## Question 1

(i) Use the diagram on the right to calculate the value of $x$. Give your answer in surd form.

(ii) Use the diagram below to calculate the value of $y$. Give your answer in surd form.

(iii) A rectangle with sides of length $x$ and $y$ is drawn using the values of $x$ and $y$ from parts (i) and (ii), as shown below.
Write the perimeter of this rectangle in the form $a \sqrt{2}$, where $a \in \mathbb{N}$.


## Question 2

A triangle has a base length of $2 x \mathrm{~cm}$ and a perpendicular height of $(x+3) \mathrm{cm}$.
The area of the triangle is $10 \mathrm{~cm}^{2}$. Find the distance $x$.



## Question 3

The diagram below shows part of the frame of a swing on a co-ordinate grid.
Each unit on the grid represents one metre.
The line segments $[A B]$ and $[A C]$ represent metal bars.

(i) Write the co-ordinates of the points $A, B$, and $C$ in the spaces provided in the diagram.
(ii) Find the total length of metal bar needed to make this part of the swing.

Give your answer in metres, correct to one decimal place.

(iii) Find the slope of $A B$ and the slope of $A C$.

(iv) Is $A B$ perpendicular to $A C$ ? Give a reason for your answer.

Answer:
Reason:
(v) Madison draws the scale diagram of the triangle $O A B$ shown on the right. She marks in the angle $X$.
Recall that $[A B]$ is a metal bar, which is part of the frame of the swing.
Write down the value of $\tan X$, and hence find the size of the angle $X$. Give the size of the angle $X$ correct to two decimal places.


In order to increase the height of the swing, it is decided to increase $X$ by $20 \%$.
The distance $|A B|$ will be kept the same.
(vi) Find the new height of the swing. Give your answer in metres, correct to one decimal place.


## Question 4


(a) Write the coordinates of $A, B$ and $C$.

$$
A(\quad, \quad B(\quad, \quad C(\quad, \quad)
$$

(b) Find the co-ordinates of $D$, the mid-point of $[A B]$.
(c) Find the equation of the line $A B$.

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(d) Find the equation of the line through $C$, perpendicular to $A B$.
(e) Let $E$ be the point where this perpendicular line through $C$ intersects $A B$. Calculate the coordinates of the point $E$.

(f) Which is the shorter distance, $|C D|$ or $|C E|$ ? Find this distance.


## Question 5

The point A is shown on the diagram.
(a) Write down the co-ordinates of $A$.

(b) Plot the following points on the diagram above.

| $\boldsymbol{B}$ | $\boldsymbol{C}$ | $\boldsymbol{D}$ | $\boldsymbol{E}$ | $\boldsymbol{F}$ |
| :---: | :---: | :---: | :---: | :---: |
| $(2,0)$ | $(-4,-4)$ | $(0,4)$ | $(-6,0)$ | $(4,-4)$ |

(c) Calculate the midpoint of [DF ].

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(d) Find the slope of $B F$.

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(e) Write down the equation of the line $B F$ in the form $y=m x+c$.

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(f) Find the slope of the line $C E$.

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(g) Write the equation of the line $C E$ in the form of $a x+b y+c=0$.

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(h) What is the ratio of the area of the triangle $B C E$ to the area of the triangle $B C F$ ?

(i) State whether the two triangles in part (h) above are congruent.

Give a reason for your answer.


## Question 6

The table below gives the equations of six lines.

| Line 1 | $y=3 x-6$ |
| :---: | :--- |
| Line 2 | $y=3 x+12$ |
| Line 3 | $y=5 x+20$ |
| Line 4 | $y=x-7$ |
| Line 5 | $y=-2 x+4$ |
| Line 6 | $y=4 x-16$ |

(a) Which line has the greatest slope? Give a reason for your answer.

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(b) Which lines are parallel? Give a reason for your answer.

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(c) Draw a sketch of Line 1 on the axes shown.


(d) The diagram below represents one of the given lines. Which line does it represent?



Answer $=$ Line $\qquad$
(e) The table shows some values of $x$ and $y$ for the equation of one of the lines. Which equation do they satisfy?

| $\boldsymbol{x}$ | $\boldsymbol{y}$ |
| :---: | :---: |
| 7 | 12 |
| 9 | 20 |
| 10 | 24 |


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Answer = Line $\qquad$
(f) There is one value of $x$ which will give the same value of $y$ for Line 4 as it will for Line 6 .

Find, using algebra, this value of $x$ and the corresponding value of $y$.

(g) Verify your answer to (f) above.

## Question 7

The equation of the line $l$ is $x-3 y-6=0$.
(i) Find the slope of the line $l$.
(ii) Show that the point $(1,-2)$ is not on the line $l$.

(iii) The line $k$ passes through $(1,-2)$ and is parallel to the line $l$.

Find the equation of the line $k$.


