

# Chapter 1

# Getting Started in Origami

## *In This Chapter*

- Finding folding materials
- Discovering origami symbols

**M**aking an origami design, whether simple or complex, generally requires concentration and accurate folding. In order to achieve these desirable aims, you need to create the proper environment in which to fold, as well as observing a few basic guidelines about how to fold. This chapter explores the things to think about before you get stuck in to the origami models – the materials and tools you need (sometimes more than paper and hands are useful!). This chapter also introduces you to the symbols that show you what folds and creases to make, not to mention how to tell when you need to rotate the paper and apply pressure.



The following tips assume you're improving your folding skills by working on new material – clearly, after you've learned a design you can (and will) fold it anywhere!

## Origami through the ages

As with many ancient arts, historians don't know for certain when origami began. Paper was invented during the second century AD in China, so it's likely that's where the art of folding paper first started. Japan began to produce paper a little later and origami as we know it was developed in Japan. Used initially for ceremonial events, recreational origami grew slowly until about 150 years ago when things really took off.

The principles of creative origami were developed by Japanese masters such as Akira Yoshizawa and Kosho Uchiyama and during the 1950s, and by Westerners Robert Harbin, Gershon Legman, and Sam Randlett. They set in place the method of diagramming used today and made huge efforts to forge links between previously isolated folders in order to develop a proper community of origamists.

## Folding Here, There, and (Nearly) Everywhere

So where and when should you fold? When to make an origami model depends on your individual circumstances, but it's generally not a good idea to tackle a new project at 3 o'clock in the morning after a 12-hour shift. Try to find a gap in your schedule where you can devote at least half an hour to folding without having to take breaks to wash the dishes or stroke the cat.

Consider where you're going to fold. Ideally you want a large flat table with plenty of elbow-room, somewhere to spread out the instructions or book, and good lighting. Don't forget to have a waste-paper basket handy in case your first efforts get a bit mangled, and keep on hand some stress-relieving devices such as hot drinks or chocolate. Just don't keep food or drink too near your paper!

You may have seen folders holding the paper in the air and making all the creases without resting on anything. These individuals are very experienced in origami and fold in this way so that others can

### Amazing origami facts

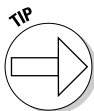
Here's a list of things you never knew about origami – save these gems for dropping into conversation at elegant dinner parties.

- ✔ The word origami has only been in use in the English language for 50 years.
- ✔ You *can* fold a piece of paper in half more than seven times.
- ✔ You can solve quadratic and cubic equations by folding paper.
- ✔ The oldest known origami book, *Hidden Senbazuru Orikata*, was written in 1797.
- ✔ The largest origami crane was 65 metres by 36 metres. The smallest was folded from a 0.25 millimetre square piece of audio tape by Akira Naito.
- ✔ The simplest origami model has only one fold, the most complex more than 200 folds.
- ✔ There are more than 200 varieties of origami elephant.
- ✔ You can make origami models from food, metal, mesh, money, and of course, paper.
- ✔ Poppadom (People Out Practising Paperfolding and Dining on Masala) is a society dedicated to folding origami while eating curry.
- ✔ Saburo Kase both created and taught origami, despite being blind.

see what they're doing. In general though, it's best to fold on a flat surface, such as a table because neat, accurate creasing is a lot easier to achieve on a table.



This may seem like obvious advice, but remember to use both hands when folding. Your hands are a partnership in origami, with one holding the paper so it doesn't move, the other creasing it.



Try to alternate the hands that you hold and crease with so that it feels natural to make a crease with either hand. Readers blessed with three or more hands will have a distinct advantage when tackling modular origami.

## *Thinking first, creasing second!*

Whenever and wherever you fold, you're always making creases. You need to put the crease in the right place at the first attempt because a crease that's been made in a sheet of paper can't be erased like a pencil line. The fibres of wood along the crease have been broken and can't be mended. Here's how to make a perfect crease:

1. Put the paper into position slowly, and take another few seconds to check the exact position of the layers or edges, checking the instructions as you do so.
2. When you're certain that everything's in order, hold the paper in place with one hand, freeing the other hand to make the crease. As with all matters dextrous, you can fold right- or left-handed, as you prefer.
3. Start the crease at the centre of the folded edge, using the pad of your finger to sweep out to first one side, then out to the other.
4. Once the crease is in place, put both fingers to the centre and run them outwards at the same time, to reinforce the crease. Think of your fingertips as an iron, putting a sharp crease into a shirt.



Don't start at one side and crease inwards, because you might 'ruffle' the paper, rucking it slightly like a badly fitted carpet. If you rush the process, you may have to make adjustments later on. Adjusted creases are far harder to work with and can make the finished model look sloppy.



As you progress in origami, you discover that creases don't all have to be made firmly. Sometimes a gentle or soft crease is more effective on a natural subject. Don't worry about this for now, I'll tell you when you might like to try making softer creases.

## Patience is a virtue . . . especially with origami

Patience is particular virtue worth having in the world of origami. You're bound to find a design that slightly (or greatly) exceeds your folding ability. Like any other skill, no real short-cuts exist; you simply have to persevere and give it time. Trying the most interesting and challenging projects first is always tempting, but not the best way to develop confidence.



