Trigonometry Workbook

The law of sines and law of cosines

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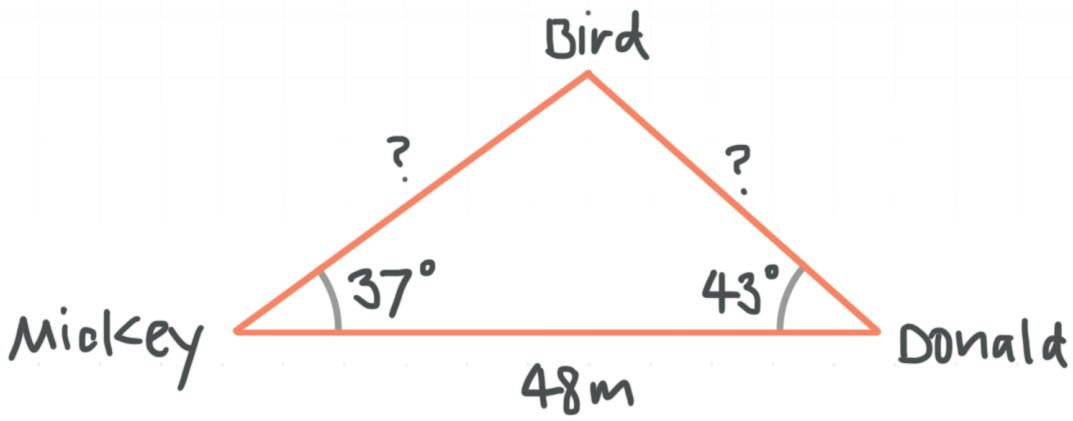
MATH

LAW OF SINES

■ 1. The interior angle measures of a triangle are $97°$, $43°$, and $40°$. How many triangles can be made with these measurements?

■ 2. Mickey and Donald stand on different sides of a tree. Each of them sees the same bird in the tree. They measure the angles of elevation from themselves to the bird, and get $37°$ and $43°$ respectively. If Mickey and Donald are 48 m apart, find the distances from Mickey and Donald to the bird.



■ 3. If the measures of two interior angles of a triangle are $53°$ and $44°$, and the length of the side opposite the $44°$ angle is 7, find the length b of the side opposite the $53°$ angle and the length c of the third side.

■ 4. Solve the triangle with angle measures $A = 30°$ and $C = 90°$ and side length $c = 13$.

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■ 5. Solve the triangle with angle measures $A = 45°$ and $B = 45°$ and side length $c = 10$.

■ 6. Find the lengths of the two unknown sides of a triangle with angle measures $A = 58°$ and $B = 42°$ and side length $a = 12$.

