GRADE 11 EXEMPLAR
2007

MATHEMATICS: PAPER II

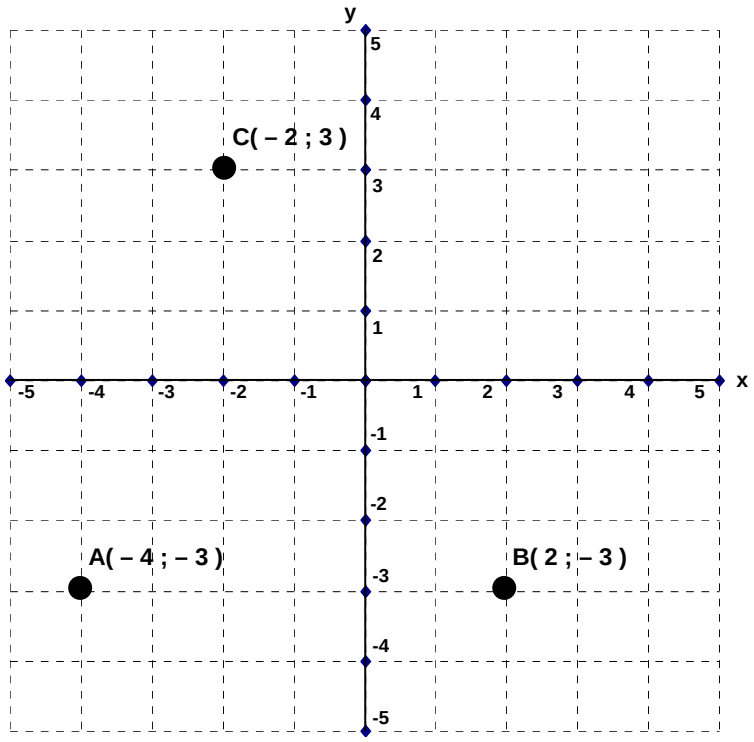
Time: 3 hours 150 marks

INSTRUCTIONS TO CANDIDATES

1. This examination consists of 15 numbered pages, excluding this coversheet.
2. All questions are to be answered on this question paper.
3. Fill in your name in the space provided below.
4. You may use a non-programmable calculator.

Name :															
Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	
11	**4**	**6**	**8**	**13**	**10**	**19**	**12**	**10**	**12**	**5**	**10**	**5**	**15**	**10**	**150**

QUESTION 1



A(– 4 ; – 3), B(2 ; – 3) and C(– 2 ; 3) are the vertices of a triangle.

1.1 Find the gradient of AC. (2)

1.2 Find the inclination of line AC, correct to 1 decimal place. (2)

1.3 Find the midpoint of AC and hence find the equation of the perpendicular bisector of AC, writing your equation in the form $y = mx + c$. (5)

1.4 Find the area of triangle ABC. (2)

11 marks

QUESTION 2

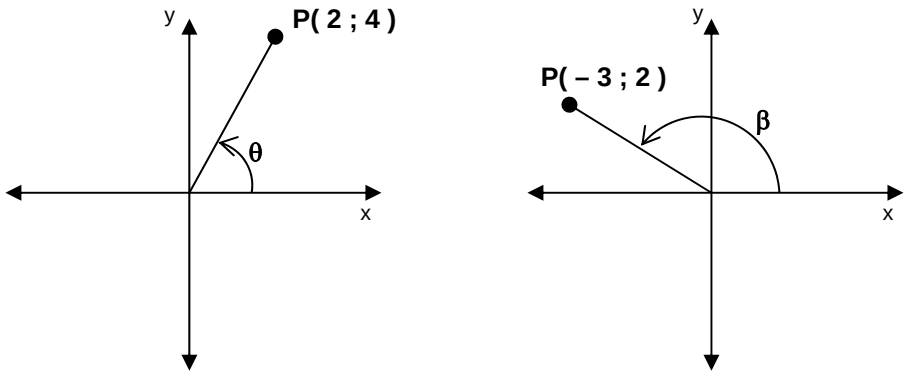
Consider the following transformations.

