



Province of the  
**EASTERN CAPE**  
EDUCATION

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REPUBLIC OF SOUTH AFRICA

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**CHIEF DIRECTORATE – CURRICULUM MANAGEMENT**

**GRADE 12 LEARNER SUPPORT  
PROGRAMME**

**REVISION AND REMEDIAL TEACHING  
INSTRUMENT:  
QUESTIONS AND ANSWERS**

**SUBJECT: MATHEMATICS – SECOND PAPER**

**June 2009**

**This document consists of 10 pages.**

***Strictly not for test/examination purposes***

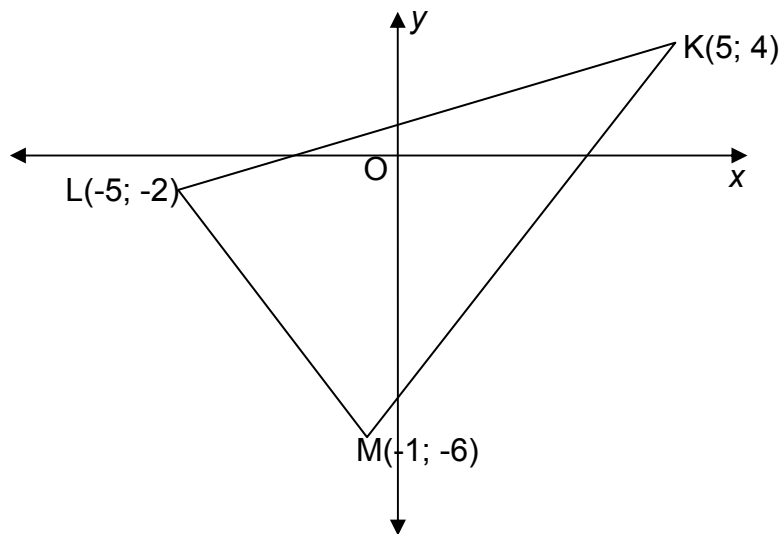
**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions:

1. This question paper consists of NINE questions. Answer ALL the questions.
2. Show clearly ALL calculations, diagrams, graphs, etc. which you have used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Diagrams are NOT necessarily drawn to scale.
7. It is in your own interest to write legibly and to present the work neatly.
8. An information sheet with formulae is attached.
9. A diagram sheet is provided.

**QUESTION 1**

In the diagram,  $L(-5; -2)$ ,  $M(-1; -6)$  and  $K(5; 4)$  are the vertices of  $\triangle KLM$  in a Cartesian plane.

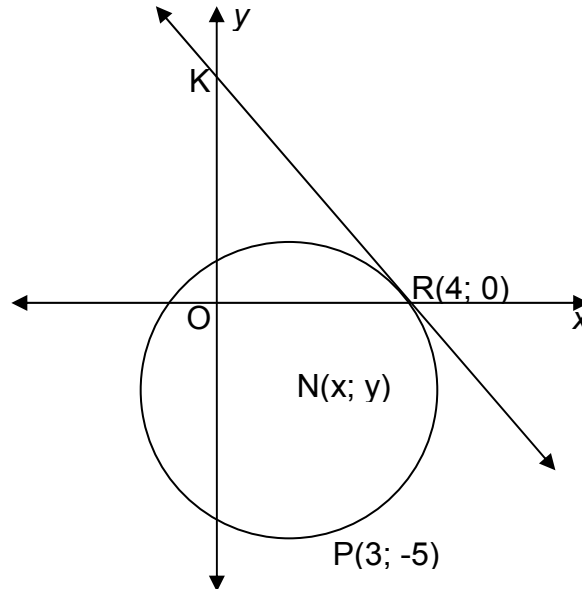


- 1.1 Prove that the midpoint  $P$  of  $LK$ , lies on the  $y$ -axis. (3)
- 1.2 Determine the gradient of  $LM$ . (2)
- 1.3 Determine the equation of the line parallel to  $LM$  passing through  $P$ . (3)
- 1.4 Determine analytically whether the line found in QUESTION 1.3 passes through  $N(2; -1)$ , the midpoint of  $KM$ . (3)
- 1.5 Calculate the length of  $LM$ . (Leave the answer in surd form) (3)
- 1.6 Hence prove that  $LM = 2PN$ . (4)

**[18]**

## QUESTION 2

In the figure,  $N(x; y)$  is the centre of the circle in a Cartesian plane passing through the point  $P(3; -5)$ . The straight line with equation  $3x + 2y - 12 = 0$  is a tangent to the circle at the point  $R(4; 0)$ , and cuts the  $y$ -axis at  $k$ .



