Name: _____

Mathematics Bridging Assignment

Scores:-

Number: /25

Graphs of Functions: /12

Algebra: 33

Total: /70

A) NUMBER.

Laws of Indices

1. Evaluate:

i) 3^{-2} $= \frac{1}{3^2} = \frac{1}{9}$

$\frac{1}{9}$ .....(1)

ii) $36^{1/2}$ $= \sqrt{36} = 6$

6 .....(1)

iii) $27^{2/3}$ $= \left(\sqrt[3]{27}\right)^2 = 3^2 = 9$

9 .....(1)

iv) $\left(\frac{16}{81}\right)^{-3/4}$ $= \left(\frac{81}{16}\right)^{3/4} = \left(\sqrt[4]{\frac{81}{16}}\right)^3 = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$

(1 mark) (1 mark)

$\frac{27}{8}$ .....(2)

(Total 5 marks)

2. $n^{-\frac{2}{3}} = \frac{1}{25}$

Find the value of n.

$n^{-2/3} = 5^{-2}$ (1 mark)

$n^{2/3} = 5^2$

$n = 125$ (1 mark)

n=125 .....

(Total 2 marks)

b) i) Rationalise the denominators of $\frac{21}{\sqrt{7}}$ and simplify your answer.

$\frac{21}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{21\sqrt{7}}{7} = 3\sqrt{7}$ (1 mark)

(1 mark)

$3\sqrt{7}$

.....(2)

ii) Rationalise the denominators of $\frac{1}{2+\sqrt{3}}$ and simplify your answer.

$\frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = \frac{2-\sqrt{3}}{4-3} = \frac{2-\sqrt{3}}{1} = 2-\sqrt{3}$ (1 mark)

(1 mark)

$2-\sqrt{3}$

.....(2)

(Total 6 marks)

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

Express your answer as simply as possible.

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

$= 5 - 2\sqrt{15} + 2\sqrt{15} - 12 =$ (1 mark)

$= -7$ (1 mark)

.....(2)

(Total 2 marks)

7. a) Given that $\sqrt{40} = k\sqrt{10}$, find the value of k.

$\sqrt{40} = 2\sqrt{10}$

$2\sqrt{10} = k\sqrt{10} \quad / \div \sqrt{10}$

$k = 2$

$k =$ 2 .....(1)

Standard Form

3. Work out $(4 \times 10^3) \div (8 \times 10^5)$

Give your answer in standard form:

$\frac{4 \times 10^3}{8 \times 10^5} = (4 \div 8) \times (10^3 \div 10^5)$

$= 0.5 \times 10^{-2}$ (1 mark) 5×10^{-3}

(Total 2 marks)

$= 5 \times 10^{-1} \times 10^{-2} = 5 \times 10^{-3}$ (1 mark)

4. a) Write 5 720 000 in standard form.

5.72×10^6 .....(1)

p = 5 720 000 $\quad q = 4.5 \times 10^5 = 450\,000$

b) Find the value of $\frac{p-q}{(p+q)^2}$

Give your answer in standard form to 2 significant figures.

$p - q = 5\,270\,000 = 5.27 \times 10^6$

$p + q = 6\,170\,000 = 6.17 \times 10^6$ } (1 mark)

$\frac{5.27 \times 10^6}{(6.17 \times 10^6)^2} = 1.4 \times 10^{-7}$ .....(2)

(1 mark) **(Total 3 marks)**

SURDS

5. Simplify.

a) $\sqrt{18} + \sqrt{50}$

$= 3\sqrt{2} + 5\sqrt{2}$ (1 mark)

$= 8\sqrt{2}$ (1 mark)

$8\sqrt{2}$ .....(2)

