

Onward, sunward: On India's mission to study the sun

Aditya-L1 gives the Indian space programme one more **boundary to push**

Roughly a week after the Indian Space Research Organisation (ISRO) soft-landed a robotic lander and rover on the moon's south polar region, it launched India's first space mission **dedicated** to studying the sun, in the form of a spacecraft named Aditya-L1. **Barely** half a day after the launch, ISRO announced that its lunar rover had completed the surface studies it had planned and that it had been "parked" ahead of the two-week-long **lunar night**. This **vignette illustrates** a certain **maturity on the part of** the Indian space programme: it enters a phase where its **growth from strength to strength becomes indistinguishable** from international leadership in space **exploration**, even as it **carries forward** an old tradition of studying the sun, **exemplified** by the Kodaikanal Solar Observatory. Aditya-L1 will study the sun in multiple wavelengths with its **suite** of seven instruments: four remote-sensing and three **in situ** (i.e., by directly sampling a particular volume of space). Even though it is the star closest to the earth and has been and continues to be observed by a **panoply of telescopes**, the sun still holds many secrets. Some of them are simply waiting to be discovered, although that is easier said than done **given** the **brutality of the star's influence** on its immediate **surroundings**. One example is the **particulars** of the solar wind, a stream of charged particles that stream out from the sun into space. **Considering** the solar wind affects space weather and **in turn** the digital components of spacecraft, Aditya-L1's **findings** could inform future space missions as well. Others are mysteries — bundles of facts not yet fully explained by scientific theories. The **archetypal** example is the **coronal heating problem**: why the uppermost layer of the sun's atmosphere is a thousand times hotter than the sun's surface.

In the next four or so months, Aditya-L1 will travel to the L1 **Lagrange point**, a point 1.5 million kilometres from the earth, where the spacecraft will have an **unobstructed** view of the star while it stays in a **halo orbit** around the point. To **deepen** its **relevance**, Aditya-L1 will also have to record and **transmit** data to earth as quickly as possible, where **the data downlink and analysis pipeline** will have to operate with similar **haste**, so that scientists can **piece together a concurrent** image of the sun. ISRO has also **demonstrated** its ability to handle complex **navigational** tasks in **interplanetary** missions (including the lunar space programme, Chandrayaan) with help from foreign space agencies, and the **attendant** skills will be **brought to bear on** Aditya-L1 as well. **Taken together**, while Aditya-L1 seems relatively simple given ISRO's recent achievements, it gives the Indian space programme and the national solar physics community one more boundary to push. **[Practice Exercise]**

- Red/blue coloring of words in the sentence indicates subject verb relationship; where 'red' denotes 'subject' and 'blue' denotes 'verb'.

Vocabulary

1. **Aditya-L1** (noun) – a satellite dedicated to the comprehensive study of the Sun. It has 7 distinct payloads developed, all developed indigenously. Five by ISRO and two by Indian academic institutes in collaboration with ISRO. Aditya in Sanskrit means the Sun. L1 here refers to Lagrange Point 1 of the Sun-Earth system.
2. **Push the boundary** (phrase) – a situation in which someone is attempting to do something difficult or unprecedented अपनी सीमा से ज्यादा कोशिश करना
3. **Dedicated** (to) (adjective) – Committed, devoted, assigned, bind, समर्पित
4. **Barely** (adverb) – Hardly, scarcely, just, only, narrowly मुश्किल से
5. **Park** (verb) – Station, position, set, place, post; leave (something) in a convenient place until required स्थानित करना; छोड़ना
6. **Lunar night** (noun) – The duration of darkness on the moon when the sun is below the horizon; on the moon, one night lasts about two weeks. चंद्रमा पर अंधेरे की अवधि
7. **Vignette** (noun) – Sketch, brief description, illustration, portrayal, depiction छोटी कहानी या चित्रण
8. **Illustrate** (verb) – Demonstrate, show, depict, represent, elucidate चित्रित करना
9. **Maturity** (noun) – Ripeness, adulthood, fullness, development, growth परिपक्वता
10. **On the part of** (phrase) – by or from (someone). की ओर से
11. **Go strength to strength** (phrase) – To improve or become more successful continuously. निरंतर सफलता की दिशा में बढ़ते जाना
12. **Indistinguishable** (adjective) – appearing to be the same एक जैसे लगने वाले, जिनमें भेद करना कठिन है;
13. **Exploration** (noun) – Investigation, examination, study, inquiry, probe अन्वेषण/ खोज
14. **Carry forward** (phrase) – To continue or progress with something. आगे बढ़ाना
15. **Exemplify** (verb) – Epitomize, embody, illustrate, represent, demonstrate उदाहरण देना
16. **Suite** (noun) – Set, collection, series, arrangement, group समूह
17. **In situ** (phrase) – in the appropriate position. अपने स्थान पर
18. **Panoply** (noun) – Array, range, collection; an extensive or impressive collection. संग्रह

