ENGLISH LANGUAGE AND COMPOSITION

SECTION II

TIME – 2 HOURS AND 15 MINUTES

Question 1

Suggested reading and writing time—*55* minutes

It is suggested that you spend 15 minutes reading the question, analyzing and evaluating the sources, and 40 minutes writing your response.

Note: You may begin writing your response before the reading period is over.

1. As nations and space agencies have sent spacecraft and satellites into space, human-created debris—or "space junk"—has accumulated in orbit around Earth. Space debris may range in size from small parts and flecks of paint to whole defunct satellites, but all of it poses a potential risk if it collides with a spacecraft. Many countries have agreed that the management of space debris is a priority because it poses a threat to space exploration and satellites. However, removing it is difficult and costly.

Carefully read the following six sources, including the introductory information for each source. Write an essay that synthesizes material from at least three of the sources and develops your position on the most important factors that space agencies and nations should consider when dealing with the problem of space debris.

Source A (O'Callaghan article)

Source B (graph from ESA)

Source C (Quell article)

Source D (Rossettini opinion article)

Source E (NOAA article)

Source F (chart from Mosher and Kiersz)

In your response you should do the following:

- Respond to the prompt with a thesis that presents a defensible position.
- Select and use evidence from at least three of the provided sources to support your line of reasoning. Indicate clearly the sources used through direct quotation, paraphrase, or summary. Sources may be cited as Source A, Source B, etc., or by using the description in parentheses.
- Explain how the evidence supports your line of reasoning.
- Use appropriate grammar and punctuation in communicating your argument.

Source A

O'Callaghan, Jonathan. "What Is Space Junk and Why Is It a Problem?" *Natural History Museum*, nhm.ac.uk/discover/what-is-space-junk-and-why-is-it-a-problem.html.

The following is an excerpt from an article on the website of the Natural History Museum, London, which conducts scientifc research and displays scientifc findings and collections to the public.

What is space junk?

Space junk, or space debris, is any piece of machinery or debris left by humans in space.

It can refer to big objects such as dead satellites that have failed or been left in orbit at the end of their mission. It can also refer to smaller things, like bits of debris or paint flecks that have fallen off a rocket.

Some human-made junk has been left on the Moon, too.

How much space junk is there?

While there are about 2,000 active satellites orbiting Earth at the moment, there are also 3,000 dead ones littering space. What's more, there are around 34,000 pieces of space junk bigger than 10 centimetres in size and millions of smaller pieces that could nonetheless prove disastrous if they hit something else.

How does space junk get into space?

All space junk is the result of us launching objects from Earth, and it remains in orbit until it re-enters the atmosphere.

Some objects in lower orbits of a few hundred kilometres can return quickly. They often re-enter the atmosphere after a few years and, for the most part, they'll burn up—so they don't reach the ground. But debris or satellites left at higher altitudes of 36,000 kilometres—where communications and weather satellites are often placed in geostationary orbits[1]—can continue to circle Earth for hundreds or even thousands of years.

Some space junk results from collisions or anti-satellite tests in orbit. When two satellites collide, they can smash apart into thousands of new pieces, creating lots of new debris. This is rare, but several countries including the USA, China and India have used missiles to practice blowing up their own satellites. This creates thousands of new pieces of dangerous debris.

What risks does space junk pose to space exploration?

Fortunately, at the moment, space junk doesn't pose a huge risk to our exploration efforts. The biggest danger it poses is to other satellites in orbit.

These satellites have to move out of the way of all this incoming space junk to make sure they don't get hit and potentially damaged or destroyed.

In total, across all satellites, hundreds of collision avoidance maneuvers are performed every year, including by the International Space Station (ISS), where astronauts live.

Fortunately, collisions are rare: a Chinese satellite broke up in March 2021 after a collision. Before that, the last satellite to collide and be destroyed by space junk was in 2009. And when it comes to exploring beyond Earth's orbit, none of the limited amount of space junk out there poses a problem.