### *Reading ahead*

When you're following origami instructions, always look at the next step, so you have an idea of what you're trying to achieve.

At times you might work out how to make your paper match the next step without really knowing how. At that point, unfold the step and try to work out how the preceding drawing tried to get you there. Read the accompanying text as well; you may have missed an instruction in the text that isn't obvious from the drawing, such as which of several overlapping layers you may need to fold.

## *What to Fold With*

You can get hold of so many different types of paper, it can be a confusing choice, but in this section I suggest some places to start. After a while, you'll be able to tell if paper is suitable simply by folding over the corner of a sheet. (If it isn't suitable, you unfold it and surreptitiously slip it back on the shelf.)

You can buy origami paper at most decent craft shops for around £2 per pack, depending on the type of paper. Origami paper usually comes in 6-inch squares, although you can buy both larger and smaller formats. For more complicated designs (such as those in Chapters 6 and 7), always fold from the largest convenient paper you have. If you need a rectangle other than of standard proportions, you'll probably need to cut it yourself.

Although paper is the obvious choice of folding material, you have many other alternatives, depending how strong you are and how much you enjoy a challenge!

✓ **Origami paper.** This paper is perfect for simple models, and a selection is included in this book. Origami paper comes in a

huge variety of colour and pattern combinations, is usually perfectly square, and often very cheap. Each pack contains a selection of colours, although you can buy packs of a single colour (such as red, when Christmas approaches). This paper has a colour or pattern on one side and is plain white on the other.

- ✔ **Duo paper.** This paper has a different colour or pattern on each side.
- ✔ **Harmony paper.** This type of origami paper has patterns made of colours fading into each other. You won't see many experienced folders using it, because it's highly decorative and may distract from the lines of the model itself.
- ✔ **Foil paper.** One side of this paper is coloured foil, the other is white paper. This used to be highly popular, but the metallic finish isn't to everyone's taste, and it's almost impossible to reverse the direction of a crease.
- ✔ **Kraft paper.** Kraft paper is usually brown and comes in huge rolls for wrapping parcels. It's brilliant for folding and you can also find it in different colours, if you look around.
- ✔ **Canson.** A high quality art paper, canson is available in a variety of colours (the same both sides). It's ideal for larger models, especially if you're wet-folding (Chapter 9 explains wet-folding in more detail).
- ✔ **Elephant hide.** This paper isn't literally made from elephants, you'll be glad to hear! It has an elegant marbled effect, and is also good for wet-folding. Elephant hide is also known as Wyndstone paper.
- ✔ **Washi.** Washi is a Japanese word meaning 'handmade paper'. It's generally thicker than normal paper and requires some experience to fold with, but can produce outstanding results that last for many years.
- ✔ **Tracing paper.** You can fold with tracing paper, but it can be quite thick, making neat creases a little harder to achieve. However, tracing paper is great for bowls and vases.
- ✔ **Photocopy paper.** This is a cheap and widely-available material for folding with. It isn't very elegant and doesn't produce very sharp creases, but is perfect for practising and experimenting with. Photocopy paper is the material of choice for making paper planes!
- ✔ **Recycled paper.** Everyone gets more than enough junk mail through the letter-box, much of which you can fold into something or other – far better and greener than simply throwing it away.

- ✓ **Money.** Because it's designed to be hard-wearing, paper currency is great for folding. Pop into your nearest bank and ask what the cheapest form of paper currency is. You can then buy 100 fresh notes from an obscure country for a few pounds. When you give people origami gifts made from money, they think very highly of you! Whole books are devoted to the subject of models made from dollar bills.
- ✓ **Napkins.** A complete genre of origami is devoted to folding napkins, which are essentially big squares. Paper napkins are quite soft, so not every model will work. Waiters at up-market restaurants always know a few designs, or you could teach them new ones!
- ✓ **Cloth.** Origami techniques are widely used in the making of clothes, often in the form of pleats, but sometimes actually using origami bases. You can make models with towels (you may have seen *towelgami* creations left on your bed by the staff on cruise ships). You'll probably need to buy a large box of starch before starting.
- ✓ **Clay.** If you want a challenge, you can make thin sheets of clay and create simple designs before firing them. You need a kiln, which adds to the overall expense. A Japanese company has invented special ceramic paper for this purpose but, trust me, this requires a deft and damp touch!
- ✓ **Pastry.** You can use filo pastry and other forms of dough to fold with, so you can make your food look interesting even if it doesn't taste wonderful!
- ✓ **Sheet metal.** Some physically gifted folders have made designs from metal. Needless to say, don't try this if you have a delicate constitution. You can use thinner sheets of silver to make beautiful origami earrings and other jewellery.
- ✓ **Tea Bags.** Tea-bag folding originated in Holland and can produce geometric designs of great beauty. You actually fold the wrappers that the bags come in, although you could always try the bag itself.
- ✓ **Tickets.** Tickets for buses, trains, concerts, as well as general business cards are great for making simple designs, especially jumping frogs (Chapter 7 shows you how to make a jumping frog). Tickets are rarely square, so you should practise designs from rectangles.
- ✓ **Netting/Mesh.** You can get your hands on small squares of a type of thin mesh aimed specifically at origamists. The mesh produces a surprisingly attractive result if you make flowers using it.

