REGNET CHRISTUS

2013

PRELIMINARY HIGHER SCHOOL CERTIFICATE

Student Number: _____

Mathematics Extension 1

TOPIC TEST

CIRCLE GEOMETRY

Assessment 2

General Instructions

- Working Time - 45 mins.
- Write using a blue or black pen.
- Approved calculators may be used..
- All necessary working should be shown for every question.
- Section1 use multiple choice sheet
- Section 2 use separate booklets for each question

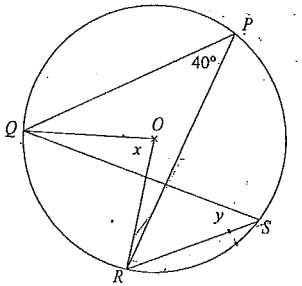
Total marks (17)

- Section 1: 2 marks
- Section2: 15 marks

Section 1:

Worth 2 marks
Each question is worth 1 mark
Fill in the multiple choice sheet for this section.

1 P, Q, R and S are points on a circle with centre O. $\angle QPR = 40°$.



What are the values of x and y?

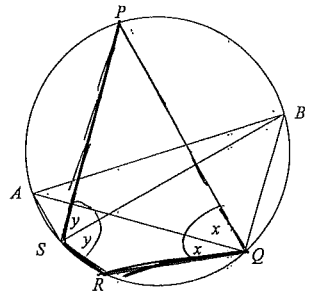
(A) $x = 40°$ and $y = 20°$

(B) $x = 40°$ and $y = 40°$

(C) $x = 80°$ and $y = 20°$

(D) $x = 80°$ and $y = 40°$

2 $PQRS$ is a cyclic quadrilateral. A and B are points on the circle such that $\angle PQA = \angle AQR = x°$ and $\angle PSB = \angle BSR = y°$.



Why is $2x° + 2y° = 180$?

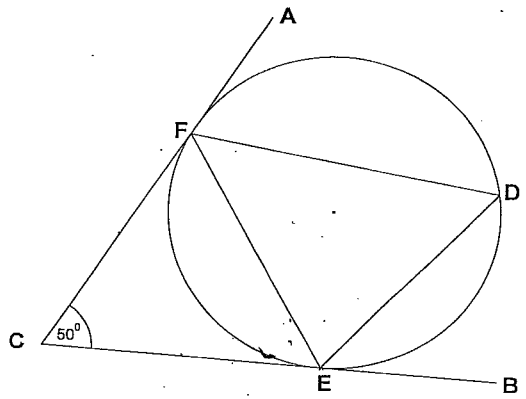
(A) Angles in the same segment standing on the same arc are equal.

(B) Opposite angles in a cyclic quadrilateral are supplementary.

(C) Angle at the circumference is equal to the angle in the alternate segment

(D) Angles in the same segment standing on the same arc are supplementary.

Section II: (15 marks)
Question 3
a)



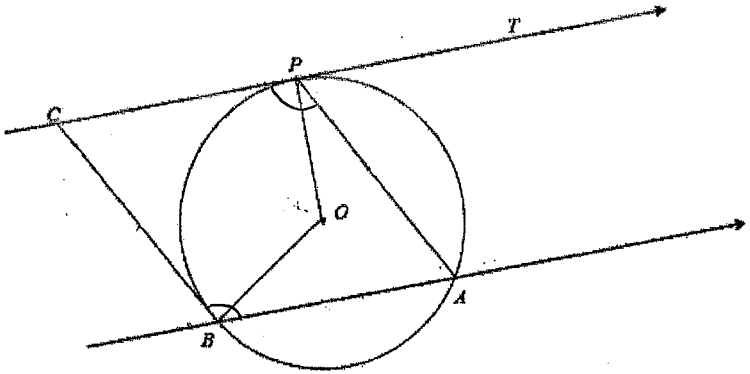
Copy this diagram in your answer booklet

In the diagram, AC and BC are tangents to the circle, touching the circle at F and E respectively. $\angle ACB$ equals 50^0.

(a) Show the $\angle CEF = 65^0$. 2

(b) Hence find $\angle EDF$. 1

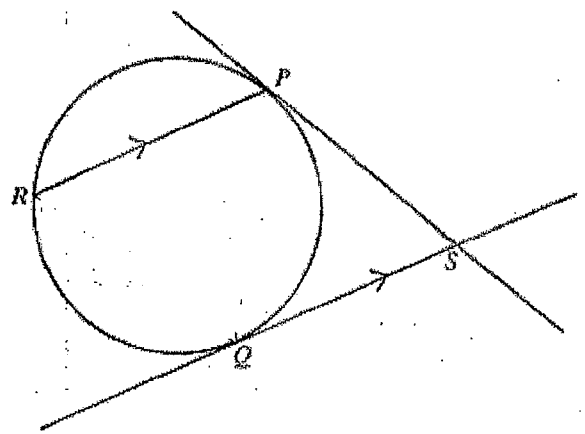
b) CT is a tangent to the circle, centre O, touching at P. Quadrilateral $PABC$ is a rhombus and CT is parallel to AB.



