

Section 2 – Advanced (40 marks)

Attempt questions 1 – 9

Allow approximately 50 minutes for this section

Multiple Choice Questions (6 marks) – Circle the correct option on the answer paper.

1. Write the following in surd form: $\left(x^{\frac{1}{2}}\right)^{\frac{1}{2}}$

A. x

B. $\sqrt[4]{x}$

C. x^2

D. $\sqrt[2]{x}$

2. Write the following in fractional index form: $\sqrt[3]{16}$

A. $2^{\frac{2}{3}}$

B. $2^{\frac{3}{2}}$

C. $2^{\frac{4}{3}}$

D. $2^{\frac{3}{4}}$

3. Solve the following quadratic equation: $72 - 2y^2 = 0$

A. $y = 6$

B. $y = 8.49$

C. $y = \pm 6$

D. There is no answer

4. Solve the following inequality: $7x - 5 < 2$

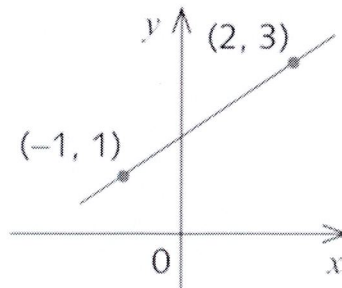
A. $x > 1$

B. $x \geq 0$

C. $x \leq 0$

D. $x < 1$

5. The equation of the line below is:



A. $3y - 2x = 5$

B. $y = \frac{3}{2}x + \frac{5}{3}$

C. $2y - 3x = 5$

D. $y = 3x + 5$

6. Which of the following is true for the linear equation:

$$x - 13y = 4$$

- A. The x -intercept is -4 and the y -intercept is 1
- B. The x -intercept is 4 and the y -intercept is $-\frac{4}{13}$
- C. The x -intercept is 4 and the y -intercept is $\frac{13}{4}$
- D. The x -intercept is 1 and the y -intercept is -13

Short Answer Questions (34 marks)

Answer the questions in the spaces provided. Your responses should include relevant mathematical reasoning and/or calculations.

Marks **CANNOT** be awarded for poorly organised written work.

Question 7 – Indices and Surds (11 marks)

a) Simplify:

i. $a^{\frac{2}{3}} \times a^{\frac{3}{7}}$ (1)

$$a^{\frac{14}{21}} \times a^{\frac{9}{21}} = a^{\frac{23}{21}}$$

ii. $\sqrt{8} + 4\sqrt{2} + 2\sqrt{18}$ (you must show full working out) (2)

$$\sqrt{2^2 \times 2} + 4\sqrt{2} + 2\sqrt{3^2 \times 2}$$

$$2\sqrt{2} + 4\sqrt{2} + 6\sqrt{2}$$

$$12\sqrt{2}$$

progress to same base surd (1)

answer (2)

iii. $7\sqrt{10} \times 3\sqrt{2}$ (2)

$$21\sqrt{20}$$

$$21\sqrt{2^2 \times 5}$$

$$42\sqrt{5}$$

multiply factors (1)

simplify to answer (2)

b) Expand and simplify the follow expression: (2)

$$(5\sqrt{2} - 3\sqrt{3})(2\sqrt{2} + 2\sqrt{3})$$

$$(5\sqrt{2} \times 2\sqrt{2}) + (5\sqrt{2} \times 2\sqrt{3}) - (3\sqrt{3} \times 2\sqrt{2}) - (3\sqrt{3} \times 2\sqrt{3})$$

$$10\sqrt{4} + 10\sqrt{6} - 6\sqrt{6} - 6\sqrt{9}$$

$$20 + 4\sqrt{6} - 18$$

$$2 + 4\sqrt{6}$$

4 terms (1)

simplified answer (2)

c) Simplify and evaluate the following term (you must show all your working) (2)

$$\sqrt[5]{32^4}$$

$$\sqrt[5]{(2^5)^4}$$

reduce 32 to 2^5 (1)

$$\sqrt[5]{2^{20}}$$

$$2^4$$

$$16$$

simplify to
evaluate answer (2)

d) Solve for x (2)

$$16^{3x} = \frac{1}{8}$$

$$16^{3x} = 2^{-3}$$

work towards

$$(2^4)^{3x} = 2^{-3}$$

base 2. (1)

$$2^{12x} = 2^{-3}$$

$$12x = -3$$

$$x = -\frac{1}{4}$$

answer (2)

Question 8 – Equations and Inequalities (10 marks)

a) Solve the following equations simultaneously:

(2)

$$2a - 3b = -13$$

①

$$11a + 4b = 31$$

②

① $\times 4$

$$8a - 12b = -52$$

③

② $\times 3$

$$33a + 12b = 93$$

④

③ $+$ ④

$$41a = 41$$

$$a = 1$$

sub a into ①

$$2 - 3b = -13$$

$$3b = 15$$

$$b = 5$$

$$\therefore a = 1, b = 5$$

answer for both (2)

correctly modify
and attempted
elimination (1)

b) Rearrange the following formula to make b the subject

(2)

$$I = \left(\frac{bh}{4}\right)^{\frac{1}{2}}$$

$$I^2 = \frac{bh}{4}$$

$$4I^2 = bh$$

$$b = \frac{4I^2}{h}$$

correctly square
both sides (1)

correct answer (2)

c) Solve the following inequality:

