

MATHEMATICS METHODS

YEAR 11 UNIT 1

TEST 1

2022



Section 1

CALCULATOR FREE

REVISION PAPER

TIME: 25 marks
MARKS: 27 marks

STUDENT'S NAME:

Solutions

CIRCLE YOUR
TEACHER'S NAME:

Mrs Gatland

Mrs Kalotay

Ms Leow

Ms Mack

Mr Riemer

Mrs Smirke

Ms Thompson

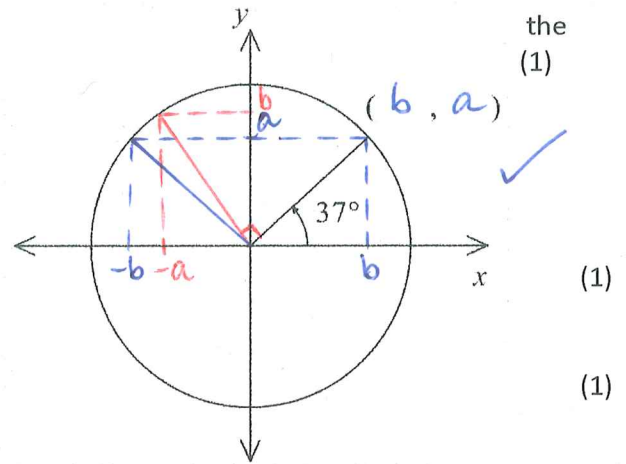
- Show all necessary working in order to obtain full marks.
- A formula sheet will be provided.

Question 1

(6 marks)

- (a) Given $\sin 37^\circ = a$ and $\cos 37^\circ = b$, complete the **coordinates** on the diagram .

- (b) Determine each of the following in terms of 'a' and 'b'.



(i) $\cos 143^\circ = -b$

(1)

ii) $\sin 143^\circ = a$

(1)

ii) $\sin 323^\circ = -a$

(1)

iii) $\tan 217^\circ = \frac{a}{b}$

(1)

iv) $\cos 127^\circ = -a$

(1)

Question 3

(6 marks)

Express each of the following as an exact value;

a) $\sin 60^\circ = \frac{\sqrt{3}}{2}$

(1)

b) $\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$

(1)

c) $\cos \frac{3\pi}{4} = -\frac{1}{\sqrt{2}} \text{ or } -\frac{\sqrt{2}}{2}$

(1)

d) $\tan \frac{5\pi}{3} = -\sqrt{3}$

(1)

e) $\sin 210^\circ = -\frac{1}{2}$

(1)

f) $\tan \left(-\frac{\pi}{6}\right) = -\frac{1}{\sqrt{3}} \text{ or } -\frac{\sqrt{3}}{3}$

(1)

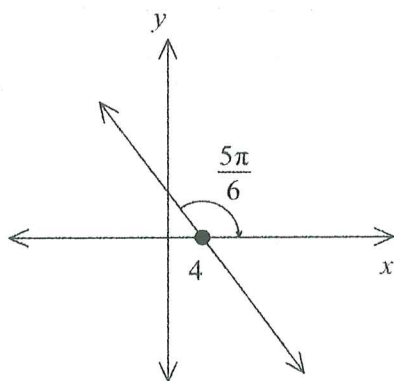
Question 6

(6 marks)

- a) A line has an equation of $3x + 3\sqrt{12} - 7y = 0$. Determine its x-intercept. (2)

$$\begin{aligned} \text{x int is when } y=0 \quad 3x + 3\sqrt{12} - 7(0) &= 0 \\ 3x &= -3\sqrt{12} \quad \checkmark \\ x &= -\sqrt{12} = -2\sqrt{3}. \\ \therefore (-2\sqrt{3}, 0) \quad (1) \quad \checkmark \end{aligned}$$

- b) Determine the gradient of the line pictured below.



$$\tan \frac{5\pi}{6} = -\frac{1}{\sqrt{3}} \quad \checkmark$$

- c) Determine the equation of the line parallel to the line pictured above and passing through the x-intercept of the line with equation $3x + 3\sqrt{12} - 7y = 0$. (3)

$$\begin{aligned} \text{Parallel gradient} &= -\frac{1}{\sqrt{3}} \quad \therefore y = -\frac{1}{\sqrt{3}}x + c \\ 0 &= -\frac{1}{\sqrt{3}}(-2\sqrt{3}) + c \\ -2 &= c \quad \therefore y = -\frac{1}{\sqrt{3}}x - 2. \end{aligned}$$