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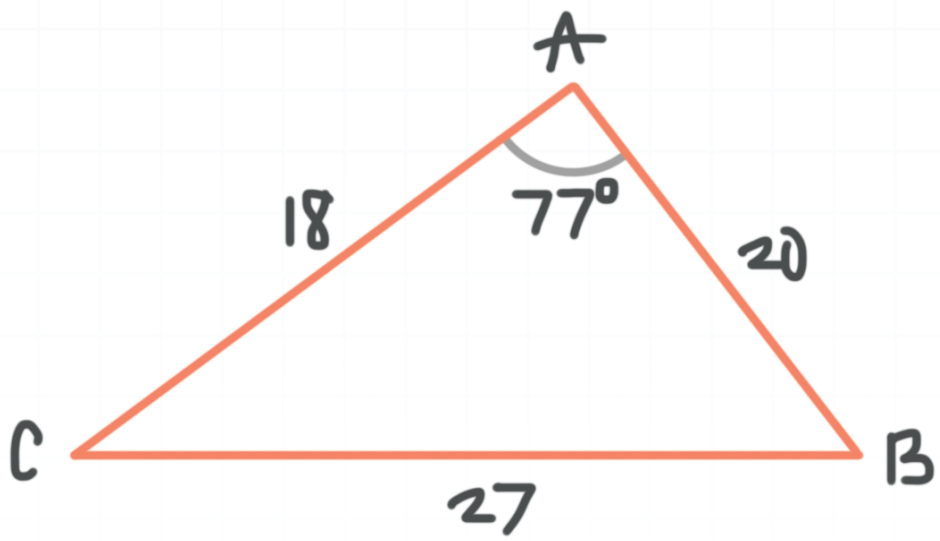
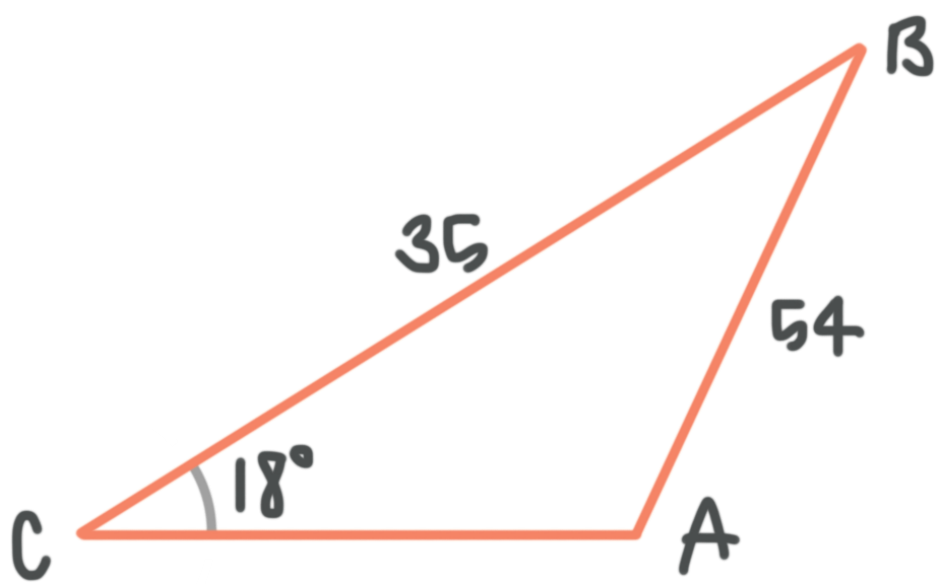
THE AMBIGUOUS CASE OF THE LAW OF SINES

■ 1. A triangle has one side with length 15 and another with length 28. The angle opposite the side with length 15 is $128°$. Complete the triangle.

■ 2. Find $\angle B$.



■ 3. Find $\angle A$.



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■ 4. If the lengths of two sides of a triangle are 18 and 34, and is the measure of the interior angle opposite the side of length 34 is $B = 127°$, find the length of the third side and the measures of angles A and C, where A is opposite the side of length 18.

■ 5. A triangle has side lengths $a = 27$ and $c = 15$ and interior angle $A = 55°$. Find all possible measures of the angle C to the nearest degree.

■ 6. How many triangles are possible with side lengths 5 and 24, where the angle opposite the side with length 24 is $95°$?

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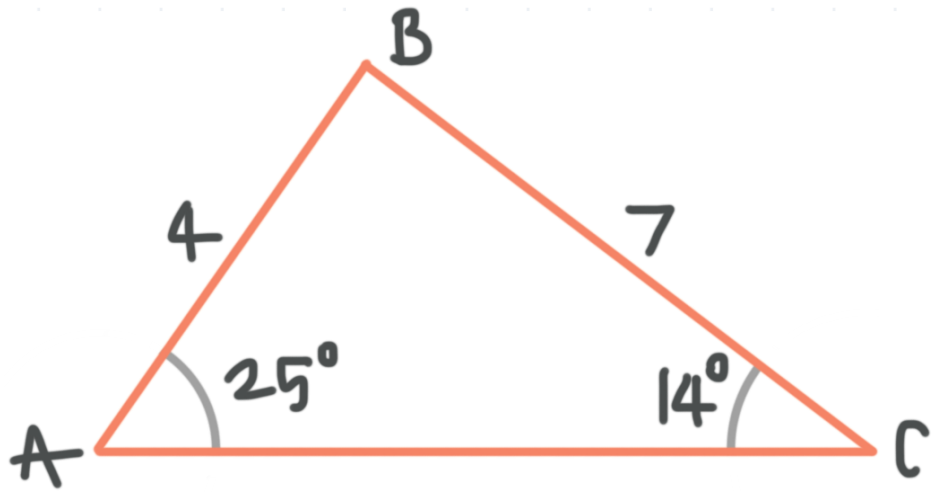
AREA FROM THE LAW OF SINES

■ 1. Find the area of the triangle in which two of the sides have lengths 15 and 24 and the measure of the included angle is $47°$.

■ 2. Find the area of the triangle with interior angles $101°$ and $25°$, if the included side has length 23.

