Twenty-One Today
N U M B E R 3
Twenty-One short, sharp questions on all aspects of the Year 1 course
You may use a calculator

Question 1

$$y \;=\; 4\sqrt{x}$$

Find the coordinates of the only point on this curve with a gradient of 8

Question 2

$$g(x) \;=\; x^3 - 7x^2 - x + 23$$

Find the remainder when $g(x)$ is divided by $(x+2)$

Question 3

Give the exact solution to the equation

$$ln(11x - 5) \;=\; 3$$

Question 4

The distance between the points $(-2, \ 10)$ and $(x, \ 6)$ is $\sqrt{65}$

Find the two possible values of x

Question 5
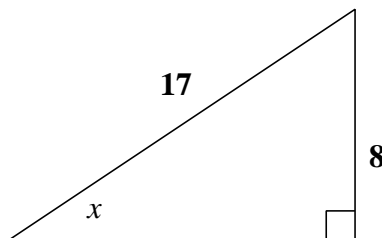
(**i**)   Work out the value of the discriminant of

$$f(x) = x^2 + x + 2$$

(**ii**)   What does your part (**i**) answer tell you about the number of roots of $f(x)$?

Question 6

If $sin \ \theta = \frac{8}{17}$ state the exact value of $cos \ \theta$ and the exact value of $tan \ \theta$

HINT :

Question 7
Simplify;

$$\frac{101 \ !}{99 \ !}$$

Question 8

Differentiate, $f(x) = \dfrac{x^3 + 9x}{3x^2}$

HINT : Use the 'wedge' technique

Question 9

Integrate, $f(x) = \dfrac{x^4 + 5x^2}{x}$

Question 10

Solve over the interval $0 \leqslant \theta \leqslant 360°$

$$2 \cos(\theta) = \sqrt{3}$$

Question 11

Given that the point A has position vector $6\boldsymbol{i} - 3\boldsymbol{j}$ and the point B has position vector $8\boldsymbol{i} + 5\boldsymbol{j}$ find the vector, $\overrightarrow{AB}$

Question 12

Find the equation of the normal to the curve with equation $y = 11 - 4\sqrt{x}$ at the point where $x = 4$

Question 13

Expand the brackets, $y = (3 - 2x)^3$

Question 14

Solve the equation, $log_3 x = -\dfrac{1}{2}$ leaving your answer as an exact value.
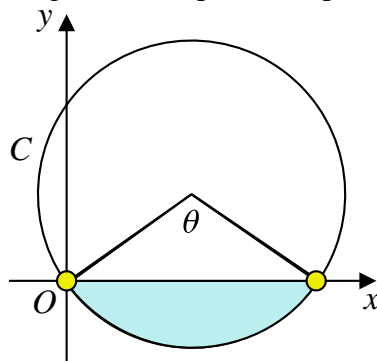
Question 15

Solve the equation, $log_7 (y + 3) + log_7 (2y + 1) = 1,\quad y \in \mathbb{R},\quad y > -\dfrac{1}{2}$

Question 16

Solve the equation, $9^x - 3^{x+1} - 18 = 0$

Question 17

A sketch of a circle, C, along with its equation is presented below;

$$(x - 3)^2 + (y - 4)^2 = 5^2$$

Find the coordinates of the two points where C crosses the x-axis.

Question 18

Considering further the circle, C, presented in Question 17, find, in degrees, the size of the angle marked θ.

Question 19

Find the set of values of x for which

$$12 + 4x > x^2$$

Question 20

Evaluate, $f(x) = \int_1^2 \dfrac{24}{x^3}\, dx$

Question 21

Solve, for $0 \leqslant \theta \leqslant 360°$, the equation, $2\cos^2\theta + \sin\theta - 1 = 0$