2.1 $(x ; y) \rightarrow (x + 2 ; y - 1)$ Find the image of A(– 3 ; 2) under the ransformation. (2)

2.2 $(x ; y) \rightarrow (- y ; x)$ Find the image of B(4 ; – 1) under the transformation. (2)

4 marks

QUESTION 3



3.1 With the aid of the diagrams, and **without using a calculator**, find the following (leaving answers in surd form where necessary)

3.1.1 $\tan \theta$ (1)

3.1.2 $\cos \beta$ (2)

3.2 Use your calculator to find the value of β (to 1 decimal place). Show all working. (3)

6 marks

QUESTION 4

A group of 7 shoppers at a local supermarket spent the following amounts (rounded off to the nearest Rand) on a Saturday morning :

37 42 45 51 66 66 141

Find the following (giving your answers, where necessary, to 2 decimal places)

4.1 the median (1)

4.2 the lower quartile (1)

4.3 the mode (1)

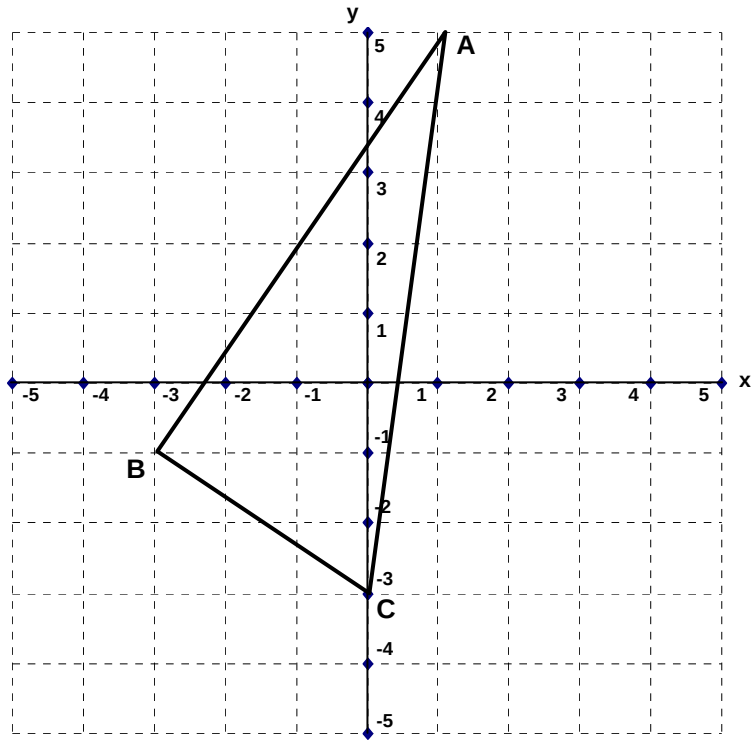
4.4 the range (1)

4.5 the mean (2)

4.6 the standard deviation (2)

8 marks

QUESTION 5



A(1 ; 5), B(– 3 ; – 1), and C(0 ; – 3) are the vertices of a triangle.

