

# The Evans Group LLC



"When I write articles for clients I am teaching from a transpersonal psychology basis. I believe that most companies do not understand the history of their own company, let alone the history of how products were developed. History helps us understand HOW A PRODUCT OR CONCEPT IS DEVELOPED.

For example, how many millions of dice have been sold, or toothpicks, condoms, and even Chapstick. We learn from viewing what was, what is, and what can be."

-Chip Evans

## The History of Dice

### Background

Dice are implements used for generating random numbers in a variety of social and gambling games. Known since antiquity, dice have been called the oldest gaming instruments. They are typically cube-shaped and marked with one to six dots on each face. The most common method of dice manufacture involves injection molding of plastic followed by painting.

### History

Dice have been used for gaming and divination purposes for thousands of years. Evidence found in Egyptian tombs has suggested that this civilization used them as early as 2000 B.C. Other data shows that primitive civilizations throughout the Americas also used dice. These dice were composed of ankle bones from various animals. Marked on four faces, they were likely used as magical devices that could predict the future. The ancient Greeks and Romans used dice made of bone and ivory. The dice of most of these early cultures were made in numerous shapes and sizes. The modern day cubical dice originated in China and have been dated back as early as 600 B.C. They were most likely introduced to Europe by Marco Polo during the fourteenth century.

Dice were typically handcrafted and produced on a small scale up until the twentieth century. As plastic technology emerged, methods for applying it to dice manufacture were developed. This allowed manufacturers to produce

# The Evans Group LLC



mass quantities of dice in a cost effective manner. Over the years a variety of patents for improved methods of dice manufacture have been granted.

## Design

The standard die is a six-sided, plastic cube. Each side is typically marked with one to six spots, or dots. These dots are arranged such that opposite sides always total seven. For example, the one dot side is opposite the six dot side and the three dot side is opposite the four dot side. In a two dice game, the dice are shaken and thrown on a surface. The rolled amount is indicated by the sides of the dice that are face up. If the dice are well-balanced and fair, each side has an equal chance of landing face up. Depending on the game, the player will either move her piece or collect money based on this rolled amount. Some popular gambling games that use dice include craps, chuck-a-luck, and poker dice. Board games such as backgammon, Monopoly, and Parcheesi also use dice.

Standard dice are available in a wide variety of sizes and colors. For board games a pair of 12 mm dice are typically used. These dice are considered imperfect because they have rounded corners, which reduce randomness. Since these dice are often used in children's games, they must be designed to meet certain toy safety standards. Casinos use perfect dice that may be hand made. They are generally larger than board game dice with a side measuring 33 mm. These are red, translucent dice which have precision-edges and corners and white dots. With this construction, rolls with these dice have the greatest probability of being fair.

Specialty dice are produced for many different applications. In some cases, the spots on a standard cube die are replaced by words, pictures, or symbols. Divining dice, which are used to predict future events, have different predictive messages on each face. Poker dice have card faces printed on each side. For blind people, Braille dice are available. Some games require dice that have a different number of sides and can provide a greater number of outcomes than standard dice. These polydice can have anywhere from three to 20 sides. They are used extensively in fantasy role playing games.

The key design element of dice manufacture is the mold. A mold is a cavity carved in steel that has the shape of the product that it forms. Typically, a mold is made up of two pieces which are forced together to form the cavity. When a plastic is injected into this mold, it takes on the mold's shape as it

# The Evans Group LLC



hardens. Since dice are solid cubes, using a standard mold is not practical because they would take too long to cool. For mass production of dice a special mold design is used. This mold is made up of separate chambers, which create individual elements of the die. As the individual pieces cool, they can be forced together to create a unified single object. The mold is then opened and the die is ejected. Special release agents are used to help make the plastic easier to remove from the mold. This mold design saves time because the smaller pieces can cool more rapidly.

## Raw Materials

Numerous materials have been forged into dice throughout history. This includes such things as bones, glass, wood, seeds, and metals. Today, the most widely used base material for dice manufacture is plastic. Plastics are high molecular weight polymers that are produced through a variety of chemical reactions. For a plastic to be suitable in dice manufacture it must have good impact strength, be easily colored, and heat stable. It is also desirable that it be clear, colorless, and transparent. Most dice are made with a thermoset plastic. One plastic that meets all of these requirements is polymethyl methacrylate (PMMA). Cellulose based plastics are also used.

Since the polymer, which makes up the bulk of the plastic is typically colorless, colorants are added to make the dice more appealing. These may be soluble dyes or comminuted pigments. To produce a white color, an inorganic material such as titanium dioxide may be used. Other inorganic materials such as iron oxides can be used to produce yellow, red, black, brown and tan dice. Organic dyes such as pyrazolone reds, quinacridone violet, and flavanthrone yellow may also be utilized.

A host of other filler materials are added to the plastics to produce a durable, high quality set of dice. To increase the workability and flexibility of the polymer, a plasticizer is included. Plasticizers are nonvolatile solvents and include things such as paraffinic oils or glycerol. To improve the overall properties of the plastic, reinforcement materials such as fiberglass are added. During production the plastic is typically heated. For this reason, stabilizers must be added to protect the plastic from breaking down.

Unsaturated oils such as soybean oil may be used as heat stabilizers. Other protective materials that are added include ultraviolet (UV) protectors such as benzophenones to prevent UV degradation and antioxidants such as aliphatic thiols to alleviate environmental oxidation. Finally, compounds are

# The Evans Group LLC



also used during manufacture to aid in processing. This generally includes materials like ethoxylated fatty acids, silicones, or metal stearates, which help with the removal of the plastic from the mold.

