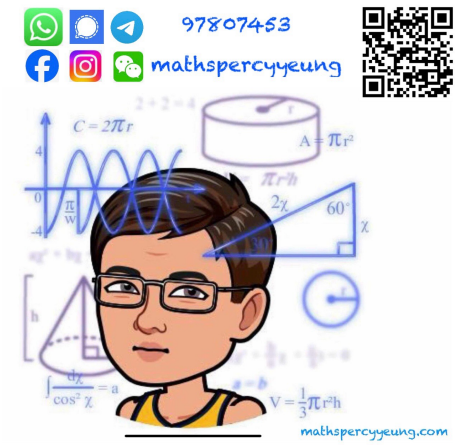
2021-2022 S4
2nd TERM UT
MATH CP



2021 – 2022
S4 Second Term Uniform Test

MATHEMATICS Compulsory Part

Question–Answer Book

17th May, 2022
8:15 am – 9:30 am (1 hour 15 minutes)
This paper must be answered in English

INSTRUCTIONS

1. Write your name, class and class number in the spaces provided on this cover.

2. Answer ALL questions in Section A. You should use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.

3. Attempt ALL questions in Sections B and C. Write your answers in the spaces provided in this Question – Answer Book.

4. Unless otherwise specified, all working must be clearly shown and numerical answers should be either exact or correct to 3 significant figures.

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

Sections	Marks
A Total	**/26**
B (14 – 16)	**/10**
B (17 – 21)	**/22**
B Total	**/32**
C Total	**/12**
TOTAL	**/70**

Section A (26 marks)

Choose the best answer for each question.

1. $(4a^{\frac{3}{2}})^{-\frac{1}{2}} =$

   A. $\dfrac{1}{2a^{\frac{3}{4}}}$.

   B. $\dfrac{2}{a^{\frac{3}{4}}}$.

   C. $2a^{\frac{3}{4}}$.

   D. $4a$.

2. If $a > 0$ and $b > 0$, which of the following MUST be true?

   I. $(\log a)^2 = 2\log a$

   II. $\dfrac{\log a}{\log b} = \dfrac{a}{b}$

   III. $\log a = \log\left(\dfrac{a}{b}\right) + \log b$

   A. I only

   B. III only

   C. I and II only

   D. II and III only

3. If $49^{x+1} = 7^{2x-1} + 342$, then $x =$

   A. -1.

   B. 0.

   C. $\dfrac{1}{2}$.

   D. 1.

4. $\dfrac{2\log x^2}{\log(3x) + \log x - \log 3} =$

   A. $\dfrac{\log x}{\log(3x)}$.

   B. $\dfrac{\log x}{\log\left(\dfrac{x}{3}\right)}$.

   C. $\dfrac{1}{2}$.

   D. 2.

5. Given that $\log 2 = x$ and $\log 3 = y$, express $\log\left(\dfrac{45}{4}\right)$ in terms of x and y.

   A. $2y - 3x + 1$

   B. $2y - 3x - 1$

   C. $3x - 2y + 1$

   D. $3x - 2y - 1$

6. If $\log_3(2x-1) - \log_3(3x-2) = 2$, then $x =$

   A. $\dfrac{1}{3}$.

   B. $\dfrac{17}{25}$.

   C. $\dfrac{19}{15}$.

   D. 3.

7. If $a>0$, $b>0$ and $a\neq b$, then $\dfrac{\sqrt{a}}{\sqrt{a}+\sqrt{b}}+\dfrac{\sqrt{b}}{\sqrt{a}-\sqrt{b}}=$

A. $\dfrac{a+b}{a-b}$.

B. $\dfrac{\sqrt{ab}}{a-b}$.

C. $\dfrac{\sqrt{a}+\sqrt{b}}{a+b}$.

D. $\dfrac{\sqrt{a}+\sqrt{b}}{a-b}$.

8. If $(x-a)(a-2x)=-a^2$, where a is a constant, then

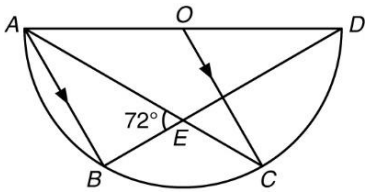
A. $x=-\dfrac{3a}{2}$ or $x=\dfrac{a}{2}$.

B. $x=3a$ or $x=-\dfrac{a}{2}$.

C. $x=0$ or $x=2a$.

D. $x=0$ or $x=\dfrac{3a}{2}$.

9. In the figure, $AB//OC$, O is the centre and AD is the diameter of the semi-circle. AC and BD intersect at E. If $\angle AEB=72°$, find $\angle ADB$.



A. 18°

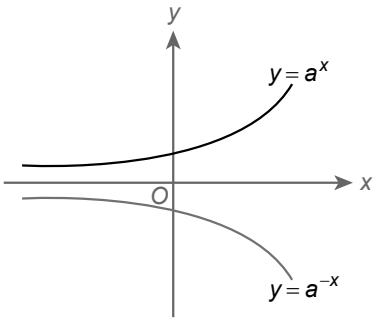
B. 36°

C. 48°

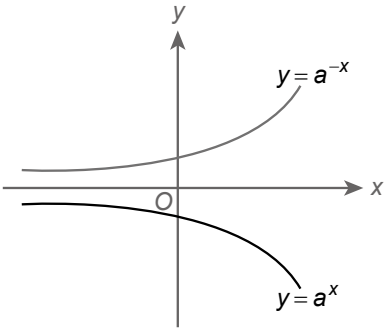
D. 54°

10. If $0<a<1$, which of the following may represent the graphs of $y=a^x$ and $y=a^{-x}$?

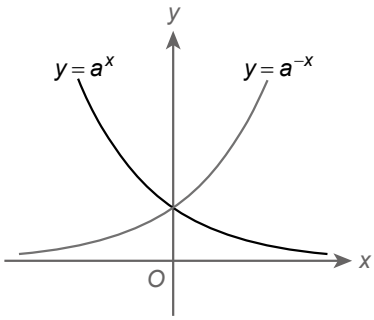
A.