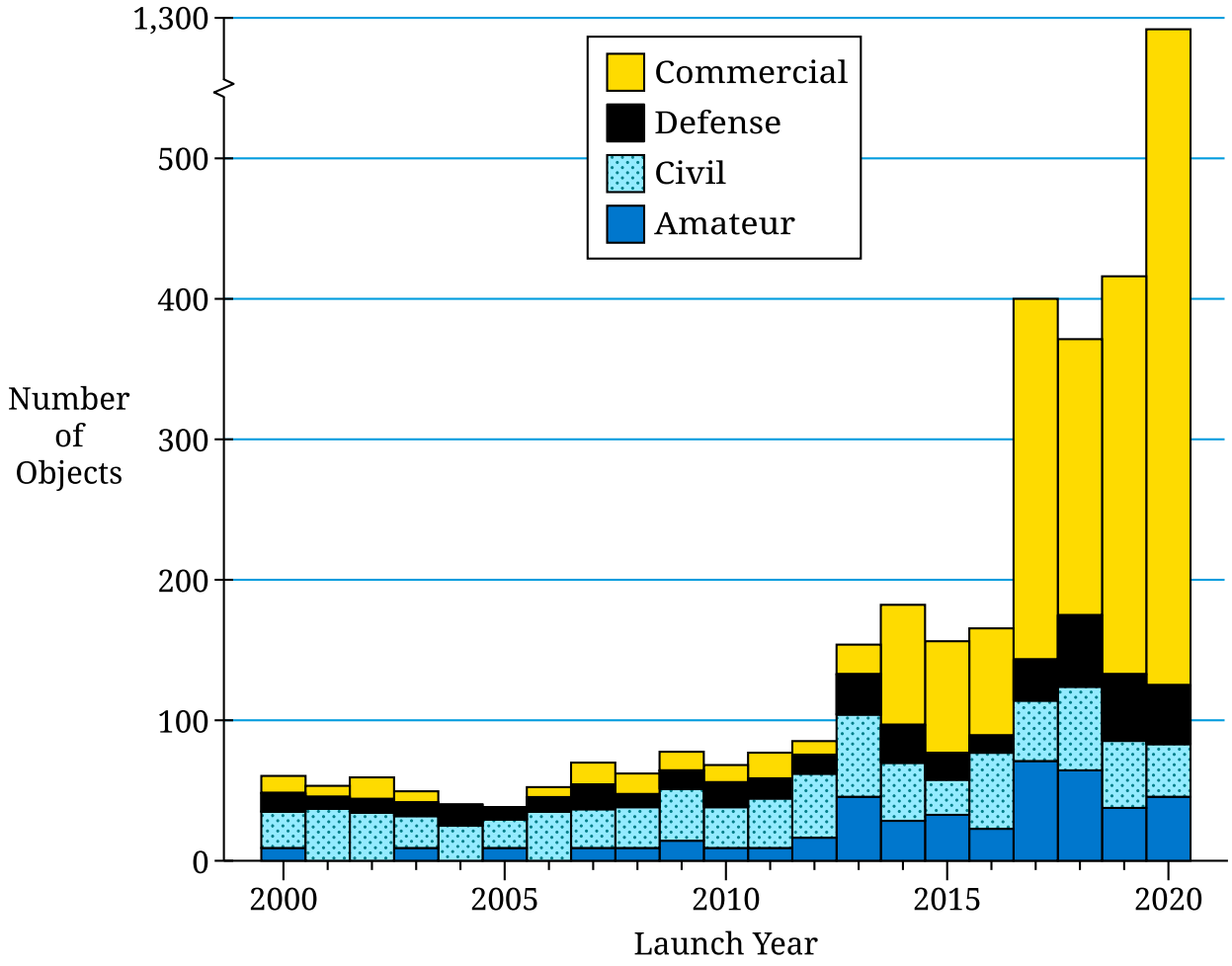
1: Satellites in geostationary orbit circle Earth above the equator following Earth's rotation.

Source B

"ESA's Space Environment Report 2021." *ESA*, The European Space Agency, esa.int/Space_Safety/Space_Debris/ESA_s_Space_Environment_Report_2021.

The following is adapted from a graph published on the website of the European Space Agency, an international organization with 22 member states.

Satellites Launched into Low-Earth Orbit



Note: Satellites are classified here according to their main source of funding.

"Commercial" indicates funding from a private business.

"Defense" indicates funding from a military source.

"Civil" indicates funding from a nonmilitary governmental source.

"Amateur" indicates funding from other sources, including private individuals and academic institutions.

Source C

Quell, Molly. "Lack of Space Law Complicates Growing Debris Problem." *Courthouse News Service*, 28 Aug. 2020, courthousenews.com/lack-of-space-law-complicates-growing-debris-problem/.

The following is excerpted from an article published by an American news service specializing in legal issues.

In total, there are five United Nations treaties that cover various aspects of space. The earliest, the Outer Space Treaty, which was ratified in 1967, has 104 signatories. It declared space free for all nations to explore and banned the use of nuclear weapons in space, a major security concern during the Cold War.

Prior to the signing of the Outer Space Treaty, each nation was considered to have sovereignty over the air above its borders. This concept was laid down in the Paris Convention of 1919, which aimed to regulate aerial travel, a new and rapidly developing industry.

Subsequent treaties—such as a 1968 agreement on the rescue of astronauts and the 1975 Registration Convention, which requires that objects launched into space be registered with a U.N. body—cover narrow aspects of space travel and have been signed by fewer than half of the world's countries.

Collisions have occurred in space. Most of them are between defunct satellites, but one 1977 crash scattered radioactive debris across Canada. A malfunction onboard the nuclear-powered Soviet spy satellite Kosmos 954 pushed it back into the Earth's atmosphere and Canada billed the Soviet Union more than 6 million Canadian dollars ($18 million today) for the damage. The two countries ultimately agreed on 3 million Canadian dollars ($9 million today).

The problem is only getting worse, said Oliver Tian, a researcher in the legal framework of space debris at the University of Leiden in The Netherlands. Nearly 9,000 satellites have been launched since the Soviet Union first sent Sputnik 1 to the Earth's orbit in 1957. SpaceX alone has launched 60 satellites this year.