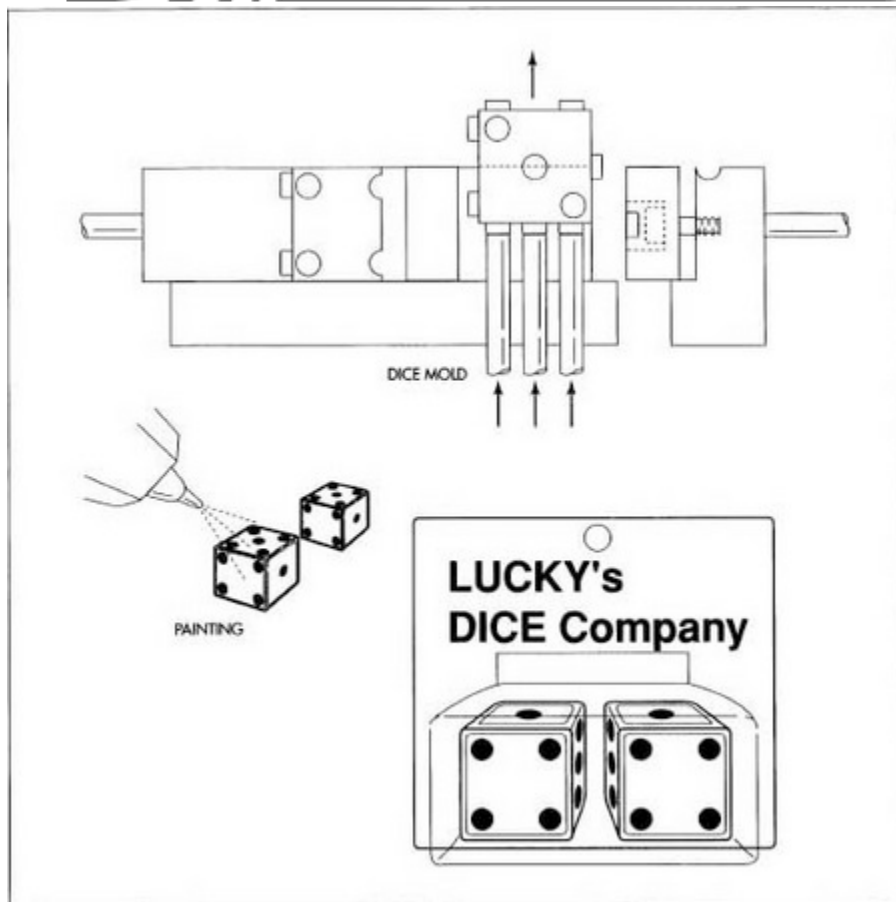
## The Manufacturing Process

The exact manufacturing process for any type of die depends on the base raw materials used. For mass production of imperfect standard dice an injection molding process is used followed by painting and packaging.

### *Forming*

- 1 At the beginning of a dice manufacturing line, plastic pellets are transformed into dice via injection molding. The pellets are plastic beads that have all the colorants and fillers already added. They are placed into a large bin known as a hopper and passed through a hydraulically controlled screw. As they travel through the screw, they are heated and melted. At the end of this screw is a spreader which injects the molten material into a cool, closed two-piece mold.

# The Evans Group LLC



Plastic pellets are placed into a large bin known as a hopper and passed through a hydraulically controlled screw. As they travel through the screw, they are heated and melted. At the end of this screw is a spreader which injects the molten material into a cool, closed two-piece mold. The dice is painted and packaged.

- 2 The mold is made up of several chambers, which create multiple plastic parts. Inside the mold, the plastic is held under pressure and then allowed to cool. As it cools, the plastic pieces harden. The mold is then opened. When the mold is opened, the individual pieces are forced together to form a single solid cube. Because the mold was appropriately designed, this cube has indentations that will become the dots on each side. The cube is then ejected from the mold, coated and passed to the next phase of production via conveyor. Meanwhile, the two piece mold closes again making it ready to create the next die.

# The Evans Group LLC



## *Painting and labeling*

- 3 To complete the production of the die, they may be washed and dried before the final decorations are applied. First, the spots are appropriately painted. For specialty dice, words may be printed or images may be applied to each side. Company logos or other advertising may also be applied. These can be stickers or coatings. The coatings used during this step are specially formulated to adhere to the plastic and dry quickly.

## *Packaging*

- 4 Depending on the final use of the dice, they may be bulk packaged for use in board games, or individually wrapped for consumer sale. For board games, the dice are packed up into boxes and shipped to game manufacturers just like any other component material. When they are sold directly to consumers, dice are typically put into plastic blister packs with a cardboard backing. This package has the dual purpose of protecting the dice during shipping and advertising the product. The finished dice are then placed in cases and shipped by truck to distributors.

## **Quality Control**

To ensure that each die produced meets specified quality standards, a number of quality control measures are taken. Prior to manufacturing, certain physical and chemical properties of the incoming plastic raw materials are checked. This includes things such as molecular weight determinations, chemical composition studies, and visual inspection of the appearance. More rigorous testing may also be done. For example, stress-strain testing can be performed to determine the strength of the plastic. Impact tests help determine the toughness of the plastic. During manufacture, line inspectors are stationed at various points on the production line. Here, they visually check the plastic parts to make sure they are shaped, sized and colored correctly. They also check the integrity of the final packaging. If any defective dice are found, they are removed from the production line and set aside for reforming. Computers are also used to control plastic use, mold retention time, and line speed.

