Math Bee – Sample Packet (7th Grade)

Regulation Tossups

(1) [Computational Pyramidal] A triangle has a base length of 13 meters and a height of 6 meters. Given that the area of a triangle can be determined by multiplying one-half times the length of the base times the height, calculate the area of the triangle. You have five seconds to answer.

ANSWER: **39** square meters

(2) [Computational Non-Pyramidal] Objects V and W are moving in the same direction, and V is 84 meters in front of W. If V is moving at 9 meters per second, and W is moving at 13 meters per second, how many seconds will it take W to catch up to V? You have 30 seconds to answer.

ANSWER: **21** seconds

(3) [Computational Non-Pyramidal] If Malachi randomly chooses two distinct elements from the set {2, 3, 4, 7}, what is the SUM of the least possible and greatest possible products of those two elements? You have 30 seconds to answer.

ANSWER: **34**

(4) [Computational Non-Pyramidal] What is the area between y equals 4, y equals 8, x equals 0, and x equals 2? You have 30 seconds to answer.

ANSWER: **8**

(5) [Computational Pyramidal] In a right triangle, the length of the hypotenuse is 17, and the length of one leg is 8. You can determine the length of the remaining side by applying the Pythagorean theorem. What is the length of the remaining side? You have five seconds to answer.

ANSWER: **15**

(6) [Computational Non-Pyramidal] Events A and B are independent. If the probability of event B is 0.3, and the probability of event A given event B is 0.4, what is the probability of event A? You have 30 seconds to answer.

ANSWER: **0.4** (or **40%**; or **2/5**; or **two-fifths**)

(7) [Computational Non-Pyramidal] If 7 to the 7th power is divided by 8, what is the remainder? You have 30 seconds to answer.

ANSWER: **7**

(8)   [Non-Computational Pyramidal] In many programming languages, performing this operation on a floating-point number results in an IEEE-754 exception. This operation, which contradicts the property that every number has a unique multiplicative inverse, is sometimes invoked in paradoxes like "proving 1 = 2" by canceling certain terms. For the point, name this forbidden arithmetic operation that results from attempting to invert the additive identity. You have three seconds to answer.

ANSWER: **dividing by zero**

(9)   [Computational Pyramidal] A flag pole 18 feet tall casts a shadow 12 feet long at a specific time of day. By estimating the value of either the tangent or the sine of the angle formed by the flag pole and the shadow, find, to within 5 degrees either way and rounded to the nearest degree, the angle of elevation of the sun at that time of day. You have five seconds to answer.

ANSWER: **56** degrees (accept any answer from **51 to 61** degrees, inclusive)

(10)   [Computational Non-Pyramidal] If 5x-12=8x-24, what is the value of x? You have 30 seconds to answer.

ANSWER: **4**

(11)   [Non-Computational Pyramidal] In projective geometry, these objects can be defined as degenerations of ellipses with one focus at infinity. These are the only conic sections that intersect a plane parallel to the generating element of a cone, and they model the trajectory of objects in gravitational fields. For the point, name these curves that are graphs of the equation y equals a x squared plus b x plus c. You have three seconds to answer.

ANSWER: **parabola**s

(12)   [Computational Non-Pyramidal] Evaluate this expression: 1+2+3+4+5+6+7+8+9+10. You have 30 seconds to answer.

ANSWER: **55**

(13)   [Computational Non-Pyramidal] Ellie is counting by eights. If the first number she says is 126, what is the sixth number she says? You have 30 seconds to answer.

ANSWER: **166**

(14)   [Computational Non-Pyramidal] What is the perimeter of an irregular pentagon with a base of 4 meters, two sides of 9 meters each, and two sides of 11 meters each? You have 30 seconds to answer.

ANSWER: **44** meters

(15)   [Computational Pyramidal] If each side of this shape is 7 centimeters long, then the perimeter of this shape is 21 centimeters. For the point, name this shape that contains 180 degrees of internal angles. You have five seconds to answer.

ANSWER: **triangle**

(16)   [Non-Computational Pyramidal] A clay tablet linked to this civilization, YBC 7289, details the numerical estimate of the square root of two. This civilization used the sexagesimal, or base 60, numeral system after it was passed down by the Sumerians. For the point, name this ancient civilization based in modern-day Iraq. You have three seconds to answer.

ANSWER: **Babylon**

(17)   [Computational Pyramidal] Billy has 291 dollars and wants to buy as many video games as he can that cost 35 dollars apiece, and there is a one-time shipping fee of $20. You can determine how many games he can buy by subtracting the shipping fee from his total money available, and then dividing by the cost per game and rounding down. What is the maximum number of video games he can buy? You have five seconds to answer.

ANSWER: **7**

(18)   [Non-Computational Pyramidal] When each term in these things equals the previous term plus a fixed value, they are arithmetic, but when each term is multiplied by a fixed ratio, they are geometric. Notable examples of these things include the Catalan numbers and the Fibonacci numbers. For the point, name these ordered lists of elements that are often studied for convergence. You have three seconds to answer.

ANSWER: **sequence**s

(19)   [Computational Non-Pyramidal] There are 3 black marbles and 4 white marbles in a bag. If you choose a marble at random, what is the probability that it is black? You have 30 seconds to answer.

ANSWER: **3/7** (**Three-Sevenths**)

(20)   [Computational Non-Pyramidal] If the quantity open parenthesis x plus y close parenthesis cubed is expanded, what is the sum of the resulting expression's numerical coefficients? You have 30 seconds to answer.

ANSWER: **8**

(21)   [Non-Computational Pyramidal] The harmonic mean of two numbers is equal to twice their product divided by their sum, which corresponds to the mean of these values. The harmonic series is the divergent sum of these values for positive integers. In elementary arithmetic, dividing one by a number produces one of these. For the point, identify these values that, when multiplied by a given number, produce one. You have three seconds to answer.

ANSWER: **reciprocal**s (accept **multiplicative inverse**s; prompt on "inverses")

(22)   [Computational Non-Pyramidal] If a cube has a side length of 3, what is its volume? You have 30 seconds to answer.

ANSWER: **27**

(23)   [Computational Non-Pyramidal] If 4x - 2 = 8, what is the value of 6 x squared plus 2? You have 30 seconds to answer.

ANSWER: **39.5** (or **39 and a half**)

(24)   [Computational Non-Pyramidal] Given 1 red car, 2 blue cars, and 2 yellow cars, how many ways can you arrange the cars, assuming that color is the only differentiating factor? You have 30 seconds to answer.

ANSWER: **30**

(25)   [Computational Non-Pyramidal] What is the sum of the two solutions to the equation x squared plus 4x minus 5 equals 0? You have 30 seconds to answer.

ANSWER: **-4** (**negative four**) (solutions are x = 1 and x = -5)