FUKIEN SECONDARY SCHOOL

S3 First Term Uniform Test (2020-2021)

Mathematics

(1 hour)

Date: 20th October 2020 Name:_____

Time: 9:45 a.m. - 10:45 a.m. Class: _____ No.: _____

Instructions to students:

1. This paper consists of THREE parts, Section A, Section B and Bonus Question. Section A carries 42 marks, Section B carries 16 marks and Bonus Question carries 4 marks.

2. The maximum score of this paper is 58.

3. Attempt ALL questions in Section A and Section B.
   Write your answers in the spaces provided in this Question / Answer Book.

4. Unless otherwise specified, show your workings clearly.

5. Unless otherwise specified, numerical answers should either be exact or correct to 3 significant figures.

6. The diagrams in this paper are not necessarily drawn to scale.

Section A (42 marks)

1. Factorize
   (a) $8x^4y^3+18x^2y$,
   (b) $5x^2-14x-3$,
   (c) $a(r-s)b-3(s-r)c$.

(6 marks)

2. Simplify $\left(\frac{a^4b^{-2}}{a^{-3}b^0}\right)^{-1}$ and express your answer with positive indices.

(3 marks)

3. Solve the simultaneous equations $\begin{cases} 2x-y+5=0 \\ x-3y+15=0 \end{cases}$.

(4 marks)

4. Solve the following linear inequalities in one unknown.

(a) $\frac{3x+8}{2} \geq 2x-3$

(b) $\frac{3x+2}{4} \leq \frac{2x-3}{7}$

(4 marks)

5. Express the following as binary numbers.

(a) $1\times2^6+1\times2^5+1\times2^3+1\times2^2+0\times2^1+1\times2^0$

(b) $1\times128+2\times32+1\times2+2$

(4 marks)

6. (a) Convert 300_{16} into denary number.

   (b) Convert 158 into hexadecimal number.

(4 marks)

7. Consider the inequality

$$\frac{5x+1}{3} - \frac{x+1}{5} < 6 \quad \ldots\ldots (*) .$$

   (a) Solve (*) and represent the solutions graphically on the number line.

   (b) Write down the greatest integer satisfying (*) .

(5 marks)

8. In Figure 1, *AEB* and *ADC* are straight lines. *BD* and *CE* are angle bisectors of $\angle ABC$ and $\angle ACB$ respectively and they meet at *F*. $\angle DFE = 115°$. Find $\angle BAC$. (4 marks)

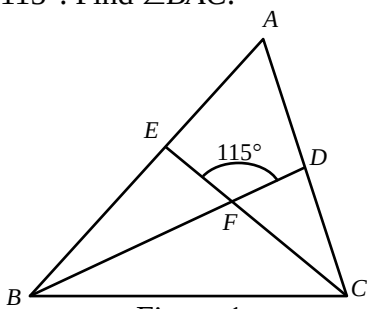

Figure 1

9. Evaluate each of the following expressions and express the answer in scientific notation.

(a) $\dfrac{(7\times10^{-5})\times(2.4\times10^{12})}{3\times10^{3}}$

(b) $\dfrac{3.35\times10^{3}+7.28\times10^{4}}{0.05\times10^{-5}}$

(4 marks)

10. In Figure 2, given that $\angle BAC = 52°$, $\angle ACD = 23°$, $\angle DBC = 38°$ and D is the circumcentre of $\triangle ABC$. Find $\angle ABD$.

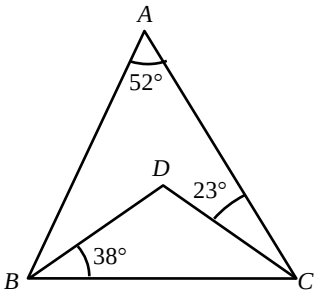

Figure 2

(4 marks)

Section B (16 marks)

11. Simplify the following expressions.

(a) $\dfrac{2^{x+3}}{15^{-x-1}} \cdot \dfrac{6^{-x+2}}{5^{x+1}}$

(b) $\dfrac{3(2^{n}) - 4^{n}(2^{2}}{2^{n} - 2^{n-1}}$

(8 marks)

12. In Figure 3, *AFD*, *BFE* and *CDE* are straight lines. *DA* // *CB*, $\angle DBE = \angle DEB$ and $\angle DBC = \angle DCB$.

(a) Prove that *BD* is a median of $\triangle BCE$.

(b) (i) Prove that $BC \perp BE$.

(ii) Hence, prove that *AD* is an altitude of $\triangle ABE$.

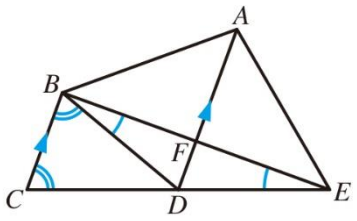

Figure 3

(8 marks)

Bonus Question (4 marks)

14. If $x + x^{-1} = \sqrt{31}$, find the value of $x^4 + x^{-4}$.

(4 marks)

END OF PAPER