# The Evans Group LLC



## The Future

In the future, dice manufacturers will concentrate on increasing sales and improving the production process. To increase sales, dice marketers will be involved in developing new games that utilize different types of dice. These games will require new types of dice that may have different shapes, sizes, and plastic compositions. From a production standpoint, future improvements will focus on increasing manufacturing speeds, minimizing chemical waste, and reducing overall costs.

From [www.Encarta.msn.com](http://www.Encarta.msn.com)

## Ancient Dice



# The Evans Group LLC



These gaming dice are from the prehistoric site of Mohenjo-Daro in what is now Pakistan. They date to the Indus Valley culture, which thrived between about 2500 and 1700 BC, and represent some of the earliest examples of dice ever found.

## History

---

**Dice are the oldest gaming implements known to man. Their precise origins are unknown but they have a long and rich history none the less.**

Sophocles (496 - 406 BC), the Greek poet and tragedian, claimed that dice were invented by the Greek, Palamedes, during the siege of Troy. Herodotus (b. 484 BC?), historian and acquaintance of Sophocles, said they were invented by the Lydians of Asia Minor. But dice date back further than this. Egyptian tombs, dated to 2000 BC, have been found containing dice and dice reputedly dated to 6000 BC have been uncovered in archaeological excavations. Dice were developed independently by many ancient cultures all over the world and did not simply originate and spread from any one place.



**Dice play in the 17th century**

In ancient times the throw of a dice was not just considered to be luck, the outcome was believed to be controlled by the gods and casting dice was a way of dividing inheritances, choosing rulers and as a method of prediction. The Roman goddess, Fortuna, daughter of Zeus (known to gamblers as Lady Luck), was believed to determine the outcome of a throw.

Before standard cubical dice became common, ancient peoples would use fruit stones, sets of flat sticks, sea shells, nut shells and pebbles to get random results for games. These were probably adopted from witch doctors and shaman who would throw them to gain insight and knowledge of the unknown and things to come. [Fortune telling](#) is still practiced with standard dice to this day.

Animal knucklebones were the next step in the evolution of dice. The Greeks and Romans used sheep anklebones as well as the more developed cubical spotted dice. The Romans called the four-sided anklebones *Tali* or *Astaragali* and the standard six-sided dice *Tesserae*. The Arab word for knucklebones is

the same word they use for dice. Playing with dice is still known as "*rolling the bones*" to this day.

Of course [games](#) have been played with dice from their early beginnings. The first were probably simple racing games and have been lost to history. The pharaohs of ancient Egypt were portrayed playing with dice and both the Romans and Greeks were keen dice players. Roman Emperors notoriously played and gambled with dice compulsively. Dice games are

# The Evans Group LLC



known to have been popular in Europe during the Middle Ages when French academics taught them to their students. In England, Richard the Lion Heart and King John both gambled with dice and King Henry VIII lost the bells of old St Paul's church on a throw. Dice games have been played in English inns since at least the 15th century.

Dominoes descended from dice in China and spread to the west during the 18th century while [standard ordinary dice](#) became the vital component of a vast array of commercial board games in the 19th and 20th centuries. In recent times [polyhedral dice](#) have gained widespread popularity with modern technological advances in plastic molding.

Whether it's the old standard six-sided cube with spots or the latest polyhedral shape, dice are still the game players most vital, versatile and treasured piece of equipment.

## Dice Quotations

---

**Dice are an integral part of the world's language and culture and are synonymous with Fate and everything random. Read how dice have been used throughout history to convey chance and destiny.**

---

*Iacta alea est. - The die is cast.*

Julius Caesar crossing the Rubicon

*The dice of Zeus fall ever luckily*

Sophocles

*The best throw of the dice is to throw them away.*

Advice from an old English proverb

*Whose game was empires and whose stakes were thrones.*

*Whose table earth, whose dice were human bones.*

Lord Byron

*I cannot believe God plays dice with the universe.*

Albert Einstein

# The Evans Group LLC



*Not only does God play dice with the universe, He's using loaded dice.*

John Ford

*Not only does God play dice, He throws them where we cannot see them.*

Steven Hawkings

*Triumph depends on a roll of Fate's dice; the ultimate prize is a place in Heaven.*

Friedrich Nietzsche

*We figured the odds as best we could, and then we rolled the dice.*

Jimmy Carter

*I'm the lone crap shooter  
Playing the field every night  
Baby can't stay  
You got to roll me  
And call me the tumbling dice  
Roll me and call me the tumbling dice*  
Mick Jagger and Keith Richards '*Tumbling Dice*'

## Standard Dice

---

**Ordinary dice, the standard dotted cubes we all know, are not as simple as they first seem.**

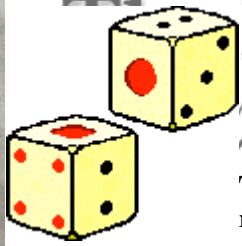
An ordinary standard die is a regular cube with its six sides numbered with dots from 1 to 6. All opposing sides adding up to 7.

The ordinary dice commonly available are not as precisely made as the [perfect dice](#) casinos use and are imperfect dice, known as *drugstore* or *candy-store dice* in the US and *shop dice* in the UK. They usually have recessed spots and often have rounded corners so they roll easier. Unless you are a serious gambler these are perfectly adequate for social games.

Plastic is the most common material commercially used but they can be found in many other materials; wood, stone, glass, metals, any material imaginable.



Casino, oversized, standard and miniature dice



available.