■ 3. Find the area of the triangle in which two of the sides have lengths 36 and 17 and the measure of the included angle is $90°$.

■ 4. Find the area of the triangle.



■ 5. Find the area of the triangle with interior angles $90°$ and $35°$, if the included side has length 7.

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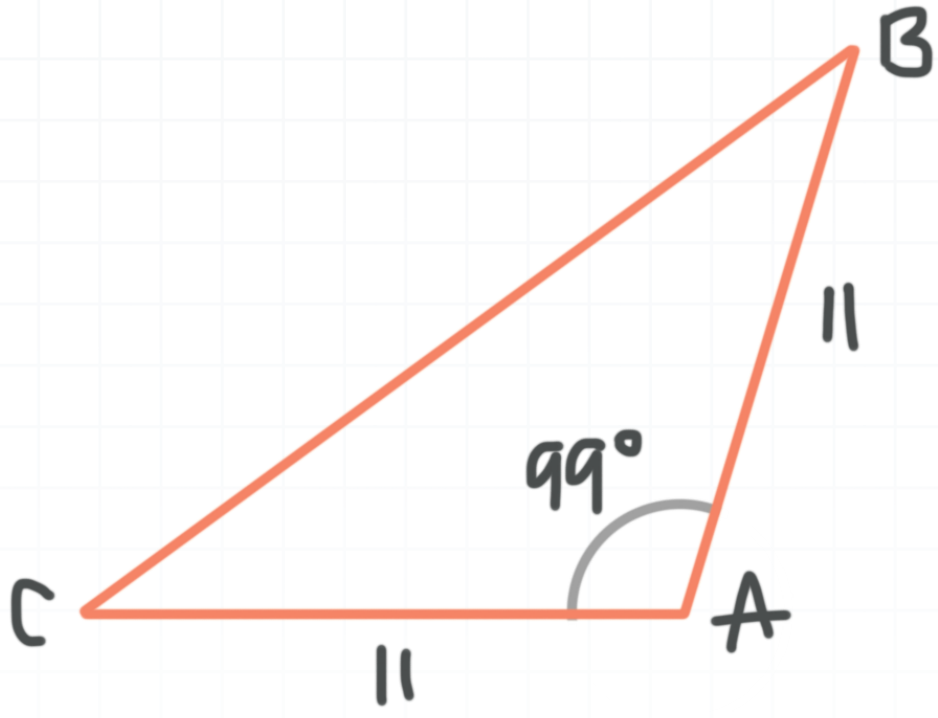
6. Find the area of a triangle.



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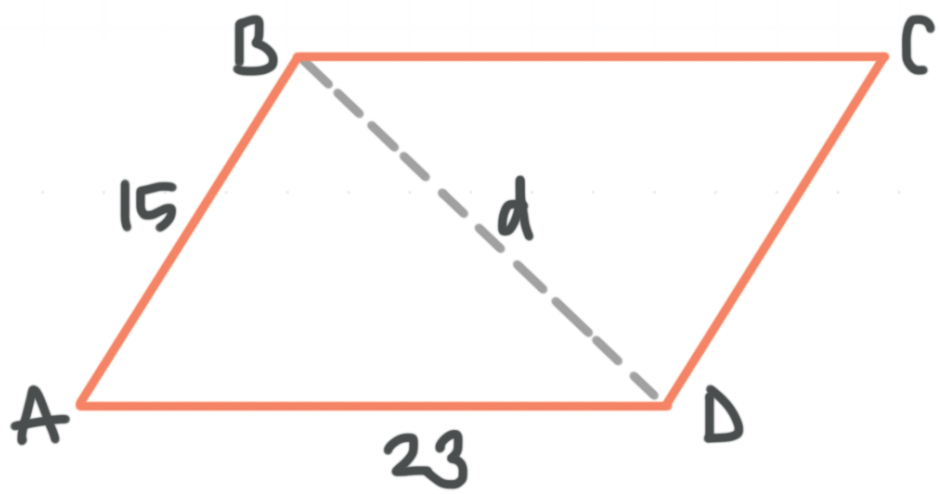
LAW OF COSINES

■ 1. Solve the triangle where two of the sides are 18 and 13 and the measure of their included angle is $121°$.

■ 2. If the side lengths of a triangle are $a = 15$, $b = 9$, and $c = 21$, what are the measures of its three interior angles?

