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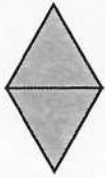
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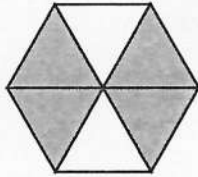
READ THESE INSTRUCTIONS FIRST

Examinations Council of Lesotho

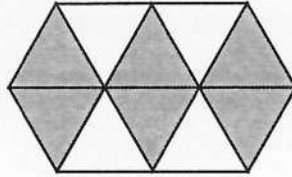
- 1 The diagram shows a sequence of patterns made of shaded and unshaded triangles.



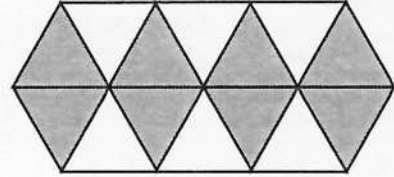
Pattern 1



Pattern 2



Pattern 3



Pattern 4

- (a) Complete the table.

Pattern number	1	2	3	4
Number of shaded triangles	2	4		
Number of unshaded triangles	0	2	4	6
Total number of triangles	2	6	10	

[2]

- (b) Find

- (i) the number of unshaded triangles in pattern 6,

..... [1]

- (ii) the n th term, for the total number of triangles in pattern n .

..... [2]

- (c) The number of unshaded triangles in a particular pattern is 98.

Find the total number of triangles in this pattern.

..... [2]

- 2 (a) $\mathcal{U} = \{x: x \text{ is whole number less than } 12\}$.
 $A = \{x: x \text{ is a prime number}\}$.
 $B = \{x: x \text{ is the solution of } 1 \leq x \leq 6\}$.

(i) Draw a Venn diagram to illustrate this information.

[2]

(ii) State the value of $n(A \cap B)$.

.....[1]

(iii) List the elements of $B \cap A'$.

.....[1]

- (b) The ceremony was attended by 64 people.
 40 people preferred fizzy drink.
 36 people preferred fruit juice.
 5 people preferred neither.

Find the number of people who preferred both fizzy drink and fruit juice.

..... [3]

- 3 In bowl A there are three red balls and one blue ball.
In bowl B there are two red balls and three blue balls.

A ball is randomly selected from each bowl.

(a) Find the probability that

(i) only blue balls are selected,

(ii) balls of the same colour are selected,

.....[1]

(iii) at least one red ball is selected.

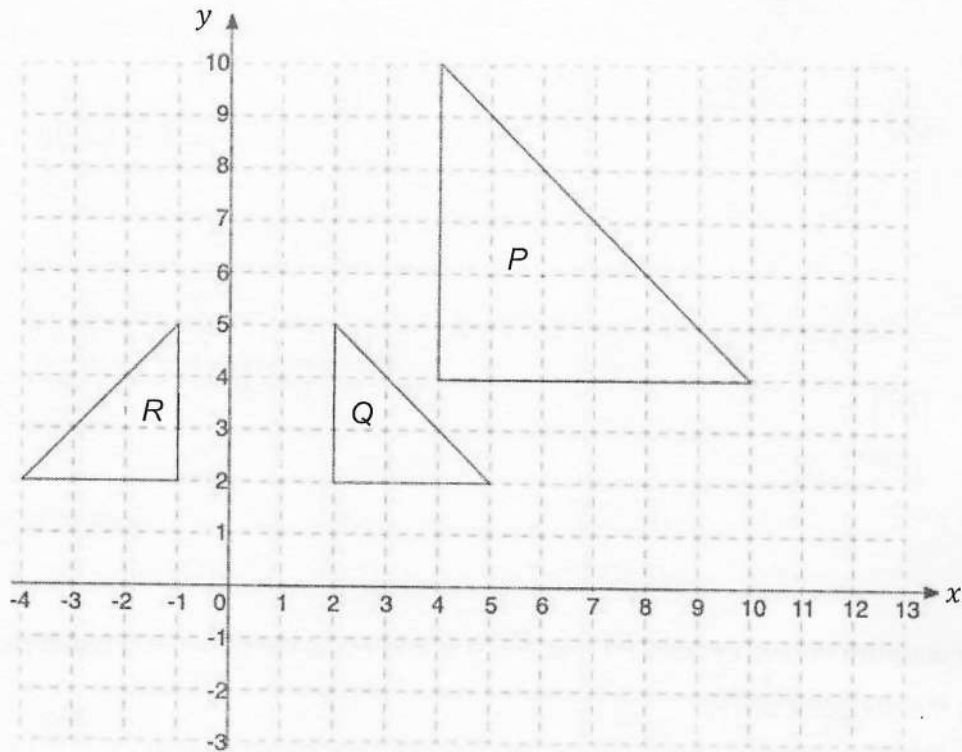
.....[3]

.....[2]

- (b) Find the number of red balls to be added in bowl B such that the probability of selecting a red ball is $\frac{2}{3}$.