Question 2 [3,3=6 marks]

- (a) Expand and simplify $(2x + 1)^4$. [3]

$$\begin{aligned} &1(2x)^4 + 4(2x)^3 + 6(2x)^2 + 4(2x) + 1 \quad \checkmark \\ &= 16x^4 + 32x^3 + 24x^2 + 8x + 1 \quad \checkmark \end{aligned}$$

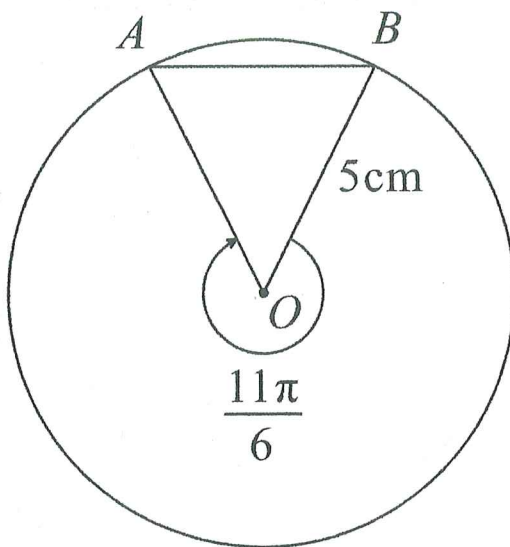
- (b) State the coefficient of the x^3 term when $(2x - \frac{3}{x})^5$ is expanded. [3]

$$\begin{aligned} &(2x)^5 + 5(2x)^4(-\frac{3}{x}) + 10(2x)^3(-\frac{3}{x})^2 + \dots \\ &= 32x^5 + 5(16x^4)(-\frac{3}{x}) + 10(8x^3)(+\frac{9}{x^2}) + \dots \\ &= 32x^5 + (-240)x^3 + \dots \\ &\therefore -240. \quad \checkmark \end{aligned}$$

Question 7

(5 marks)

Find the following as an exact value in its simplest form.



- a) The length of the minor arc AB.

(2)

$$\begin{aligned} \text{length} &= r\theta \\ &= 5 \times \frac{\pi}{6} \quad \checkmark \\ &= \frac{5\pi}{6} \text{ cm} \quad \checkmark \end{aligned}$$

- b) The area of major segment AB. (There is no need to simplify your answer.)

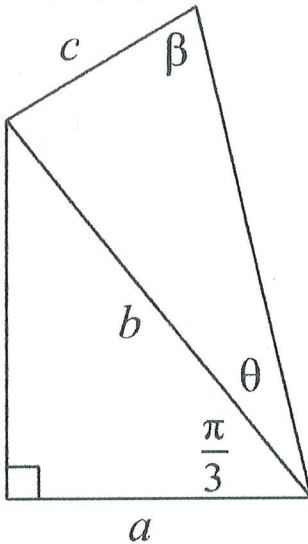
(3)

$$\begin{aligned} \text{Area of Segment} &= \frac{1}{2} r^2 \left(\frac{11\pi}{6} - \sin \frac{11\pi}{6} \right) \quad \checkmark \\ &= \frac{25}{2} \left(\frac{11\pi}{6} - \left(-\frac{1}{2} \right) \right) \quad \checkmark \\ &= \frac{275\pi}{12} + \frac{25}{4} \text{ cm}^2 \quad \checkmark \end{aligned}$$

Question 8

(4 marks)

Given the following diagram, prove that $c = \frac{2a \sin \theta}{\sin \beta}$.



$$\cos \frac{\pi}{3} = \frac{a}{b} \quad \checkmark$$

$$\frac{1}{2} = \frac{a}{b}$$

$$b = 2a \quad \checkmark$$

$$\frac{\sin \beta}{2a} = \frac{\sin \theta}{c} \quad \checkmark$$

$$c \sin \beta = 2a \sin \theta \quad \checkmark$$

$$c = \frac{2a \sin \theta}{\sin \beta}$$

END OF CALC FREE

MATHEMATICS METHODS

YEAR 11 UNIT 1

TEST 1

2022



Section 2

CALCULATOR ASSUMED

REVISION PAPER

TIME: 20 mins
MARKS: 18 marks

STUDENT'S NAME:

Solutions.

