FKS F2 2024-2025 Final

S2 Final Examination (2024-2025)

Mathematics

(1 hour 30 minutes)

Date: 4th June 2025

Time: 8:30 a.m. – 10:00 a.m.

Name: _____

Class: _____ No. : _____

Instructions to students:

1. This paper consists of THREE parts, Conventional Questions, Multiple-choice Questions and Bonus Question. There are Section A and Section B in Conventional Questions. Section A carries 62 marks. Section B carries 18 marks. Multiple-choice Questions carry 20 marks. Bonus Question carries 3 marks.

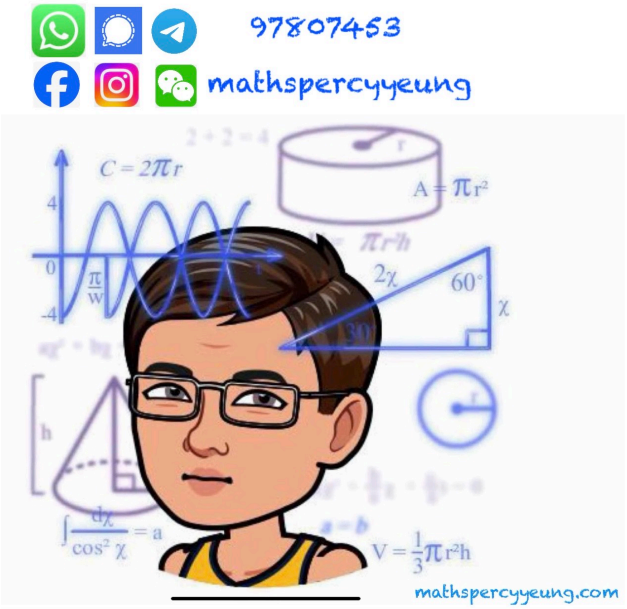
2. The maximum score of this paper is 100.

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.



Conventional Questions

Section A (62 marks)

1. Factorize

   (a) $4x^2 - 4x + 1$,

   (b) $4x^2 - 4x + 1 - 9y^2$.

(3 marks)

2. Simplify the following expressions.

   (a) $\frac{5h+10}{7k^2} \times \frac{14k}{2+h}$

   (b) $\frac{2x}{3} + \frac{3}{2x}$

(4 marks)

3. Consider the formula $a+3=\dfrac{1-a}{b}$.

(a) Make a the subject of the formula.

(b) If $b=3$, find a.

(4 marks)

4. Simplify each of the following and rationalize the denominator of the result if necessary.

(a) $\sqrt{18}$

(b) $\left(2-\sqrt{2}\right)^2$

(c) $\sqrt{3}(\sqrt{27}+\sqrt{8})$

(d) $\dfrac{24}{\sqrt{32}}$

(7 marks)

5. In Figure 1, AFB is a straight line. If $EA = EF$, find x and y.

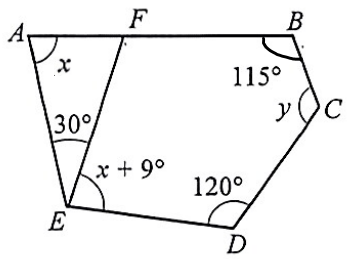


Figure 1

(5 marks)

6. In Figure 2, the area of sector OAB is 12π cm^2.
   (a) Find the radius of the sector OAB.
   (b) Find the perimeter of the sector OAB in terms of π.

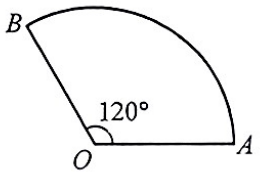


Figure 2

(4 marks)

7. The height of Cindy is measured as 150 cm. The percentage error of this measured value is 2%.
   (a) Find the maximum absolute error of this measurement.
   (b) Find the lower limit of Cindy's height.

(3 marks)

8. In a shop, the total price of 5 apples and 3 pears is \$27, and the total price of 4 apples and 7 pears is \$40.
   (a) Find the price of an apple and the price of a pear.
   (b) Mr. Chan has \$50. Does he have enough money to buy 7 apples and 9 pears? Explain your answer.

(5 marks)

9. Figure 3 shows a map of a route from A to B. The length of the route on the map is 53 cm.

(a) Find the actual length of the route in m.

(b) Mr Lau runs from A along the route at an average speed of 150 m/min. Can he arrive at B within two hours? Explain your answer.

