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19 $f(x) = x^2 - 4$

$g(x) = 2x + 1$

Solve $fg(x) > 0$

Show clear algebraic working.

.....
(Total for Question 19 is 4 marks)



P 6 8 7 9 1 A 0 2 1 2 8

20 The centre O of a circle has coordinates $(4, 7)$

The point A , on the circle, has coordinates $(6, 11)$ and AOP is a diameter of the circle.

Find an equation of the tangent to the circle at the point P

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.....
(Total for Question 20 is 4 marks)



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21 Solve the simultaneous equations

$$\begin{aligned}x - 2y &= 3 \\x^2 - y^2 + 2x &= 10\end{aligned}$$

Show clear algebraic working.

.....
(Total for Question 21 is 5 marks)



22 The point A with coordinates $(-3, 2)$ lies on the straight line with equation $y = f(x)$

(a) Find the coordinates of the image of the point A on the straight line with equation

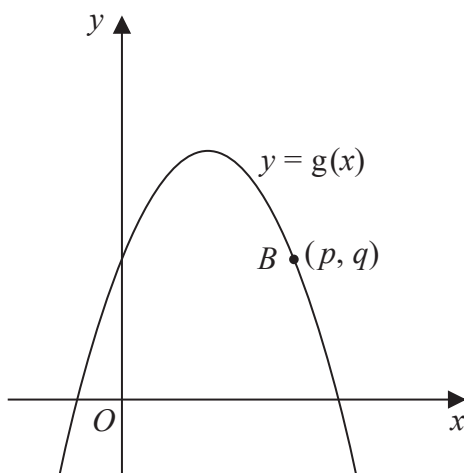
(i) $y = f(x) - 3$

(.....,)
(1)

(ii) $y = f\left(\frac{x}{2}\right)$

(.....,)
(1)

Here is a sketch of part of the curve with equation $y = g(x)$



The point B with coordinates (p, q) lies on the curve.

(b) Find the coordinates of the image of the point B on the curve with equation

$$y = -g(x - c)$$

where c is a constant.

(.....,)
(2)

(Total for Question 22 is 4 marks)



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23 Express $\left(\frac{20}{x^2 - 36} - \frac{2}{x - 6}\right) \times \frac{1}{4 - x}$ as a single fraction in its simplest form.

.....
(Total for Question 23 is 3 marks)

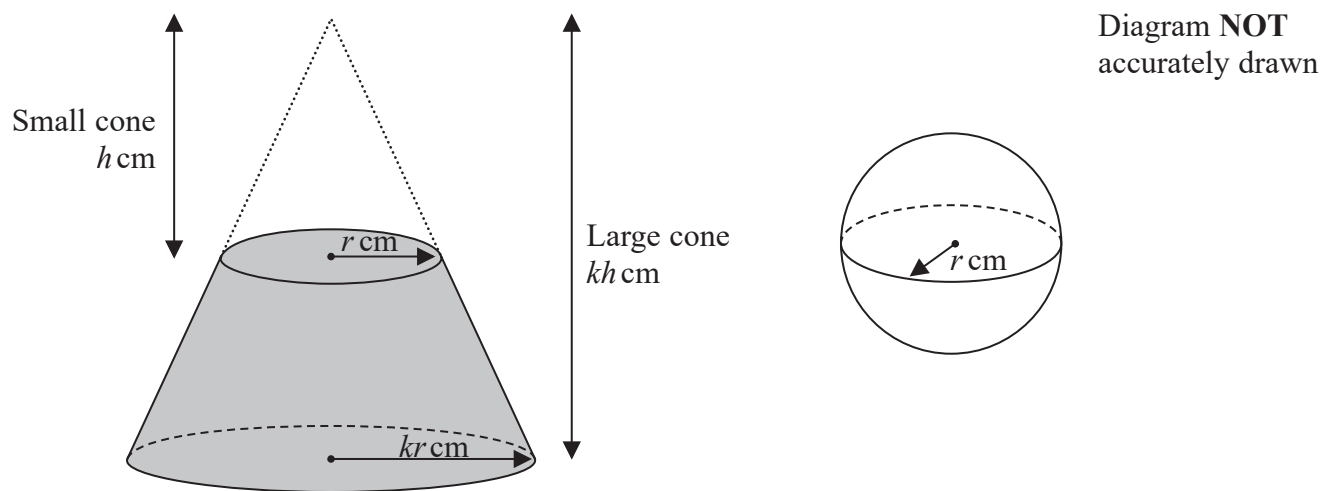


P 6 8 7 9 1 A 0 2 5 2 8

24 The diagram shows a frustum of a cone, and a sphere.

The frustum, shown shaded in the diagram, is made by removing the small cone from the large cone.

