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0178/03

October/November 2022

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic Calculator
Geometrical Instruments
Tracing Paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and candidate number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown below that question.

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π use either your calculator value or 3.142.

The number of marks is given in brackets [] at the end of each question or part question.
The total of the marks for this paper is 100.

This document consists of **15** printed pages and **1** blank page.

1 (a) $\mathbf{A} = \begin{pmatrix} -2 & 1 \\ 0 & 2 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 3 & -1 \\ 1 & 0 \end{pmatrix}$

(i) $k\mathbf{A} = \begin{pmatrix} 4 & -2 \\ 0 & -4 \end{pmatrix}$

Find the value of k .

(ii) Work out $\mathbf{A} + \mathbf{B}$.

..... [1]

(b) The coordinates of the points P and Q are $(-3, 1)$ and $(5, 7)$ respectively.

Find

(i) the coordinates of the mid-point of PQ ,

..... [2]

(.....,)[2]

(ii) $|\overline{PQ}|$,

..... [3]

(iii) the equation of the line PQ .

..... [3]

2 (a) 20 litres of drink contains a concentrate and 40% of water.

(i) Write the ratio of water to concentrate in its simplest form.

..... [2]

(ii) Calculate the volume of water that must be added if the new mixture of drink contains 70% of water.

..... [3]

(b) The cost of petrol in November 2019 was M12.65 per litre.

(i) Calculate the maximum number of **full litres** of petrol that could be bought for M150.

..... [2]

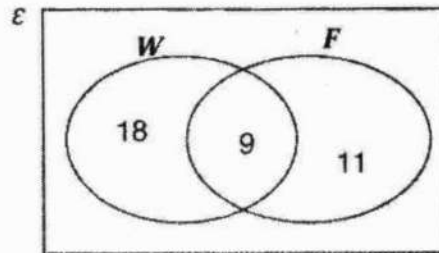
(ii) In January 2020 the cost of a litre of petrol decreased by 1.98%.

Calculate the cost of a litre of petrol in January 2020.

M..... [3]

- 3 In a survey, 45 students were asked if they use WhatsApp (W) or Face book (F) as their social media.

The Venn diagram represents part of the information.



- (a) Find

(i) the total number of students who use **only one** social media,

..... [1]

(ii) the number of students who use neither WhatsApp nor Facebook.

..... [2]

- (b) Find

(i) $n(W \cap F)'$,

..... [2]

(ii) $n(W' \cup F)$.

..... [2]

- (c) Describe in words the set $(W' \cap F)$.

.....
 [1]

- 4 (a) Factorise completely.

$$6xa - 3y - 9x + 2ay$$

..... [3]

- (b) Mpho is n years old and her brother, Pule, is $n + 7$ years old.
Their mother is 3 times as old as Mpho.

- (i) The father will retire at 60 years old when he is $2n + 22$.

Find Pule's age.

..... [3]

- (ii) Calculate the sum of the ages of Mpho and her mother.

..... [2]

- (iii) Find the mother's age when Pule was born.

..... [2]

- 5 (a) Solve the equation $x^2 - 3x - 18 = 0$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

- (b) Express as a single fraction.

$$1 + \frac{2x-5}{3} - \frac{x+3}{2}$$

$\dots\dots\dots$ [3]

- (c) Mr. Khutlo invests Mx in Bank **A** and My in Bank **B**.

The total money invested is M2500.

He gets 10% interest from Bank **A** and 20% interest from Bank **B** which makes a **total interest** of M380 after the investment.

One of the equations which represent the information is $x + y = 2500$.

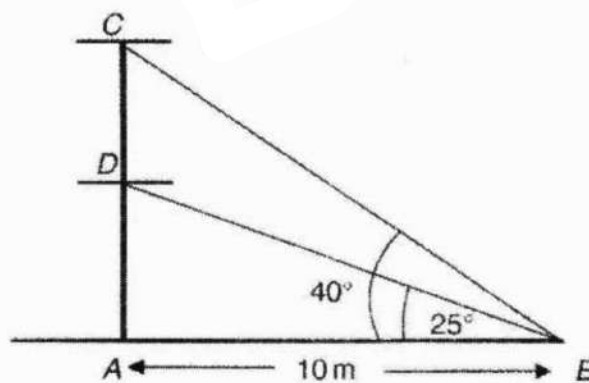
By forming another equation, or otherwise, find the amount of money Mr. Khutlo invested in Bank **B**.

