

2006
NSW HIGHER SCHOOL CERTIFICATE
PRELIMINARY EXAMINATION



2 UNIT

MATHEMATICS

General Instructions

- Reading time: 5 minutes
- Working time: 2 hours
- Board approved calculators may be used
- Write using blue or black pen
- Draw diagrams using pencil
- Write your name at the top of every page
- Start each question on a new page

Total Marks - 100

Attempt **ALL** questions

All necessary work should be shown in every question. Marks may be deducted for careless or badly arranged work.

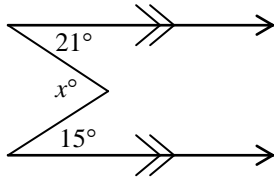
QUESTION 1 (25 marks)

- | | |
|---|---|
| A. Solve i) $ 5x - 3 = 3x + 1$ | 2 |
| ii) $y(y - 6) = 0$ | 2 |
| iii) $2x^2 - 3x + 1 = 0$ | 2 |
| iv) $\frac{a}{4} - \frac{a+2}{3} = 9$ | 2 |
| v) $4 - x > 7$ | 2 |
| B. Simplify | |
| i) $\frac{3a+12}{3}$ | 2 |
| ii) $\sqrt{3}(2\sqrt{2} - 5)$ | 2 |
| iii) If $a = \left(\frac{1}{3}\right)^4$ and $b = \left(\frac{3}{4}\right)$ evaluate ab^3 as a fraction | 2 |
| C. Expand and simplify | |
| i) $7 - 2(x + 4) - 5x$ | 1 |
| ii) $(4x - 3)^2$ | 1 |
| iii) $(\sqrt{7} + 2)^2$ | 2 |
| D. i) If $A = \frac{1}{2}h(a + b)$ gives the area of a trapezium, find A when $h = 7$, $a = 2.5$ and $b = 3.9$ | 2 |
| ii) Convert $0.06\bar{3}$ to a fraction | 2 |
| iii) If $x = 3.1$ and $y = -2.3$ find $\frac{18.9}{x-y}$ to 2 decimal places | 1 |

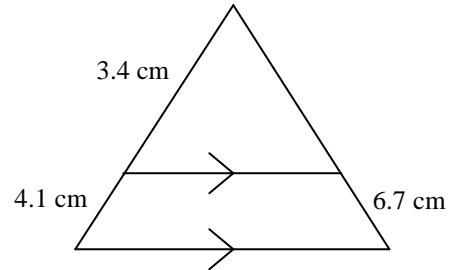
QUESTION 2 (15 marks)

A. Find the value of x

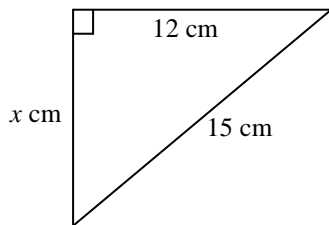
i)



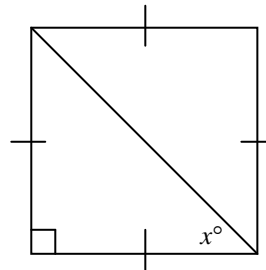
ii)



iii)



iv)



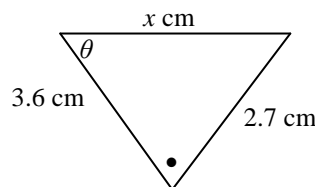
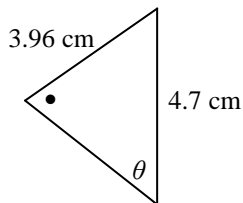
4

B. Find i) the angle sum of a hexagon

2

ii) the size of each angle of a regular hexagon

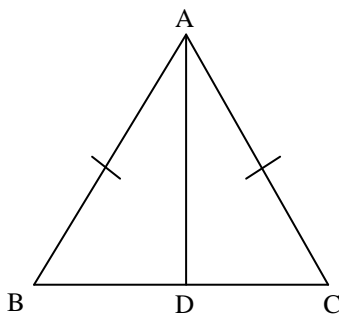
C. Triangles ABC and DEF are similar



2

Find x to 2 decimal places

D.



