Year 2 **Pure Mathematics Examination Revision : Health Check N° 3**

Vaccinate against Maths Confusion

Any solution based entirely on graphical
or numerical methods is not acceptable
Marks Available : 30

Question 1

(i) Find the first four terms, in ascending powers of x, of the binomial expansion of $\frac{1}{1 + 2x}$ giving each coefficient in its simplest form.

[4 marks]

(ii) Write down the coefficient of x^8 were the part (i) expansion to be extended further.

[1 mark]

Question 2

$y = 5x^3 + ax^2 + 3x + 2$ where a is an integer constant.

Given that there is a point of inflection when $x = \frac{1}{5}$ determine the value of a

[4 marks]

Question 3

Two circles have equations;

$$(x + 4)^2 + (y - 6)^2 = 25$$

$$(x - 7)^2 + (y + 3)^2 = 16$$

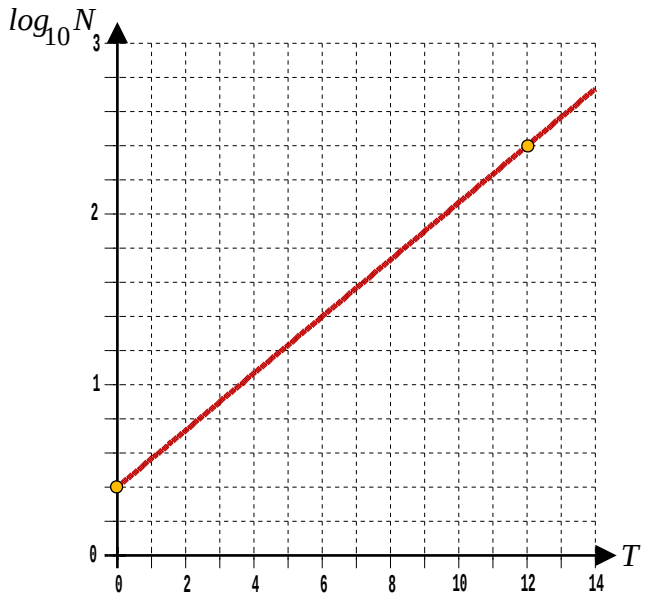
What is the minimum distance between the circles ?

Give your answer correct to 3 decimal places.

[4 marks]

Question 4

An epidemiologist is modelling the number of people, N, who have tested positive for a virus after T days. From looking at a graph of the results, he suggests that the number of people sick be modelled by the equation $N = a\,b^T$ where a and b are constants to be found. The graph passes through $(0,\ 0.4)$ and $(12,\ 2.4)$



(i) Write down the equation of the line.

[2 marks]

(ii) Hence, or otherwise, find the values of a and b.
Work to an accuracy of 4 significant figures.

[4 marks]

(iii) Interpret the meaning of the constant a in this model.

[1 mark]

(iv) Use your model to predict the number of sick people after 21 days.
Give one reason why this might be an overestimate.

[2 marks]

Question 5

The vectors $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$ are given as,

$$\boldsymbol{a} = \begin{pmatrix} 8 \\ 23 \end{pmatrix}, \quad \boldsymbol{b} = \begin{pmatrix} -15 \\ x \end{pmatrix} \text{ and } \boldsymbol{c} = \begin{pmatrix} -13 \\ 2 \end{pmatrix}$$

where x is an integer.

Given that $\boldsymbol{a} + \boldsymbol{b}$ is parallel to $\boldsymbol{b} - \boldsymbol{c}$, find the value of x

[4 marks]

Question 6

The functions p and q are defined by: $p(x) = x^2$, $q(x) = 5 - 2x$

(i) Given that $pq(x) = qp(x)$ show that $3x^2 - 10x + 10 = 0$

[3 marks]

(ii) Explain why $3x^2 - 10x + 10 = 0$ has no real solutions

[1 mark]