Student's name

Teacher's name

2014
Half Yearly

Mathematics Year 10 Extension

General Instructions
- Working time – 55 minutes
- Write using blue or black pen
- Calculators may be used

Total Marks –

Section I:
10 marks
- Attempt questions 1-10, circle the correct answer
- Allow about 10 minutes for this section

Section II:
30 marks
- Attempt questions 11-13, answering in the space provided.
- Allow about 30 minutes for this section

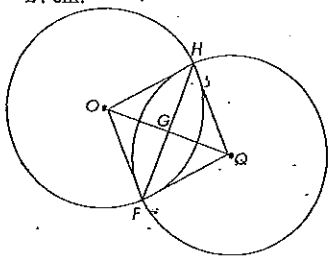
Multiple Choice	11	12	13	Total
				%

Student Comment:

Teacher Comment:

Section I
Circle geometry
10 marks
Attempt Questions 1 to 10
Allow about 10 minutes for this section
Circle the correct answer

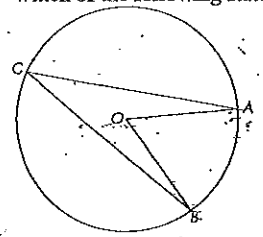
1. FH is a common chord of the circles centres O and Q. $FH = 70$ cm, $FQ = 37$ cm, and $OQ = 24$ cm.



The length of QF is

(A) 32 (B) 37
(C) 40 (D) 30

2. Which of the following statements is incorrect?



(A) $\angle ACB$ is called the angle at the circumference standing on the arc AB.

(B) $\angle AOB$ is the angle at the centre standing on the arc AB.

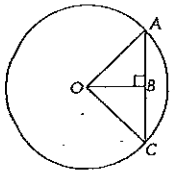
(C) If a chord AB had been drawn we would say that $\angle ACB$ and $\angle AOB$ were standing on the chord AB or they were subtended by the chord AB.

(D) $\angle ACB = 2\angle AOB$.

3. A cyclic quadrilateral has one angle measuring 97° and another angle measuring 102°. Another angle in the quadrilateral is:

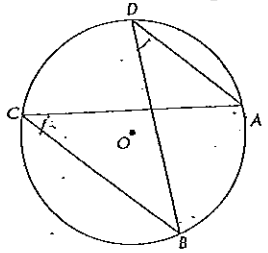
(A) 80.5° (B) 97° (C) 161° (D) 83°

4. Given that $AC = 30$ cm and $OB \perp AC$, the length of BC in this diagram is:



(A) $10cm$ (B) $15cm$ (C) $20cm$ (D) $30cm$

5. Which of the following statements is incorrect?



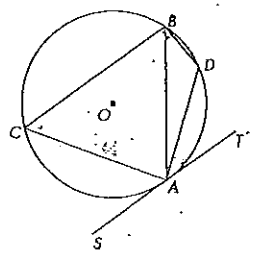
(A) $\angle BCA$ and $\angle BDA$ are angles at the circumference subtended by the minor arc AB.

(B) $\angle BCA$ and $\angle BDA$ are in the same segment because they are on the same line.

(C) $\angle CAD = 2\angle DBC$.

(D) $\angle CBD$ and $\angle CAD$ are angles at the circumference subtended by the minor arc CD.

6. Fill in the blank:



The segment ACB of the circle on the opposite side of AB to $\angle BAT$ is called the

_____

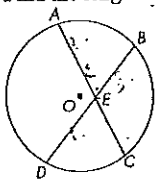
(A) Corresponding arc

(B) Alternate Chord

(C) Alternate segment

(D) Corresponding segment

7. Find the length of AC if $AE = 5$ cm, $BE = 2$ cm, and $DE = 10$ cm.



(A) $12cm$ (B) $4cm$ (C) $20cm$ (D) $9cm$

8. Which if the following is not a test for concyclic points?

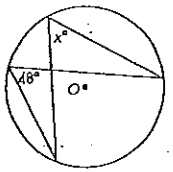
(A) If the opposite angles in a quadrilateral are supplementary then the quadrilateral is cyclic and hence its vertices are concyclic points.

(B) If an interval doesn't subtend equal angles at two points on the same side of it, then the end points of the interval and the two points are concyclic.

