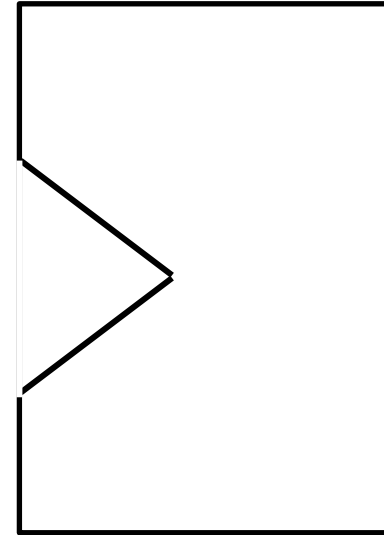**Fold** both ways and **crease** to break the fibres up and make the **fold** more flexible.
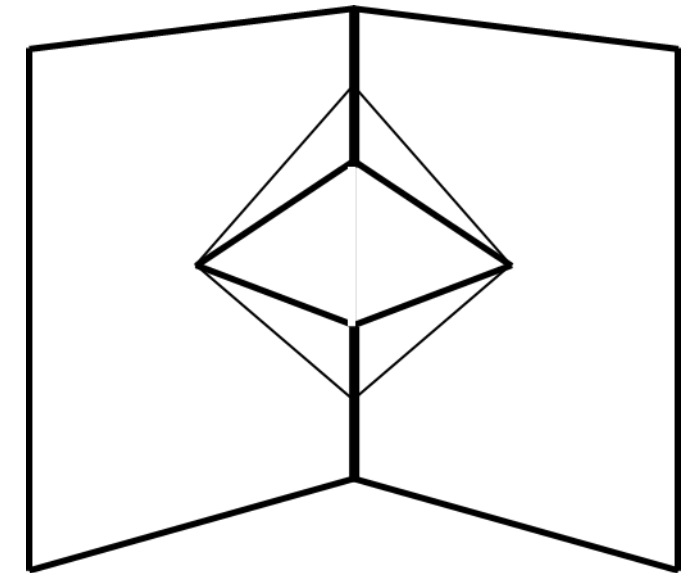
V-Fold: Variations – Mouth Fold

PUSH

4: Put both the top and bottom flaps back to their original positions.

5: Open the card like a tent. The tricky bit…….using your thumb or fingers, push the top triangle through to the inside.
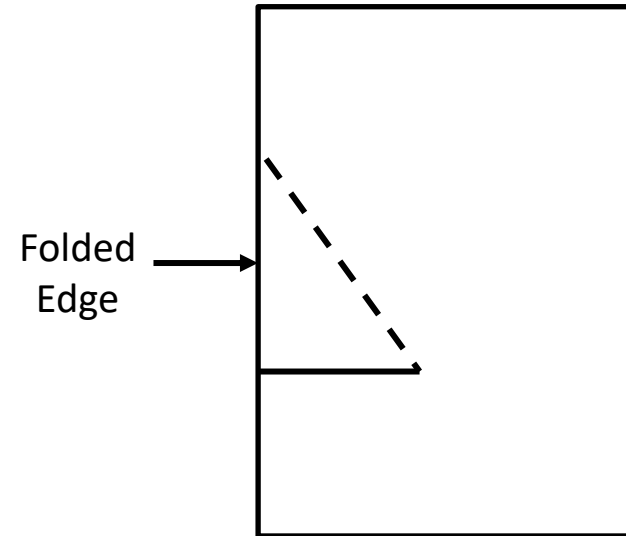Repeat this for the bottom triangle.

