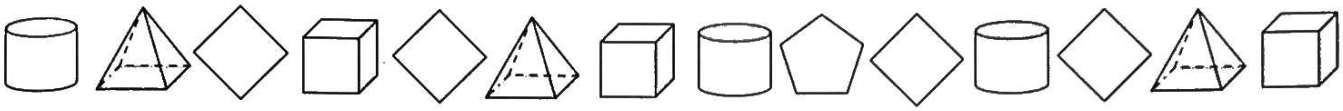
NS8-47: Introduction to Ratios

A **ratio** is a comparison of two or more numbers. A ratio of two numbers may be written in three different ways.

The ratio of squares to triangles is 2 to 3 2 : 3 $\frac{2}{3}$

When there are more than two numbers, the colon (:) notation is more general than fractions because fractions cannot be used to compare three numbers. The ratio of circles to squares to triangles is 2 : 2: 3.

1.



a) The ratio of pyramids to cubes is _____ : _____ b) The ratio of diamonds to pentagons is ____ : ____

c) The ratio of cylinders to diamonds to pyramids is _____ : _____ : _____

2. Write ratios to represent the following:

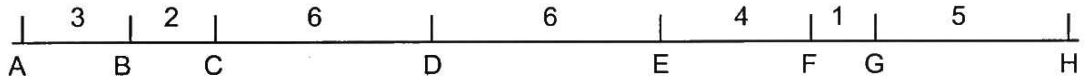
a) The total number of days in a week to the number of days in the weekend 7 : 2

b) The total number of days in a week to the number of days in October _____ : _____

3. Write the number of vowels compared to the number of consonants in the following words:

a) apple 2 : 3 b) banana ___ : ___ c) orange ___ : ___ d) grape ___ : ___

4. Write the ratio of the lengths:



a) AB to CD _____ : _____ b) BC to DE _____ : _____ c) EF to FH _____ : _____

d) EF to BC to FG _____ : _____ : _____ e) AB to GH to CD _____ : _____ : _____

5. To make punch, you need 4 L of ginger ale, 2 L of orange juice, and 3 L of mango juice. What is the ratio of ginger ale to punch?

_____

6. a) What does the ratio 2 : 5 describe?

_____

b) What does the ratio 3 : 10 describe?

_____

NS8-48: Equivalent Ratios

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A recipe for granola calls for 2 cups of raisins for every 3 cups of oats. To find out how many cups of raisins she will need for 12 cups of oats, Eschi writes a sequence of **equivalent ratios**. (She multiplies both terms in the ratio 2 : 3 by 2, then by 3, then by 4.)

$2:3 = 4:6 = 6:9 = 8:12$

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1. Starting with the given ratios, write a sequence of four ratios that are all equivalent.

   a) $2:5 = 4:10 = \quad : \quad = \quad :$

   b) $3:4 = \quad : \quad = \quad : \quad = \quad :$

   c) $4:9 =$

   d) $5:7 =$

2. a) 4 cm on a map represents 30 km. How many km do 12 cm on the map represent?

   b) Four bus tickets cost $5.50. How much will 16 tickets cost?

   c) A math test has 3 geometry questions for every 8 algebra questions. How many algebra questions are on a test with 9 geometry questions?

3. Falmataa plants 3 rows of vegetables in $\frac{1}{2}$ an hour. He wants to know how many rows of vegetables he can plant in 6 hours.

   He changes the ratio $\frac{1}{2} : 3$ to a more convenient form by doubling both terms of the ratio:

   $\frac{1}{2}$ hour : 3 walls = 1 hour : 6 walls

   Then, he multiplies each term by 6.

