East Doncaster

STUDENT CODE:

STUDENT NAME: *Marking Scheme*

TEACHER NAME:

10 PRE-METHODS

2023 Semester 1 Examination

Reading time: 10 minutes
Writing time: 90 minutes

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	10	10	10
B	12	12	45
C	3	3	15
		Total	70

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference and one scientific calculator
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied
- Question and answer book
- Additional space is available at the end of the book if you need extra paper to complete an answer.

Instructions
- Write your student number in the space provided above on this page.
- Answer all questions in the spaces provided.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A

> ## Instructions for Section A
>
> Answer all questions in the boxes on the bottom of the next page.
> Marks will not be deducted for incorrect answers

Multiple Choice Questions

Question 1.

The solution to the linear equation $\dfrac{3}{2x}+6=4$ is:

A. $x=-0.75$

B. $x=\dfrac{3}{20}$

C. $x=-\dfrac{5}{12}$

D. $x=\dfrac{9}{8}$

E. $x=\dfrac{3}{10}$

Question 2.
The solution $x>-4$ satisfies which inequality?

A. $3x-2>10$

B. $\dfrac{8}{x}+5=3$

C. $5-x<9$

D. $-2x+1>9$

E. $\dfrac{x}{2}+5<7$

Question 3.
The simplest form of the following expression is:

$$\frac{3\sqrt{20}\times\left(\sqrt{8}\right)^{2}}{4\sqrt{120}}$$

A. $6\sqrt{6}$

B. $\dfrac{6}{\sqrt{6}}$

C. $\dfrac{\sqrt{6}}{6}$

D. $\dfrac{1}{\sqrt{6}}$

E. $\sqrt{6}$

Question 4.
Identify the set which contains like surds:

A. $\sqrt{12},\sqrt{24},\sqrt{48}$

B. $\sqrt{12},\sqrt{18},\sqrt{24}$

C. $\sqrt{12},\sqrt{48},\sqrt{60}$

D. $\sqrt{12},\sqrt{27},\sqrt{48}$

E. $\sqrt{12},\sqrt{27},\sqrt{36}$

Question 5.

The rational form of $\dfrac{1}{\sqrt{2}-\sqrt{3}}$

A. $\sqrt{2}+\sqrt{3}$

B. $\sqrt{3}-\sqrt{2}$

C. $\sqrt{2}-\sqrt{3}$

D. $-\sqrt{2}-\sqrt{3}$

E. $-\sqrt{3}+2$

$$\frac{1}{\sqrt{2}-\sqrt{3}} \times \frac{\sqrt{2}+\sqrt{3}}{\sqrt{2}+\sqrt{3}}$$

$$= \frac{\sqrt{2}+\sqrt{3}}{-1}$$

$$= -\sqrt{2}-\sqrt{3}$$

Question 6.

The solutions to the equation $x^2 - 16x = 0$ are:

A. $x = 0$ and $x = 4$

B. $x = 0$ and $x = -4$

C. $x = 4$ and $x = -4$

D. $x = 0$ and $x = 16$

E. $x = 16$ and $x = -16$

Question 7.

Which of the following is equivalent to $6x^2 - 24x - 6$

A. $6(x-2)^2 - 5$

B. $6(x-2)^2 - 3$

C. $6(x-2)^2 - 36$

D. $6(x-2)^2 - 30$

E. $6(x-2)^2 - 5$

Question 8.

The value of the discriminant of the equation $3x^2 - 6x + 5 = 0$ is:

A. 0

B. -96

C. 60

D. -24

E. 36

$$\triangle = 36 - (4 \times 5 \times 3)$$
$$= 36 - 60$$
$$= -24$$

Question 9.

To transform the equation $y = x^2$ into $y = (x-1)^2 - 7$ you must translate:

A. Right 1 and up 7

B. Left 1 and up 7

C. Right 1 and down 7

D. Left 1 and down 7

E. Right 7 and left 1

Question 10.