Most of what goes into space doesn't come back. Nations aren't required to remove their garbage from space and to do so voluntarily would cost a tremendous amount of money. So more than half of those 9,000 satellites remain, some as operational but more as decommissioned junk. As they crash into each other, they create more tiny bits of debris whizzing around the Earth.

"Space could be inaccessible to humans," said Tian.

This worst-case scenario is known as the Kessler Effect, when the quantity of space debris created from objects crashing into one another increases until it's no longer possible to travel through it.

The European Space Agency launched its Clean Space Initiative in 2013 and has commissioned the first debris removal mission, scheduled for 2025. Together with the Swiss tech startup Clear Space, the ESA plans to use robotic arms to capture part of a rocket and deorbit it to the Earth's atmosphere, where it will burn up on reentry.

"This is an environmental problem," said Schrogl. "What is happening on Earth is happening in space."

Despite the growing problem, the ESA's chief strategy officer is optimistic. Unlike other issues facing humanity—climate change, poverty, war—the ones surrounding space debris have clear and straightforward solutions. If, that is, countries are willing to get together and act.

"It is a solvable problem," Schrogl said.

Courtesy of Courthouse News Service

Source D

Rossettini, Luca. "Space Debris: Prevention, Remediation or Mitigation?" *SpaceNews*, 3 Mar. 2015, spacenews.com/op-ed-space-debris-prevention-remediation-or-mitigation/.

The following is an excerpt from an opinion article published in an online newsletter that focuses on the analysis of factors and trends shaping the global space industry. The author is the chief executive and cofounder of a start-up company dedicated to addressing the space debris problem.

What is the best strategy to stop the increasing concentration of junk around the planet?

Passive and active devices can be installed on satellites to remove them at the end of their missions. Some envision an active debris removal (ADR) mission to go grab a dead satellite and remove it. There are even studies for refurbishing missions, where a robotic space vehicle would grab a satellite nearing its end of life to refuel and service it. Nearly all of these plans are real only on paper.

Effort and money are being spent today on the development of ADR missions, a remediation technique focused on eliminating the garbage that is already in space. These technologies, once developed, will permit spacecraft to grab large or small satellites and remove them from orbit. Unfortunately there are still several criticalities to face. There are political and legal issues related to the ownership of defunct satellites that prevent, for example, a European ADR vehicle from disposing of an Indian satellite without permission. There are also technology development challenges, like the need to capture a noncooperating target. Finally, there is the cost of every single mission that will be paid by taxpayers. Moreover, according to some experts, we need to remove about 10 big satellites per year to significantly reduce the collision risk. With more than 100 satellites launched into space every year, pulling 10 down does not get us closer....

Mitigation is the process of reducing the likelihood that a specific object will cause more debris. It involves passivation[1] of rocket bodies and decommissioned spacecraft—venting pressure vessels and fuel tanks and discharging batteries to prevent explosions in space. These fundamental measures are quite well implemented in all the new satellites launched.

But once more, mitigation measures by themselves don't get us any closer still.

In the end we can't limit ourselves to "reducing," "remediating" or "mitigating" if what we ultimately want is to operate in a clean space, where operators are not bothered by other threatening man-made objects approaching their assets.

We should first make sure that every new satellite and launch vehicle is properly and effectively removed at the end of life. Then we can start removing the defunct satellites already in space. Finally, we may think about recycling and reusing spent satellites already in space.

Therefore, prevention is the first action to be put in place, while we develop effective and efficient technologies for the ADR missions. Tethers, balloons, solar sails and active decommissioning devices are all examples of systems that can be installed on satellites before launch to increase the chances of being able to dispose of them at the end of life. Whatever is ready and available today is better than doing nothing. No more dead satellites such as DMSP-F13 should be left uncontrolled in orbit, representing a risk to operative satellites due to possible collisions and to the safe access to space of incoming missions.

Used with permission

1: in engineering, a process that makes a material less vulnerable to corrosion or other interaction with its environment

Source E

National Environmental Satellite, Data, and Information Service. "Does Space Junk Fall from the Sky?" *National Oceanic and Atmospheric Administration*, 19 Jan. 2018, www.nesdis.noaa.gov/news/does-space-junk-fall-the-sky.

The following is an excerpt from an article published on a National Oceanic and Atmospheric Administration (NOAA) website devoted to providing environmental data gathered from satellites.

Despite their size, even the smallest of objects, some of which cannot be detected by sensors, can be hazardous to unmanned and manned spacecraft. This is because they are orbiting at extremely high velocities. This is faster than a bullet, which means that the debris can easily punch through the protective covering on satellites or spacecraft.

While space debris is rarely a concern for humans on Earth, our satellites in the sky often have to avoid its dangerous path.