   1 hour : 6 walls = 6 hours : 36 walls

   Change each ratio so the number on the left is a whole number:

   a) $\frac{1}{2}$ hour : 3 km ran =

   b) $\frac{1}{3}$ cup of flour : 3 cups of milk =

   c) $\frac{1}{4}$ hour : 5 km rowed =

   HINT: For the ratios below, multiply each term by 10.

   d) .4 cup of raisins : 3 cups of oats =

   e) .3 litre of gas used : 6 km =

   f) 1.9 : .4 g) $\frac{3}{10} : \frac{2}{5}$ h) .9 : .2 : .3

4. In your notebook, solve each problem by changing the ratio into a more convenient form.

   a) Rhonda can ride her bike 4 km in $\frac{1}{4}$ of an hour. How far can she ride in 5 hours?

   b) A recipe for 12 cookies uses $\frac{1}{2}$ cup pecans and 1 cup of sugar. Angela has 3 cups of pecans. How much sugar will she need? How many cookies can she make?

NS8-49: Finding Equivalent Ratios

There are 3 boys for every 2 girls in a class of 20 children. To find out how many boys are in the class, write out a sequence of ratios. Stop when the terms of the ratio add to 20:

3 boys : 2 girls = 6 boys : 4 girls = 9 boys : 6 girls = 12 boys : 8 girls

12 boys + 8 girls = 20 kids. So there are 12 boys in the class.

1. Write a sequence of ratios to solve each problem. The first one is started for you.
   a) There are 5 boys for every 4 girls in a class of 27 children. How many girls are in the class?

      5 : 4 = 10 : 8 =

   b) There are 2 red marbles for every 7 blue marbles in a box. With 27 marbles, how many marbles are blue?

   c) A recipe for punch calls for 3 L of orange juice for every 4 L of mango juice. How many litres of orange juice are needed to make 21 L of punch?

5 subway tickets cost $4. Kyle wants to know how much 20 tickets will cost. He writes the ratio of tickets to dollars as a fraction. Then, he finds an equivalent fraction by multiplying:

Step 1:

$$\frac{4}{5} = \frac{?}{20}$$

Step 2:

$$\frac{4}{5} \overset{\times 4}{=} \frac{\quad}{20}$$

Step 3:

$$\frac{4}{5} \overset{\times 4}{=} \frac{16}{20}$$

2. Solve the following ratios. Draw arrows to show what you multiply by.

   a) $\frac{3}{4} \overset{\times 5}{=} \frac{\quad}{20}$ b) $\frac{1}{5} = \frac{\quad}{15}$ c) $\frac{3}{5} = \frac{\quad}{35}$ d) $\frac{4}{7} = \frac{\quad}{49}$

   e) $\frac{3}{8} = \frac{\quad}{24}$ f) $\frac{2}{3} = \frac{\quad}{18}$ g) $\frac{13}{20} = \frac{\quad}{100}$ h) $\frac{5}{9} = \frac{\quad}{72}$

BONUS: **NOTE: Sometimes, the arrow may point from right to left.**

3. a) $\frac{15}{\quad} \overset{\times 5}{=} \frac{3}{4}$ b) $\frac{12}{\quad} = \frac{2}{5}$ c) $\frac{15}{\quad} = \frac{3}{7}$ d) $\frac{12}{18} = \frac{\quad}{3}$

4. For each question below, you will have to reduce the fraction given before you can find the equivalent fraction. The first one has been started for you:

   a) $\frac{8}{10} = \frac{4}{5} = \frac{\quad}{15}$ b) $\frac{4}{6} = \frac{\quad}{\quad} = \frac{\quad}{15}$ c) $\frac{40}{100} = \frac{\quad}{\quad} = \frac{\quad}{45}$

   d) $\frac{15}{18} = \frac{\quad}{\quad} = \frac{\quad}{30}$ e) $\frac{70}{100} = \frac{\quad}{\quad} = \frac{\quad}{90}$ f) $\frac{50}{75} = \frac{\quad}{\quad} = \frac{\quad}{36}$

being compared: $\frac{3}{2}$

Step 3:
On the other side of an equals sign, write the *same* words, on the *same* levels:

