

RADLEY

Academic Scholarship Examination Paper

MATHEMATICS I

24th January 2024

Time allowed – 1 hour

There are 9 questions in total

The last part of each question is generally the most difficult part

No calculating aids may be used

Show all working.

Answer the questions in the spaces provided. If you run out of space please add your solutions on the end, numbering the pages.

Name	
School	

1. Find the value of

a. 17^2 *(1 mark)*

b. 1.7^2 *(1 mark)*

c. 0.17^2 *(1 mark)*

d. $17^2 \div 1.7^2$ *(1 mark)*

2. Give the answers to the following as fractions.

a. $2\frac{3}{5} \div \frac{7}{4}$

(3 marks)

b. $7\frac{1}{3} - 5\frac{2}{5}$

(3 marks)

3. Multiply out and simplify,

a. $(3x - 4y)(2y^2 - 3xy + x^2)$

(4 marks)

b. $(7a - 2b)^3$

(5 marks)

4. Please note the expansions

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

Given that x and y are both positive, $xy = 4$ and $x^2 + y^2 = 17$

a) What does $x + y$ equal?

(3 marks)

b) What is the value of $x^3 + y^3$?

(3 marks)

5. Factorise completely.

a. $4a^2b^3 - 6ab^4$ (3 marks)

b. $x^2 - 11x + 24$ (3 marks)

c. $27q^2 - 12p^4$ (3 marks)

d. $15pq + 2qr + 6q^2 + 5pr$ (3 marks)

e. $12x^2 - 17x + 6$ (4 marks)

By **first factorising** or otherwise,

6. Find the values of

a. $41^2 - 39^2$ *(2 marks)*

b. $101^2 - 99^2$ *(2 marks)*

c. $\frac{75}{25^2 - 50}$ *(3 marks)*

7. Solve each of these pairs of equations for x and y

a. $4y - 3x = 15$
 $2x + 3y = 17$

(4 marks)

b. $x^2 + 2y^2 = 11$
 $y - 3x = 8$

(6 marks)

c. $(x - y)^2 = (y - 3)(y + 3)$

$$\frac{6}{\sqrt{xy}} = 2$$

(6 marks)

8. Solve each of these equations for x

a. $4(x - 3) - 2(2x - 5) = 8 - 3(4 - 3x)$ *(3 marks)*

b. $x^2 + 12x = 64$ *(3 marks)*

c. $x^2 = 9x$ *(3 marks)*

d. $x + 3 = 2\sqrt{x + 3}$

(5 marks)

e. $(x - 7)^3 - 5(x - 7)^2 - 24(x - 7) = 0$

(5 marks)

9. Solve each of these equations for x

a.
$$\frac{7-4x}{3} + 4\frac{1}{8} = \frac{5x-2}{6}$$

(5 marks)

b.
$$\frac{4x-3}{x+3} - \frac{4-x}{x-1} = 3$$

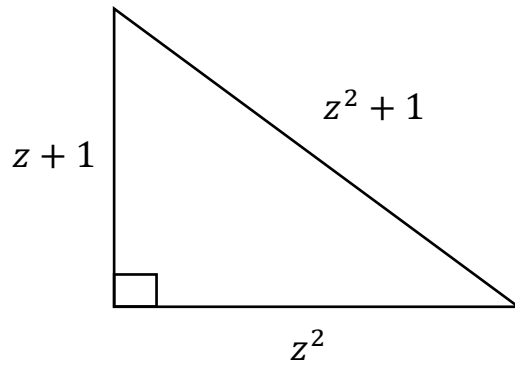
(5 marks)

c. Find the largest possible value of x^{z-y} given that

(7 marks)

$$y^2 - 16 = 0$$

$$x + \frac{6}{x} = 5$$



Total 100 marks