

Accelerated math. Homework 13.

Problems marked with * are more difficult.



1. Rewrite without parenthesis:

Example: $a - (b - d + c) = a - b + d - c$

- | | |
|---|---|
| a. $a + (b - c + d)$;
b. $a - (b - c - d)$;
c. $a - (b + c + d)$;
d. $a + (b + c - d)$;

a. $a + (b - c + d) = a + b - c + d$
b. $a - (b - c - d) = a - b + c + d$
c. $a - (b + c + d) = a - b - c - d$
d. $a + (b + c - d) = a + b + c - d$

e. $(a - b) + (c - d) = a - b + c - d$
f. $(x + y) - (z + t) = x + y - z - t$
g. $(a - b) - (c - d) = a - b - c + d$
h. $(a + b) + (-c - d) = a + b - c - d$ | e. $(a - b) + (c - d)$;
f. $(x + y) - (z + t)$;
g. $(a - b) - (c - d)$;
h. $(a + b) + (-c - d)$; |
|---|---|

2. Simplify the following fractions, factories nominator and/or denominator first:

$$\text{a. } \frac{6a+6b}{9a}; \quad \text{c. } \frac{ab-ad}{abd}; \quad \text{e. } \frac{ax-ay}{ax+ay};$$

$$\text{b. } \frac{8y}{4x-4y}; \quad \text{d. } \frac{xyz}{xz-yz}; \quad \text{f. } \frac{3cd+3d}{6cd-3d};$$

$$\text{a. } \frac{6a+6b}{9a} = \frac{3(a+b)}{9a} = \frac{a+b}{3a}$$

$$\text{d. } \frac{xyz}{xz-yz} = \frac{xyz}{z(x-y)} = \frac{xy}{x-y}$$

$$\text{b. } \frac{8y}{4x-4y} = \frac{8y}{4(x-y)} = \frac{2}{x-y}$$

$$\text{e. } \frac{ax-ay}{ax+ay} = \frac{a(x-y)}{a(x+y)} = \frac{x-y}{x+y}$$

$$\text{c. } \frac{ab-ad}{abd} = \frac{a(b-d)}{abd} = \frac{b-d}{bd}$$

$$\text{f. } \frac{3cd+3d}{6cd-3d} = \frac{3d(c+1)}{3d(2c-1)} = \frac{c+1}{2c-1}$$

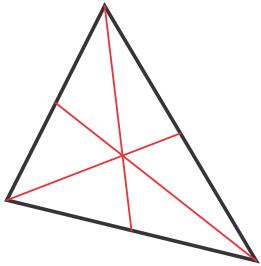
3. Write the definitions of median, altitude, and bisector in a triangle.

Median in a triangle is a segment connecting the vertex of the triangle and the midpoint of the opposite side.

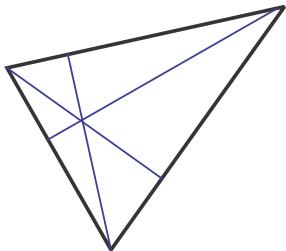
Altitude in a triangle is a segment, connecting the vertex and the opposite side (or it's continuation) and perpendicular to the opposite side.

Bisector in a triangle is a segment, connecting the vertex and the opposite side and dividing the angle into two equal angles.

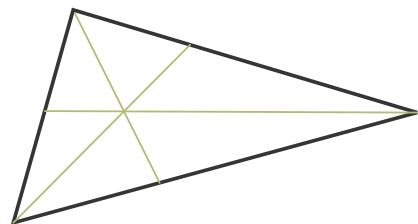
4. Draw three arbitrary triangles (use ruler). In one triangle show three medians, in the second triangle draw three altitudes, in the third one draw three bisectors.



1



2



3

5. Simplify the following expressions:

Example:

$$\begin{aligned}
 & \left(\frac{4}{5}abc^2 - \frac{5}{8}ab^2c + 5abc \right) - \left(\frac{14}{25}abc^2 - \frac{18}{32}ab^2c + 3abc \right) \\
 &= \frac{4}{5}abc^2 - \frac{5}{8}ab^2c + 5abc - \frac{14}{25}abc^2 + \frac{18}{32}ab^2c - 3abc = \\
 &= \frac{4}{5}abc^2 - \frac{14}{25}abc^2 - \frac{5}{8}ab^2c + \frac{18}{32}ab^2c + 5abc - 3abc = \\
 &= \frac{20}{25}abc^2 - \frac{14}{25}abc^2 - \frac{20}{32}ab^2c + \frac{18}{32}ab^2c + 5abc - 3abc = \\
 &= \frac{6}{25}abc^2 - \frac{2}{32}ab^2c + 2abc = \frac{6}{25}abc^2 - \frac{1}{16}ab^2c + 2abc
 \end{aligned}$$

a. $\left(\frac{2}{7}xy^2 - \frac{4}{15}x^2y + \frac{5}{12}x^2yz \right) - \left(\frac{3}{14}xy^2 - \frac{2}{5}x^2y + \frac{1}{4}x^2yz \right);$