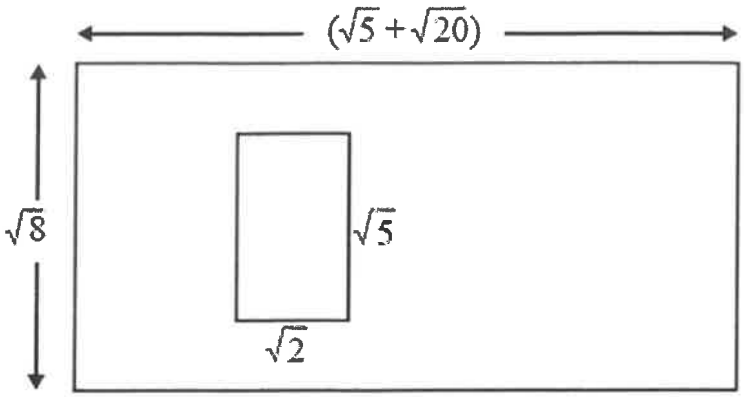


Diagram NOT accurately drawn

A large rectangle piece of card is $(\sqrt{5}+\sqrt{20})$ cm long and $\sqrt{8}$ cm wide.
A small rectangle $\sqrt{5}$ cm long and $\sqrt{2}$ cm wide is cut out of the piece of card.

b) Express the area of the card that is left as a percentage of the area of the large rectangle.

Area large $= \sqrt{8}(\sqrt{5}+\sqrt{20}) = \sqrt{40}+\sqrt{160} = 2\sqrt{10}+4\sqrt{10} =$
$= 6\sqrt{10}\ cm^2$ (1 mark)

Area small $= \sqrt{2}\times\sqrt{5} = \sqrt{10}\ cm^2$ (1 mark)

Area card left $= 6\sqrt{10}-\sqrt{10} = 5\sqrt{10}\ cm^2$ (1 mark)

Percentage $= \frac{5\sqrt{10}}{6\sqrt{10}} \times 100 = 83\%$ (1 mark)

83 .....% (4)

(Total 5 marks)

B) GRAPHS OF FUNCTIONS

8. A straight line L, has equation $3y = 5x - 6$ | $\div 3$

Find

i) The gradient of L, $y = \frac{5}{3}x - 2$

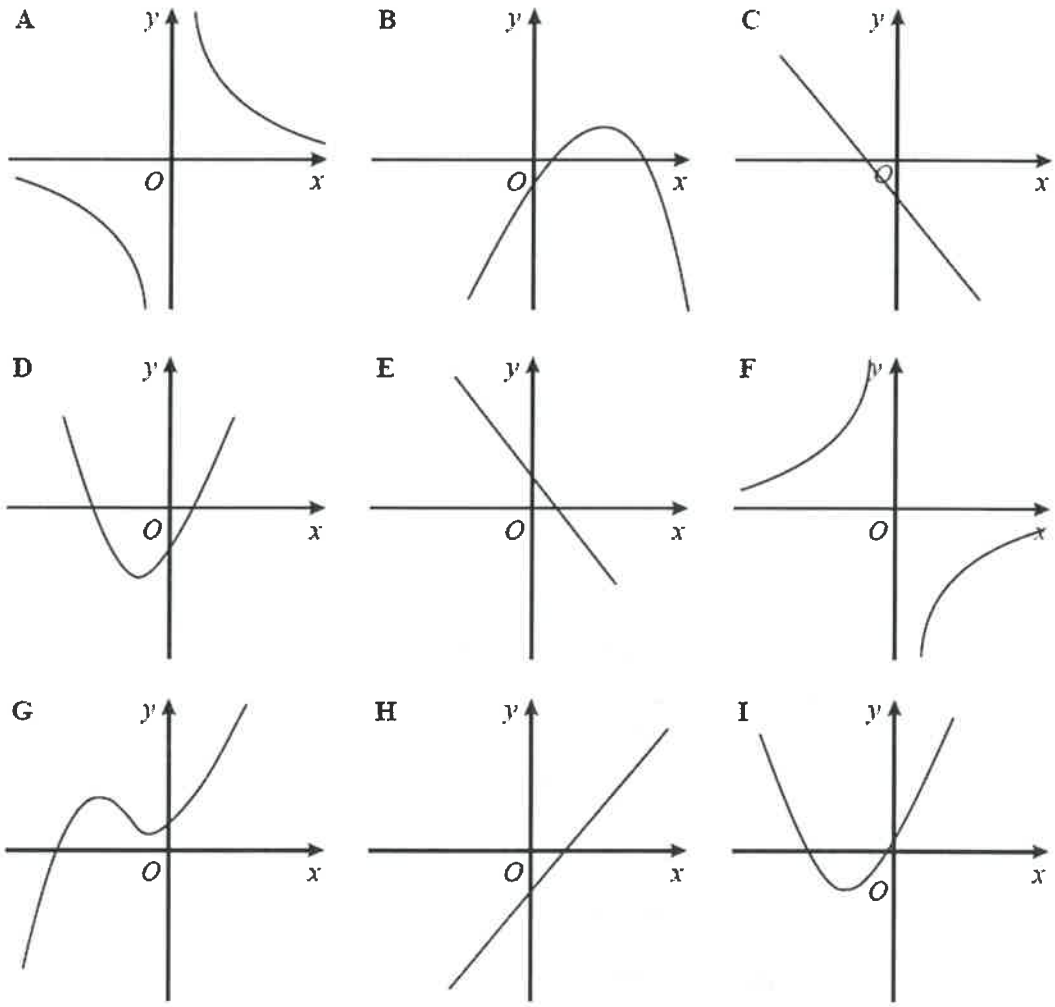
$\frac{5}{3}$ .....(1)

