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2 Section B

B1

When Joanne was 19 years old, she adopted a cat that was 3 years old. If the cat is currently 8 years old, how old is Joanne?

Solution. If the cat is 8 years old and it was 3 when Joanne adopted it, it has been $8 - 3 = 5$ years since the adoption. So Joanne is $19 + 5 = 24$ years old.

Answer to B1: 24

B2

A number is divisible by 9 if and only if when you add up all of its digits, the result is divisible by 9. How many of the following numbers are divisible by 9?

9, 72, 3572, 96059601

Solution. Clearly 9 is divisible by 9. We have that $7 + 2 = 9$ so 72 is divisible by 9. Also, $3 + 5 + 7 + 2 = 17$ and 17 is not divisible by 9, so neither is 3572. Finally, $9 + 6 + 0 + 5 + 9 + 6 + 0 + 1 = 36$ and 36 is divisible by 9, so 96059601 is as well. Thus 3 of the numbers are divisible by 9.

Answer to B2: 3

B3

Jim has a collection of baseballs. If he added half the size of his collection to his collection, he would have 18 baseballs. How many baseballs does Jim actually have?

Solution. Jim must have an even number of baseballs, since otherwise half of his collection would not be a whole number, and so adding it could not give 18. We proceed by trial and error. If Jim has 2 baseballs, half of that is 1, and adding them gives 3. If he has 4 baseballs, half is 2, and adding them gives 6. Proceeding, after a few more computations we find that if he has 12 baseballs, half of this is 6, and $12 + 6 = 18$. Thus Jim has 12 baseballs.

Answer to B3: 12

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B4

In American football, a touchdown is worth 7 points, while a field goal is worth 3 points. If a team scores 48 points and all points are from touchdowns or field goals, what is the largest number of touchdowns they could have gotten?

Solution. We have that $7 \times 7 = 49$, and so the team must have scored fewer than 7 touchdowns. If they scored 6 touchdowns, this would give $7 \times 6 = 42$ points. Then we would need $48 - 42 = 6$ points to come from field goals, and since each field goal is worth 3 points, this requires 2 field goals. Thus 6 is the largest number of touchdowns they could have gotten.

Answer to B4: 6

B5

The famous book One Thousand and One Nights contains 1001 stories inside of it. If someone were to read 3 stories per day, starting on day 1, on what day would they have finished reading the last story?

Solution. A calculator will tell you that $1001/3 = 333.\bar{6}$. In 333 days, someone can read $333 \times 3 = 999$ stories, and so they will need to read the 1000th and 1001st stories on day 334.

Answer to B5: 334

B6

A bingo card contains the numbers 1 to 75. The first 15 numbers are associated with the letter B, the next 15 are associated with the letter I, and so on for the letters N, G, and O, with 75 being the highest number. How many numbers that start with a 4 are associated with G?

Solution. The letter B has the numbers 1 to 15, so I has 16 to 30, N has 31 to 45, and G has 46 to 60. Of these, 46, 47, 48, and 49 start with a 4, so there are 4 such numbers.

Answer to B6: 4

B7

To convert Celsius to Fahrenheit, first multiply by 9, then divide by 5, and then add 32. What is 20 degrees Celsius in Fahrenheit?

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Solution. We have that $20 \times 9 = 180$, $180/5 = 36$, and $36 + 32 = 68$. Thus 20 degrees Celsius is 68 degrees Fahrenheit.

Answer to B7: 68

B8

A baker’s dozen consists of a group of 13 objects (a regular dozen, plus one for the baker to eat as well). If Annie has a baker’s dozen cartons of eggs, each of her cartons of eggs contains a baker’s dozen of eggs, Brianna has a dozen cartons of eggs, and each of her cartons contains a dozen eggs, how many more eggs does Annie have than Brianna?

Solution. Annie has $13 \times 13 = 169$ eggs, while Brianna has $12 \times 12 = 144$ eggs. Thus Annie has $169 - 144 = 25$ more eggs than Brianna.

Answer to B8: 25