

# False Color Images

## Novice

- Images are made out of three colors combined together: red, green, and blue.
- We use three colors because this is how the human eye works.

## Intermediate

- Create three-color images.
- Take three-color images.
- Explain difference between representative color and false color.
- Explain the astronomical definition of color (the difference between two wavelengths' magnitudes).
- Create graphs using astronomical color to determine properties of clusters.

## Expert

- Calculate exposure times for three-color images.
- Determine meaning from color images.
- Create graphs using astronomical color to determine properties of galaxies.
- How can a CCD be used to make color images? Design a scheme for a color CCD.
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses.

## Related NGSS

Grade Level	Student Performance Expectations
3-5	4-PS4-3 <b>Generate and compare multiple solutions that use patterns to transfer information.</b>
MS	MS-PS4-2 <b>Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.</b>
HS	HS-PS4-5 <b>Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.</b>

## Related CCSSM

Grade Level	Student Performance Expectations
3-5	<p><b>CCSS.MATH.PRACTICE.MP4 Model with mathematics.</b> Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.</p> <p><b>CCSS.MATH.CONTENT.4.G.A.1</b> Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p>
MS	<p><b>CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.</b> Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to <i>decontextualize</i>—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to <i>contextualize</i>, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</p> <p><b>CCSS.MATH.CONTENT.6.RP.A.1 Ratios and Proportional Relationships</b> Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.</p>
HS	<p><b>CCSS.MATH.CONTENT.HSA.SSE.A.1</b> Interpret expressions that represent a quantity in terms of its context.</p>