(C) If an exterior angle of a quadrilateral is equal to the interior opposite angle then the vertices of the quadrilateral are concyclic.

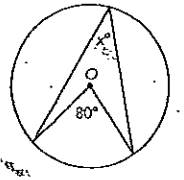
(D) If two straight lines AB and CD are divided internally or both externally at the same point P such that $PA \times PB = PC \times PD$, then the four points A, B, C, and D are concyclic.

9. Find the value of x:



(A) 24° (B) 42° (C) 48° (D) 96°

10. Find the value of x:



(A) 10° (B) 40° (C) 80° (D) 160°

End of Questions 1 - 10

Section II

30 marks
Attempt Questions 11 to 13
Allow about 30 minutes for this section

Answer each question in the space provided
All necessary working should be shown in every question.

Question 11 (10 marks) Probability

Morse code is a way of making letters from patterns of dots (•) and dashes (–). Each letter of the alphabet is made up of a combination of between 1 and 4 symbols.

For example,
E = •, A = • –, K = – • – and Z = – – • •

(a) How many letters can be made with just two symbols (• or –)? Use a tree diagram to show the possibilities. 1

(b) How many different letters can be made with:

(i) Three dots? 1

(ii) Two dots and one dash? 1

(iii) One dot and two dashes? 1

(iv) Three dashes? 1

(c) Calculate the probability that a 3-symbol letter is made up of:

(i) Three dots? 1

(ii) Two dots and one dash? 1

(iii) One dot and two dashes? 1

(iv) Three dashes? 1

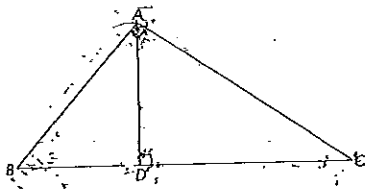
(d) Now, include letters made up of four symbols. Complete the following table: 1

No. of dots	0	1	2	3	4
Probability					

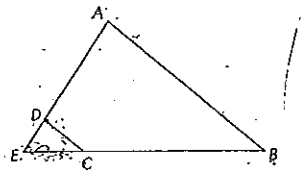
End of Question 11

Question 12 (10 marks) Similarity and Consumer Maths

(a) Triangle ABC is right angled at A. $AD \perp BC$.
Prove ADB and BAC are similar. 3



(b) ABE is a triangle. C and D are a fourth of the way from E on BE and AE respectively. Prove that $\Delta AEB \parallel\parallel \Delta DEC$ 3



(c) Steven borrows \$3000 for a term of 3.5 years at a flat rate of 12.6% per annum. The loan including interest is paid back in equal monthly instalments. Calculate the amount of the monthly repayment. 3

(d) Allie deposits \$7000 towards the cost of a round-the-world trip she plans to take in four years' time. Find the interest earned if it is calculated at: 6

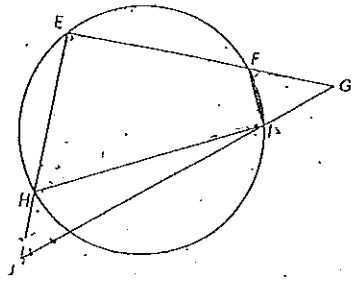
(i) 6.9% compounded annually

(ii) 6.9% compounded monthly

End of Question 12

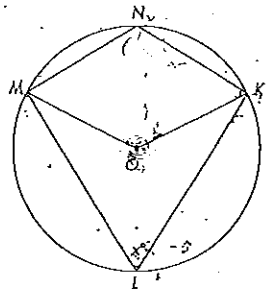
Question 13 (10 marks) Miscellaneous Questions

(a) 3



If $\angle HJI = 34°$, $\angle IFG = 57°$, calculate the size of $\angle HIJ$, giving reasons for your answer.