## Origami tools

All you really need to make origami models is paper and your hands (plus love, if you're a Beatles fan) but here are some tools that may enhance your folding experience. You can pick up these tools from most craft or art stores.

- ✔ **Folding tool.** A folding tool is a small strip with a rounded edge, a bit like a short chopstick. Traditionally made from bone, now plastic or wooden folding tools are widely available for a few pounds. Use them to *really* flatten creases. Some folders love them, others are more disdainful, Make up your own mind!
- ✔ **Trimmer.** An A3 rotary trimmer is perfect for preparing squares of the right size. Guillotine types are best for large sheets, but can be dangerous. If you decide to buy a trimmer, check that it cuts paper at right angles!
- ✔ **Paper storage.** Okay, storage isn't really a tool, but you need some means of storing paper to keep it flat and compact. Many suitable second-hand drawer units are out there, and you can use plastic wallets for smaller squares.
- ✔ **Model storage.** When you've made a superb model, you have four main choices about what to do with it. You can give it away (the altruistic option), display it (but most houses only have so much shelf space), throw it away (gasp), or store it. Smaller cardboard boxes that have been used for packaging are usually free from supermarkets. Put tissue paper, scrunched-up newspaper, or even polystyrene 'worms' in the box and arrange your model inside so it can't move about. The same applies in triplicate when you want to send origami through the post!
- ✔ **Cutting board and knife.** The knife isn't for cutting your models, but for preparing odd shaped paper, such as triangles or hexagons. Be *very* careful when cutting. I foolishly once cut on an old book resting on my knee, only to slide the knife off the end of the book and into my leg. Ouch.
- ✔ **Glue.** What? This is origami – no glue allowed, surely? Actually, glue is generally considered acceptable to use when preparing a model for display. You want it to stay in place under potentially adverse conditions and glue helps. Some folders use wet-folding techniques with liquid glue when folding intricate designs. The end result is as permanent as can be.
- ✔ **Digital camera.** A digital camera is perfect for making rough diagrams, keeping a gallery of your work, or capturing inspiring images from an exhibition. However, be aware that some folders don't allow their work to be photographed out of fear of piracy. You can read more about making diagrams in Chapter 2.
- ✔ **Paper clips.** At times you'll wish you had extra hands, especially when assembling modular designs. A few well-placed paper clips can be really useful.
- ✔ **Hammer.** Sometimes layers of paper simply won't lie flat. You can use a small hammer to encourage the paper to do as it's told. Careful, now!

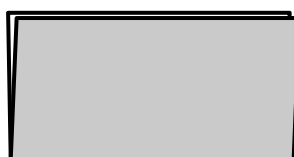
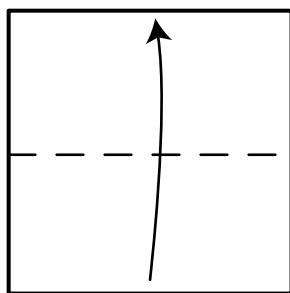


Not every design works with every medium, so experiment until the model works.

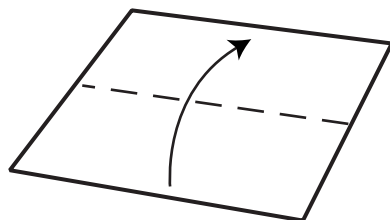
## Knowing Your Symbols

At first glance, origami diagrams can appear a bit complicated, but once you master the basic symbols, they'll soon make perfect sense to you. You see about a dozen symbols on a regular basis, plus as many again that crop up less often. People who make lots of origami diagrams sometimes come up with their own variations and additions, but in general, origami diagrams from anywhere in the world use the same basic set:

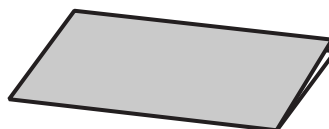
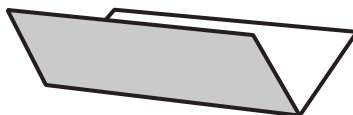
✓ **Valley fold.** This is the fold everyone knows how to make – it's the one you use to fold a letter in half, for example. You fold the paper over and line up the edges (or corners), then use one hand to hold the paper in position and the other to iron in the crease, starting in the centre and working outwards. The symbol is a line with an arrow head of some kind at one end. A dashed line indicates where the crease should lie. The arrow gives you the direction in which to fold.



valley fold



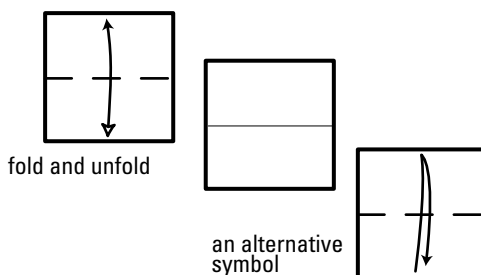
valley fold (shown in perspective)





✓ **Valley and unfold.** Here you make a fold, then unfold it. This may form a reference crease to line up with, or you may refold it later on (they're then known as *precreases*). Different symbols are in common use but in this book I use the solid and hollow arrowheads – the solid arrowhead shows the direction to fold in, the hollow one shows where the fold returns to.

