LOST ON MARS TEACHER NOTES & ANSWER KEY

Teacher Preparation Time: 20 minutes
Lesson Duration: One or two 50-minute class periods (Depending on the extent of discussions and debriefing)

BACKGROUND: Astronauts prepare for emergency situations by learning survival strategies and bringing supplies. In this activity, students will rank 15 items in order of their importance for astronauts to survive on Mars. Originally created by NASA, this activity calls attention to:

- The decision-making process
- Differences between individual and group decision-making
- Leadership in groups
- Conflicts in groups facing a competitive task

ACTIVITY PREPARATION:

Provide each student with a copy of the **Lost on Mars Student Worksheet.**

1. Individual Work: Allow students 15 minutes to make their individual rankings in the My Rank column.
2. Group Work: Have students form groups of three to discuss their individual choices and re-rank the items as a group. They can record the group rank in the Group Rank column.
3. Provide students with the correct answers supplied by NASA scientists and engineers, and have them write NASA's ranking in both NASA's Rank columns.
4. For each item, have students calculate the difference between their rank and NASA's, as well as between the group's rank and NASA's. Students should subtract the lower rank from the higher one; there should be no negative values.

Overview: Group Survival Scenario Exercise

- This is a group communication and decision-making exercise.
- Consensus can be hard to reach. However, try to have participants at least partially agree on each ranking.
- Watch for participants who avoid conflict or change their minds simply to come to agreement. Highlight these kinds of behaviours during the post-activity debrief.
- An important outcome of this exercise is learning that compromise is often necessary for working together.
- Watch for participants who are overly concerned with choosing correct answers. Guide the group to achieve the true goal of the exercise: practising decision-making and and communication.
- Developing the confidence to be a divergent and innovative thinker requires participants to justify the reasons for their rankings.

PROCESS SKILLS:

- Predict, Interpret Data, Infer, Organize

Possible Debrief Questions:

- How were decisions made?
- Who influenced the decisions and how?
- Did your group members listen to each other?
- What roles did your group members adopt?
- How was conflict managed?
- What kinds of behaviour helped or hindered the group?
- How did everyone feel about the decisions your group made?
- Were different opinions seen as helpful or a hindrance in decision-making?
- What have you learned about the functioning of your group?
- How would you do the activity differently next time?
- What situations at home or school do you think are similar to this exercise?

FAQ: Why would astronauts pack matches or a pistol in the first place?

This activity should prompt students to think beyond their fixed mindsets in order to view objects in non-traditional, creative ways. It is also intended to spark conversations about the Martian environment and human survival in contrast to life on Earth.

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Students can use this answer key to calculate the difference between (a) their rank and NASA's for each item, and (b) the group's rank and NASA's for each item. To determine the difference, subtract the lower rank from the higher one for each item. (There should be no negative numbers.)

Then, have students add up their difference columns and compare the value to the scores below. The lower the total, the better the score.

Item	NASA's Rank	Reasoning
Box of Matches	**15**	The atmosphere of Mars is 97% carbon dioxide (CO_2). As there is no oxygen to sustain a flame, there is no conventional use for matches. Creative uses, such as splinting a broken finger, may still be possible.
Food Concentrate	**4**	This food will supply the astronauts with energy.
15 metres of Nylon Rope	**7**	Rope could be useful for scaling cliffs or crossing crevasses on the Martian surface.
Parachute Silk	**9**	Silk can provide protection from solar radiation. It can also be used as a sled to drag items.
Solar-powered Portable Heating Unit	**6**	Mars can get very cold, reaching temperatures as low as -100 °C.
Two .45 Caliber Pistols	**12**	While there are no aliens to subdue, Mars's surface gravity is about one-third of Earth's. The astronauts could possibly use the pistols for self-propulsion.
1 Case Dehydrated Milk	**13**	While milk is useful sustenance, the case of milk will be very heavy to carry compared to the food concentrate.
Two 50 Kg Tanks of Oxygen	**1**	Oxygen only comprises around 0.13% of Mars's atmosphere. By comparison, it makes up 21% of Earth's atmosphere. The astronauts cannot survive without oxygen. Due to lower gravity, each tank would weigh about 19 kg.
Star Map	**3**	This is the astronauts' primary tool for navigation.
Self-inflating Life Raft	**10**	The CO_2 canisters that inflate the raft could be used for propulsion, and the raft could be used for protection from dust storms.
Magnetic Compass	**14**	Unlike Earth, Mars has no spinning inner core to create a major global magnetic field, making a conventional compass useless for navigation.
18 Litres of Water	**2**	The astronauts cannot survive for long without water, especially considering the bone-dry air on Mars.
Solar Flares	**11**	The flares can be used to send a distress signal for Mars Base crew members to see.
First Aid Kit	**8**	This is useful in case of injury.
Solar-powered FM Receiver-Transmitter	**5**	The astronauts need this for communication with the rescue party. However, because FM requires line-of-sight transmission and short ranges, its usefulness may be limited.

Scores

0–25 Excellent — You and your crew demonstrated superior survival skills.

26–32 Good — Great work. You made it back to the Mars Base.

33–45 Average — You faced some challenges, but you made it in the end.

46–55 Fair — Your team survived, but you faced some close calls.

56–70 Poor — Some members of your team did not survive the mission.

71+ Very Poor — No one survived the mission.

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LOST ON MARS STUDENT WORKSHEET

Your spacecraft has just crashed-landed on Mars. You and your crew have landed about 320 km away from your intended destination, the Mars Base. The rough landing has ruined your ship and destroyed most of the equipment on board, except for the 15 items listed below.

Now, to survive, your crew must reach the Mars Base on foot. Which of these items will you choose to take for your journey?

1. To decide, rank the 15 items in terms of their importance for survival, with Item 1 being the most critical and Item 15 being the least useful for survival. Write your ranking in the My Rank column.
2. Form groups of three to discuss and re-rank the items collectively. Record the group rank in the Group Rank column.
3. Your teacher will provide NASA's Rank. Calculate the difference between (a) your rank and NASA's for each item, and (b) the group's rank and NASA's Rank.

Item	My Rank	Difference	Group Rank	Difference	NASA's Rank
Box of Matches					
Food Concentrate					
15 Metres of Nylon Rope					
Parachute Silk					
Solar-powered Portable Heating Unit					
Two .45-Calibre Pistols					
1 Case of Dehydrated Milk					
Two 50-kg Tanks of Oxygen					
Star Map					
Self-inflating Life Raft					
Magnetic Compass					
18 Litres of Water					
Solar Flares					
First Aid Kit					
Solar-powered FM Receiver-Transmitter					
	Total Score		Total Score		

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