

Name

Date

GCSE Mathematics 9-1

APPLYING UPPER AND LOWER BOUNDS



Instructions

- Use black ink or ball-point pen.
- Fill in the boxes at the top of this page with your name and date number.
- Answer all questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- You must show all your working.
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- Calculators may **not** be used.

Information

- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

1 The volume, V of a cone is given by $V = \frac{1}{3} \pi r^2 h$

The radius $r = 4.2$ cm correct to 1 decimal place

The height $h = 12$ cm correct to the nearest cm

(i) Write down the upper bound of r

.....
(1)

(ii) Write down the lower bound of V

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

2 The area, A , of a cone is given by $A = \frac{1}{2} b h$

The base $b = 13.6$ cm correct to 1 decimal place

The height $h = 9.5$ cm correct to 1 decimal place

(i) Write down the upper bound of b

.....
(1)

(ii) Write down the upper bound of A

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

3 The density, d of a cone is given by $d = \frac{m}{V}$

The mass $m = 120$ g correct to the nearest gram

The volume $V = 60 \text{ cm}^3$ correct to the nearest cm^3

(i) Write down the upper and lower bound of m

upper bound:

lower bound:

(2)

(ii) Write down the upper bound of d

Give your answer to 3 significant figures

.....
(4)

Total (6 marks)

4 The speed, S , of a cone is given by $S = \frac{D}{T}$

The distance $D = 2.4$ km correct to 2 significant figures

The time $T = 180$ s correct to the nearest second

(i) Write down the lower bound of D

.....
(1)

(ii) Write down the upper bound of S

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

5 The surface area, A , of a sphere is given by $A = 4\pi r^2$

The radius $r = 6.0$ cm correct to 1 decimal place

(i) Write down the upper bound of r

.....
(1)

(ii) Find the upper bound of A

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

6 The kinetic energy E of a moving object is given by $E = \frac{1}{2}mv^2$

The mass $m = 75$ kg to the nearest kg

The velocity $v = 12.3$ m/s correct to 1 decimal place

(i) Write down the lower bound of v

.....
(1)

(ii) Write down the upper bound of E

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

7 The pressure P is given by $P = \frac{F}{A}$

The force $F = 350$ N correct to the nearest 10 N

The area $A = 2.8$ m² correct to 2 significant figures

(i) State the lower bound of A

.....
(1)

(ii) Find the lower bound of P

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

8 The circumference C of a circle is given by $C = 2\pi r$

The radius $r = 7.4$ cm correct to 1 decimal place

(i) Write down the lower bound of r

.....
(1)

(ii) Calculate the upper bound of C

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

9 The momentum p is given by $p = mv$

The mass $m = 4.5$ kg correct to 2 significant figures

The velocity $v = 16$ m/s correct to the nearest m/s

(i) Write down the lower bound of m

.....
(1)

(ii) Calculate the upper bound of p

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

10 The volume V of a cylinder is given by $V = \pi r^2 h$

The radius $r = 5.0$ cm correct to 1 decimal place

The height $h = 20$ cm correct to the nearest cm

(i) Write down the upper bound of r

.....
(1)

(ii) Calculate the lower bound of V

Give your answer to 3 significant figures

.....
(4)

Total (5 marks)

- 11** The force F acting on an object is given by $F = ma$

where m is the mass in kilograms and a is the acceleration in m/s^2

$m = 48.2$ correct to 1 decimal place

$a = 3.5$ correct to 2 significant figures

Write down the upper bound of F

.....
(4)

Total (4 marks)

- 12** The kinetic energy E of a moving ball is given by $E = \frac{1}{2}mv^2$

where m is the mass in kilograms and v is the velocity in m/s

$m = 1.8$ correct to 2 significant figures

$v = 6.25$ correct to 3 significant figures

Write down the lower bound of E

.....
(4)

Total (4 marks)

13 The pressure P is given $P = \frac{F}{A}$

where F is the force in newtons and A is the area in m^2

$F = 560$ correct to 2 significant figures

$A = 4.6$ correct to 2 significant figures

Write down the upper bound of P

.....
(4)

Total (4 marks)

14 The momentum p of a moving object is given by $p = mv$

where m is the mass in kilograms and v is the velocity in m/s

$m = 3.2$ correct to 2 significant figures

$v = 14.7$ correct to 3 significant figures

Write down the lower bound of p

.....
(4)

Total (4 marks)