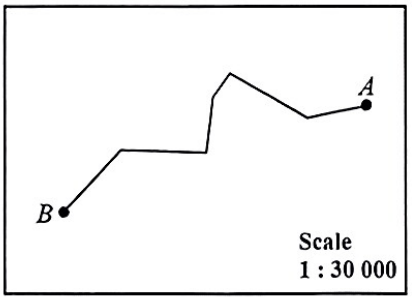


Figure 3

(4 marks)

10. Prove that $\tan 45° + \tan^2 \theta \equiv \dfrac{1}{\sin^2(90° - \theta)}$.

(4 marks)

11. In Figure 4, BNC is a straight line.

(a) Find BN. *(Leave the answer in surd form.)*

(b) Find θ.

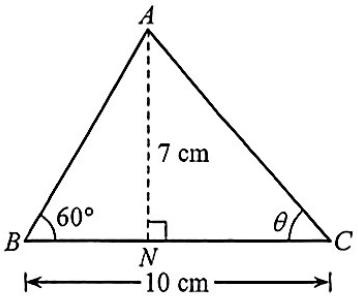


Figure 4

(4 marks)

12. Figure 5 shows the graph of the equation $2x + 3y - 15 = 0$. The graph cuts the x-axis at A.

(a) Find the coordinates of A and B.

(b) Alice draws the graph of the equation $x + 3y - 18 = 0$ on the same figure. Does the graph pass through B? Explain your answer.

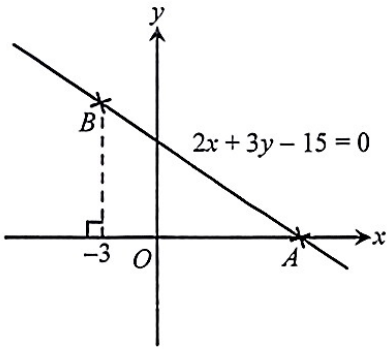


Figure 5

(4 marks)

13. In Figure 6, AD // BC and $\angle ADC = \angle CAB$.

(a) Prove that $\triangle ABC \sim \triangle DCA$.

(b) Find AD and CD.

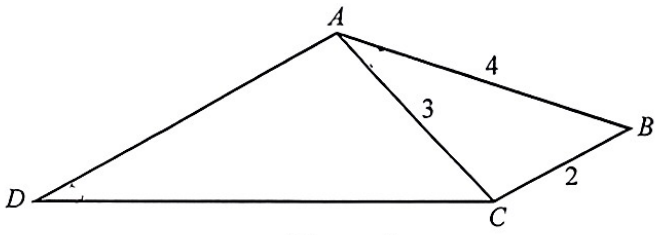


Figure 6

(5 marks)

14. The frequency distribution table and the cumulative frequency distribution table below show the distribution of the time taken to finish an assignment by a group of students.

Time taken (minutes)	*Frequency*
36 – 45	a
46 – 55	$2a$
56 – 65	b
66 – 75	q

Time taken less than (minutes)	*Cumulative frequency*
45.5	2
55.5	p
65.5	q
75.5	$2q$

It is given that the percentage of the students takes less than 55.5 minutes to finish the assignment is 18.75%.

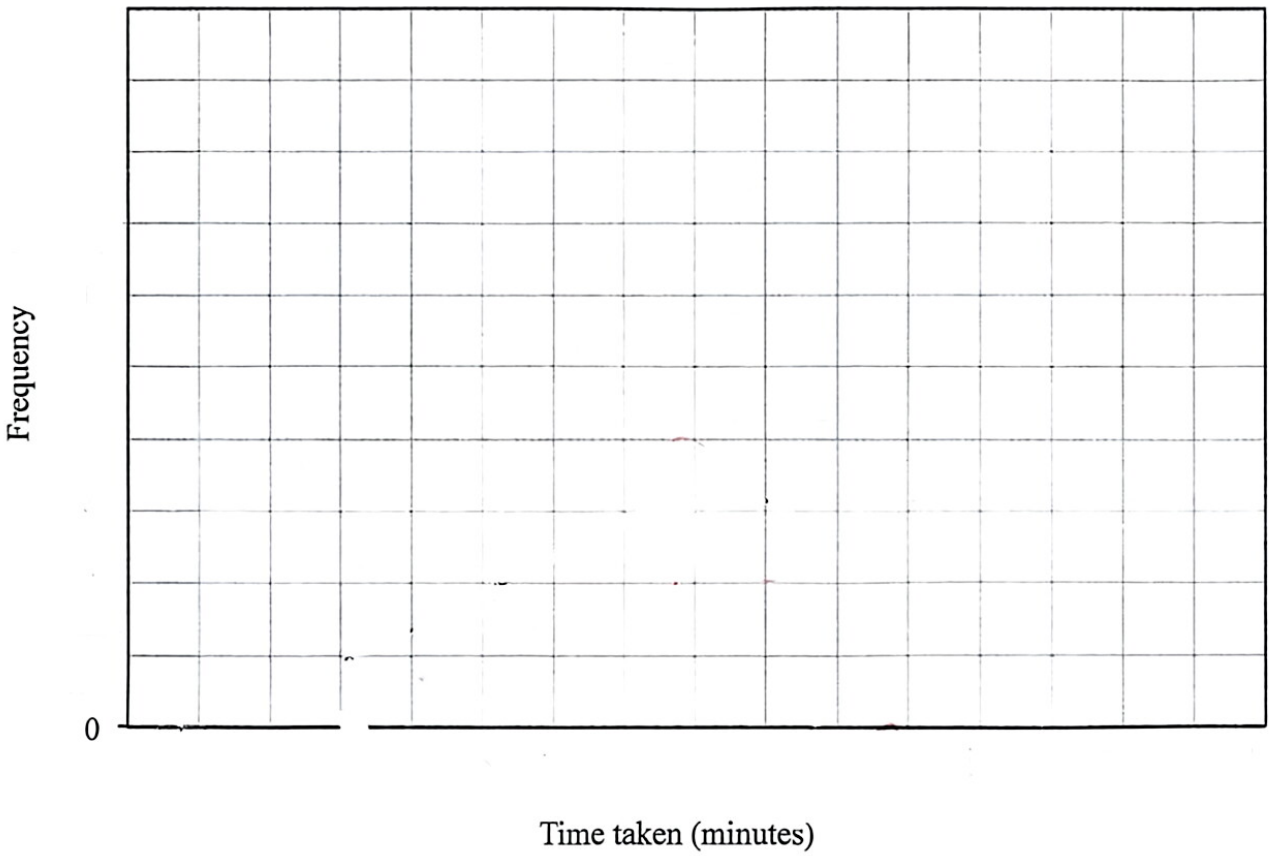
(a) Find p, q and b.

