Binocular Basics

Quality is the most important "feature" of binoculars.

In many cases the brand name is a guide to quality. Companies like Celestron, Leica, Minolta, Nikon, Pentax, Steiner, Swarovski, and Zeiss have spent decades earning a reputation for high quality optical products, and they are unlikely to produce a clearly inferior product. Other companies, like Tasco, Jason, and Bushnell have built a reputation on low price. You usually get what you pay for.

Magnification (power)

Binoculars are commonly described by using a pair of numbers, as in "7x50" or "8x25." The first of these numbers refers to the magnification offered by the binocular. Magnification is why most people buy a pair of binoculars. In the examples above, "7x" means the binocular makes whatever you look at appear seven times closer than it does to the unaided human eye. "8x" means the binocular makes whatever you look at eight times closer than the unaided human eye. "10x" makes things look ten times closer, and so on. The first number used to describe binoculars always refers to their magnification. Common binocular magnifications are 6x, 7x, 8x, 9x, and 10x.

There are also variable power (zoom) binoculars, such as 7-21x50. These almost always perform much better at the low power setting than they do at the higher settings. This is natural, since the front objective cannot enlarge to let in more light as the power is increased, so the view gets dimmer. At 7x, the 50mm front objective provides a 7.1mm exit pupil, but at 21x, the same front objective provides only a 2.38mm exit pupil. Also, the optical quality of a zoom binocular at any given power is inferior to that of a fixed power binocular of that power. In general, zoom binoculars are not the bargain they seem to be.

Remember that everything (including movement) is magnified when you look through a pair of binoculars, especially your own shakes and tremors. So the higher the power, the harder it seems to hold the binoculars steady. 6, 7, or 8 power binoculars are easier for most people, even those with very steady hands, to hold reasonably still. The higher powers sound like a good deal, but often result in jiggly, blurred views. This is why 7x binoculars are chosen by so many experts, including the military.

Power affects brightness. Other things being equal, the higher the power, the dimmer the view. And power also affects the field of view of the binoculars. Again, everything being equal, the higher the power, the smaller the field of view. So, as you can see, power must be balanced against other desirable characteristics when choosing binoculars.

Relative brightness index (RBI)

RBI endeavors to measure image brightness. It is computed by squaring the exit pupil. For example, 7x35 binoculars have a 5mm exit pupil (35/7=5). So their RBI is 25 (5x5=25).

A RBI of 25 or greater is considered good for use in dim light. Since you already have learned (above) how to compute the actual exit pupil size, and what it means, RBI is largely redundant.

Twilight factor

This is a somewhat subjective measurement that purports to reveal how much detail you can see in twilight conditions (however that is defined). It tends to favor magnification, which is good for binocular sales.

For instance, Celestron computes the twilight factor of 7x50 binoculars as 18.7, and the twilight factor of 10x50 binoculars as 22.4, even though the former has a 7.1mm exit pupil, and the latter only a 5.0mm exit pupil. The increased magnification presumably makes up for the decrease in brightness in "twilight conditions" (when the eye is not yet fully dark-adapted). This rather artificial measurement can be useful to the hunter and birdwatcher, since animals are often spotted just before sunrise, and just after sunset.

Binoculars for astronomy

A good pair of binoculars are very handy for locating objects in the night sky. Once an object has been located with binoculars, it is easy to train a telescope on it for a more detailed view. The binocular astronomer needs very high quality, very bright binoculars. For general hand held use 7x50, 8x56, and 9x63 binoculars will serve very well. Pick the highest power that you can hold steady.

For more info see:
http://www.chuckhawks.com/binocular_basics.htm

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1 of 1 people found the following review helpful
3.0 out of 5 stars **7x50 or 10x50 for astronomy?** February 13, 2012
By The Penguin
I wasn't sure if I should get 7x50's or 10x50's for astronomy. Lots of astronomy websites recomend 7x50's for beginners. I ended up ordering both. These were inexpensive, so I gave both a shot. I ordered these and a pair of Bushnell Permafocus 10x50's.

Pros:

Better eye relief than the 10x50's
Larger exit pupil size
Focus closer than the 10x50's
Image appears brighter
Reasonably good optics for under $30
$20 cheaper than the Bushnell 10x50's
Nice case

Cons:

Just as big and heavy as the 10x50's
7x magnification may not be enough for astronomy
Field of view is smaller
Not wide angle
Not as rugged
Eyecups don't seem as durable
Distant focus is not as sharp
Image looks better through the 10x50's

My initial impression is that the Bushnell 10x50's are better. I don't see any advantage to the lower 7x magnification or narrower field of view for astronomy. Maybe they're less shakey when handheld? They aren't bad for under $30, but I think Bushnell Permafocus 10x50's are more bang for the buck.