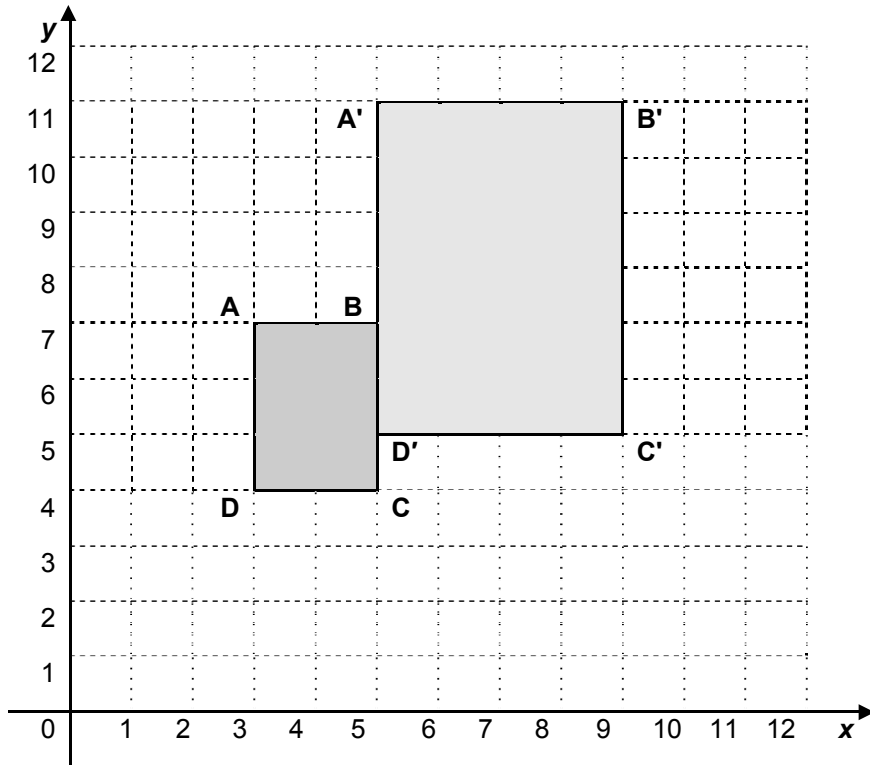
Determine:

- 2.1 The length of  $RK$ . (4)
- 2.2 The equation of  $RN$ . (5)
- 2.3 The coordinates of the point  $N$ . (8)
- 2.4 The equation of the circle in the form:  
 $ax^2 + by^2 + cx + dy + e = 0$  (5)

