Twenty-One Today

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

Question 1

Rationalise the denominator of, $\frac{\sqrt{2} + 3}{5 + \sqrt{2}}$

Question 2

Given that,
$$\int_{2}^{a} x^{2} dx = 111\frac{2}{3}$$

determine the value of the constant a

Question 3

$$f(x) = 5x^6 + 8x^5 - 13$$

Is (x - 1) a factor of f(x)?

Justify your answer.

What is the circumference of the circle with equation,

$$(x + 3)^2 + (y - 8)^2 = 64$$

Write your answer as a multiple of π .

Question 5

Find the coordinates where the line with equation $y = 4x - \frac{7}{2}$ meets the line with equation $y = -\frac{1}{4}x + 5$

Question 6

- (i) What is the minimum value of the function $f(x) = (x + 7)^2 + 5$?
- (ii) What is the maximum value of the function $g(x) = 8 \sin x + 13$?
- (iii) Hence state the *minimum* value of,

$$\frac{f(x)}{g(x)}$$

Write out Pascal's triangle up to the row that runs, 1, 6, 15, 20, 15, 6, 1

Question 8

Given that, in row 6 of Pascal's Triangle,

$$^{n}C_{r} = 20$$

State the value of n and the value of r

Question 9

Write without any brackets;

$$\left(\frac{3}{x}-\frac{x^2}{2}\right)^4$$

A line segment has endpoints (3, 5), (8, -5)

Find the equation of the perpendicular bisector of this line.

Question 11

Given that $y = 1.6x^4 + 0.9x^2$, what is $\int y dx$

Question 12

- (i) Which part of $x = \frac{-b \pm \sqrt{b^2 4ac}}{2a}$ is termed the discriminant?
- (ii) Suppose that the discriminant is negative. What can then be deduced about the graph of $y = ax^2 + bx + c$?

Give the equation of the curve which passes through the point (1, 13) and which has a gradient equation given by;

$$\frac{dy}{dx} = 40 x^3$$

Question 14

A circle has equation

$$x^2 + y^2 - 10x + 4y = 7$$

Determine the centre of the circle and its radius.

Question 15

Solve the inequality,

$$x^2 - 3 \ge 1$$

Given that

$$128\sqrt{2} = 2^a$$

find the value of a

Question 17

Solve over the interval $0^{\circ} \le x \le 360^{\circ}$,

$$tan^2x + cos^2x = 1$$

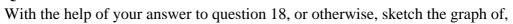
Question 18

(i) Factorise completely,

$$f(x) = x^3 - x$$

(ii) Hence write down the coordinates of the three points where the graph of f(x) crosses the x-axis

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$$f(x) = x^3 - x$$

Find the equation of the tangent to the curve $y = x^3 - x$ from the point (1, 0)

Question 21

Find the area bounded by $y = x^3 - x$, the x-axis, x = -1 and x = 1