5.1 Write down the co-ordinates of D if ABCD is a parallelogram. (2)

5.2 Show that ABCD is in fact a rectangle. (3)

5.3 If A, B and E(5 ; y) are three collinear points, find the value of y. (3)

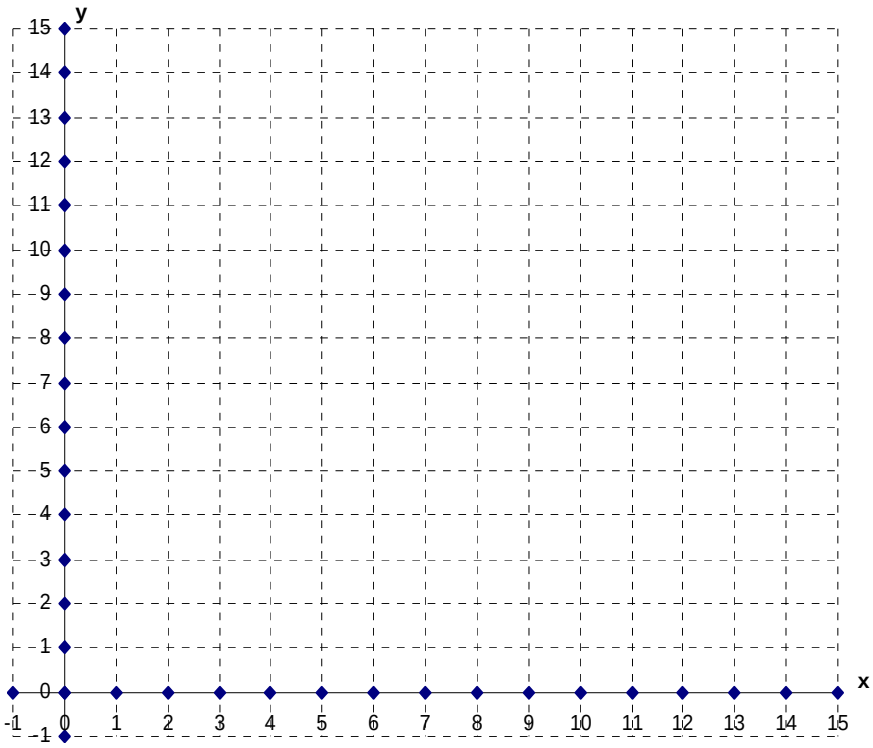
5.4 If the distance between C and F(8 ; p) is 10 units, find the possible values of p. (5)

13 marks

QUESTION 6

The vertices of ΔDEF are D(4 ; 2), E(6 ; 4) and F(1 ; 5).

ΔD'E'F' is an enlargement of ΔDEF through the origin by a constant factor of k = 2.



6.1 On the plane, draw ΔDEF and ΔD'E'F'. (4)

6.2 Find the length of OD and OD', leaving answers in surd form if necessary. (4)

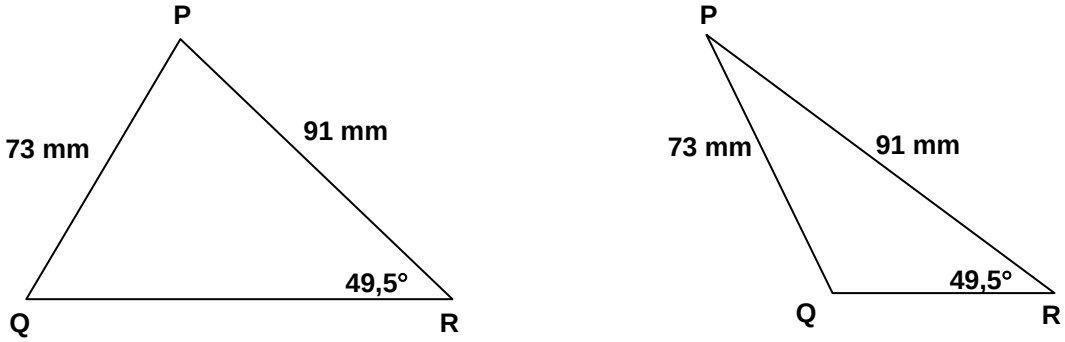
6.3 What is the relationship between the area of ΔDEF and the area of ΔD'E'F' ? (1)

6.4 If ΔD*E*F* was an enlargement of ΔDEF through the origin by a constant factor of k = 3, write down the co-ordinates of F*. (1)

10 marks

QUESTION 7

7.1 ΔPQR has the following dimensions : PR = 91 mm, PQ = 73 mm and $\hat{R} = 49{,}5°$. Two triangles are shown below with these dimensions.