**[22]**

## QUESTION 3

3.1 In the following diagram,  $A'B'C'D'$  is the enlarged image of  $ABCD$ .

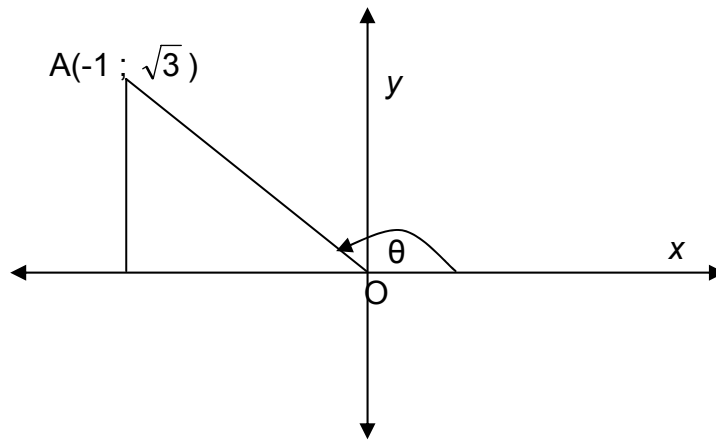


- 3.1.1 Calculate the scale factor of enlargement. (2)
- 3.1.2 Calculate the area of  $ABCD$  and its image  $A'B'C'D'$ . (4)
- 3.1.3 How many times larger is the area of the image than the area of the original rectangle? (1)
- 3.1.4 Are the two shapes similar or congruent? Explain your answer. (2)
- 3.2 In  $\triangle PQR$ , the coordinates of the vertices are  $P(2; 5)$ ,  $Q(2; 1)$  and  $R(5; 1)$ .
- 3.2.1 Plot these points on the grid paper provided. (3)
- 3.2.2 Draw the reflection of  $\triangle PQR$  in the  $y$ -axis and label the image  $\triangle P'Q'R'$ . (3)
- 3.2.3 If  $\triangle PQR$  is rotated  $90^\circ$  clockwise about the origin, the image is  $\triangle KLM$ . Sketch the image. (3)
- 3.2.4 Translate  $\triangle P'Q'R'$  according to the rule  $(x; y) \rightarrow (x + 1; y - 3)$ . Write down the coordinates of the image  $P''$ ,  $Q''$  and  $R''$ . (Do not sketch the image) (3)

[21]

**QUESTION 4**

In the following diagram, A is the point  $(-1 ; \sqrt{3})$  in a Cartesian plane.



4.1 Use the diagram and calculate, without the use of a calculator, the value of  $\cos \theta$ . (3)

4.2 If  $A'$  is the reflection of A in the x-axis, determine the size  $\widehat{A'OX}$ . (3)  
[6]

**QUESTION 5**

Simplify without the use of a calculator:

5.1  $\frac{1}{2} \tan(-225^\circ) \cdot \cos^2 585^\circ$  (5)

5.2  $\frac{\sin \theta - \cos \theta}{\tan \theta - 1} - \cos \theta$  (4)  
[9]

**QUESTION 6**

6.1 Solve for x in the following equation rounded off to two decimal digits:

$$\cos(x + 12,4^\circ) = -0,334 \quad x \in (180^\circ; 360^\circ) \quad (3)$$

6.2 Find the general solution for x in the following equation:

$$2\sqrt{3} \cdot \sin x \cdot \tan x - \sqrt{3} \cdot \tan x - 2 \sin x + 1 = 0 \quad (8)$$

[11]

**QUESTION 7**

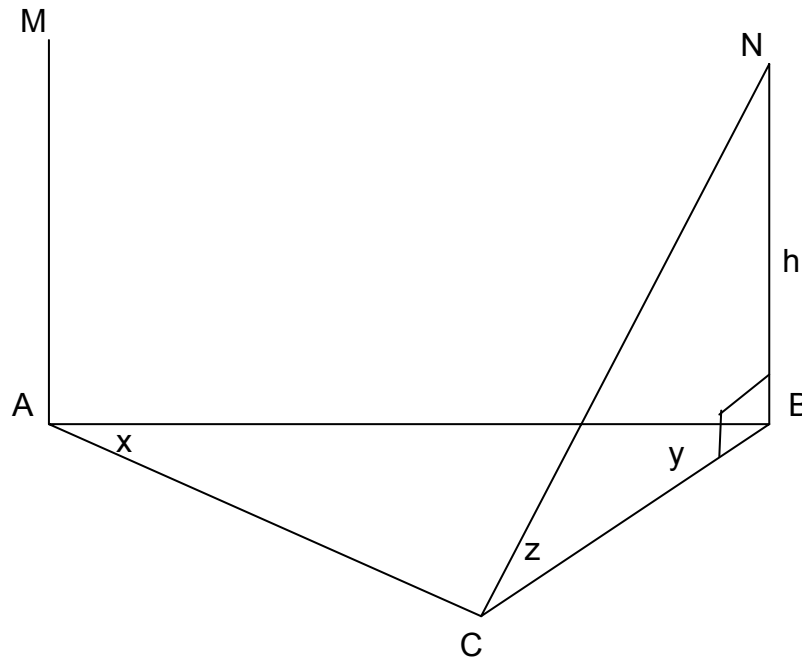
Given:  $f(x) = -2 \sin x + 1$   
and  
 $g(x) = \cos(x + 30^\circ)$

