

7 ESSENTIAL QUESTIONS TO MASTER

RATIO & RATE

1	A playpen contains red, blue and yellow balls. The ratio of red to blue balls is 3:5 and the ratio of blue to yellow balls is 7:2. If 20 blue balls are added, the ratio of red to blue balls will become 7:15. Calculate the number of yellow balls in the playpen.	[3]
2	A car travels 75 km at a speed of 60 km/h from Town A to Town B. (a) Express this speed in m/s. (b) Find the time taken for the car to travel from Town A to Town B in minutes and seconds. (c) The car then travelled 45 km from Town B to Town C in 42 minutes 30 seconds. Find the average speed of the car in km/h, for its journey from Town A to Town C. Correct your answer to 3 significant figures.	[3] [3] [4]
3	David is traveling from the United States to Europe. In the United States, the exchange rate is 1 US Dollar = 0.92 Euros. In Europe, the exchange rate is 1 Euro = 1.08 US Dollars. David wants to exchange 500 US Dollars into Euros. By showing your working clearly, justify whether he should change the money in the United States or Europe.	[2]
4	Adam, Ben, and Cayden share a sum of money. The ratio of Adam's money to Ben's is in the ratio 2:7. Cayden has 2 times the money that Ben has. (a) Find the ratio of Adam's money to Ben's money to Cayden's money. (b) If Cayden has \$75 more than Adam, find the total amount of money the three of them have.	[2] [2]
5	Sarah drives at an average speed of y km/h for 45 minutes and then for another 15 minutes at an average speed of $1.5y$ km/h. (a) Find the distance travelled, in km, in the first 45 minutes. Give your answer in terms of y . (b) Show that the total distance travelled for the whole journey is $1.125y$ km. (c) Given that the average speed for the entire journey was 100 km/h, form an equation in y and solve the equation. (d) Sarah says that she will reach her destination earlier if she drives at a constant speed of 100 km/h. Is her statement reasonable? Explain your answer.	[1] [1] [4] [2]
6	The ration of $X : Y$ is $0.8 : 0.05$ and the ration of $Y : Z$ is $4 : 3$. Find the ration of $X : Y : Z$	[3]
7	Company A produces a rectangular rug with dimensions 40 cm by 30 cm. Customers request that the dimensions of a new rectangular rug be increased in the ratio of 6:5. Find: (a) the length and width of the new rectangular rug, Length = Width = (b) the ratio of the perimeter of the original rectangular rug to the new rectangular rug.	[2] [3]

Answer Key:

1	Original red: blue: yellow =21:35:10 New red: blue 21:45 45-35=10 units =20 balls Number of yellow balls =10 units =20 Ans: 20	
2	(a) $60 \text{ km/h} = 60 \text{ km/h} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ h}}{3600 \text{ s}} = 60 \times \frac{1000}{3600} \text{ m/s} = 16.67 \text{ m/s} = 16.7 \text{ m/s}$ (b) $\text{Time} = \frac{75 \text{ km}}{60 \text{ km/h}} = \frac{75}{60} \text{ h} = 1.25 \text{ h}$ $1.25 \text{ h} = 1.25 \times 60 \text{ minutes} = 75 \text{ minutes}$ (c) First, find the total distance traveled: Town A to Town B (75 km) + Town B to Town C (45 km) = 120 km Find the total time taken: Town A to Town B (75 minutes) + Town B to Town C (42 minutes 30 seconds) = 117 minutes 30 seconds = 1 hour 57 minutes 30 seconds = 1.958 hours $\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{120 \text{ km}}{1.958 \text{ h}} = 61.28 \text{ km/h}$ Correcting to 3 significant figures: 61.3 km/h	
3	Let's calculate how many Euros (EUR) David would receive in each location: Option 1: Exchange in the United States Using the exchange rate in the US: 1 USD = 0.92 EUR $500 \text{ USD} \times 0.92 \text{ EUR/USD} = 460 \text{ EUR}$ Option 2: Exchange in Europe Using the exchange rate in Europe: 1 EUR = 1.08 USD We need to convert this to find how many EUR he gets per USD: $1 \text{ USD} = \frac{1}{1.08} \text{ EUR} = 0.926 \text{ EUR}$ Now we can calculate: $500 \text{ USD} \times 0.926 \text{ EUR/USD} = 463 \text{ EUR}$ Comparison and Conclusion - In the United States: David gets 460 EUR - In Europe: David gets 463 EUR - Difference: 463 - 460 = 3 EUR Based on these calculations, David should exchange his money in Europe because he will receive 3 EUR more than if he exchanges it in the United States. Therefore, the correct answer is: David should exchange his money in Europe because he	