M. [4]

- 6 The diagram shows a radio station tower which is built in two sections.

The angle of elevation of the top of the first section is 25° and for the top of the second section is 40° .

$AB = 10$ m.



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(a) Find the angle of depression of B from D .

..... ° [1]

(b) Calculate

(i) BC ,

..... m [3]

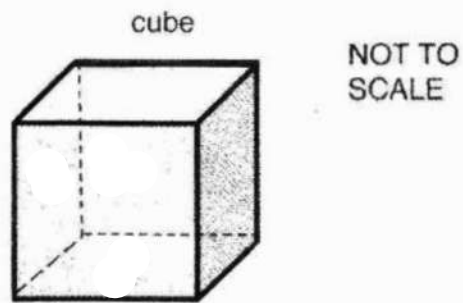
(ii) the angle BDC ,

$\widehat{BDC} =$ ° [2]

(iii) DC .

..... m [4]

- 7 The diagram shows a container in a form of a cube.
The container is completely filled with water of volume 3375 cm^3 .

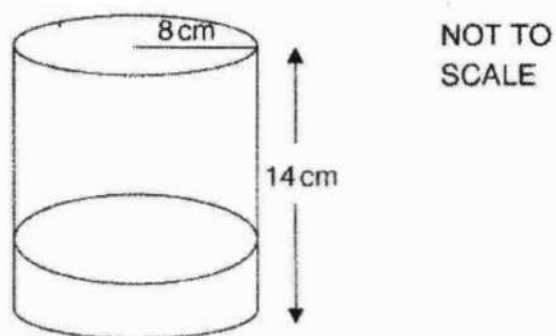


- (a) Calculate the total surface area of the cube.

..... cm^2 [2]

- (b) All the water from the cube is poured into the cylinder which already has some water as shown in the diagram.

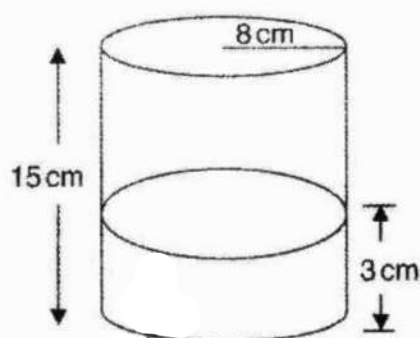
The cylindrical container has radius 8 cm and height 14 cm .



By making all the necessary calculations, show whether or not all the water from the cube can fill the cylinder.

[3]

- (c) Another cylinder has radius 8 cm and height of 15 cm.
It contains water to a depth of 3 cm as shown in the diagram.



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Calculate the total surface area of the container which is in contact with water.

..... cm² [3]

- 8 The table shows the results of 45 students who took part in a quiz.

Number of correct answers	3	4	5	6	7	8	9	10
Number of students	5	3	7	8	10	5	4	3

(a) Find

- (i) the number of students who have more than 7 correct answers,

..... [1]

- (ii) the median,

..... [2]

- (iii) the mean.

..... [3]

- (b) Find the probability that a student chosen at random has less than 6 correct answers.

..... [2]

- (c) A pie chart is to be drawn to represent the information in the table.

Calculate the sector angle that would represent the number of students who have 7 correct answers.

..... [2]

- 9 The table shows values of x and y for $y = x^2 + bx - 4$.