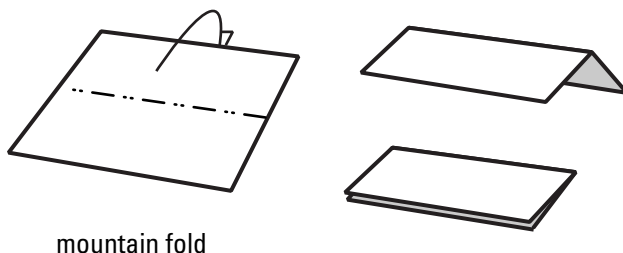
Why bother? I use this convention because for any given valley crease, you could fold paper from either side of the crease. In some cases it doesn't matter which way you fold (for example, a basic diagonal). In other cases, it's considerably *easier* to fold from a specific direction. Where there's no advantage to be gained from creasing in a certain direction, I use two solid arrowheads.



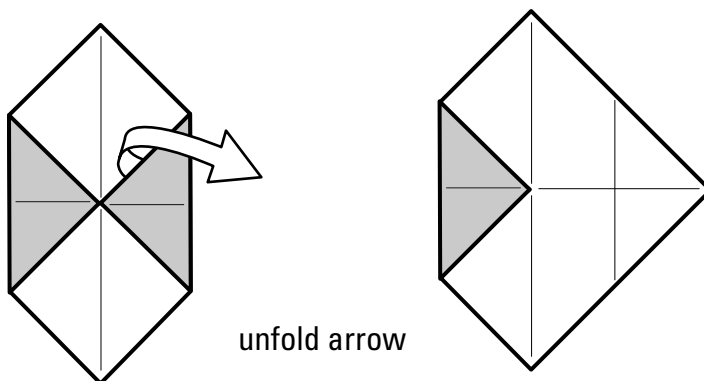
✓ **Existing crease.** When you've made a valley fold and unfolded the paper, it leaves a *crease line*, indicated by a very thin line. Crease lines are as important as edges of paper, because you use them to locate other folds.

✓ **Mountain fold.** This is the opposite of a valley fold because you fold the paper underneath. You either hold the paper in the air to fold, or turn the paper over and treat it as a valley fold, remembering to turn back over afterwards so you tally with the diagrams.

Every time you make a valley fold, you make a mountain fold on the opposite side of the paper. Strictly speaking, these are the only two types of creases you can make – all the others are combinations of mountains and valleys.



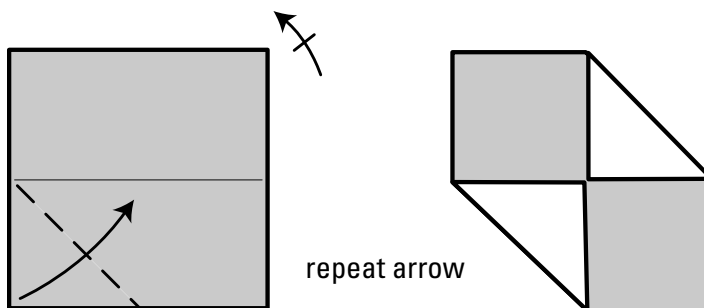
- ✓ **Unfold arrow.** The arrow line disappears behind an edge and then comes back. The unfold arrow is a solid white arrow showing that you're unfolding a layer, or easing paper out from between layers.



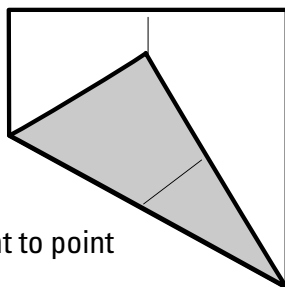
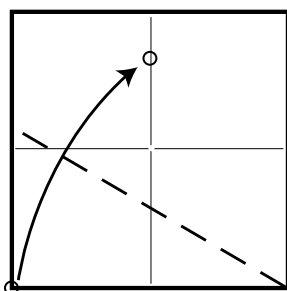
- ✓ **Repeat arrow.** If a move is applied more than once, a repeat arrow means 'do the same'. If a folding line has a small line (or lines) across it, you repeat the indicated fold somewhere – it's usually obvious where, but the text should make it clear, or you can check the next drawing. If a fold line has three lines on it, you repeat the action three times, for example when folding all four corners into the centre.

The repeat arrow is used for one of two reasons: to keep the instructions simple and easy to follow, or because the artist is too lazy to draw the sequence over and over again.

The repeat arrow is also used to indicate repeating a sequence of steps, in which case it has the number of the first and last steps to be repeated alongside.