# Evans Group LLC

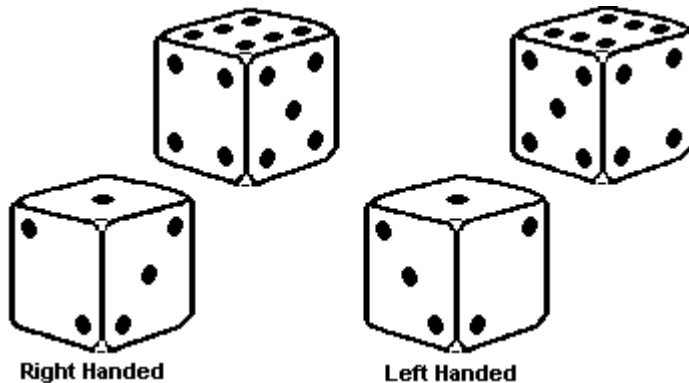
The standard Western size is just over half an inch square, but miniature dice of one-quarter inch square and oversized or giant dice from three-quarters up to an inch across are also commonly

The dots on the faces of a die are called *spots* in the USA but are sometimes referred to by the more British term, *pips*.

The standard factory made plastic *shop* or *drugstore dice* commonly available will favour the high numbers (6 then 5 then 4) because these sides are lighter than the opposite low number sides due to the indentations of the spots. This bias will only become apparent after a very considerable number of throws. If this is a problem then you need [casino precision dice](#).

There are tactile/braille dice available with recessed faces and raised spots that can be read by touch.

Opposite faces of a die should add up to 7. However there are two ways of arranging the faces, one a mirror image of the other, so there are left and right handed dice.



Today Western dice all have the same face arrangement. If the 1-spot is face up and the 2-spot is turned to face the left then the 3-spot is to the right of it. Chinese dice will have the faces the opposite way round. Japanese dice are arranged like Western dice but like other Asian dice they will have a very large and deep 1-spot painted red. Chinese and Korean dice will have a red 4-spot as well as the 1.

The Chinese custom of painting the 4-spot red is said to have originated when an Emperor playing *sugoroku* with his queen was about to lose and desperately needed fours to win the game. He cried out, threw the dice and they came up accordingly. He was so glad that he ordered that fours be painted red from then on. The emperor is said to have been Lo Ling Wong who reigned under the title Chong Tsung (AD 684 - 701) during the Ming dynasty. Whether this story is true is questionable and it has been suggested that the 4-spot is painted red because dice were imported from India where red fours are also traditional. The reason why the 1-spot is large and painted red is not clear. It is said the stark combination of black and white would be unlucky, red being considered very lucky in China. Another

# The Evans Group LLC



possibility is that it counters and balances the die, compensating for the opposite 6-spot indentations.

Chinese dice come in various sizes and customarily certain sizes are preferred for particular games. Generally the traditional size ranges between 2/10ths and 7/10ths of an inch.

Indian dice are also traditionally said to be spotted black and red. Why isn't known but Indian dice traditionally have the 3 and 4-spots painted red. The ancient Hindu Sanskrit *Mahabharata* refers to "*dice, dotted black and red.*"

Dice from Pakistan are right handed like Western dice and are traditionally marked with a red 6-spot as well as a standard size red 1-spot.

Another feature of Asian dice is the orientation of the 2 and 3-spots. You may find the spots on either the 2 or both faces arranged vertically/horizontally rather than diagonally as on Western dice.

# The Evans Group LLC



## Casino Dice

---

**Casinos don't take any chances when it comes to profit so they don't use just any dice when thousands of dollars are riding on a roll.**

Casino dice are called *perfect* or *precision dice* because of the way they are made. They are as close to being perfect true cubes as possible, measured to within a fraction of a millimeter, manufactured so each die has an absolutely equal chance of landing on any one of its six faces.

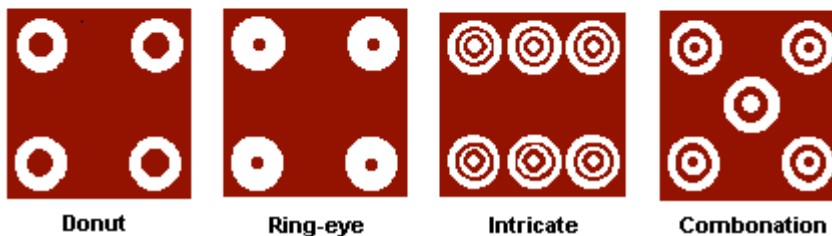
Casino dice are specially hand made to within a tolerance of 0.0005 of an inch. The spots are drilled and filled with material that is equal in weight to the material removed. Usually sides are flush and edges sharp. They are predominantly transparent red but can come in other colors like green, purple or blue. Spots are usually solid but a number of different designs can be found.



**Solid**

**Birds-eye**

**Bulls-eye**



**Donut**

**Ring-eye**

**Intricate**

**Combonation**

It is believed all casino dice should have the same conventional arrangement of faces and spots. They're right handed so that if the 1-spot is face up and the 2-spot is turned to face the left then the 3-spot is to the right of it with all opposing sides adding up to 7. If the 1 spot is face up then the 3-spot runs diagonally up from the left and the 2-spot runs diagonally down from the left. A different orientation of the spots is sometimes used on [crooked dice](#) (made to look like casino dice) so a cheat can differentiate them from a set of straight dice.