The turning point of graph with the equation $y = -2\left(x+\dfrac{1}{2}\right)^2 - 5$ is

A. $\left(\dfrac{1}{2},5\right)$

B. $(1,5)$

C. $\left(-\dfrac{1}{2},5\right)$

D. $\left(-\dfrac{1}{2},-5\right)$

E. $(1,-5\_$

END OF SECTION A

Response:

Question	1	2	3	4	5	6	7	8	9	10
Response	A	D	E	D	D	D	D	D	C	D

3

SECTION B

Instructions for Section B

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working must be shown.

Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Short Answer Questions

Question 1. (5 marks)

Solve each equation, leaving your answer as a fraction where appropriate

    a) $5 - 2(7 - 3x) = 3$ 2 marks

$$\therefore -2(7 - 3x) = -2$$

$$7 - 3x = 1 \qquad \text{(1M)}$$

$$-3x = -6$$

$$x = 2 \qquad \text{(1A)}$$

    b) $\dfrac{1-2x}{5} = \dfrac{3-2x}{7}$ 3 marks

$$7 - 14x = 15 - 10x \qquad \text{(1M)}$$

$$-4x = 8 \qquad \text{(1M)}$$

$$x = -2 \qquad \text{(1A)}$$

Question 2. (4 marks)

Consider the following inequality.

$$\frac{3 - 2x}{4} \le 5$$

a) Find its solution   (3 marks)   **b)** Represent the solution on a number line

(1 mark)

$$\therefore 3 - 2x \le 20 \quad \text{(1M)}$$

$$-2x \le 17 \quad \text{(1M)}$$

$$x \ge \frac{-17}{2} \quad \text{(1A)}$$

$-\frac{17}{2}$
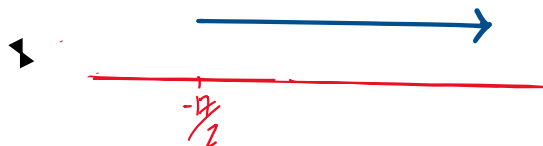
Question 3. (8 marks)

$$3x - y = 1$$
$$x + 2y = 12$$

a) Solve the following pair of simultaneous equations above

SUBSTITUTION

If $y = 3x - 1$

$\therefore x + 6x - 2 = 12$

$\therefore 7x = 14$

$\therefore x = 2$ (1M)

$\therefore y = 3(2) - 1$

$y = 5$ (1M)

P.O.I = (2,5) (1A)

ELIMINATION   3 marks

$3x - y = 1$ ①
$x + 2y = 12$ ②

① × 2
$6x - 2y = 2$ ③
$\therefore x + 2y = 12$

$\therefore$ ③ + ②

$\therefore 7x = 14$

$x = 2$ (1M)

$\therefore 3(2) - y = 1$

$\therefore y = 5$ (1M)

P.O.I = (2,5) (1A)

5

b) Sketch both equations on the axes below showing all intercepts and the point of intersection

5 marks

Annotations (in red):
- 1m POI LABELLED
- 1M X-INTS LABELLED
- 1m Y-INTS LABELLED
- 2 Correct lines drawn