NOAA / NASA Suomi NPP Satellite Avoids Head On Collision at 35,000 mph

For example, on an otherwise quiet Sunday in September 2014, the Suomi NPP mission team was monitoring the possible close approach of a debris object (which was determined to be between 4 inches and 3.3 feet in size range). By early evening, the risk was assessed to be high enough to start planning to maneuver the satellite into a safer zone.

The team determined that the small space debris object was traveling at a rate of almost 17,000 mph directly towards Suomi NPP. They calculated that if no action was taken, it was likely to miss the satellite by just 300 feet on Tuesday, September 30. With that knowledge, the decision was made at 1:30 p.m. on Monday, September 29, for NOAA's Satellite Operations Facility, or NSOF, in Suitland, Maryland, to reposition Suomi NPP.

"Because Suomi NPP moves at a similar speed as the debris object, if there had been an impact, it would have occurred at a combined speed of nearly 35,000 mph. This would have been catastrophic not only to the satellite, but would result in thousands of pieces of new debris," said Harry Solomon, Mission Manager for NOAA/NASA Suomi NPP.

Since Suomi NPP's launch in October 2011, it has successfully completed a few Risk Mitigation Maneuvers to avoid space debris!

Where to Safely Crash Space Junk? The Most Remote Place on Earth!

In a global effort to reduce space debris, many satellite mission teams are able to safely maneuver retired satellites back into Earth's atmosphere so that one of two things occur. For satellites orbiting close to Earth, operators lower the orbit of a decommissioned satellite so that it will naturally re-enter the atmosphere within 25 years (known as the "25-year Rule"). As the satellite begins to fall back toward Earth and loses altitude, the compression and friction in the dense region of the atmosphere closest to the Earth generates a lot of heat which breaks up and burns most of the satellite machinery.

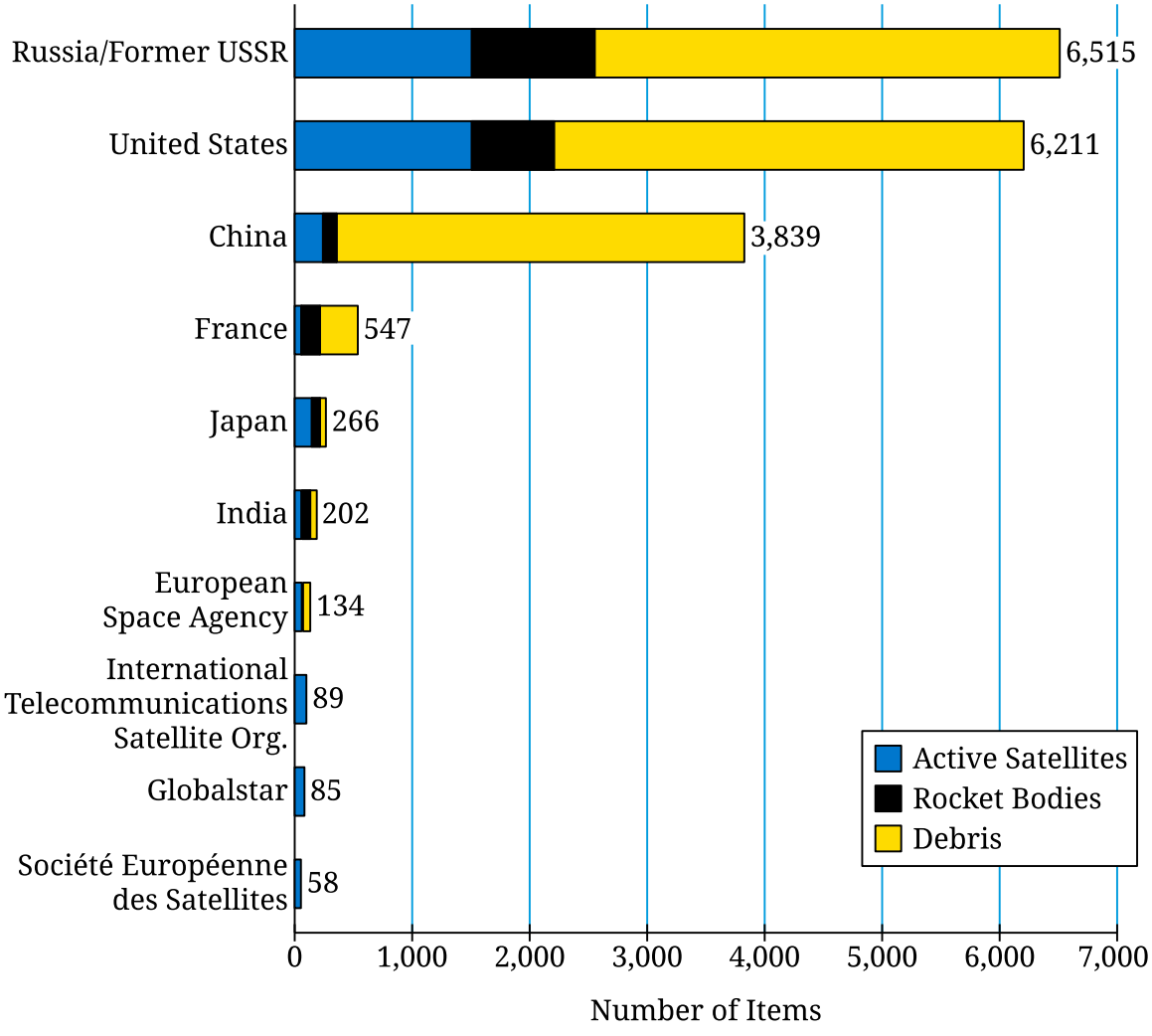
Or, if the satellite has enough fuel, it can fly back through the atmosphere and be crashed into the ocean. This Pacific Ocean location has many names, Point Nemo (which is Latin for 'no one') and the Oceanic Pole of Inaccessibility. The nearest land mass is 1,450 nautical miles away.