.....[2]

- 4 The diagram shows triangles P , Q and R .



- (a) Describe fully a single transformation which maps triangle

(i) Q onto R ,

.....
 [2]

(ii) P onto Q .

.....
 [3]

- (b) Q is transformed onto S using the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -\frac{1}{2} \end{pmatrix}$.

(i) Draw the triangle S .

[2]

(ii) Describe fully, a single transformation which is represented by the matrix.

.....
 [3]

5 (a) $\overrightarrow{ML} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and $\overrightarrow{LN} = \begin{pmatrix} -6 \\ -1 \end{pmatrix}$.

Find

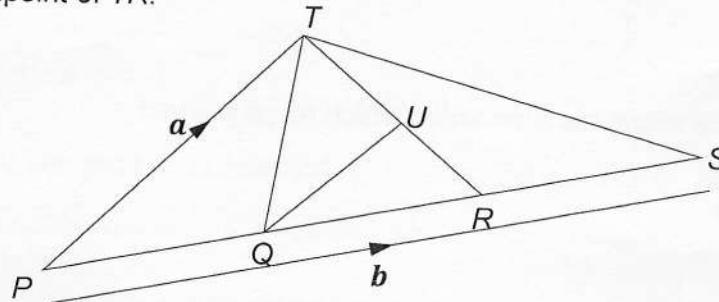
(i) $\overrightarrow{MN}$,

(ii) $|\overrightarrow{ML}|$.

.....[2]

.....units [2]

- (b) The diagram shows vectors $\overrightarrow{PT} = \mathbf{a}$, $\overrightarrow{PS} = \mathbf{b}$ and PS is divided into 3 equal parts at Q and R . U is the midpoint of TR .



Express, in simplest form, in terms of $\mathbf{a}$ and/or $\mathbf{b}$

(i) $\overrightarrow{TS}$,

(ii) $\overrightarrow{TR}$.

..... [1]

..... [1]

- (c) Using the information in (b), show that $\overrightarrow{PT} = 2\overrightarrow{QU}$.

[3]

6 $h(x) = 2x - 5$ and $g(x) = x^2 + 1$.

(a) Find

(i) $g(-6) - 3$,

(ii) $h^{-1}g(x)$, in its simplest form.[2]

$h^{-1}g(x) = \dots\dots\dots$ [3]

(b) $2g(x) - h(x)$ can be expressed in the form $px^2 + qx + 7$, where p and q are integers.

Find the value of p and the value of q .

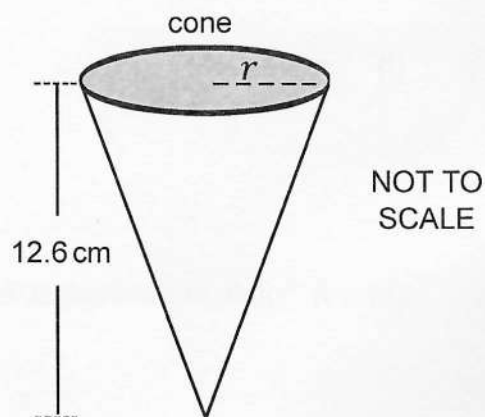
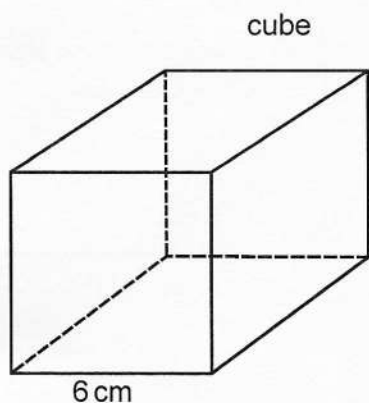
$p = \dots\dots\dots$

$q = \dots\dots\dots$ [3]

(c) Find the value of x for which $xh(x) - 2g(x) = -12$.

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

- 7 The diagram shows a solid cube of side 6 cm and the solid cone of height 12.6 cm and radius r . The cube and the cone have the same volume.



- (a) Show that the radius, r , of the cone is 4.05 cm correct to 2 decimal places.

