Solutions 62

Edexcel GCSE
Mathematics (Linear) – 1MA0

TRIAL & IMPROVEMENT

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers
Nil

Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may 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.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

Advice

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

1. The equation $x^3 + 3x = 41$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **all** your working.

x	Working	Too big / Too small.
3.5	$3.5^3 + 3 \times 3.5 = 53.375$	Too Big
3.3	$3.3^3 + 3 \times 3.3 = 45.837$	Too big
3.1	$3.1^3 + 3 \times 3.1 = 39.09$	Too small } between these two.
3.2	$3.2^3 + 3 \times 3.2 = 42.368$	Too big }
3.15	$3.15^3 + 3 \times 3.15 = 40.7$	Too small
3.18	$3.18^3 + 3 \times 3.18 = 41.69$	Too big

Closer to 3.2

$x =$ 3.2

(4 marks)

2. The equation

$$x^3 - 6x = 72$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **all** your working.

x	Working	Too big / Too small
4.5	$4.5^3 - 6 \times 4.5 = 64.125$	Too small
4.8	$4.8^3 - 6 \times 4.8 = 81.792$	Too big
4.7	$4.7^3 - 6 \times 4.7 = 75.623$	Too big
4.6	$4.6^3 - 6 \times 4.6 = 69.736$	Too small
4.65	$4.65^3 - 6 \times 4.65 = 72.64$	Too big
4.63	$4.63^3 - 6 \times 4.63 = 71.47$	Too small.

$x =$ 4.6

(4 marks)

3. The equation

$$x^3 - 3x = 15$$

has a solution between 2 and 3

Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place.
You must show **all** your working.

x	Working	Too big / Too small
2.5	$2.5^3 - 3\times2.5 = 8.125$	Too small
2.7	$2.7^3 - 3\times2.7 = 11.583$	Too small
2.8	$2.8^3 - 3\times2.8 = 13.552$	Too small
2.9	$2.9^3 - 3\times2.9 = 15.689$	Too big
2.85	$2.85^3 - 3\times2.85 = 14.599$	Too small }
2.87	$2.87^3 - 3\times2.87 = 15.0299$	Too big }

$x =$ 2.9

(4 marks)

4. The equation

$x^3 + 5x = 67$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **ALL** your working.

x	Working	Too big/small
3.5	$3.5^3 + 5 \times 3.5 = 60.375$	Too small
3.7	$3.7^3 + 5 \times 3.7 = 69.153$	Too big
3.6	$3.6^3 + 5 \times 3.6 = 64.656$	Too small
3.65	$3.65^3 + 5 \times 3.65 = 66.897$	Too small
3.68	$3.68^3 + 5 \times 3.68 = 68.236$	Too big

$x =$ 3.6

(4 marks)

5. The equation

$$x^3 + 2x = 42$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **ALL** your working.

x	Working Out	Too big / small
3.5	$3.5^3 + 2 \times 3.5 = 49.875$	Too big
3.3	$3.3^3 + 2 \times 3.3 = 42.537$	Too big
3.2	$3.2^3 + 2 \times 3.2 = 39.168$	Too small
3.25	$3.25^3 + 2 \times 3.25 = 40.828$	Too small
3.27	$3.27^3 + 2 \times 3.27 = 41.50978$	Too small

$x =$ 3.3

(4 marks)

6. The diagram shows a cuboid.

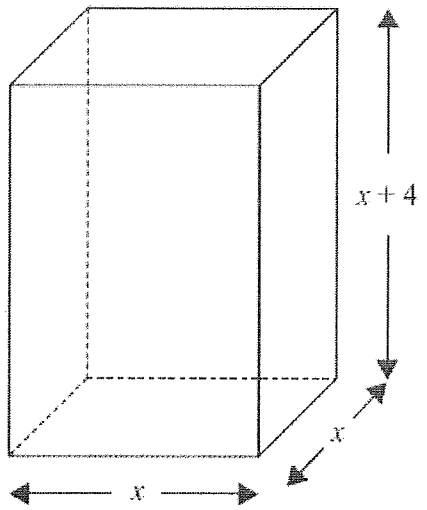


Diagram **NOT** accurately drawn

A cuboid has a square base of side x cm.
The height of the cuboid is $(x + 4)$ cm.
The volume of the cuboid is 150 cm^3.

(a) Show that $x^3 + 4x^2 = 150$

$x \times x(x+4) = x^2(x+4) = 150$

$x^3 + 4x^2 = 150$

(2)

The equation $x^3 + 4x^2 = 150$ has a solution between 4 and 5

(b) Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show ALL your working.

(4)

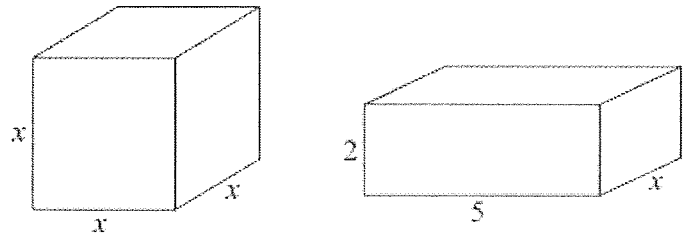
x	Working	Too big / small
4.5	$4.5^3 + 4 \times 4.5^2 = 172.125$	Too big
4.3	$4.3^3 + 4 \times 4.3^2 = 153.467$	Too big
4.2	$4.2^3 + 4 \times 4.2^2 = 144.648$	Too small
4.25	$4.25^3 + 4 \times 4.25^2 = 149.0156$	Too small
4.27	$4.27^3 + 4 \times 4.27^2 = 150.786$	Too big

$x =$ 4.3cm .....

(6 marks)

7. The diagram shows a cube and a cuboid.

Diagram **NOT** accurately drawn



All the measurements are in cm.
The volume of the cube is 100 cm^3 more than the volume of the cuboid.

(a) Show that $x^3 - 10x = 100$

Volume of cuboid $= 2 \times 5 \times x$
$= 10x$

Volume of cube $= 100 + 10x$
$= x^3$

$x^3 = 100 + 10x$
$-10x$ $x^3 - 10x = 100$

(2)

(b) Use a trial and improvement method to find the value of x.
Give your answer correct to 1 decimal place.
You must show **all** your working.

x	Working	Too big / Too small
5	$5^3 - 10 \times 5 = 75$	Too small
6	$6^3 - 10 \times 6 = 156$	Too big
5.5	$5.5^3 - 10 \times 5.5 = 111.375$	Too big
5.3	$5.3^3 - 10 \times 5.3 = 95.877$	Too small
5.4	$5.4^3 - 10 \times 5.4 = 103.464$	Too big
5.35	$5.35^3 - 10 \times 5.35 = 99.63$	Too small
5.37	$5.37^3 - 10 \times 5.37 = 101.15$	Too big

$x =$ 5.4 cm

(4)

(6 marks)