JRA Tutors
Private tuition and small online Study Pods

Iteration

Grade 7 topic · Higher tier · Edexcel and AQA

How to use this pack
20 questions that get harder as you go. Questions 1–15 (55 marks) build up to the harder Grade 8–9 style questions at the end; aim to complete all 20. Show your working on the lines and write your final answer on the answer line, then mark yourself with the answers at the back. Diagrams are not drawn accurately. Total: 76 marks.

Warm-up

1 $x_{n+1} = (x_n + 7)/5$ and $x_0 = 2$. Work out x_1. **[3 marks]**

Answer _____

2 $x_{n+1} = (x_n + 4)/3$ and $x_0 = 1$. Work out x_2 to 3 d.p. **[3 marks]**

Answer _____

3 $x_{n+1} = 4x_n - 1$ and $x_0 = 1$. Work out x_1 and x_2. **[3 marks]**

Answer _____

4 $x_{n+1} = x_n^2 - 2$ and $x_0 = 2$. Work out x_1 and x_2. **[3 marks]**

Answer _____

5 $x_{n+1} = 1/(x_n + 5)$ and $x_0 = 1$. Work out x_1 to 3 d.p. **[3 marks]**

Answer _____

Core

6 Show that $x^3 + x - 3 = 0$ has a solution between 1 and 2. **[4 marks]**

Answer _____

7 Rearrange $x^3 + x - 4 = 0$ to give $x = \sqrt[3]{(4 - x)}$. **[3 marks]**

Answer _____

8 Use $x_{(n+1)} = \sqrt[3]{(7 - x_n)}$ with $x_0 = 1$ to find x_1, x_2, x_3 to 3 d.p. **[4 marks]**

Answer _____

9 Use $x_{(n+1)} = \sqrt[3]{(7 - x_n)}$ with $x_0 = 1$. Find x_4 to 3 d.p. **[4 marks]**

Answer _____

10 The equation $x^2 - x - 9 = 0$ can be written $x = \sqrt{(x + 9)}$. Use $x_0 = 3$ to find x_1 and x_2 to 3 d.p. **[4 marks]**

Answer _____

Stretch

11 $x_{(n+1)} = \sqrt{(x_n + 6)}$ with $x_0 = 3$. Find x_3 to 4 d.p. **[4 marks]**

Answer _____

12 $x_{(n+1)} = \sqrt{(x_n + 8)}$ with $x_0 = 3$. Find the solution to 2 d.p. by continuing to iterate until two answers agree. **[5 marks]**

Answer _____

13 Show that $x^2 - x - 9 = 0$ has a root between 3 and 4. **[4 marks]**

Answer _____

14 Use $x_{n+1} = \sqrt{(x_n + 6)}$ to show that the solution is approximately 3.0. **[5 marks]**

Answer _____

15 Explain why an iterative formula can be used to find a solution that cannot be found by factorising. **[3 marks]**

Answer _____

Challenge

16 Write $x^3 - 2x - 5 = 0$ in the form $x = \sqrt[3]{(2x + 5)}$. **[3 marks]**

Answer _____

17 Use $x_{(n+1)} = \sqrt[3]{(2x_n + 5)}$ with $x_0 = 2$ to find the root to 3 d.p. **[5 marks]**

Answer _____

18 Show that $x^3 - 2x - 5 = 0$ has a root between 2 and 3. **[4 marks]**

Answer _____

19 Use the iteration $x_{n+1} = \frac{4}{x_n + 1}$ with $x_0 = 1$ to find x_1, x_2, x_3 to 3 d.p. **[4 marks]**

Answer _____

20 A student uses $x_{n+1} = x_n^2 - 2$ with $x_0 = 1$ and says the values settle. Check x_1, x_2, x_3. **[5 marks]**

Answer _____