Triangle ABC is isosceles
AD bisects BC

a) Prove $\triangle ABD$ and $\triangle ACD$ are congruent

3

b) Prove AD and BC are perpendicular

1

E. A rhombus has diagonals 6cm and 8cm

a) Find the area of the rhombus

1

b) Find the length of its side

2

QUESTION 3 (15 marks)

A. i) Given $f(x) = 2x^2 - 3x + 4$ find $f(3)$

1

ii) Given $f(x) \begin{cases} 3 & \text{if } x > 3 \\ x^2 & \text{if } 1 \leq x \leq 3 \\ 2 - x & \text{if } x < 1 \end{cases}$

find a) $f(4)$

3

b) $f(1)$

c) $f(-3)$

B. State the domain and range for the following functions

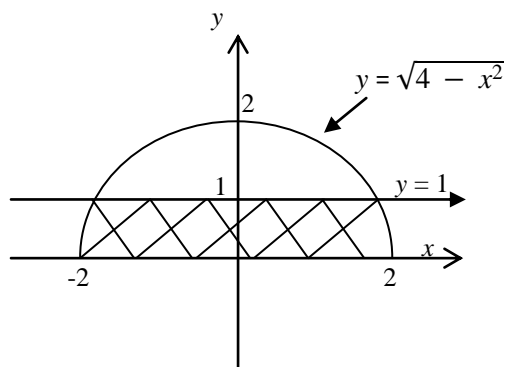
i) $y = \sqrt{2x - 4}$

2

ii) $y = \frac{4}{x - 3}$

2

C. Write down the pair of inequalities that determines the shaded region



2

D. Determine whether $f(x) = x^2 - 1$ is an odd, even or neither odd nor even function Show all working)

2

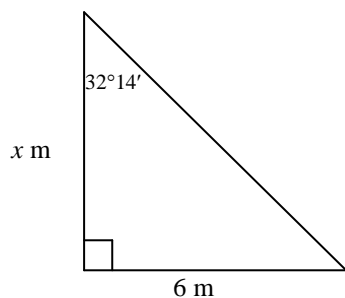
E. Indicate clearly on a number plane the region which each set of inequalities hold simultaneously: $y \geq |x|$ and $x \geq 0$

3

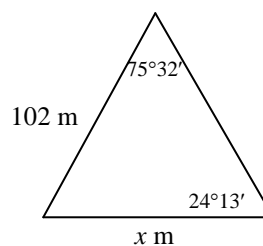
QUESTION 4 (15 marks)

A. i) Find the value of the pronumerals (to 2 decimal places and nearest degree)

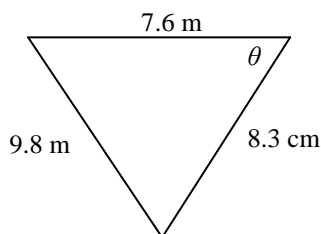
a)



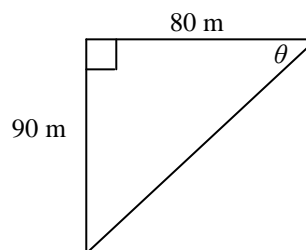
c)



b)



d)



A.
1 each

B. A ship leaves port and travels on a course of 215° for 100 nautical miles

i) Draw a diagram to show this information

1

ii) How far is the ship west of the port?

2

iii) What is the bearing of the sport from the ship?

1

C. Find the values of θ ($0^\circ \leq \theta \leq 360^\circ$) for which:

$$\sin^2 x = \frac{3}{4}$$

2

D. Simplify $\sin x \cot x$

1

QUESTION 5 (15 marks)

- | | | |
|----|--|---|
| A. | For the points A(3, -1) and B(-2, 5) find | |
| | i) the gradient of AB | 1 |
| | ii) the equation of the line AB | 2 |
| | iii) the midpoint of AB | 1 |
| | iv) the perpendicular distance of the origin to the line | 2 |
| B. | i) Find the point of intersection of the lines $y = 2x + 3$ and $x - 5y + 6 = 0$ | 2 |
| | ii) Determine whether the line $5x - 2y + 7 = 0$ passes through the point of intersection in i) (show working) | 2 |
| C. | Find the equation of the circle with centre at the origin and touched the line $x - 3y + 9 = 0$ | 3 |
| D. | The midpoint of (a, 3) and (-4, b) is (1, 2). Find the values of a and b | 2 |

QUESTION 6 (15 marks)

- | | | |
|----|---|---|
| A. | i) Show by First Principles the derivative of the curve $y = 2x^2$ is $4x$ | 3 |
| | ii) Find the gradient of the tangent to the above curve at (-1, 2) | 1 |
| B. | i) Factorise $8a^3 - 1$ | 1 |
| | ii) Find $\lim_{x \rightarrow 2} \frac{x-2}{x^2-4}$ | 2 |
| | iii) Solve $4 - x^2 < 0$ | 3 |
| | iv) Sketch the following graphs | |
| | a) $y = x - 2$ | 5 |
| | b) $y = x - x^2$ | |
| | c) $y = 2^x$ | |
| | d) $y = \frac{1}{x-3}$ | |
| | e) $y = -\sqrt{36-x}$ | |