Math Kangaroo

Level 5-6

Ratio & Proportion

Warm Up

Instruction

a:b

Ratio & Proportion

Wrap Up

Bonus Slides

Ratio & Proportion: Warm-Up

(MK 2011 #2)

A motorcyclist drove a distance of 28 kilometers in 30 minutes. How many kilometers would he drive in one hour if he drives at the same speed?

Ratio

A ratio is a relationship between two quantities, usually expressed as the quotient of one divided by the other. Ratios can be written in three different ways: words, fractional notation, and colon notation.

Example: A pancake recipe calls for 2 cups of water to 1 cup of pancake mix. What is the ratio of water to pancake mix?

- words-> 2 to 1
- fractional notation–> $\frac{2}{1}$
- colon notation-> 2:1

Ratio

Writing Ratio as a Fraction

1. Write the first number in the ratio as the numerator.
2. Write the second number as the denominator.

Example: Write the ratio 3 to 5 as a fraction.

—

Note: The order of the numbers is very important.

The ratio 3 to 5 is —. The fraction — is incorrect.

Ratio

Simplifying Ratio

Ratios can be simplified by writing them in the lowest terms.

1. Write the ratio as a fraction.
2. Reduce the fraction to the lowest terms.
3. Rewrite the fraction as a ratio.

Example: There are 6 girls and 9 boys. Write the ratio in the simplest form.

1. Write the ratio as a fraction - > $\frac{6}{9}$

2. Reduce the fraction to the lowest terms - > $\frac{6}{9} = \frac{2}{3}$

3. Rewrite the fraction as a ratio-> 2:3

Proportion

A proportion is an equation stating that two ratios or rates are equal.

- It is written in the following form.

$$\frac{a}{b} = \frac{c}{d}$$

- The proportion can be read as "a is to b as c is to d".
- If the equation is true, then the two ratios are equivalent.

Proportion

Cross products

A cross product, also known as cross multiplying, is a technique used to determine whether a proportion is true or to solve an equation.

1. Write the proportion. $\frac{a}{b} = \frac{c}{d}$

2. Find the product of "a" and "d" and set it to equal the product of "b" and "c".

$$ad = bc$$

Note: Think of the cross product as multiplying on a diagonal across the equal sign. If the cross products are equal, then the proportion is true.

(MK 2017 #9)

1. In the time it takes Peter to solve 2 problems for the Math Kangaroo competition, Nick manages to solve 3 problems. In total, the boys solved 30 problems. How many more problems did Nick solve than Peter?

(MK 2009 #9)

2. There are cats and dogs in a room. The number of cat paws in this room is twice the number of dog noses. The number of cats is …

   (A) twice the number of dogs.

   (B) equal to the number of dogs.

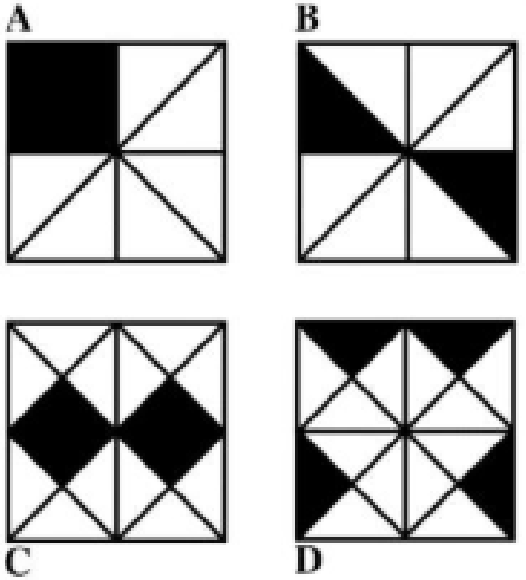
   (C) half the number of dogs.

   (D) one fourth the number of dogs.

   (E) one sixth the number of dogs.

(MK 2018 #11)

3. In which of the four squares is the ratio of the black area to the white area the largest?



(MK 1999 #13)

4. A stick that in reality measures 1 m is 2 cm long in a certain picture, and in that same picture the height of the fence is 4.5 cm. What is the actual height of the fence in cm?

(MK 1999 #16)

5. The dog is 9 times as heavy as the cat, the mouse is 20 times lighter than the cat, and the turnip is 6 times as heavy as the mouse. How many times is the dog as heavy as the turnip?

(MK 2001 #16)

6. The length of a certain rectangle is 80 cm and its area is 3200 cm^2. Find the length of another rectangle if its area and width are half the area and width of the rectangle described.

(MK 2001 #20)

7. Together, Adam, Bart, and Charlie earned 280 dollars during their vacation. Adam made twice as much money as Bart and four times as much as Charlie. How many dollars did Charlie earn?

Wrap Up

Ratio & Proportion

- A ratio is a relationship between two numbers.
- A proportion is an equation stating that two ratios or rates are equal.

When we solve problems with ratios, it is helpful to write the ratio as a fraction and then simplify it.

We can solve proportions by using cross product.

Bonus Question

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(MK 2000 #23)

The length on one side of the rectangle was increased by 10%, and the length of the other side of the rectangle was decreased by 10%. How did the area of the rectangle change?

(A) It did not change. (B) It decreased by 1%.

(C) It increased by 1%. (D) It increased by 20%. (E) It depends on the lengths of the sides.

Bonus Question

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Ratio & Proportion

(MK 2008 #26)

A train travelling at a steady speed crossed a bridge which was 200 meters long in 1 minute. The whole train passed a person standing on the bridge in 12 seconds. How long was the train?