



Are you ready for Beast Academy 3C?



Before beginning Beast Academy 3C, a student should have a strong foundation in basic multiplication, perfect squares, and the distributive property.

A student ready for Beast Academy 3C should be able to answer at least 10 of the 14 problems below correctly.

Step 1. The student should try to answer every question without a calculator and without help.

Step 2. Check the student's answers using the solutions at the end of this document.

Step 3. The student should be given a second chance on problems that he or she answered incorrectly.

1. Complete the missing entries in the times table below:

$\times$	8	4		3
			49	
	72			
		8		
6			42	

2. Complete the missing entries in the times table below:

$\times$		5		8
70				
3	18		60	
				48
		200		

3. Find the area of the rectangle below, in square units.



3. _____

4. What is the greatest possible area of a rectangle that has the same perimeter as the rectangle above (in square units)?

4. _____



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Compute:

5. 42×5 5. _____
6. 8×251 6. _____
7. $17 \times 7 + 23 \times 7$ 7. _____
8. $5 \times 9 \times 2 \times 2 \times 4 \times 5 \times 5 \times 3$ 8. _____
9. $(115 \times 115) - (114 \times 114)$ 9. _____
10. $9 \times 79 \times 9$ 10. _____
11. What is the sum of the first thirty odd numbers:
 $1 + 3 + 5 + 7 + \cdots + 55 + 57 + 59$? 11. _____

Answer each:

12. Rae, Sara, and Taj each have a perfect square number of books. All together, they have 93 books. Taj has the most books. How many books does Taj have? 12. _____
13. Gumballs cost 6 cents each. Chocolates cost 11 cents each. What is the cost in cents of 19 gumballs and 6 chocolates? 13. _____
14. Captain Kraken has 7 treasure chests. Each chest holds 95 rubies. He gives 45 rubies to *each* of his 7 crew members. How many rubies does Captain Kraken have left? 14. _____



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Solutions

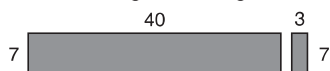
1. The missing entries are filled in below in bold.

×	8	4	7	3
7	56	28	49	21
9	72	36	63	27
2	16	8	14	6
6	48	24	42	18

2. The missing entries are filled in below in bold.

×	6	5	20	8
70	420	350	1400	560
3	18	15	60	24
6	36	30	120	48
40	240	200	800	320

3. To find the area of a rectangle, we multiply its height by its width. To find the area of a 7-by-43 rectangle, we can split it into two smaller rectangles whose areas are easy to compute. We add the areas of the smaller rectangles to find the area of the larger rectangle:



$$7 \times 43 = 7 \times 40 + 7 \times 3 = 280 + 21 = 301.$$

The area of the rectangle is **301 (square units)**.

4. The perimeter of the rectangle is $43 + 7 + 43 + 7 = 100$. For a given perimeter, a square is the rectilinear shape with the greatest area. Since $\boxed{25} \times 4 = 100$, a square with perimeter 100 has side length 25. The area of a square with side length 25 is 25×25 (square units). We can use the distributive property to compute 25×25 . $25 \times 25 = 25 \times (20 + 5) = 25 \times 20 + 25 \times 5 = 500 + 125 = \mathbf{625 \text{ (square units)}}$.

— or —

In Beast Academy 3B, we learn another way to square any number that ends in 5. Here's how it works with 25: $25 \times 25 = (20 \times 30) + 25 = 600 + 25 = \mathbf{625 \text{ (square units)}}$.

5. We can use the distributive property:

$$\begin{aligned} 42 \times 5 &= (40 + 2) \times 5 \\ &= (40 \times 5) + (2 \times 5) \\ &= 200 + 10 \\ &= \mathbf{210}. \end{aligned}$$

— or —

Five is half of 10. To multiply a number by 5, we can multiply the number by 10, then find half the result. $42 \times 10 = 420$. Half of 420 is **210**.

