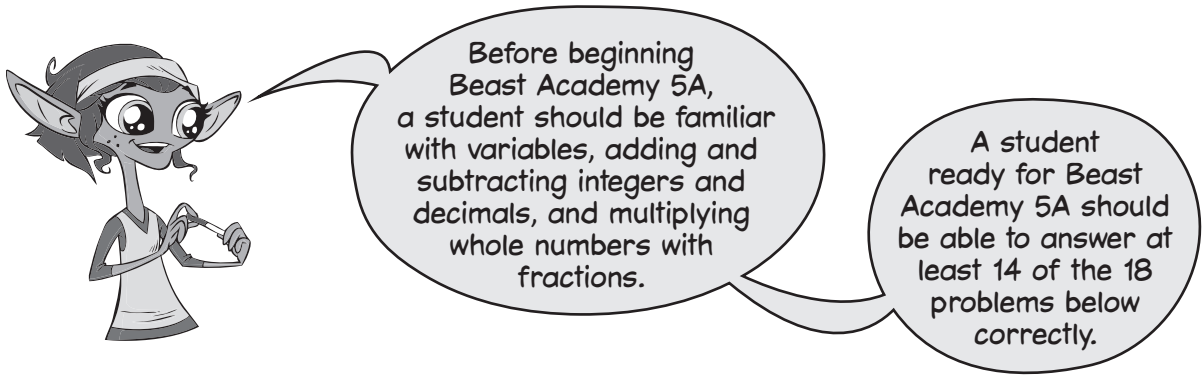
Are you ready for Beast Academy 5A?



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.

Evaluate each sum, difference, or product below.

1. $1.234+9.87 =$ _____

2. $5.15-1.515 =$ _____

3. $\frac{5}{12}\times 9 =$ _____

4. $7\times 11\frac{3}{8} =$ _____

5. $7+8-9-10 =$ _____

6. $-4-(-3)+(-2)-(-1) =$ _____

7. What is the perimeter of a regular hexagon with side length $4\frac{3}{4}$ ft? **7.** _____

8. What is the probability that a randomly selected factor of 36 is odd? **8.** _____

Fill the missing cells of each grid below so that each row, column, and diagonal has the sum given.

9. Sum: 5.4

	0.57	
	1.8	
		0.77

10. Sum: -6

5		-4
	3	

Are you ready for Beast Academy 5A?

Find the value of the variable in each equation below.

11. $5 \times w = 37$

12. $s + 33 = 16$

11. $w =$ _____

12. $s =$ _____

Evaluate each expression below for $a = 6$ and $b = 3$.

13. $7 \times a + 18 \div (a + b)$

14. $12 - b \times 7 \times (10 - a)$

13. _____

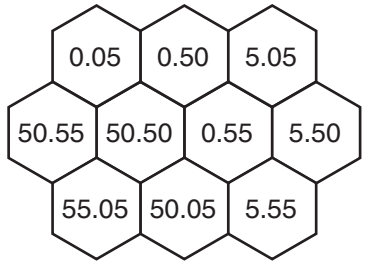
14. _____

15. Use the given digits once each to fill the blanks in the statement below so that the statement is true.

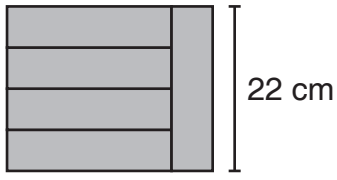
1, 3, 4, 5

$\square.\square 4 < \square.3\square < 5.\square$

16. Trace a path through the grid that crosses every number in order from least to greatest.



17. Five congruent rectangles are attached as shown. What is the perimeter and area of the larger rectangle they create?



17. Perimeter: _____

Area: _____

18. Rita picks a number from the list below at random.

10, 11, 12, ... , 77, 78, 79

What is the probability that her number is ***not*** divisible by 5?

18. _____

Are you ready for Beast Academy 5A?