(3 marks)

(b) Draw the frequency polygon to present the data.

(3 marks)

The time taken to finish an assignment by a group of students



Section B (18 marks)

15. In Figure 7, N is a point on BC such that $AN \perp BC$ and $BN : CN = 16 : 9$. Let $CN = x$ cm.

(a) By considering $\triangle ACN$, express AN in terms of x.

(b) Find x.

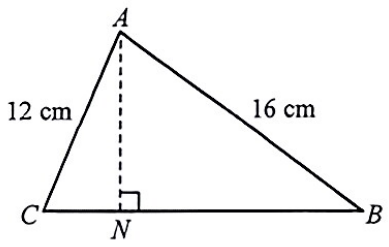


Figure 7

(4 marks)

16. A right cylindrical sealed container of height 11 cm is placed horizontally on a table as shown in Figure 8. The water level in the container is 8 cm above the table.

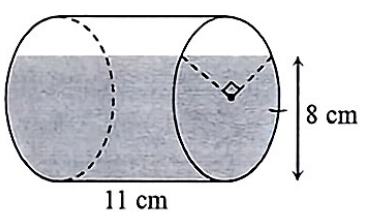


Figure 8

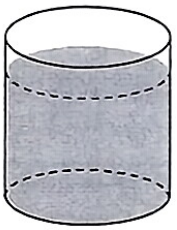


Figure 9

(a) Find the base area of the water in the container in Figure 8.

(b) The container is then placed vertically as shown in Figure 9. The volume of water in the container remains unchanged.

(i) Find the new water level.

(ii) Find the wet curved surface area of the container in Figure 9.

(8 marks)

17. In Figure 10, AE and BC intersect at D.

(a) Find $\angle DCE$.

(b) Show that $CD = 2 \tan 15°$.

(c) By considering $DB = CB - CD$, show that $\tan 15° = \frac{1}{2+\sqrt{3}}$.

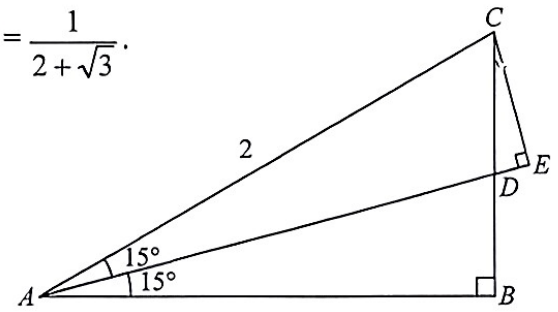


Figure 10

(6 marks)

Multiple-choice Questions (20 marks)

Each question carries 2 marks. Put ✓ in the correct boxes.