Source F

Mosher, Dave, and Andy Kiersz. "These Are the Countries on Earth with the Most Junk in Space." *Business Insider*, 20 Oct. 2017, businessinsider.com/space-debris-garbage-statistics-country-list-2017-10.

The following is a chart based on an image published in an online business magazine.

Countries and Agencies with the Most Stuff in Orbit



Note: The European Space Agency is an intergovernmental organization devoted to space exploration. The International Telecommunications Satellite Organization is an international regulator of satellite services. Globalstar and Société Européenne des Satellites are private telecommunications providers.

<table>
<tr><th>Reporting Category</th><th colspan="2">Scoring Criteria</th></tr>
<tr><td rowspan="5">Row A
Thesis
(0–1 points)</td><td>0 points
For any of the following:
• There is no defensible thesis.
• The intended thesis only restates the prompt.
• The intended thesis provides a summary of the issue with no apparent or coherent claim.
• There is a thesis, but it does not respond to the prompt.</td><td>1 point
Responds to the prompt with a thesis that presents a defensible position.</td></tr>
<tr><td colspan="2">Decision Rules and Scoring Notes</td></tr>
<tr><td>Responses that do not earn this point:
• Only restate the prompt.
• Do not take a position, or the position is vague or must be inferred.
• Equivocate or summarize other’s arguments but not the student’s (e.g., some people say it’s good, some people say it’s bad).
• State an obvious fact rather than making a claim that requires a defense.</td><td>Responses that earn this point:
• Respond to the prompt by developing a position on the most important factors that space agencies and nations should consider when dealing with the problem of space debris, rather than restating or rephrasing the prompt. Clearly take a position rather than just stating there are pros/cons.</td></tr>
<tr><td>Examples that do not earn this point:
Restate the prompt
• “There are several factors space agencies need to consider when they are thinking about how to remove space debris.”
Address the topic of the prompt but do not take a position
• “Space debris is accumulating around the planet because of defunct satellites or debris left behind by humans on space missions.”
Address the topic of the prompt but state an obvious fact as a claim
• “The amount of space junk orbiting Earth has greatly increased in recent years.”</td><td>Examples that earn this point:
Present a defensible position that responds to the prompt
• “Cost is the most important factor space agencies and nations need to keep in mind when deciding what to do about the problem of space junk.”
• “There are multiple problems related to space debris. While removing existing space debris is important, the most important factor is preventing more debris from accumulating.”
• “Space agencies need to figure out an effective way to deal with space debris, and they need to make sure that the plan is implemented in a way where the countries and people responsible for putting the debris in space are the ones who pay the costs.”</td></tr>
<tr><td colspan="2">Additional Notes:
• The thesis may be more than one sentence, provided the sentences are in close proximity.
• The thesis may be anywhere within the response.
• For a thesis to be defensible, the sources must include at least minimal evidence that could be used to support that thesis; however, the student need not cite that evidence to earn the thesis point.
• The thesis may establish a line of reasoning that structures the essay, but it needn’t do so to earn the thesis point.
• A thesis that meets the criteria can be awarded the point whether or not the rest of the response successfully supports that line of reasoning.</td></tr>
</table>

