# Fukien Secondary School S2 Final Examination (2020-2021) Mathematics (1 hour 30 minutes)

Date: 15<sup>th</sup> June 2021 Time: 8:30 a.m. – 10:00 a.m.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ No. : \_\_\_\_\_

## **Instructions to students:**

- This paper consists of THREE parts, Conventional Questions, Multiple-choice Questions and Bonus Question. There are Section A(1), Section A(2) and Section B in Conventional Questions. Section A(1) carries 32 marks. Section A(2) carries 24 marks. Section B carries 24 marks. Multiple-choice Questions carry 20 marks. Bonus Questions carrie 5 marks.
- 2. The maximum score of this paper is 100.
- 3. Attempt ALL questions in Conventional Questions and Multiple-choice Questions. Write your answers in the spaces provided in this Question / Answer Book.
- 4. Unless otherwise specified, all workings must be clearly shown.
- 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.

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Conventional Questions	
Section A(1) (32 marks)	
1. Make x the subject of the formula $5(x - 2y) + 3 = 2(2y - x)$ .	
	(3 marks)
2 (a) Eactorize $25h^2$ $64h^2$	
2. (a) Factorize $25h^2 + 15h - 64k^2 - 24k$	
(0)  1  actorize  25n + 15n  0  tr  2  tr.	(4 marks)
	(1 marks)
$x^2 + 37 + 8x$	
3. Simplify $\frac{1}{2y} \times \frac{1}{5xy} \times \frac{1}{2yz}$ .	
	(3 marks)

- 4. (a) Factorize 2xy + 5y 2x 5.
  - (b) Using the result of (a), simplify  $\frac{4x+10}{2xy+5y-2x-5}$ .

(4 marks) 

## 5. If *a* : *c* = 11 : 18 and *b* : *c* = 15 : 24, find *a* : *b* : *c*.

(3 marks)

6. In Figure 1, AC intersects BD at E.  $\angle ABE = \angle DCE$  and  $\angle ACB = \angle DBC$ . Prove that  $\triangle ABC \cong \triangle DCB$ .



Figure 1

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\_\_\_\_\_

(3 marks)



8. In Figure 2, *ABCD* is a trapezium, where AD = 4.5, BC = 8 and CD = 6. Find the value of x.



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(4 marks)

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- 9. In Figure 3, *C* is a point on *BD* such that  $AC \perp BD$ . It is given that AB = 15 cm, BC = 9 cm and AD = 13 cm.
  - (a) Find AC. (b) Find the area of  $\triangle ABD$ . 15 cm  $B \xrightarrow{9 \text{ cm}} C \xrightarrow{13 \text{ cm}} D$



(4 marks)

Section A(2) (24 marks)

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10. (a) Express the surd  $\sqrt{75}$  in its simplest form.

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(b) Simplify  $\sqrt{192} + \sqrt{75}$ . (c) Simplify  $\frac{\sqrt{192} + \sqrt{75}}{\sqrt{30}}$  and rationalize the denominator of the result.

(6 marks)

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11. Figure 4 shows  $\triangle ABC$ . Find the value of *h*.

		A 12  cm h  cm B D C	
		Figure 4	(1 marks)
		(	<u>4 marks)</u>
12.	(a)	Simplify $\frac{3\tan(90^\circ - \theta)}{\cos\theta} - \frac{1}{\cos(90^\circ - \theta)}$ .	
	(b)	Given that $\sin (90^\circ - \theta) = \frac{4}{5}$ , find the value of $5\cos\theta - \frac{\cos(90^\circ - \theta)}{\sin\theta - 1}$ without solving $\theta$	
	(c)	Prove the identity $\frac{1-2\sin^2(90^\circ-\theta)}{\sin\theta+\cos\theta} = \sin\theta - \sin(90^\circ-\theta).$	
		$\sin \theta + \cos \theta$ (	8 marks)


13. Figure 5 shows a logo of a company which is drawn on a wall outside the company's building. It is known that *O* is the centre of the sectors *BOC* and *AOD*. *OAB* and *ODC* are straight lines. The

length of  $\widehat{BC}$  is  $15\pi$  m, OA : AB = 1 : 1 and  $\angle AOD = 90^{\circ}$ .

- (a) Find the radii of the sectors *AOD* and *BOC*.
- (b) Find the area of the shaded region *ABCD*.