ii) The y- co-ordinate of the point where L cuts the y-axis.

$(0, -2)$.....(1)

(Total 2 marks)

9.



Write down the letter of the graph which could have the equation

i) $y=3x-2$

H

.....(1)

ii) $y = 2x^2 + 5x - 3$

D

.....(1)

iii) $y = \frac{3}{x}$

A

.....(1)

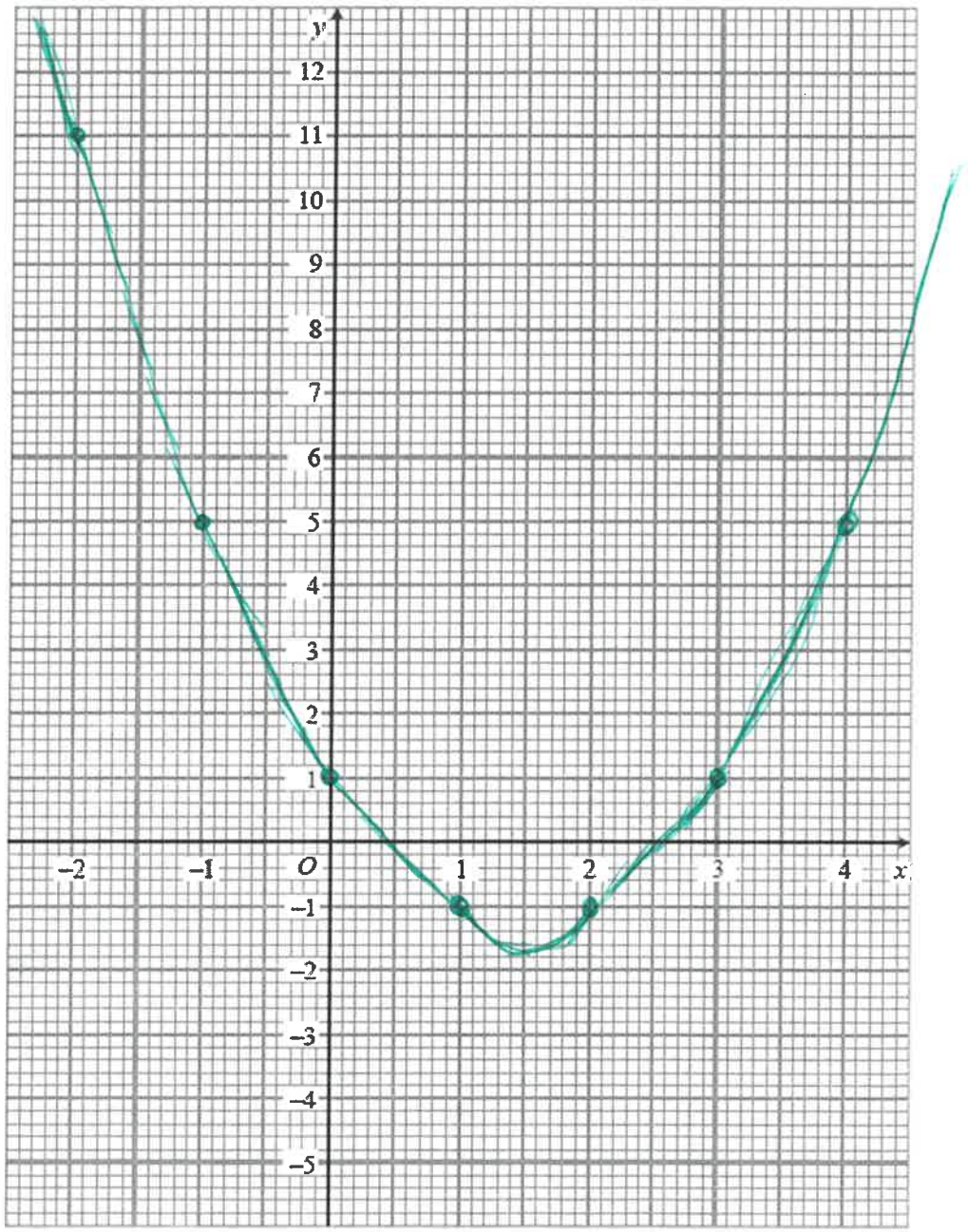
(Total 3 marks)

