Student Name: _____

1. A hen is called a "super hen" if it can lay more than one egg in a day. If 2 super hens lay 18 eggs in 3 days, with the same productivity, how many eggs will 1 super hen lay in 1 day?

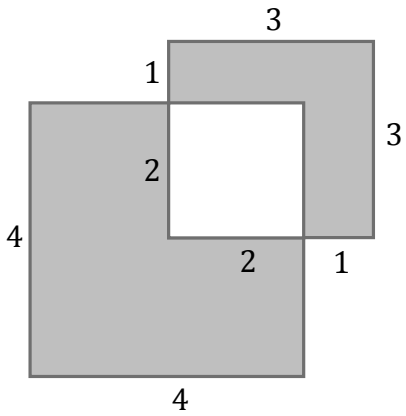
If 2 super hens lay 18 eggs in 3 days, then 1 super hen will lay 9 eggs in 3 days (18 / 2 = 9). If 1 super hen will lay 9 eggs in 3 days, then 1 super hen will lay **3** eggs in 1 day (9 / 3 = 3).

2. The product of three consecutive whole numbers is 60. What is their sum?

This question may be solved with variables. However, given that for 3 consecutive numbers' product to equal 60, the numbers must be low. In particular 5×6 is already 30 so we know the first of the consecutive numbers is smaller than 5. By intuition, we find that $3 \times 4 \times 5 = 60$. Therefore, the sum of these 3 numbers is simply:

$$3+4+5 = \mathbf{12}$$

3. A square of side length 4 and a square of side length 3 overlap to form a square of side length 2, as shown. What is the area of the shaded region?



Let A represent the area of the large square.
Let B represent the area of the small square.
Let C represent the area of the overlapping square from A and B.

$$A = 4 \times 4 = 16$$
$$B = 3 \times 3 = 9$$
$$C = 2 \times 2 = 4$$

Area of the shape formed by overlapping A and B is given by:

$$16 + 9 - 4 = 21$$

Since C is the overlapping square and would otherwise be counted twice.However, the overlapping square is not shaded. Thus, the area of the shaded region is:

$$21 - 4 = \mathbf{17}$$

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4. A, B, C, D, and E are sitting in a row of five seats. A is not beside B. C is beside D. Who cannot be sitting in the middle seat?

With A in the middle, the arrangement "BEACD" can be made, which satisfies the conditions. With B in the middle, the arrangement "EABCD" can be made, which satisfies the conditions. With C in the middle, the arrangement "ADCEB" can be made, which satisfies the conditions. With D in the middle, the arrangement "ACDEB" can be made, which satisfies the conditions. With E in the middle, for C and D to sit together, A and B must sit together (i.e. CDEAB), which violates one of the conditions. For A and B to not sit together, C and D cannot sit together (i.e. ACEDB), which also violates one of the conditions. Thus, $\boxed{\boldsymbol{E}}$ cannot sit in the middle.

5. There are 20 questions on a test. A correct answer gets you 5 marks and an incorrect answer makes you lose 1 mark. Joe scored 82 on the test and he answered all questions. How many questions did he answer correctly?

Let x represent the number of correct answers scored by Joe.
Then we can solve for the following equation if there are only 20 questions and all are answered:

$$5x + (20 - x)(-1) = 82$$
$$5x - 20 + x = 82$$
$$6x = 102$$
$$x = 17$$

Therefore, Joe scored $\boxed{\mathbf{17}}$ answers correctly.

Alternatively, all correct answers will lead to a total mark of a multiple of 5. Since Joe got 82, not a multiple of 5, so Joe must had some number of wrong answers. Observing 82 is lower than 85 (the next number above 82 that is a multiple of 5) by 3, is it possible that Joe got 3 questions wrong? Try it: 3 wrong questions got -1 x 3 = -3, among 20 questions, he got 20 - 3 = 17 questions right, obtaining 17 x 5 = 85, so the total mark is 85 – 3 = 82, which satisfies the condition. So $\boxed{\mathbf{17}}$ is the answer.

6. If $X \geq 3$ and $1.5 \leq Y \leq 7.5$, what is the maximum possible value for $Y - X$?

To maximize $Y - X$, we need to make Y as large as possible and X as small as possible (convince yourself of this). Since $1.5 \leq Y \leq 7.5$, choose Y to be 7.5. Since $X \geq 3$, choose X to be 3. Then, $Y - X = 7.5 - 3 = \boxed{\mathbf{4.5}}$.

7. One day, Jim wakes up and discovers that a thief has invaded his wardrobe, leaving him with only 2 shirts, 3 pants, and 1 hat. Obviously, Jim has to wear a shirt and a pair of pants, but the hat is optional. How many ways are there for Jim to dress?

Jim has 2 shirts to choose from and 3 pants to choose from. For his hat, however, he has 2 choices (one for wearing a hat, plus one for not wearing a hat at all). In total, he has $2 \times 3 \times 2 = \boxed{\mathbf{12}}$ possible ways to dress.

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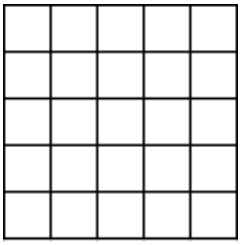
8. What is the maximum number of 1×3 tiles that can be packed in a 5×5 grid with no overlap? (Rotation by 90 degrees is allowed.)



The answer is **8**, and surprisingly, the only way to do it is to not occupy the centre square. Please also note that floor($\frac{25}{3}$) = 8.