Since the 1970's, and the move to corporate owned casinos, it has become more and more common for casino dice to have serial numbers printed on them. The number is 3 or 4 numeric digits, possibly with letters and dashes, usually printed on the 6-spot but can be found on any face except the 1-spot. This number denotes the issue and is used to prevent

# The Evans Group LLC



them being switched for [crooked dice](#). Another security check sometimes used is having *key letters* printed on the underneath of spots which can only be viewed by looking through the transparent die. The casino's name, sometimes location, and/or logo will often be printed on the dice too using a metallic *foil*. The 1-spot usually bares the casino's name while the 2-spot may have the logo.

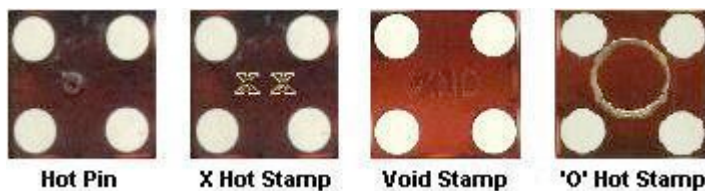


The most common size today is 3/4 inch but the size can vary with 5/8 inch and 11/16 inch the next most common sizes.

Casino dice were made of *cellulose nitrate*, starting around the 1920s, but sometime around the 1950s the manufacturers switched to *cellulose acetate* which is more durable. Very old casino dice have often started to crystallize and will have turned yellowish around the edges. This crystallization is caused by age and exposure to moisture and ultra-violet light. A completely crystallized die will disintegrate if pressure is applied.

Casino dice can be readily bought. However many cheap casino dice are in fact rejects that haven't met the manufacturers standards or used dice that have been cancelled by their casino. Both rejects and used dice will have been defaced in some way.

Manufacturers call rejects *culls*. These are factory marked with a hot pin in the centre of the 4-spot or hot stamped with a number of 'X' or star symbols or just simply stamped with the word "VOID". Some manufacturers stamp a gold "O" onto the four spot.



Used dice may be bought as souvenirs from many casinos although some refuse to let them go. When a die is taken out of play it will be cancelled. It could be that a hole is drilled through it or a crescent or circle is pressed into one side with a vice. Sometimes a gold bar is hot stamped on the six-spot. A sharp pointed metal scribe is often used to press a small shallow mark into a face. Some older dice were scratched or had a date or initials marked on them. By state law Atlantic City casinos must drill all the way through their used dice.

# The Evans Group LLC



If you want true perfect dice then pay the extra for a *stick*. A stick is a number of dice that are still in their sealed pack as delivered by the manufacturer.

# The Evans Group LLC



## Crooked Dice

---

**With so much money riding on the roll of a die it's no surprise that crooks try to influence the outcome. Here you can learn all about the methods the cheats use to win your money...**

Crooked dice are not a recent development. The Indian Hindu Sanskrit, *Mahabbarata*, the first documented reference to dice, mentions crooked dice and examples have been found in ancient sites in the Orient, South America and the Middle East.

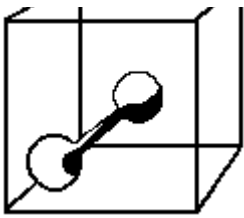
Dice that are fair are known as *straight* or *square dice*, *perfects* or *levels*. Terms for crooked dice are numerous and there are a number of methods for *gaffing* dice. Crooked dice do not behave in the same manner on every throw but they do change the odds and so are known as *percentage* or *P.C. dice*.

A dice *mechanic* will substitute crooked or gaffed dice for the real ones and can quickly switch them back once they have gained their advantage. Slight of hand may be used or the switch will take place when the dice are out of sight. Crooked gambling houses used to employ stickmen for Craps who would switch the dice when signaled. Today the major casinos are honest and have no reason too cheat. An expert *switcher* will almost be impossible to spot. If you suspect a switch has taken place then you could examine the dice yourself. Remember the dice you are playing with may not be the dice that started the game and cheats will switch the dice back and forth as it suits them. A cheat may even let another player take his crooked dice away, just writing his loss off as part of his scam. This means there could be crooked dice in circulation that no one is aware of.

[Craps](#) is where the money is so crooks and cheats target this game the most. *Passers* are crooked dice that favor passes and not the 7, or craps on the come out throw. *Missouts* are crooked dice that favor the 7 and not the points.

*Loaded dice* or *weight* will be heavier on one side. The extra weight may be lead, gold or platinum so it only takes a small amount to change the odds. The weight is often placed nearer one corner or edge rather than at the centre of one face. Transparent dice do not prevent loading because the actual spots can contain the weight. Check if the spots are deeper on some sides than others, although this is no guarantee because a well made gaffed dice will look straight and even. To test for loaded dice simply repeatedly drop the die in a glass of water. It should sink and if a particular number always faces up the die is loaded. The pivot test is one where you hold the die between your thumb and finger by diagonally opposite corners. If the die is loaded it will tend to turn downward as you lightly hold it.

*Floats* or *floaters* don't have extra weight added but weight taken away so they become lighter. They are hollow inside and the gap is placed off centre to bias the dice. They are known as floaters because they will often float, with the hollow side up, when placed in water.



# The Evans Group LLC



*Tapping dice* or *tappers* are dice with a hollow dumb-bell shaped chamber inside. The hollow chamber is filled with mercury. When the mercury is in the end of the chamber near the centre of the die it is fair. But when the cheat wants the die to be biased he will tap the die so the mercury runs to the other end and weight one corner. Some tappers use the same principal but with a weight that slides up and down the chamber on a fine wire. These may have a ratchet mechanism to hold it in place until the die is tapped and may have a rubber bumper to prevent any noise. Obviously these dice must be opaque. Tappers are not used often because of their unreliability. To test for these, tap the die on all it's corners and use the loaded die tests.