Solutions

1. We write 9.87 as 9.870 so that both both numbers have digits with the same place values. Then, we stack the numbers vertically and add the thousandths, hundredths, tenths, and ones.

$$\begin{array}{r} 1.234 \\ +\ 9.870 \\ \hline 4 \end{array} \qquad \begin{array}{r} {\scriptstyle 1} \\ 1.234 \\ +\ 9.870 \\ \hline 04 \end{array} \qquad \begin{array}{r} {\scriptstyle 1\ 1} \\ 1.234 \\ +\ 9.870 \\ \hline 104 \end{array} \qquad \begin{array}{r} {\scriptstyle 1\ 1} \\ 1.234 \\ +\ 9.870 \\ \hline \mathbf{11.104} \end{array}$$

2. We write 5.15 as 5.150 so that both numbers have digits in the same place values, then stack the numbers vertically and subtract the thousandths, hundredths, tenths, and ones as shown below.

$$\begin{array}{r} {\scriptstyle 4\ 10} \\ 5.1\not{5}\not{0} \\ -\ 1.515 \\ \hline 5 \end{array} \qquad \begin{array}{r} {\scriptstyle 4\ 10} \\ 5.1\not{5}\not{0} \\ -\ 1.515 \\ \hline 35 \end{array} \qquad \begin{array}{r} {\scriptstyle 4\ 11\ 4\ 10} \\ \not{5}.\not{1}\not{5}\not{0} \\ -\ 1.515 \\ \hline 635 \end{array} \qquad \begin{array}{r} {\scriptstyle 4\ 11\ 4\ 10} \\ \not{5}.\not{1}\not{5}\not{0} \\ -\ 1.515 \\ \hline \mathbf{3.635} \end{array}$$

3. $\frac{5}{12}\times 9=\frac{5\times 9}{12}=\frac{45}{12}=\mathbf{\frac{15}{4}=3\frac{3}{4}}$.

— ***or*** —

We notice both 9 and 12 are multiples of 3:

$\frac{5}{12}\times 9=\frac{5\times 9}{12}=5\times\frac{9}{12}=5\times\frac{3}{4}=\mathbf{\frac{15}{4}=3\frac{3}{4}}$.

4. We convert $11\frac{3}{8}$ to a fraction: $11\frac{3}{8}=\frac{91}{8}$.

Then, we multiply: $\frac{91}{8}\times 7=\frac{91\times 7}{8}=\mathbf{\frac{637}{8}=79\frac{5}{8}}$.

— ***or*** —

We use the distributive property:

$$\begin{aligned} 7\times 11\tfrac{3}{8} &= 7\times\left(11+\tfrac{3}{8}\right) \\ &= \left(7\times 11\right)+\left(7\times\tfrac{3}{8}\right) \\ &= 77+\tfrac{21}{8} \\ &= 77+2\tfrac{5}{8} \\ &= \mathbf{79\tfrac{5}{8}}. \end{aligned}$$

5. We add and subtract, from left to right:

$7+8=15$, then $15-9=6$, and $6-10=\mathbf{-4}$.

6. $-4-(-3)+(-2)-(-1)=-4+3+(-2)+1=\mathbf{-2}$.

7. The perimeter of a regular hexagon with side length $4\frac{3}{4}$ feet is

$6\times 4\frac{3}{4}=\left(6\times 4\right)+\left(6\times\frac{3}{4}\right)=24+\frac{18}{4}=24+4\frac{2}{4}=28\frac{2}{4}=\mathbf{28\frac{1}{2}}$ **ft**.

— ***or*** —

$6\times 4\frac{3}{4}=\left(6\times 4\right)+\left(6\times\frac{3}{4}\right)=24+\frac{18}{4}=24+\frac{9}{2}=24+4\frac{1}{2}=\mathbf{28\frac{1}{2}}$ **ft**.

8. The factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, 36.

Among the nine factors of 36, three are odd. So, the probability that a randomly selected factor of 36 is odd is

$$\frac{\text{\# of odd factors of 36}}{\text{\# of factors of 36}}=\frac{3}{9}=\mathbf{\frac{1}{3}}.$$

9. In the middle column, we have $0.57+1.8=2.37$. So, the bottom cell in the middle column is $5.4-2.37=\mathbf{3.03}$.

Similarly, in the diagonal from top-left to bottom-right, we have $1.8+0.77=2.57$. So, the top-left cell is $5.4-2.57=\mathbf{2.83}$.

2.83	0.57	
	1.8	
	3.03	0.77

We use the same method to fill the remaining cells as shown in the steps below:

2.83	0.57	**2**
	1.8	
1.6	**3.03**	0.77

2.83	0.57	**2**
0.97	1.8	**2.63**
1.6	**3.03**	0.77

10. In the top row, we have $5+(-4)=1$. So, the top cell in the middle column is $-6-1=\mathbf{-7}$.

5	**-7**	-4
	3	

We use the same method to fill the remaining cells as shown in the steps below:

5	**-7**	-4
	-2	
	3	

5	**-7**	-4
	-2	
0	3	**-9**

5	**-7**	-4
-11	**-2**	**7**
0	3	**-9**

11. If $5\times w=37$, then $w=37\div 5=\mathbf{\frac{37}{5}=7\frac{2}{5}}$.

We check that $5\times\frac{37}{5}=\frac{5\times 37}{5}=\frac{5}{5}\times 37=1\times 37=37$. ✓

12. If $s+33=16$, then $s=16-33=\mathbf{-17}$.

We check that $-17+33=16$. ✓

Are you ready for Beast Academy 5A?

