



EXAMINATIONS COUNCIL OF ESWATINI  
Junior Certificate Examination

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**MATHEMATICS**

**309/02**

Paper 2

**October/November 2022**

**2 hours 30 minutes**

Candidates answer on the Question Paper.

Additional materials: Geometrical Instruments

Tracing paper (optional)

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on the spaces provided.

Write in dark blue or black pen in the spaces provided on the Question Paper.

You may use a pencil for any diagrams or graphs.

Do **not** use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

All working should be clearly shown below each question.

The number of marks is given in brackets [ ] at the end of each question or part question.

Calculators should **not** 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.

3-figure tables may be used in any question where necessary.

The total of the marks for this paper is 100.

For Examiner's Use	
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1 The following is a list of ingredients a scientist uses to make a litre of hand sanitiser.

- 666 ml - rubbing alcohol
- 333 ml - aloe vera
- 1 ml - eucalyptus oil

(a) Find the ratio of the aloe vera to rubbing alcohol in its simplest form.

*Answer (a)* ..... [2]

(b) The scientist uses 1998 ml of rubbing alcohol.

(i) Calculate the volume of sanitiser produced.

*Answer (b)(i)*.....litres [2]

(ii) The produced sanitiser is packed into 125 ml bottles.

Find the number of bottles that can be packed.

*Answer (b)(ii)* ..... [3]

(c) The cost of making each 125 ml bottle is E20.00.  
If each 125 ml bottle is sold at 30% profit.

Calculate the selling price of each bottle.

*Answer (c)* E..... [3]

- (d) The workers of a company are categorised as follows.

Group A	Group B	Group C
Mixing and Packaging	Marketing	Administration

The ratio of the number of workers in Group A to the number of workers in Group B is 3:1

The ratio of the number of workers in Group B to the number of workers in Group C is 3:5

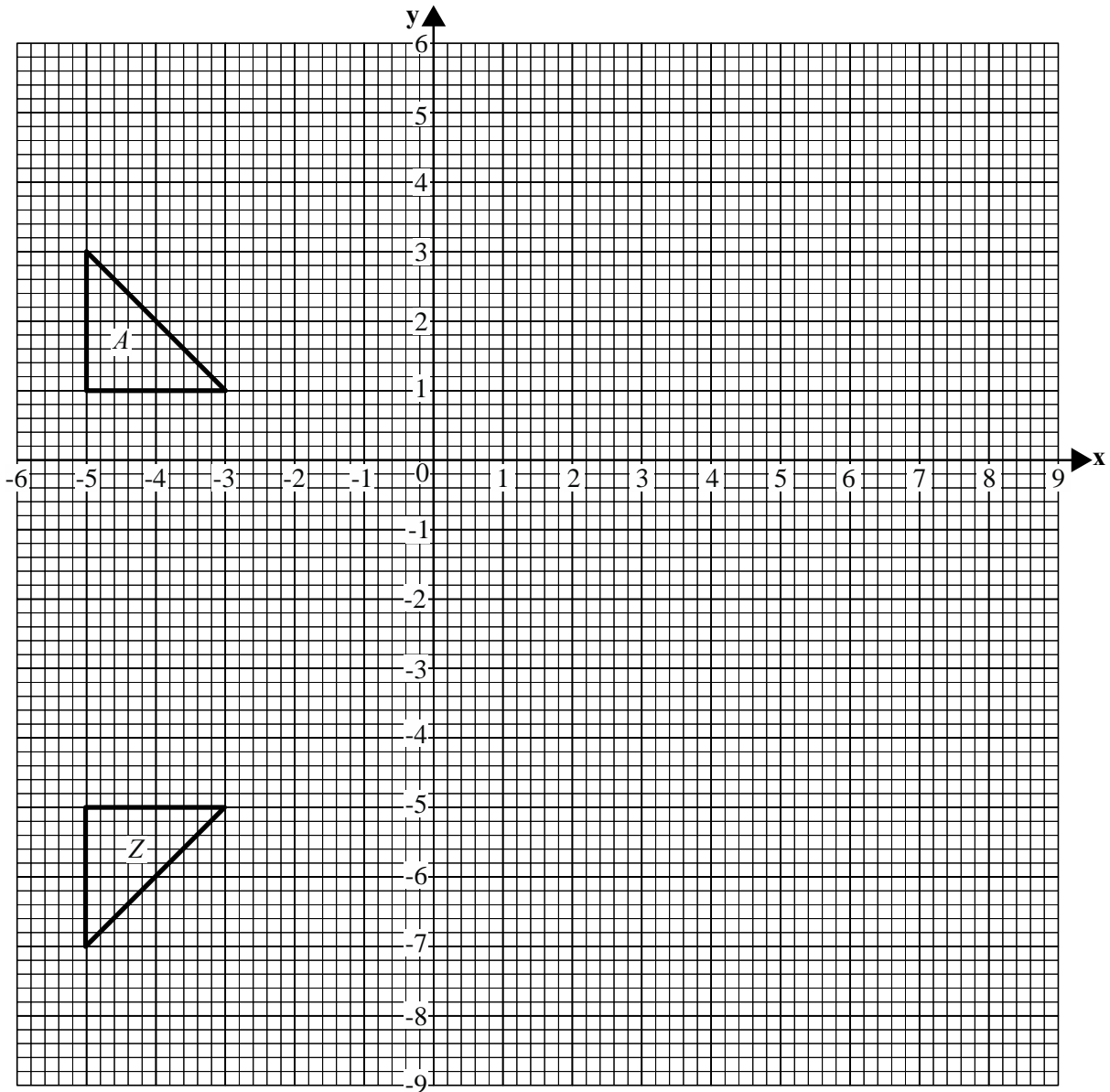
- (i) Find the ratio of the number of workers in Group A to the number of workers in Group C in its simplest form.