(b) 3



Quadrilateral $KLMN$ is inscribed in a circle centre O. By joining MO and OK, prove that $\angle MNK + \angle MLK = 180°$

(c) An athlete runs at a constant speed of 6 m/s for the first 420 m of a race. The next 400 m are run at a constant speed of 5 m/s and the final 180 m at a constant speed of 6 m/s

(i) How far is the race? 1

(ii) How long does it take to run the first 420 m? 1

(iii) Sketch the graph of distance, D metres, versus time, T seconds 2

End of paper

Student's name

Teacher's name

MASTER COPY - SOLUTIONS

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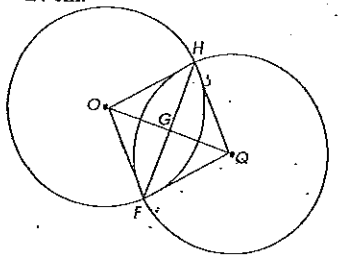

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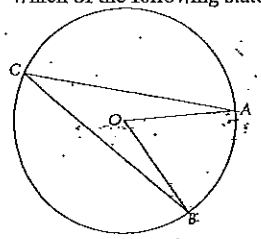

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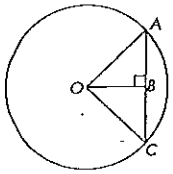

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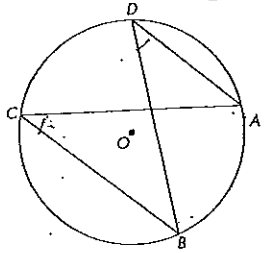

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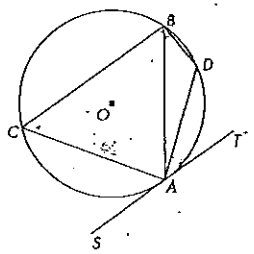

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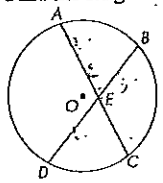

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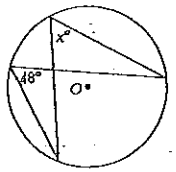

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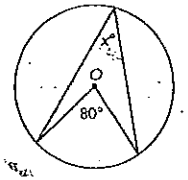

(A) 10° (B) 40° (C) 80° (D) 160°

End of Questions 1 - 10

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Question 11 (10 marks) Probability

Morse code is a way of making letters from patterns of dots (•) and dashes (–). Each letter of the alphabet is made up of a combination of between 1 and 4 symbols.

For example,
E = •, A = • –, K = – • – and Z = – – • •

(a) How many letters can be made with just two symbols (• or –)? Use a tree diagram to show the possibilities. 1

4

(b) How many different letters can be made with:

(i) Three dots? 1

1

(ii) Two dots and one dash? 1

3

(iii) One dot and two dashes? 1

3

(iv) Three dashes? 1

1

(c) Calculate the probability that a 3-symbol letter is made up of:

(i) Three dots? 1

$\frac{1}{8}$

(ii) Two dots and one dash? 1

$\frac{3}{8}$

(iii) One dot and two dashes? 1

$\frac{3}{8}$

(iv) Three dashes? 1

$\frac{1}{8}$

(d) Now, include letters made up of four symbols. Complete the following table: 1

Assuming – – • •

No. of dots	0	1	2	3	4
Probability	0	1/4	1/6	1/4	1

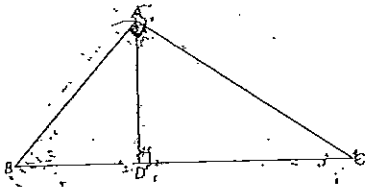
Total sample space = 6

– – – – • – – –

End of Question 11

Question 12 (10 marks) Similarity and Consumer Maths

(a) Triangle ABC is right angled at A. $AD \perp BC$.
Prove ADB and BAC are similar. 3



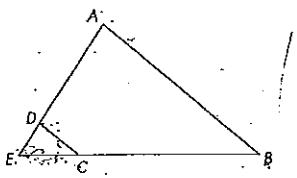
In △ ADB, △ BAC

∠ ADB = ∠ BAC (Given 90°)

∠ B is common

∴ △ ADB ||| △ CBA (Equiangular)

(b) *ABE* is a triangle. *C* and *D* are a fourth of the way from *E* on *BE* and *AE* respectively. Prove that $\Delta AEB \parallel\parallel \Delta DEC$ 3



In ΔAEB, ΔDEC

$\angle E$ is common

$\frac{ED}{EA} = \frac{EC}{EB} = \frac{1}{4}$ (Given)

