



A Maths Tonic To Take

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 30

Question 1

A-Level Examination Question from June 2018, Paper C12, Q8 (Edexcel)

The equation $(k - 4)x^2 - 4x + k - 2 = 0$, where k is a constant, has no real roots.

(a) Show that k satisfies the inequality $k^2 - 6k + 4 > 0$

[3 marks]

(b) Find the exact range of possible values for k

[4 marks]

Question 2

A-Level Examination Question from 2018, Specimen Paper 1, Q8 (Edexcel)

There were 2100 tonnes of wheat harvested on a farm during 2017.

The mass of wheat harvested during each subsequent year is expected to increase by 1.2 % per year.

- (a) Find the total mass of wheat expected to be harvested from 2017 to 2030 inclusive, giving your answer to 3 significant figures.

[3 marks]

Each year it costs

- £5.15 per tonne to harvest the first 2000 tonnes of wheat
- £6.45 per tonne to harvest wheat in excess of 2000 tonnes

- (b) Use this information to find the expected cost of harvesting the wheat from 2017 to 2030 inclusive. Give your answer to nearest £1000.

[3 marks]

Question 3

A-Level Examination Question from 2018, Specimen Paper 1, Q10 (Edexcel)

The function f is defined by

$$f : x \rightarrow \frac{3x - 5}{x + 1}, \quad x \in \mathbb{R}, \quad x \neq -1$$

(a) Find $f^{-1}(x)$

[3 marks]

(b) Show that $ff(x) = \frac{x + a}{x - 1}$, $x \in \mathbb{R}$, $x \neq \pm 1$
where a is an integer to be found.

[4 marks]

The function g is defined by

$$g : x \rightarrow x^2 - 3x, \quad x \in \mathbb{R}, \quad 0 \leq x \leq 5$$

(c) Find the value of $fg(2)$

[2 marks]

(d) Find the range of g

[3 marks]

(e) Explain why the function g does not have an inverse.

[1 mark]

Question 4

The equation $|2x - 7| = x + k$ has exactly two distinct solutions.
Find the range of possible values of k

[4 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com