- 7.1 Draw on the same system of axes neat sketch graphs of  $f$  and  $g$ .  
Coordinates of turning points and intercepts with the axes must be clearly indicated. Use the interval:  $[-180^\circ; 150^\circ]$  (8)
- 7.2 Write down the following:
- 7.2.1 The amplitude of  $f$ . (1)
- 7.2.2 The period of  $g$ . (1)
- 7.3 Determine from the graph ONE value of  $x$  for which  
 $2 \sin x - 1 + \cos(x + 30^\circ) = -1$  (2)
- 7.4 Write down the equation of  $g(x)$  after the transformation:  
 $(x; y) \rightarrow (x - 30^\circ; y + 1)$  (2)

**[14]**

## QUESTION 8

Two falcons sitting on top of two ESCOM pylons, M and N (with the same height), are watching a field mouse at C looking for food in the grass. A and B are the bases of the pylons in the same horizontal plane as C.



$\hat{BAC} = x$ ,  $\hat{ABC} = y$ , and the angle of elevation at C is  $z$ .  $NB = h$

8.1 Prove that:

$$8.1.1 \quad AB = \frac{BC \sin(x + y)}{\sin x} \quad (3)$$

$$8.1.2 \quad MN = \frac{h \sin(x + y)}{\tan z \cdot \sin x} \quad (4)$$

8.2 If  $MN = 70$  meters,  $x = 52,3^\circ$ ,  $y = 27,3^\circ$  and  $z = 42^\circ$ , calculate the height of the pylon BN. (3)

8.3 If  $AB = 70$  m,  $BC = 48,3$  m,  $y = 27,3^\circ$  and  $\triangle ABC$  is the hunting area of the two falcons, calculate the perimeter of their hunting ground. (5)

8.4 Ecologists believe one mouse needs  $10 \text{ m}^2$  to survive. How many mice can this area  $\triangle ABC$  sustain? (5)

**[20]**



**QUESTION 9**

9.1 Using the following data:

**13 19 20 22 22 22 22 24 25 27 35 39**

9.1.1 Calculate the interquartile range for the data values. (3)

9.1.2 Draw a box and whisker diagram of the data. (4)

9.1.3 Use your answers in QUESTIONS 9.1.1 and 9.1.2 to comment on the dispersion of the data. (2)

9.2 The heights of a group of girls are shown in the table:

| Height in cm       | Frequency | Cumulative Frequency |
|--------------------|-----------|----------------------|
| $110 \leq h < 115$ | 10        |                      |
| $115 \leq h < 120$ | 14        |                      |
| $120 \leq h < 125$ | 22        |                      |
| $125 \leq h < 130$ | 23        |                      |
| $130 \leq h < 135$ | 16        |                      |
| $135 \leq h < 140$ | 5         |                      |

9.2.1 Complete the cumulative frequency table given in the diagram sheet. (2)

9.2.2 Draw an ogive curve for the data. (3)

9.2.3 Use the graph to find how many girls are shorter than 128 cm. (2)

9.3 The masses of 8 people are shown in the table:

| Mass in kg | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|------------|---------------|-------------------|
| 26         |               |                   |
| 28         |               |                   |
| 32         |               |                   |
| 35         |               |                   |
| 38         |               |                   |
| 43         |               |                   |
| 47         |               |                   |
| 55         |               |                   |
| $\Sigma =$ |               | $\Sigma =$        |