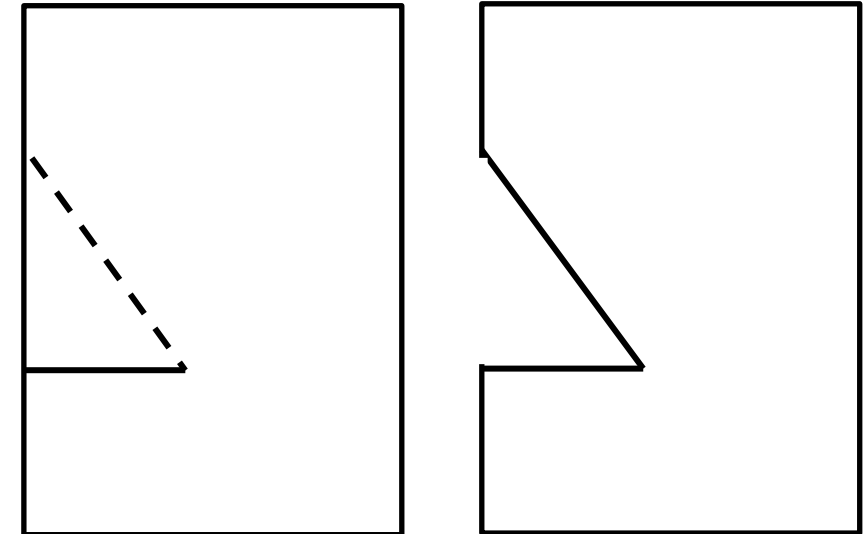6: Close the card and firmly press, **creasing** these edges

7: Open the card and see your Mouth Pop-up

V-Fold: Variations – Angle Fold

Folded Edge →

1: **Fold** a piece of card in half down the centre. Use a ruler to **crease** along the fold, reinforcing it.
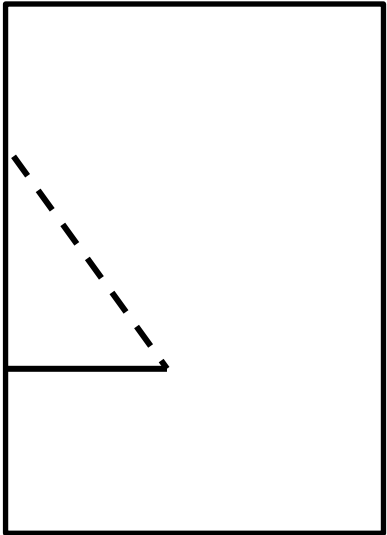
2: With the folded edge on the left, Draw a line at 90 degrees to the folded edge, just under halfway across the card, **cut** along this line.
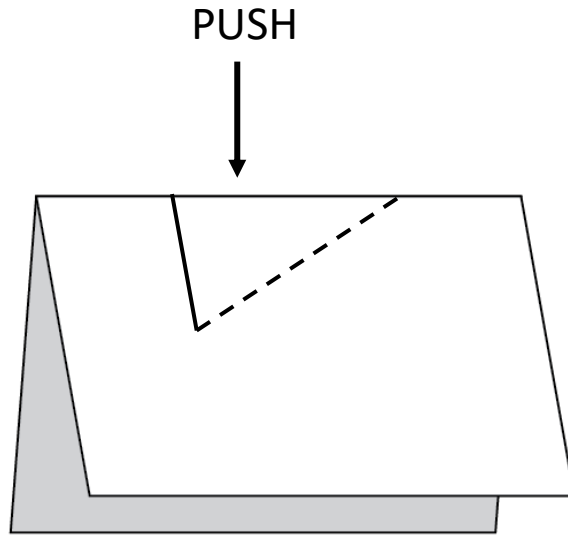
3: **Fold** the card back along the dotted line.

Fold both ways and **crease** to break the fibres up and make the **fold** more flexible.
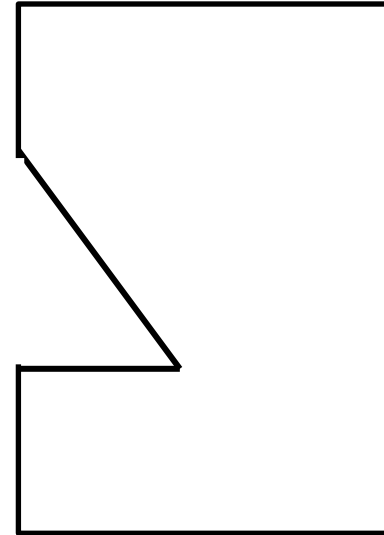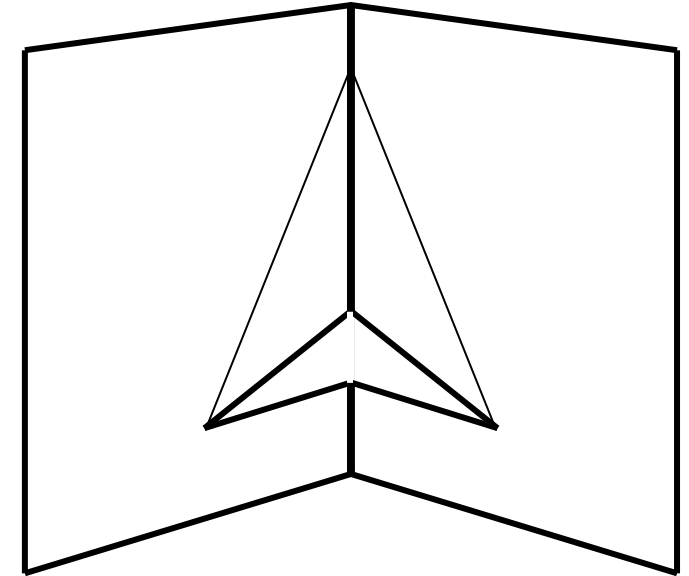
V-Fold: Variations – Angle Fold