*Shapes* are dice that are not true cubes. Shapes may be convex or concave on some sides or edges or a side may have been shaved down.

*Bevels* are shapes with one or more convex sides. These dice will be more likely to roll off the convex sides and on to a flat one.

*Suction dice* have a concave side which can create a slight vacuum when rolled on a hard flat surface. On a rough surface the dice tend to stop on the concave side when a flat side would keep on rolling. These dice favor the opposite side of the concave one.

*Trip dice* have *edge work* and flat sides. Dice are manufactured with different types of edge. There are different ways to machine the edge of a die and if all the edges are machined the same way the die is fair. Trip dice will have differing edges. They tend to wear after use and need to be replaced by the cheat quite often.

*Cut-edge dice* are trip dice that have an edge shaved at an angle of 45 degrees while the others may be at 60 degrees which effects the roll.

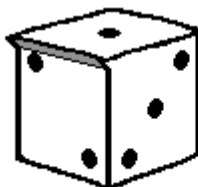
*Raised-edge dice* are trip dice with a lip on some sides. These sides have more surface area and also grip when rolled on cloth.

Dice with *razor-edge work* have different edges. Dice can be razor edged on some sides and turned or rounded on others so the die will roll off the rounded edges and grip on flat ones.

*Split-edge* or *Saw-tooth edge work* is serrating some edges of the dice with tiny cuts. The idea is these edges will grip. The bias is hard to ascertain and these dice are said to be worthless to a cheat.



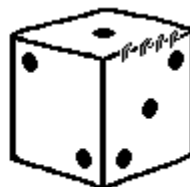
Cut-edge



Raised-edge



Razor-edge



Saw-tooth



square die and a "brick"

# The Evans Group LLC



*Bricks* or *flats* are shapes that have one side shaved down so the four adjoining sides are made smaller and have less surface area. The shaved side and its opposite face will be the more likely outcome. *Six-ace flats* will favor the 1 and 6 sides and work against the shooter in a game of Craps. *Flat passers* are a pair of dice cut down to favor 3-4 and 6-1 so totals of 4, 5, 9 and 10 occur more often (point numbers in Craps). *Barred dice* is another term used for these.

Bevels can be held together or pressed on to a flat surface. If they rock back and forth you know the die's face is convex. Try running your finger over the sides of the die feeling for lips or edges. Remember to check all sides of a die to determine if it is a shape. There are devices used by casinos called micrometers that measure the sides of dice extremely accurately. Sometimes shapes and loaded dice are combined, with both defects so minute that spotting them is difficult. Different methods of shaping and gaffing dice can also be combined to produce such things as *razor edge convexes*, *beveled suction shapes*, etc. An obviously misshaped or loaded die is said to have *very strong work* that won't *pass in fast company*.

Raised spots are supposed to cause the dice to roll off that side. The spots aren't finished properly and these are used by amateur cheats. They can be easily felt and are not as effective as other crooked dice.

*Capped dice* are shaved down on some sides and then have the material replaced by a layer of material that matches in look but differs in elasticity. The dice tend to bounce off these sides and settle on one not doctored. The join should be invisible all though wear and heat may show it up after time. Use your finger nail or something sharp to feel the resiliency of all sides. *Liquid capping* is the painting of dice with a solution that dries to get the same effect. This isn't worth doing because the substance becomes sticky in players hands and picks up dirt.

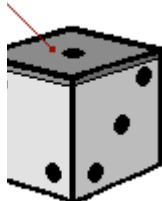
You will often see dice players blowing on the dice for good luck. Another way to cheat is to paint sides of the dice with a clear sticky substance which can be activated by the moisture in the cheats breath causing the dice to have a tendency to stick to the throwing surface.

*Slick dice* are polished on some sides while the other sides are roughened. This is supposed to make the dice slide to a stop on the smooth side and roll off a rough one. This bias is negligible but is hard to spot because even straight dice can become rough after a lot of use.

*Bristles* are dice gaffed with a pin. The pin is inserted into the centre spot of the 5 side, only slightly protruding, and will hold if rolled on a cloth or baize surface. They are known as *bristles* because pig or horse bristles were used. It is an extremely old method of gaffing dice. Outmoded and not used by professional cheats because of the likely hood of being discovered.

Mis-spotted dice with duplicate numbers on opposing faces are called *tops and bottoms*. Other terms for these dice are *tops*, *mis-spots*, *horses* or *tees (T's)*. A gamblers term for these is *busters*. These can easily be identified simply by examining all the faces of the die. Remember all opposing sides must add up to 7. These dice are not as instantly recognizable as you may think because only three sides of a die are visible at any one time.

doctored Face



Capped Die

# The Evans Group LLC



*Double number* dice have two sides of the same number, *double deuces* will have two 2 spots and no 5. A pair of dice with duplicate sides of 1, 5, 6 and 3, 4, 5 will never produce a total of 2, 3, 7 or 12, the only numbers that can lose in Craps. *High-low splitters* are marked twice with 1, 2, 3 on one die and 4, 5, 6 on the other. These produce a lot of 7's and a crooked house would switch them in when some one has made a heavy bet on the field in a Craps game. *Door pops* are a pair of dice that only ever come up 7 or 11. One die is spotted with 6's and 2's the other is all 5's on every side and only a complete idiot would fall for these. Games that require high numbers to win, like Backgammon or [High Dice](#), can be played with *high number* dice that have two 4's, 5's and 6's. *Low number* dice have two 1s, 2s and 3s.