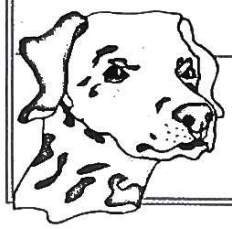
$$\begin{matrix}\text{cats} \\ \text{dogs}\end{matrix} \quad \frac{3}{2} \quad = \quad \underline{\qquad} \quad \begin{matrix}\text{cats} \\ \text{dogs}\end{matrix}$$

Write, in words, what each number stands for:

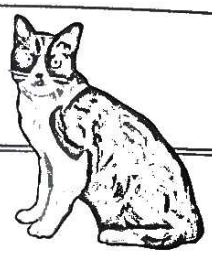
$$\begin{matrix}\text{cats} \\ \text{dogs}\end{matrix} \quad \frac{3}{2}$$

Step 4:
Re-read the question to determine which quantity (i.e. number of cats or dogs) has been given (in this case, cats) – then place that quantity on the proper level:

$$\begin{matrix}\text{cats} \\ \text{dogs}\end{matrix} \quad \frac{3}{2} \quad = \quad \underline{12} \quad \begin{matrix}\text{cats} \\ \text{dogs}\end{matrix}$$



Step 5:
Solve the ratio.



Solve the following questions in your notebook.

1. A zoo has 3 tigers for every 4 lions.
   If there are 12 lions in the zoo, how many tigers are there?

2. A list of numbers has 3 primes for every 5 composites.
   If the list has 12 primes, how many composites does it have?

3. Four bus tickets cost $7. How many bus tickets can you buy with $21?

4. An unusual deck of cards has 4 face cards for every 7 numbered cards.
   If the deck has 16 face cards, how many numbered cards does it have?

5. A basketball team won 3 out of every 5 games they played.
   They played a total of 15 games. How many games did they win?

   NOTE: The quantities are "games won" and "games played."

6. Three cm on a map represent 7 km in real life. If a lake is 35 km long, how long would it be on the map? (Here the quantities compared are cm and km).

7. A zoo has 2 mammals for every 3 reptiles and 5 birds.
   If the zoo has 12 mammals, how many reptiles and birds does it have?
   HINT: First compare mammals to reptiles and then compare mammals to birds.

1. Express each of the ratios below in **lowest terms** by dividing each term in the ratio by the same number:

a) $2 \overset{\div 2}{:} 6 \overset{\div 2}{} = 1 : 3$ b) 4 : 6 c) 10 : 15 d) 12 : 18 e) 27 : 36

Answer the questions below in your notebook.

2. Find the missing term in each expression by first reducing the ratio on the left to lowest terms:

a) 25 : 20 = 10 : ☐ b) 24 : 21 = 8 : ☐ c) 12 : 8 = 33 : ☐ d) 18 : 15 = 24 : ☐

3. Express each of the ratios in lowest terms by dividing each term in the ratio by the same number.

a) 10 : 12 : 14 b) 10 : 25 : 30 c) 6 : 15 : 21

4. The ratio of uncooked to cooked rice is 2 : 5. How much uncooked rice would you need to make 50 g of cooked rice? To make 320 mL of cooked rice?

5. The ratio of girls to boys in a class is 2 : 3. There are 12 boys in the class.

a) How many students are in the class? b) Write the ratio of girls to students in lowest terms.

6. In a scale diagram, the **scale** tells you the ratio of any dimension of the diagram to the corresponding dimension of the object.

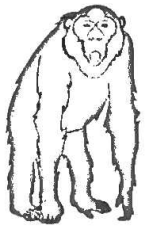


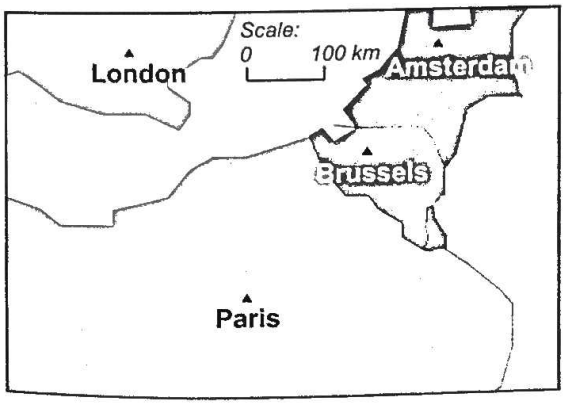
diagram A
scale: $\frac{1}{30}$

a) Measure the diagram of the monkey. The scale indicates that 1 cm in the diagram is equivalent to _____cm in real life.

b) Use a ratio to find its actual height.