Reporting	Scoring Criteria				
Row B Evidence AND Commentary (0–4 points)	**0 points** Simply restates thesis (if present), repeats provided information, or references fewer than two of the provided sources.	**1 point** EVIDENCE: Provides evidence from or references at least two of the provided sources. AND COMMENTARY: Summarizes the evidence but does not explain how the evidence supports the student's argument.	**2 points** EVIDENCE: Provides evidence from or references at least three of the provided sources. AND COMMENTARY: Explains how some of the evidence relates to the student's argument, but no line of reasoning is established, or the line of reasoning is faulty.	**3 points** EVIDENCE: Provides specific evidence from at least three of the provided sources to support all claims in a line of reasoning. AND COMMENTARY: Explains how some of the evidence supports a line of reasoning.	**4 points** EVIDENCE: Provides specific evidence from at least three of the provided sources to support all claims in a line of reasoning. AND COMMENTARY: Consistently explains how the evidence supports a line of reasoning.
	Decision Rules and Scoring Notes				
	Typical responses that earn 0 points: • Are incoherent or do not address the prompt. • May be just opinion with no textual references or references that are irrelevant.	**Typical responses that earn 1 point:** • Tend to focus on summary or description of sources rather than specific details.	**Typical responses that earn 2 points:** • Consist of a mix of specific evidence and broad generalities. • May contain some simplistic, inaccurate, or repetitive explanations that don't strengthen the argument. • May make one point well but either do not make multiple supporting claims or do not adequately support more than one claim. • Do not explain the connections or progression between the student's claims, so a line of reasoning is not clearly established.	**Typical responses that earn 3 points:** • Uniformly offer evidence to support claims. • Focus on the importance of specific words and details from the sources to build an argument. • Organize an argument as a line of reasoning composed of multiple supporting claims. • Commentary may fail to integrate some evidence or fail to support a key claim.	**Typical responses that earn 4 points:** • Uniformly offer evidence to support claims. • Focus on the importance of specific words and details from the sources to build an argument. • Organize and support an argument as a line of reasoning composed of multiple supporting claims, each with adequate evidence that is clearly explained.
	Additional Notes: • Writing that suffers from grammatical and/or mechanical errors that interfere with communication cannot earn the fourth point in this row.				

<table>
<tr><th>Reporting Category</th><th colspan="2">Scoring Criteria</th></tr>
<tr><td rowspan="4">Row C
Sophistication
(0–1 points)</td><td>0 points
Does not meet the criteria for one point.</td><td>1 point
Demonstrates sophistication of thought and/or a complex understanding of the rhetorical situation.</td></tr>
<tr><td colspan="2">Decision Rules and Scoring Notes</td></tr>
<tr><td>Responses that do not earn this point:
Attempt to contextualize their argument, but such attempts consist predominantly of sweeping generalizations (“In a world where …” OR “Since the beginning of time …”).
Only hint at or suggest other arguments (“While some may argue that …” OR “Some people say …”).
Use complicated or complex sentences or language that is ineffective because it does not enhance the argument.</td><td>Responses that earn this point may demonstrate sophistication of thought and/or a complex understanding of the rhetorical situation by doing any of the following:
Crafting a nuanced argument by consistently identifying and exploring complexities or tensions across the sources.
Articulating the implications or limitations of an argument (either the student’s argument or arguments conveyed in the sources) by situating it within a broader context.
Making effective rhetorical choices that consistently strengthen the force and impact of the student’s argument throughout the response.
Employing a style that is consistently vivid and persuasive.</td></tr>
<tr><td colspan="2">Additional Notes:
This point should be awarded only if the sophistication of thought or complex understanding is part of the student’s argument, not merely a phrase or reference.</td></tr>
</table>

When humanity's odyssey into space first began over half a century ago, it seemed as though civilization was journeying into an inestimable vastness that even the entire effort of the world could never alter. As space travel becomes more and more commonplace and the very void becomes yet another instrument of human productivity through GPS and satellite transmission, an unexpected yet pressing issue has emerged: the present dangers of "space junk," or little particles left as remnants from any human object sent to space. It is clear that such objects pose significant danger to future efforts -- those harmless little specks of paint become much less harmless when they whiz around the planet at thousands of miles an hour -- but the answer to the question of how to solve this issue remains less clear. It is consequently imperative that space agencies and nations should start to solve the problem of space junk by regulating the space corporations and private astronautical companies who possess both the greatest responsibility for the problem and the easiest path for fixing it.

To satellites orbiting the Earth, the presence of space junk poses an ever-present risk -- an object that was estimated to be possibly as small as 4 inches across nearly decimated a the Suomi NPP satellite and could have easily killed its crew if the object made contact with it whizzing at 17,000 mph (Source E). This danger does not just harm humanity's creations but also humans themselves. In an article summarizing the lack of legal codes regarding space, Molly Quell points out that these collisions aren't limited to just extraterrestrial settings: in 1977 an accident caused a nuclear-powered Soviet satellite to crash back down and spread radioactive fallout across Canada, causing millions in damages and putting its citizens' health at risk (Source C). Though it can be conceded, as the United States's National Oceanic and Atmospheric Administration states, that "space debris is rarely a concern for humans on Earth" (Source E), it is clear from the prior example that even one endangering incident is too much, especially when clear methods of prevention can be demonstrated.

These methods of prevention can be discovered by looking at past trends and examining what the future holds. Looking at current statistics, it is clear that the majority of earth's satellites now come from a specific source. Comparing the years 2000 to 2020, the number of satellites launched from military and civil government projects and amateur experiments has merely doubled, while the number launched by private corporations has increased from about 10 to an astonishing figure above 1000, now comprising over 90% of all satellites launched (Source B). Though the prospects of convincing private companies to spend hard-earned profits on junk removal initially seems sobering, it may in fact be much more approachable than government operations: the legal issues of, say, a European vehicle illegally removing an Indian satellite or the burden on taxpayers of funding said removal (Source D) are made irrelevant. In light of this, the hope of prevention not only seems possible but plausible. If even half of the future satellites launched by corporations are equipped with instruments ranging from solar sails to balloons to planned decommissioners (Source D), then the amount of future satellites that could potentially pose a hazard would be reduced by hundreds, even if not a single government, agency, or research instituition spends a cent: their only issue is enforcing these rules and regulations on these companies.