19. **Telescope** (noun) – An optical instrument that makes distant objects appear magnified. दूरबीन
20. **Given** (preposition) – Considering, taking into account, bearing in mind देखते हुए
21. **Brutality** (noun) – Savagery, cruelty, barbarity, inhumanity, harshness क्रूरता
22. **Influence** (noun) – Impact, effect, sway, control, hold प्रभाव
23. **Surroundings** (noun) – Environment, setting, milieu, background, ambience परिवेश
24. **Particular** (noun) – Specific detail or piece of information. विशेष जानकारी
25. **Considering** (preposition) – Given that, taking into account, bearing in mind ध्यान में रखते हुए
26. **Findings** (noun) – Conclusions, results, determinations, outcomes निष्कर्ष
27. **Archetypal** (adjective) – having all the qualities that make somebody/something a typical example of a particular kind of person or thing प्रतिनिधिक, प्रतिरूपी
28. **Coronal** (adjective) – Pertaining to the sun's outer atmosphere. सूर्य के बाहरी वायुमंडल संबंधित
29. **Lagrange point** (noun) – A point in space where the gravitational forces of a two-body system, like Earth and the Moon or Earth and the Sun, produce enhanced regions of attraction and repulsion.
30. **Unobstructed** (adjective) – Clear, open, unblocked, free, unhindered अवरोधित/अबाधित
31. **Halo orbit** (noun) – A periodic three-dimensional orbit near the L1, L2 or L3 Lagrange points in the three-body problem of orbital mechanics.
32. **Deepen** (verb) – Intensify, enhance, amplify, heighten, strengthen गहरा करना
33. **Relevance** (noun) – Pertinence, applicability, significance, importance, relevancy प्रासंगिकता
34. **Transmit** (verb) – Send, transfer, communicate, broadcast, भेजना
35. **The Data downlink** (noun) – The method or process of transmitting data from a satellite or spacecraft to the ground station.
36. **Analysis pipeline** (noun) – A sequence or series of data processing steps, especially used in bioinformatics and related fields
37. **Haste** (noun) – Speed, urgency, quickness, rapidity, swiftness शीघ्रता
38. **Piece together** (phrase) – to understand a story, situation, etc. by taking all the facts and details about it and putting them together

39. **Concurrent** (adjective) – Simultaneous, coexisting, coinciding, parallel समानान्तर communication between planets. ग्रहों के बीच का
40. **Demonstrate** (verb) – Show, exhibit, display, illustrate, prove प्रदर्शित करना
41. **Navigational** (adjective) – Relating to navigation, guiding, steering नेविगेशन संबंधित
42. **Interplanetary** (adjective) – Between planets; relating to travel or
43. **Attendant** (adjective) – Associated, linked, related, connected, consequent, resultant संबंधित
44. **Bring to bear on** (phrase) – Apply, utilize, employ, exert पर लागू करना
45. **Taken together** (phrase) – Collectively, as a whole, in combination सम्मिलित रूप से

