

GCSE (9–1) MATHEMATICS

Foundation Check In - 4.01 Approximation and estimation

Do questions 1 – 8 without a calculator.

Round the following to an appropriate degree of accuracy.

1. Annual tax calculation of £2153.6752.
2. Average speed of a car journey of 38.241 km/h.
3. If $x = 3.74$ rounded to 3 significant figures, what is the error interval for x ?
4. If the speed of a bus, b , is given as 43.7 km/h truncated to 1 decimal place, what is the error interval for b ?
5. The surface area of an object is given by the formula $A = \pi r \left(10r + \sqrt{r^2 + d^2} \right)$. Estimate the value of A correct to 1 significant figure if $r = 3.08$ cm and $d = 3.87$ cm.
6. Write an appropriate estimation to show that $\left(\frac{2.9}{2.2 \times 2.6} \right)^2 \approx 0.25$.
7. Explain why $\sqrt{\frac{11.72 \times 19.93}{2.15^2}}$ is slightly greater than 7.
8. A TV report claimed that an accident on a motorway had caused a 3 km queue of 750 cars. Given that the average length of a car is 4.17 m, explain whether the report overestimated or underestimated the number of cars in the queue.
9. The number of people who attended a concert was reported as 25 000, correct to 2 significant figures. If tickets cost £50 per person, what would be the **minimum** possible income from ticket sales?
10. A petrol pump display truncates the number of litres to 2 decimal places. If one litre of petrol costs £1.019 and the pump display indicates that 32.00 litres of petrol has been dispensed, what would be the **maximum** cost of the petrol? Give your answer to an appropriate degree of accuracy.

Extension (Do not use a calculator)

There are 7430 cinemas in the UK, and every day an average of 280 people visit each cinema. A recent newspaper article claimed that over 4% of the UK population visited a cinema every day. Given that the UK population is around 64.1 million, is this article fair? Show your working to explain your decision.



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Answers

1. £2154 to the nearest pound (£2153.68 to the nearest penny)
2. 38 km/h (accept 40 km/h)
3. $3.735 \leq x < 3.745$
4. $43.7 \leq b < 43.8$
5. 315 cm^2
6. $\left(\frac{3}{2 \times 3}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$
7. $\sqrt{\frac{10 \times 20}{2^2}} = \sqrt{\frac{200}{4}} = \sqrt{50}$ and $\sqrt{50} \approx \sqrt{49}$
8. $\approx 3000 \div 4 = 750$ cars, but the average car length is greater than 4 m so the number of cars has been overestimated. In addition, there will be gaps between the cars so there will be fewer cars in the queue.
9. $24500 \times \text{£}50 = \text{£}1225000$
10. £32.62

Extension

Cinema visits per day $\approx 7000 \times 300 = 2100000$
4% of the UK population $\approx 60000000 \div 100 \times 4 = 2400000$

The article is not fair. The percentage of the population visiting cinemas every day has been overestimated.

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AO1	1	Round to an appropriate degree of accuracy			
AO1	2	Round to an appropriate degree of accuracy			
AO1	3	Use inequality notation to write the error interval of a rounded value			
AO1	4	Use inequality notation to write the error interval of a truncated value			
AO1	5	Substitute appropriate approximate values into a formula			
AO2	6	Use appropriate approximations to check an answer			
AO2	7	Use appropriate approximations to make an estimation of a complex calculation			
AO2	8	Use appropriate approximations to estimate an answer to a problem			
AO3	9	Use limits of accuracy to solve a problem in context			
AO3	10	Use limits of accuracy to solve a problem in context, rounding the answer to an appropriate degree of accuracy			

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