[3]

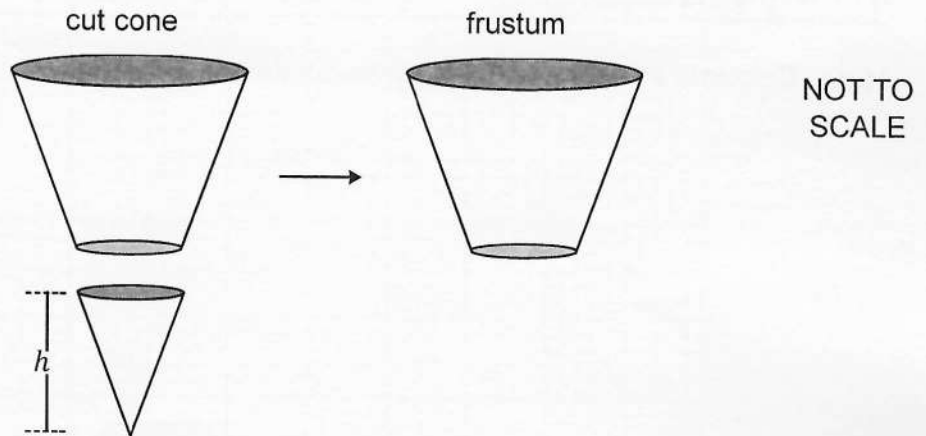
- (b) Calculate the total surface area of the cone.

[The curved surface area A , of the cone with radius r and slant height l is $A = \pi r l$]

..... cm² [4]

- (c) The cone is then cut into a frustum and a smaller cone as shown in the diagram. The height of the smaller cone is $\frac{1}{3}$ the height of the original cone.

[The volume V , of a cone of radius r and height h is given by $V = \frac{1}{3}\pi r^2 h$]



Calculate the volume of the frustum.

..... cm^3 [3]

- 8 A man randomly gave sweets to 120 shepherds.
The table shows the number of sweets collected by the shepherds.

sweets (m)	$0 < m \leq 20$	$20 < m \leq 60$	$60 < m \leq 80$	$80 < m \leq 120$	$120 < m \leq 200$
frequency	41	30	24	19	6

- (a) Calculate an estimate of the mean number of sweets.

.....[4]

- (b) Estimate the number of shepherds who received less than 24 sweets.

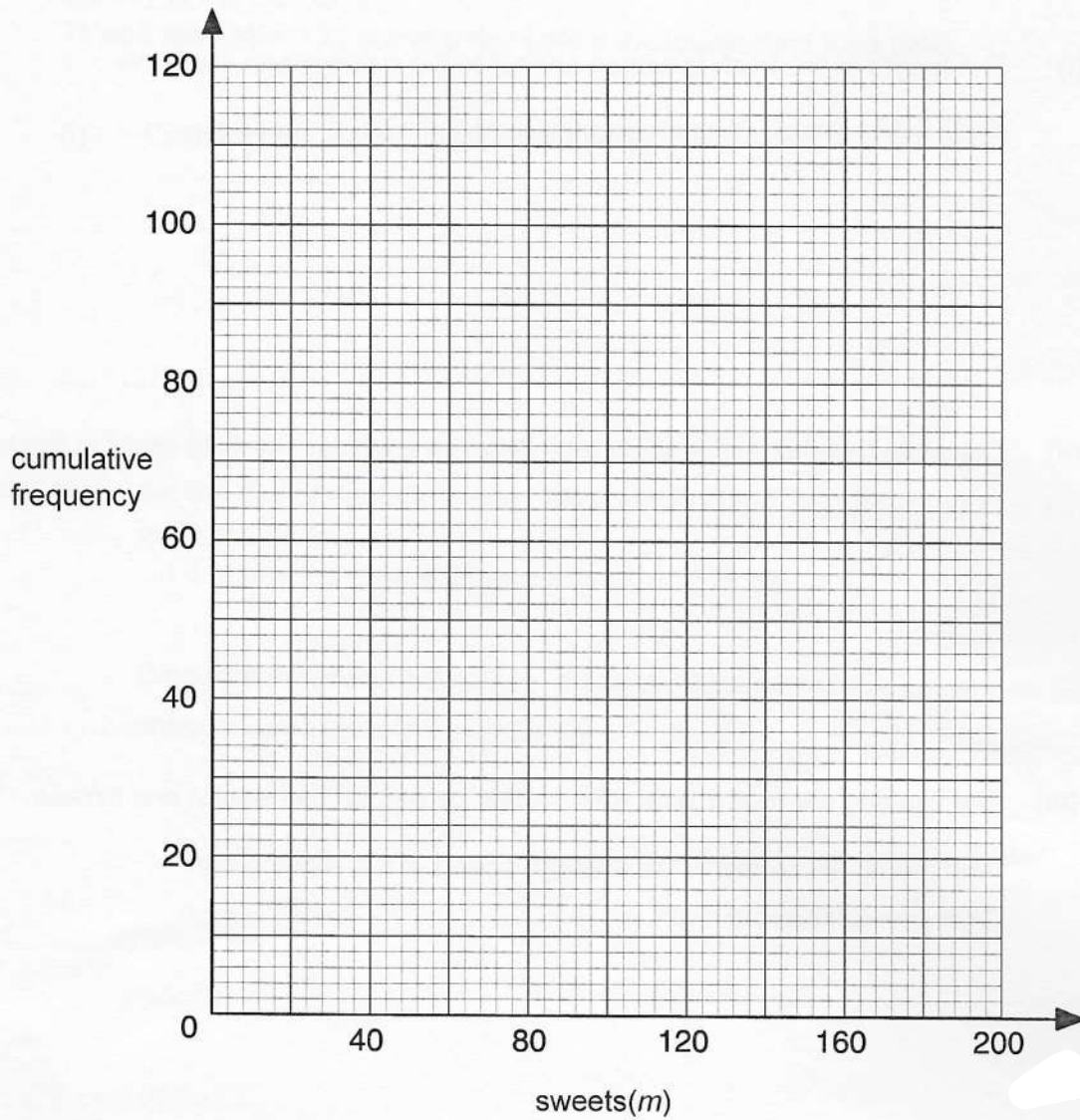
..... [2]

