Estimation and Geometry

Practice Worksheet (Problem Solving)

I Do

A theatre has 49 rows of seats. Each row has 31 seats.

The price of a ticket is £19.80.

Estimate the total money from ticket sales when all the seats are sold.
Show clearly how you have rounded the numbers.

(Total for Question is 2 marks)

We Do

A football stadium has 104 sections. Each section has 295 seats.

The price of a ticket is £48.50.

Estimate the total money from ticket sales when all the seats are sold.
Show clearly how you have rounded the numbers.

(Total for Question is 2 marks)

You Do 1

A cinema has 18 screens. Each screen has 112 seats.

The price of a ticket is £8.95.

Estimate the total money from ticket sales when all the seats are sold.
Show clearly how you have rounded the numbers.

(Total for Question is 2 marks)

You Do 2

A concert hall has 41 rows of seats. Each row has 88 seats.

The price of a ticket is £31.20.

Estimate the total money from ticket sales when all the seats are sold.
Show clearly how you have rounded the numbers.

(Total for Question is 2 marks)

You Do 3

A train has 11 carriages. Each carriage has 78 seats.

The price of a ticket is £104.50.

Estimate the total money from ticket sales when all the seats are sold.
Show clearly how you have rounded the numbers.

(Total for Question is 2 marks)

Challenge 1

Exam Formula:
The volume of a cylinder with base radius r and height h is $\pi\mathbf{r^2h}$.

A solid cylinder has a radius of 4.8 cm and a height of 9.7 cm.

By rounding each number to 1 significant figure, estimate the volume of the cylinder.
Use the approximation $\pi \approx 3$ in your calculation.
Show your working clearly.

(Total for Question is 3 marks)

Challenge 2

Exam Formula:
The volume of a sphere with radius r is $\frac{4}{3}\pi\mathbf{r^3}$.

A solid sphere has a radius of 3.8 cm.

By rounding each number to 1 significant figure, estimate the volume of the sphere.
Use the approximation $\pi \approx 3$ in your calculation.
Show your working clearly.

(Total for Question is 3 marks)

Extreme Challenge

Exam Formula:
The curved surface area of a cone with base radius r and slant height l is $\pi\mathbf{rl}$.

A solid cone has a base radius of 9.8 cm and a slant height of 20.4 cm.

By rounding each number to 1 significant figure, estimate the **total surface area** of the solid cone.
Use the approximation $\pi \approx 3$ in your calculation.
You must show all your working clearly.

(Total for Question is 4 marks)

Worked Answers

I Do

$49 \approx 50$, $31 \approx 30$ and £19.80 ≈ £20.
Estimated seats $= 50 \times 30 = 1500$.
Estimated ticket sales $= 1500 \times$ £20 = **£30,000**.

We Do

$104 \approx 100$, $295 \approx 300$ and £48.50 ≈ £50.
Estimated seats $= 100 \times 300 = 30{,}000$.
Estimated ticket sales $= 30{,}000 \times$ £50 = **£1,500,000**.

You Do 1

$18 \approx 20$, $112 \approx 100$ and £8.95 ≈ £9 (to 1 significant figure).
Estimated seats $= 20 \times 100 = 2000$.
Estimated ticket sales $= 2000 \times$ £9 = **£18,000**.

You Do 2

$41 \approx 40$, $88 \approx 90$ and £31.20 ≈ £30.
Estimated seats $= 40 \times 90 = 3600$.
Estimated ticket sales $= 3600 \times$ £30 = **£108,000**.

Worked Answers

You Do 3

$11 \approx 10$, $78 \approx 80$ and £104.50 $\approx$ £100.
Estimated seats $= 10 \times 80 = 800$.
Estimated ticket sales $= 800 \times$ £100 $=$ **£80,000**.

Challenge 1

Round r $= 4.8$ cm to 5 cm and h $= 9.7$ cm to 10 cm.
$V = \pi r^2 h$, using $\pi \approx 3$.
$V \approx 3 \times 5^2 \times 10 = 3 \times 25 \times 10 =$ **750 cm^3**.

Challenge 2

Round r $= 3.8$ cm to 4 cm.
$V = (4/3)\pi r^3$, using $\pi \approx 3$.
$V \approx (4/3) \times 3 \times 4^3 = 4 \times 64 =$ **256 cm^3**.

Extreme Challenge

Round r $= 9.8$ cm to 10 cm and l $= 20.4$ cm to 20 cm.
Total surface area $= \pi r^2 + \pi r l$, using $\pi \approx 3$.
Base area $\approx 3 \times 10^2 = 300$ cm^2.
Curved surface area $\approx 3 \times 10 \times 20 = 600$ cm^2.
Total surface area $\approx 300 + 600 =$ **900 cm^2**.