Measurement error: 10 practice questions

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Name: _____ Date: _____

Attempt all questions and show your working. Suggested time: 15 to 20 minutes.

Section A: Consolidating (Questions 1-4)

Question 1

In this test, absolute error = the difference between the measured value and the true value, relative error = (absolute error)/(true value), and percentage error = relative error × 100%.

The true length of a piece of timber is 50 cm. Jack measures it as 48 cm. What is the absolute error in Jack's measurement?

Question 2

A ruler is marked in millimetres, so lengths are measured to the nearest millimetre.

(a) What is the largest possible absolute error in a measurement made with this ruler?

(b) A pencil is measured as 12.4 cm to the nearest millimetre. Between what two lengths does its true length lie?

Question 3

Write each relative error as a percentage error.

(a) 0.04

(b) 0.125

Question 4

A bag of rice has a true mass of 200 g. A kitchen scale shows 205 g. Find:

(a) the absolute error

(b) the relative error, as a decimal

(c) the percentage error

Section B: Standard (Questions 5-10)

Question 5

Draw and complete a table with these headings for the three measurements below: true value, measured value, absolute error, relative error, percentage error.

Item	True value	Measured value
Desk length	80 cm	78 cm
Bottle of juice	2.5 L	2.4 L
Walking track	1200 m	1260 m

Question 6

Jo's mass is 64 kg on an accurate scale at the doctor's, but her bathroom scale shows 62.4 kg. Find the percentage error of the bathroom scale.

Question 7

Two measurements are made.

Measurement A: a 4.0 cm bolt is measured as 4.2 cm.

Measurement B: a 250 m running track is measured as 255 m.

(a) Which measurement has the larger absolute error?

(b) Find the percentage error of each measurement.

(c) Which measurement is more accurate? Explain.

Question 8

Ella's height is recorded as 172 cm, correct to the nearest centimetre.

(a) Write the smallest and largest values her true height could be.

(b) Find the largest possible percentage error, using 172 cm as the value, correct to two decimal places.

Question 9

A race time is shown on a stopwatch as 12.43 seconds, which is correct to the nearest hundredth of a second. What is the largest possible absolute error?

Question 10

At a school fete, Sam estimates there are 300 jellybeans in a jar. The true number is 250. Find the percentage error in Sam's estimate.

Measurement error: answers

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Question 1

Answer: 2 cm

Question 2

Answer: (a) 0.5 mm (half the smallest unit) (b) Between 12.35 cm and 12.45 cm

Question 3

Answer: (a) 4% (b) 12.5%

Question 4

Answer: (a) 5 g (b) 0.025 (5/200) (c) 2.5%

Question 5

Answer: Desk: 2 cm, 0.025, 2.5%. Juice: 0.1 L, 0.04, 4%. Track: 60 m, 0.05, 5%.

Question 6

Answer: 2.5% ((1.6)/(64) × 100)

Question 7

Answer: (a) B (5 m compared with 0.2 cm) (b) A: 5%, B: 2% (c) B, because its percentage (relative) error is smaller, even though its absolute error is larger.

Question 8

Answer: (a) 171.5 cm and 172.5 cm (b) 0.29% ((0.5)/(172) × 100)

Question 9

Answer: 0.005 seconds

Question 10

Answer: 20% (50/250 × 100)