10. a) Complete the table for $y = x^2 - 3x + 1$

x	–2	–1	0	1	2	3	4
y	11	5	1	–1	–1	1	5

b) On the grid Draw the graph of $y = x^2 - 3x + 1$

(2)

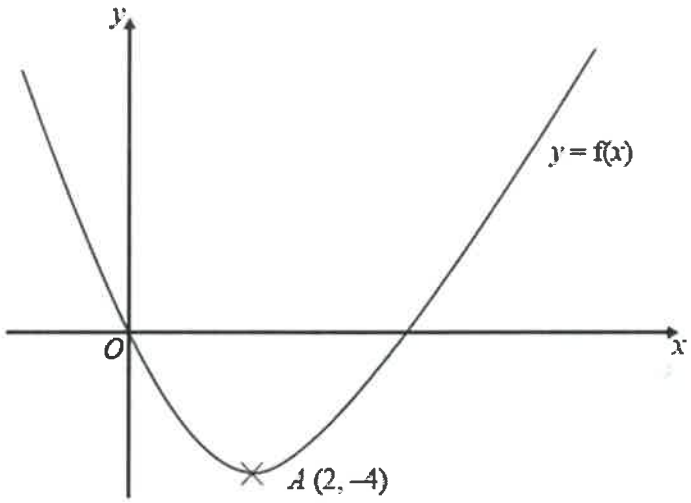


c) Use your graph to find on estimate for the minimum value of y.

y=.....–1.8.....(1)

(Total 3 marks)

11. This is the sketch of the curve with the equation $y = f(x)$
It passes through the origin O.



The only vertex of the curve is A(2, - 4)
Write down the coordinates of the vertex of the curve with equation.

i) $y=f(x-1)$ move right 1 unit (3, -4)

ii) $y=f(x)-5$ move down 5 units (2, -9)

iii) $y=-f(x)$ reflection in x-axis (2, 4)

iv) $y=f(2x)$ horizontal stretch by scale factor $\frac{1}{2}$ (1, -4)

(4)
(Total 4 marks)

