

# RIGHT-HAND RULE - DIRECTIONS

## Direction associated with an ordered pair of directions

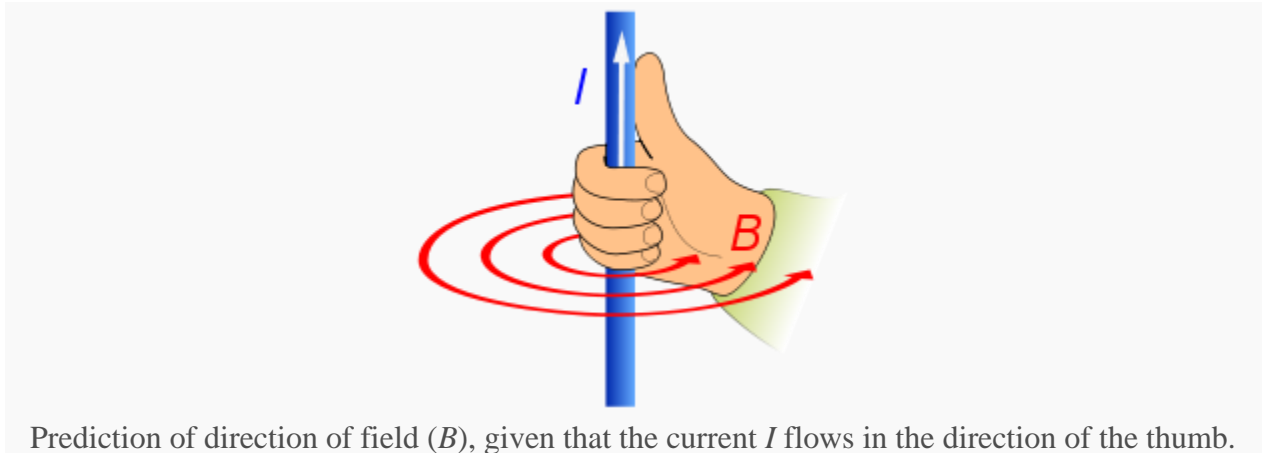
One form of the right-hand rule is used in situations in which an ordered operation must be performed on two vectors  $a$  and  $b$  that has a result which is a vector  $c$  perpendicular to both  $a$  and  $b$ . The most common example is the vector cross product. The right-hand rule imposes the following procedure for choosing one of the two directions.

$$\vec{a} \times \vec{b} = \vec{c}$$

- With the thumb, index, and middle fingers at right angles to each other (with the index finger pointed straight), the middle finger points in the direction of  $c$  when the thumb represents  $a$  and the index finger represents  $b$ .

Other (equivalent) finger assignments are possible. For example, the first (index) finger can represent  $a$ , the first vector in the product; the second (middle) finger,  $b$ , the second vector; and the thumb,  $c$ , the product.

## Direction associated with a rotation



Prediction of direction of field ( $B$ ), given that the current  $I$  flows in the direction of the thumb.

A different form of the right-hand rule, sometimes called the right-hand grip rule, is used in situations where a vector must be assigned to the rotation of a body, a magnetic field or a fluid. Alternatively, when a rotation is specified by a vector, and it is necessary to understand the way in which the rotation occurs, the right-hand grip rule is applicable.

This version of the rule is used in two complementary applications of Ampère's circuital law:

An electric current passes through a solenoid, resulting in a magnetic field. When you wrap your right hand around the solenoid with your fingers in the direction of the conventional current, your thumb points in the direction of the magnetic north pole.

An electric current passes through a straight wire. Here, the thumb points in the direction of the conventional current (from positive to negative), and the fingers point in the direction of the magnetic lines of flux.

The principle is also used to determine the direction of the torque vector. If you grip the imaginary axis of rotation of the rotational force so that your fingers point in the direction of the force, then the extended thumb points in the direction of the torque vector.

The right hand grip rule is a convention derived from the right-hand rule convention for vectors. When applying the rule to current in a straight wire for example, the direction of the magnetic field (counterclockwise instead of clockwise when viewed from the tip of the thumb) is a result of this convention and not an underlying physical phenomenon.

Source: [http://web.ua.es/docivis/magnet/righthand\\_rule.html](http://web.ua.es/docivis/magnet/righthand_rule.html)