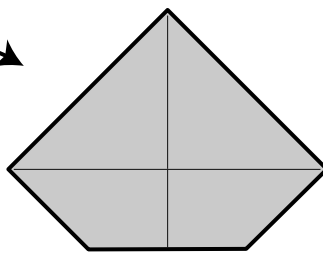
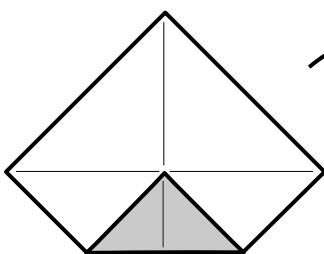


- ✓ **Fold Point to Point.** A small circle helps to show which part of the paper meets which other point. Make sure you can locate both points before proceeding!



fold point to point

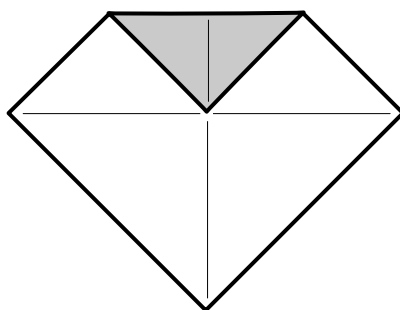
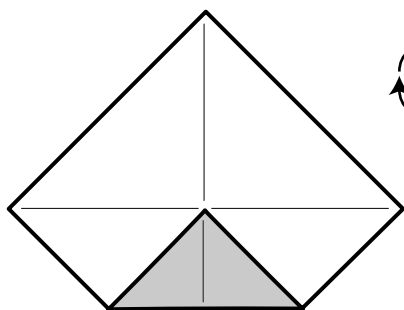
- ✓ **Turn the paper over.** Pick the paper up and turn it over. The paper is turned in the direction of the symbol, generally from side to side like turning the pages of a book, but sometimes from top to bottom (or vice versa) as if you were tossing a pancake.



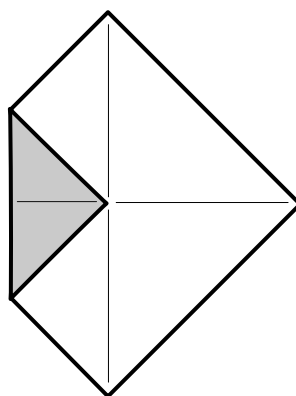
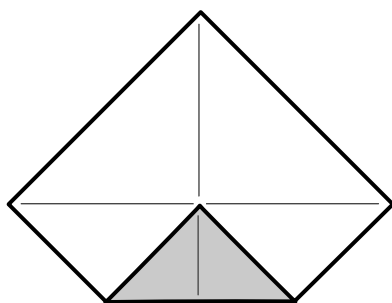
- ✓ **Rotate the paper.** Sometimes, you need to rotate the paper relative to the previous step. This could be 180 degrees or perhaps 90 degrees. The symbol makes clear which way to turn and by how much.

I use the 90-degree symbol flexibly to indicate some kind of rotation that's less or equal to 90 degrees. Because folds are most easily made away from your body on a horizontal axis, turning the paper can make a diagonal fold much easier.

Look carefully at the rotate symbol – rotating a hexagon through 30 degrees can be a subtle change and can lead to unwanted creasing if you don't spot it.



rotate 180 degrees



rotate 90 degrees or less

✓ **Scale increase.** Keep an eye out for the little 'scale increases' arrow, used where the next drawing is shown larger than it would be in reality to makes it easier to read. The symbol doesn't tell you to do anything, but provides information. Sometimes you'll see a matching 'scale decreases' symbol.



scale increases

- ✓ **Press or apply pressure.** A small black triangle means you need to apply some pressure in a given direction. Nothing too excessive is required, just gentle pressure. The triangle is also used to show in which direction to move the paper (often used in reverse folds – coming up!).



apply pressure

- ✓ **New viewpoint.** The eye shows you where the next step is viewed from.



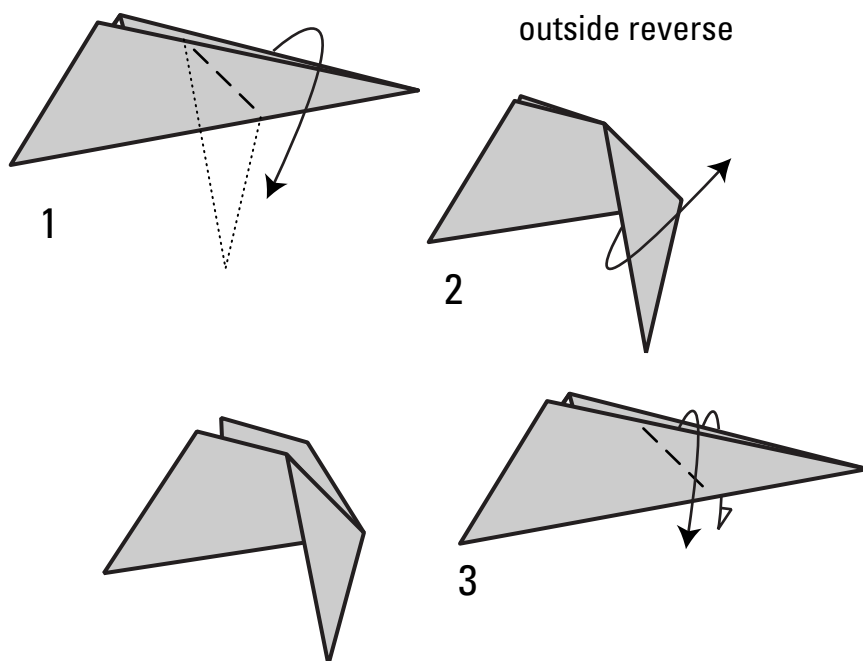
new viewpoint

- ✓ **Outside reverse fold.** With an outside reverse, both layers wrap around on opposite sides, to the outside. You can make these easier by *pre-creasing* – making the indicated crease as an ordinary valley fold through all layers, then unfolding.