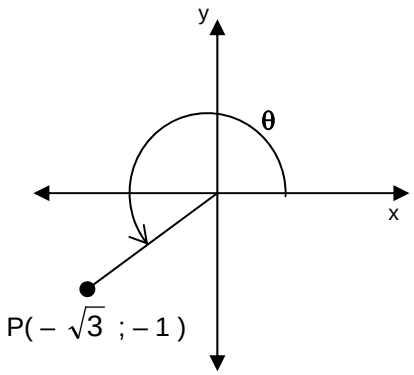


7.1.1 Find the two possible sizes of $\hat{Q}$ correct to 1 decimal place. (4)

7.1.2 Hence find the greater length of QR, to 1 decimal place. (3)

7.2 Simplify $\dfrac{\sin(180° - A)\cdot\tan A\cdot\sin(90° + A)}{\tan(180° + A)\cdot\cos(-A)\cdot\sin(-A)}$ (6)

7.3



P is the point $(-\sqrt{3}\,;-1)$; $X\hat{O}P = \theta$

7.3.1 **Without using a calculator** find the value of θ (3)

7.3.2 **Hence, without using a calculator**, find the value of sin(2θ). Show all working and leave your answer in surd form. (3)

19 marks

QUESTION 8

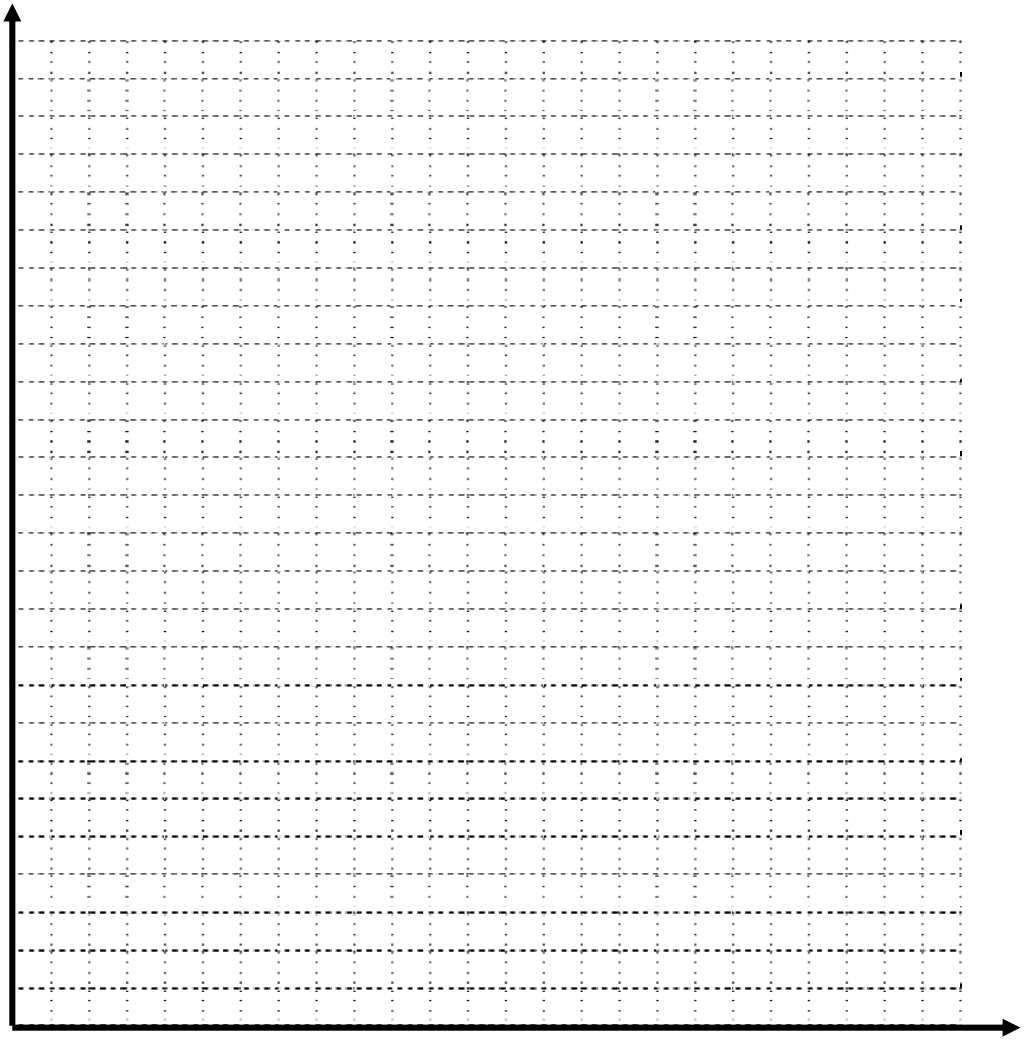
The table represents the percentage of income spent on a certain activity for **50** families.

