School of Isolated and Distance Education
MATHEMATICS SPECIALIST Year 11

Test 2 2023

Section 2: Classpad assumed

Time allowed for this section

Working time: 35 minutes

Marks allocation: ~~38~~ 39 marks

PERMISSIBLE ITEMS

Standard Items: pens, pencils, pencil sharpener, highlighter, eraser, ruler
Special Items: **Formulae Sheet, CAS calculator, ONE A4 page of notes**

STANDARD FORMULAE SHEET IS PROVIDED

NO OTHER ITEMS MAY BE TAKEN INTO THE EXAMINATION ROOM

INSTRUCTIONS FOR CANDIDATES

Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

All work must be done in the space provided. Should you need extra working area you may use the blank pages at the end.

Student's name: _____

SIDE Teacher's name: _____

SUPERVISOR'S DECLARATION

I declare that this test paper has been completed without assistance by the student named above. The time and resource restrictions have been observed and the student has NOT accessed additional notes other than the one A4 page allowed, texts, reference books, the internet, a computer, a mobile phone or other electronic device. I understand that this paper will not be counted for assessment if these conditions have not been met and that notifications will occur.

Supervisor's name: _____

Supervisor's signature: _____ **Date:** _____

QUESTION 1 **[3 marks]**

Determine whether the statement below is true or false. If it is false, find a counterexample.

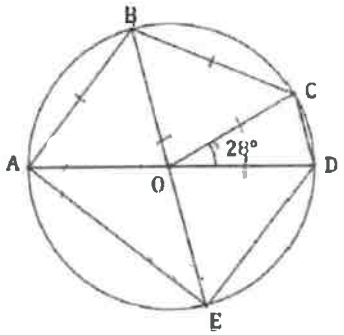
$$If\ a > b, then\ \frac{1}{a} < \frac{1}{b}, \qquad a \text{ and } b \neq 0$$

QUESTION 2 **[1, 1, 1 = 3 marks]**

In the diagram below, AD and BE are diameters of the circle with centre O, C lies on the circumference and $\angle COD = 28^o$.

Determine the sizes of the following angles, give reason for each of your answer.

(a) ∠AOB

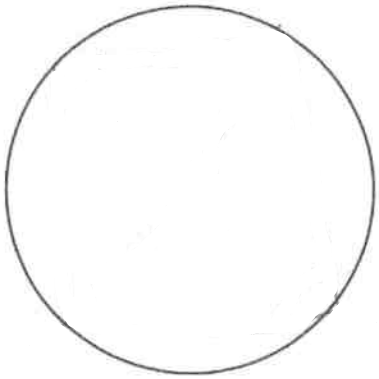


(b) ∠AEB

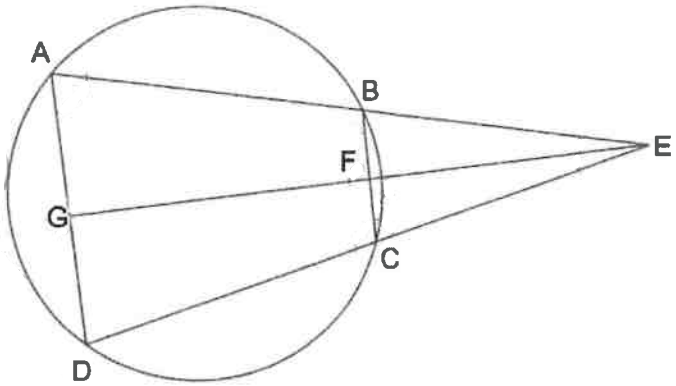
(c) ∠EAB

QUESTION 3 **[4, 4, 2 = 10 marks]**

(a) If a quadrilateral is a cyclic quadrilateral, prove that each pair of opposite angles sum to 180°.



(b) ABCD is a cyclic quadrilateral. Bisector of ∠BEC intersects BC at F and AD at G.
Prove: ∠AGF = ∠BFG



(QUESTION 3 continued)

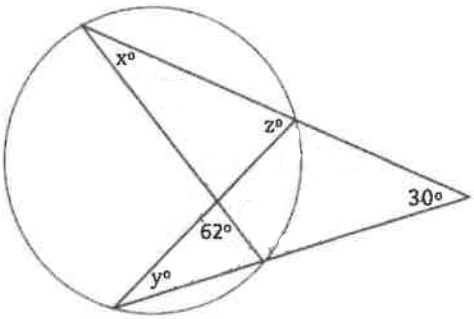
Consider the statement:
"If the opposite angles of a quadrilateral are supplementary, then the quadrilateral is cyclic."

(c) (i) In relation to the theorem in (a), this statement is which of the following?
converse, negation, inverse or contrapositive

(ii) Is the statement true?

