Camera
a lens
a box
a light sensitive film
a shutter
an iris

Cameras: shutter

Exposure time
1 1/2 1/4 1/8 1/15 1/30 1/60 1/125 1/250 1/500 1/1000

Geometric progression
1 1/2 1/4 1/8 1/16 1/32 1/64 1/128 1/256 1/512 1/1024

Film speed is usually expressed in ISO (International Standards Organization).
Examples of film speeds are: 25, 40, 50, 64, 80, 100, 125, 160, 200, 250, 320, 400, 500, 640, 800, 1000, 1250, and 1600
The film speed determines the sensitivity, the contrast and grain size of the film.
Fast film (e.g. 1000) requires less light but has less contrast and larger grain size
Film speed can also be expressed in ASA (American Standards Association) or ANSI (American National Standards Institute), or DIN (Deutsche Industrie Norm).

Lens aperture (D) and $f/$

\[ f/ = \frac{f}{D} \]

all lenses set to f/4 transmit the same I

$\begin{array}{ccccccccccc}
\text{f/ (or f-stop)} & f/ & 1 & 1.4 & 2 & 2.8 & 4 & 5.6 & 8 & 11 & 16 & 22 & 32 & 45
\end{array}$

amount of light on film (I) changes by a factor of 2
for a change in aperture of 1 stop

Depth of field

smaller lens aperture, larger depth of field

larger f/

planes of perfect focus
planes of perfect focus are still the same, but rays are at smaller angles, therefore less blurring on film
small aperture (large f/)
requires longer exposure time

<table>
<thead>
<tr>
<th>aperture</th>
<th>f/ 1</th>
<th>1.4</th>
<th>2</th>
<th>2.8</th>
<th>4</th>
<th>5.6</th>
<th>8</th>
<th>11</th>
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<th>22</th>
<th>32</th>
<th>45</th>
</tr>
</thead>
<tbody>
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<td>I increases by factors of 2</td>
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Less light on film
BUT: increasing depth of field

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I increases by factors of 2

Less light on film
BUT: captures movement better