Further Maths Revision

Q1 x+1 is increased by 45% so that it is now x+12. What is the value of x?

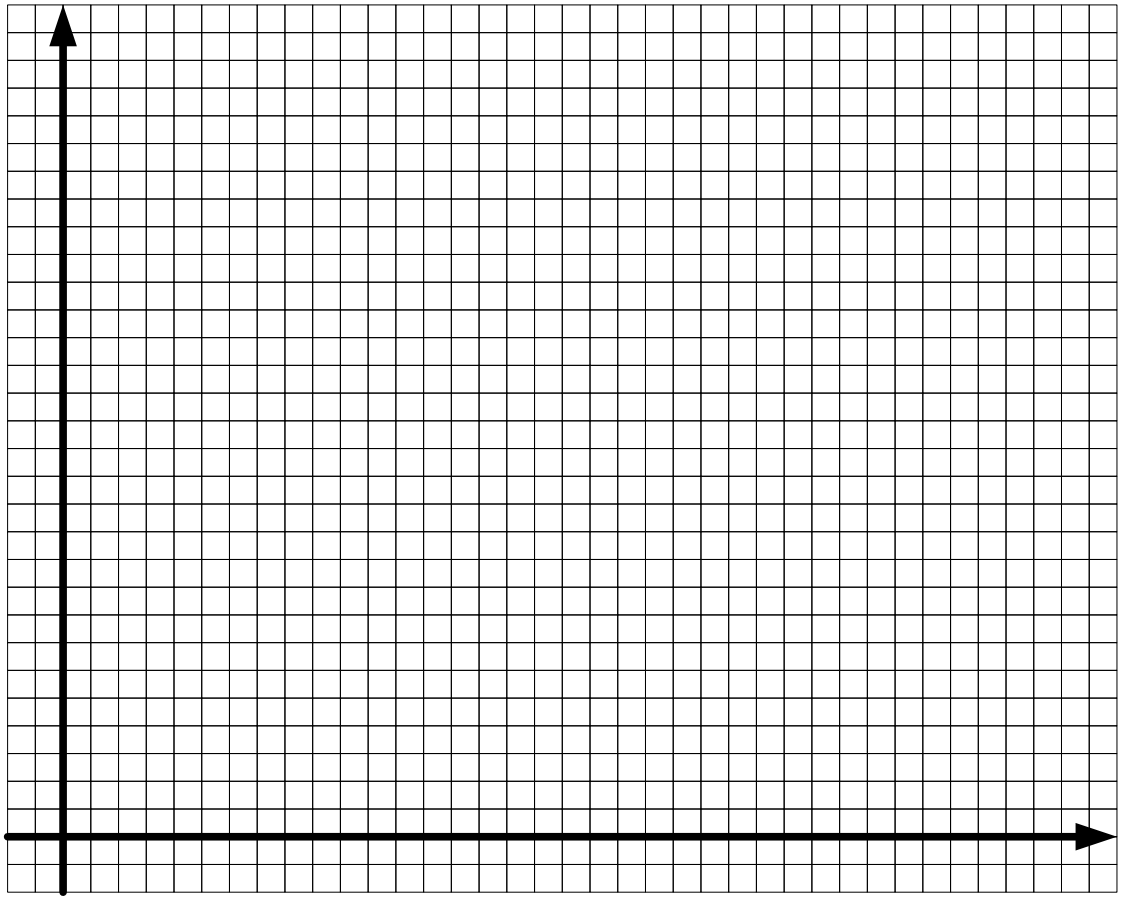
Q2 The point (5,-3) lies on a straight line with a gradient of $\frac{3}{5}$. Work out the co-ordinates of the point where the line crosses the y-axis.

Q3 The function $f(x) = 7 - x \quad 0 \leq x < 2$

$= 5x - x^2 \quad 2 \leq x < 5$

$= 3x - 6 \quad 5 \leq x \leq 7$

On the grid, draw the graph of $y = f(x)$



Q4 $g(x) = 8 - 4x$

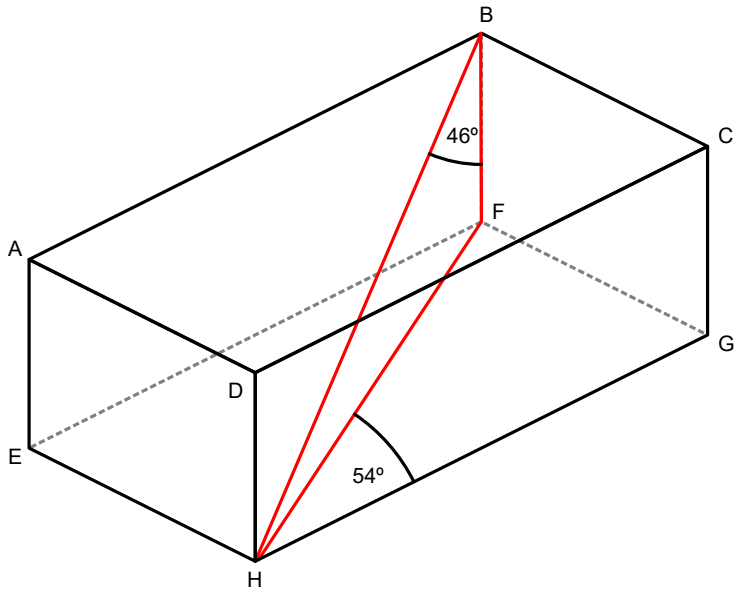
Work out $g^{-1}(x)$.