- (c) Complete the cumulative frequency table.

sweets (m)	$m \leq 20$	$m \leq 60$	$m \leq 80$	$m \leq 120$	$m \leq 200$
cumulative frequency	41	71			120

[1]

- (d) Draw the cumulative frequency curve.



- (e) Use your curve to estimate

(i) the median,

(ii) the interquartile range.

[3]

.....[1]

.....[2]

9 (a) In a 25-lap car race, 10 cars need to race on an approximately 17 km track.

(i) The length of the track is written correct to the nearest one kilometer.

State the shortest possible distance each car travels in one lap.

.....km [1]

(ii) Calculate the shortest possible total distance each car needs to cover to finish the race.

..... km [1]

(iii) The winning car took 1 hour 45 minutes, correct to the nearest one minute.

Find the upper bound of the average speed of the winning car.

Give your answers in km/h.

.....km/h [4]

- (b) To attend the race tournament, a ticket price is reduced by 25% if it is bought online, before the day of the tournament.

Ts'epo pays M660.32 online a day before the tournament for a ticket.

- (i) Calculate the original price of the ticket.

M.....[3]

- (ii) On the day of the tournament, Mike arrived from England and bought the ticket at the price of £75.74.

On that day the exchange rate was £1 = M 21.05.

Calculate the amount of money, in Maluti, Mike would have saved if he bought the ticket online a day before the tournament.

M.....[3]

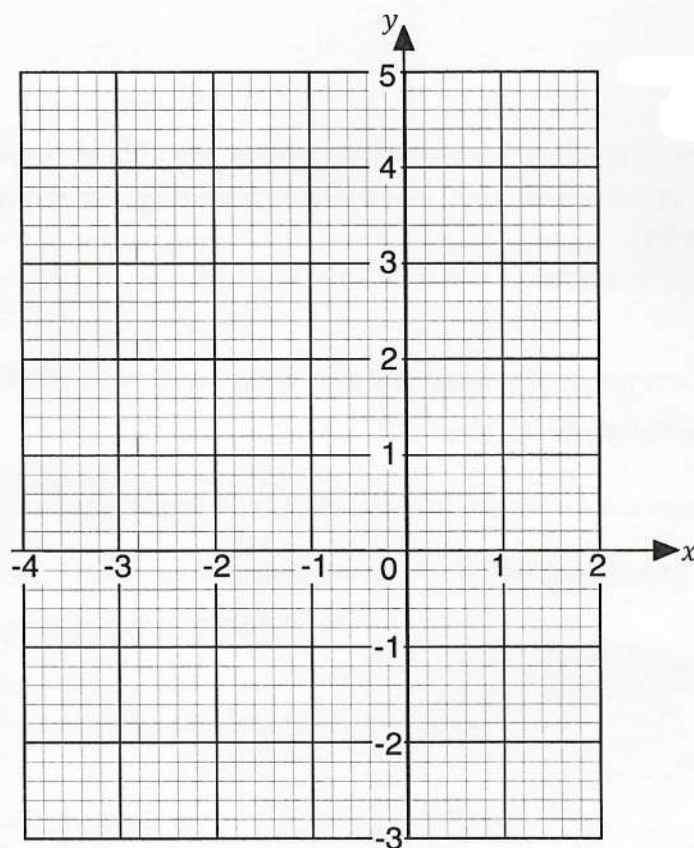
- 10 The table shows x and y values for the function $y = x^3 + 3.5x^2 - 2$.

