

Student Name: _____

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Section B

B1.

What is the value of $(12 + 3) \times 4 - 7$

Solution:

By order of operations this reduces to $15 \times 4 - 7 = 60 - 7 = 53$

Answer to B1: 53

B2.

A group of 5 friends is looking to split a pack of gummies. Originally the pack had 50 gummies but somebody ate a gummy, leaving only 49 in the pack, and the group was unable to split the gummies evenly! The group of friends thus must call more people to join them in order to split the gummies evenly! What is the least amount of people they must call?

Solution:

Consider that the integer factors of 49 are 1, 7 and 49, and 7 is the closest integer value above 5, then the friends need to bring $7 - 5 = 2$ people to split the gummies evenly

Answer to B2: 2

B3

Alice is writing a list of numbers on the chalkboard. She starts by writing two 1s on the chalkboard. Then, the next number she writes down is the sum of the previous two numbers in the list (thus she would write $1+1 = 2$ as the third number, and then $1 + 2 = 3$ as the fourth etc.) What is the 12th number she writes down?

Solution:

Note that this is just the fibonacci sequence. Thus writing out the sequence would continue as: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144. Thus 144, is the 12th number.

Answer to B3: 144

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B4

Anna and Bob are playing a game. Anna starts by rolling two dice. Bob then must guess what number Anna got. What is the minimum number of guesses Bob needs to guarantee that he guesses Anna’s number?

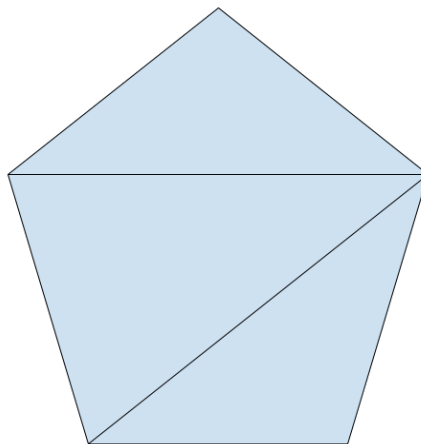
Solution:

Notice that on two regular dice, there are a total of 11 possible values (2-12) of the sums of the faces one can roll. Thus, Bob needs at least 11 guesses to guarantee he guesses Anna’s number

Answer to B4: 11

B5

Consider that we can split a pentagon into three triangles using 2 non-intersecting line segments attached to corners, as shown below



How many triangles could be made with 9 line segments following the same rules as above with a dodecahedron (12 sided shape).

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Solution:

One can notice by playing around with a rectangle and a triangle that the number of triangles that can be made is always 2 less than the number of sides present. Thus for a dodecahedron, which has 12 sides, 10 triangles can be made.

(this is actually the basis for the sum of the interior angles of a convex polygon)

Answer to B5: 10

B6

We call a number “twin prime” if both the number itself is prime, and also the number of letters in its spelling is prime. For example, 2 is “twin prime” since 2 is a prime, and 3, the number of letters in two is also a prime, while 5 is not since five contains 4 letters which is not a prime number. Find how many twin primes there are less than 30.

Solution:

One good way to solve this problem is to simply check all of the prime numbers less than 30, since in order to be “twin prime” they need to firstly be prime. 2, 3, and 5 have already been done for us above, but the remaining primes less than 30 are 7, 11, 13, 17, 19, 23, and 29. Note seven has 5 letters, which is prime, eleven has 6 which isn’t prime, thirteen has 8 which isn’t prime, seventeen has 9 which isn’t prime, twenty three has 11 which is prime, and twenty nine has 10 which is prime. Thus 2,3,7, and 23 are the twin primes less than 30, which is 4 twin primes.

Answer to B6: 4

B7

Professor Jerry is showing his class a cool sequence. He starts by writing the number 1 on the chalkboard. He then writes 2×1 as the second number, and then $3 \times 2 \times 1$ as the third number and so on. What is the first number he writes that is bigger than 2024?

Solution:

By continuing the pattern, one may recognize $6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$ is less than 2024, but $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$ is larger. Thus it is 5040

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(Note due to confusion around the way the question was worded, 7 or any answer indicating the seventh number was the first number bigger than 2024 was also accepted as an answer)

Answer to B7: 5040

B8

30 years ago, William was twice the age of his son, Henry. 10 years ago, Henry was twice the age of his son, Terry. In 10 years, Terry will be 41. What is the current age of William?

Solution:

Let William’s current age be x . 30 years ago, William was twice the age of Henry. Thus, we can write Henry’s age thirty years ago as $\frac{x-30}{2}$. 10 years ago, Henry was twice the age of his son, Terry. Thus, 10 years ago, Henry was $\frac{x-30}{2} + 20 = \frac{x+10}{2}$ years old. Thus Terry 10 years ago was $\frac{x+10}{4}$ years old. In 10 years, Terry will be 41. Therefore, $\frac{x+10}{4} + 20 = 41$. Solving for x , we get $x = 74$. Thus William is 74.

Answer to B8: 74