Summary of the Editorial

1. The Indian Space Research Organisation (ISRO) recently soft-landed a robotic lander and rover on the moon's south polar region.
2. Following this, ISRO launched Aditya-L1, India's first space mission dedicated to studying the sun.
3. Shortly after the launch, ISRO announced the completion of the lunar rover's planned surface studies.
4. These actions signal the maturity of the Indian space programme, aligning it with international leadership in space exploration.
5. ISRO's initiatives resonate with India's tradition of studying the sun, reminiscent of the Kodaikanal Solar Observatory.
6. Aditya-L1 carries seven instruments, with four dedicated to remote-sensing and three for in situ sampling.
7. Despite extensive observation, the sun harbors many undiscovered secrets due to its intense environmental conditions.
8. Aditya-L1 aims to uncover secrets, such as the intricacies of the solar wind, which impacts space weather and spacecraft's digital components.
9. Another major mystery is the coronal heating problem, questioning why the sun's atmosphere is significantly hotter than its surface.
10. Aditya-L1 will position itself at the L1 Lagrange point, located 1.5 million kilometers from earth, to obtain an unobstructed sun view.
11. From this point, it will orbit in a halo formation around the sun.
12. The spacecraft needs to relay data swiftly to Earth, demanding quick data downlink and analysis for concurrent sun imaging.
13. ISRO's history of managing intricate navigational challenges in interplanetary missions, such as Chandrayaan, equips it for the Aditya-L1 mission.
14. Collaboration with foreign space agencies has further honed ISRO's navigational skills.
15. The Aditya-L1 mission, though appearing straightforward in light of ISRO's recent accomplishments, offers new frontiers for the Indian space and solar physics communities.

Practice Exercise: SSC Pattern Based

1. **What significant event occurred roughly a week before the launch of India's first space mission dedicated to studying the sun?** Editorial page
 - A. ISRO launched another spacecraft to study Venus.
 - B. ISRO soft-landed a robotic lander and rover on the moon's south polar region.
 - C. The Kodaikanal Solar Observatory made a significant discovery about the sun.
 - D. ISRO announced a collaboration with foreign space agencies for future missions.
2. **Which statement best describes the significance of the solar wind, as mentioned in the passage?**
 - A. It is an energy source for the earth.
 - B. It is responsible for the sun's brilliance.
 - C. It affects space weather and the digital components of spacecraft.
 - D. It is the primary cause for the coronal heating problem.
3. **What is the primary mission of Aditya-L1 once it reaches the L1 Lagrange point?**
 - A. To study the moon's surface from a closer proximity.
 - B. To maintain a halo orbit and get an unobstructed view of the sun while transmitting data back to earth.
 - C. To solve the coronal heating problem by direct intervention.
 - D. To aid ISRO in its collaboration with foreign space agencies.
4. **Which of the following best describes the tone of the passage regarding the Indian space programme's achievements?**
 - A. Skeptical
 - B. Critical
 - C. Celebratory
 - D. Indifferent
5. **Which of the following best represents the main theme of the passage?**
 - A. The complexity of ISRO's interplanetary missions.
 - B. The history and tradition of India's solar studies.
 - C. The achievements and ambitions of the Indian space programme with a focus on Aditya-L1's mission to study the sun.
 - D. The intricacies of solar winds and their effect on spacecraft.
6. **Choose the word that is opposite in meaning to the given word.**
Abduct
 - A. Redeem
 - B. Impress
 - C. Sociable
 - D. Hijack
7. **Some parts of one or more sentences have been jumbled up, and labelled A, B, C and**

D. Select the option that gives the correct sequence in which these parts can be rearranged to form a meaningful and grammatically correct sentence.

Their approach sensitized

- A. of it. Similarly, behind them, in the halls,
 - B. flicked on when they came within ten feet
 - C. a switch somewhere and the nursery light
 - D. lights went on and off as they left them behind, with a soft automaticity.
- A. DCBA
 - B. CBAD
 - C. BADC
 - D. BCAD

8. Select the most appropriate meaning of the given idiom.

Save your breath

- A. To make an effort that will be futile
- B. To hold one's anger
- C. To work hard
- D. To be resentful

9. Fill in the blank with an appropriate option.

Participants were _____ a meal of steak and French fries under dim light.

- A. served
- B. nerved
- C. cured
- D. calmed

10. Choose the word that can substitute the given group of words.

One who does not express oneself freely

- A. Skeptic
- B. Erudite
- C. Introvert
- D. Pessimist

11. Choose the word that means the same as the given word.

Faddish

- A. Unpopular
- B. Phony
- C. Barge
- D. Fashionable

12. Select the most appropriate 'one word' for the expression given below.

A person who can speak multiple languages.