The small cone and the large cone are similar.



The height of the small cone is h cm and the radius of the base of the small cone is r cm. The height of the large cone is kh cm and the radius of the base of the large cone is kr cm. The radius of the sphere is r cm.

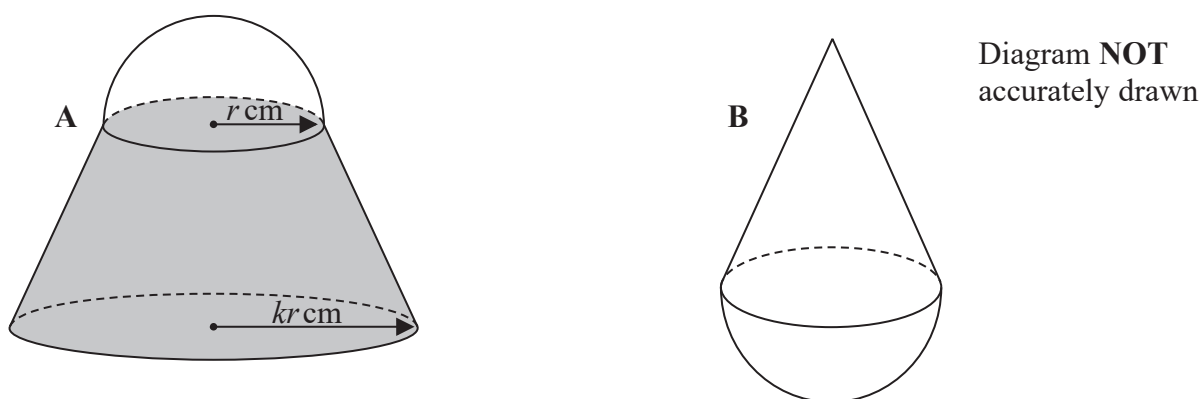
The sphere is divided into two hemispheres, each of radius r cm.

Solid **A** is formed by joining one of the hemispheres to the frustum.

The plane face of the hemisphere coincides with the upper plane face of the frustum, as shown in the diagram below.

Solid **B** is formed by joining the other hemisphere to the small cone that was removed from the large cone.

The plane face of the hemisphere coincides with the plane face of the base of the small cone, as shown in the diagram below.



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The volume of solid **A** is 6 times the volume of solid **B**.

Given that $k > \sqrt[3]{7}$

find an expression for h in terms of k and r

$h = \dots\dots\dots$

(Total for Question 24 is 6 marks)



P 6 8 7 9 1 A 0 2 7 2 8

25 $ABCD$ is a parallelogram and ADM is a straight line.

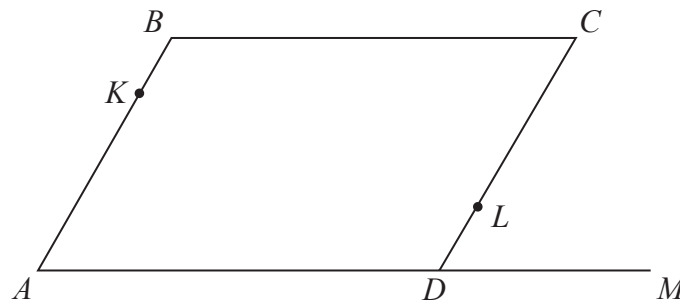


Diagram **NOT** accurately drawn

$$\vec{AB} = \mathbf{a} \quad \vec{BC} = \mathbf{b} \quad \vec{DM} = \frac{1}{2}\mathbf{b}$$

K is the point on AB such that $AK:AB = \lambda:1$
 L is the point on CD such that $CL:CD = \mu:1$
 KLM is a straight line.

Given that $\lambda:\mu = 1:2$

use a vector method to find the value of λ and the value of μ

$$\lambda = \dots\dots\dots$$

$$\mu = \dots\dots\dots$$

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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