(Many times in this test “James Webb Space Telescope” is shortened as JWST)

1. Yimo has come up with the idea to replace the Hubble Space Telescope. He has named the new telescope the “James Webb Space Telescope”. There will be a meeting held at the Kennedy Space Center at (10, 2). Yimo is currently studying Barnard 68 at the Mauna Kea Observatory at (-2, -3). If each unit of length in the grid is 350 miles, how many miles will Yimo need to travel to reach the Kennedy Space Center from his current location at the Mauna Kea Observatory?

A. 4500 miles B. 5250 miles C. 3750 miles D. 4550 miles E. NOTA

1. James attends this meeting at Kennedy Space Center. He writes top secret information on the JWST’s blueprint on a small piece of paper, and puts it in his phone case. Katharine is a thief with an extensive criminal record, and decides to rob James in broad daylight for the top secret papers. This turns out to be quite the terrible decision, as James has 10 large bodyguards protecting him. Katharine is immediately arrested and sentenced to 5 life sentences in supermax prison. The supermax prison is the shape of a square with a diagonal of 100 yards. What is the area of the supermax prison?

A. 8000 yards2 B. 2500 yards2 C. 10000 yards2 D. 5000 yards2 E. NOTA

1. James wants to change the official name of the telescope from James Webb Space Telescope to “James Zhang Space Telescope”. NASA has decided that in order to make this change, James must evaluate this expression:

(26 + 45(235 + 12 - 555/3)/9) • 1 + 714/7 + (-113)0.

What is the value of this expression?

A. 440 B. 282 C. 413 D. 439 E. NOTA

1. Unfortunately, James was unable to solve the problem, and his dreams were crushed. Yangyang decided to bake him a large moon pie in the shape of a cylinder. While making the pie, Yangyang got a little hungry and ate 1/9 of the pie. What percent of the pie is remaining after Yangyang eats his portion (rounded to the nearest hundredth)?

A. 90.91% B. 88.89% C. 90.00% D. 11.11% E. NOTA

1. The NASA engineers are on a lunch break! It just happens to be Arib’s birthday, and there are three boxes with a dozen donuts in each. The smell of the donuts immediately caught William’s attention, and he broke Usain Bolt’s record while running to the donuts! He took a whole box for himself and eats all the donuts he has. Nelson grabbed 3 donuts, but was only able to eat 1. Nelson then offered his remaining donuts to Bruce, who ate both of the donuts. Jiayi then took 1/3 of the remaining donuts. How many donuts remain?

A. 14 donuts B. 18 donuts C. 12 donuts D. 15 donuts E. NOTA

1. The JWST consists of 18 equal-sized hexagonal-shaped mirror segments. Wesley is closely analyzing these hexagons and finds that the side of one hexagonal mirror is 2 feet. What is the surface area of the mirror segments of the JWST? (Hint: The equation for the area of a hexagon is , where s is the side length).

A. in2 B. ft2 C. ft2 D. ft2 E. NOTA

1. While on lunch break, Nima and Caleb decide to have a one-versus-one basketball match right next to the telescope! What could go wrong?! The base of the basketball hoop is a rectangular prism with dimensions 12 inches 3 feet 40 inches. What is the volume of the base of the basketball hoop?

A. 5 ft3 B. 10 in3 C. 120 ft3 D. 1440 in3 E. NOTA

1. Aaron is trying to find the specific dimensions of the entire basketball hoop (Ball is life). The pole of the basketball hoop is a cylinder and has a base radius of 2 inches and a height of 11 feet. The hoop is 1 foot below the top of the pole. What is the volume of the pole?

A. ft3 B. ft3 C. ft3 D. ft3 E. NOTA

1. Nima’s dream is to one day touch the rim of the basketball hoop. If Nima’s arm reaches 76 inches above the ground and the rim is 120 inches high, how high does Nima need to jump to touch the rim?

A. 54 inches B. 56 inches C. 44 inches D. 120 inches E. NOTA

1. The one-versus-one between Nima and Caleb is at game point for Caleb. Caleb crosses Nima and makes him fall on one of the hexagonal panels. Unfortunately, Nima’s force while falling was too great and all 18 panels on the JWST need to be repaired. If each panel costs $250,000 to repair and insurance only pays for 40% of the total repair costs, how much does Nima have to pay to repair the 18 panels given that he pays the remaining costs?

A. $4,500,000 B. $1,800,000 C. $150,000 D. $2,700,000 E. NOTA

1. After inspecting the broken panels, they turned out to be faulty from the beginning! Nima is named a hero after revealing the black mold growing inside of one of the mirrors! The mold grew into a peculiar shape of 2 rectangles and a square all put together! The dimensions of the rectangles are 2 in 5 in and 1 ft 4 in, and the square has a side length of 3 in. What is the area of the black mold?

A. 62 in2 B. 29 in2 C. 67 in2 D. 23 in2 E. NOTA

1. The JWST is being launched on the Ariane 5 Rocket at the Guiana Space Centre in French Guiana. However, Hadriel spots a storm coming and calls off the launch for the time being. It is currently 10:42 AM and the storm will begin in 1 hour and 13 minutes. If the storm is predicted to stay above the launch site for 5 hours and 49 minutes, at what time will the storm pass so that the JWST can be launched?

A. 5:40 PM B. 4:44 PM C. 5:34 PM D. 5:44 PM E. NOTA

1. Once the storm passes, Linsey gives the final go-ahead for approval to launch the JWST. At the T-10 second mark on the countdown, the electricity suddenly goes out! Yejun is tasked with fixing the electricity and sprints to the electricity room. However, the room is password locked and requires a four digit code with only non-negative, single-digit integers for each digit. There is a hint for the password on the door. It reads “The first digit is not a natural number, the second digit is the largest possible single-digit number, the third digit is the first odd prime number, the last digit is the only even prime number” What is the code?