Graph labels (in blue):
- $(0,6)$
- $(2,5)$
- $(\frac{1}{3},0)$
- $(12,0)$
- $(0,-1)$
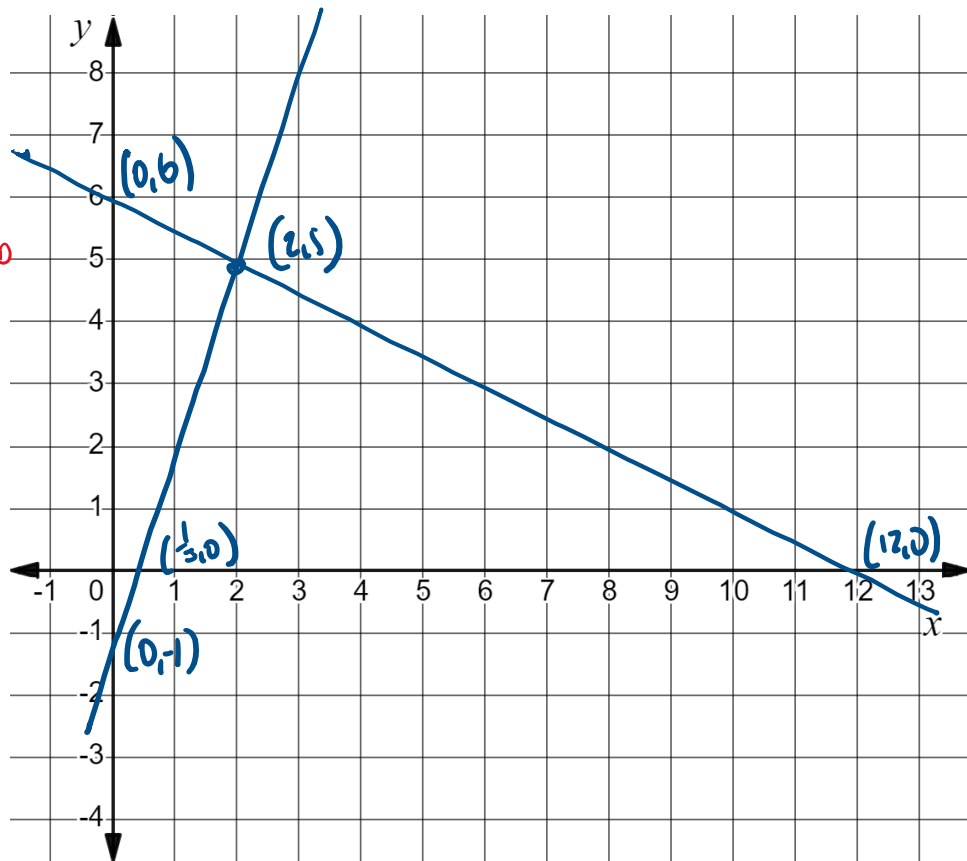
Question 4. (6 marks)

Find the rule for each line with the given information. Write your answer in the form $ax + by + c = 0$

a) The line which passes through the points (-8,1) and (10,10)   3 marks

$m = \frac{1}{2}$ (1M)

$y - 10 = \frac{1}{2}(x - 10)$

$\therefore y = \frac{1}{2}x - 5 + 10$

$\therefore y = \frac{1}{2}x + 5$ (1M)

Accept $-\frac{1}{2}x + y - 5 = 0$ or $-x + 2y - 10 = 0$

on variations

b) The line which is perpendicular to the graph $2x - 4y - 1 = 0$ and passes through the point (-1,-1)   3 marks

$-4y = -2x + 1$
$y = \frac{1}{2}x - \frac{1}{4}$

$\pm$ $m = -2$

(1M)

$\therefore y + 1 = -2(x + 1)$

$y + 1 = -2x - 2$

$y = -2x - 3$ (1M)

Accept any variation of

$2x + y + 3 = 0$

Question 5. (4 marks)

Simplify the following expressions

a) $\frac{\sqrt{12}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ 1 mark

$\frac{6}{3}$

$= 2$

c) $(3\sqrt{2} - 2\sqrt{3})(2\sqrt{3} - 3\sqrt{2})$ 3 marks

$6\sqrt{6} - 18 - 12 + 6\sqrt{6}$

$= 12\sqrt{6} + 30$

(2M) - CORRECT F.O.I.L EXPANSION

(1A) - ANSWER IS EXPRESSED

Question 6. (3 marks)

Simplify   3 marks

$$\frac{4\sqrt{6} \times 2\sqrt{8}}{3\sqrt{12} \times 5\sqrt{15}}$$

$$= \frac{4\sqrt{6} \times 4\sqrt{2}}{6\sqrt{3} \times 5\sqrt{15}} \quad \text{(1M)}$$

$$\frac{32\sqrt{3}}{90\sqrt{5}}$$

$$\therefore \frac{16\sqrt{3}}{45\sqrt{5}} \quad \text{(1M)}$$

$$\therefore \frac{16\sqrt{3}}{45\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{16\sqrt{15}}{225} \quad \text{(1A)}$$

Question 7. (2 marks)

Expand the following

a) $(3x - 5)(x + 1)$ (1 mark)   **b)** $(7 - 4y)^2$ (1 mark)