(2)

$$-\frac{4x+7}{3} \leq 7$$

$$4x+7 \geq -21$$

$$4x \geq -28$$

$$x \geq -7$$

correctly modify
inequality for -1 product
(1)

answer (2)

d) Simplify the following expression:

(2)

$$\frac{4ab^3}{12ab} \div \frac{6a^4b^2}{16a^3b}$$

$$\frac{4ab^3}{12ab} \times \frac{16a^3b}{6a^4b^2}$$

$$\frac{4 \times 16 \times b}{3 \times 6 \times a}$$

$$\frac{8b}{9a}$$

correctly simplify/factorise
coefficients or pronumerals
(1)

simplified answer (2)

e) Solve the following equation for x

(2)

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

$$\frac{12x+8}{12} - \frac{9x-12}{12} = 6$$

$$12x+8 - (9x-12) = 72$$

$$3x+20 = 72$$

$$3x = 52$$

$$x = \frac{52}{3}$$

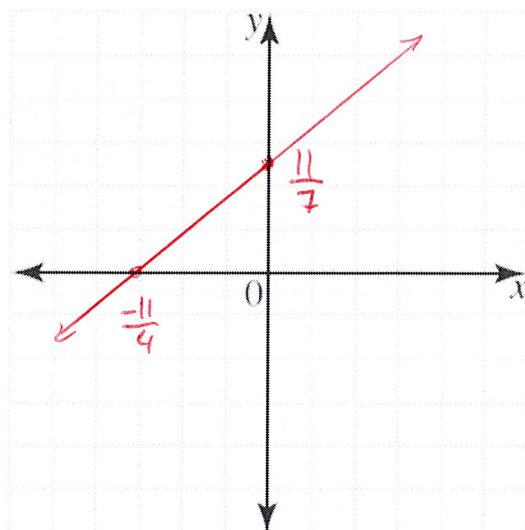
correctly group like
terms (1)

correct answer (2)

Question 9 – Linear Relationships (13 marks)

- a) Find the x-intercept and y-intercept of the following equation and label them on your sketch of the line (3)

$$4x - 7y + 11 = 0$$



correct line
with labels (3)

x int (where $y=0$)

$$4x + 11 = 0$$

$$x = -\frac{11}{4}$$

correct x-int (1)

y int (where $x=0$)

$$-7y + 11 = 0 \rightarrow y = \frac{11}{7}$$

correct y-int (1)

- b) Find the midpoint of the interval AB with endpoints $A(17, -18)$ and $B(-14, 7)$. (2)

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$M\left(\frac{17 + (-14)}{2}, \frac{-18 + 7}{2}\right)$$

consistent A point or
B point first in formula (1)

$$M\left(3\frac{1}{2}, -\frac{11}{2}\right)$$

answer (2)

- c) Find the equation of the line that is perpendicular to the line $3y - 4x = 5$ and passes through the point $(1, 5)$ (3)

$$m_1 \times m_2 = -1$$

$$m_2 = \frac{-1}{m_1}$$

$$3y = 4x + 5$$

find gradient of given eq. (1)

$$y = \frac{4}{3}x + \frac{5}{3} \therefore m_1 = \frac{4}{3}$$

$$m_2 = \frac{-1}{\frac{4}{3}} = \frac{-3}{4}$$

find perpendicular gradient (1)

$$y = \frac{-3}{4}x + C$$

sub $(1, 5)$

$$5 = \frac{-3}{4}(1) + C$$

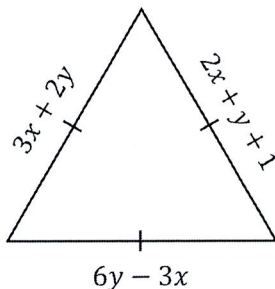
$$C = 5.75$$

answer

(3)

$$y = \frac{-3}{4}x + \frac{23}{4}$$

- d) The diagram shows an equilateral triangle. Find the value of x and y . (3)



$$3x + 2y = 6y - 3x \Rightarrow 6x - 4y = 0 \quad (1)$$

correctly form two eq. (1)

$$2x + y + 1 = 6y - 3x \Rightarrow 5x - 5y = -1 \quad (2)$$

$$(1) \quad 6x = 4y \therefore y = \frac{3}{2}x \quad (3)$$

sub (3) into (2) $5x - 5\left(\frac{3}{2}x\right) = -1$

$$10x - 15x = -2$$

$$5x = 2$$

$$x = \frac{2}{5}$$

use eq to find an answer (1)

sub x into (3)

$$y = \left(\frac{3}{2}\right)\left(\frac{2}{5}\right)$$

$$x = \frac{2}{5} \quad y = \frac{3}{5}$$

correct answer (3)

- e) Consider the points $A(-7, -11)$, $B(-4, -6)$, $C(-1, 1)$ and $D(2, 7)$. Only three of these points lie on the same line. Determine which three points lie on the same line. (2)

$$m_{AB} = \frac{-6 - (-11)}{-4 - (-7)} = \frac{5}{3}$$

$$m_{BC} = \frac{1 - (-6)}{-1 - (-4)} = \frac{7}{3}$$

$$m_{CD} = \frac{7 - 1}{2 - (-1)} = 2$$

$$m_{DA} = \frac{-11 - 7}{-7 - 2} = 2$$

Since $m_{CD} = m_{DA}$, CDA must lie on same line.

B is off the line.

correct answer (2)

viable method
for finding answer
(either accurate plot or
gradient method.) (1)

END OF EXAM