*Answer (d)(i) .....* [3]

- (ii) There are 18 workers in Group A.  
Find the total number of workers for the company.

*Answer (d)(ii) .....* [3]

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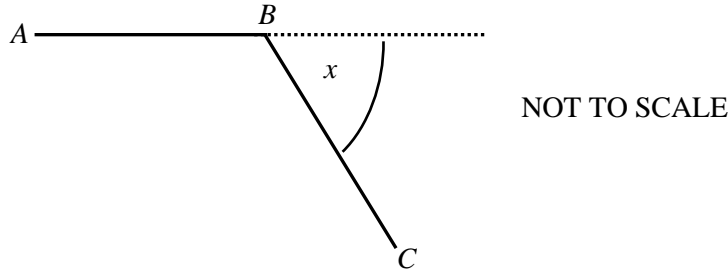


- (a) Draw the image of triangle A after a reflection in line  $x = 0$ , Label the image  $Q$ . [2]
- (b) Draw the image of triangle A after translation by column vector  $\begin{pmatrix} 0 \\ -5 \end{pmatrix}$ , Label the image  $R$ . [2]
- (c) Draw the image of triangle A after rotation, center  $(0,0)$ , angle  $180^\circ$ . Label the image  $K$ . [2]
- (d) Draw the image of triangle A after enlargement, centre  $(0,0)$ , scale factor  $-2$ .  
Label the image  $P$ . [3]
- (e) Describe a single transformation which maps triangle A onto triangle Z.

..... [2]

..... [2]

- 3 (a) The figure shows part of a regular polygon.  
 $x$  is an exterior angle of the polygon.



- (i) Write an expression in terms of  $x$  for the size of the interior angle.

Answer (a)(i) ..... [1]

- (ii) The size of the interior angle is three times the size of the exterior angle.  
 Find the value of  $x$ .

Answer (a)(ii)  $x =$  ..... [2]

- (iii) Find the number of sides of the polygon.

Answer (a)(iii) ..... [2]

- (iv) Write the name of the polygon.

Answer (a)(iv) ..... [1]

- (b) Write the mathematical terms that describe the following;

- (i) A four sided polygon.

Answer (b)(i) ..... [1]

- (ii) A number with only two factors.

Answer (b)(ii) ..... [1]

- (iii) Angles that sum up to  $180^\circ$ .

Answer (b)(iii) ..... [1]

- (iv) Lines that form an angle of  $90^\circ$  when they intersect.

Answer (b)(iv) ..... [1]

4 (a) Simplify

$$(3xy^3)^3$$

Answer (a) ..... [2]

(b)  $\left(\frac{3^2}{4}\right)^{-2}$

Answer (b) ..... [3]

(c) Factorise.

$$2x^2 + 2xy - 4x$$

Answer (c) ..... [2]

(d) Solve the equation

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

Answer (d) ..... [4]

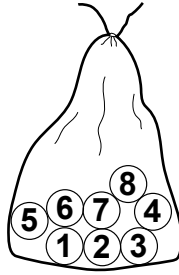
(e) Write as a single fraction

$$\frac{x-4}{3} - \frac{x+3}{4}$$

Answer (e) ..... [3]

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- 5 The diagram shows a bag with eight identical balls.