A. 1923 B. 0932 C. 0923 D. 0912 E. NOTA

1. After Yejun successfully opens the door, Rohan is standing in the room with pliers and a bunch of broken wires in his hands (He is the imposter)! Rohan then says “Solve this problem to fix the wires instantly: What is the largest prime factor of 2022?”

A. 1011 B. 511 C. 101 D. 337 E. NOTA

1. The Electrical system is back up, and the JWST is now launched. Given that the JWST needs to travel 62 miles to reach the Kármán Line, how far does it need to travel in feet?

A. 358360 feet B. 327360 feet C. 363940 feet D. 360840 feet E. NOTA

1. Yimo, Cyrus, and Lillian’s dream is to someday become astrophysicists! Out of curiosity, they decide to take their spaceship, the “Ye Machine” to see the JWST for themselves. If they need to travel 1.5 million kilometers to reach the telescope, how far are they from the JWST in centimeters?

A. 15 109 cm B. 1.5 1012 cm C. 15 1011 cm D. 1.5 1013 cm E. NOTA

1. Yimo, Cyrus, and Lillian are in a time crunch and they only have 200 hours to reach the JWST. Assuming they move in a straight line towards the JWST, what is the minimum average speed they have to travel at in order to arrive within the time limit? (Use the distance from the previous question)

A. 75,000 km/hr B. 7,500 km/hr C. 750 km/hr D. 7.5 108 km/hr E. NOTA

1. Oh no! On the way to the telescope, Cyrus notices that the “Ye Machine” doesn’t have enough fuel to reach the JWST. If the “Ye Machine” is at (2,4) and the gas station is at (3,7), how far is the group from the gas station?

A. B. 3 C. D. 4 E. NOTA

1. Heewon can solve an NxNxN Rubik’s cube in f(N) seconds where f(N) is the Nth Fibonacci number given by f(1)=0, f(2)=1, and f(N) = f(N - 1) + f(N - 2) for N . How long, in seconds, will it take Heewon to solve a 10x10x10 Rubik’s cube?

A. 10 B. 21 C. 55 D. 144 E. NOTA

1. The JWST has a 5-layer rectangular sunshield that measures 70 feet 45 feet. If the gap between each layer is 10 inches, what is the volume of the space between the combined gaps of the 5 layers?

A. 13125 ft3 B. 157500 ft3 C. 126000 ft3 D. 10500 ft3 E. NOTA

1. Ryan is tasked with temperature control, and reported that the JWST is currently at 7 degrees Kelvin. What is the temperature that JWST is at in Celsius (The conversion from Kelvin to Celsius is K = C + 273.15 where K is the temperature in Kelvins and C is the temperature in Celsius).

A. 266.15 degrees Celsius B. 280.15 degrees Celsius C. -266.15 degrees Celsius D. -280.15 degrees Celsius E. NOTA

1. Oh no! Nicholas and Farhana have discovered an asteroid heading straight towards the JWST! If they calculated that it will take 30 (45 - 3) / 14 7 + 3 hours for the asteroid to hit the telescope, how long does the JWST have until being annihilated from existence?

A. 676.5 hours B. 633 hours C. 723 hours D. 900 hours E. NOTA

1. If Linda and Khawla are able to take a combined 47 pictures each hour with the JWST, using the information from question 22, how many pictures can they take before the asteroid hits the telescope?

A. 42300 pictures B. 31795.5 pictures C. 33981 pictures D. 29751 pictures E. NOTA

1. The pictures are then analyzed by Jay who adjusts the color wavelengths so that humans can see the pictures. JWST only detects infrared wavelengths around 1000 nanometers (nm). If the visible light wavelengths range from 380 nm to 740 nm. What is the range of the visible light wavelengths?

A. 360 nm B. 440 nm C. 370 nm D. 1320 nm E. NOTA

1. While on a cruise ship, Cruz claims that he is able to spot the JWST even though it is 1.5 million kilometers away. He convinces Grace to look up in the sky for it, but she only has her eyes focused on a seagull flying. The seagull is flying 9 miles above the cruise ship in the opposite direction at a constant 21 mph, and the cruise ship is traveling in the opposite direction from the seagull at a constant 39 mph. After 40 minutes from the point where the seagull is directly above Grace, what is the distance between the seagull and the cruise?

A. 12 miles B. 15 miles C. 40 miles D. 41 miles E. NOTA

1. Chanith and Shreeyan (Group 1) are in a race against Miaohan and Nonoko (Group 2) to count the number of stars in the sky that they can see. Chanith and Shreeyan collectively count 19874 stars while Miaohan and Nonoko each count 9947 stars. What is the absolute difference between the number of stars the two groups counted?

A. 20 B. 30 C. 9917 D. 9927 E. NOTA

1. Elijah says that the answer to the next question is not C. David says that the answer to the next question is A. Elijah and David are both lying.

A. A B. B C. C D. D E. E

1. The answer to the previous question is D.

A. A B. B C. C D. D E. E

1. Auska loves rowing! NASA has developed new advanced technology which allows anyone in space to row within a 27 mile radius around the JWST. Given the space is 2 dimensional, what is the area of space that someone can row in?

A. miles2 B. miles2 C. miles2 D. miles2 E. NOTA

1. If you are seeing this problem, James and Nima did not do a good job of writing this test. How many distinct letters does “James Webb Space Telescope” have?

A. 10 letters B. 13 letters C. 12 letters D. 14 letters E. NOTA