Ratio and Proportion CbC	
G7 U4, Comparing and Scaling	**Name:**

In this document, you will find tiered questions covering the following learning goals:

I can write, simplify and find equivalent forms of ratios.
I can use rate as a ratio of two quantities with different units.
I can write and solve proportions.

Colour	Questions
Green	Q1-30
Blue	Q31-48
Black	Q1 -20

You may choose either **Green** or **Blue**.

- Calculators are allowed.
- These questions should be completed as <u>independently</u> as possible.
- Answers are provided at the end of the document.

Green

Ratio

Simplify the following ratios.

1. 18 : 12
2. 60 : 150 : 210
3. 7.5 : 20
4. 6 minutes: 4 hours

5. Split 540 into the ratio of 4:5.

6. In a Maths test, 4/5 of the questions include algebra. Write the ratio of algebraic questions to non-algebraic questions in simplest form.

7. A school sends 99 students to compete in the Maths competition. Of the 99, 90 are girls. Write the ratio of girls to boys in simplest form.

Rate

In Q8-11, find the unit rate.

8. 80 miles in 4 hours
9. $17.10 for 9 apples

10. 64 students to 4 teachers
11. 400 metres in 50 seconds

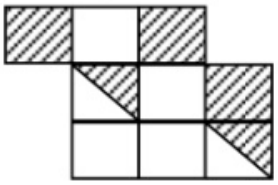
12. Ms Benson drives 95 km in 2 hours. Mr Donohue drives 210 km in 4 ½ hours. How long would it take the faster driver to travel 760 km?

13. Water is pumped at a rate of 160L in 2 h. How long will it take to pump 280 L?

14. I can buy a 1.2 kg bag of carrots for $2 or a 900 g bag for $1.44. Which is the best buy? Show your answer with clear workings.

Proportion

15. What proportion of the shape is shaded?



16. Do the following ratios form a proportion? Show at least one method.

$\frac{27}{36}, \frac{36}{48}$

Solve each proportion.

17. $\frac{x}{30} = \frac{3}{5}$

18. $\frac{2}{19} = \frac{m}{76}$

19. $\frac{24}{y} = \frac{6}{5}$

20. $\frac{7p}{45} = \frac{21}{9}$

Green Problem Solving with Ratio and Proportion

21. An employee's wages are directly proportional to the time worked. If an employee earns $120 for 8h, how much will the employee earn for 20 h?

22. A certain car used 21 gallons of petrol in 7h. If the rate of petrol use is constant, how much petrol will the car use on a 6 hour trip?

23. This distance traveled by a bus at a constant speed is directly proportional to the length of time it travels. If a bus travels 320 km in 4h, how far will it travel in 9h?

24. The number of words typed is directly proportional to the time spent typing. If a typist can type 325 words in 5 min, how long will it take the typist to type 1040 word report?

25. The ratio of two integers is 9:7. Their sum is 1024. Find the two integers.

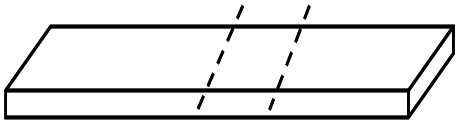
26. 12000 people attend a professional basketball game. From a small sample, you determine that the ratio of men to women is 3:2. About how many of the people attending are women?

27. The sides of a triangle are in the ratio 7 : 10 : 11. Its perimeter is 112 metres. How long is each side?

28. Mike and Steve share some money in the ratio 9:11. If Steve has $40 more than Mike, how much does Mike have?

29. Alex plays Mario Kart and Fortnite in the ratio 4:9. If he plays Fortnite 50 more times than Mario Kart, find the total number of times he plays video games.

30. A 12-foot board is cut into three pieces whose lengths are in the ratio 3:1:2. How many inches are in the length of the shortest piece? (Hint: 12 inches = 1 foot).



Blue

Ratio

31. Three bitcoins have values of $0.04, $0.40, $0.52, respectively. What is the simplified ratio?

32. Three quarters of a wall is painted blue. One third of the remaining wall is painted white, and the rest is red. What is the ratio of blue to white to red?

Rate

33. A car travels 80 k in 75 minutes. What is its speed in km/h?

34. A tap leaks at a rate of 1 pint every 2 hours for 4 full days. How many gallons of water leaked from the tap? *Note: 1 gallon = 4 quarts, 2 pints = 1 quart*

35. Usain Bolt was once clocked at 44.64 km/h.

a. How many metres per second is this?

b. Mr Brogden's scooter can travel 57 metres in 4.8 seconds. Would his scooter beat Usain Bolt in a race?

c. By how many seconds would the faster person be in a 50-metre race (to 2 d.p.)?

Proportion

Solve each proportion.

36. $\frac{x+4}{x-5}=\frac{5}{2}$

37. $\frac{3x-2}{4}=\frac{x+4}{2}$

38. $\frac{4(x+7)}{2}=\frac{2x^2+4}{x}$

39. $\frac{\frac{1}{4}}{15x}=\frac{\frac{2}{5}}{2}$

Blue Problem Solving with Ratio and Proportion

40. The sum of three numbers is 81 and their ratio is 3 : 7 : 17. What is the difference between the smallest and largest numbers?