- (a) A ball is picked at random from the bag.

Find the probability that the ball has;

- (i) an even number,

Answer (a)(i) ..... [1]

- (ii) a square number,

Answer (a)(ii) ..... [1]

- (iii) a number greater than 8.

Answer (a)(iii) ..... [1]

- (b) Another bag has  $x$  balls.

The probability of picking a ball with a number less or equal to 10 is  $\frac{10}{x}$ .  
Find the probability of picking a ball with a number greater than 10.

Answer (b) ..... [1]

6 The distribution below shows marks for 30 learners in a class.

4	6	5	7	8	9
5	10	7	5	7	10
8	7	8	5	6	4
7	9	10	7	9	6
6	7	6	9	7	6

(a) Fill in the frequency table below.

Marks		Frequency
4		
5		
6		
7		
8		
9		
10		

[3]

(b) State the modal mark.

*Answer (b)* ..... [1]

(c) Find the median.

*Answer (c)* ..... [2]

(d) Calculate the mean mark.

*Answer (d)* ..... [3]



(e) Find the number of learners who scored at least eight marks.

*Answer (e)* ..... [2]

(f) If 20% of the learners liked brown shoes.  
Calculate the number of learners that did not like brown shoes.

*Answer (f)* ..... [2]

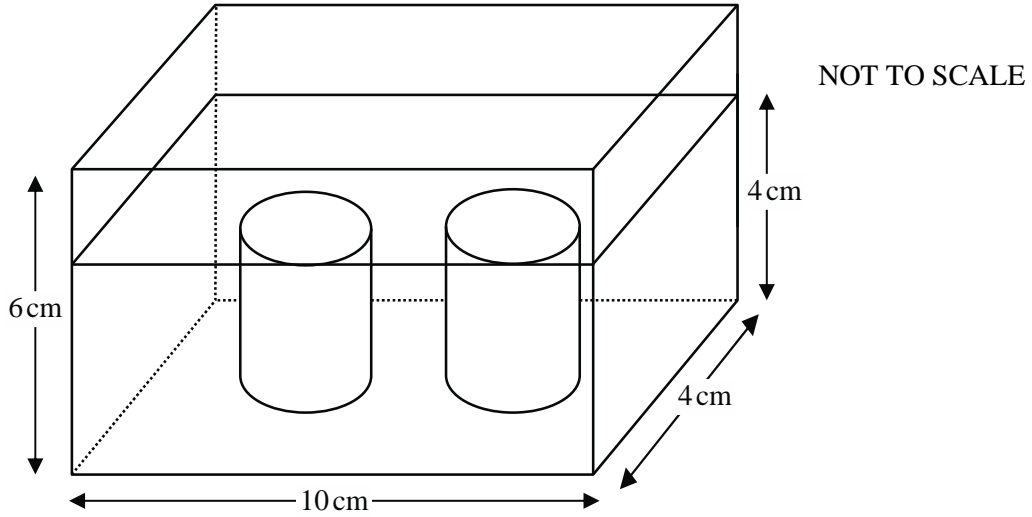
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7 The diagram shows two closed cylinders of base area of  $12.5 \text{ cm}^2$  on the base of a cuboid.

The cuboid has length 10 cm, width 4 cm and height of 6 cm.

Water is added to a height of 4 cm.

The water just covers both cylinders.



(a) Calculate the volume of each cylinder.

Answer (a) ..... [2]

(b) Calculate the volume of the water in the cuboid.

Answer (b) ..... [3]

- (c) The two cylinders are removed from the cuboid.  
Calculate the new height of the water in the cuboid.

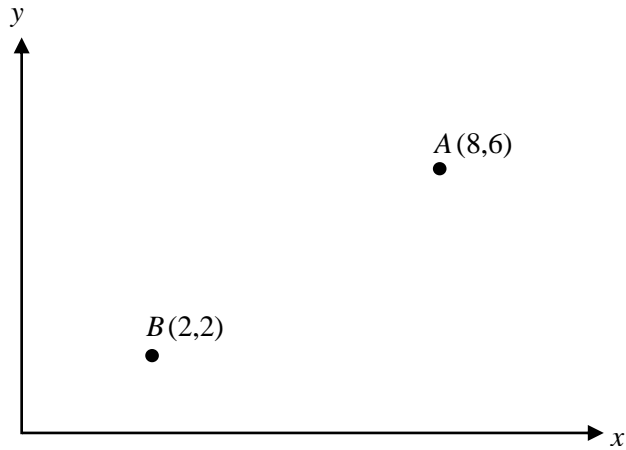
*Answer (c)* ..... [2]

- (d) Calculate the surface area of the cuboid when closed.