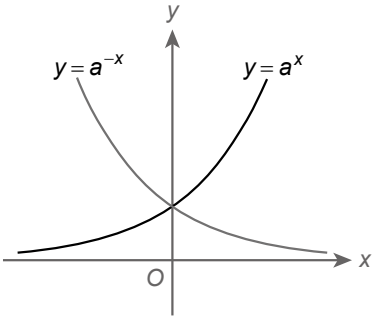
B.



C.



D.



11. Consider the graph of $y=\left(\frac{1}{5}\right)^x$. Which of the following is/are true?

I. The graph cuts the y-axis at $\left(0,\frac{1}{5}\right)$.

II. The graph lies above the x-axis.

III. The graph has an axis of symmetry.

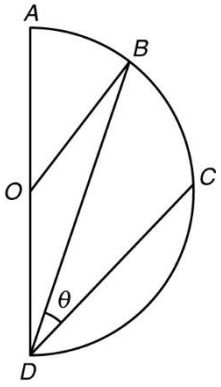
A. I only

B. II only

C. I and II only

D. II and III only

12. In the figure, O is the centre of the semi-circle and $\overset{\frown}{AB}:\overset{\frown}{BC}=3:4$. If $\angle BDC = \theta$, then $\angle AOB =$



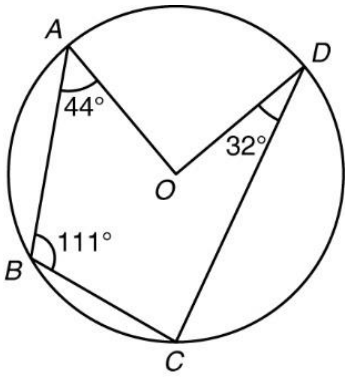
A. $\frac{\theta}{2}$.

B. $\frac{3\theta}{4}$.

C. $\frac{3\theta}{2}$.

D. $\frac{5\theta}{2}$.

13. In the figure, O is the centre of the circle. $\angle ABC=111°$, $\angle BAO=44°$ and $\angle CDO=32°$. Find $\angle BCD$.



A. 53°

B. 99°

C. 104°

D. 136°

Section B(1) (18 marks)

14. Simplify $(\frac{x^2y^0}{6x^{-1}y})^{-3}$ and express your answer with positive indices. (3 marks)

15. Make y the subject of the formula $x = \frac{2y}{5+3y}$. (3 marks)

16. (a) Factorize $x^2 - 5x - 6$.
    (b) Factorize $x^2 + 2xy + y^2$.
    (c) Hence, or otherwise, factorize $a^2 + 2ab + b^2 - 5(a+b) - 6$.

(4 marks)

17. Solve the logarithmic equation $\log(x+10)+\log(x-2)=2\log(x+3)$. (3 marks)

18. It is given that $f(x)=a(4^x)$ and $f(2)=48$.

(a) Find the value of a.

(b) If $f(k+1)-f(k-1)=90$, find the value of k.

(5 marks)

Section B(2) (14 marks)

19. The number (N) of bananas on a tree after t weeks is given by $N = P(1.32)^t$, where P is a constant. Initially, the number of bananas on the tree is 20.

    (a) Find the value of P. (2 marks)

    (b) Find the number of bananas after 5 weeks, correct to the nearest integer. (2 marks)

    (c) At least how many weeks later, will the number of bananas be greater than 13 times its initial number? (Give your answer correct to the nearest integer) (3 marks)

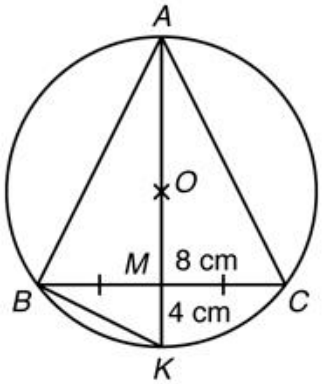
20. It is given that α and β are the roots of the quadratic equation $x^2 + (p+3)x + 4 = 0$.

(a) Form a quadratic equation in y with the roots $2\alpha + 3$ and $2\beta + 3$ in terms of p. (5 marks)

(b) If the quadratic equation in (a) has a double real root, find the values of p. (2 marks)

Section C (12 marks)

21. In the figure, AK is a diameter of the circle. AK and BC interact at M. MK = 4 cm, $BM = CM = 8$ cm.



(a) Prove that ΔABC is an isosceles triangle. (3 marks)

(b) Show that $\angle ABC = \angle AKB$. (2 marks)

(b) Find the radius of the circle and AB. (5 marks)
(Leave your answers in surd form if necessary.)

(c) Hence or otherwise, find the area of ΔABK. (2 marks)

END OF PAPER