	18	19	20	21	22	23	24	25	26	27
A										
B										
C										
D										

18. Which of the following are rational numbers?

I. $\frac{3}{7}$

II. $1.\dot{2}$

III. $\sqrt{2}$

IV. $\sqrt[3]{27}$

A. I and II only
B. III and IV only
C. I, II and III only
D. I, II and IV only

19. If $p : q = 5 : 2$ and $q : r = 1 : 3$, then $(2p - q) : (4q + 2r) =$

A. 2 : 5.
B. 3 : 5.
C. 6 : 7.
D. 9 : 7.

20. If A and B are constants such that $(x + 1)(x - 3) + A(x - 3) \equiv x^2 + Bx$, then $A =$

A. –3.
B. –1.
C. 1.
D. 3.

21. Solve the simultaneous equations $2x - 2y = 7x + 2y = 18$.

A. $x = 4, y = -5$
B. $x = 4, y = 5$
C. $x = -4, y = -5$
D. $x = -4, y = 5$

22. The weight of a pack of candy is measured as 250 g, correct to the nearest 5 g. Find its relative error.

A. $\frac{1}{100}$

B. $\frac{1}{50}$

C. $\frac{1}{25}$

D. $\frac{2}{25}$

23. If the sum of interior angles of a regular n-sided polygon is 7 times the sum of its exterior angles, which of the following must be true?

I. The value of n is 16.

II. The size of each exterior angle of the polygon is 25°.

III. The size of each interior angle of the polygon is 157.5°.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

24. In Figure 11, $\frac{AB}{CD} =$

A. $\frac{\sin\alpha}{\cos\beta}$.

B. $\frac{\cos\alpha}{\sin\beta}$.

C. $\sin\alpha\cos\beta$.

D. $\cos\alpha\sin\beta$.

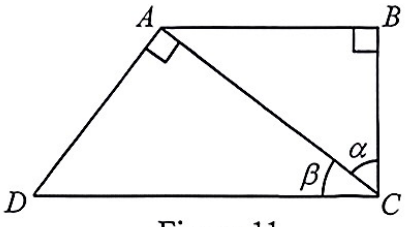


Figure 11

25. Figure 12 shows a cake composed of two right cylindrical layers. Find the total surface area of the cake.

A. 60π cm^2

B. 96π cm^2

C. 132π cm^2

D. 156π cm^2

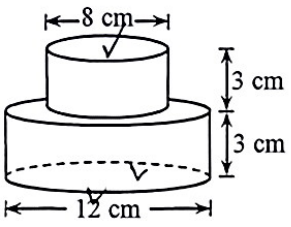


Figure 12

26. In Figure 13, $PQRS$ is a rectangle. N is a point on QR.

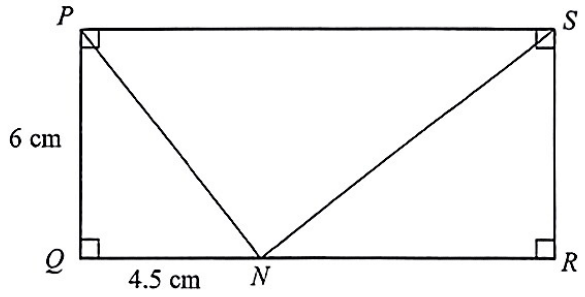


Figure 13

It is given that $\triangle PQN \sim \triangle NRS$. Which of the following are true?

I. $PN \perp NS$

II. $\triangle PQN \sim \triangle SNP$

III. $PS = 12.5$ cm

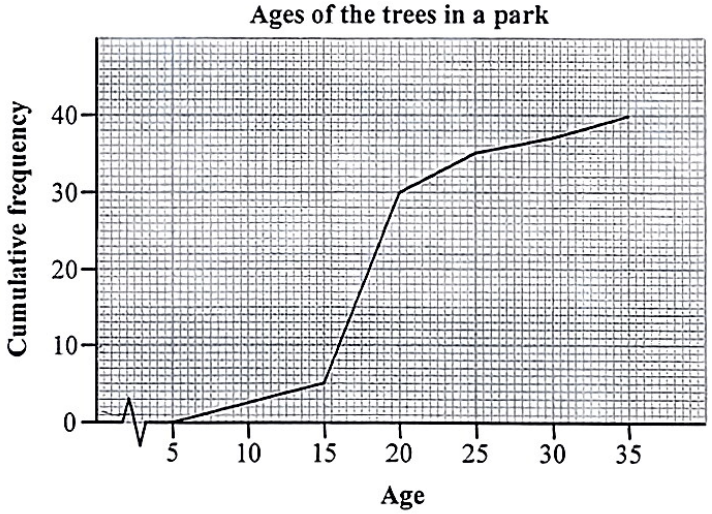
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

27. The cumulative frequency polygon below shows the ages of the trees in a park.



The 80th percentile =

A. 20

B. 22

C. 24

D. 32

Bonus Question (3 marks)

28. Simplify $\sqrt{9-2\sqrt{23-6\sqrt{6-4\sqrt{2}}}}$.

END OF PAPER