7. Write a ratio to find each missing term:
NOTE: When the numerator of a scale is larger than the denominator, the drawing is larger than the actual object.

Scale	Length in Diagram	Length in Real Life
$\frac{1}{5}$	16 cm	
$\frac{1}{6}$		54 m
$\frac{7}{1}$	14 cm	



8. Find the distances between the following cities on the map and in real life:

	On map	Real
Paris – Brussels		
London – Amsterdam		
London – Paris		

1. Find the missing numbers by first drawing arrows as in a):

a) $\frac{10\text{ km}}{2\text{ h}} \xrightarrow{\div 2} \frac{5\text{ km}}{1\text{ h}}$ (= $\xrightarrow{\div 2}$ 1 h) b) $\frac{18\text{ km}}{3\text{ h}} = \frac{\text{km}}{1\text{ h}}$ c) $\frac{20\text{ m}}{8\text{ s}} = \frac{\text{m}}{2\text{ s}}$ d) $\frac{100\text{ mg}}{20\text{ mL}} = \frac{20\text{ mg}}{\text{mL}}$

e) $\frac{\$35}{7\text{ kg}} = \frac{\$5}{\text{kg}}$ f) $\frac{\$5.50}{10\text{ min}} = \frac{\$}{2\text{ min}}$ g) $\frac{\$96}{6\text{ h}} = \frac{\$32}{\text{h}}$ h) $\frac{50\text{ kg}}{20\text{ L}} = \frac{\text{kg}}{4\text{ L}}$

Answer the remaining questions in your notebook.

2. Find the missing numbers by first writing each ratio in fraction form:

a) 40 : 8 = 5 : ☐ b) 72 : 18 = ☐ : 3 c) 54 : 9 = ☐ : 6 d) 66 : ☐ = 44 : 4

In a **unit rate** one of the terms is equal to one.

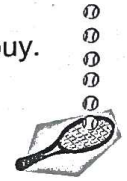
3. Find the unit rate for each rate by reducing the ratio to lowest terms (include the units):

a) 20 km : 5 h = ☐ : 1 h b) 60¢ : 3 apples = ☐ : 1 apple c) \$30 : 2 h = ☐ : 1 h

d) 96 m : 12 s = ☐ : 1 s e) \$80 : 16 jar = ☐ : 1 jar f) \$68 : 4 kg = ☐ : 1 kg

4. Solve each problem by first changing the rate to a unit rate:
   a) Dana rode 60 km in 5 hours. How far could she ride in 8 hours?
   b) Cindy can type 60 words in 3 min. How many words can she type in 5 minutes?
   c) If 45 miles per hour is 20 m/s, how fast is 72 miles per hour in m/s?

5. Change both prices to a unit rate to find out which offer is a better buy.
   a) \$1.40 for 7 peaches or \$ 1.00 for 4 peaches.
   b) 66¢ for 3 lemons or 85¢ for 5 lemons.
   c) \$3.39 for 3 tennis balls or \$4.20 for 4 tennis balls?



6. Clare can cycle at a speed of 23 km/hr. Erin can cycle at a speed of 17 km/hr. How much further can Clare cycle in 3 hours than Erin?

7. a) A car travels 45 kilometres in half an hour. What is its average speed in km/hr?
   b) A cheetah runs 700 metres in 30 seconds. What is its average speed in km/hr?

8. Karen walked at a speed of 4 km/hr. At this rate, how far can she walk in
   a) 2 hr b) $\frac{1}{2}$ hr c) 15 minutes

9 Estimate to the nearest half hour how long it would take to drive:
   a) 254 km b) 723 km c) 1425 km