MASENO SCHOOL

TOPIC 2: APPROXIMATION AND ERRORS

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1. The length and width of a rectangular room are 15 cm and 12 cm respectively. If each of these measurements is subject to 1.5% error, calculate the absolute error in the perimeter of the room.

2. The length and width of a rectangle are given to the nearest 0.1 cm as 18.5 cm and 12.4 cm respectively. Calculate the percentage error in the area of the rectangle.

3. The top of a table is in the shape of a regular hexagon. Each side of the hexagon measures 50.0 cm. Calculate the maximum percentage error in calculating the perimeter of the top of the table.

4. A rectangular room has length 12.0 metres and width 8.0 metres. Find the maximum percentage error in estimating the area of the room.

5. The base and the perpendicular height of a triangle are measured to the nearest centimetre as 12cm and 8cm respectively. Find:

a) The absolute error in calculating the area of the triangle

b) The percentage error in the area of the triangle. Give the answer to 1 decimal place.

6. The dimensions of a rectangle are 10cm and 15cm. If there is an error of 5% in each of the measurements, calculate the maximum percentage error in the area of the rectangle.

7. The mass of a metal is given as 14kg to the nearest 10g. Find the percentage error in this measurement.

8. Each side of a metal cube is given to the nearest centimetre as 6cm. If the mass of the cube is also given correct to the nearest 100g as 7.2kg;

a) State the limits within which its density lie.

b) Calculate the relative error in the density of the cube.

9. A carpenter has a 3 metre long piece of timber that he wishes to cut into 7 equal pieces. He approximates $\frac{3}{7}m$ to 0.42m. Calculate the percentage error in this approximation.

10. The height of a rectangular tank is exactly 5 metres. If the dimensions of its base are given correct to one decimal place as 2.5m by 1.8m, calculate the limits in litres within which its capacity lie.

11. The length and width of a rectangular floor are given as 3.8m and 3.2m respectively. The dimensions are given with 1.5% and 2% of error respectively. Find the range within which the area of this floor lie.

12. An athlete runs a distance of 100 metres measured to the nearest 10 centimetres in 12 seconds measured to the nearest 1 second. Calculate her maximum and minimum speed.

13. The radius of a cylindrical tin is exactly 4.2cm while its height is given correct to the nearest centimetre as 10cm. Taking π to be $\frac{22}{7}$, calculate the maximum relative error in the volume of the tin.

14. The minor sector of a circle centre O and radius 5.4cm measured to the nearest 0.1cm subtends an angle of exactly 1.2 radians. Calculate the maximum absolute error in calculating:

a) The perimeter of the sector

b) The area of the sector

15. The radius of a spherical ball is 2.5cm correct to one decimal place. Calculate the percentage error in calculating the surface area of the ball.

16. Calculate the percentage error when $2.777\ldots$ is truncated to 3 significant figures.

17. By correcting each number to one significant figure, approximate the value of 785×0.004 hence calculate the percentage error arising from this approximation.

18. Find the exact value of $1.\dot{8}\times\frac{3}{17}$ hence calculate the percentage error when $1.\dot{8}$ is truncated to 1 decimal place in the operation.

19. Given that $6\le x\le 8$ and $2\le y\le 5$, find the range within which $\frac{x+y}{x-y}$ lies.

20. If $A=2.3,\ B=8.7$ and $C=2.2$, find the percentage error in evaluating $\frac{A+B}{C}$

Answers

1. 0.81
2. 0.6735%
3. 0.1
4. 1.044%
5. 5, 10.4%
6. 10.25%
7. $\frac{1}{28}\simeq 0.03571\%$
8. $26.05\le\rho\le 43.58$
0.2631
9. 2%
10. $21437.5\le C\le 23587.5$
11. $11.738048\le A\le 12.589248$
12. 7.996m/s
13. 0.05
14. (a) 0.46 (b) 0.3255
15. 4%
16. 0.28%
17. 1.911%
18. $4\frac{12}{17}\simeq 4.706\%$
19. $1\frac{1}{3}\le\frac{x+y}{x-y}\le 13$
20. $4.844\le\frac{A+B}{C}\le 5.163$