Are you ready for Beast Academy 5A?

A student ready for Beast Academy 5A should be able to answer at least 14 of the 18 problems below correctly.

Before beginning Beast Academy 5A, a student should be familiar with variables, adding and subtracting integers and decimals, and multiplying whole numbers with fractions.

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

<table>
<thead>
<tr>
<th>0.57</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>0.77</td>
<td></td>
</tr>
</tbody>
</table>

10. Sum: -6

<table>
<thead>
<tr>
<th></th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td></td>
</tr>
</tbody>
</table>

3
Find the value of the variable in each equation below.

11. \(5 \times w = 37\)

12. \(s + 33 = 16\)

13. \(7 \times a + 18 ÷ (a + b)\)

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

Evaluate each expression below for \(a = 6\) and \(b = 3\).

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

\[5. \_ \_ \ 4 < \_ \_ \_ \_ \ 3 < 5. \_ \_ \_ \_\]

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

\[
\begin{array}{c}
1.234 \\
+ 9.870 \\
\hline
4
\end{array}
\]

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.

\[
\begin{array}{c}
5.150 \\
- 1.515 \\
\hline
3.635
\end{array}
\]

3. \( \frac{5}{12} \times 9 = \frac{5 \times 9}{12} = \frac{45}{12} = 3 \frac{3}{4} \).

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

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

\[
\begin{align*}
7 + 8 &= 15, \\
15 - 9 &= 6, \\
6 - 10 &= -4.
\end{align*}
\]

6. \(-4 - (-3) + (-2) - (-1) = -4 + 3 + 1 = -2\).

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

\[
6 \times 4 \frac{3}{4} = (6 \times 4) + (6 \times \frac{3}{4}) = 24 + 18 \frac{1}{4} = 24 + 4 \frac{9}{4} = 28 \frac{1}{2} \text{ ft}.
\]

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

\[
\frac{\# \text{ of odd factors of 36}}{\# \text{ of factors of 36}} = \frac{3}{9} = \frac{1}{3}.
\]

9. In the middle column, we have 0.57 + 1.8 = 2.37. So, the bottom cell in the middle column is \( 5.4 - 2.37 = 3.03 \).

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

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

11. If \( 5w = 37 \), then \( w = \frac{37}{5} = 7 \frac{2}{5} \).

We check that \( 5 \times 7 \frac{2}{5} = 37 \).

12. If \( s + 33 = 16 \), then \( s = 16 - 33 = -17 \).

We check that \(-17 + 33 = 16 \).

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13. Replacing \(a\) with 6 and \(b\) with 3, we get
\[7 \times 6 + 18 \div (6 + 3) = 7 \times 6 + 18 \div 9 = 42 + 2 = 44.\]

14. Replacing \(a\) with 6 and \(b\) with 3, we get
\[12 - 3 \times 7 \times (10 - 6) = 12 - 3 \times 7 \times 4 = 12 - 84 = -72.\]

15. Since the ones digits of the first and last numbers are both 5, the ones digit of the middle number is also 5.
\[
\begin{array}{cccccc}
5 & 4 & < & 5 & 3 & < & 5 & 4
\end{array}
\]

Then, the number on the far right must have tenths digit larger than 3. The only remaining digit larger than 3 is 4.
\[
\begin{array}{cccccc}
5 & 4 & < & 5 & 3 & < & 5 & 4
\end{array}
\]

Finally, only placing the 1 and 3 into the remaining empty boxes as shown creates a true statement.
\[
\begin{array}{cccccc}
5 & 1 & 4 & < & 5 & 3 & < & 5 & 4
\end{array}
\]

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 \(22 \div 4 = 22 \div 4 = \frac{22}{4} = \frac{11}{2} = 5\frac{1}{2}\) 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
\[(22 + 22) + \left(27\frac{1}{2} + 27\frac{1}{2}\right) = 44 + 55 = 99\text{ cm}.
\]

The area of the large rectangle is
\[22 \times 27\frac{1}{2} = 22 \times \frac{55}{2} = \frac{22 	imes 55}{2} = 55 \times 11 = 605\text{ sq cm}.
\]

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.

\[
\begin{array}{cccccccccc}
10, & 11, & 12, & \ldots, & 77, & 78, & 79 \\
-9 & -9 & -9 & \ldots & -9 & -9 & -9 \\
1, & 2, & 3, & \ldots, & 68, & 69, & 70
\end{array}
\]

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

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 \(1 - \frac{1}{5} = \frac{4}{5}\).