Percentage (p)	**Frequency**	**Midpoint**	**Cumulative frequency**
$12 < p \leq 18$	8	15	8
$18 < p \leq 24$	20		
$24 < p \leq 30$	12		
$30 < p \leq 36$	8		
$36 < p \leq 42$	2	39	50

8.1 Complete the table. (3)

8.2 Calculate the mean and standard deviation. (3)

8.3 Draw an ogive (cumulative frequency polygon) of the data.
Use a horizontal scale of 1 block = 2% and a vertical scale of 1 block = 2 families. (4)



8.4 From your ogive read off the median, clearly showing where you made your reading. (2)

12 marks

QUESTION 9

The equation of a line is defined by $(3 – 2k)x + (k + 1)y = 12$

9.1 Rewrite the defining equation in the form $y = mx + c$ (2)

9.2 Find the value of k if

9.2.1 the line is parallel to the line defined by $y = 4x + 7$ (3)

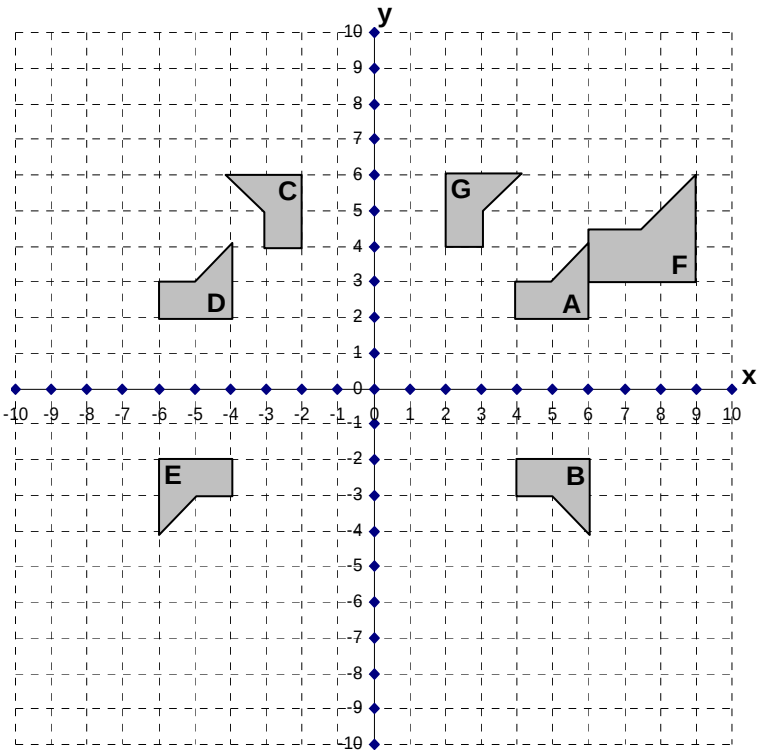
9.2.2 the line passes through the point $(– 3 ; 4)$ (3)

9.2.3 the line is parallel to the x-axis (1)

9.2.4 the line is parallel to the y-axis (1)

10 marks

QUESTION 10



In the figure on the left, pentagons B, C, D, E, F and G are ALL images of **pentagon A** under different transformations.