$3x^2 - 5x + 3x - 5$ $49 - 56y + 16y^2$

$\therefore 3x^2 - 2x - 5$

Question 8. (2 marks)

Factorise the following

a) $16m^2 - 25n^2$ 1 mark

$(4m + 5n)(4m - 5n)$

b) $(x + 3)^2 - 100$ 1 mark

E

$$\left(x+3\right)^2 \pm \left(\sqrt{100}\right)^2$$

$$\therefore \left(x+3+10\right)\left(x+3-10\right)$$

$$\therefore \left(x+13\right)\left(x-7\right)$$

Question 9. (3 marks)

Simplify the following expression   3 marks

$$\frac{x^2 + x - 2}{x^2 - 4} \times \frac{x^2 - 4x + 4}{x^2 - 5x + 4}$$

$$\therefore \frac{(x+2)(x-1)}{(x-2)(x+2)} \times \frac{(x-2)(x-2)}{(x-4)(x-1)}$$

$$= \frac{(x-2)}{(x-4)}$$

$\left(2\textsf{m}\right)$ - CORRECT FACTORISING

$\left(1A\right)$

Question 10. (2 marks)

Solve the following equation using the quadratic formula, giving your answer in exact form   2 marks

$$x^2 + 4x - 3 = 0$$

$x = \dfrac{-4 \pm \sqrt{16+12}}{2}$

$\therefore x = \dfrac{-4 \pm \sqrt{28}}{2}$ (1m)

$\therefore x = \dfrac{-4 \pm 2\sqrt{7}}{2}$

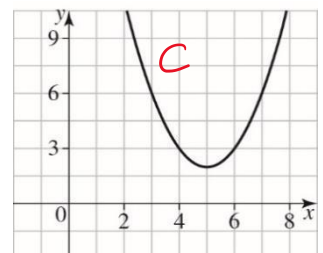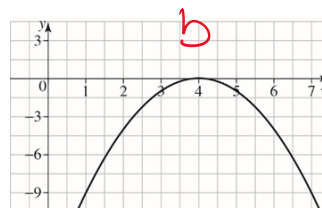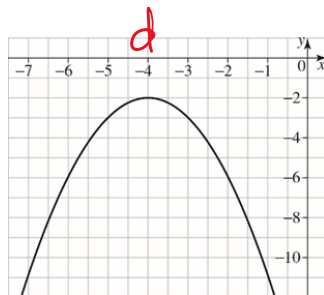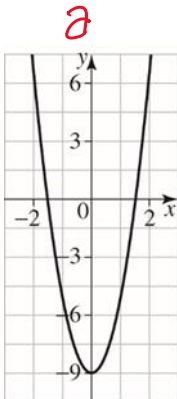$\therefore x = -2 \pm \sqrt{7}$ (1A)

Question 11. (2 marks)