$\therefore \Delta AEB \parallel\parallel \Delta DEC$

(2 sides in the same proportion + included angle equal)

(c) Steven borrows \$3000 for a term of 3.5 years at a flat rate of 12.6% per annum. The loan including interest is paid back in equal monthly instalments. Calculate the amount of the monthly repayment. 3

$3000 + \frac{12.6}{100} \times 3.5 \times 3000 = \underbrace{4323}_{\text{Total amount}}$

$\therefore$ Monthly repayment

$= \frac{4323}{42} = \$102.93$

(d) Allie deposits \$7000 towards the cost of a round-the-world trip she plans to take in four years' time. Find the interest earned if it is calculated at: 6

(i) 6.9% compounded annually

\$2141.73

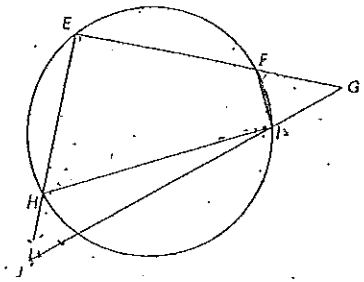
(ii) 6.9% compounded monthly

\$2217.65

End of Question 12

Question 13 (10 marks) Miscellaneous Questions

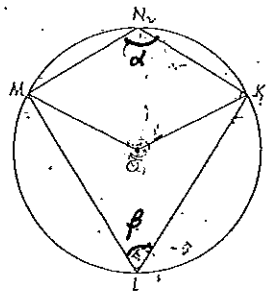
(a) 3



If $\angle HJI = 34°$, $\angle IFG = 57°$, calculate the size of $\angle HJI$, giving reasons for your answer.

$\angle HIJ = 23°$ (Tutor to check working)

(b) 3



Quadrilateral *KLMN* is inscribed in a circle centre *O*. By joining *MO* and *OK*, prove that $\angle MNK + \angle MLK = 180°$

$\alpha + \beta = 180°$

Let $\angle MNK = \alpha$, $\angle KLM = \beta$

Reflex $\angle MOK = 2\alpha$ ($\angle$ at centre = 2 at circumf)

$\angle MOK = 2\beta$ (" " " ")

But $2\alpha + 2\beta = 360$ (1 revolution)

$\therefore \alpha + \beta = 180°$ as reqd.

(c) An athlete runs at a constant speed of 6 m/s for the first 420 m of a race. The next 400 m are run at a constant speed of 5 m/s and the final 180 m at a constant speed of 6 m/s

(i) 1

How far is the race?

1 km

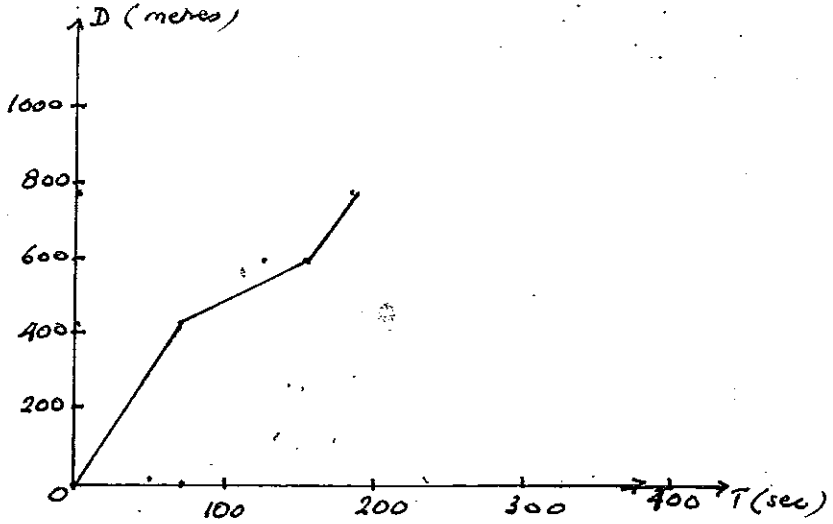
(ii) 1

How long does it take to run the first 420 m?

70 seconds

(iii) 2

Sketch the graph of distance, D metres, versus time, T seconds



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