



Are you ready for Beast Academy 3D?



Before beginning Beast Academy 3D, a student should have a basic understanding of variables, be able to compute quotients with remainders, and be familiar with most common units of measurement.

A student ready for Beast Academy 3D should be able to answer at least 11 of the 16 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.

Solve for the variable in each equation below:

1. $54 = 9 \times w$

2. $37 + n = 115$

1. $w = \underline{\hspace{2cm}}$

2. $n = \underline{\hspace{2cm}}$

3. Evaluate $w \times 10 + 6$ for $w = 45$.

3. $\underline{\hspace{2cm}}$

4. Evaluate $300 - 2 \times k$ for $k = 10$.

4. $\underline{\hspace{2cm}}$

5. Simplify $9 + y - 4 + y + 12 - y$.

5. $\underline{\hspace{2cm}}$

6. Write an equation with the same meaning as the sentence below. Then, solve for m .

6. $\underline{\hspace{2cm}}$

Seven less than m is sixty-six.

$m = \underline{\hspace{2cm}}$

7. When 35 is divided by 8, the quotient is a with remainder b . What number can be divided by 8 to get quotient b with remainder a ?

7. $\underline{\hspace{2cm}}$

8. What is the side length in inches of a regular hexagon that has a perimeter of 8 feet?

8. $\underline{\hspace{2cm}}$

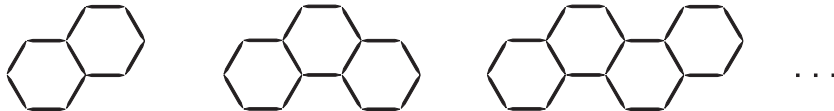
9. What is the remainder when 24×17 is divided by 7?

9. $\underline{\hspace{2cm}}$

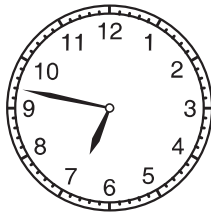


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10. Grogg arranges toothpicks to make hexagons as shown below. It takes 11 toothpicks to make 2 hexagons, 16 toothpicks to make 3 hexagons, and 21 toothpicks to make four hexagons. How many toothpicks will Grogg need to make 50 hexagons if he continues this pattern? 10. _____



11. What will the time be 93 minutes *after* the time shown on the clock below? 11. _____



12. Fill in the empty white squares in the puzzle below so that each of the five equations in the puzzle is true.

54	÷	3	=	□
30	÷	□	=	□
45	÷	15	=	□

13. How many seconds are in two hours? 13. _____
14. How many inches are in five yards? 14. _____
15. The perimeter of a square is one meter. What is the length in centimeters of one side of the square? 15. _____
16. Dara has nine U. S. coins for a total of 68 cents. How many nickels does she have? 16. _____



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Solutions

1. $9 \times \boxed{6} = 54$, so $w = 6$.

2. To solve the equation, we subtract 37 from both sides:

$$\begin{array}{r} 37+n=115 \\ -37 \quad -37 \\ \hline n=78 \end{array}$$

So, $n = 78$.

3. When $w = 45$, the expression $w \times 10 + 6$ is equal to $45 \times 10 + 6 = 450 + 6 = 456$.

4. When $k = 10$, the expression $300 - 2 \times k$ is equal to $300 - 2 \times 10 = 300 - 20 = 280$.

5. We use the associative and commutative properties of addition to rewrite the expression:

$$\begin{aligned} 9+y-4+y+12-y &= (9+y)-4+(y+12)-y \\ &= (y+9)-4+(12+y)-y \\ &= y+(9-4+12)+y-y \\ &= y+17+y-y \end{aligned}$$

Then, starting with $y+17$, adding y and subtracting y is the same as doing nothing. So, $y+17+y-y = y+17$.

$9+y-4+y+12-y$ simplifies to $y+17$ (or $17+y$).

6. "Seven less than m " means $m-7$ (not $7-m$), and "is" means "equals." Therefore, our equation is $m-7 = 66$.

To solve the equation, we add 7 to both sides:

$$\begin{array}{r} m-7=66 \\ +7 \quad +7 \\ \hline m=73 \end{array}$$

So, $m = 73$.

7. First, we divide 35 by 8:

$$\begin{array}{r} 4 \\ 8 \overline{) 35} \\ \underline{-32} \\ 3 \end{array}$$

$35 \div 8$ has quotient 4 and remainder 3. So, $a = 4$ and $b = 3$. We are looking for a number that has quotient 3 and remainder 4 when divided by 8. This means that 8 goes into our number 3 times, with 4 left over.

8×3 is 24, plus 4 extra is 28.

So, **28** has quotient 3 and remainder 4 when divided by 8.

8. Since 1 foot is equal to 12 inches, 8 feet equals $8 \times 12 = 96$ inches.

A regular hexagon has 6 sides of equal length. So, to find the side length of the hexagon, we divide 96 by 6:

$$\begin{array}{r} 10+6 \\ 6 \overline{) 96} \\ \underline{-60} \\ 36 \\ \underline{-36} \\ 0 \end{array}$$

Since the remainder is 0, we can write $96 \div 6 = 10 + 6 = 16$.