PUSH

4: Put the flap back to its original position.

5: Open the card like a tent.
The tricky bit…….using your thumb or fingers, push the triangle through to the inside.
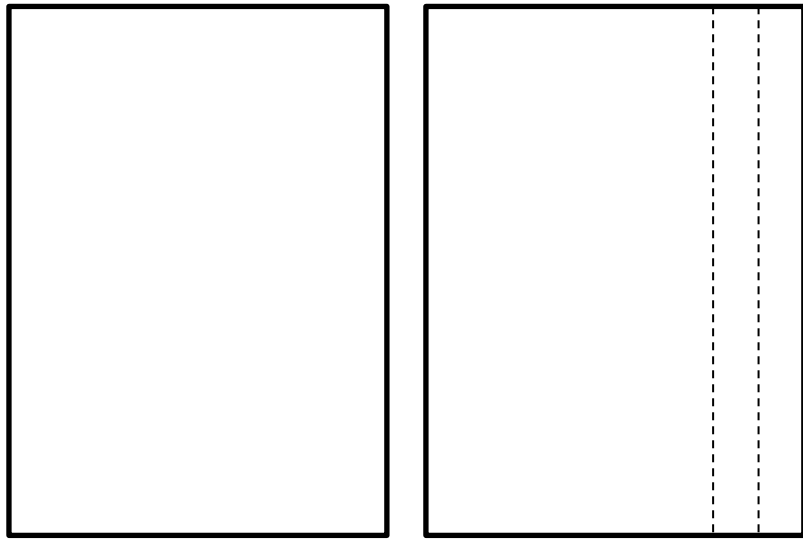
6: Close the card and firmly press, **creasing** the **folded** edge.

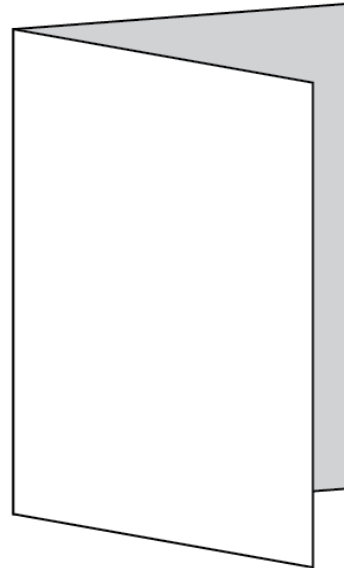7: Open the card and see your Angle Fold Pop-up