41. The length and width of a rectangle are in the ratio 3 : 2. If the perimeter is 73 centimetres, find the length and the width.

42. Ecologists are trying to determine how many fish there are in a particular lake. They catch 100 fish from the lake, put small tags in their tails, and put them back into the lake. Several days later they catch 15 fish. They find that 2 are tagged and the other 13 are not. Assuming that the tagged to untagged fish are in the ratio 2 : 13, how many fish are in the lake (counting the 15)?

43. A recipe uses 2 eggs, 3 cups of flour and some other ingredients. The recipe makes enough batter for six servings. How many cups of flour will be needed to make enough batter for 10 servings?

44. A clock reads 5:00.

a. What is the ratio of the area on the clock's face between the two hands to the rest of the area?

b. If the total area is 132 square centimetres, what is the area between the hands?

45. Nakisha and Sanjana shared some money in the ratio 11:5. If Nakisha has $30 more than Sanjana, how much do they have altogether?

46. The ratio of the number of appetisers to desserts at a Christmas feast is 2:5. After another 40 appetisers were brought, there were two times as many appetisers as desserts. How many desserts were there?

47. There are 12 blue marbles and 12 red marbles in a jar. What is the least number of marbles that must be removed so that the ratio of blue to red marbles is 4:3?

48. In order for students to sit their exams, two halls need to be set up. The ratios of the number of chairs to the number of tables in Halls A and B are 5:2 and 6:1, respectively. The total number of chairs and tables in Hall B is three times that of Hall A. What is the ratio of the number of tables in Hall A to the number of chairs in Hall B?

Black Tier Problem Solving

1. What is the simplified ratio of the area of a circle to its circumference?

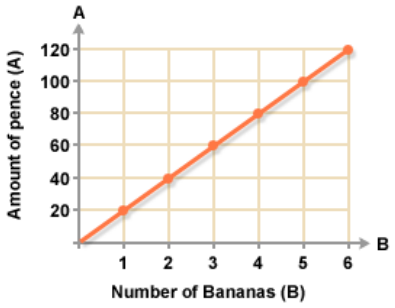
2. Darlene is 31 years old. Her sister Molly is 47. When will their ages be in the ratio 4 : 5?

3. If $a:b:c = 3:5:6$ and $c:d = 1:5$, then what is the ratio of b to d? Express your answer as a common fraction.

4. The speed of light is 670,000,000 miles per hour. How many seconds does it take light to travel 121,000,000 miles? Express your answer to the nearest second.

5. The length and width of a rectangle are in the ratio 3 : 2. If the area is 486 square centimetres, find the length and the width.

6. A is directly proportional to B, as shown in the graph. Find:
a. the unit rate
b. the equation of the line that links A and B



7. Three Quidditch ring-shaped goals have different heights. The left-hand goal and the middle goal have heights in the ratio 3:4, while the middle goal and the right-hand goal have heights in the ratio 3:2.

a. Find the ratio of the height between the left-hand and right-hand goals.

b. If the total height of the goals is 116 metres, find the height of each goal.

8. 400 students from 3 schools competed in a Mathematics competition, and 85 students failed to make it out of the first round. The ratio of number of students who passed the first round in SAS and UWC is 4:5, while the ratio of number of students who passed in Tanglin and SAS is 2:3. Find the number of students that passed in each school.

9. As a softball pitcher, Leticia's ratio of strikeouts to walks was 2:1. In the next two games she pitched, she had 10 strikeouts and allowed 10 walks, which changed her ratio of strikeouts to walks to 5:3. What is the total number of strikeouts that Leticia has thrown in all? *(Hint: try solving algebraically.)*

In Q10-13, answer each question. Some involve inverse proportion.

10. Four men lay a pipeline in 5 days. How long would 10 men take?

11. I have three cats who eat a large bag of cat food every 4 days. If I get another cat, how long will the bag of food last now?

12. Four buckets standing in a rain shower take 40 minutes to fill. How long would three buckets standing in the same rain shower take to fill?

13. Nine men build a wall in 20 days. How long will the job take 15 men?

More Advanced Problem Solving

14. The ratio of boys to girls in G7 is 9 : 7.

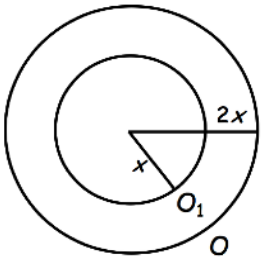
2/3 of the boys proclaim to love Mathematics.

70% of the girls proclaim to love Mathematics.

Write the ratio of students who love Mathematics to those who do not.

15. Given the proportions $\frac{a}{b}=\frac{3}{7}$ and $\frac{c}{b}=\frac{9}{14}$, what is the value of $\frac{c}{a}$? Express your answer as a common fraction.

