Student Name _____ Date _____

# PLOTTING THE PATHS OF SPACECRAFT

THIS ACTIVITY IS ADAPTED FROM NASA'S *Destination: Mars* curriculum.

Many considerations for traveling to Mars are the amount of time the trip takes, the amount of fuel needed for the trip, and the size of the payload. A fast trip would be advantageous to the crew by reducing the time they are exposed to weightlessness, radiation, and other dangers inherent to space travel. However, fast trips require more fuel and that means less payload. People, equipment, and supplies would be reduced as larger amounts of fuel are carried to increase the speed of the trip.

Earth and Mars move at different speeds around the Sun. The Earth completes it solar orbit every 365 days while Mars completes its orbit every 687 days. This happens for two reasons. First, the Earth is closer to the Sun so it travels less distance. Secondly, it travels faster in its orbit. Planets closer to the Sun travel faster.

Directions:

1. Locate the following on the *Earth to Mars* student page:
2. Review the Spacecraft Position Data Table at the bottom of *Earth to Mars* student page. (The Data Table shows the position of the spacecraft on the first day of each month. The first column is the distances from the spacecraft from the Sun in million km. The second column is the distances for the spacecraft fro the Earth in million km.)
3. Plot the path (trajectory) of the spacecraft:
4. Using the key, check that your line is similar to the model. If the two lines differ, find the place in the process where the error occurred. Make sure you understand the process before going to step 5.
5. Plot the trajectory of the return trip to Earth from Mars using the second diagram and Data Table.
6. A minimum fuel trip between Earth and Mars takes about 200 days. Think about how this affects planning trips to Mars. Because of this long time in space, what must happen? What cannot happen? What might happen? These are the questions that mission planners must answer. What are other questions that might be asked about planning trips with minimum fuel orbits? Write your thoughts/answers on a separate sheet of paper.

Student Name _____ Date _____

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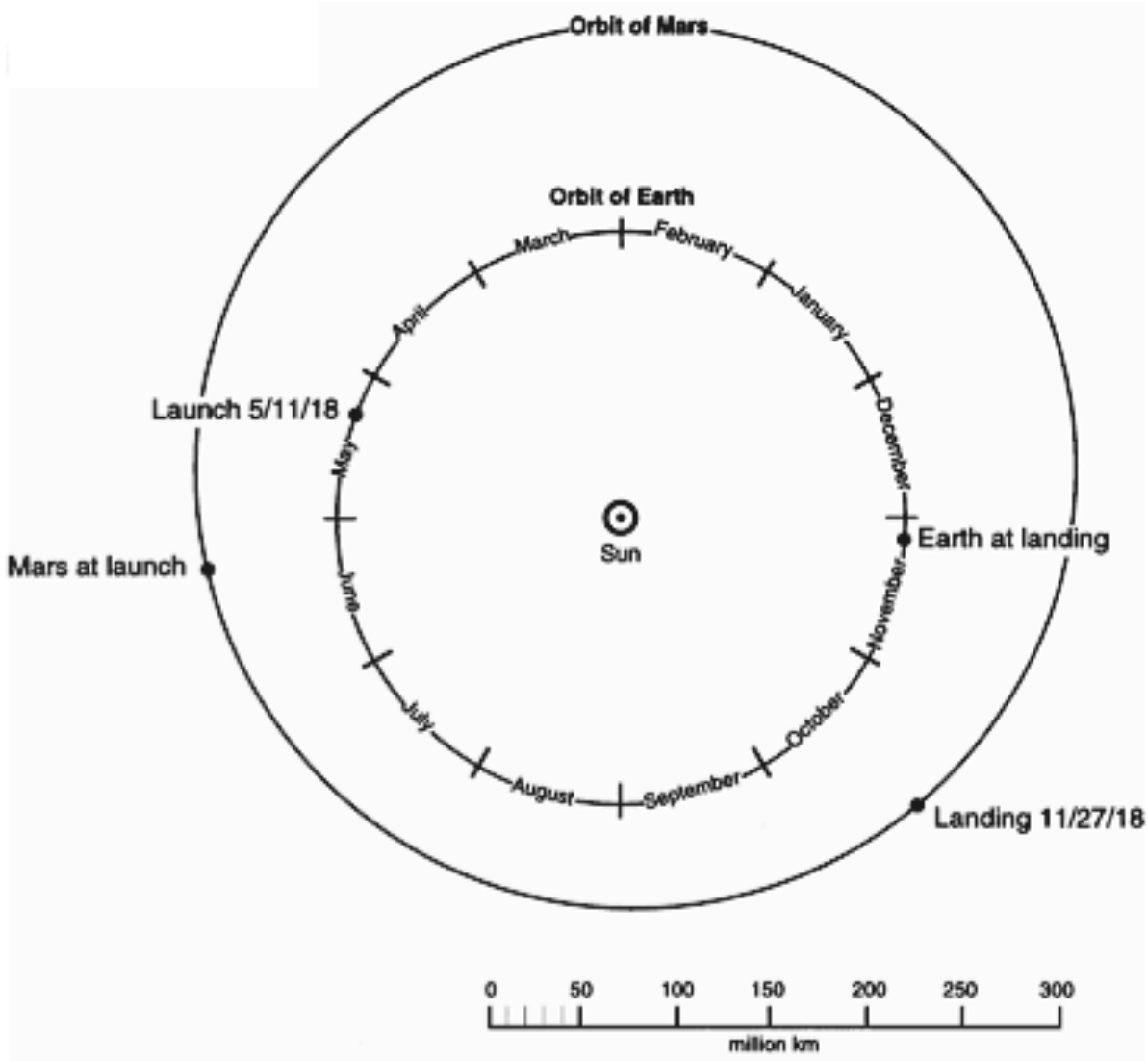


**Spacecraft Position** Data Table

| | Date | Distance from Sun (million km) | Distance from Earth on this date (million km) | |
|---|---|---|---|---|
| (1) | May 11, 2018 | 152 | 0 | Launch from Earth |
| (2) | June 1 | 155 | 5 | |
| (3) | July 1 | 164 | 12 | |
| (4) | Aug 1 | 176 | 25 | |
| (5) | Sep 1 | 188 | 46 | |
| (6) | Oct 1 | 199 | 76 | |
| (7) | Nov 1 | 208 | 113 | |
| (8) | Nov 27 | 213 | 147 | Landing on Mars |

Student Name _____ Date _____

# PLOTTING THE PATHS OF SPACECRAFT

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**Spacecraft Position** Data Table

| | Date | Distance from Sun (million km) | Distance from Earth on this date (million km) | |
|---|---|---|---|---|
| (1) | May 30, 2020 | 212 | 153 | Launch from Mars |
| (2) | July 1 | 207 | 115 | |
| (3) | Aug 1 | 196 | 80 | |
| (4) | Sep 1 | 187 | 50 | |
| (5) | Oct 1 | 174 | 28 | |
| (6) | Nov 1 | 161 | 14 | |
| (7) | Dec 1 | 151 | 4 | |
| (8) | Dec 16 | 148 | 0 | Landing on Earth |