Figure 5

(6	marks)	
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Section B (24 marks)  $\begin{cases} x - 4y = 7\\ 3x + 2y = 14 \end{cases}$ 14. (a) Solve the simultaneous equations (b) Using the result of (a), solve the simultaneous equations  $\begin{cases} m+4n = -7mn \\ 3m-2n = -14mn \end{cases}$ (6 marks) \_\_\_\_\_ 

- 15. Figure 6 shows a cylindrical container of height 20 cm with a cylindrical hole. The base diameters of the container and the hole are 22 cm and 8 cm respectively. It is given that  $1050\pi$  cm<sup>3</sup> of water is poured into the container.
  - (a) Find the depth of water inside the container.
  - (b) Find the area of the wet surface of the container.



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16. Figure 7 shows a vertical tower *AB*. David and Tim stand at *C* and *D* respectively. If *C*, *B* and *D* are on the same horizontal line and CD = 250 m, find the height of the tower.

A $A$ $A$ $A$ $A$ $A$ $A$ $A$ $A$ $A$	
	(5 marks)

- 17. In Figure 8, *ABCDE* is a regular pentagon. *EA* and *BA* are produced to *J* and *G* respectively so that  $\angle AJG = 25^{\circ}$ . *JGF* is a straight line. *DA* is produced to cut *JG* at *H*.
  - (a) Find  $\angle BAE$ .
  - (b) Find *a* and *b*.




## Multiple-choice Questions (20 marks)

Each question carries 2 marks. Put  $\checkmark$  in the correct boxes.

	18	19	20	21	22	23	24	25	26	27
А										
В										
С										
D										

- 18. Polly makes a scale drawing of a fashion model. The scale of her drawing is 1 : 24. Kenneth makes another scale drawing of the same model, where the height of the model in his drawing is 75% of that in Polly's drawing. Find the scale of Kenneth's drawing.
  - A. 1:18
  - B. 1:20
  - C. 1:30
  - D. 1:32

19. If  $(x-3)(ax+5) \equiv -2x^2 + bx - 15$ , then

- A. a = -2 and b = -1. B. a = -2 and b = 11. C. a = 2 and b = -1.
- D. a = 2 and b = 11.

20. (3a+2b+c)(3a-2b+c) =

A.  $(3a+2b)^2 - c^2$ B.  $(3a)^2 - (2b+c)^2$ C.  $(3a+c)^2 - (2b)^2$ D.  $(3a)^2 + (2b)^2 - c^2$ 

20. The following cumulative frequency curve shows the scores of 35 students in a mathematics quiz.



If the bottom 20% of the students have to re-test, find the maximum score for the students taking re-test.

- A. 20
- B. 25
- C. 26
- D. 32
- 22. Figure 9 shows the graphs of the simultaneous equations  $\begin{cases} ax + y 4 = 0 \\ x + by + 2 = 0 \end{cases}$ , where *a* and *b* are constants. The graphs intersect at a point (1, 3). Find the values of *a* and *b*.
  - A. a = 1, b = 1B. a = 1, b = -1C. a = -1, b = 1D. a = -1, b = -1

ax + y - 4 = 0 (1, 3) x

Figure 9

- 23. In Figure 10, AC and BD intersect at E. Find x.
  - A. 30°
  - B. 35°
  - C. 40°
  - D. 45°



С

24. In Figure 11, find the value of  $\cos \angle C - \cos \angle B$ .



- A.  $\frac{\sqrt{11}}{6}$ . B.  $\frac{2}{3}$ . C.  $\frac{5}{6}$ . D. 1.
- 26. In Figure 12, 2 identical semi-circles are cut from a larger semi-circle. *O* is the centre of the larger semi-circle. If the perimeter of the figure is  $6\pi$  cm, find the area of the figure, correct to 2 decimal places.
  - A.  $6.75 \text{ cm}^2$
  - B.  $7.07 \text{ cm}^2$
  - C.  $21.21 \text{ cm}^2$
  - D. 28.27 cm<sup>2</sup>



27. In Figure 13, *O* is the centre of the circle with radius 6 cm. *BOC* is a straight line and  $\angle OAB = 35^{\circ}$ . Find the length of  $\widehat{ABC}$ , correct to the nearest 0.1 cm.

- A. 7.3 cm
- B. 9.7 cm
- C. 11.5 cm
- D. 30.4 cm



Figure 13

# **Bonus Question (5 marks)**





(5 marks)

END OF PAPER