	will receive 463 Euros compared to 460 Euros in the United States.	
4	(a) Given: The ratio of Adam's money to Ben's money is 2:7 Cayden has 2 times the money that Ben has Let's denote: Adam's money = $2k$ (for some value) Ben's money = $7k$ (for the same value) Cayden's money = $2 \times 7k = 14k$ Therefore, the ratio of Adam's money to Ben's money to Cayden's money is: $2k : 7k : 14k = 2 : 7 : 14$ We can simplify this by dividing all terms by their greatest common divisor (GCD = 1): $2:7:14$ (b) If Cayden has more than Adam, find the total amount of money the three of them have. Given that Cayden has \$75 more than Adam: $14k - 2k = 75$ $12k = 75$ $k = 75 \div 12 = 6.25$ Now we can calculate each person's amount: Adam's money = $2k = 2 \times 6.25 = \\$12.50$ Ben's money = $7k = 7 \times 6.25 = \\$43.75$ Cayden's money = $14k = 14 \times 6.25 = \\$87.50$ Total amount of money = $\\$12.50 + \\$43.75 + \\$87.50 = \\$143.75$	
5	(a) $y \text{ km/h} \times \frac{45}{60} \text{ h} = 0.75y \text{ km}$ (b) $1.5y \text{ km/h} \times \frac{15}{60} \text{ h} = 0.375y \text{ km}$ $0.75y + 0.375y = 1.125y \text{ km}$ $100 = \frac{1.125y}{(45 + 15)/60} = \frac{1.125y}{1}$ $1.125y = 100$ $y = 88.89 \text{ km/h}$ (c) Analyze whether driving at a constant speed of 100 km/h would be faster. Current journey: Variable speeds for 1 hour, covering $1.125y = 1.125 \times 88.89 = 100 \text{ km}$ Constant speed journey: 100 km/h for $\frac{100}{100} = 1 \text{ hour}$ Both journeys take the same time, so Sarah's statement is not reasonable.	
6	The ration of X : Y is 0.8 : 0.05 and the ration of Y : Z is 4 : 3. Find the ration of X : Y : Z 1. Simplify the first ration (X:Y): • $X : Y = 0.8 : 0.05$ • Multiply both side by 100 to remove decimals $X : Y = 80 : 5$ • Divide both sides by 5 to simplify : $X : Y = 16 : 1$	

	2. Express both ratios with a common term (Y): - We have $X : Y = 16 : 1$ and $Y : Z = 4 : 3$ - To make the Y values the same, Multiply the first ratio by 4 : $X : Y = 16 * 4 : 1 * 4 = 64 : 4$ - Now we have $X : Y = 64 : 4$ and $Y : Z = 4 : 3$ 3. Combine the ratios: - Since the Y values are now the same, we can combine the ratios $X : Y : Z = 64 : 4 : 3$ Answer $X : Y : Z = 64 : 4 : 3$	
7	Company A produces a rectangular rug with dimensions 40 cm by 30 cm. Customers request that the dimensions of a new rectangular rug be increased in the ratio of 6:5. Find: (a) the length and width of the new rectangular rug, - The dimensions are increased in the ratio of 6 : 5. This means the new length is $\frac{6}{5}$ times the original length, and the new width $\frac{6}{5}$ times the original width Length = $\frac{6}{5} * 40 \text{ cm} = 48 \text{ cm}$ Width = $\frac{6}{5} * 30 \text{ cm} = 36 \text{ cm}$ (b) the ratio of the perimeter of the original rectangular rug to the new rectangular rug. 1. Calculate the perimeter of the original rug: - Perimeter = $2 * (\text{length} + \text{width}) = 2 * (40 \text{ cm} + 30 \text{ cm}) = 2 * 70 \text{ cm} = 140 \text{ cm}$ 2. Calculate the perimeter of the new rug: - Perimeter = $2 * (\text{length} + \text{width}) = 2 * (48 \text{ cm} + 36 \text{ cm}) = 2 * 84 \text{ cm} = 168 \text{ cm}$ 3. Find the ratio of the original perimeter to the new perimeter: - Ratio = $140 : 168$ - Simplify the ratio by dividing both sides by their greatest common divisor, which is 28: - Ratio = $\frac{140}{28} : \frac{168}{28} = 5 : 6$	