



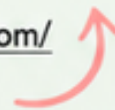
JP Maths

Revision



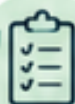
Attempt the paper
before watching the
solutions!

[https://www.youtube.com/
@JPMathsRevision](https://www.youtube.com/@JPMathsRevision)



HIGHER TIER

Iteration



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.*
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.



You've got this!

1. (a) Show that

$$x^2 + x - 7 = 0$$

has a solution between $x = 1$ and $x = 2$.

(b) Show that the equation can be rearranged to give (2)

$$x = \sqrt[3]{7 - x}$$

(1)

(c) Starting with $x_0 = 1.8$, use

$$x_{n+1} = \sqrt[3]{7 - x_n}$$

twice to estimate the solution.

Give your answer to 4 decimal places.

.....
(3)

(Total for Question 1 is 6 marks)

2. (a) Show that

$$x^3 + 5x - 12 = 0$$

has a solution between $x = 1$ and $x = 2$.

(b) Show that the equation can be rearranged to give (2)

$$x = \frac{12}{x^2 + 5}$$

(1)

(c) Starting with $x_0 = 1.6$, use

$$x_{n+1} = \frac{12}{x_n^2 + 5}$$

three times to estimate the solution.

Give your answer to 4 decimal places.

.....
(3)

(Total for Question 2 is 6 marks)

3. (a) Show that

$$x^3 + x - 4 = 0$$

has a solution between $x = 1$ and $x = 2$.

(2)

(b) Show that the equation can be rearranged to give

$$x = \sqrt[3]{4 - x}$$

(1)

(c) Starting with $x_0 = 1.4$, use

$$x_{n+1} = \sqrt[3]{4 - x_n}$$

three times to estimate the solution.

Give your answer to 4 decimal places.

.....
(3)

(Total for Question 3 is 6 marks)

4. A water tank contains 3500 litres of water at time $t = 0$ hours.

At the end of every hour, 4% of the water has leaked away.

The volume of water after t hours is V_t .

Given that $V_0 = 3500$

and

$$V_{t+1} = kV_t$$

- (a) Write down the value of k

- (b) Find the volume after 5 hours.

.....
(1)

.....
(3)

(Total for Question 4 is 4 marks)

5. The number of fish in a lake at the start of year n is P_n .

At the start of year 1 there are 1200 fish.

Given that $P_{n+1} = 1.06P_n$

(a) Write down the percentage that the population of fish increases by each year.

.....
(1)

(b) Work out the number of fish at the start of year 6.

.....
(3)

(Total for Question 5 is 4 marks

6. The number of rabbits on a farm at the end of month n is R_n .

The number of rabbits at the end of the next month is given by

$$R_{n+1} = 1.15R_n - 40.$$

At the end of April there are 240 rabbits.

Work out how many rabbits there will be at the end of July.

.....
(Total for Question 6 is 4 marks

7. The value of a bicycle at the end of year n is V_n .

The value is modelled by $V_{n+1} = 0.88V_n + 30$.

The bicycle is worth £600 initially.

Work out its value after 3 years.

.....
(Total for Question 7 is 3 marks)

- 8.** A balloon is descending.

The height of the balloon n minutes after it starts to descend is h_n metres.

The height is modelled by $h_{n+1} = Kh_n + 15$, where K is a constant.

The balloon starts descending from 1500m.

After one minute its height is 1275m.

- (a) Find the value of K .

.....
(3)

- (b) Work out the height of the balloon after 4 minutes.

.....
(3)

(Total for Question 8 is 6 marks)

9. A cup of coffee cools according to the formula

$T_{n+1} = 0.9T_n + 2$, where T_n is the temperature in degrees celsius after n minutes.

Initially the coffee has a temperature of 92°C .

Work out the temperature after 5 minutes.

Give your answer to 1 decimal place.

.....
(Total for Question 9 is 3 marks)

10. The annual profit of a company in year n is $\text{£}P_n$.

The profits follow the model $P_{n+1} = 1.08P_n + 1200$.

In 2026, the profit is $\text{£}45000$.

Work out the predicted profit in 2029.

.....
(Total for Question 10 is 3 marks)

11. The value of a car is modelled by

$$V_{n+1} = 0.82V_n + 450,$$

Where V_n is the value of the car after n years.

Initially the car is worth £18,000.

(a) Work out the value after 4 years.

.....

(3)

(b) Explain what the 450 represents in this model.

.....

.....

.....

(1)

.....

(Total for Question 13 is 4 marks
