# Higher Check In - 4.01 Approximation and estimation

1. Truncate 9.87635 m/s2 to 2 decimal places and state the error interval.
2. A calculator displays the answer 10.61428042 to the calculation .

Round the answer to an appropriate degree of accuracy.

1. If  and  correct to 1 decimal place, calculate the maximum value of 
2. Find the range of possible values for a length of cable measuring 24.3 m to the nearest 10 cm. Give the answer as an inequality.
3. A rectangular garden measures 11.5 m by 14.8 m to 3 significant figures. What is the lower bound of the length of the diagonal?
4. Write an appropriate estimate to show that .
5. Explain why the error interval of 400 cars to the nearest 50 cars could be written as  or .
6. Tom bought one tonne of sugar, correct to the nearest kilogram for £2200.

He repackages the sugar to sell at £1.10 per 500 grams.

Explain why he may make a loss if his scales are only correct to the nearest 10 grams.

1. Calculate the maximum area of a circle enclosed by a rope of 18.5 m, measured to 3 significant figures.
2. The table below gives the personal best times for a m relay team.

| Team Member | Terry | Marvin | Kazim | Han |
| --- | --- | --- | --- | --- |
| Personal Best | 48 seconds | 56 seconds | 51 seconds | 54 seconds |

All measurements are given to 2 significant figures. Find the maximum and minimum average speed for the team.

**Extension (Do not use a calculator)**

A West End theatre group are performing a show twice a day, every day for the month of July at a local theatre.

The theatre has the following range of seating price options:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Stalls | Dress Circle | Upper Circle |
| Afternoon show price | £37.50 | £28.50 | £19.50 |
| Evening show price | £51.50 | £37.50 | £22.50 |

There are 27 rows of 32 seats in the dress circle. The dress circle has half the number of seats as the stalls and the upper circle has a third of the number of seats as the dress circle.

A journalist from the local news interviewed the manager of the theatre. The manager was reported to say that the show had sold out in July and broken their £10 million box office record.

Show your working to explain whether you agree or disagree with the manager.

Answers

1. 9.87 m/s2, 
2. 10.614 (3 dp) (Answer need be no more accurate than the original values in the calculation)
3. 0.438 (3 sf)
4. 
5. 18.7 m
6. 
7. Cars are discrete data so 424 is the maximum number of cars. However, there is no possible number the value can take between 424 and 425, so  is also appropriate.
8.  which is less than £2200.
9. 27.4 m2
10. Maximum m/s, minimum m/s

**Extension**

No, I don’t agree with the manager as approximately £9 million of sales income would be generated.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Number of Seats | Tickets Sold Per Day | Tickets Sold in July |
| Dress Circle | 30 × 30 = 900 | 900 × 70 = £63 000 |  |
| Stalls | 900 × 2 = 1800 | 2000 × 90 = £180 000 |  |
| Upper Circle | 900 ÷ 3 = 300 | 300 × 40 = £12 000 |  |
| Total |  | £255 000 or £270 000 | £300 000 × 30 = £9 000 000 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |  | **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |
| AO1 | 1 | Use inequality notation to write the error interval of a truncated value |  |  |  |  | AO1 | 1 | Use inequality notation to write the error interval of a truncated value |  |  |  |
| AO1 | 2 | Round to an appropriate degree of accuracy |  |  |  |  | AO1 | 2 | Round to an appropriate degree of accuracy |  |  |  |
| AO1 | 3 | Calculate upper bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |  | AO1 | 3 | Calculate upper bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |
| AO1 | 4 | Use inequality notation to write the error interval of a rounded value |  |  |  |  | AO1 | 4 | Use inequality notation to write the error interval of a rounded value |  |  |  |
| AO1 | 5 | Calculate lower bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |  | AO1 | 5 | Calculate lower bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |
| AO2 | 6 | Use appropriate approximations to make an estimation of a complex calculation |  |  |  |  | AO2 | 6 | Use appropriate approximations to make an estimation of a complex calculation |  |  |  |
| AO2 | 7 | Understand the difference between error bounds for discrete and continuous quantities |  |  |  |  | AO2 | 7 | Understand the difference between error bounds for discrete and continuous quantities |  |  |  |
| AO2 | 8 | Use appropriate upper and lower bound values in a calculation set in a context |  |  |  |  | AO2 | 8 | Use appropriate upper and lower bound values in a calculation set in a context |  |  |  |
| AO3 | 9 | Use appropriate upper bound values in calculations using geometric formulae |  |  |  |  | AO3 | 9 | Use appropriate upper bound values in calculations using geometric formulae |  |  |  |
| AO3 | 10 | Use appropriate upper and lower bound values in compound measure calculations |  |  |  |  | AO3 | 10 | Use appropriate upper and lower bound values in compound measure calculations |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
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| AO1 | 3 | Calculate upper bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |  | AO1 | 3 | Calculate upper bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |
| AO1 | 4 | Use inequality notation to write the error interval of a rounded value |  |  |  |  | AO1 | 4 | Use inequality notation to write the error interval of a rounded value |  |  |  |
| AO1 | 5 | Calculate lower bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |  | AO1 | 5 | Calculate lower bound of a calculation using measurements rounded to a known degree of accuracy |  |  |  |
| AO2 | 6 | Use appropriate approximations to make an estimation of a complex calculation |  |  |  |  | AO2 | 6 | Use appropriate approximations to make an estimation of a complex calculation |  |  |  |
| AO2 | 7 | Understand the difference between error bounds for discrete and continuous quantities |  |  |  |  | AO2 | 7 | Understand the difference between error bounds for discrete and continuous quantities |  |  |  |
| AO2 | 8 | Use appropriate upper and lower bound values in a calculation set in a context |  |  |  |  | AO2 | 8 | Use appropriate upper and lower bound values in a calculation set in a context |  |  |  |
| AO3 | 9 | Use appropriate upper bound values in calculations using geometric formulae |  |  |  |  | AO3 | 9 | Use appropriate upper bound values in calculations using geometric formulae |  |  |  |
| AO3 | 10 | Use appropriate upper and lower bound values in compound measure calculations |  |  |  |  | AO3 | 10 | Use appropriate upper and lower bound values in compound measure calculations |  |  |  |