Topics: Fractions and decimals. More word problems

The absolute value of a number is the distance from the number on the number line to zero. The symbol for absolute value is | |.

o The absolute value of a positive number is that number; the absolute value of a negative number is the opposite number. For example, $|4| = |-4| = 4$. The absolute value of 0 is zero.

Addition/subtraction with negative numbers:

$$+(-a) = -a \quad \text{keep the sign}$$
$$-(-a) = +a \quad \text{change the sign}$$

$$(-a) + (-b) = -a - b = -(a+b)$$
$$(-a) + (+b) = -a + b = +(b-a) \quad \text{if } |b| > |a|$$
$$= -(a-b), \quad \text{if } |a| > |b|$$

o To add negative numbers, add the absolute values and write the negative sign in front of their sum.
o To add numbers with different signs, subtract the absolute values and write the sign of the larger number in front of their sum

• Equations with absolute values:

An equation like $|x| = 5$ has two solutions: $x = 5$ and $x = -5$.
An equation like $|x - 1| = 4$ also has two solutions: $x - 1 = 4$ (which gives x = 5) or $x - 1 = -4$, which gives $x = -4 + 1 = -3$

• Powers notation

General notation (n is a whole number):

$$a^n = a \times a \times a \times \dots \times a \ (n \text{ times}). \quad a \text{ is called the base}, \text{ and } n - \text{ the exponent}$$

Special cases:
$a^0 = 1$ read: a-to-the-zero
$a^1 = a$ is just itself 'a'
$a^2 = a \times a$ read: a-squared
$a^3 = a \times a \times a$ read: a-cubed

Problems

1. **Review:** We have a set of the following numbers: $x \in \{-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6\}$

   a) List the numbers for which $|x| < 4$
   b) Draw the solution on the number line
   c) Do the same for $|x| > 4$

2. Check if the following equalities are true:

    a) $|10 + 25| = |10| + |25|$

    b) $| 13 - 7| = |13| = |7|$
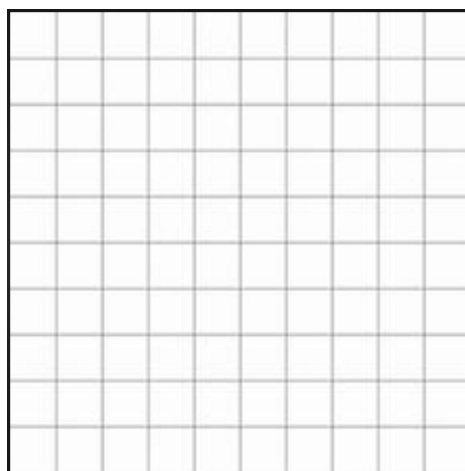
    c) $|36 + (-6)| = |36| + | - 6|$

    d) $|49 - (-3)| = |49| - |-3|$

    e) $-|-5| = -5$

3. a) Calculate the value of the following expression for $x = \{-3, -2, -1, 0, 1, 2, 3\}$

       $|x - 1| = y$

 b) Graph the pairs of numbers (x, y) on a graph

4. Find all whole numbers for which the following equality is true.
    a) $|x \cdot y| = 13$
    b) $|x| \cdot |y| = |x \cdot y|$

5. If a certain population of bacteria doubles every day, and right now we have 1 gram of them, how much will we have in 2 days? In a week? In a month?

6. A friend thinks of a number between 1 and 100; you try to deduce the number by asking questions that can only be answered by 'yes' or 'no.' What is the number of questions that will be asked?

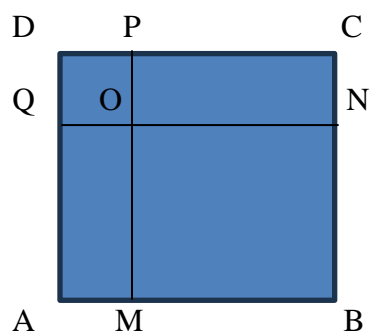7. Write the following as a power with a base and an exponent.

    a) $a \cdot a \cdot a \cdot a$; $5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$; $\frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3}$; a;

    b) 25;   81;   0.16 ; $\frac{9}{36}$;

8. Write as multiplication of numbers and calculate

    5^4 7^2 1^7 2^6 0.5^3 $\left(\frac{2}{3}\right)^4$

9. In the figure, the square ABCD is divided into rectangles. Find the area of MBNO if AB = 10 cm and AQ = 8 cm.

10. Calculate a^n if:

    a) $a = 1,\ n = 5$

    b) $a = 78,\ n = 1$

    c) $a = 0,\ n = 4$

    d) $a = 5, n = 0$