Year 1 Pure Mathematics Examination Revision Health Check N° 1



# Statistically, nine out of ten injections are in vein. Questions kindly provided by Jeremy Lucas

Any solution based entirely on graphical or numerical methods is not acceptable Marks Available : 70

#### **Question 1**

(i) Complete the square for  $x^2 - 8x - 13$ 

[ 2 marks ]

 $f(x) = x^2 - 8x - 13, \qquad x \in \mathbb{R}$ 

[1 mark]

(iii) Also state the value of x for which the minimum value occurs.

[1 mark]

(i) Expand  $(1 - 2x)^8$  in ascending powers of x up to and including the term in  $x^3$ . Simplify each term where it's appropriate to do so.

## [ 3 marks ]

(ii) Hence find an approximation to the value of  $0.98^8$  to four decimal places.

## [ 2 marks ]

## **Question 3**

(i) Solve the equation  $\sin 2x = 0.5$  for  $0 \le x \le 360^\circ$ 

[4 marks]

(ii) Solve the equation 
$$\sin^2 x = \cos x - 1$$
 for  $-360 \le x \le 360$ 

[4 marks]

(i) Differentiate 
$$y = \frac{x^2 + 2x + 3}{x}$$

[4 marks]

(ii) Integrate 
$$\int \frac{4x-9}{\sqrt{x}} dx$$

[4 marks]

## **Question 5**

On the graph paper sketch (i)  $y = (x - 2)^{2}$ (ii)  $y = (x + 4)(x + 1)^{2}$ 



[ 5 marks ]

A triangle has sides of length 4 cm, 5 cm and 6 cm.

(i) Find the size of the smallest angle in the triangle.Give your answer correct to 3 significant figures.

[ 3 marks ]

(ii) Find the area of the triangle.Give your answer correct to 3 significant figures.

[ 3 marks ]

#### **Question 7**

Solve the simultaneous equations;  $x^2 + y^2 = 100$ x - y = 2

[4 marks]

Solve the inequalities

(i)  $4x^2 + 3 < 39$ 

[ 3 marks ]

(ii)  $x^2 + 5x > 14$ 

[ 3 marks ]

## **Question 9**

A circle has equation  $x^2 + y^2 - 6x + 4y - 3 = 0$ (i) Find the centre and radius of the circle

[ 3 marks ]

(ii) Find the equation of the tangent to the circle at (3, 2)

[4 marks]

A straight line  $L_1$  is given by the equation 2x + 3y = 13

(i) Find the equation of the line  $L_2$  which is parallel to  $L_1$  and passes through the point (1, 5)

#### [ 2 marks ]

(ii) Find the equation of the line  $L_3$  which is perpendicular to  $L_1$  and passes through the point (1, 5)

[ 2 marks ]

#### **Question 11**

A curve is given by the equation  $y = x^3 - 3x^2 - 9x + 15$ (i) Find the coordinates of the two turning points

[4 marks]

(ii) Classify each of these turning points as a minimum or a maximum

[ 2 marks ]

Solve the following equations,

(i)  $2^{2x} - 3 \times 2^{x} + 2 = 0$ 

[ 3 marks ]

(ii)  $2 \log_3(x+2) - \log_3 x = 2$ 

[ 3 marks ]

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Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk

All Questions by Jeremy Lucas