Box Fold: Variations – Double Box
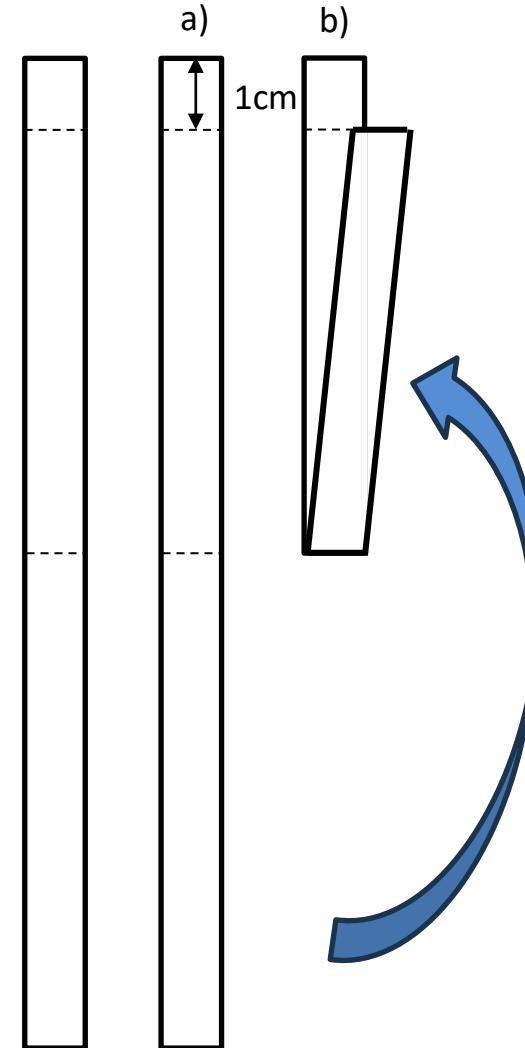
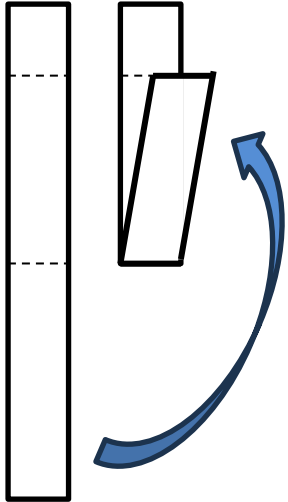You will need 2 pieces of A4 card

a)   b)

1cm

3:
a) Mark and **Fold** a line 1cm from the top edge on both strips, these will form a tab.

b) **Fold** the strip from the bottom edge to the folded line.

1: One card is for the outer card; the other is for the strips to make the 'floating plane' box.
Cut two strips from the long edge, at least 1cm wide.

2: **Fold** a piece of card in half down the centre. Use a ruler to press along the **fold**, reinforcing it. Set aside.
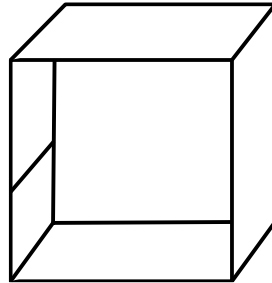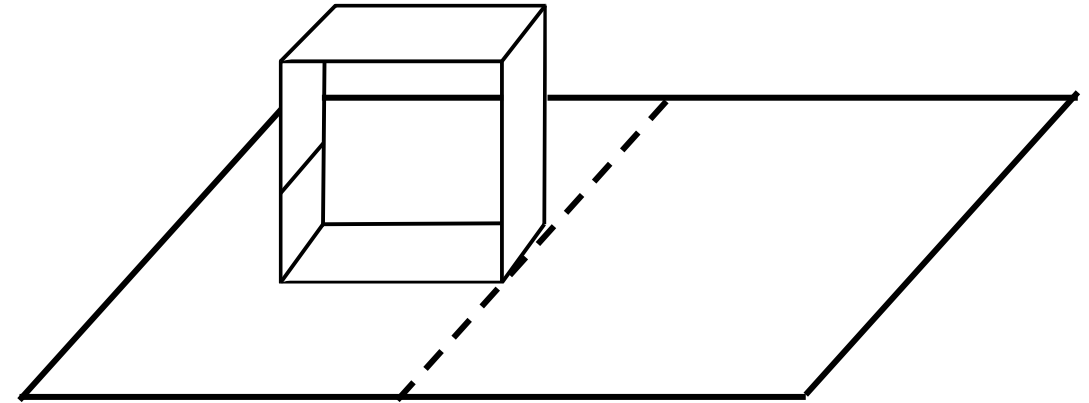
Box Fold: Variations – Double Box

c)

d)