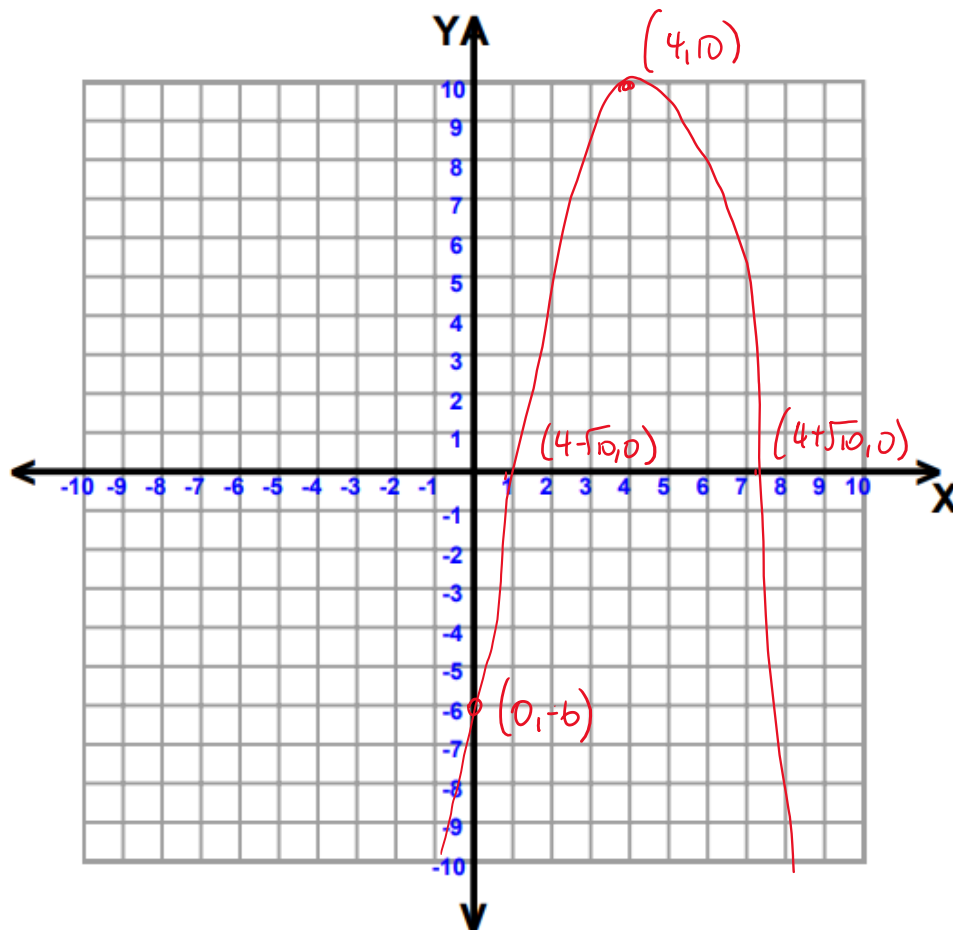Match each of the equations to one of the graphs below   2 marks

a) $y = 4x^2 - 9$ **b)** $y = -x^2 + 8x - 16$ **c)** $y = x^2 - 10x + 27$ **d)** $y = -x^2 - 8x - 18$

Question 12. (4 marks)

Sketch the graph of $y = -x^2 + 8x - 6$ showing all intercepts and turning points

4 marks

END OF SECTION B

1A - TP LABELLED

1A - SMOOTH CURVE

1A - Y-INT LABELLED

1A - X-INT LABELLED

SECTION C

Instructions for Section C

Answer **all** questions in the spaces provided.

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Extended Response

Question 1.   (7 marks)

The price of shares in a company named Eduspire rose and then fell during one day of trade. Trade began at 10 am and closed at 4 pm. It was noted that the company's share price following the curve $P = -0.1(t-5)^2 + 3$ where P was the price of shares t hours after 10 am

a. What was the initial share price (price at 10 am)?

1 mark

$P = -0.1(5)^2 + 3$

$P = .5$ $P = 50 \text{ CENTS}$

b. What was the highest share price?

1 mark

$3.00

c. At what time was the share price at its highest?

