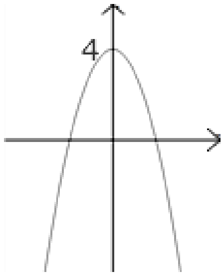
If b, h and r are lengths, which of these calculate an area: $2bh$, r^2h , $3b+2r$, $b(h+r)$, $\pi r^2 b$, $\frac{3b^2+r^2}{h}$?	What is the formula for the total surface area of a closed cylinder with base radius r and height h?
$2bh$ $b(h+r)$	$A=\pi r^2 h+2\pi r^2$
When would you use the sine rule?	When would you use the cosine rule?
In non-right angled triangles, the sine rule involves two angles and their opposite sides. $\frac{a}{\sin A}=\frac{b}{\sin B}\left(=\frac{c}{\sin C}\right)$	In non-right angled triangles, the cosine rule involves all three sides and one angle. $a^2=b^2+c^2-2bc\cos A$
Describe the graph given by the equation $x^2+y^2=9$.	Give the equation of a circle with centre (0,0) and radius $\sqrt{5}$.
Circle; centre (0,0); radius 3	$x^2+y^2=5$
How can you tell if two vectors are parallel?	How do you calculate the magnitude of a vector?
One is a multiple of the other e.g. $\begin{pmatrix}2\\8\end{pmatrix}$ and $\begin{pmatrix}4\\16\end{pmatrix}$	Using Pythagoras' theorem (Vectors are given in horizontal and vertical components.)

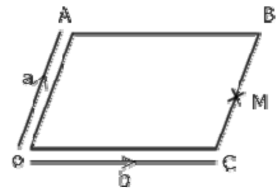
Sketch the parabola $y = 4 - x^2$



$-x^2$ gives the shape of the curve
4 gives the y-intercept

OABC is a parallelogram. M is the midpoint of BC. $\overrightarrow{OA}$ = **a** and $\overrightarrow{OC}$ = **b**.
Find: a) $\overrightarrow{OB}$ b) $\overrightarrow{AC}$ c) $\overrightarrow{MA}$.

a) $\overrightarrow{OB}$ = **a** + **b**
b) $\overrightarrow{AC}$ = **b** – **a**
c) $\overrightarrow{MA}$ = ½**a** – **b**



Describe the transformation which maps $y = f(x)$ onto $y = f(x) + a$.

Translation, vector $\begin{pmatrix} o \\ a \end{pmatrix}$

Describe the transformation which maps $y = f(x)$ onto $y = f(x + a)$.

Translation, vector $\begin{pmatrix} -a \\ o \end{pmatrix}$

Describe the transformation which maps $y = f(x)$ onto $y = -f(x)$.

Reflection in the x-axis

Describe the transformation which maps $y = f(x)$ onto $y = f(-x)$.

Reflection in the y-axis

Describe the transformation which maps $y = f(x)$ onto $y = af(x)$.

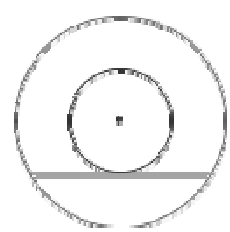
Vertical stretch, scale factor a

Describe the transformation which maps $y = f(x)$ onto $y = f(ax)$.

Horizontal stretch, scale factor $^1/_a$

Describe the transformation which maps $y = \sin x$ onto $y = 2\sin x$	Describe the three transformations needed to map $y = \cos x$ onto $y = 4 - 2\cos 3x$.
Vertical stretch, scale factor 2	Vertical stretch, scale factor 2 Horizontal stretch; scale factor $^1/_3$ Translation, vector $\begin{pmatrix}0\\4\end{pmatrix}$

The four cards below contain more complex puzzles, which require more working (all using GCSE Maths skills). You may wish to use them separately as a starter, plenary, discussion exercise or homework task.

Extension: Find an expression for the difference in area between a circle with radius r and the square it contains.	**Extension:** In a circle, a chord measuring 2m is also a tangent of a smaller concentric circle. Find the area of the ring between the two circles.
Circle radius = square diagonal Using Pythagoras, square side = $r\sqrt{2}$ Area difference $= \pi r^2 - \left(r\sqrt{2}\right)^2$ $= r^2(\pi - 2)$	Call the large circle a and the small circle b.  Using Pythagoras: $r_a{}^2 = 1 + r_b{}^2$ $A = \pi\left(1 + r_b{}^2\right) - \pi r_b{}^2$ $= \pi$ metres
Extension: The volumes of two spheres are 5cm^3 and 135cm^3. State the ratio of their: a) radii b) diameters c) surface areas.	**Extension:** Calculate the area of a right angled triangle where: $a = (x - 2)$, $b = (x + 5)$, hypotenuse $= (2x - 1)$.
Ratio of volumes = 1 : 27, so ... a) ratio of radii = 1 : 3 b) ratio of diameters = 1 : 3 c) ratio of surface areas = 1 : 9.	Using Pythagoras: $(2x-1)^2 = (x-2)^2 + (x+5)^2$ $x = 7$ (cannot be -2) Area $= \frac{1}{2}(7-2)(7+5) = 30$ sq. units