- A. Minaret
- B. Polyglot
- C. Spire
- D. Intestate

13. Fill in the blank with an appropriate option.

- _____ threats to elephants requires public and political will to take action.
- Dignifying
 - Addressing
 - Perplexing
 - Stagnating
14. **Select the word that is closest in meaning (SYNONYM) to the word given below.**
DEPRESSED
- DOLEFUL
 - DYNAMIC
 - STURDY
 - NOISY
15. **Some parts of a few sentences have been jumbled up, and labelled A, B, C and D Select the option that gives the correct sequence in which these parts can be rearranged to form a meaningful and grammatically correct sentence.**
My years in my father's house
- would have been unbearable had
 - the feel of his hand clutching mine, his
 - I not had my brother. I never forgot
 - refusal to abandon me. Perhaps he and I would have been close even otherwise.
- ACBD
 - DBCA
 - CBDA
 - BCDA
16. **Choose the word that can substitute the given group of words.**
A person who has given up their beliefs
- Misanthrope
 - Versatile
 - Apostate
 - Crusade
17. **Parts of the following sentence are given as options. Identify the part that contains a grammatical error. If there is no error, select 'No error'.**
Shyam, so good with weapons, fail to find the words / to tell him that everything he'd done / so far, all the compromises he'd made, had been for love.
- to tell him that everything he'd done
 - Shyam, so good with weapons, fail to find the words
 - so far, all the compromises he'd made, had been for love.
 - No error
18. **Parts of the following sentence are given as options. Identify the part that contains a grammatical error. If there is no error, select 'No error'.**
That will truly / been a milestone to / celebrate.
- No error
 - celebrate.

- C. been a milestone to
- D. That will truly

19. **Select the word that is closest in meaning (SYNONYM) to the word given below.**

THRIFTY

- A. PRUDENT
- B. WASTEFUL
- C. GENEROUS
- D. EXTRAVAGANT

20. **Choose the correctly spelt word.**

- A. TEMPORERY
- B. CAMOFLAGUE
- C. PSEUDONYM
- D. TABBOO

Comprehension:

In the following passage some words have been deleted. Fill in the blanks with the help of the alternatives given. Select the most appropriate option for each number.

The man with the shotgun (1) _____ the guard to his knees. He handed up the shotgun to his partner and yanked the guard's wrists up behind his back and locked (2) _____ together with a pair of handcuffs. He (3) _____ him onto the floor with a kick between the shoulder blades. Then he took his shotgun back and (4) _____ to the security gate at the end of the counter. He was short and heavy and moved with peculiar slowness. "Buzz him (5) _____," his partner said.

21. **Select the most appropriate option to fill in the blank No. 1.**

- A. steered
- B. pushed
- C. motivated
- D. swayed

22. **Select the most appropriate option to fill in the blank No. 2.**

- A. them
- B. that
- C. these
- D. it

23. **Select the most appropriate option to fill in the blank No. 3.**

- A. toppled
- B. ascended
- C. placed
- D. straightened

24. **Select the most appropriate option to fill in the blank No. 4**

- A. went over
- B. went under
- C. went along
- D. went besides

25. Select the most appropriate option to fill in the blank No. 5.

- A. to
- B. on
- C. with
- D. in

Answers

1. B 2. C 3. B 4. C 5. C 6. A 7. B 8. A 9. A 10. C 11. D 12. B
 13. B 14. A 15. A 16. C 17. B 18. C 19. A 20. C 21. B 22. A 23. A 24. A
 25. D

[\[Practice Exercise\]](#)

Explanations

- B) The passage mentions that "Roughly a week after the Indian Space Research Organisation (ISRO) soft-landed a robotic lander and rover on the moon's south polar region, it launched India's first space mission dedicated to studying the sun." This means that option B is the correct answer.
- C) The passage states, "One example is the particulars of the solar wind, a stream of charged particles that stream out from the sun into space. Considering the solar wind affects space weather and in turn the digital components of spacecraft, Aditya-L1's findings could inform future space missions as well." This supports that option C is the correct answer.
- B) The passage mentions that "In the next four or so months, Aditya-L1 will travel to the L1 Lagrange point, a point 1.5 million kilometres from the earth, where the spacecraft will have an unobstructed view of the star while it stays in a halo orbit around the point. To deepen its relevance, Aditya-L1 will also have to record and transmit data to earth as quickly as possible." This means that option B is the correct answer.
- C) Celebratory
 Throughout the passage, the achievements of the Indian space programme, as demonstrated by ISRO's latest missions, are highlighted positively. Phrases such as "one more boundary to push", "illustrates a certain maturity", and "its growth from strength to strength" all emphasize the progress and success of the programme in a positive and celebratory tone.
- C) The passage primarily details ISRO's recent achievements, particularly its mission to study the sun with the Aditya-L1 spacecraft. While the text touches upon the intricacies of the sun, the historical context of India's solar studies, and ISRO's other missions, the central theme is the advancement of the Indian space programme and its dedication to understanding the sun through Aditya-L1.
- A) **Abduct** (verb) – Kidnap, snatch, seize, capture अपहरण करना
 Antonym: **Redeem** (verb) – Release, liberate, free, emancipate मुक्त करना
 - Impress** (verb) – Amaze, sway, astound, astonish प्रभावित करना
 - Sociable** (verb) – Friendly, outgoing, gregarious, affable मिलनसार
 - Hijack** (verb) – Seize, capture, usurp, take control अपहरण करना
- B) **CBAD**
 Their approach sensitized a switch somewhere and the nursery light flicked on when they came within ten feet of it. Similarly, behind them, in the halls, lights went on and off as they left them behind, with a soft automaticity.