■ 3. If the measure of the angle B is $56°$, find the length of the parallelogram's diagonal, d, to the nearest centimeter. Hint: Consecutive angles of a parallelogram are supplementary, so $m\angle A + m\angle B = 180°$.



■ 4. Solve the triangle where two of the sides are 27 and 14 and the measure of their included angle is $33°$.

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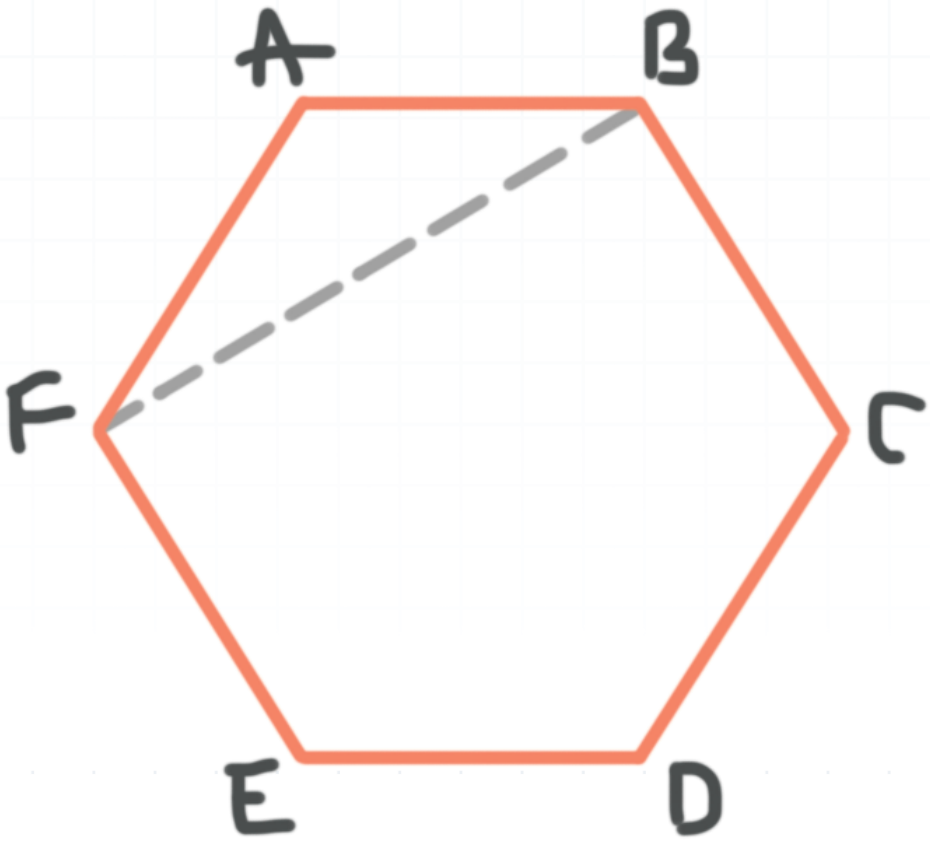
■ 5. If the side lengths of a triangle are $a = 17$, $b = 25$, and $c = 28$, what are the measures of its three interior angles?

■ 6. A regular hexagon (all side lengths are equal, and all interior angles are equal) has side lengths of 20 inches. Find $\overline{FB}$ to the nearest tenth. Hint: The sum of the interior angles of a hexagon is $720°$.



