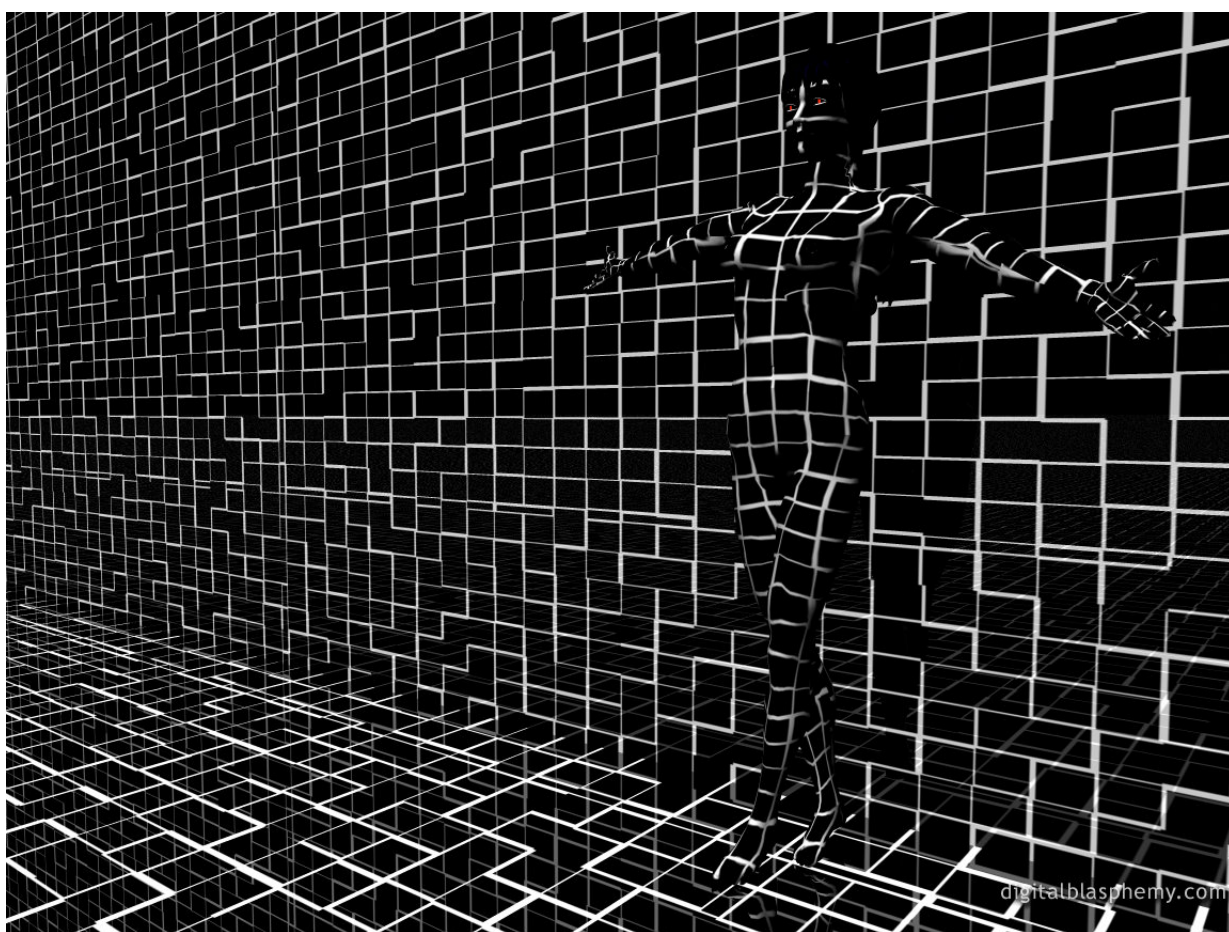


Year 1 Pure Mathematics Examination Revision

TWENTY-ONE TODAY

Four 50 minute Revision Sessions
of 21 Short, Sharp Questions
(Full detailed answers included)



PURE MATHEMATICS YEAR 1 REVISION

Twenty-One Today

NUMBER 1

*Twenty-One short, sharp questions on all aspects of the Year 1 course
You may use a calculator*

Question 1

Rationalise the denominator,

$$\frac{1}{\sqrt{7} - 1}$$

Question 2

$$f(x) = 4x^3 - 7x^2 + ax + 13$$

$f(x)$ is divisible by $(x - 1)$

Find the value of the constant, a

Question 3

A circle has centre $(8, 15)$ and its circumference passes through the origin.

Determine the equation of the circle.

Question 4

Use the rules of logs to simplify

$$\log_m 45 - 2 \log_m 3$$

Question 5

Using your answer to Question 4, or otherwise, state the value of m if

$$\log_m 45 - 2 \log_m 3 = 1$$

Question 6

$$f(x) = \frac{12}{x^2}$$

What is the integral of $f(x)$?

Don't forget the constant of the integration !

Question 7

$$f(x) = \frac{x^3}{3} + 5x^2 + 27x - 100$$

Prove that $f(x)$ is an increasing function.

HINT : Differentiate, complete the square, explain why derivative is always positive.

Question 8

Find the equation of the curve which passes through $(3, -1)$ and for which

$$\frac{dy}{dx} = 2x + 5$$

Question 9

Which two of the following lines are mutually perpendicular ?

(a) $y = \frac{1}{\sqrt{2}}x + 3$

(b) $y = \frac{1}{2}x + 3$

(c) $y = -2x + 3$

(d) $y = \sqrt{2}x + 3$

Question 10

Consider these three facts about a function $f(x)$

$$f(x) = x^3 + x^2 + px + q$$

$f(x)$ is divisible by $(x - 1)$

$f(x)$ Has remainder -7 when divided by $(x - 2)$

Determine the value of p and the value of q .

Question 11

Solve

$$7^x = 102$$

Give your answer to three significant figures.

Question 12

By first expanding the brackets, solve

$$2^x (2^x - 5) + 6 = 0$$

Question 13

What is the reverse of the process known as integration called ?

Question 14

The endpoints of the diameter of a circle are $(-8, 1)$ and $(4, 5)$

Find the equation of the circle.

Question 15

Provide a counter-example to show that the following is not true;

$$1 + x^2 < (1 + x)^2$$

Question 16

Solve the following equation over the interval $0 \leq \theta \leq 360^\circ$

$$2 \cos^2 \theta - 5 \cos \theta + 2 = 0$$

Question 17

Without using the binomial theorem or logarithms solve,

$$(2x + 1)^5 = 32$$

Question 18

Expand the brackets

$$\left(\frac{x}{3} - 1 \right)^3$$

Question 19

Sketch the curve of the equation $y = 25 - x^2$, giving the coordinates of any points where it crosses axes.

Question 20

Using Question 19, solve the inequality

$$25 - x^2 \leq 0$$

Question 21

Determine the area enclosed by the curve $y = 25 - x^2$ and the x -axis.