C) ALGEBRA – Manipulating Expressions and Solving Equations

12. Simplify fully

a) $2(3x+4) - 3(4x-5)$ =

$= 6x + 8 - 12x + 15$ = (1 mark) (expanding)

$= -6x + 23$ (1 mark)

$-6x+23$
.....(2)

b) $(2xy^3)^5$ $= 2^5 x^5 (y^3)^5$ = (1 mark) (for $2^5 = 3$

$= 32x^5y^{15}$ (1 mark)

.....(2)

c) $(7x-2)^2$ $= (7x-2)(7x-2) =$

$= 49x^2 - 14x - 14x + 4$ = (1 mark) (expand

$= 49x^2 - 28x + 4$ (1 mark)

.....(2)

d) $\frac{n^2-1}{n+1} \times \frac{2}{n-2}$ $= \frac{(n+1)(n-1)}{n+1} \times \frac{2}{n-2}$ (1 mark) (difference of 2 squares)

$= \frac{n-1}{1} \times \frac{2}{n-2}$ (1 mark)

$= \frac{2(n-1)}{n-2}$ or $\frac{2n-2}{n-2}$ (1 mark)

.....(3)

e) $\frac{x^2-3x}{x^2-8x+15}$ $= \frac{x(x-3)}{(x-3)(x-5)}$ (1 mark) factorising numerator

(1 mark) factorising denominator

$= \frac{x}{x-5}$ (1 mark)

.....(3)

(Total 12 marks)

13. Factorise the following expression.

$3x^2 + 10x - 8$ =

$= 3x^2 + 12x - 2x - 8 =$

$= 3x(x+4) - 2(x+4) =$ (1 mark) (start to factorise)

$= (x+4)(3x-2)$ (1 mark)

$(x+4)(3x-2)$ .....(2)

(Total 2 marks)

14.

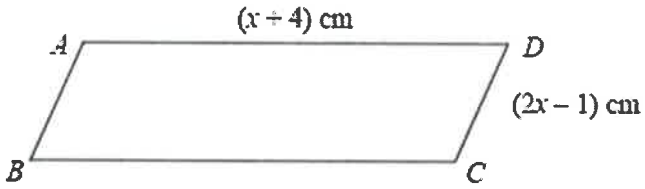


Diagram **NOT** accurately drawn

ABCD is a parallelogram
AD = $(x + 4)cm$
CD = $(2x - 1)cm$
The perimeter of the parallelogram is 24cm

i) Use the information to write down an equation in terms of x.

$(x+4) + (2x-1) + (x+4) + (2x-1) = 24$

$6x + 6 = 24$ or

$x + 1 = 4$

.....(1)

ii)Solve your equation.

$6x + 6 = 24$

$-6 \quad -6$

$6x = 18$ (1 mark)

$x =$.....(2)

(Total 3 marks)

$x = 3$ (1 mark)

15. The expression $x^2 - 6x + 14$ can be written in the form $(x - p)^2 + q$

by completing the square , for all values of x. Find the value of p and q.

$x^2 - 6x + 4 = (x-3)^2 - (-3)^2 + 4 =$ (1 mark)

$= (x-3)^2 - 9 + 4 =$

$= (x-3)^2 - 5$

p= 3 (1 mark)

q= −5 (1 mark)

(Total 3 marks)

16. Solve the simultaneous equations.

(1) $3x - 4y = 11$ / × 5

(2) $5x + 6y = 12$ / × 3

$15x - 20y = 55$

$-\ 15x + 18y = 36$

$-38y = 19$ / ÷(−38)

(1 mark) process to get the same number of x's or y's.

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

Substitute y into equation (1)

$3x - 4x\left(-\frac{1}{2}\right) = 11$ (1 mark)

$3x + 2 = 11$

$-2 \quad -2$

$3x = 9$

$x = 3$ (1 mark)

x = 3

y = −1/2

(Total 4 marks)

17.

