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16 There are 12 beads in a bag.

- 7 of the beads are red.
- 3 of the beads are green.
- 2 of the beads are yellow.

Lucy takes at random a bead from the bag and keeps it.
Then Julian takes at random a bead from the bag.

(a) Work out the probability that they each take a yellow bead.

(2)

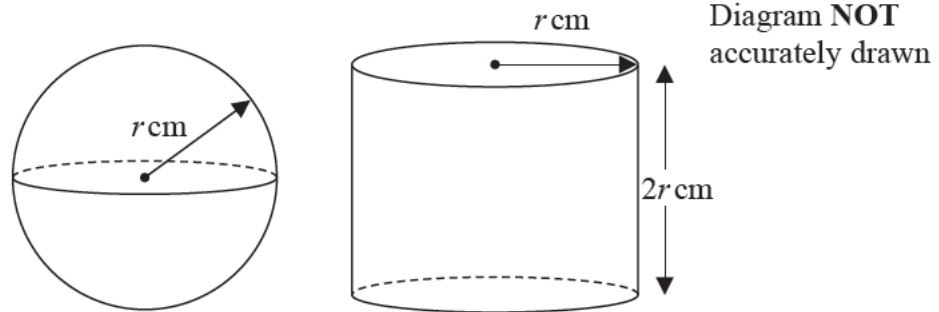
(b) Work out the probability that the beads they take are **not** the same colour.

(3)

(Total for Question 16 is 5 marks)



17 Here are a solid sphere and a solid cylinder.



The radius of the sphere is $r \text{ cm}$.

The radius of the cylinder is $r \text{ cm}$.

The height of the cylinder is $2r \text{ cm}$.

The total surface area of the cylinder is $k\pi \text{ cm}^2$

(a) Find an expression for k in terms of r .

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(2)



(b) Show that the ratio

total surface area of the cylinder : total surface area of the sphere

is the same as the ratio

volume of the cylinder : volume of the sphere

(3)

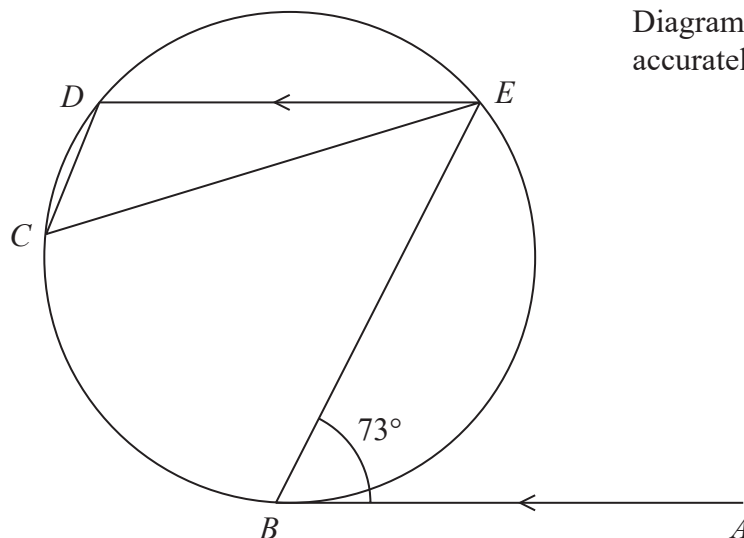
(Total for Question 17 is 5 marks)

- 18 Show that $\frac{\sqrt{8}}{\sqrt{8}-2}$ can be written in the form $n + \sqrt{n}$, where n is an integer.
Show your working clearly.

(Total for Question 18 is 3 marks)



Diagram **NOT**
accurately drawn



B , C , D and E are points on a circle.

AB is the tangent at B to the circle.

AB is parallel to ED .

Angle $ABE = 73^\circ$

Work out the size of angle DCE .

Give a reason for each stage of your working.

(Total for Question 19 is 5 marks)



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20 Here is a cube $ABCDEFGH$.