CIRCLE YOUR
TEACHER'S NAME:

Mrs Gatland

Ms Kalotay

Ms Leow

Ms Mack

Mr Riemer

Mrs Smirke

Ms Thompson

- Show all necessary working in order to obtain full marks as marks will be allocated for specific working.
- A formula sheet will be provided.
- One single sided A4 page of notes is permitted

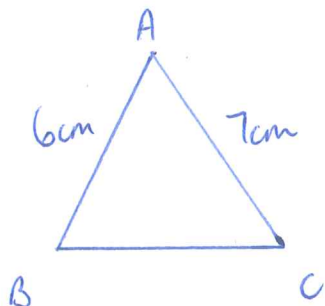
Question 9

(5 marks)

Triangle ABC has sides AB = 6cm, AC = 7cm, and an area of 13.50 cm².

- (a) Determine the size of angle BAC in radians to 3 decimal places.

(3)



$$\text{Area} = 13.5 \text{ cm}^2$$

$$\text{Area} = \frac{1}{2} (6)(7) \sin A \quad \checkmark$$

$$13.5 = 21 \sin A$$

$$\sin A = \frac{27}{42}$$

$$\angle A = 0.698 \text{ or } 2.443. \quad \checkmark$$

- b) Determine the longest possible length of BC.

(2)

$$a^2 = 6^2 + 7^2 - 2(6)(7) \cos A$$

$$= 36 + 49 - 84 \cos(2.443) \quad \checkmark$$

$$a = 12.22 \text{ cm} \quad \checkmark$$

Question 8 [1,3=4 marks]

Mya is choosing which five subjects she wants to study in Year 11. If there are eight humanities subjects and six science subjects on offer at her school:

- (a) Determine the total number of choices Mya can make in selecting her five subjects.

[1]

$$\binom{14}{5} = 2002. \quad \checkmark$$

- (b) If Mya has to choose either three from the humanities and two from the sciences, or two from the humanities and three from the sciences, determine the number of choices Mya has.

[3]

$$\binom{8}{3} \binom{6}{2} \checkmark + \binom{8}{2} \binom{6}{3} \checkmark$$

$$= 840 + 560$$

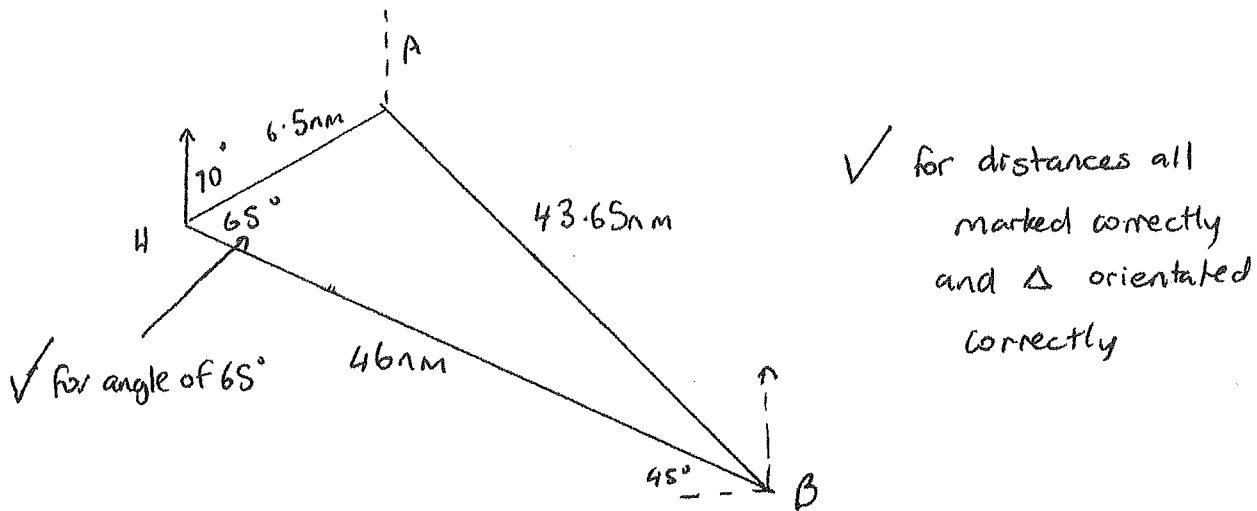
$$= 1400. \quad \checkmark$$

Question 10

(5 marks)