6. We use the distributive property:

$$\begin{aligned} 251 \times 8 &= (200 + 50 + 1) \times 8 \\ &= (200 \times 8) + (50 \times 8) + (1 \times 8) \\ &= 1,600 + 400 + 8 \\ &= \mathbf{2,008}. \end{aligned}$$

— or —

Eight is equal to $2 \times 2 \times 2$. To multiply a number by 8, we can double the number three times:

$$\begin{aligned} 251 \times 8 &= (251 \times 2) \times 2 \times 2 \\ &= (502 \times 2) \times 2 \\ &= 1,004 \times 2 \\ &= \mathbf{2,008}. \end{aligned}$$

7. We use the distributive property:

$$\begin{aligned} 17 \times 7 + 23 \times 7 &= (17 + 23) \times 7 \\ &= 40 \times 7 \\ &= \mathbf{280}. \end{aligned}$$

8. Since multiplication is commutative and associative, we can multiply the numbers in any order. So, we can pair numbers whose products are multiples of ten:

$$\begin{aligned} 5 \times 9 \times 2 \times 2 \times 4 \times 5 \times 5 \times 3 &= (5 \times 2) \times (2 \times 5) \times (4 \times 5) \times (9 \times 3) \\ &= (10 \times 10) \times (20 \times 27) \\ &= 100 \times 540 \\ &= \mathbf{54,000}. \end{aligned}$$

9. In Beast Academy 3B, we learn that we don't need to calculate these squares to calculate their differences!

$$\begin{aligned} 115 \times 115 &= (114 \times 114) + (114 + 115), \text{ so} \\ 115 \times 115 &= 114 \times 114 + 229. \\ 115 \times 115 &\text{ is } 229 \text{ more than } 114 \times 114, \text{ so we have} \\ (115 \times 115) - (114 \times 114) &= \mathbf{229}. \end{aligned}$$

10. First, we multiply 9×79 .

$$\begin{aligned} \text{Since } 79 &= 80 - 1, \text{ we have} \\ 9 \times 79 &= 9 \times (80 - 1) \\ &= (9 \times 80) - (9 \times 1) \\ &= 720 - 9 = \mathbf{711}. \end{aligned}$$

Then, we multiply 711 by 9.

$$\begin{aligned} 711 \times 9 &= (700 + 10 + 1) \times 9 \\ &= (700 \times 9) + (10 \times 9) + (1 \times 9) \\ &= 6,300 + 90 + 9 = \mathbf{6,399}. \end{aligned}$$

— or —

We can multiply the 9's first:

$$\begin{aligned} 9 \times 79 \times 9 &= (9 \times 9) \times 79 = 81 \times 79. \text{ In Beast Academy 3B,} \\ &\text{we learned an easy way to compute the product of} \\ &\text{two numbers that differ by 2. We find the square of the} \\ &\text{number between them, then subtract 1.} \\ \text{So, } 81 \times 79 &= (80 \times 80) - 1 = 6,400 - 1 = \mathbf{6,399}. \end{aligned}$$



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11. The sum of the first thirty odd numbers is equal to 30 squared. $30 \times 30 = 900$, so the sum of the first thirty odd numbers is **900**.

— or —

Since addition is commutative and associative, we can add the numbers in any order we want. So, we rearrange these numbers, pairing numbers whose sum is 60:

$$1+3+5+\cdots+57+59=(1+59)+(3+57)+\cdots+(29+31)$$

All together, there are 15 pairs of numbers whose sum is 60. So, the sum is equal to 15×60 .

We use the distributive property to evaluate 15×60 :

$$15 \times 60 = (10+5) \times 60 = 10 \times 60 + 5 \times 60 = 600 + 300 = \mathbf{900}.$$

12. Since each person has a perfect square number of books, we look for a way to write 93 as the sum of three perfect squares. The perfect squares less than 93 are 1, 4, 9, 16, 25, 36, 49, 64, and 81. The only way to write 93 as the sum of three perfect squares is $93 = 64 + 25 + 4$. Since Taj has the most books, he has **64** books.

13. Since gumballs cost 6 cents each, 19 gumballs cost 19×6 cents. Chocolates cost 11 cents each, so 6 chocolates cost 6×11 cents. The total cost in cents of gumballs and chocolates is $(19 \times 6) + (6 \times 11)$. We can use the distributive property to factor and compute $(19 \times 6) + (6 \times 11)$:
- $$\begin{aligned}(19 \times 6) + (6 \times 11) &= (19 \times 6) + (11 \times 6) \\ &= (19 + 11) \times 6 \\ &= 30 \times 6 \\ &= 180.\end{aligned}$$

So, 19 gumballs and 6 chocolates cost **180** cents.

14. All together, Captain Kraken has 7×95 rubies, and he gives away 7×45 rubies. Then, he is left with $7 \times 95 - 7 \times 45$ rubies.
- To calculate $7 \times 95 - 7 \times 45$, we can use the distributive property: $7 \times 95 - 7 \times 45 = 7 \times (95 - 45) = 7 \times 50$. $7 \times 50 = 350$, so Captain Kraken is left with **350** rubies.