FURTHER MATHEMATICS: BRIDGING ACTIVITY

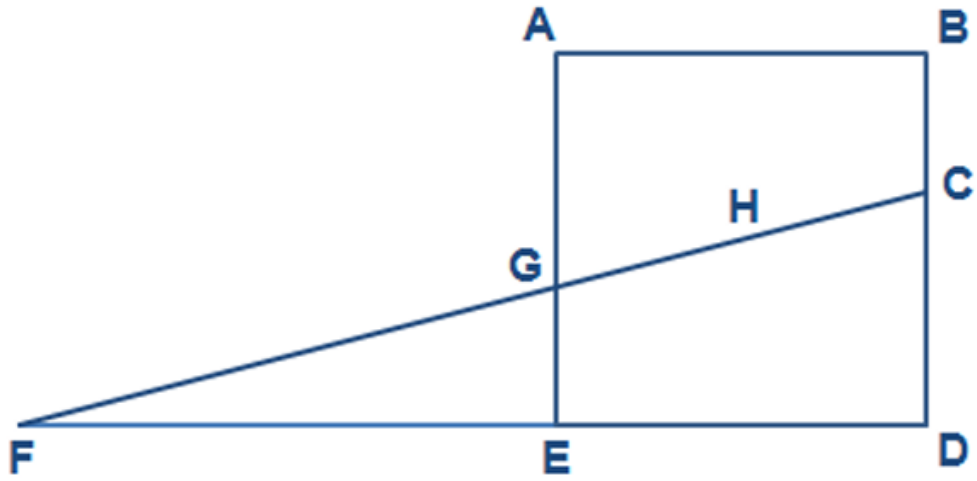
Once you have completed your maths bridging work your task is to complete these problems.

These questions are designed to be challenging and push you out of your comfort zone, so be prepared to be stumped! You will find it useful to annotate on to the diagrams, adding angles, radii, and other additional information to build toward a solution.
Good luck – and enjoy!

5! means 5 x 4 x 3 x 2 x 1. In general n! means n x (n – 1) x (n – 2) x...x 2 x 1.

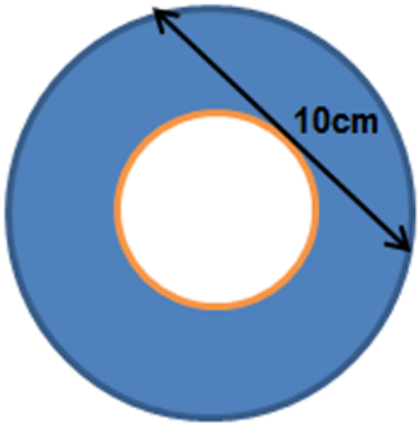
What is 101! divided by 99! ?

ABDE is a square with centre *H*. The base of the square *DE* is extended so that it meets the straight line *CF* which passes through *H*.



If *BC* = 3cm and *CD* = 4cm find the area of the triangle *CDF*.

The diagram shows two concentric circles. The straight line shown just touches the smaller circle. Can you work out the shaded area?



Find all real solutions of the equation

$$(x^2 - 7x + 11)^{(x^2 - 11x + 30)} = 1$$

Show that, for any natural number n,

a) $n(n + 1)$ is even

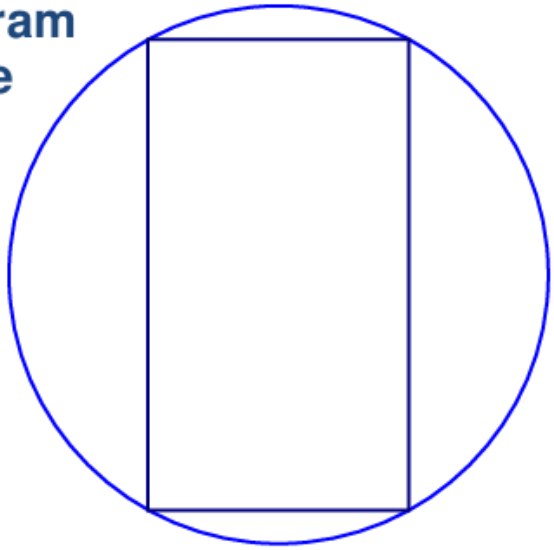
b) $n^3 - n$ is a multiple of 6

c) $n(n + 1)(2n + 1)$ is a multiple of 6

Solve the system of equations:

ab = 1, bc = 2, cd = 3, de = 4, ea = 6

The circle in the diagram has radius 6 cm. If the perimeter of the rectangle is 28 cm, what is its area?

