



RADLEY

Academic Scholarship Examination Paper

MATHEMATICS I

24th January 2023

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. 23^2 *(1 mark)*

b. 2.3^2 *(1 mark)*

c. 0.023^2 *(1 mark)*

d. $23^2 \div 0.23$ *(2 mark)*

2. Give the answers to the following as fractions in their simplest form

a. $6\frac{2}{5} \div \frac{8}{7}$

(3 marks)

b. $4\frac{1}{5} - 2\frac{1}{3}$

(3 marks)

3. A 13 year old takes x seconds to run the 100m. A formula has been created to predict how quickly they can run the 100m aged 18 (time in y seconds)

$$y = \frac{4x + 2}{5}$$

Using the formula provided,

a) If Jacob runs 100m in 17 seconds aged 13, how long will it take him as an 18 year old?

(2 mark)

b) If Sunil ran 100m in 12.8 seconds as an 18 year old. How long does it suggest he took when he was 13 years old?

(2 marks)

c) Comment on the suitability of this formula.

(2 marks)

4. Multiply out and simplify,

a. $(2x - 5y)(3x^2 - 2xy + 6y^2)$

(4 marks)

b. $(3a - 4b)^3$

(5 marks)

5. Factorise completely.

a. $6a^3b^4 - 14a^4b^6$ (3 marks)

b. $2x^2 + 2xz + 3yz + 3xy$ (3 marks)

c. $5q^4 - 125p^6$ (3 marks)

d. $x^2 + 9x + 14$ (2 marks)

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

By first factorising or otherwise,

6. Find the values of

a. $24^2 - 16^2$ *(2 marks)*

b. $\frac{16^2 + 48}{32}$ *(3 marks)*

c. $\frac{16^4 - 5 \times 16^3 + 32^2}{64^2}$ *(6 marks)*

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

a. $3x - 4y = 11$
 $2x + 6y = 3$

(3 marks)

b.

I have 70 British coins. Some are 2 pence pieces and the rest are 5 pence pieces.
The total amount I have is £2.69.

By forming your own simultaneous equations, find how many 2 pence pieces I have.

(5 marks)

c. $(x - y)^2 = \frac{16}{9}$

$6x + 5y + 3 = 0$

(6 marks)

8. Solve each of these equations for x

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

(3 marks)

b. $x^2 - 11x - 60 = 0$

(3 marks)

c. $24x^2 + 39x - 18 = 0$

(3 marks)

d. $x^3 = 3x^2 + 10x$

(4 marks)

e. $x^2 - 5 - \frac{8}{x^2 - 5} = 2$

(6 marks)

9. Solve each of these equations for x

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

(5 marks)

b. $\frac{3x-2}{2x-1} - \frac{7-x}{5x-13} = 1$

(5 marks)

c. $\frac{x+1}{x-2y} - \frac{x+1}{x+2y} = \frac{12y}{4y^2-x^2}$

(5 marks)

Total 100 marks