4:
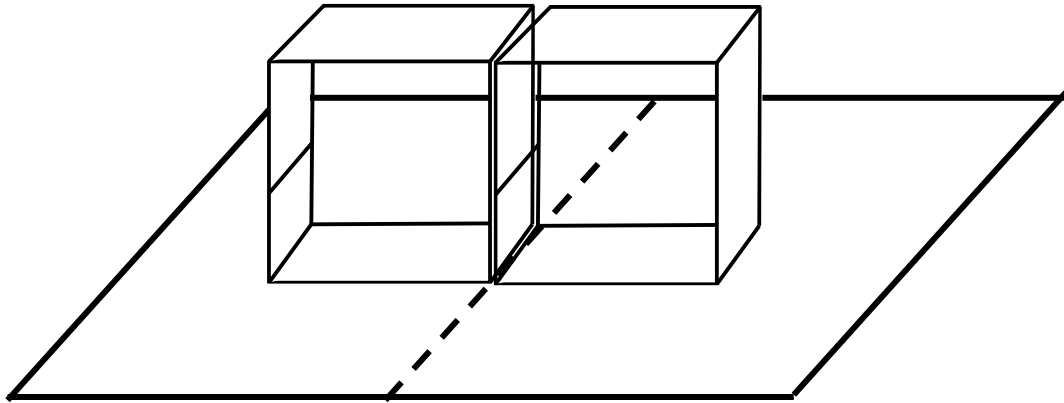c) **Fold** the strip from the new folded bottom edge to the folded line.

5:
d) **Fold** along the folds, back and forth a couple of times to make the **creases** flexible.
Add some glue to the tab and form a square box.

6: Taking the first A4 sheet of card that has been folded in half that was set aside, open it out flat. Line up one of the boxes folded edge with the **crease** on the folded sheet of card, with the long edge of the box facing away and glue in place.
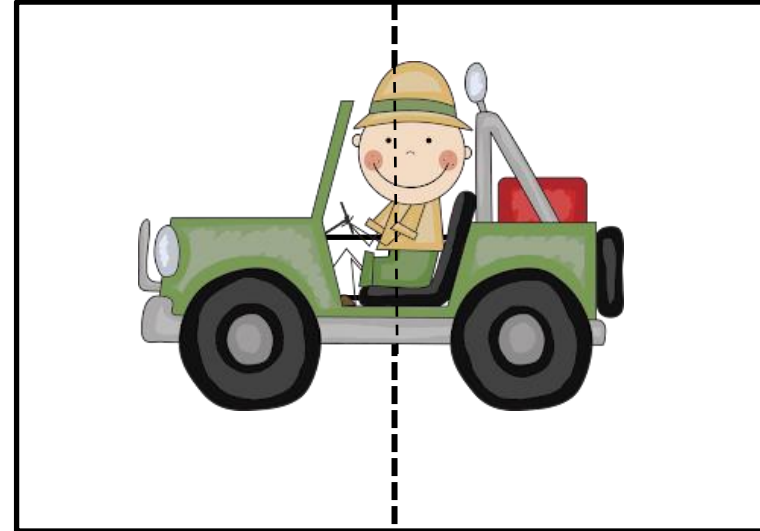
Box Fold: Variations – Double Box

7: Glue the other box directly opposite the first, mirroring its position.
Carefully close the sheet of card and press over the surface. The glue on the first box should stick to the second box.
This is a good way to check that the pop-ups are lined up when pages are closed.

8: Using the left-over piece of card, draw a picture on it, carefully cut it out and fold it in half horizontally, (bottom to top, not side to side).
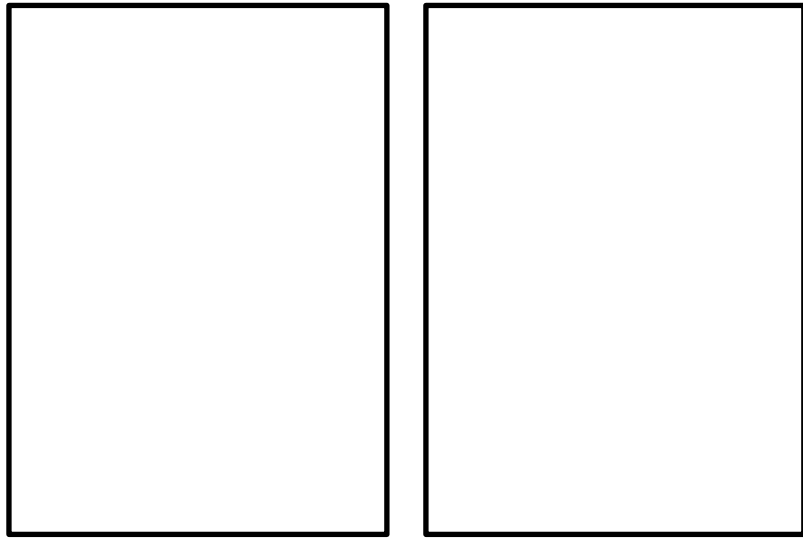Stick the picture to the top edge of the pop-up double box, by putting glue on the top edge of the two boxes, lining up the fold in the picture with the crease where the two boxes meet.

