**GRADE 12**

**MATHEMATICS PAPER II**

**PRELIMINARY EXAMINATION**

**20th JULY 2009**

MARKS: 150 TIME : 3 Hours

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions:

1. This question paper consists of 13 pages, which includes a diagram sheet (Page 1 and Page 2)

and a formula sheet.

1. The question paper consists of two sections. Answer all the questions.
2. **Work on both sides of the paper in the answer booklet.**
3. Please note that diagrams are not necessarily drawn to scale.
4. All necessary working details must be shown.
5. Approved non-programmable and non-graphical calculators may be used, unless otherwise stated.
6. If necessary answers should be corrected to TWO decimal digits, unless stated otherwise.
7. It is in your own interest to write legibly and to present your work neatly.

**SECTION A**

**QUESTION 1**

The points A (-2; 8) and B (4; 4) are given.

a) Find the equation of the perpendicular bisector of the line AB. (4)

b) Find the value(s) of *x* if the distance from D(*x*; 4) to B is exactly six units. (2)

**[6]**

**QUESTION 2**

a) If  determine the value of . (3)

b) Evaluate without using a calculator: (6)

c) Prove that  = cos A (6)

d) If , determine each of the following in terms of *p*:

1)  (1)

2)  (3)

3)  (2)

e) Determine the general solution of the equation: 2 sin (*x* − 30°) = cos *x* (6)

f) 1) Prove that  (6)

2) For which values of *x* is the identity in f) 1) undefined? (5)

**[38]**

**QUESTION 3**

Refer to the diagram and answer the questions that follow.



a) Determine the equations of  and . (4)

b) For what values of *x* is  ? (2)

c) For what value(s) of *x* is ? (2)

d) If  was reflected about the *x* axis, what would its new equation be? (1)

e) Write down the maximum value of . (1)

**[10]**

**QUESTION 4**

Let Q (*x* ; *y*) be any point in the Cartesian plane.

Match column A to column B: (write down only the number and letter of your choice e.g. 3b))

|  |  |
| --- | --- |
| **A**  **TRANSFORMATION** | **B**  **IMAGE OF Q** |
| 1. Rotation through  anticlockwise | a) |
| b) |
| 2. Rotation through | c) |
| d) |
| 3. Reflection about line | e) |
| f) |
| 4. Reflection about the *y*-axis | g) |
| h) |
| 5. Reduction of OQ by a factor of 3 through  the origin. | i) |
| j) |

**[5]**

**QUESTION 5**

1. For 18 days, the number of Grade 12 learners attending a Winter School was recorded as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 282 | 291 | 293 | 296 | 305 | 305 |
| 312 | 313 | 322 | 324 | 325 | 327 |
| 336 | 342 | 345 | 353 | 354 | 368 |

1. Find the five number summary for the data above. (5)
2. Construct a box and whisker plot for the data. (4)

b) The following are the ages (*x*) and the blood pressures (*y*) of 12 women.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Age (*x*)** | 57 | 43 | 73 | 61 | 69 | 43 | 39 | 50 | 56 | 48 | 64 | 37 |
| **Blood Pressure (*y*)** | 148 | 126 | 161 | 156 | 153 | 141 | 116 | 146 | 151 | 129 | 150 | 119 |

1) Make a scatter plot on the axes provided on the detachable diagram sheet. (2)

2) Evaluate i)  (1)

ii)  (1)

3) Draw the line of best fit onto the scatter plot, going through the point . (2)

1. Use your line to predict the blood pressure of a 55 year-old woman, correct to

the nearest integer. (1)

**[16]**

**SECTION B**

**QUESTION 6**

The equation of a straight line *RS* is  The equation of a straight line *AB* is .

Find the value of in each case, if :

a)  (3)

b) AB cuts RS in the point (-3; 4) (2)

c) the angle of inclination of AB is equal to  (3)

**[8]**

**QUESTION 7**

a) **No calculator to be used in this question.**

Given  and .

Evaluate  , where  and B is an acute angle. (8)

b) In the figure AB is a diameter of the circle with centre M and radius *r*. It is further given that

CD = DE = AE and . It is also given that BC = *r*.

C

D

E

A

M

B

*r*



Prove by using the cosine rule in triangles AME and CME, that . (8)

**[16]**

**QUESTION 8**

The points A (8;5) and C lie on the circumference of a circle. C and D lie on the *x*-axis.

B(12; 7) lies on the line AC.

*y*





*D*

*x*

*C*

*O*

a) Show that the equation of the line through A and B is given by . (3)

b) Find the coordinates of C. (2)

c) If AC is the diameter of this circle, find the length of the radius in simplest surd form. (3)

d) Show that the equation of the circle is given by . (3)

e) Determine the co-ordinates of , the image of *,* which has been enlarged by a scale

factor of 3, followed by a translation of five units upwards. (3)

f) If the line BC was rotated  about C in an anti-clockwise direction, what would the

angle of inclination of the new line be? (2)

g) Determine the equation of the tangent to the circle, at A. (3)

**[19]**

**QUESTION 9**

Some Grade 12 learners took part in a fun run. Their finishing times are recorded in the table that follows.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Finishing time in hours | 0 |  |  |  |  |  |  |
| Frequency | 0 | 0 | 10 | 27 | 16 | 5 | 2 |
| Cumulative frequency |  |  |  |  |  |  |  |

a) Complete the table **on the diagram sheet**. (2)

b) Draw a cumulative frequency curve (ogive) of the graph on the axes provided **on**

**the diagram sheet.** (2)

c) Use the letter A on the graph to indicate where the median finishing time is read off. (2)

d) Calculate an estimate of the mean finishing time. (3)

**[9]**

**QUESTION 10**

θ

θ

θ

A

D

B

*x*

**No calculator to be used in this question.**

In the diagram, BD = *x*, and



a) Determine  in terms of . (1)

b) Prove that units. (5)

c) Find the area of ΔADC if units and θ = 15°. (5)

**[11]**

C

**QUESTION 11**

Without using a calculator, and showing sufficient working, evaluate the following:

a) 1° + 89° (2)

b) 1° + 2° + 88° + 89° (2)

c) 1° + 2° + 3° + ……..+ 87° + 88° + 89° (3)

**[7]**

**QUESTION 12**

By multiplying each of the numbers in a particular set A by three and then adding eight,

we obtain a new set B.

a) What is the relationship between the means of sets A and B? (2)

b) What is the relationship between the standard deviations of sets A and B ? (3)

**[5]**

**DIAGRAM SHEET PAGE 1**

NAME :

**SECTION A**

**QUESTION 5 b**) 1) and 3)

115

125

*x*

*y*

35

**DIAGRAM SHEET PAGE 2**

**SECTION B**

**QUESTION 9**

**a)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Finishing time  in hours | 0 |  |  |  |  |  |  |
| Frequency | 0 | 0 | 10 | 27 | 16 | 5 | 2 |
| Cumulative frequency |  |  |  |  |  |  |  |

1. **and c)**

**MATHEMATICS**

0,5

1

**INFORMATION SHEET**



 



 ;  ; , 



 where  *f*  is the first term of the first difference

and  *s*  is the second difference



 

 

 

 

 

 



** 





 

 

 



 

 