b. $\left(\frac{1}{2}a - \frac{1}{3}b + \frac{1}{5}c \right) + \left(\frac{3}{4}a - \frac{2}{9}b - \frac{3}{25}c \right) - \left(\frac{5}{8}a - \frac{4}{27}b + \frac{9}{125}c \right);$

c. $\left(3\frac{1}{6}mn - 2\frac{1}{3}m \right) - \left(\frac{2}{9}mn - 5\frac{1}{15}m \right) - \left(3\frac{5}{18}mn + 3\frac{8}{45}m \right)$

$$\begin{aligned}
 \text{a. } & \left(\frac{2}{7}xy^2 - \frac{4}{15}x^2y + \frac{5}{12}x^2yz \right) - \left(\frac{3}{14}xy^2 - \frac{2}{5}x^2y + \frac{1}{4}x^2yz \right) = \frac{2}{7}xy^2 - \frac{4}{15}x^2y + \frac{5}{12}x^2yz - \frac{3}{14}xy^2 + \\
 & \frac{2}{5}x^2y - \frac{1}{4}x^2yz = \frac{2}{7}xy^2 - \frac{3}{14}xy^2 - \frac{4}{15}x^2y + \frac{2}{5}x^2y + \frac{5}{12}x^2yz - \frac{1}{4}x^2yz = \frac{4}{14}xy^2 - \frac{3}{14}xy^2 - \frac{4}{15}x^2y + \\
 & \frac{6}{15}x^2y + \frac{5}{12}x^2yz - \frac{3}{12}x^2yz = \frac{1}{14}y^2x + \frac{2}{15}x^2y + \frac{1}{6}x^2yz
 \end{aligned}$$

$$\begin{aligned}
& b. \left(\frac{1}{2}a - \frac{1}{3}b + \frac{1}{5}c\right) + \left(\frac{3}{4}a - \frac{2}{9}b - \frac{3}{25}c\right) - \left(\frac{5}{8}a - \frac{4}{27}b + \frac{9}{125}c\right) = \frac{1}{2}a - \frac{1}{3}b + \frac{1}{5}c + \frac{3}{4}a - \frac{2}{9}b - \frac{3}{25}c - \frac{5}{8}a + \\
& + \frac{4}{27}b - \frac{9}{125}c = \frac{1}{2}a + \frac{3}{4}a - \frac{5}{8}a - \frac{1}{3}b - \frac{2}{9}b + \frac{4}{27}b + \frac{1}{5}c - \frac{3}{25}c - \frac{9}{125}c = \frac{4}{8}a + \frac{6}{8}a - \frac{5}{8}a - \frac{9}{27}b - \frac{6}{27}b + \\
& \frac{4}{27}b + \frac{25}{125}c - \frac{15}{125}c - \frac{9}{125}c = \frac{5}{8}a - \frac{11}{27}b - \frac{1}{125}c
\end{aligned}$$

$$\begin{aligned}
& c. \left(3\frac{1}{6}mn - 2\frac{1}{3}m\right) - \left(\frac{2}{9}mn - 5\frac{1}{15}m\right) - \left(3\frac{5}{18}mn + 3\frac{8}{45}m\right) = 3\frac{1}{6}mn - \frac{4}{18}mn - 3\frac{5}{18}mn - 2\frac{5}{15}m + \\
& + 5\frac{1}{15}m - 3\frac{8}{45}m = 3\frac{1}{6}mn - 3\frac{3}{6}mn - 2\frac{15}{45}m + 5\frac{1}{15}m - 3\frac{8}{45}m = -\frac{1}{3}mn - 5\frac{23}{45}m + 5\frac{3}{45}m = \\
& -\frac{1}{3}mn - \frac{20}{45}m = -\frac{1}{3}mn - \frac{4}{9}m
\end{aligned}$$

6. Which expression should be placed instead of A to make the equality true.

Example: $c^5 \cdot A = c^7$, $A = c^2$, $c^5 \cdot c^2 = c^{5+2} = c^7$

- a. $a^2 \cdot A = a^5$; $A = a^3$, $A = a^5 : a^2$
- b. $A \cdot b^7 = b^{11}$; $A = a^4$, $A = b^{11} : b^7$
- c. $c^{35} \cdot A = c^{70}$; $A = a^{35}$, $A = c^{70} : c^{35}$
- d. $A \cdot d^{348} = d^{412}$; $A = a^{64}$, $A = d^{412} : d^{348}$

7. Segments AB and CD intersect at a point O. Point O is a midpoint of both segments. What is the length of the segment BD, if the length of the segment AC=10 cm? Draw a picture, write solution.

$|CO| = |OD|$, and $|AO| = |OB|$, angle $\angle AOC = \angle BOD$ as vertical angles. Therefore $\Delta ACO \cong \Delta BOD$, by SAS criteria. So, $|AC| = |BD| = 10 \text{ cm}$