TIPS: Does the picture cover the two boxes? The picture produces a 'plane' and to give the illusion of floating, the boxes need to be fully covered.
You could choose your picture first and then work out the sizes of your strips to achieve the correct size boxes, they could be thicker and shorter
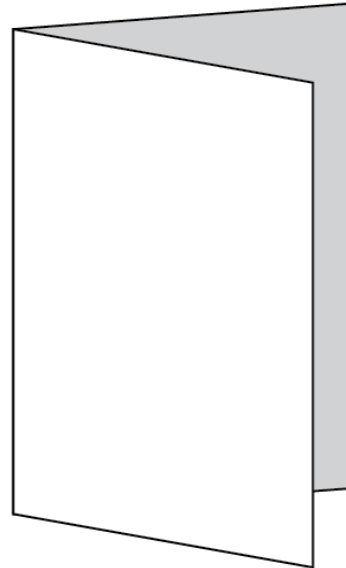
Box Fold: Variations – Tent
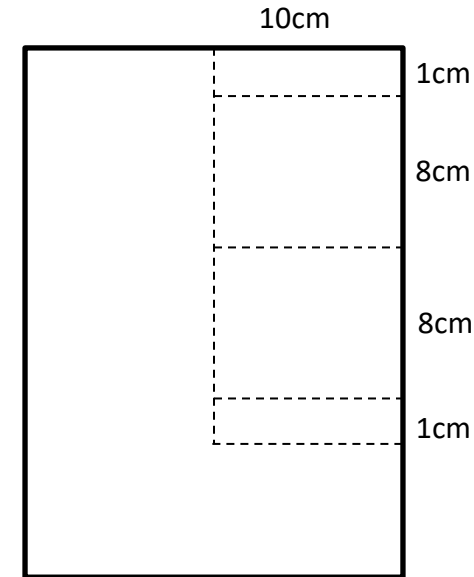
You will need 2 pieces of A4 card

10cm

1cm

8cm

8cm

1cm

1: One card is for the outer card; the other is for the strips to make the 'floating plane' box.
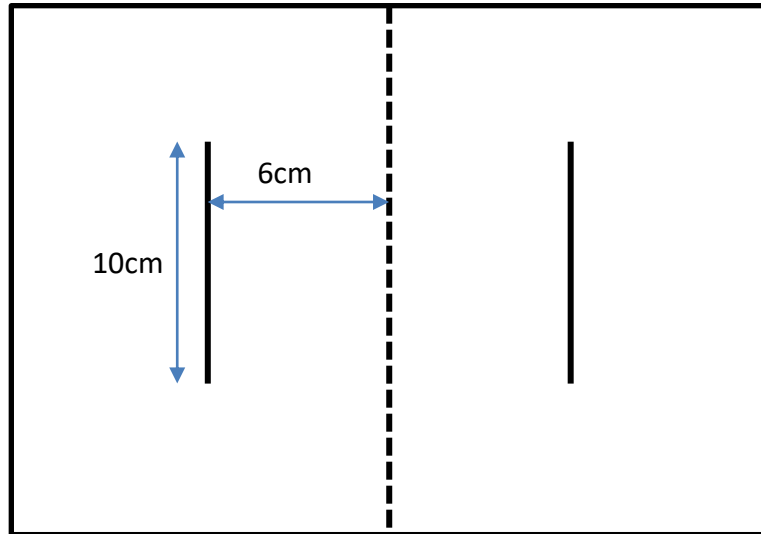**Cut** two strips from the long edge, at least 1cm wide.