*Electric dice* are metallic on one side or have metal slugs in the spots on one side. These are used with an electromagnet under the playing surface. Greedy [Chuck-A-Luck](#) operators sometimes use them under the counter or chuck cage and special Craps tables were manufactured to incorporate the magnet. Electric dice are not as commonly used as they once were due to the fact that many dice players carried a magnet to test for them. If a die sticks to a magnet then without doubt it is crooked. Gambling venues that use electromagnets are known as *juice joints* or *wire joints*. These are not strictly speaking percentage dice because when the magnet is on the outcome is certain.

Crooked dice may be unconventionally spotted so a cheat can differentiate between them and a set of straight dice when switching them back and forth from a game.

If playing dice for money you should play with transparent dice to reduce the chances of using crooked ones. Casinos always use these dice and today's major casinos are respectable, professional operations and have no need to cheat. Don't play with strangers but rather stick to a friendly game with people you know well and trust. Should you ever find that you are in a crooked dice game the best advice is to cut your losses and take no further part. Even if you are positive the game is rigged the situation could rapidly turn ugly if you were to accuse some one.

## Polyhedral Dice

---

**Dice are not just the regular spotted cubes we recognise as standard ordinary dice, they can come in many different shapes.**

Many Role Playing Games (RPGs) along the lines of *Dungeons and Dragons* use polyhedral dice that do not have six faces but instead may have 4, 8, 10, 20, 30 even 100s of faces with numbers, spots, words or symbols.



In RPGs the dice are used to gain strength and power in specific categories. Wizardry and sorcery in ancient times may be expressed in terms of dice throws. Players take on character identities and may become elves, knights, wizards, etc. These characters will have abilities like speed, strength and magic which can be determined by the throw of the dice.

# The Evans Group LLC



In Collectable Dice Games (CDGs) players must buy or collect particular dice to use against opposing players, giving them superior abilities, powers and the advantage. Consequently, some dice are rarer and than others.

These small plastic polyhedral shapes hold the key to a RPG or CDG games course and outcome.

There is a shorthand used by game players to express the results and the type of dice used in a game. Read about [standard dice notation](#) for an explanation.

Polyhedral dice are usually numbered with numerals not spots. Sometimes they are numbered more than once with the same numeral. d20s are sometimes numbered twice with the numbers 0 - 9. It is also possible that some numbers will be marked more frequently than others. For example a d6 marked 1, 2, 2, 3, 3, 4. Dice like these are known as *averaging dice*. They change the odds of particular totals being thrown and prevent extreme results. Unscrupulous players may use crooked polyhedral dice marked twice with a particular number to give themselves better odds.

Many polyhedral dice are not marked with numbers but are marked with symbols, categories or instructional words. These dice are usually specifically used for their own particular RPG or CDG although not always.

The geometry of these polyhedral shapes is a science in its self and has fascinated scholars and mathematicians through the ages. Read [polyhedral dice geometry](#) if you want to learn about the mathematics and variety of these dice solids.

Polyhedral dice often come in standard sets of seven - d4, d6, d8, 2d10, d12, d20. One d10 will be marked in tens, 0 to 90, so it can be used with the other as percentile dice (d%).



The standard polyhedral set above is only part of the range of solid shapes used for dice. You may come across all sorts of dice shapes and there are many patents in existence detailing interesting and new ideas and weird, exotic solid forms.

Polyhedral dice come in a range of attractive finishes, colours and materials to appeal to a RPG or CDG gamer's aesthetic senses. You can even find them made from real semi-precious stones and minerals.

RPG and CDG gamers love of dice manifests itself in the adoption of new interesting or unusual dice, found, bought or borrowed, which are incorporated into the original game play adding a new dimension or aspect to the proceedings.

# The Evans Group LLC



## Cubes Without Spots

---

**Six sided regular cubic dice are sometimes made without the standard arrangement of 1 to 6 spots, but instead will have symbols, letters, words, pictures, etc. The development is often used to incorporate a new aspect or gimmick to a game.**

Obviously standard six sided dice can be substituted for the new design by simply giving a spotted number a corresponding symbol, letter or word from the face of the new die.

Sometimes dice are marked with the numerals **1, 2, 3, 4, 5, 6** instead of spots. This is a role playing game convention and of course they can be used in exactly the same way as the standard spotted dice. Similarly, but less common, some dice are marked with Roman numerals - **I, II, III, IV, V, VI**.

You may come across dice that are not marked with the usual round spots but use a small symbol as a replacement for the common and usual circular dot. They are marked with the symbol conventionally so each face has one up to six symbols arranged like an ordinary standard die's spots. Symbols used are - **stars, hearts, dollars, champagne glasses, pumpkins, shamrocks, christmas trees**.

### Some common specially marked cubic dice include...

Poker Dice are the most common pictured dice available and have playing cards printed on them (**A, K, Q, J, 10, 9**). No particular suits are assigned to the King, Queen and Jack while the 10 is usually a diamond or sometimes a heart and the 9 may be either a spade or club. The Ace is usually a spade but very occasionally a club. Poker dice come in sets of five.



Crown and Anchor dice have a **club, diamond, spade, heart, crown** and **anchor** printed on them. It is thought they originated in Australia. They come in sets of three and are really only a gimmick on the game of Chuck-A-Luck. In Belgium and Flemish France, where they call the game *Ancre, Pique et Soleil*, they use a **Sun** symbol instead of a crown while in Nepal they use a **flag** symbol and call it *Langurburjar* simply meaning *dice*. It's believed the Nepalese adopted the game from British, Dutch, Belgian and French sailors.