So, the side length of a regular hexagon with a perimeter of 8 feet is $96 \div 6 = 16$ inches (in).

9. We first multiply 24×17 , then divide by 7 to find the remainder.

$$24 \times 17 = 24 \times (20 - 3) = 480 - 72 = 408.$$

So, $24 \times 17 = 408$. Next, we divide 408 by 7:

$$\begin{array}{r} 50+8 \\ 7 \overline{) 408} \\ \underline{-350} \\ 58 \\ \underline{-56} \\ 2 \end{array}$$

So, 24×17 has remainder **2** when divided by 7.

— or —

We begin by finding the remainder when each number is divided by 7.

$24 \div 7$ has remainder 3.

$17 \div 7$ has remainder 3.

Then, we multiply the remainders.

$(24 \times 17) \div 7$ has the same remainder as $(3 \times 3) \div 7$.

$3 \times 3 = 9$, and $9 \div 7$ has remainder 2.

So, $(24 \times 17) \div 7$ has remainder **2**.

— or —

10. To make the first hexagon, Grogg needs 6 toothpicks. To make each additional hexagon, he must add 5 more toothpicks. So to make 50 hexagons, Grogg needs 6×1 toothpicks for the first and 5×49 toothpicks for the next 49. All together, he needs $6 + (5 \times 49) = 6 + 245 = 251$ toothpicks.

— or —

We could think of Grogg starting with 1 toothpick and adding 5 toothpicks for each hexagon. So, to make n hexagons, Grogg starts with 1 toothpick and adds $5 \times n$ more toothpicks for a total of $1 + 5 \times n$ toothpicks.

To make 50 hexagons, Grogg needs $1 + (5 \times 50) = 1 + 250 = 251$ toothpicks.



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- 11.** The time shown on the clock is 6:47.
13 minutes after 6:47 is 7:00.
This leaves $93 - 13 = 80$ minutes to add.
60 minutes (1 hour) after 7:00 is 8:00.
This leaves $80 - 60 = 20$ minutes to add.
20 minutes after 8:00 is 8:20.
So, 93 minutes after 6:47 is **8:20**.
- 12.** We start with the horizontal equation at the top: $54 \div 3$.
We use long division to compute $54 \div 3 = 18$, so we have

54	÷	3	=	18
		×		÷
30	÷		=	
		=		=
45	÷	15	=	

Then, we solve the center vertical equation: $3 \times \square = 15$.
Since $3 \times 5 = 15$, we have

54	÷	3	=	18
		×		÷
30	÷	5	=	
		=		=
45	÷	15	=	

Next, we solve the center horizontal equation: $30 \div 5$.
Since $30 \div 5 = 6$, we have

54	÷	3	=	18
		×		÷
30	÷	5	=	6
		=		=
45	÷	15	=	

Then, we can use either the right vertical equation or the bottom horizontal equation to find the correct number to place in the final square.

$$18 \div 6 = 3 \text{ and } 45 \div 15 = 3$$

So, we have

54	÷	3	=	18
		×		÷
30	÷	5	=	6
		=		=
45	÷	15	=	3

- 13.** Since there are 60 seconds in 1 minute and 60 minutes in 1 hour, one hour equals $60 \times 60 = 3,600$ seconds.
So, two hours equal $3,600 \times 2 = 7,200$ seconds.
- 14.** Since there are 3 feet in 1 yard, and 12 inches in 1 foot, one yard equals $3 \times 12 = 36$ inches.
So, 5 yards equal $5 \times 36 = 180$ inches (in).
- 15.** One meter equals 100 centimeters, so the perimeter of the square is 100 centimeters. A square has 4 sides of equal length, so we calculate the side length by dividing the perimeter by 4:

$$100 \div 4 = 25.$$

The side length of a square with a perimeter of 1 meter is **25 centimeters (cm)**.

- 16.** Using nickels, dimes, and quarters, we can only get a number of cents that is a multiple of 5.

Dara has 9 coins worth 68 cents. Since 68 is not a multiple of 5, we know that Dara must have at least 3 pennies. That leaves $9 - 3 = 6$ coins worth $68 - 3 = 65\text{¢}$.

If all 6 of the remaining coins were only dimes, nickels or pennies, then the coins would be worth $10 \times 6 = 60$ cents or less. That's not enough!

So, Dara must have at least one quarter. That leaves $6 - 1 = 5$ coins worth $65 - 25 = 40\text{¢}$.

If Dara had a second quarter, that would leave 4 coins to make $40 - 25 = 15\text{¢}$. We cannot make 15¢ with 4 coins, so Dara only has one quarter.

If all 5 remaining coins were nickels, they would be worth only $5 \times 5 = 25\text{¢}$. So, we must have at least 1 dime.

We look for a way to make 40¢ with 5 coins, all of which are dimes and nickels.

Dimes	Nickels	Total Value
1	4	$10 + 20 = 30\text{¢}$
2	3	$20 + 15 = 35\text{¢}$
3	2	$30 + 10 = 40\text{¢}$
4	1	$40 + 5 = 45\text{¢}$
5	0	50¢

We can only make 40¢ with 3 dimes and 2 nickels.

So, all together, Dara has 1 quarter, 3 dimes, **2 nickels**, and 3 pennies for a total of 68¢.