Describe EACH transformation in words and then write down the rule for the transformation, giving your answer in the form

$$(x\,;y) \rightarrow \ldots\ldots \qquad (12)$$

A → B	A → C
A → D	A → E
A → F	A → G

12 marks

QUESTION 11

If $\sin 20° = t$ express each of the following in terms of t

11.1 $\cos 70°$ (1)

11.2 $\tan 20°$ (4)

5 marks

QUESTION 12

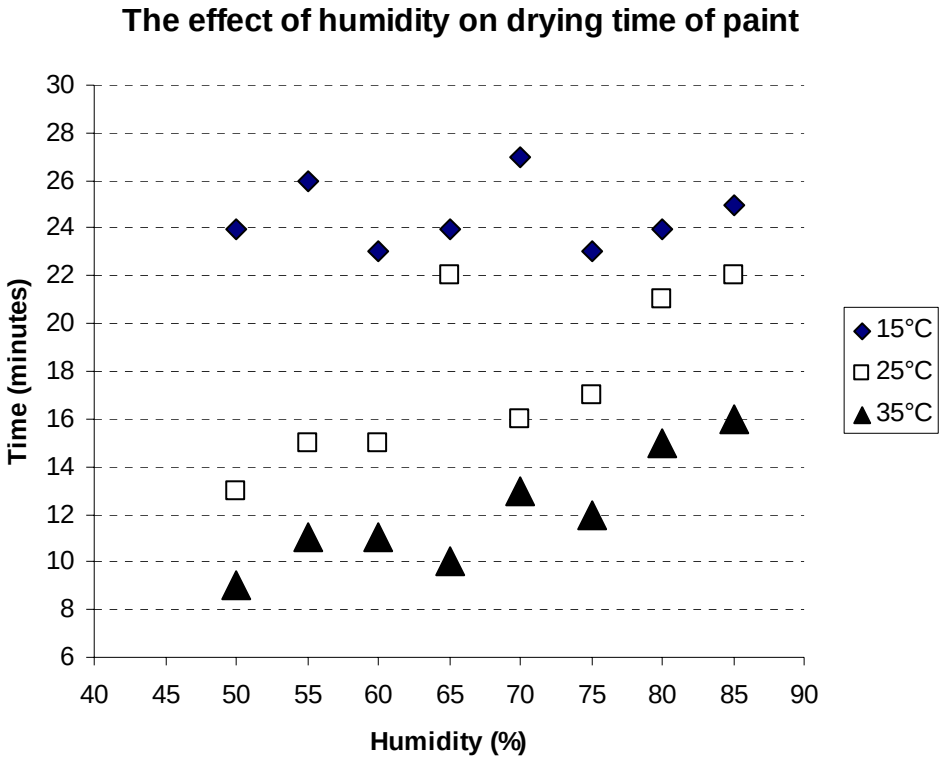
12.1 Prove the identity

$$\frac{(\tan^2\theta - \sin^2\theta)\left(\frac{\cos^2\theta}{\sin^2\theta} + 1\right)}{\tan^2\theta} = 1 \quad (5)$$

12.2 If $\sin(2\theta - 40°) = -\frac{1}{2}$ find the values of $\theta \in [0° ; 360°]$ **without using a calculator.** (5)

10 marks

QUESTION 13



A paint manufacturer wants to establish the effect of humidity on the drying times of it's paints at various temperatures.

The results are shown in the scatterplot, for three different temperatures.

13.1 How long does paint take to dry at 35°C with humidity of 80% ? (1)

13.2

13.2.1 On the scatterplot, roughly draw in a line-of-best-fit for the set of data measured at 25°C.
Explain below what criteria you used to draw the line. (2)

13.2.2 Is there an outlier in this data set ? If so, what is the outlying data point? (1)

13.3 Use your line-of-best-fit to find the drying time of paint at 25°C with humidity of 65%. (1)

5 marks

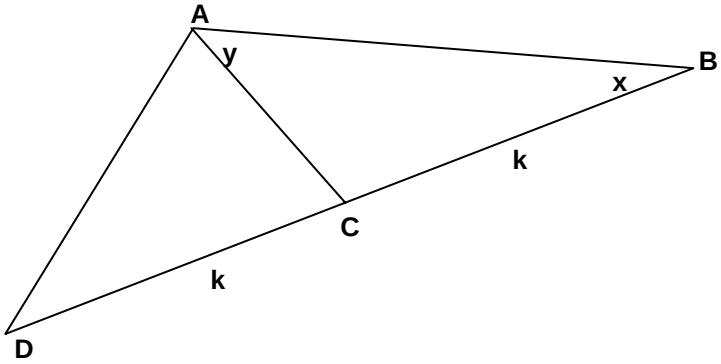
QUESTION 14

14.1 $\cos A = p$ and $\sin A = 2p$

14.1.1 find the possible values of p, leaving answers in surd form if necessary (5)

14.1.2 and hence, with the aid of your calculator, find the value of A if $90° < A < 360°$ (answers correct to 1 decimal place) (3)

14.2



BC = CD = k.