Q5 What is the value of $tan^2 60°$

Q6 Draw axes and sketch

$$y = \sin x \quad \text{for} \quad 0° \leq x \leq 360°$$

Q7 The height of the cube is $5\sqrt{3}$ cm. Find the area of the red triangle.



Q8 $(6x + a)(9x - 4) = 54x^2 + 3x - b$

Work out the values of a and b.

Q9 $y = 5x^2\left(\sqrt[3]{x} + 6x^5 - \frac{4}{x}\right)$

Find $\frac{dy}{dx}$

Q10 Use matrix multiplication to show that, in the x-y plane,

- a rotation, 90° anticlockwise about the origin, followed by
- a reflection in the line $y = x$

is equivalent to a reflection in the x-axis.

Q11 A quadratic sequence has the nth term $3n^2 - 6n$

Use an algebraic method to work out how many terms in the sequence are less than 3500.

Q12 Rationalise and simplify fully $\frac{\sqrt{5}}{5+\sqrt{5}}$

Q13 Use binomial expansion to find $\left(3x - 2\sqrt{2}\right)^5$

Q14 The nth term in a sequence is $\frac{5n^2}{n^2+8}$

One term in the sequence is $4\frac{21}{56}$

Work out the value of n.

Q15 Write down the limiting value as $n \to \infty$ for the sequence $\frac{5n^2+6}{3n}$

Q16 Rearrange $dt = \frac{8d-7}{9}$ to make d the subject

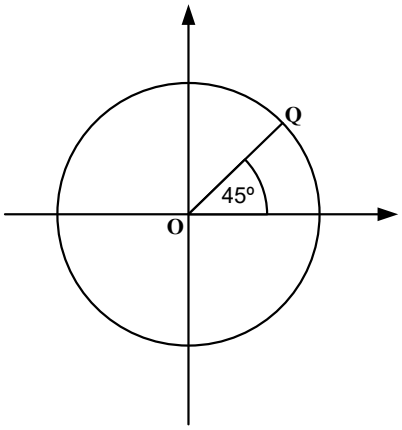
Q17 Solve the simultaneous equations

$$2x - y = \frac{37}{5}$$

$$xy = 1.6$$

Q18 The point Q lies on the circle $x^2 + y^2 = 36$

The line OQ is at an angle of 45° to the positive x-axis.



Determine the co-ordinates of Q.

Q19 Following on from Q18, work out the equation of the tangent to the circle at Q.

Write your answer in the form $x + ay = b$ where a and b are constants.

Q20 Write the equation $8x^2 - 24x + 21$ in the form $a(x + b)^2 + c$ where a, b and c are integers.

Q21 The curve $y = 2x^4 - 24x^2$ has three stationary points.

Work out the co-ordinates of the stationary points and determine their nature.

Q22 Show that $(3\sin x)(\sin x + 2) - 3(2\sin x - \cos^2 x)$ simplifies to an integer.

Q23 The nth term of a quadratic sequence is $n^2 - 40n + 405$. Prove that every term is positive.

Q24 Prove that $\frac{6p-18}{2p-6}$ is always a positive integer when $p \neq 3$

Q25 A deadly virus hits an island which has 200 inhabitants. It will be 7 days before an antidote can be shipped in. The number of people surviving after t hours is given by the model

$$n = 200 \times 10^{-\frac{t}{100}}$$

a Calculate the number of survivors after 24 hours.

b Calculate the number of survivors at beginning of the seventh day.

It takes twenty-four hours for the antidote to take effect.

c How many people died of the virus?

Q26 Find all possible solutions for

$$(12x^2 - 5x - 2)^{x-5} = 1$$

Q27 $\frac{7}{\sqrt{x}} + \frac{264}{x} = 5$

Q28 $\begin{pmatrix} 8 & a \\ b & -1 \end{pmatrix}\begin{pmatrix} 3 & a+2 \\ b-1 & 5 \end{pmatrix} = \begin{pmatrix} -14 & 42 \\ -35 & -77 \end{pmatrix}$

Find the values of a and b.