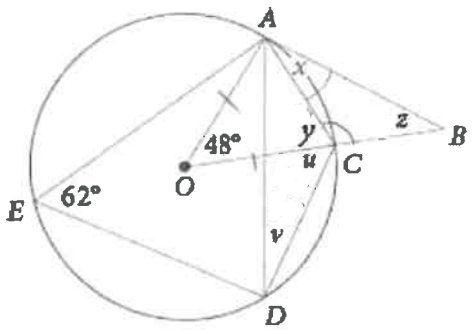
QUESTION 4 [4 marks]

Find the values of the pronumerals for the following:



QUESTION 5 **[2, 2, 2, 2, 2 = 10 marks]**

If O is the centre of the circle, AB is a tangent, determine the value of the following pronumerals and give reason for each step of your working out.



(a) v

(b) y

(c) u

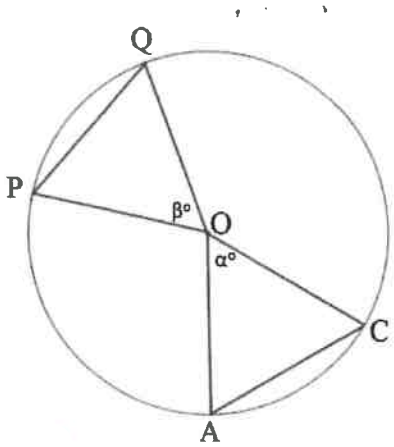
(d) x

(e) z

6 3 9

QUESTION 6 [~~3~~, ~~5~~ = ~~8~~ marks]

AC and PQ are chords of the circle centre O.



(a) Prove that $\alpha = \beta \iff AC = PQ$

(b) In addition to $\alpha = \beta$, if P, O and C are collinear (three points lie on a straight line) and Q, O and A are collinear, prove that PQ parallel to AC.

End of Test

Additional page for working out

School of Isolated and Distance Education
MATHEMATICS SPECIALIST Year 11

Test 2 2023

Section 1: Calculator Free

Time allowed for this section

Working time: **20 minutes**

Mark allocation: **30 marks**

PERMISSIBLE ITEMS

Standard Items: pens, pencils, pencil sharpener, highlighter, eraser, ruler
Special Items: **none**

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Supervisor's name: _____

Supervisor's signature:_____ **Date:**_____

QUESTION 1 **[2, 2, 2 = 6 marks]**

A true statement is "if a shape is a quadrilateral, then it is a polygon".

(a) Write the contrapositive of the statement and explain whether the contrapositive is also true

(b) Write the inverse of the statement and explain whether the inverse is also true.

(c) Write the converse of the statement and explain whether the converse is also true.

QUESTION 2 **[4 marks]**

A sentence that is true or false is a statement. A premise is a statement from which a conclusion can be made.

Use the logical statements below to answer the questions:

1. Eleanor: Old men are grumpy
2. Rudolph: I'm an old man
3. Eleanor: Then you must be grumpy
4. Rudolph: ouch!
5. Eleanor: Have you been bitten by a mosquito?
6. Rudolph: Mosquitoes bite on a hot day
7. Eleanor: I think you were bitten because you have fair skin

(a) Which of the statements are conclusions?

(b) Which of the sentences are not statements?

(c) Which of the statements are premises?

(d) How many statements does Eleanor make?

QUESTION 5 **[2, 2, 2, 2 = 8 marks]**

(a) Write the inverse of the following true statement and comment on the truth of the inverse statement.

"If the discriminant of the quadratic formula is zero, then the quadratic has just one real root."

(b) Write the converse of the following true statement and comment on the truth of the converse statement.

"if $x>3$ then $x>2$."

(c) Determine the truth of the following statements, using an example or counter-example to support each answers.

i. If $z \in \mathbb{R}$ *and* z^3 is an even number then z is an even number.

Note: $\mathbb{R}$ *is the set of numbers*

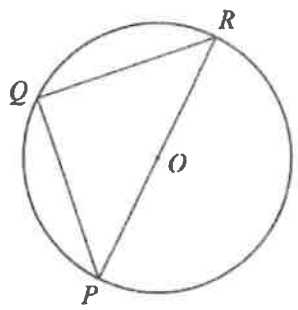
ii. If $x, y \in \mathbb{Z}$ and $x > y$ then $x^2 > y^2$.

Note: $\mathbb{Z}$ *is the set of integers.*

End of Test

QUESTION 3 **[6 marks]**

The diameter below shows a triangle with vertices P, Q and R lie on a circle with centre O. Chord PR passes through 0. Prove by contradiction, that angle is acute $\angle QPR$ angle.



QUESTION 4 **[6 marks]**

Diameter AB of a circle with centre O is extended to C and from C a line is drawn tangent to the circle at P. The line PT is drawn perpendicular to AB at T. Prove that

$$CA \times CB - TA \times TB = CT^2$$