(a) Let $\angle ABC = \angle APC$, $\angle TPA = x$ and prove that $\angle POB = 2x$ 2

(b) Find the value of x such that $POBC$ is a cyclic quadrilateral.
You must support your answer with geometrical reasons. 2

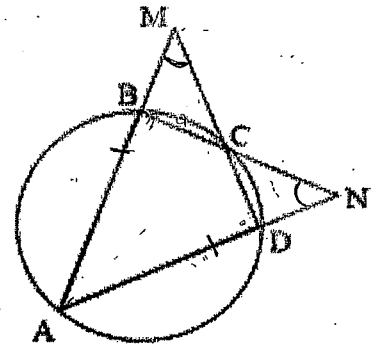
c)



P and Q are points on a circle and the tangents to the circle at P and Q meet at S. R is a point on the circle so that the chord PR is parallel to QS.

Copy the diagram and prove that $QP = QR$ 3

d)



In the figure ABM, DCM, BCN and ADN are straight lines and $\angle AMD = \angle BNA$.
a) Copy the diagram and prove that $\angle ABC = \angle ADC$ 3

b) hence, or otherwise prove that AC is the diameter 2

tion 2

5a. a. $\angle CFE = \angle CEF$ (equal angles at tangent point of contact from circle; from external point) — not a very clear sentence

$\angle CFE = \angle CEF = \frac{180-50}{2}$ (∠ sum of isosceles triangle; CF = CE, tangent from circle to external point are equal)

$= 65°$

$\therefore \angle CEF = 65°$ — state why it is isosceles

2

b. $\angle EDF = \angle CEF = 65°$ (angles in alternate segment are equal)

1

b. a. $\angle TPA = \angle PAB = x$ (given CT || BA, alternate angles in parallel lines)

$\angle POB = 2x$ (∠ at the centre is twice angle at the circumference)

2

b. $\angle PCB = x = \angle PAB$ (given CPAB is rhombus, opp. angles of a rhombus are equal)

In cyclic quad POBC:

$x + 2x = 180$ (opposite sides in a cyclic quad equal 180)

$3x = 180$

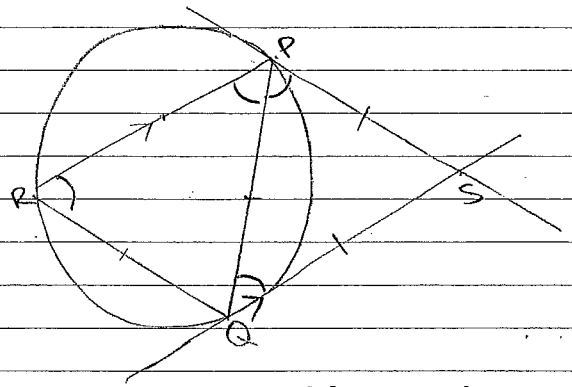
$x = 60$

2

SECTION 1

(1) D (2) B

(c)



SP = SQ (tangents extended to an external point are equal in length)

$\angle SPQ = \angle SQP$ (angles at the point of contact from a tangent to an external point are equal)

$\angle SQP = \angle RPQ$ (alternate angles in parallel lines, RP || QS)

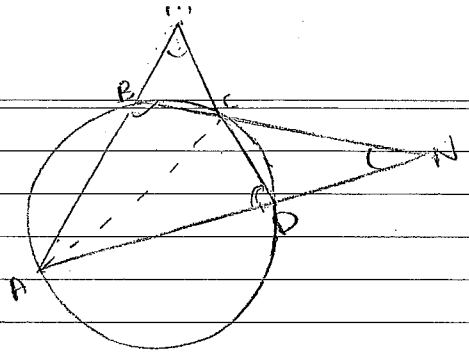
$\angle SQP = \angle QRP$ (angles in alternate segment are equal)

$\therefore$ RPQ is isosceles (proven - $\angle QRP = \angle QPR$, equal base angles of an isosceles triangle)

$\therefore QP = QR$ (equal sides of proven isosceles $\triangle RPQ$)

3

(d)



a. AM = AN (equal angles subtended by equal chords)

In △AMD and △ANB

∠MAN is common

∠AMD = ∠ANB (given) ✓

AM = AN (proven)

∴ △AMD ≡ △ANB (A.S.A) (AAS)

∴ ∠ABC = ∠ADC (corresponding angle in congruent triangles)

(2)

b. ABCD is a cyclic quad

∴ ∠ABC + ∠ADC = 180° (opposite angles in cyclic quad are supplementary)

let ∠ABC = x

∴ ∠ADC = x (proven ∠ABC = ∠ADC)

∴ x + x = 180°

2x = 180

x = 90°

3

∴ ∠AC = 2(90) (angle at the centre is double angle at the circumference)

= 180°

∴ AC is a straightline

∴ AC is the diameter.