2: **Fold** a piece of card in half down the centre. Use a ruler to press along the **fold**, reinforcing it. Set aside.
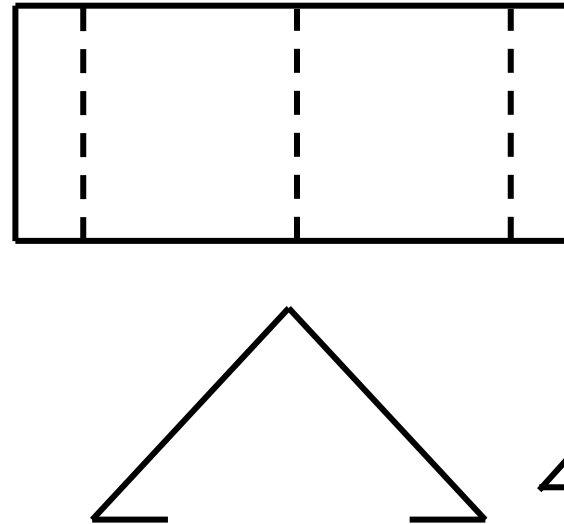
3: On the second piece of card, draw a rectangle **measuring** 10cm by 18cm, **measure** a 1cm deep strip at each short end and mark the centre.
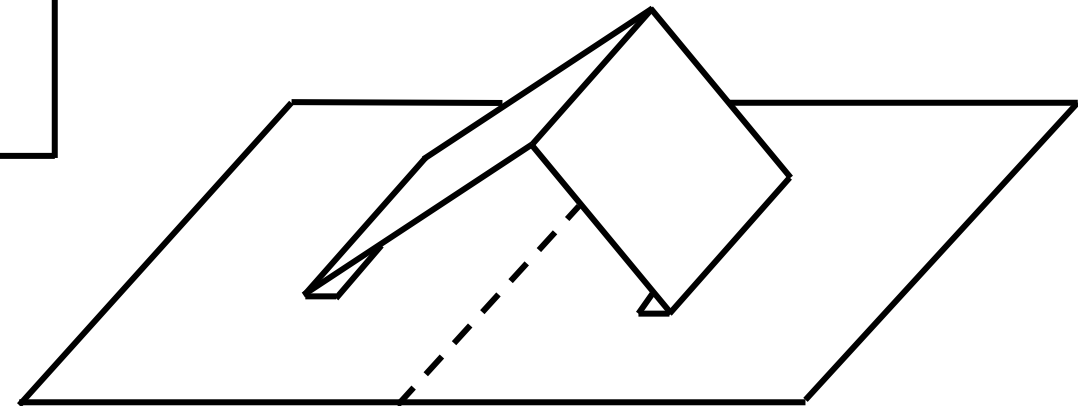**Cut** out.

Box Fold: Variations – Tent

4: On the first piece of card, **measure** 6cm away from the centre **crease** and draw a line 10cm long, that is parallel to the centre **crease**, repeat on the other side of the centre **crease**.

5: Take your cut out rectangle and **score** along the 3 lines, putting glue along the tabs, fix to the main card, lining up the folded edge to the measured lines

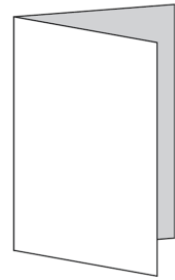6: The tent will stand up when the card is open at 180°

Assessment

Can you explain how to do each of the essential techniques for accurate pop-up making and why the technique is important?

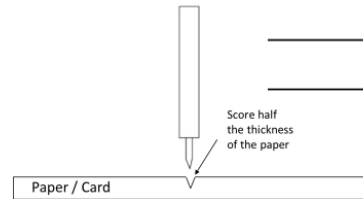The essential techniques for accurate pop-up making:

Explain how to do each technique

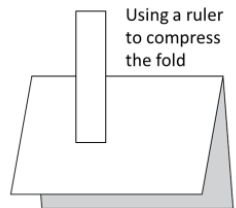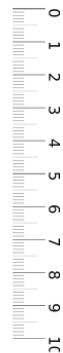Explain why the technique is important?

FOLDING

SCORING

Score half the thickness of the paper

Paper / Card

CREASING

Using a ruler to compress the fold

MEASURING

CUTTING

Do any of the pop-ups stick out from the cards when they are closed?

Is there anything that needs to be improved and what would you need to do to improve it?