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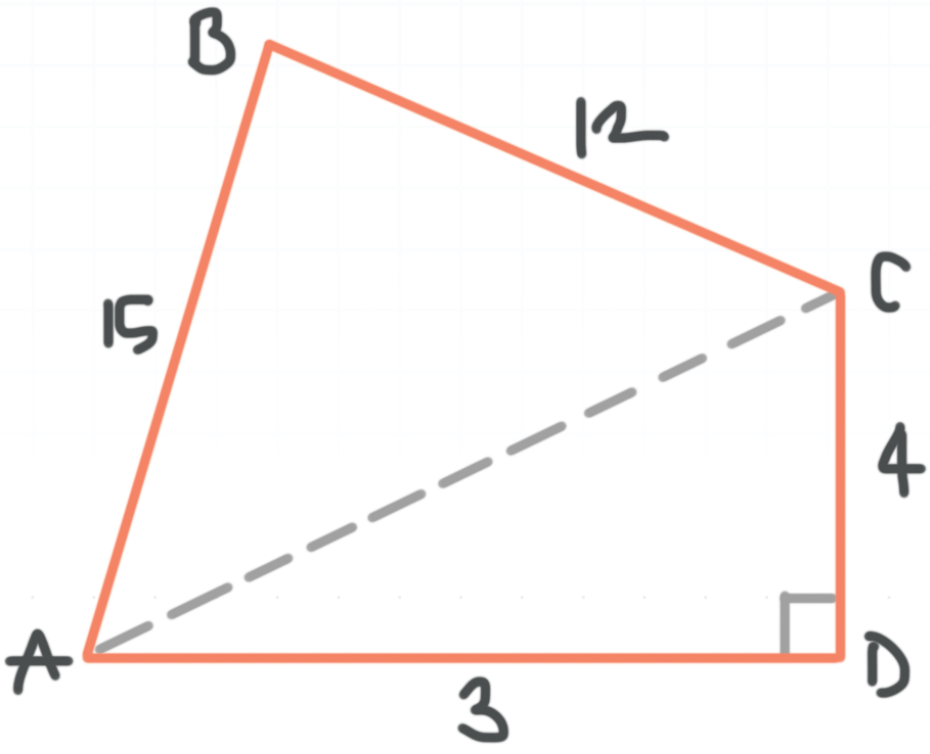
HERON'S FORMULA

■ 1. The lengths of the sides of a triangle have a ratio of $5 : 8 : 12$, and the triangle's perimeter is 200 cm. Find the area of the triangle.

■ 2. Find the area of the quadrilateral, given that it's made of two separate triangles.



■ 3. A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 12 cm, 14 cm, and 16 cm, and the parallelogram has a base of 14 cm, find the height of the parallelogram. Hint: The area of a parallelogram is $A = bh$, where b is its base and h is its height.

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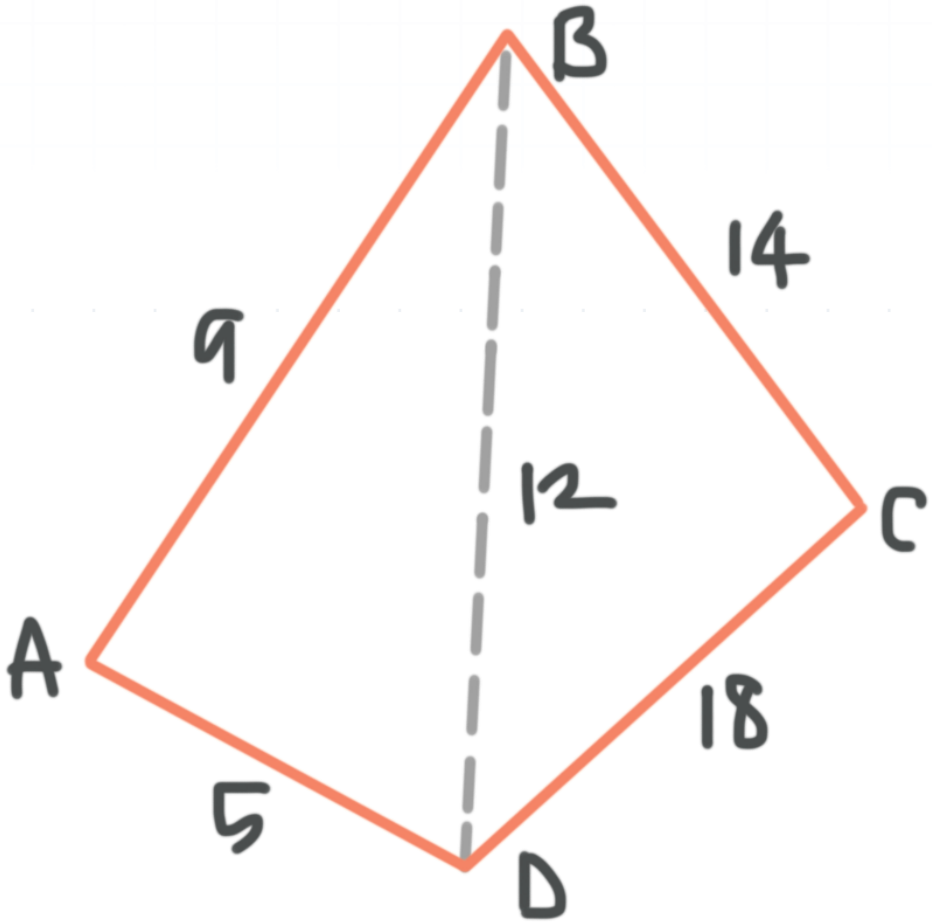
■ 4. Find the area of a triangle with side lengths 34 cm and 29 cm, if half its perimeter is 62 cm.