8. A) **Save your breath** (phrase) – To make an effort that will be futile
9. A) **Serve**
The verb "serve" means to provide someone with food or drink, usually in a formal or arranged situation such as a meal at a restaurant. It fits well in the sentence since the participants were given (or provided) a meal.
- 'Serve' का अर्थ होता है किसी को भोजन या पेय प्रदान करना! यह sentence में अच्छी तरह से ठीक बैठता है क्योंकि भाग लेने वालों को भोजन दिया गया (या प्रदान किया गया) था।
10. C) **Introvert** – One who does not express oneself freely
- **Skeptic** – a person inclined to question or doubt accepted opinions संदेहवादी
 - **Erudite** – having or showing great knowledge or learning पाण्डित्यपूर्ण
 - **Pessimist** – a person who tends to see the worst aspect of things or believe that the worst will happen. निराशावाद
11. D) **Faddish** (adjective) – intensely fashionable for a short time
Synonym: **Fashionable**
- **Phony** (adjective) – Fake, counterfeit, false, spurious नकली
 - **Barge** (verb) – to push people out of the way in order to get past them लोगों को इधर उधर ढकेलकर ज़बरदस्ती घुसना
12. B) **Polyglot** – A person who can speak multiple languages
- **Minaret** – a tall thin tower, usually forming part of a building where Muslims meet and pray (a mosque) मीनार
 - **Spire** – a tall pointed tower on the top of a church (चर्च का) मीनार, नुकीला शिखर
 - **Intestate** – a person who has died without having made a will. बिना वसीयतनामा मारा हुआ
13. B) Addressing का प्रयोग होगा क्योंकि हाथियों के लिए खतरों को address (सुलझाना, निपटाना) करने के लिए public और political इच्छाशक्ति की ज़रूरत है!
- "Addressing threats to elephants" fits best as it means taking notice of and dealing with the threats, which is a logical action in this context and pairs well with the need for "public and political will to take action."
14. A) **Depressed** (adjective) – Unhappy, miserable, dejected, disheartened उदास
- **Doleful** (adjective) – Unhappy, miserable, sad, woeful, dejected मातमी, उदास
 - **Dynamic** (adjective) – Lively, active, energetic, vibrant गतिशील
 - **Sturdy** (adjective) – Robust, durable, strong, well-made, tough, मजबूत
15. A) **ACBD**

My years in my father's house would have been unbearable had I not had my brother. I never forgot the feel of his hand clutching mine, his refusal to abandon me. Perhaps he and I would have been close even otherwise.

16. C) **Apostate** – A person who has given up their beliefs पक्षत्यागी

- **Misanthrope** – a person who dislikes humankind and avoids human society मानवद्वेषी
- **Versatile** – able to adapt or be adapted to many different functions or activities. परिवर्तनशील
- **Crusade** – a vigorous campaign for political, social, or religious change. धर्मयुद्ध

17. B) "Fail" के बदले 'Fails' का प्रयोग होगा क्योंकि Subject 'Shyam' singular noun है, इसलिए verb भी उससे मेल खाने के लिए singular रूप में होगा।

- Replace 'Fails' with 'Fail' because Subject "Shyam" is singular, so the verb should also be in singular form to agree with it.

18. C) 'Be' should be used in place of 'Been' because Base form of verb (i.e. V¹) is used after the Modal verbs (i.e. must, could, will, should, would etc.). The base form of 'Been' is 'Be'.

