**Choose the letter of the correct answer. In all cases, E) NOTA means “none of these answers”. Good luck!**

1. The night sky is so large! In order to measure distances, we have to describe it using the speed of light which is 300,000,000 m/s. Write this number in Scientific Notation.

**A) 3.0 × 10-9 B) 3.0 × 10-8 C) 3.0 × 108 D) 3.0 × 109 E) NOTA**

1. One light-year describes how far light can travel in one year. How far, in meters, is one

light-minute? [Hint: look at Question #1!]

**A) 300,000,000 B) 1,800,000,000**

**C) 3,000,000,000 D) 18,000,000,000 E) NOTA**

1. Victoria and Aidan are having a fight over who is smarter. Annoyed by Aidan’s stubbornness, Victoria decides to fly away to the nearest star to our solar system, Alpha Centauri—just 4.2 light years away! Assuming she flies at the speed of light, how many days (to the nearest day) would it take her to reach Alpha Centauri? [Note: use 365 days in a year]

**A) 4.2 B) 1460 C) 1533 D) 4200 E) NOTA**

1. As Victoria flies away she sees a number of stars. The number of stars she sees equals

(5 ★ 9) ★ (12 ★ 4) where (a ★ b) = a2  b. How many stars did Victoria see?

**A) 8 B) 16 C) 116 D) 256 E) NOTA**

1. The number of stars within 3 light years of us is equal to the sum of all integer solutions of . How many such stars are there?

**A) 3 B) 6 C) 9 D) No such stars exist E) NOTA**

1. What is the sum of the integers that satisfy the compound inequality and

?

**A) 20 B) 30 C) 35 D) 39 E) NOTA**

1. When Brandon looks up at the night sky, he sees two bright stars, one at (0, 4) and one at (5, -2). What is the midpoint between these two stars?

**A) (2.5, 1) B) (2.5, 3) C) (5, 2) D) (5, 3) E) NOTA**

1. Simplify:

**A) B)**

**C) D) E) NOTA**

1. Tommy looks up on the night of December 9th, 2017. He sees that the moon is waning and has just started its last quarter, looking like exactly half of a full moon. If the moon cycles from new moon to new moon every 28 days, what is the next date that there will be a full moon in the night sky?

**A) December 10th  B) December 16th C) December 23rd  D) December 30th E) NOTA**

1. One night Andrew looks into the sky and sees two stars. The next night he sees 8 new stars. The third night he sees 18, on the fourth night 32, and on the fifth night 50. If this pattern continues, how many new stars will he see on the sixth night?

**A) 64 B) 72 C) 84 D) 96 E) NOTA**

1. Yuqing has seen 21 shooting stars in her lifetime. Kim has only seen 18 shooting stars. What is ?

**A) B) 6 C) 7880 D) 143640 E) NOTA**

1. Consider the set of numbers {4, 17, -3, 8, 19}. Which of the following does NOT describe this set?

**A) Natural numbers B) Rational numbers C) Real numbers D) Integers E) NOTA**

1. The constellation “Orion” is famous for its three bright stars that create a line known as “Orion’s Belt.” If the three stars lie on the points (13, -29), (-8, -20), and (27, -35), which of the following points are on the same line as Orion’s Belt?

**A) (40, -66) B) (20, -26) C) (-15, -23) D) (-50, -2) E) NOTA**

1. What is the distance between the x-intercept and y-intercept for the line ?

**A) B) 4 C) 5 D) 6 E) NOTA**

1. When Townsend looks at the sky he doesn’t notice a star, instead he sees the blinking red light of an airplane flying above him! To him, it appears the plane moves across the sky at a rate of 5 millimeters/second. In reality, the plane flies at 1200 meters/minute. If the airplane has flown 1500 meters, how far has its position changed (in millimeters) according to Townsend?

**A) 240 B) 375 C) 400 D) 450 E) NOTA**

1. Find the value of *x* in the solution of the system 2x + 3y = 12

5x – 7y = -86

**A) -6 B) 8 C) 10 D) 29 E) NOTA**

1. Amy saw two shooting stars when she looked at the night sky! Star A flew at 7500 yards/minute. Star B flew at 5000 inches/second. Which star flew faster?

**A) Star A B) Star B C) A & B were equal D) Cannot be determined E) NOTA**

1. Evaluate the expression below using x = -2 and y = 2:

**A) -2048 B) -1024 C) 1024 D) 2048 E) NOTA**

1. Kevin looked up at the sky and was shocked to see an alien ship approaching! Kevin is on the ground at situated at (-6, 0) and the alien ship is at (6, 8). When the alien sees Kevin, it shot out a laser beam directly from its position, in its ship, to his. What is the slope of the line the laser beam creates?

**A) B) C) D) E) NOTA**

1. In order to protect himself, Kevin asks his friend Leon, situated at (2, 0) to save him! To deflect the alien’s laser, Leon must shoot another laser that is perpendicular to the alien’s laser. He successfully shot his laser (and saved Kevin!) so it intercepted the alien’s laser. What was the equation of the path of Leon’s laser?

**A) 2x + 3y = 6 B) 2x – 3y = 6 C) 3x + 2y = 6 D) 3x – 2y = 6 E) NOTA**

**For problems 21-23 consider the following equation:**

1. How many roots does the equation have?

**A) 0 B) 2 C) 3 D) 4 E) NOTA**

1. What is the sum of the roots?

**A) -5 B) 0 C) 13 D) There are no roots E) NOTA**

1. What is the smallest root?

**A) -2 B) 0 C) 9 D) There are no roots E) NOTA**

1. Given that a > b, a + b = 11 and a2 + b2 = 73, what is the value of a – b?

**A) 2 B) 4 C) D) 7 E) NOTA**

1. The night sky is partially covered by clouds tonight. If 45% of the stars are covered by clouds, but we are still able to see 385 stars, how many stars would we be able to see if only 30% of the stars were covered by clouds?

**A) 210 B) 490 C) 630 D) 700 E) NOTA**

1. For what value of *k* would the system of equations 2x + 3y = 6 and 5x – ky = 8 be inconsistent?

**A) B) C) D) E) NOTA**

1. Jennifer looks up to the night sky and sees the Man in the Moon! He says, “I am thinking of a number. It is the second smallest number such that when divided by 5, it has a remainder of 2, and when divided by 7 it has a remainder of 3.” What is the sum of the digits the Man in the Moon is thinking of?

**A) 8 B) 9 C) 10 D) 12 E) NOTA**

1. Jennifer answers the question correctly, and is shocked to see that now there is a cow jumping over the moon! The cow’s trajectory can be modeled by the parabola:

The vertex of the cow’s trajectory is . Find .

**A) 6 B) 14 C) 30 D) 38 E) NOTA**

1. The cow, from the previous question, began his jump on Earth. He took off at the sky line

y = 0. At which two points did the cow take off and land?

**A) (-1, 0) and (3, 0) B) (2, 0) and (4, 0) C) (0, 0) and (6, 0) D) (5, 0) and (9, 0) E) NOTA**

1. The Helix Nebula is the closest nebula to us! The probability it makes a red star is and the probability it makes a blue star is Otherwise, it will make a yellow star. What is the probability that the nebula creates a yellow star?

**A) B) C) D) E) NOTA**