The key to reverse folds is to make the pre-crease a firm one. Pre-creasing always puts in the creases you need, but some of them always need swapping from valley to mountain or vice-versa. You have to do a *bit* of work.

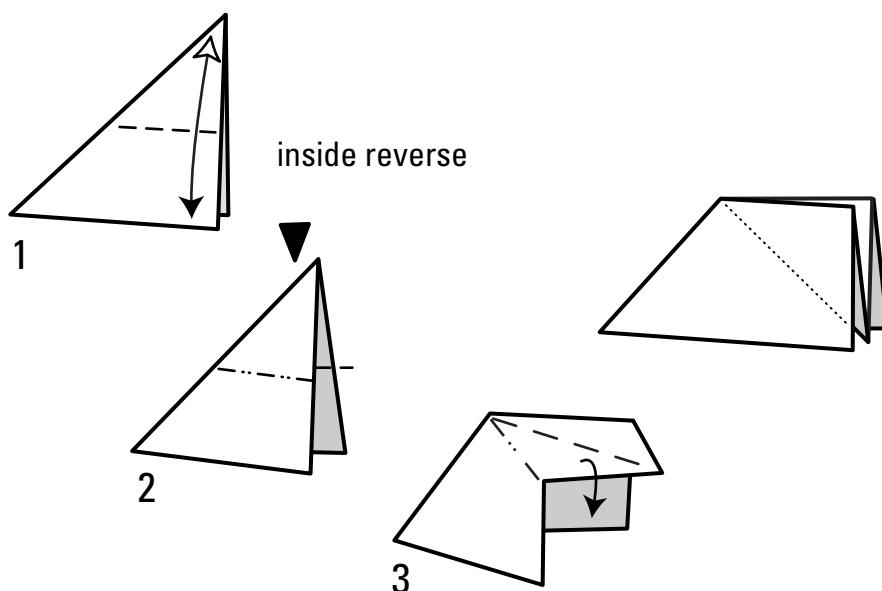
1. Start with a square folded in half on a diagonal. Fold the top corner to the bottom corner, crease firmly, and unfold.
2. Change the crease on this side of the paper to a mountain and carefully start to manoeuvre the paper in-between the layers.
3. Here's the move in progress.
4. And completed.

The Duck sequence in Chapter 2 is a good model to try out an outside reverse fold.

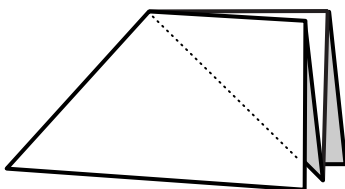


✓ **Inside reverse fold.** Pre-crease the paper like you did for the outside reverse fold, then turn the creases on both sides into a mountain crease, gently pressing the paper up and in-between the original layers. The black triangle indicates the direction in which to apply pressure.

To put this fold in action, make the Miniphant model in Chapter 4.

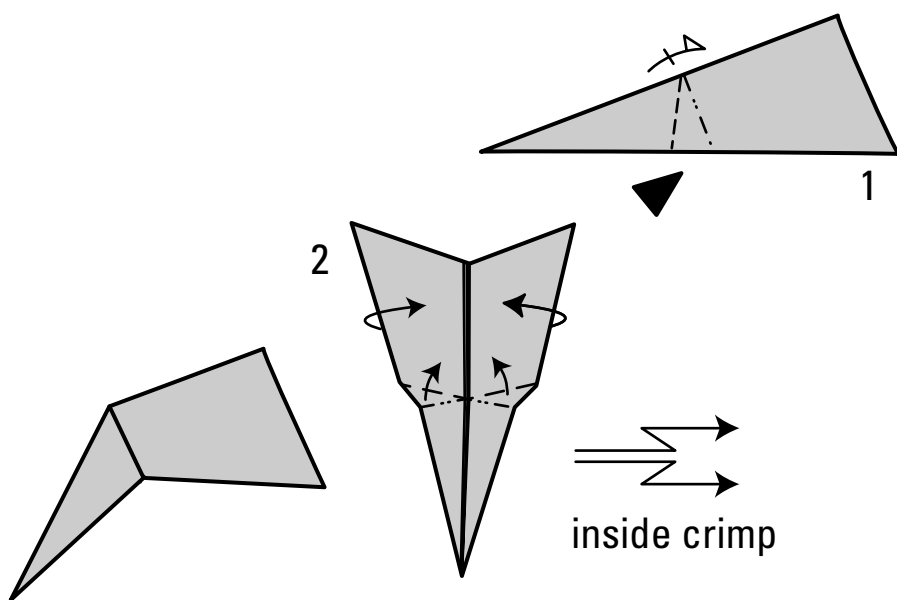


- ✓ **Double reverse fold.** If you make an inside, then an outside reverse fold, you can create heads or beaks
- ✓ **X-ray view.** Dotted lines indicate the hidden flaps, to give an idea of what's going on in between the layers.