1 mark

3pm

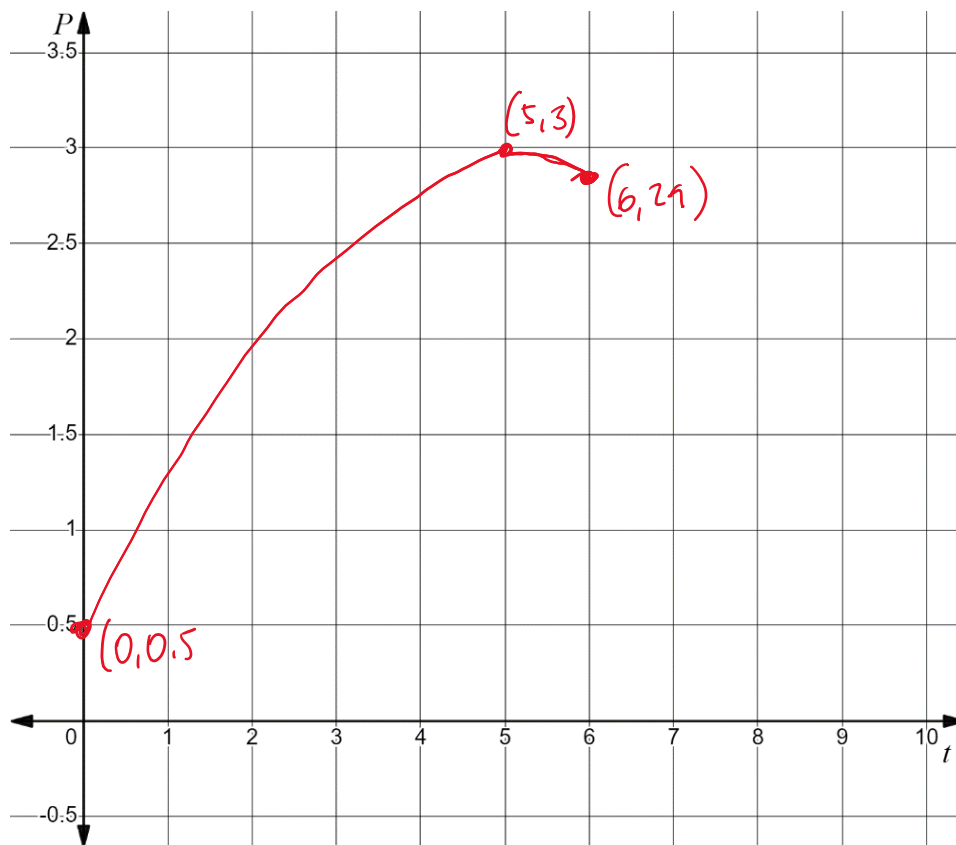**d.** What was the closing share price at 4 pm?

1 mark

$2.90

e. Sketch the graph of $P = -0.1(t-5)^2 + 3$ over $0 \le t \le 6$ on the axes below labelling all intercepts and the turning point with their coordinates

3 marks

Question 2. (4 marks)

The ages of three sisters are x years, x^2 years and $4x - 2$ years. The total sum of their ages is 34 years. What is the age of the oldest sister?

4 marks

$$x^2 + x + 4x - 2 = 34 \quad \text{(1M)}$$

$$\therefore x^2 + 5x - 36 = 0 \quad \text{(1M)}$$

$$\therefore (x+9)(x-4) = 0$$

$$\therefore x = 4 \quad \text{as} \quad x > 0 \quad \text{(1M)}$$

Sister 1 is 4

Sister 2 is 16

Sister 3 is 14.   (1A)

Let $x = 1^{ST}$ Sister

$x^2 = 2^{ND}$ Sister

$4x - 2 = 3^{RD}$ Sister

Question 3.   (6 marks)

For a hot food stall, Sophie buys and then sells sausage rolls and meat pies. The sausage rolls cost 65 cents each and the meat pies cost 26 cents each. Sophie sells the sausage rolls for $1.20 each and the meat pies for 50 cents each.

Sophie has a budget of $60 per day. Let *s* be the number of sausage rolls and *m* be the number of meat pies Sophie buys.

a.   Write an inequality that describes how Sophie can spend her budget each day.

1 mark

$$0.65s + 0.26m \leq 60$$

b.   If Sophie buys 50 sausage rolls, how many meat pies can she buy?

1 mark

$$0.65(50) + 0.26m \leq 60 \qquad m \leq 105 \ pies$$

$$\therefore m \leq \frac{60 - (0.65 \times 50)}{0.26}$$

Assume that Sophie can sell all the sausage rolls and meat pies on a particular day. Let P be the profit Sophie will make that day.

c.   Show that the profit Sophie can make each day can be written as $P = 0.55s + 0.24m$

1 mark

$$PROFIT = SALES - COST$$

$$= 1.20s + 0.5m - (0.65s + 0.26m)$$

$$= 0.55s + 0.24m$$

d.   State the maximum number of meat pies Sophie could have bought and sold on the day she made a $50 profit.

ASSUME 0 SAUSAGE ROLLS

1 mark

$$50 = 0.55(0) + 0.24m$$

$$\therefore 50 = 0.24m$$

$$\therefore m = \frac{50}{0.24}$$

$$m = 208 \ pies$$

END OF QUESTION AND ANSWER BOOKLET