■ 5. An isosceles triangle (a triangle with two equal side lengths) has a half perimeter of 48 in. Its two equal sides measure 27 in each. Find the area of the triangle.

■ 6. Find the area of the quadrilateral by finding the sum of the areas of the triangles.



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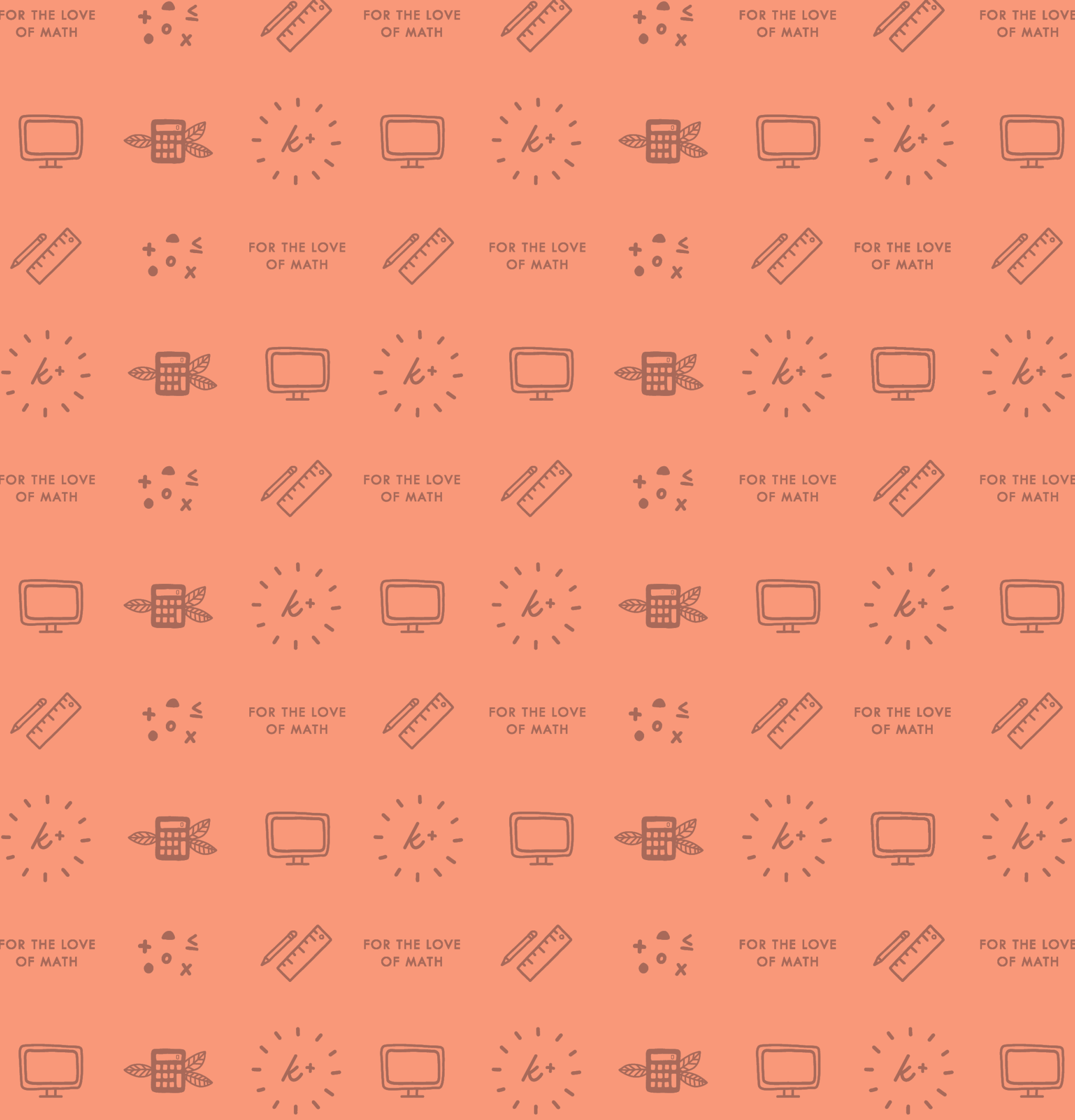

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