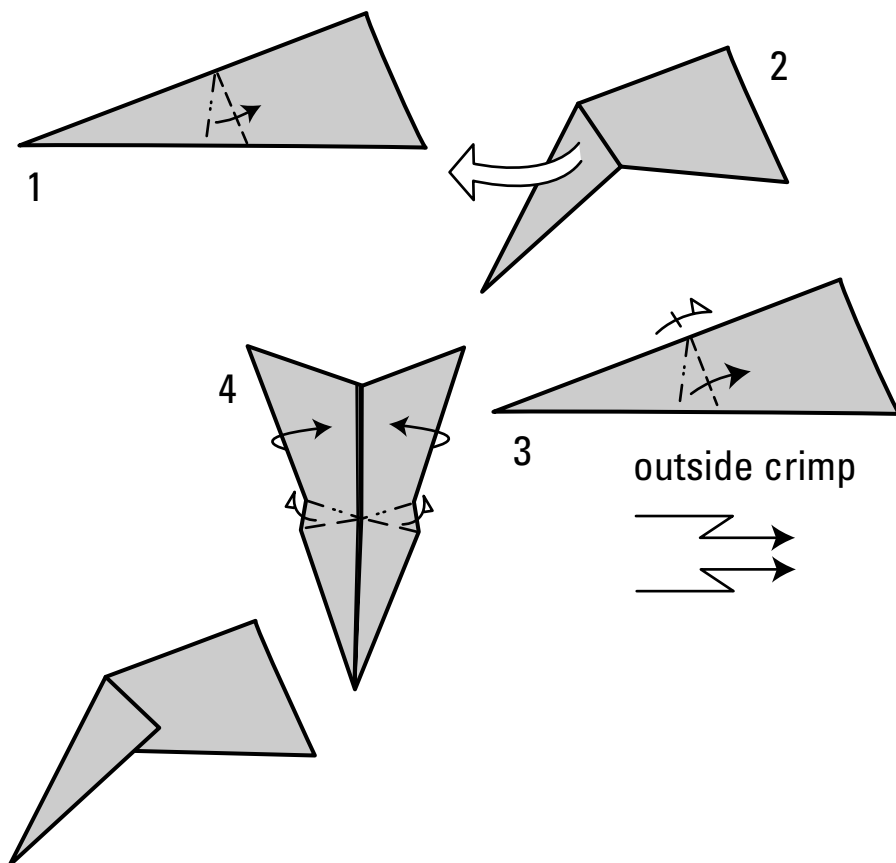


x-ray view

- ✓ **Inside crimp.** Pre-crease both indicated creases through both layers, then make them valley and mountain on both sides. The paper acts like a hinge. This is often used when forming heads.



✓ **Outside crimp.** A similar move to the inside crimp, but the paper swivels on the outside, rather than the inside. You simply need to make the mountain and valley creases in the correct order.



✓ **Squash.** A squash fold is a satisfying move where you precrease all the creases, then apply a bit of pressure to gain the required result.

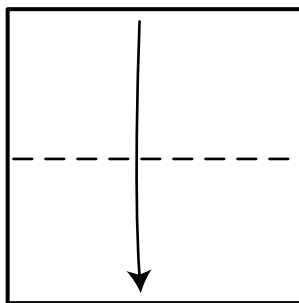
1. Fold a square in half from top to bottom.
2. Crease in half from side to side.
3. Fold the top left corner to the lower centre. Note the hollow arrowhead shows where to *start* the fold. Crease and unfold.
4. Lift the left half of the paper up at 90 degrees. The right-angle symbol clarifies this.



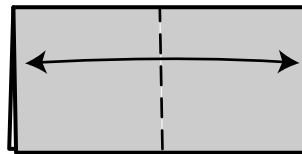
5. Put one finger in between the upright layers and start to press on the vertical spine. The idea is to persuade both diagonal creases to be mountains from the outside. One already is, and the other needs persuading to change direction.

6. This is the move in progress.

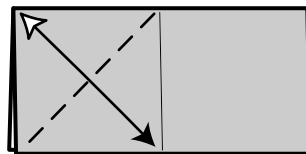
7. The squash is complete.



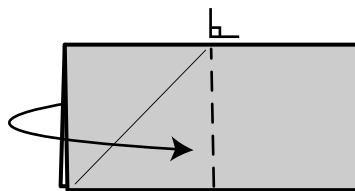
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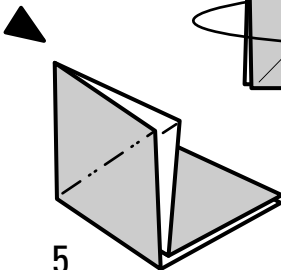
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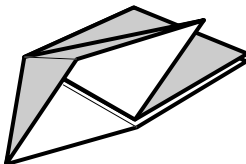
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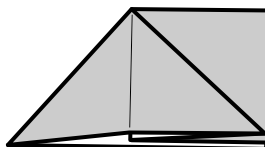
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6

