RIGOUR

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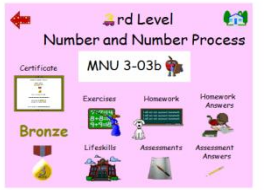
Numeracy for Learning, Life and Work



April Higher Maths Calendar

#abitofmathseveryday

1 A line has a midpoint of (-2, 5). One of the end points on the line is (8, 11). What are the coordinates of the other end point?

2 Two functions are defined as $f(x) = x^2 + 1$ and $g(x) = 2x - 3$.
Calculate $f(g(x))$.

3 Change 225° into radians.

4 Are the points K(3, 9), L(6, 24) and M(12, 48) collinear?

5 Factorise the following polynomial

$g(x) = x^3 - 39x + 70$

6 Triangle ABC has vertices A(-4, 1), B(3, 3) and C(8, 7). Calculate the equation of the perpendicular bisector AC.

7 Solve
$\tan^2 x - 3 = 0$
$0 \leq x \leq 2\pi$

8 Calculate the coordinates of the stationary points on the curve
$y = 6x^2 - 2x^3$
& determine nature.

9 A curve for which $\frac{dy}{dx} = 6x^2 - 2x$ passes through (-1, 3). Express y in terms of x.

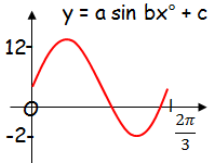
10 Calculate the size of the angles between the vectors
$\underline{c} = \begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix}$ & $\underline{d} = \begin{pmatrix} 5 \\ 1 \\ 0 \end{pmatrix}$.

11 Find

$$\int (4x + 9)^2 \, dx$$

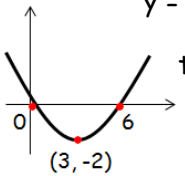
12 A sequence is defined by the recurrence relation
$u_{n+1} = au_n + b$, $u_0 = 6$
If $u_1 = 12$ and $u_2 = 15$, calculate a and b.

13 What are the values of a, b and c?



14 Find the centre and radius for the circle
$x^2 + y^2 - 6x - 40 = 0.$

15 For the equation $y = ax(x + b)$, what are the values of a and b?



16 A function is $k(x) = \frac{x+1}{4}$.
Find the inverse function $k^{-1}(x)$.

17 If A and B are acute angles with $\sin A = \frac{1}{2}$ and $\cos B = \frac{3}{4}$ find the exact value of $\sin(A + B)$.

18

$$A(x) = \frac{6}{\sqrt{x}}$$

Calculate $A'(4)$

19 Show that...

$$\frac{\sin 2x}{\tan x} = 2\cos^2 x$$

20 Solve
$2\cos 2x = \sin x - 1$
for $0 \leq x \leq 360$

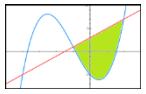
21 A sequence is defined by the recurrence relation
$u_{n+1} = au_n + 12$, $u_0 = 2$
and has a limit of 16.
Calculate the value of a.

22 Circle 1 has equation $(x + 2)^2 + (y + 5)^2 = 36$ and circle 2 has equation $x^2 + y^2 - 8x - 6y + 9 = 0$.
Show that these circles intersect at one point.

23 For what values of x is the function
$y = \frac{1}{3}x^3 - 2x^2 - 12x$
decreasing?

24 Write
$y = 4x^2 - 8x + 9$
in the form
$y = a(x + b)^2 + c.$

25 The curve $y = x^3 + 3x^2 - 4x - 5$ intersects the line $y = 2x + 3$ at points (-4, -5), (-1, 1) and (2, 7).
Calculate the shaded area.



26 The curve $y = x^3 - 5x^2 + 3x + 10$ intersects the line $y = x + 2$ at 3 points.
Calculate the points of intersection.

27 Express
$\sqrt{3}\sin x° + \cos x°$
in the form
$k\cos(x + a)°$
where $k > 0$ and $0 < a < 360$.

28 A point (x, y) lies on the curve with equation $y = x^2 - 8x$.
Calculate the coords for which the gradient of the tangent is 6.

29 Find the range of values of c such that the equation
$x^2 + cx + 2c = 2x + 4$
has real roots.

30 Solve the following equation

$$\log_7(x - 1) + \log_7(x + 5) = 1$$