

Answers to questions in the Motivation (and Assessment) section:

***When did the first astronauts walk on the moon?***

July 24, 1969

***What are their names?***

Buzz Aldrin and Neil Armstrong

***Who else was on the mission?***

Michael Collins

***What did it take to get people to the moon and back?***

Answers may start from the very basic (build spaceships to get the astronauts into space, on the moon, back into space, and back to earth) to discussing in more detail about the years of work it takes to find and train astronauts; design and build the rocket, command module, and lunar module; design and build communications systems; design and create space suits; bring the astronauts safely back through earth's atmosphere and into the ocean; etc.

***What fields of science and technology were necessary to make the Apollo mission work?***

Some examples of the fields necessary for the Apollo mission are: engineering, astronomy, communications, computer science, biology, geology, chemistry, materials science, medicine, aeronautics, mathematics, and navigation to name a few.

***What types of professionals were required to make the mission a reality?***

From page 7 of *Team Moon*: flight directors, controllers, planners, and engineers; rocket designers, builders, and technicians; managers, supervisors, quality control, and safety inspectors; programmers, electricians, welders, seamstresses, gluers, painters, doctors, geologists, scientists, trainers, navigators, etc.

***What other projects require the efforts of many people working together?***

Answers will vary, but could include skyscrapers (architects, city planners, engineers, builders, welders, electricians, plumbers), movies, pharmaceuticals, and farming.

***How was the technology of the late 1960's different than today?***

There was no Internet, no personal computers, satellite technology was in its infancy, and material science was not as advanced.

***What were some of the risks involved in the mission?***

Again, answers will vary, but here are just a few of the countless risks: the rocket could explode before it enters space, life-support systems could fail, the lunar module could crash on the moon's surface, the lunar module wouldn't lift off the moon or wouldn't hook up with the command module, the command module could burn up on reentry, the parachutes could fail to open (or open correctly), the astronauts could bring back "moon germs"

***What scientific knowledge can be gained by traveling to the Moon?***

See One Great Leap for Mankind: <http://history.nasa.gov/ap11-35ann/top10sci.html>.

***What are some benefits and risks of space technology?***

There are no right or wrong answers. The point is to make sure that students think about how technology is used. Is it in the best interest of society? What are some of the benefits, risks, alternatives, and limitations?

***The U.S. made an enormous and expensive effort to put people on the moon. Did this effort pay off for the society as a whole, or could all this money and ingenuity have been used in ways that would have benefited more people?***

There are no right or wrong answers. Students should discuss the benefits of having gone to the moon (scientific knowledge, technological advances used for not only space missions but for other applications, etc.) and other ways in which the money might have been spent (medical care, fighting poverty, etc.).

***What are the strengths and weaknesses of massive team projects like Apollo, as compared to the work of lone creative individuals, like Einstein at his desk in the Swiss patent office?***

Again, there are no right or wrong answers. Some possible answers about the strength of team projects are that they use the ingenuity of many people, big projects require many people, people working in teams can come up with answers that none of the participants could have discovered alone. Some possible answers for the strength of an individual working alone include the autonomy people enjoy working alone, no communication or personality issues, etc.

***How successful was the Apollo team in imagining all the things that could go wrong and preparing for them? What possible problems, if any, did they miss?***

Answers will vary, but overall the Apollo team prepared extremely well for problems, or else the astronauts would not have landed on the moon and been brought back safely! Some problems they missed were that the software development alarms were left in the program and astronauts were not aware of them (pp. 18–24) and the possibility of frozen slugs in the fuel line (pp. 30–32).