Civilization is lucky to be very early on what is hoped to be a long and fruitful journey through the aether: think of how much worse this problem could become if such an exponential growth in satellites and their associated junk remains unchecked! For now, though, space debris remains one of the most uniquely solvable of humanity's problems, unlike those perennial issues of conflict and poverty (Source C). With proper integrity and

diligence among corporations and their engineers, the hope of achieving a junk-free cosmos is well within reach.

Space exploration was the goal for many nations in the 1900's, but those same nations did not account for the pollution their travels would leave behind. "Space junk" has become a ever-growing problem over the past century, and researchers and scientists are researching ways to mitigate the damage posed by this threat. Nations looking to fix the problem of space debris should consider the important factors of, reducing the amount of satelittes being put into space, mitigation of debris through new scientific developments, and communication between nations to manage the damage of space debris.

Reducing the amount of satellites that are put into space can have a lasting impact that can mitigate the amount of space debris in the atmosphere. Over the past few decades humans have used satellites for far more than just space exploration, they have also used them for commercial uses, defense uses, civil uses, and amateur uses. This growth can be looked at positively as it shows the evolution of technology, but they point fails to see the amount of space debris being created by this excessive use of satellites. The European Space Agency, adapted these numbers into a graph that demonstrated that in 2020 alone, there were over 1,300 satellites cast into orbit. To further this point, nearly 1,200 of these satellites were of commercial uses. (Source, B) This graph demonstrates that while the evolution of technology has become more entertaining for us as individuals, we as humans fail to see the lasting impacts left from these launches. These satellites if not removed from space become dead satellites and are destined to float in space as debris until they inevitably cause damage. This damage isn't miniscule either, as the National Oceanic and Atmpospheric Administation said, "Despite their size, even the smallest of objects, some of which cannot be detected by sensors, can be hazardous to unmanned and manned spacecraft." (Source, E) The authors of this source articulate that not only does it put our inventions at risk, but also the people that are manning them. Space debris is a problem that forces scientific minds, not just from one nation, but from all over the world to come together and fix this growing problem.

Almost every nation with access to space has played a part in space debris, working together these nations should be able to reduce the effects of space debris. Nations are trying to fix this problem on their own terms, failing to realize that they would be able to further reduce the risks if they were to just work together. As Mosher and Kiersz demonstrate in their graph, over 16,000 man made space items are made from just the United States, Russia, and China, not to mention the other nations that have access to space technology. (Source, F) This is an important factor as communication between nations could reduce the amount of debris put into space, by reducing the amount of objects that man throws into space to begin with. Some of these nations have already been doing reseach into how they themselves can change the problem of space debris through vast scientific research.

Scientists all over the world have started coming up with solutions to the problem of space debris. Active debris removal (ADR) has become an impressive scientific feat that has been furthered in recent years with the development of new technology. As Luca Rossettini writes, "Some envision an active debris removal (ADR) mission to go grab a dead satellite and remove it." (Source, D) Scientific reseach has been driven to help eliminate the continued problem of space debris, and if nations would work together and put their most influential minds together, they might be able to reduce and mitigate the problems of space debris.

Space debris has become a lasting problem and many factors have atributed to that, but scientists in todays day in age are trying to mitigate those problems through the most

important factors of national communication, scientific development, and the reduction of satellites.

Space initiatives have been happening since the mid 50's, many satalites and vessels have been sent into orbit only to stay in orbit. All of these objects in space are known as space junk. Space Junk is highly dangerous to any satlite and human vessels sent into space, therfore removing all of it should be and is becoming a top priority. Some of the factors to consider when removing this are the facts of how to remove it safely along with the sheer amount of debri is up there.

The amount of debri in space is an important factor because of how dangerous all the debri can be. Many countries have at least some satalites in space and as source F shows some countries have thousands of peice of junk. All this space debri sitting up there poses the question of how are we supposed to get it all down? Every piece of debri out there poses the risk of hitting something like the ISS or some satalites. As stated in Source E [T]he small space debri was traveling at a rate of almost 17,000 mph directly towards Suomi NPP". Space debri travels at extremly high rates of speed, combine this with the fact that there are over 10,000 satalites, vessel parts and active satalites combined makes for dangerous situations, even the smallest pieces of debri can tavel like a bullet through space. Since there is such a substantial number of it up there there need to be a plan put in place to acount for the ammount and speed to remove it safely.