From a harbour H, ship A is anchored on a bearing of $070^\circ T$, 6.5 nautical miles from the harbour. A second ship B departs the harbour on a bearing of $135^\circ T$ and travels for two hours at 23 nautical miles before dropping anchor. The distance between ship A and ship B after two hours is 43.65 nautical miles.

- a) Draw a fully labelled diagram complete with all known angles to represent the situation two hours after ship B departed. (2)



- b) Find the bearing of ship B from ship A two hours after ship B departed. (3)

$$\cos B = \frac{46^2 + 43.65^2 - 6.5^2}{2 \times 46 \times 43.65}$$

$$\cos B = \frac{a^2 + b^2 - c^2}{2ab}$$

$$= 0.99085425$$

$$\therefore \angle B = 7.754947^\circ$$

$$\therefore \text{Bearing} = 180^\circ - (45^\circ - 7.75589^\circ)$$

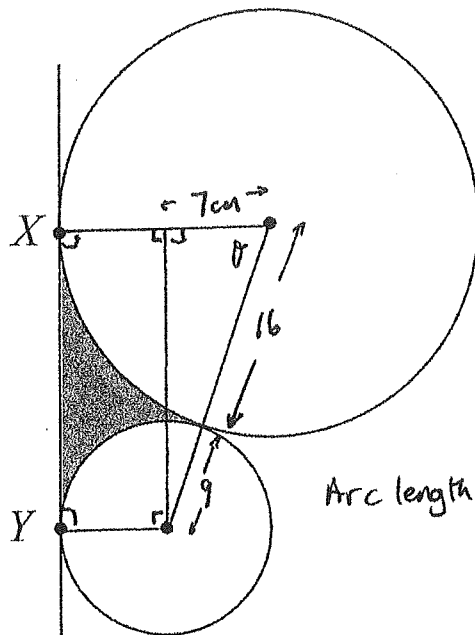
$$= 142.756^\circ T \quad \text{or} \quad 143^\circ T$$

Question 11

(8 marks)

Two circles of radius 16 cm and radius 9 cm touch each other in one spot only, and both touch the line XY in one place, as shown in the diagram below.

Find the perimeter of the shaded region to the nearest centimetre.



$$XY = \sqrt{25^2 - 7^2}$$

$$= \sqrt{625 - 49}$$

$$= \sqrt{576}$$

$$= 24 \text{ cm} \quad \checkmark$$

$$\cos \theta = \frac{7}{25} \quad \checkmark$$

$$\theta = 73.739795^\circ \quad \text{or} \quad 1.2870022 \text{ radians} \quad \checkmark$$

$$\text{Arc length large} = \frac{73.7398}{360} \times 2\pi \times 16 \quad \checkmark$$

$$\text{or } 16 \times 1.287 \quad \checkmark$$

$$= 20.5920 \text{ cm} \quad \checkmark$$

$$= 20.5920 \text{ cm} \quad \checkmark$$

$$\text{Arc length small} = \frac{106.2602}{360} \times 2\pi \times 9 \quad \checkmark$$

$$\text{or } 9 \times 1.85459 \quad \checkmark$$

$$= 16.6913 \text{ cm} \quad \checkmark$$

$$= 16.6913 \text{ cm} \quad \checkmark$$

$$\therefore \text{Perimeter} = 24 \text{ cm} + 20.5920 \text{ cm} + 16.6913 \text{ cm}$$

$$= 61.2833 \text{ cm}$$

$$= 61.28 \text{ cm}$$

$$= 61 \text{ cm} \quad (\text{to nearest centimetre}) \quad \checkmark$$

END OF CALC ASSUMED