Name_____Date_____Period_____

# Origami



***Origami*** meaning "folding paper", /is the art of folding paper which is often associated with Japanese culture. In modern usage, the word "origami" is used as an inclusive term for all folding practices, regardless of their culture of origin. The goal is to transform a flat square sheet of paper into a finished sculpture through folding and sculpting techniques. Modern origami practitioners generally discourage the use of cuts, glue, or markings on the paper. Traditional Japanese origami, which has been practiced since the Edo Period (1603–1867), has often been less strict about these differences, sometimes even cutting the paper or using non-square shapes to start with. Cutting was often used in traditional Japanese origami, but modern innovations in technique have made the use of cuts unnecessary. Most origami designers no longer consider models with cuts to be origami, instead using the term Kirigami to describe them. This change in attitude occurred during the 1960s and 70s, so early origami books often use cuts, but for the most part they have disappeared from the modern origami repertoire and most modern books don't even mention cutting.

Almost any flat material can be used for folding; the only requirement is that it should hold a crease. Origami paper, often referred to as "kami" (Japanese for paper), is sold in prepackaged squares of various sizes. It is commonly colored on one side and white on the other; however, dual colored and patterned versions exist and can be used effectively for color-changed models. Origami paper weighs slightly less than copy paper, making it suitable for a wider range of models. Normal copy paper can be used for simple folds, such as the crane and waterbomb. Heavier weight papers can be wet-folded. This technique allows for a more rounded sculpting of the model, which becomes rigid and sturdy when it is dry.

It is common to fold using a flat surface to help crease, but many folders believe that no tools should be used when folding especially when the design is for display. However, a couple of tools can help especially with the more complex models. For instance a bone folder allows sharp creases to be made in the paper easily, paper clips can act as extra pairs of fingers, and tweezers can be used to make small folds. When making complex models from origami crease patterns, it can help to use a ruler and ballpoint embosser to score the creases. Completed models can be sprayed so they keep their shape better and a spray is needed when wet folding.

A small number of basic origami folds can be combined in a variety of ways to make intricate designs. The best-known origami model is the Japanese paper crane. The principles of origami are also used in packaging and other engineering applications. Many technological advances have come from insights obtained through paper folding. For example, techniques have been developed for the deployment of car airbags and stent implants from a folded position. The problem of rigid origami even has great practical importance. For example, the Miura map fold is a rigid fold that has been used to deploy large solar panel arrays for space satellites.

The practice and study of origami encapsulates several subjects of mathematical interest. During the 1980s, many folders started systematically studying the mathematical properties of folded forms, which led to a rapid increase in the complexity of origami models. For instance, the problem of *flat-foldability* (whether a crease pattern can be folded into a 2-dimensional model) has been a topic of considerable mathematical study. Origami can be used to construct various geometrical designs not possible with compass and straightedge constructions. For instance paper folding may be used for angle trisection and doubling the cube.

Origami tessellations is a branch that has grown in popularity after 2000. A tessellation is a collection of figures filling a plane with no gaps or overlaps. In origami tessellations, pleats, twists, and folds are used together in a repeating fashion. Chris Palmer is an artist who has extensively explored tessellations after seeing the Zilij patterns in the Alhambra, and has found ways to create detailed origami tessellations out of silk. Robert Lang and Alex Bateman are two designers who use computer programs to create origami tessellations. A number of computer aids for origami like Tree Maker and Oripa, have been devised. Tree Maker allows new origami bases to be designed for special purposes and Oripa tries to calculate the folded shape from the crease pattern.

Technical origami, known in Japanese as origami sekkei is an origami design approach in which the model is conceived as an engineered crease pattern, rather than developed through trial-and-error. With advances in origami mathematics, the basic structure of a new origami model can be theoretically plotted out on paper before any actual folding even occurs and allows for the creation of extremely complex multi-limbed models such as many-legged centipedes, human figures with a full complement of fingers and toes, and the like.

Distinct paperfolding traditions arose in Europe, China, and Japan which have been well-documented by historians. These seem to have been mostly separate traditions, until the 20th century. In China, traditional funerals often include the burning of folded paper, most often representations of gold nuggets. The practice of burning paper representations instead of full-scale wood or clay replicas dates from the Song Dynasty, though it's not clear how much folding was involved. Chinese paper folding includes a style called Golden Venture Folding where large numbers of pieces are put together to make elaborate models. It is most commonly known as "3D origami". Sometimes paper money is used for the modules. This style originated from some Chinese refugees while they were detained in America and is also called Golden Venture folding from the ship they came on. Paper money from various countries is also popular to create origami with; this is known widely as Dollar Origami, Orikane, and Money Origami.