9.3.1 Calculate the mean mass. (2)

9.3.2 Complete the table given in the diagram sheet. (5)

9.3.3 Calculate the standard deviation of the data. (4)

9.3.4 How many people's mass is within 1 standard deviation of the mean? (2)

**[29]**

**TOTAL: 150**

**INFORMATION SHEET: MATHEMATICS**  
**INLIGTINGSBLAD: WISKUNDE**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n (a + (i-1)d) = \frac{n}{2}(2a + (n-1)d)$$

$$\sum_{i=1}^n ar^{i-1} = \frac{a(r^n - 1)}{r - 1} ; \quad r \neq 1$$

$$\sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1-r} ; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$P = \frac{x[-(1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta \quad (x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2 \sin^2 \alpha \\ 2 \cos^2 \alpha - 1 \end{cases}$$

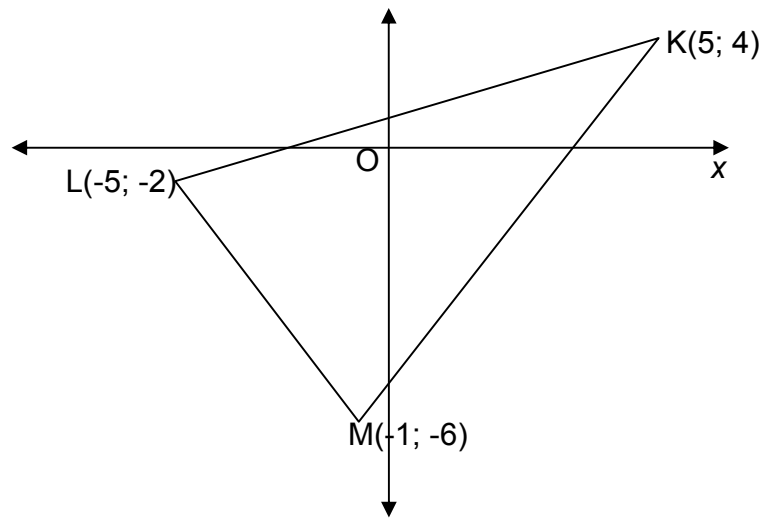
$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

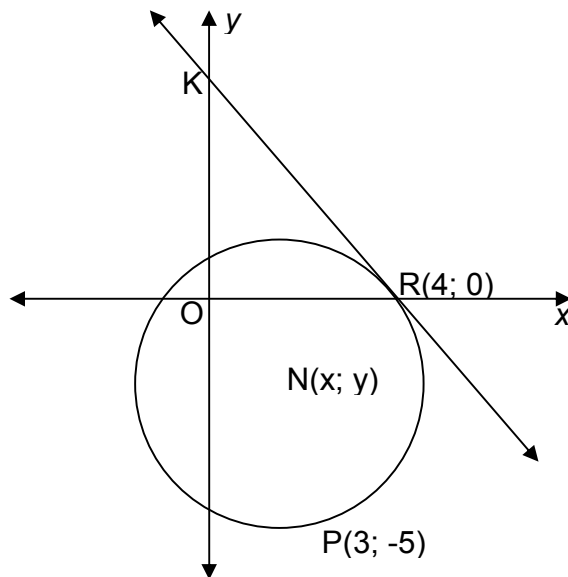
$$\bar{x} = \frac{\sum fx}{n} \quad \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n} \quad P(A) = \frac{n(A)}{n(S)} \quad (A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$