Another factor to consider is how to remove it becuase the debri comes from many different countries. As covered previously many different countries own the bit of the debri that litter space. And I sure doubt that these countries want other people messing with there junk, despite the fact it's junk. With so many satalites and objects belonging to places like countries to even private organizations the effort to remove it will have to be extremely organized. In source C it states "Most of what goes into space doesn't come back. Nations aren't required to remove their garbage from space...as they crash into each other, they create more tin bits of debri". Each country when not held accountable for their junk is just going to leave it up there because why spend several thousand dollars o remove that hazard when the money can go elswhere. This leaves space organizations haveing to dodge the debri and private organzations have to try and step up to solve this problem. The nations should aslo try to be held accountable for what they are doing to the envioronment of space and the dangers their irresponisibility poses to the future generations of space missions. So we can all band together and pulled down more than we send up.

Question 1

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Overview

NEW for 2025: The question overviews can be found in the *Chief Reader Report on Student Responses* on AP Central.

Sample: 1A
Score: 1-4-1

Thesis (0–1 points): 1

The response offers a defensible position at the end of paragraph 1: "It is consequently imperative that space agencies and nations should start to solve the problem of space junk by regulating the space corporations and private astronautical companies who possess both the greatest responsibility for the problem and the easiest path for fixing it."

Evidence and Commentary (0–4 points): 4

The response provides specific evidence to support all claims in its line of reasoning that prevention of threats is entirely achievable. For example, it begins with Source E evidence in paragraph 2 about the Suomi NPP satellite that "could have easily killed its crew if the object made contact with it whizzing at 17,000 mph" and continues with evidence from Source C, citing that in "1977 an accident caused a nuclear-powered Soviet satellite to crash back down and spread radioactive fallout across Canada, causing millions in damages and putting its citizens' health at risk" as evidence of the claim that space junk poses a threat both in outer space and on the earth's surface.

The commentary consistently and clearly explains how the evidence supports the line of reasoning, such as in paragraph 3, when it states "the amount of future satellites that could potentially pose a hazard would be reduced by hundreds, even if not a single government, agency, or research instituition spends a cent: their only issue is enforcing these rules and regulations on these companies."

Sophistication (0–1 points): 1

The response demonstrates sophistication of thought by consistently identifying and exploring complexities or tensions across the sources, such as with the statement in paragraph 2: "Though it can be conceded, as the United States's National Oceanic and Atmospheric Administration states, that 'space debris is rarely a concern for humans on Earth' (Source E), it is clear from the prior example that even one endangering incident is too much, especially when clear methods of prevention can be demonstrated." It also articulates the implications or limitations of an argument: "Though the prospects of convincing private companies to spend hard-earned profits on junk removal initially seems sobering, it may in fact be much more approachable than government operations: the legal issues of, say, a European vehicle illegally removing an Indian satellite or the burden on taxpayers of funding said removal (Source D) are made irrelevant."

Question 1 (continued)

Sample: 1B
Score: 1-4-0

Thesis (0–1 points): 1

The response offers a defensible position in paragraph 1: "Nations looking to fix the problem of space debris should consider the important factors of, reducing the amount of satellites being put into space, mitigation of debris through new scientific developments, and communication between nations to manage the damage of space debris."

Evidence and Commentary (0–4 points): 4

The response provides specific evidence to support all claims in its line of reasoning. For example, the response illustrates the need for consideration of the severity of the debris problem with the statement: "Over the past few decades humans have used satellites for far more than just space exploration, they have also used them for commercial uses, defense uses, civil uses, and amateur uses." The response focuses on the importance of specific words and details to build an argument, such as "As Mosher and Kiersz demonstrate in their graph, over 16,000 man made space items are made from just the United States, Russia, and China, not to mention the other nations that have access to space technology. (Source, F)."

The commentary consistently and clearly explains how the evidence supports the line of reasoning. After providing specific evidence in paragraph 2, the response comments "This graph demonstrates that while the evolution of technology has become more entertaining for us as individuals, we as humans fail to see the lasting impacts left from these launches."

Sophistication (0–1 points): 0

The response does not demonstrate sophistication of thought or complex understanding of the rhetorical situation. While paragraph 2 does have elements of complexity, the subsequent paragraphs rely on more simplistic statements.

Question 1 (continued)

Sample: 1C
Score: 1-2-0

Thesis (0–1 points): 1

The response offers a defensible position in paragraph 1: “Some of the factors to consider when removing this are the facts of how to remove it safely along with the sheer amount of debri is up there.”

Evidence and Commentary (0–4 points): 2

The response provides relevant evidence from 3 sources (F, E, and C). Some evidence is specific; for example, in paragraph 2 it states the speed at which space debris travels: “almost 17,000 mph directly towards Suomi NPP.” However, it also includes broad generalities, such as, “Many countries have at least some satalites in space and as source F shows some countries have thousands of peice of junk.”

The response provides commentary that explains how some of the evidence relates to the argument, such as “Since there is such a substantial number of it up there there need to be a plan put in place to acount for the ammount and speed to remove it safely.” However, the response does not explain the connection to the claims, so a line of reasoning is not clearly established.

The response contains some simplistic explanations that do not strengthen the argument, such as “And I sure doubt that these countries want other people messing with there junk, despite the fact it’s junk.”

Sophistication (0–1 points): 0

The response does not demonstrate sophistication of thought or a complex understanding of the rhetorical situation.