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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 27

Iteration

Higher tier

Past paper question booklet

31	2003-2023	Higher
question groups	available papers	tier

Before you begin

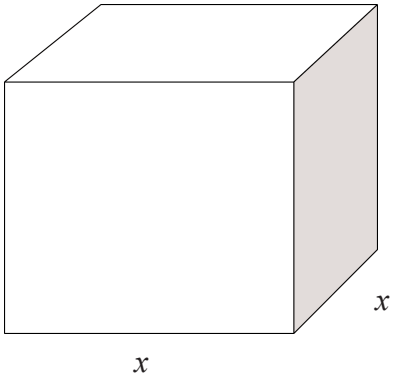
1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

4.

Leave blank



A cuboid has a square base of side x cm.
The height of the cuboid is 1 cm more than the length x cm.
The volume of the cuboid is 230 cm^3.

(a) Show that $x^3 + x^2 = 230$

(2)

The equation $x^3 + x^2 = 230$

has a solution between $x = 5$ and $x = 6$.

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

$x =$ .....

(4)

Page Total

3. The equation

$$x^3 - 4x = 24$$

has a solution between 3 and 4.
Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place.
You must show **all** your working.

$x =$ .....

(Total 4 marks)

Q3

Blank

9. The equation

$$x^3 + 20x = 71$$

has a solution between 2 and 3

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

$x =$ .....

(Total 4 marks)

Q9

14. The equation

$$x^3 + 2x = 60$$

has a solution between 3 and 4

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

$x =$ .....

Q14

(Total 4 marks)

8. The equation

$$x^3 + 10x = 25$$

has a solution between 1 and 2

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

$x =$ .....

(Total 4 marks)

Q8

12. 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.

$x =$ .....

Q12

(Total 4 marks)

11 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.

$x =$ .....

(Total for Question 11 is 4 marks)

7 The equation $x^3 + 10x = 23$

has a solution between 1 and 2

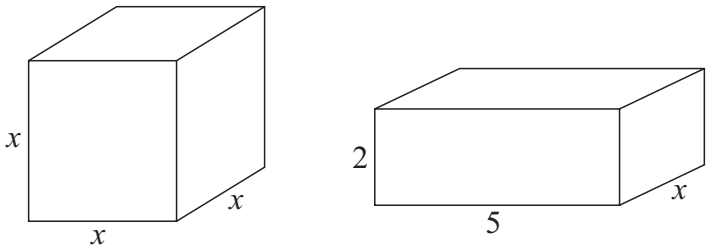
Use a trial and improvement method to find the solution.
Give your answer correct to one decimal place.
You must show all your working.

$x =$ .....

(Total for Question 7 is 4 marks)

11 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 $x^3 - 10x = 100$

(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.

$x =$ .....

(4)

(Total for Question 11 is 6 marks)

11 The equation

$$x^3 - x = 32$$

has a solution between 3 and 4

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

$x =$ .....

(Total for Question 11 is 4 marks)

8 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.

$x =$ .....

(Total for Question 8 is 4 marks)

10 The equation

$$x^3 - 2x = 30$$

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.

.....

(Total for Question 10 is 4 marks)

10 The equation

$$x^3 + 2x = 110$$

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.

$x =$ .....

(Total for Question 10 is 4 marks)

11 The equation

$$x^3 - 6x = 84$$

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.

.....

(Total for Question 11 is 4 marks)

3 The equation $x^3 + 4x = 60$ 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.

$x =$ .....

(Total for Question 3 is 4 marks)

3 The equation $x^3 + 4x = 60$ 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.

$x =$ .....

(Total for Question 3 is 4 marks)

8 The equation

$$x^3 + 6x = 27$$

has a solution between 2 and 3

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

$x =$ .....

(Total for Question 8 is 4 marks)

10 The equation

$$x^3 - 2x = 125$$

has a solution between 5 and 6

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

$x =$ .....

(Total for Question 10 is 4 marks)

9 The equation $x^3 + 27x = 90$

has a solution between 2 and 3

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

$x =$ .....

(Total for Question 9 is 4 marks)

2 The equation

$$x^3 - x^2 = 30$$

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.

.....

(Total for Question 2 is 4 marks)

7 The equation $x^3 - 9x = 48$
has a solution between 4 and 5

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

$x =$ .....