x	-3.4	-3	-2.3	-2	-1.4	0.5	0.69	1
y	0	2.5			2	-1	0	2.5

(a) Complete the table.

[2]

(b) On the grid, draw the graph of $y = x^3 + 3.5x^2 - 2$ for $-3.4 \leq x \leq 1$.



(c) Draw an appropriate graph, on the grid in (b), to solve the equation

$$x^3 + 3.5x^2 - 2 = 1 - x.$$

$x = \dots\dots\dots x = \dots\dots\dots x = \dots\dots\dots$ [4]

(d) Use your graph to complete the inequality in k for which the equation $y = x^3 + 3.5x^2 - 2 = k$ has three different solutions.

$\dots\dots\dots < k < \dots\dots\dots$ [2]

11 A dealer bought n books, each at the equal price, for a total cost of M3 000.

(a) Write an expression, in terms of n , for the cost of each book.

M [1]

(b) The dealer kept 2 books for himself and sold the rest at a profit of M150 per book.

Write an expression, in terms of n , for the total sales he received for the books sold.

M [2]

(c) Given that the dealer received the total sales of M5 400 altogether, form an equation in n and show that it reduces to $n^2 - 18n - 40 = 0$.

[3]

(d) Solve $n^2 - 18n - 40 = 0$.

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

(e) Find the selling price of each book.

M [2]

- 12 (a) The lowest common multiple of three numbers is 9000.
Two of these numbers are 24 and 125.

Find the least possible value of the third number.

..... [2]

- (b) y varies inversely as the square root of x .
 $y = 6$ when $x = 25$.

Find the value of y when $x = 12$.

$y =$ [3]

- (c) Express as a single fraction.

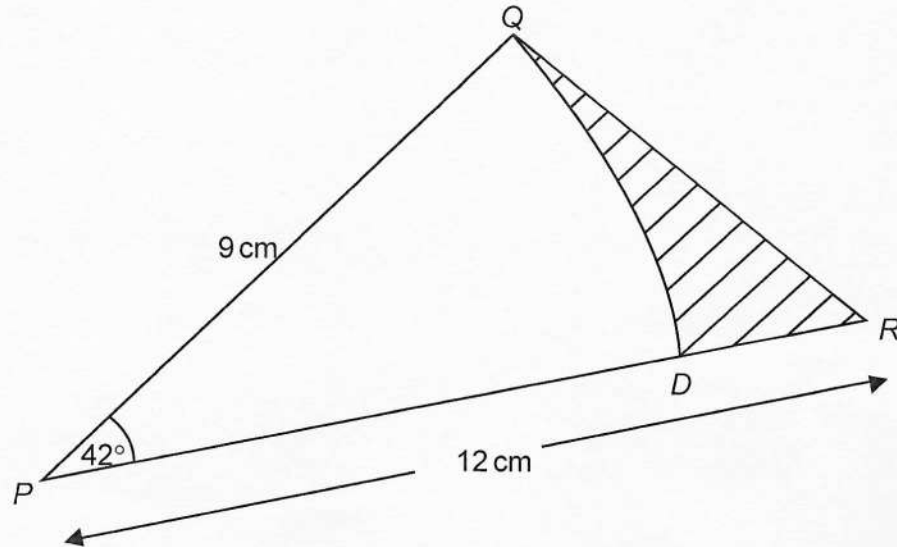
$$\frac{2x-1}{3} - \frac{x+2}{5}$$

..... [3]

- (d) Factorise fully.
 $6a - 9ab + 4c - 6bc$

..... [2]

- 13 The diagram shows triangle PQR and the arc QD of a circle with radius 9 cm, centre P . There is a region bounded by the arc QD , DR and RQ . $\angle QPR = 42^\circ$ and $PR = 12$ cm.



(a) Calculate

(i) the length of QD ,

..... cm [2]

(ii) the length of QR .

.....cm [4]

(b) Calculate the area of the shaded region.

.....cm² [4]