$A\hat{B}C = x$ *and* $C\hat{A}B = y$

14.2.1 Prove that area of $\Delta ADC = \dfrac{k^2 \cdot \sin x \cdot \sin(x+y)}{2\sin y}$ (5)

14.2.2 Find the area of ΔADC to 1 decimal place if k = 14,2, x = 34° and y = 41° (2)

15 marks

QUESTION 15

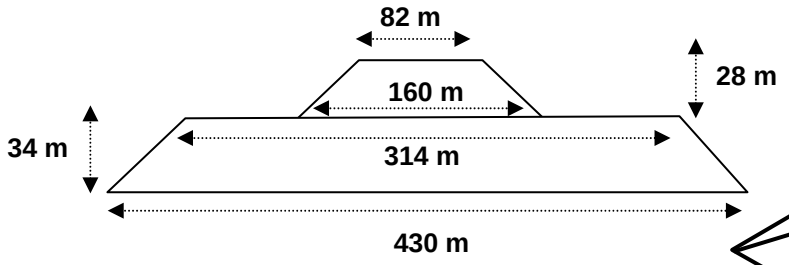


Figure 1 - Side view

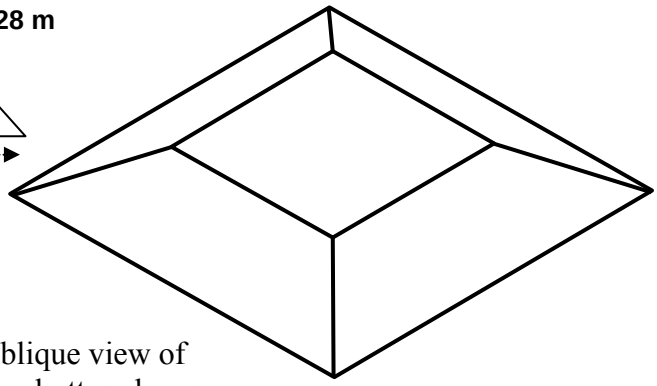
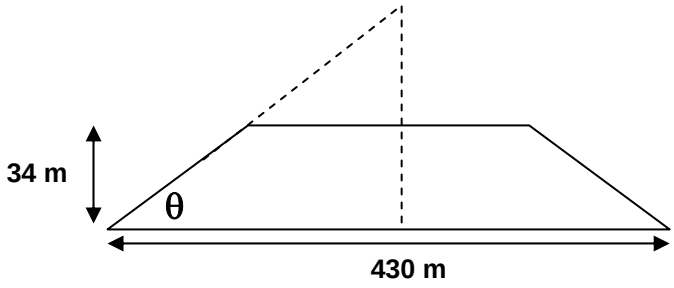


Figure 2 - Oblique view of bottom layer

The ancient Aztec pyramids consist of flat-topped pyramids placed on top of each other. A side view of the Cholula pyramid (which consists of 2 layers) is shown in Figure 1. An oblique view of a single layer is shown in Figure 2. The base and top of each layer is a **square**.

15.1 Show that IF the <u>bottom layer</u> of the Cholula pyramid had been built upwards to a point (like the Egyptian pyramids) then it would have been 126 metres high (to the nearest metre). (6)



(b) Hence calculate the volume of the <u>bottom layer</u> of the Cholula pyramid to the nearest m^3. (4)

[The formula for the volume of a pyramid is : volume = $\frac{1}{3} \times base\ area \times height$]

10 marks

[Total: 150 marks]