13. Replacing a with 6 and b with 3, we get

$$7\times6+18\div(6+3).$$

Then, using the order or operations to evaluate this expression gives us

$$7\times6+18\div(6+3)=7\times6+18\div9=42+2=\mathbf{44}.$$

14. Replacing a with 6 and b with 3, we get

$$12-3\times7\times(10-6).$$

Then, using the order or operations to evaluate this expression gives us

$$12-3\times7\times(10-6)=12-3\times7\times4=12-84=\mathbf{-72}.$$

15. Since the ones digits of the first and last numbers are both 5, the ones digit of the middle number is also 5.

$$5.\square4<\mathbf{5}.3\square<5.\square$$

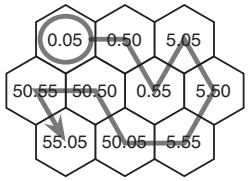
Then, the number on the far right must have tenths digit larger than 3. The only remaining digit larger than 3 is 4.

$$5.\square4<5.3\square<5.\mathbf{4}$$

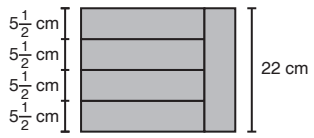
Finally, only placing the 1 and 3 into the remaining empty boxes as shown creates a true statement.

$$5.\mathbf{1}4<5.3\mathbf{3}<5.4$$

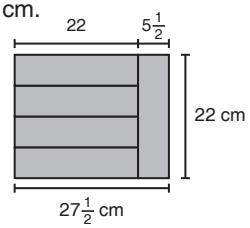
16. We begin by circling the smallest number on the grid, 0.05. Then, we move from hexagon to hexagon, always connecting to the next-smallest number. We finish at the largest number, 55.05.



17. The length of the short side of each congruent rectangle is $22\div4=\frac{22}{4}=\frac{11}{2}=5\frac{1}{2}$ cm.



So, the height of the large rectangle is 22 cm and its width is $22+5\frac{1}{2}=27\frac{1}{2}$ cm.



Therefore, the perimeter of the large rectangle is

$(22+22)+\left(27\frac{1}{2}+27\frac{1}{2}\right)=44+55=\mathbf{99\ cm}$.

The area of the large rectangle is

$22\times27\frac{1}{2}=22\times\frac{55}{2}=55\times\frac{22}{2}=55\times11=\mathbf{605\ sq\ cm}$.

18. We first count the numbers in Rita's list. To make the list easier to count, we subtract 9 from each number. This gives us a list from 1 to 70.

10,	11,	12,	…,	77,	78,	79
−9	−9	−9	…	−9	−9	−9
1,	2,	3,	…,	68,	69,	70

So, there are 70 numbers in the original list.

Next, we count the numbers in the original list which *are* divisible by 5:

$$10,\ 15,\ 20,\ \ldots\ ,\ 65,\ 70,\ 75.$$

To make this list easier to count, we divide each number by 5 to get

$$2,\ 3,\ 4,\ \ldots,\ 13,\ 14,\ 15.$$

Subtracting 1 from each number in this list gives us a list of whole numbers from 1 to 14.

So, there are 14 multiples of 5 in this list, leaving $70-14=56$ numbers that are *not* divisible by 5.

Therefore, the probability that Rita's number is *not* divisible by 5 is

$$\frac{\#\text{ of \#s not divisible by 5 in list}}{\#\text{ of \#s in list}}=\frac{56}{70}=\frac{\mathbf{4}}{\mathbf{5}}.$$

— ***or*** —

There are 70 numbers in this list, and 14 are divisible by 5. So, the probability that Rita chooses a number that is divisible by five is

$$\frac{\#\text{ of \#s divisible by 5 in list}}{\#\text{ of \#s in list}}=\frac{14}{70}=\frac{1}{5}.$$

Therefore, the probability that Rita's choice is *not* divisible by five is $1-\frac{1}{5}=\frac{\mathbf{4}}{\mathbf{5}}$.