# The Evans Group LLC



There are other dice with the playing card suit symbols but without the crown and anchor. There are also dice with a heart, spade and two clubs and two diamonds. Anyone know how they are used?

Bar or Slots dice are marked with slot machine symbols - **cherries, lemon, Barr, Jackpot, melon**, etc. Usually found in sets of three these are used for gambling with payoffs for triples and cherries etc.



[Fig](#) and other games are sometimes played with *Death Dice* that have a skull instead of a 1-spot.

Hearts dice come in sets of six and have letters (**H, E, A, R, T** and **S**) instead of spots. They are an old gimmick on the game of [Sequences](#).

[Beetle](#) dice have letters to represent a beetle's body parts **B**-ody, **H**-ead, **E**-ye, **L**-eg, **A**-ntennae and **T**-ail. A single die, or sometimes a pair, is used for this game.

There have been many commercially marketed games that use dice with letters of the alphabet (**A - Z**) printed on dice faces. These games often require the player to make words from the letters thrown in a Scrabble or anagram type game. Some games that use letter dice include Boggle, Word Yahtzee, Scrabble Dice, and Spill and Spell.

Similarly dice with numerals and/or mathematical operators (**+**, **-**, **/**, **x**) and/or fractions are used in commercial and educational math games.

Dice marked **2, 4, 8, 16, 32, 64** are *doubling cubes* used for gambling in Backgammon. Players double their bets during a game and turn the cube accordingly to show this.

Put and Take dice come in pairs and are a variation on the spinner game. They have letters and numbers - **P** and **T** three times on one and **1, 2, 3, A** on the other.

Words on dice are another commercially used method of marking dice. Dice are marked with different instructional words that players must obey or have categories that are selected by rolling a die. Many role playing games use dice like this.

There are dice marked with different toppings (**onions, extra cheese, pepperoni**) that can be used for deciding your pizza when ordering. Similarly there are dice marked with different activities like **TV, Disco, Bar, Read**, etc. *Erotic dice* have intimate and sensuous instructions and areas of the body printed on them (for example **kiss, touch, massage** and **neck, back, leg**).

# The Evans Group LLC



A number of sports have been interpreted as dice games by printing the sport's common terms or actions on cubes. Sports like snooker, football, cricket, golf, bowls and tennis have all been given less strenuous dice rolling alternative treatments. Examples are - **In Off The Black, Goal, Not Out, Caught, On the Green, Return, Touch Down** etc.

Dice with images of different drinks can be used for deciding what to have in a bar, and there are *Karma Sutra* dice marked with illustrations from the book.

Some dice simply have different colors marked on each face for young children to make a selection.

Fudge dice were developed for the Fudge game but can be incorporated in many other games if you want to. A Fudge die is marked twice with '+', '-' and two blank sides. A number of Fudge dice are used and any + signs mean add 1, a minus sign means subtract 1 and a blank side represents a zero and no change. Two Fudge dice produce numbers in the range -2 to +2.

## History of Dice & Dice Games

Dice probably evolved from knucklebones, which are approximately tetrahedral. Even today, dice are sometimes referred to as "bones", as in "shake them bones". Ivory, bone, wood, metal, and stone materials have been commonly used, though the use of plastics is now nearly universal. It is almost impossible to trace clearly the development of dice as distinguished from knucklebones, on account of the confusing of the two games by the ancient writers. It is certain, however, that both were played in times before those of which we possess any written records.

The fact that dice have been used throughout the Orient from time immemorial, as has been proved by excavations from ancient tombs, seems to point clearly to an Asiatic origin. Dicing is mentioned as an Indian game in the Rig-veda, a Hindu religious document. In its primitive form knucklebones was essentially a game of skill played by women and children. In a derivative form of knucklebones, the four sides of the bones received different values and were counted as with modern dice. Gambling with three or sometimes two dice was a very popular form of amusement in Greece, especially with the upper classes, and was an almost invariable accompaniment to banquets and gatherings.

The Romans were passionate gamblers, especially in the luxurious days of the Roman Empire, and dicing was a favorite form, though it was forbidden except during the Saturnalia. Horace derided what he presented as a typical youth of the period, who wasted his time amid the dangers of dicing instead

# The Evans Group LLC



of taming his charger and giving himself up to the hardships of the chase. Throwing dice for money was the cause of many special laws in Rome. One of these stated that no suit could be brought by a person who allowed gambling in his house, even if he had been cheated or assaulted. Professional gamblers were common, and some of their loaded dice are preserved in museums. The common public-houses were the resorts of gamblers like a modern day Las Vegas.

Tacitus states that the Germans were passionately fond of dicing, so much so, indeed, that, having lost everything, they would even stake their personal liberty. Centuries later, during the middle ages, dicing became the favorite pastime of the knights, and both dicing schools and guilds of dicers existed. After the downfall of feudalism the famous German mercenaries called landsknechts established a reputation as the most notorious dicing gamblers of their time. Many of the dice of the period were curiously carved in the images of men and beasts. In France both knights and ladies were given to dicing. This persisted through repeated legislation, including interdictions on the part of St. Louis in 1254 and 1256.

In Japan, China, Korea, India, and other Asiatic countries, dice have always been popular and are so still. The markings on Chinese dominoes evolved from the markings on dice, taken two at a time. <sup>1</sup>

---

<sup>1</sup> Sources: [Wikipedia](#) and [www.madehow.com](#)