*Answer (d)* ..... [4]

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- 8 The diagram shows points  $A$  and  $B$ .



- (a) Find the column vector  $\overrightarrow{AB}$ .

Answer (a) ..... [2]

- (b)  $\overrightarrow{BC} = \frac{1}{2}\overrightarrow{AB}$ .

Find  $\overrightarrow{BC}$ .

Answer (b) ..... [2]

- (c) Find the equation of the line that passes through  $A$  and  $B$ .

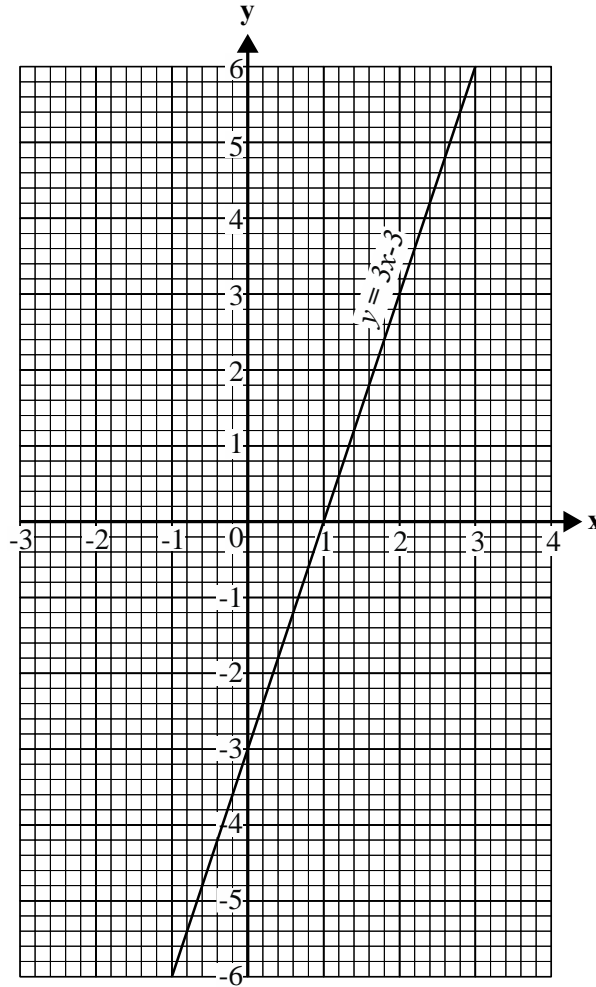
Answer (c) ..... [3]

- (d) The coordinate  $M(1, p)$  lies along the line  $AB$ .

Find the value of  $p$ .

Answer (d) ..... [1]

9 The diagram shows the graph  $y = 3x - 3$ .



(a) (i) On the same grid, draw the line  $y = 3 + x$  [2]

(ii) Use your graph to solve;

$$y = 3x - 3$$

$$y = 3 + x$$

Answer (a)(ii)  $x = \dots\dots\dots$

$y = \dots\dots\dots$  [2]

(b) On the same grid, shade the region that is represented by  $y \leq 3x - 3$  [2]

- 10** There are three Towns  $A$ ,  $B$  and  $C$ .

The distance between Town  $A$  and Town  $B$  is  $x$  km.

The distance between Town  $B$  to Town  $C$  is 5km less than the distance between Town  $A$  and Town  $B$ .

- (a) Mr Adams drove from Town  $A$  to Town  $B$  at an average speed of 80 km/h.

Express in terms of  $x$  the **time** taken by Mr Adams to travel from Town  $A$  to Town  $B$ .

*Answer (a)* .....hours [1]

- (b) Mr Adams then drove from Town  $B$  to Town  $C$  at an average speed of 120 km/h.

- (i) Find in terms of  $x$  the distance between Town  $B$  and Town  $C$ .

*Answer (b)(i)* .....km [1]

- (ii) Find in terms of  $x$ , the time taken by Mr Adams to travel from Town  $B$  to Town  $C$ .

*Answer (b)(ii)*..... [2]

- (c) The total time taken by Mr Adams to travel from Town  $A$  via Town  $B$  to Town  $C$  was  $2\frac{1}{2}$  hours.  
Form and solve an equation to find the value of  $x$ .

*Answer (c)*  $x =$  ..... [4]



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