- 'Been' के बदले 'Be' का प्रयोग होगा क्योंकि Modal verb (i.e. must, could, will, should, would आदि) के बाद verb का base form (V¹) का प्रयोग होता है। 'Been' का base form 'Be' होता है।

19. A) **Thrifty** (adjective) – Frugal, economical, careful, cautious, prudent किफ़ायती

- **Prudent** (adjective) – Judicious, sensible; careful in the way that you make decisions or spend money so that you avoid unnecessary risks मितव्ययी
- **Wasteful** (adjective) – Extravagant, lavish, uneconomical अपव्ययी
- **Generous** (adjective) – Lavish, plentiful प्रचुर
- **Extravagant** (adjective) – Profligate, spendthrift, wasteful अत्यधिक

20. C) The correctly spelt word is 'Pseudonym' which means "a fictitious name, especially one used by an author" उपनाम

21. B) **Pushed**

Grammatical दृष्टिकोण से, सभी options वाक्य में technical रूप से फिट बैठ रहा हैं, लेकिन वाक्य का संदर्भ और अर्थ ही सबसे best option का निर्धारण करेगा। यहाँ, बन्दूक वाला आदमी गार्ड को घुटनों के बल लाने के लिए physical force का उपयोग कर रहा है, इसलिए 'Push' option सबसे उपयुक्त हैं!

- Grammatically, all options could technically fit into the sentence, but it's the specific context and meaning of the sentence that determines the best option. Here, the man with the shotgun is exerting physical force to get the guard to his knees, suggesting a physical action like pushing.

22. A) **Them**

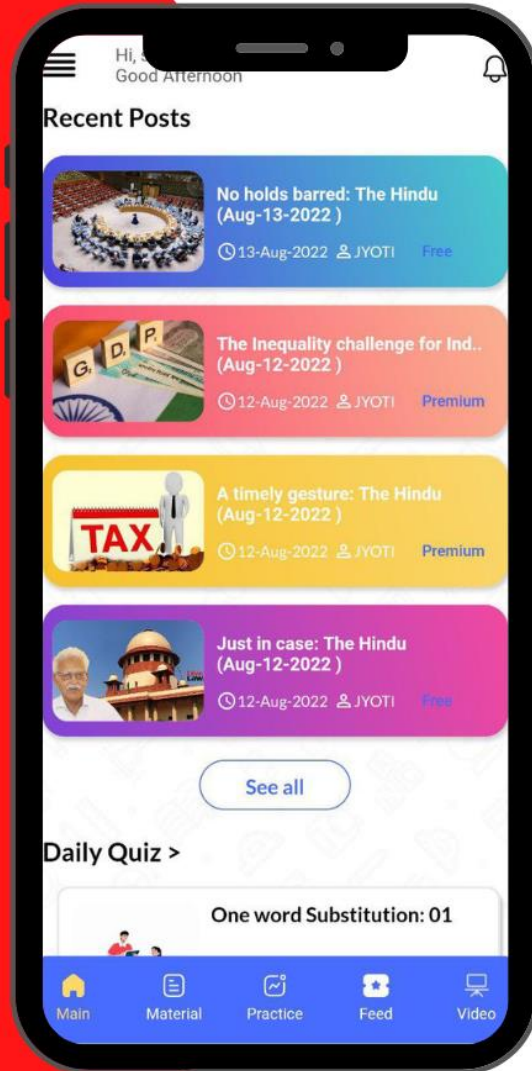
पिछले वाक्य में guard's wrists का उल्लेख किया गया है जिस के लिए "them" pronoun का प्रयोग होगा जो guard की wrists को संदर्भित कर रहा है ! "them" शब्द "locked" verb का object है!

- In this context, "them" is being used as a pronoun to refer to the guard's wrists, which have been mentioned in the previous sentence. The word "them" is the object of the verb "locked" and it agrees in number with the antecedent "the guard's wrists," which is plural.

23. A) **toppled**

“Toppled” should be used in the given blank because it refers to ‘overbalance or cause to overbalance and fall.’ नीचे गिरा देना

24. A) **Went over** (phrasal verb) – This phrase can mean to traverse, pass across something. In this context, it suggests the man with the shotgun is heading to the security gate. पार करना25. D) **Buzz in** (phrasal verb) – To come into a place rapidly or unexpectedly.



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