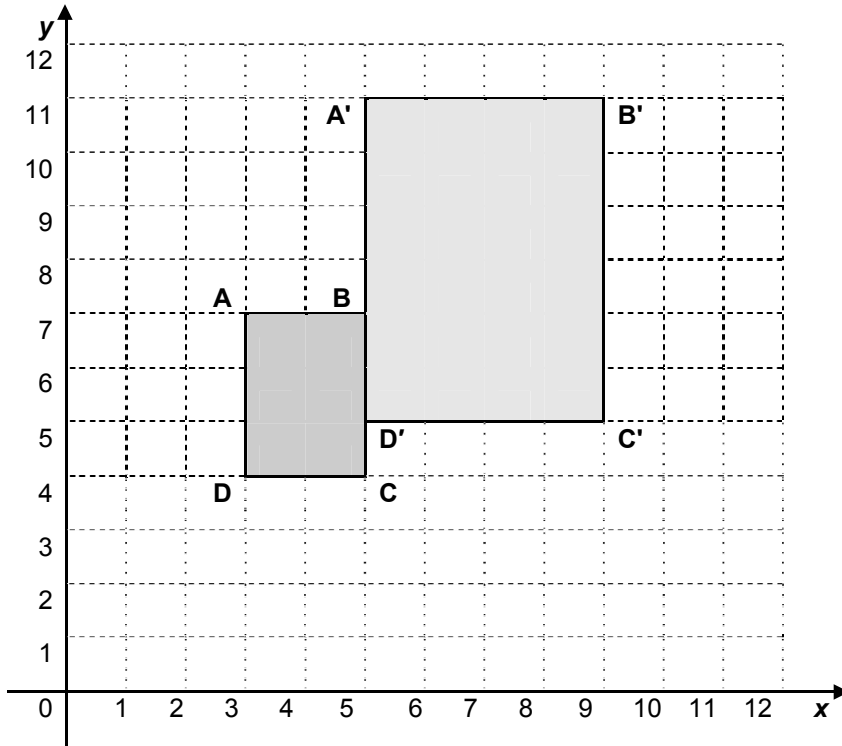
## QUESTION 1 / VRAAG 1



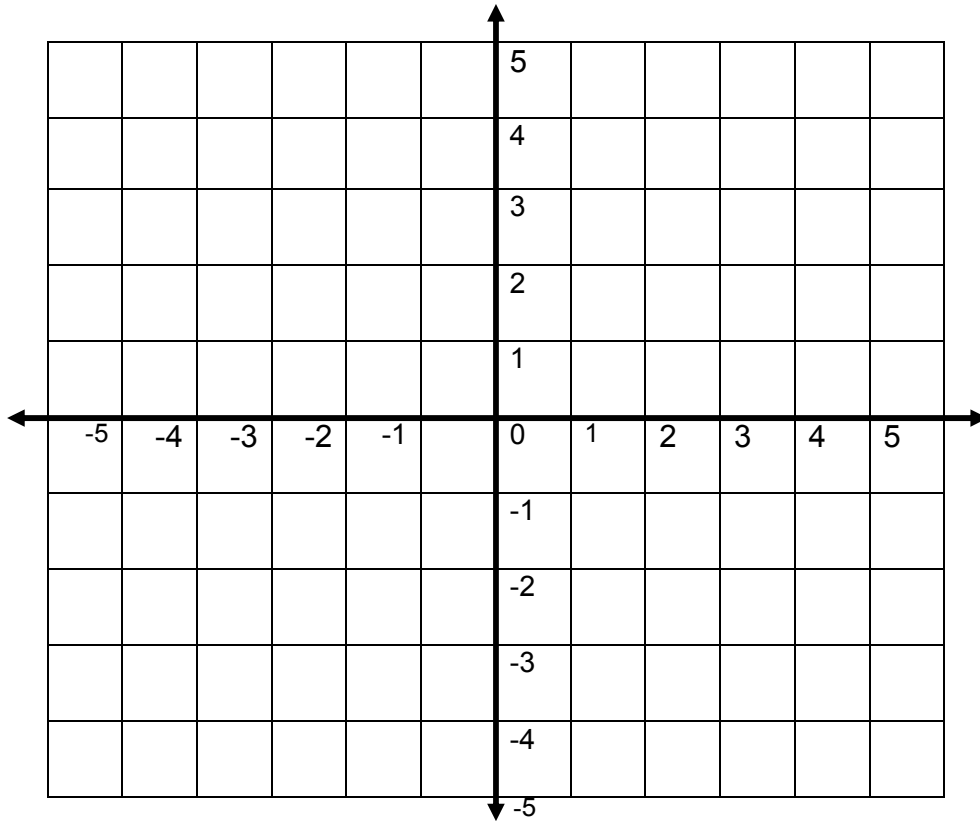
## QUESTION 2 / VRAAG 2



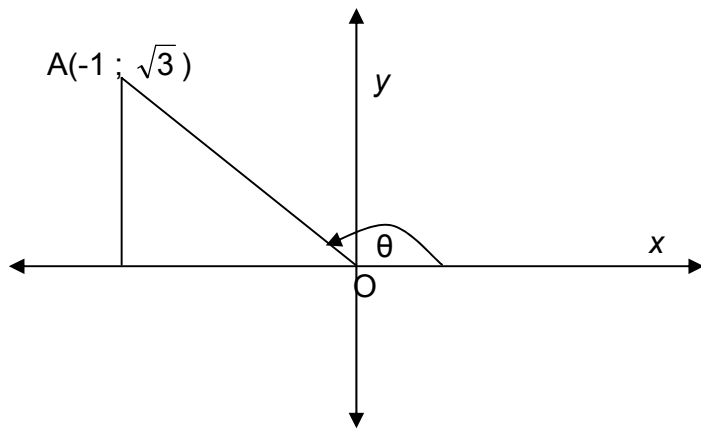
QUESTION 3.1 / VRAAG 3.1



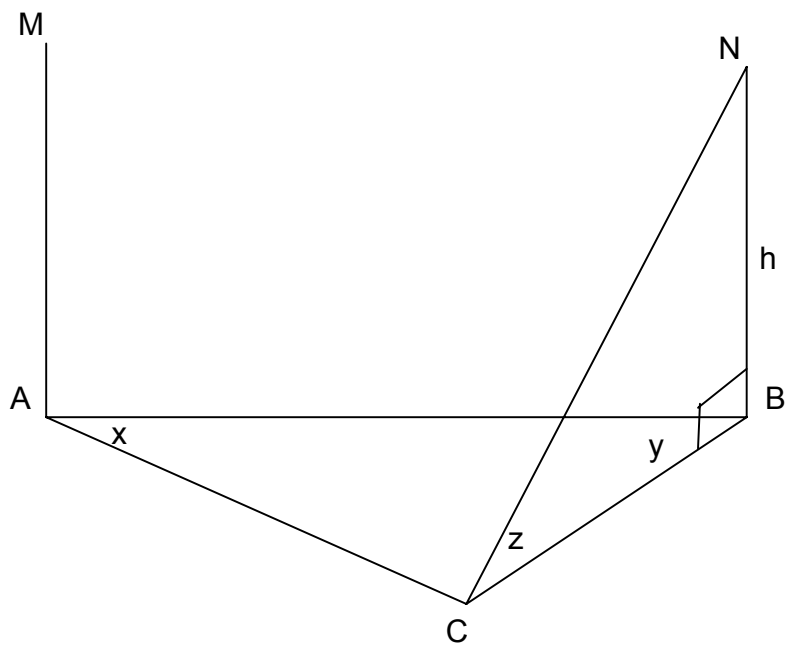
QUESTION 3.2.1 / 3.2.2 / 3.2.3 VRAAG 3.2.1 / 3.2.2 / 3.2.3



## QUESTION 4 / VRAAG 4



## QUESTION 8 / VRAAG 8



## QUESTION 9.2 / VRAAG 9.2

| Height in cm       | Frequency | Cumulative Frequency |
|--------------------|-----------|----------------------|
| $110 \leq h < 115$ | 10        |                      |
| $115 \leq h < 120$ | 14        |                      |
| $120 \leq h < 125$ | 22        |                      |
| $125 \leq h < 130$ | 23        |                      |
| $130 \leq h < 135$ | 16        |                      |
| $135 \leq h < 140$ | 5         |                      |

## QUESTION 9.3 / VRAAG 9.3

| Mass in kg | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|------------|---------------|-------------------|
| 26         |               |                   |
| 28         |               |                   |
| 32         |               |                   |
| 35         |               |                   |
| 38         |               |                   |
| 43         |               |                   |
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| $\Sigma =$ |               | $\Sigma =$        |