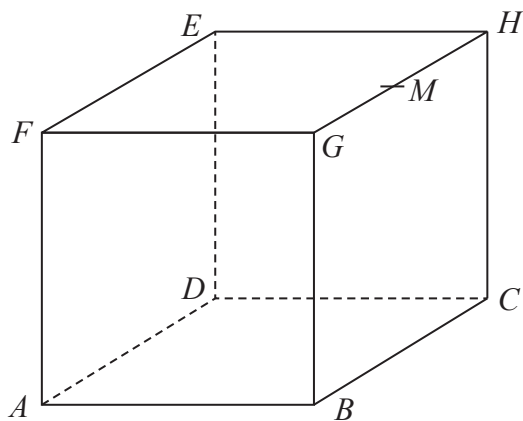


Diagram **NOT** accurately drawn

M is the midpoint of the edge GH .

Find the size of the angle between the line MA and the plane $ABCD$.
Give your answer correct to 1 decimal place.

(Total for Question 20 is 4 marks)



21 Here is a triangle XYZ .

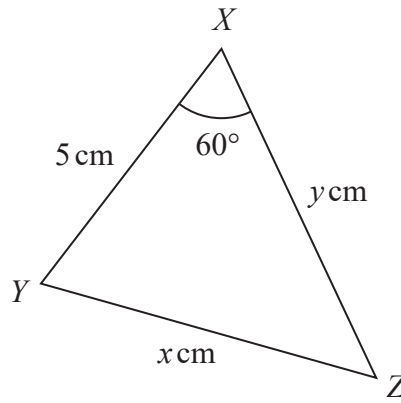


Diagram **NOT**
accurately drawn

The perimeter of the triangle is $k\text{ cm}$.

Given that $x = y - 1$

find the value of k .

Show your working clearly.

$k =$

(Total for Question 21 is 5 marks)

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22 $ABCDEF$ is a regular hexagon.

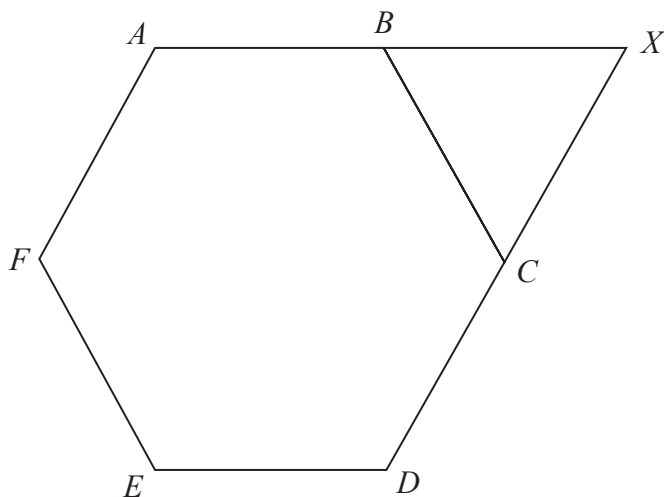


Diagram **NOT** accurately drawn

ABX and DCX are straight lines.

$$\vec{AB} = \mathbf{a} \quad \vec{BC} = \mathbf{b}$$

Find \vec{EX} in terms of \mathbf{a} and \mathbf{b} .

Give your answer in its simplest form.

(Total for Question 22 is 4 marks)



P 5 9 0 2 2 A 0 2 5 2 8

23 The function f is defined as $f(x) = \frac{\sqrt{x^2 + k^2}}{x}$ for $x > 0$ and where k is a positive number.

(a) Find the value of p for which $f^{-1}(p) = k$

$$p = \quad (3)$$

The function g is defined as $g(x) = x^2$ for $x > 0$

(b) Given that $gf(a) = k$ for $k > 1$
find an expression for a in terms of k .

$$a = \quad (3)$$

(Total for Question 23 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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