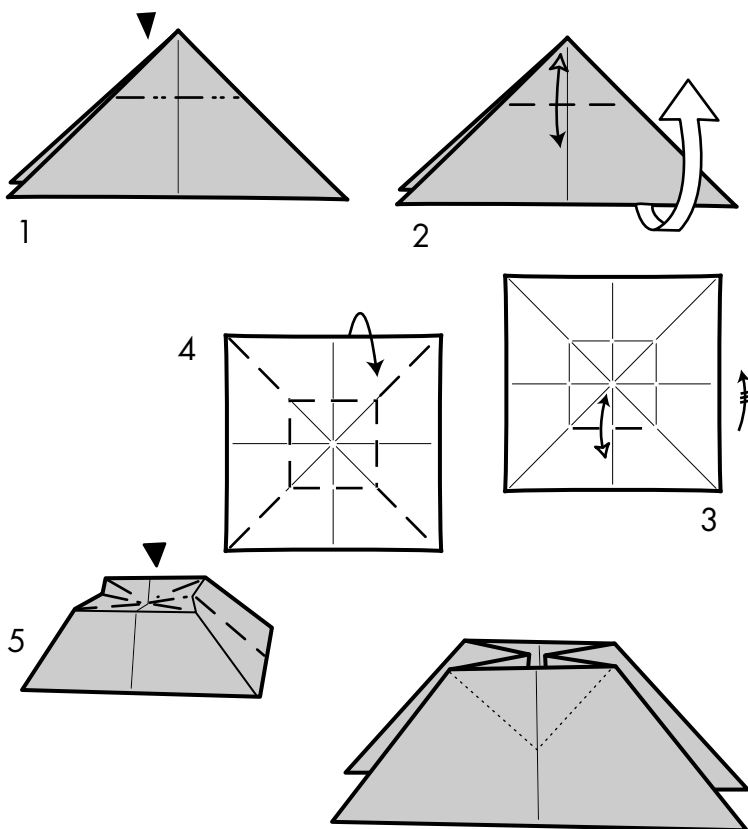


squash

✓ **Sink.** The sink is a descriptive name for when a *closed* corner is folded back inside itself. By closed, I mean with no raw edges.

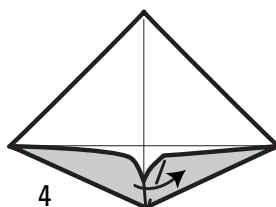
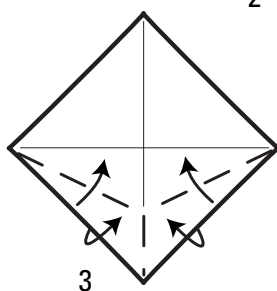
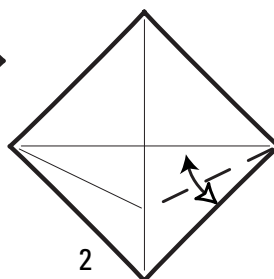
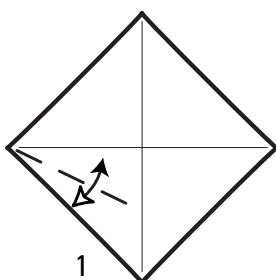
1. Here's a sink in a single step. The next steps break it down.
2. Make a firm valley fold to indicate where the sink will take place, then unfold back to the square.
3. Where necessary, alter the creases that form the central square so that they're all valley creases.
4. Partially form the creases shown, turning the paper over to outline the central square, almost like a table-top.
5. As you pinch each of the sides together, encourage the centre of the paper inwards.
6. Here's the completed sink. The dotted lines shown where the edges lie on the inside.

You can check how good your sink is by having a peek from underneath, to see if the internal layers come to a neat point.

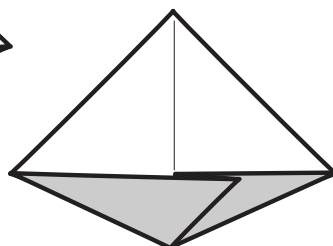


✓ **Rabbit ear.** This move is widely used in origami.

1. Start with a square creased along both diagonals. Fold the lower left edge to the horizontal centre, creasing only as far as the vertical diagonal.
2. Repeat the fold on the right.
3. Fold both sides in at the same time, using the creases shown. A small pointed flap forms in the centre.
4. Flatten the flap to the right.
5. The completed rabbit's ear.



rabbit-ear



## **The history of origami symbols**

In the earliest days of origami, no coherent system for creating instructions existed. Even well into the 20th century a variety of symbols were used to show how to fold – no wonder that origami remained a relatively obscure activity for so long.

In the early 1950s a Japanese origami master called Akira Yoshizawa published his first book, using a system of dotted lines and arrows he'd developed in order to diagram his paper creations. A South African man called Robert Harbin, wrote a book called *Paper Magic* in 1956. In it, he presented certain common sequences and gave them names, such as 'squash fold', and 'crimp fold'. He also collaborated with an American called Sam Randlett to create symbols for origami diagrams. These differed from, but were undoubtedly influenced by those of Yoshizawa. With some additions, the symbols from this very international collection of men remains the basis of all modern origami diagrams.