(Total for Question 7 is 4 marks)

7 The equation

$$x^3 - 5x = 34$$

has a solution between 3 and 4

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

$x =$ .....

(Total for Question 7 is 4 marks)

8 The equation $x^3 + 5x = 70$ 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.

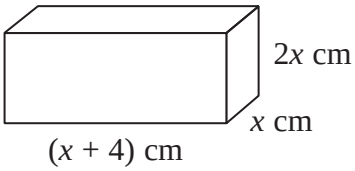
$x =$ .....

(Total for Question 8 is 4 marks)

12 A cuboid has dimensions $2x$ cm, x cm and $(x + 4)$ cm.

The volume of the cuboid is 180 cm^3.

Diagram **NOT** accurately drawn



(a) Show that $x^3 + 4x^2 = 90$

(2)

The equation $x^3 + 4x^2 = 90$ has a solution between $x = 3$ and $x = 4$

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

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(4)

(Total for Question 12 is 6 marks)

13 The equation

$$x^3 + x = 21$$

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.

.....

(Total for Question 13 is 4 marks)

16 Using $x_{n+1} = -2 - \frac{4}{x_n^2}$

with $x_0 = -2.5$

(a) find the values of x_1, x_2 and x_3

$x_1 =$ .....

$x_2 =$ .....

$x_3 =$ .....

(3)

(b) Explain the relationship between the values of x_1, x_2 and x_3 and the equation $x^3 + 2x^2 + 4 = 0$

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.....

.....

.....

(2)

(Total for Question 16 is 5 marks)

15 (a) Show that the equation $x^3 + 7x - 5 = 0$ has a solution between $x = 0$ and $x = 1$

(2)

(b) Show that the equation $x^3 + 7x - 5 = 0$ can be arranged to give $x = \dfrac{5}{x^2 + 7}$

(2)

(c) Starting with $x_0 = 1$, use the iteration formula $x_{n+1} = \dfrac{5}{x_n^{\,2} + 7}$ three times to find an estimate for the solution of $x^3 + 7x - 5 = 0$

.....

(3)

(d) By substituting your answer to part (c) into $x^3 + 7x - 5$,
comment on the accuracy of your estimate for the solution to $x^3 + 7x - 5 = 0$

.....

.....

(2)

(Total for Question 15 is 9 marks)

18 (a) Show that the equation $x^3 + x = 7$ has a solution between 1 and 2

(2)

(b) Show that the equation $x^3 + x = 7$ can be rearranged to give $x = \sqrt[3]{7 - x}$

(1)

(c) Starting with $x_0 = 2$,
use the iteration formula $x_{n+1} = \sqrt[3]{7 - x_n}$ three times to find an estimate for a solution of $x^3 + x = 7$

.....

(3)

(Total for Question 18 is 6 marks)

16 (a) Use the iteration formula $x_{n+1} = \sqrt[3]{10 - 2x_n}$ to find the values of x_1, x_2 and x_3
Start with $x_0 = 2$

$x_1 =$ .....

$x_2 =$ .....

$x_3 =$ .....

(3)

The values of x_1, x_2 and x_3 found in part (a) are estimates of the solution of an equation of the form $x^3 + ax + b = 0$ where a and b are integers.

(b) Find the value of a and the value of b.

$a =$ .....

$b =$ .....

(1)

(Total for Question 16 is 4 marks)

17 (a) Show that the equation $x^4 - x^2 - 5 = 0$ can be written in the form $x = \sqrt[4]{x^2 + 5}$

(1)

(b) Starting with $x_0 = 1.5$
use the iteration formula $x_{n+1} = \sqrt[4]{x_n^2 + 5}$ three times to find an estimate for a solution of $x^4 - x^2 - 5 = 0$

.....

(3)

(Total for Question 17 is 4 marks)

17 (a) Show that the equation $x^3 + 2x - 6 = 0$ has a solution between $x = 1$ and $x = 2$

(2)

(b) Show that the equation $x^3 + 2x - 6 = 0$ can be rearranged to give $x = \dfrac{6}{x^2 + 2}$

(1)

(c) Starting with $x_0 = 1.45$

use the iteration formula $x_{n+1} = \dfrac{6}{x_n^{\,2} + 2}$ twice to find an estimate for the solution of $x^3 + 2x - 6 = 0$

Give your answer correct to 4 decimal places.

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(3)

(Total for Question 17 is 6 marks)