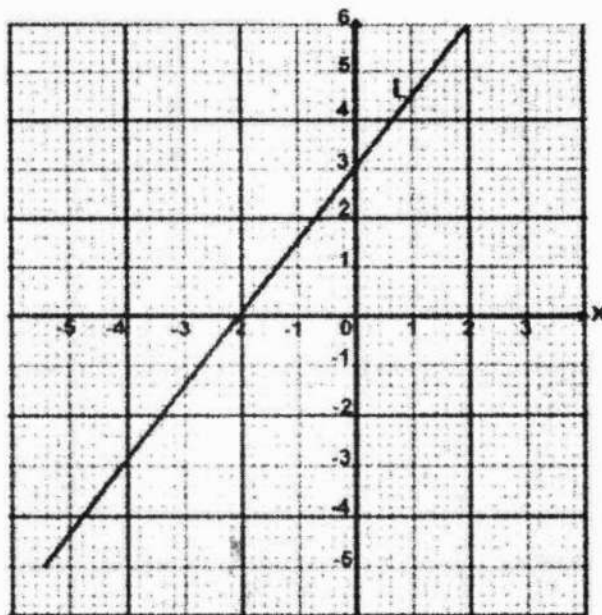
x	-5	-4	-3	-2	-1	0	1	2
y	6	0	-4	-6	-6	-4	0	6

- (a) Use the information from the table to calculate the value of b in $y = x^2 + bx - 4$.

$b = \dots\dots\dots$ [2]

- (b) The line **L** is drawn on the grid.

On the same grid, draw the graph of $y = x^2 + bx - 4$ for $-5 \leq x \leq 2$. [3]



- (c) The equation of the line **L** is written in the form $ky = hx + 6$.

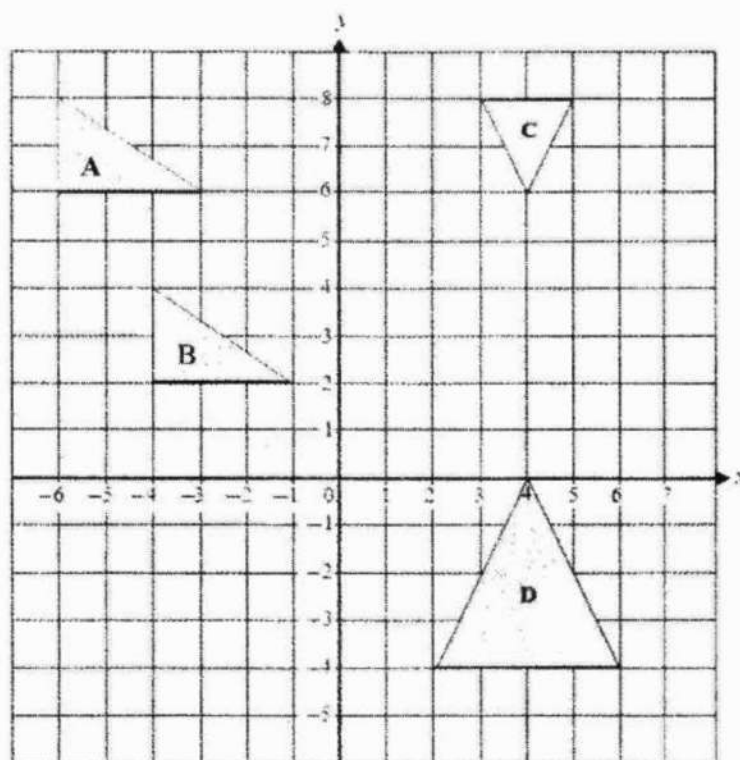
Find the values of k and h .

$k = \dots\dots\dots$ $h = \dots\dots\dots$ [3]

- (d) Write down the x -coordinates of the points where the two graphs meet.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

- 10 The diagram shows four triangles A , B , C and D .



- (a) Describe fully the single transformation that maps

- (i) A onto B .

..... [2]

- (ii) C onto D .

..... [3]

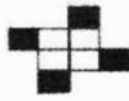
- (b) Draw the image of triangle B after a rotation through 90° anticlockwise using the centre as $(-1, 2)$. [2]

11 The diagram shows patterns with shaded and unshaded squares.

Pattern 4 is incomplete.



Pattern 1



Pattern 2



Pattern 3



Pattern 4

(a) Complete the 4th pattern.

[1]

(b) Complete the table.

Pattern Number	1	2	3	4
Unshaded squares	1	4		
Shaded squares	4	4	4	4
Total number of squares	5	8	13	

[2]

(c) Find the number of unshaded squares in the 21st pattern.

[1]

(d) Find the pattern number with total number of 965 squares.

[2]