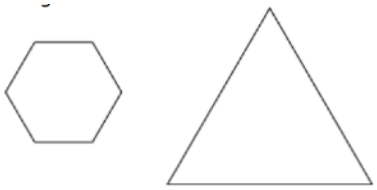
16. A wheel rotates once a second. Object two (O) is twice the distance from the center of the wheel as object one (O_1). How fast is O moving in comparison to O_1?



17. Three miners can load 350 pounds of coal in 15 minutes. How many minutes would it take two miners to load 700 pounds of coal?

18. Three 3-digit numbers are formed using the digits 1 through 9 exactly once each. The hundreds digit of the first number is 1. The tens digit of the second number is 8. The unit digit of the third number is 5. The ratio of the first number to the second number to the third number is 1:3:5, respectively. What is the sum of the three numbers?

19. What is the ratio of the area of a regular hexagon with side length 1 to that of an equilateral triangle of side length 4?
(Hint: Try breaking the figures into smaller congruent triangles, or scale one of the figures.)



20. A box contains red and black counters in the ratio 4 : 7.
The teacher picks 2 counters, without replacement.
The probability that she takes two black counters is $\frac{35}{88}$.
How many black counters are in the box?

Green Solutions

1. 3 : 2
2. 2 : 5 : 7
3. 3 : 8
4. 1 : 40
5. 240 : 300
6. 4 : 1
7. 10: 1
8. 20 miles per hour
9. $1.90 per apple
10. 16 students per teacher
11. 8 metres per second
12. 16 hours
13. 3.5 hours
14. 900 g bag for $1.44
15. $\frac{4}{9}$
16. Yes
17. x = 18
18. m= 8
19. y = 20
20. p = 15
21. $300
22. 18 gallons
23. 720 km
24. 16 minutes
25. 576 and 448
26. 4800 women
27. 28m, 40m and 44m
28. $180
29. 130 times
30. 2 feet = 24 inches

Blue Solutions

31. 1 : 10 : 13
32. 9 : 1 : 2
33. 64 km/h
34. 6 gallons
35.
a. 12.4 m/s
b. No, he scoots 11.875 m/s
c. Usain would win by 0.18 seconds
36. $x = 11$
37. $x = 10$
38. x = 2/7
39. x = 1/12
40. difference of 42
41. 21.9 cm x 14.6 cm
42. 750 fish

43. If three cups of flour make enough batter for six servings, then five (5) cups of flour will be needed to make enough batter for 10 servings. That's half a cup of flour per serving. Incidentally, 10 servings would require three and one-third eggs. Most cooks would probably double the recipe, using four eggs and six cups of flour, which would make enough batter for 12 servings.

44. a. 5:7 b. 55sq cm 45. $80 46. 25 desserts

47. 3 red marbles are the fewest that must be removed 48. 1 : 9

Black Solutions

1. $r:2$ 2. Not for another 33 years, when Darlene is 64 and Molly is 80. 3. 1 : 6

4. We know that it will take less than one hour for light to go 121,000,000 miles since it travels 670,000,000 miles in a full hour. Dividing 121 by 670, we get 0.1806 hours or 0.1806 x 60 = 10.836 minutes or 10.836 x 60 ≈ 650 seconds.

5. 27 cm x 18 cm

6. a.20 pence per banana b. A = 20B

7. a. 9 : 8 b. Left – 36 m, Middle – 48 m, Right – 32 m

8. SAS – 108, UWC – 135, Tanglin – 72

9. Prior to the last two games, Laticia's strikeouts to walks ratio was 2 : 1 or 2x strikeouts and x walks. After the last two games she had 2x + 10 strikeouts and x + 10 walks which resulted in a 5:3 ratio. So $\frac{2x+10}{x+10}=\frac{5}{3}$. By using the cross products, we have 3(2x + 10) = 5(x + 10); 6x + 30 = 5x + 50; x = 20. To find the number of strikeouts that Laticia has thrown, we need to evaluate 2x + 10 for x = 20. We get 2 x 20 + 10 = **50** strikeouts.

10. 2 days. 11. 3 days 12. 40 minutes 13. 12 days 14. 109 : 51 15. $\frac{3}{2}$

16. Let x be the distance from the center of the wheel O_1. In one second O_1 goes a distance $2\pi x$. The distance O goes in the same second is $4\pi x$, or twice the distance O_1 goes. Hence, O goes twice the speed of O_1.

17. If three miners can load 350 pounds in 15 minutes, then three miners can load 2 • 350 = 700 pounds in 2 • 15 = 30 minutes. Then, 1 miner can load 700 pounds in 3 • 30 = 90 minutes, and 2 • 1 = 2 miners can load 700 pounds in 90 ÷ 2 = **45 minutes**. Remember, double the number of miners can load double the number of pounds in the same time, or double the number of miners can load the same number of pounds in half the time.

18. After filling in the 1, 5 and 8, the ratio tells us the units digits of the first two numbers are 3 and 9 or 9 and 7; the hundreds digit of the second number is 3 or 4; and the hundreds digit of the third number is then 6 or 7 (5, 8 and now 9 are already used). By trial and error we find that the first number is 129, the second is 387 and the third is 645. Their sum is **1161**.

19. 3 : 8 20. 21 black counters