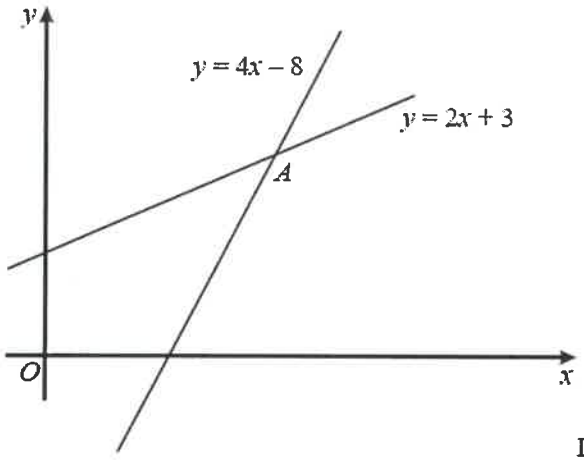


Diagram **NOT** accurately drawn

The diagrams show two straight lines intersecting at point A.
The equations of the lines are

$$y = 4x - 8$$

$$y = 2x + 3$$

Work out the coordinates of A.

The lines intersect when:

$4x - 8 = 2x + 3$

$-2x \qquad -2x$

$2x - 8 = 3$

$+8 \qquad +8$

$2x = 11$

$x = \frac{11}{2}$ (1 mark)

$y = 2 \times \frac{11}{2} + 3$

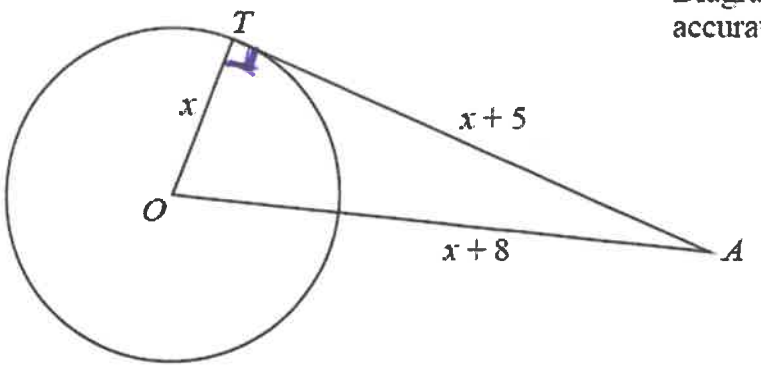
$y = 14$ (1 mark)

$(\frac{11}{2}, 14)$

(Total 2 marks)

18.

Diagram **NOT** accurately drawn



AT is a tangent at T to a circle centre O.

$OT = x\ cm\ ,\ AT = (x + 5)cm\ ,\ OA = (x + 8)cm$

a) Show that $x^2 - 6x - 39 = 0$

Angle between radius and tangent is 90° (1 mark)

$x^2 + (x+5)^2 = (x+8)^2$

$x^2 + x^2 + 10x + 25 = x^2 + 16x + 64$ (1 mark expanding 2nd bracket)

(1 mark expanding first bracket)

$x^2 - 6x - 39 = 0$ (1 mark)

(4)

b) Solve the equation $x^2 - 6x - 39 = 0$ to find the radius of the circle.
Give your answer correct to 3 significant figures.

$x^2 - 6x - 39 = 0$

$a = 1$
$b = -6$
$c = -39$

Use quadratic formulae:

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-6) \pm \sqrt{(-6)^2 - 4 \times 1 \times (-39)}}{2 \times 1}$$ (1 mark)

$$x = \frac{6 \pm \sqrt{192}}{2} = \frac{6 \pm 8\sqrt{3}}{2}$$

(1 mark)

$x_1 = \frac{6+8\sqrt{3}}{2} = 3+4\sqrt{3}$

$x_2 = \frac{6-8\sqrt{3}}{2} = 3-4\sqrt{3}$

$x = 9.92820...$

$x = 9.93$ (1 mark)

9.93 .....cm (3)

(Total 7 marks)