In Japan, the earliest reference to a paper model is in a short poem by Ihara Saikaku in 1680 which mentions a traditional butterfly design used during Shinto weddings. Folding adorned some ceremonial functions in Edo period Japanese culture; noshi were attached to gifts, much like greeting cards are used today. This developed into a form of entertainment; the first two instructional books published in Japan are clearly recreational. When Japan opened its borders in the 1860s, as part of a modernization strategy, they imported Froebel's Kindergarten system—and with it, German ideas about paperfolding. This included the ban on cuts, and the starting shape of a bicolored square. These ideas, and some of the European folding techniques, were integrated into the Japanese tradition. Before this, traditional Japanese sources use a variety of starting shapes, often had cuts; and if they had color or markings, these were added after the model was folded.

In Europe, there was a well-developed genre of napkin folding, which flourished during the 17th and 18th centuries. After this period, this genre declined and was mostly forgotten; historian Joan Sallas attributes this to the introduction of porcelain, which replaced complex napkin folds as a dinner-table status symbol among nobility. However, some of the techniques and bases associated with this tradition continued to be a part of European culture; folding was a significant part of Friedrich Froebel's "Kindergarten" method, and the designs published in connection with his curriculum are stylistically similar to the napkin fold repertoire.

In the early 1900s, Akira Yoshizawa, Kosho Uchiyama, and others began creating and recording original origami works. Akira Yoshizawa in particular was responsible for a number of innovations, such as wet-folding and the Yoshizawa–Randlett diagramming system, and his work inspired a renaissance of the art form. Wet-folding is an origami technique used for producing models with gentle curves rather than geometric straight folds and flat surfaces. The paper is dampened so it can be molded easily and the final model can keep its shape when it dries. It can be used to produce very natural looking animal models.

Foil-backed paper, as its name implies, is a sheet of thin foil glued to a sheet of thin paper. Related to this is tissue foil, which is made by gluing a thin piece of tissue paper to kitchen aluminum foil. A second piece of tissue can be glued onto the reverse side to produce a tissue/foil/tissue sandwich. Foil-backed paper is available commercially, but not tissue foil; it must be handmade. Both types of foil materials are suitable for complex models.

Washi is the traditional origami paper used in Japan. Washi is generally tougher than ordinary paper made from wood pulp and is used in many traditional arts. Artisan papers can have long fibers and are often extremely strong. These papers are also extremely thin and compressible, allowing for thin, narrowed limbs as in the case of insect models.

Origami not only covers still-life, but also moving objects. Action origami includes origami that flies, requires inflation to complete, or, when complete, uses the kinetic energy of a person's hands, applied at a certain region on the model, to move another flap or limb. Some people argue that the latter is only "recognized" as action origami. Action origami, first appeared in traditional Japanese flapping birds.

Modular origami consists of using many identical pieces together to form a complete model. Normally the individual pieces are simple but the final assembly may be tricky. Another type of origami is Pureland origami, and it adds the restrictions that only simple mountain/valley folds may be used, and all folds must have straightforward locations. It was developed by John Smith in the 1970s to help inexperienced folders or those with limited motor skills. Some designers also like the challenge of creating within the very strict constraints.

Copyright in origami designs and the use of models has become an increasingly important issue in the origami community, as the internet has made the sale and distribution of pirated designs very easy. It is considered good etiquette to always credit the original artist and the folder when displaying origami models The Origami Authors and Creators group was set up to represent the copyright interests of origami artists and facilitate permissions requests. However, a court in Japan has asserted that the folding method of an origami model "comprises an idea and not a creative expression, and thus is not protected under the copyright law". The Japanese decision is arguably in agreement with the U.S. Copyright Office, which asserts that "copyright does not protect ideas, concepts, systems, or methods of doing something."

***** BE SURE TO ANSWER IN COMPLETE SENTENCES AND CIRCLE, UNDERLINE, OR HIGHLIGHT WHERE THE ANSWERS ARE FOUND. *****

**1. The word origami means what?**

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**2. The principles of origami are also used in what applications?**

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**3. Besides space satellites, what other developments have been assisted through origami techniques?**

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**4. Is origami copyrighted protected under Japanese law?**

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**5. Most origami designers no longer consider models with cuts to be origami, instead they use what term to describe them?**

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**6. The only requirement for origami paper or flat surfaces is what?**

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**7. In Japan, the earliest reference to a paper model is in what year and documented in what type of writing?**

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**8. What tool can help assist with sharp creases when folding?**

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**9.What origami technique is used for producing models with gentle curves rather than geometric straight folds and flat surfaces?**

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**10. Origami not only covers still-life as a theme but what else?**

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