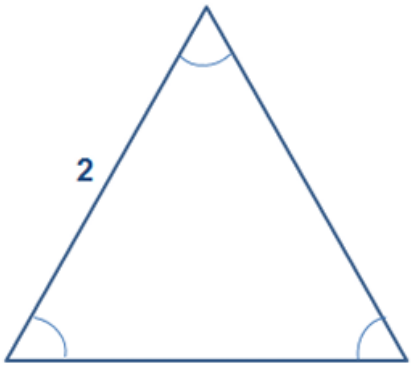


What is the area of the triangle whose vertices lie on the points

(2,3), (-1, -2), (-9,10) ?

What is the equation of the set of points that are equidistant from (2, 4) and (1, 1)?

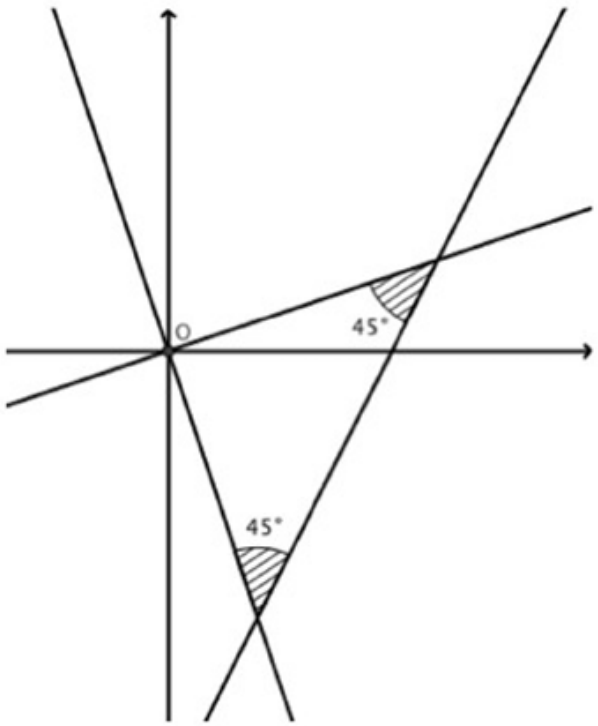
What is the area of the equilateral triangle shown?



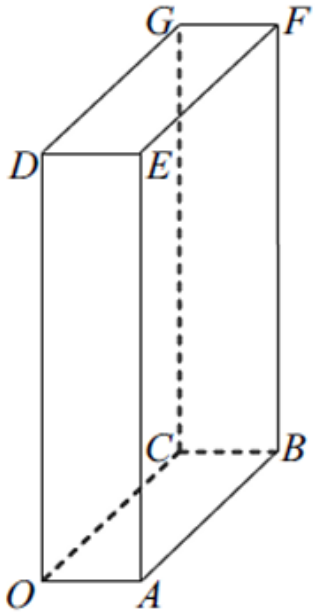
Let L_1 be the straight line $y = 2x - 5$. L_2 and L_3 are two straight lines passing through the origin and each makes an angle of 45° with L_1.

Find the equations of L_2 and L_3.

Find the area of the triangle bounded by L_1, L_2 and L_3.



The diagram shows a cuboid OABCDEFG, where O is the origin, A has coordinates (5,0,0), C has coordinates (0,10,0) and D has coordinates (0,0,20). Find the cosine of angle CAF.



Let $f(x) = 3x + 4$
$f(f(x))$ can be represented by $f^2(x)$
$f(f(f(x)))$ can be represented by $f^3(x)$ and so on.
e.g. $f(5) = 19$ and $f^2(5) = 61$.

Using the same notation, let $g(x) = 2x + 5$ and $h(x) = 2x - 5$.

Calculate the value of $g^{25}(0.5) + h^{25}(0.5)$, giving your answer as a power of 2.

Give that $[f(x)]^2 = x(x + 1)(x + 2)(x + 3) + 1$ and $f(1) > 0$, calculate $f(x)$.