First Name	
Last Name	
Date	
Total Marks	/ 100 marks

MathsMadeEasy

GCSE Mathematics

Non-Calculator

Higher Tier

Mock 3, paper 1

1 hour 45 minutes

Instructions

Write your name and other details in the boxes above.
Answer all the questions
Take π to be 3.142

Information

Marks are shown in brackets for each question (2)
Calculators may NOT be used

Advice

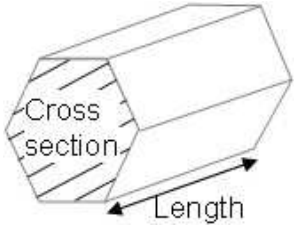
Don't spend too long on one question
Show all your working in calculations for full marks
You will get marks for method even if your answer is incorrect
Leave a question until later it you cannot answer it

Materials needed for examination

Ruler marked in centimetres and millimetres, protractor, compasses, pen, pencil, rubber
Tracing paper may be used

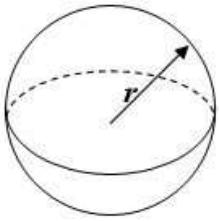
Formulae sheet — Higher tier

Volume of prism = area of cross-section × length



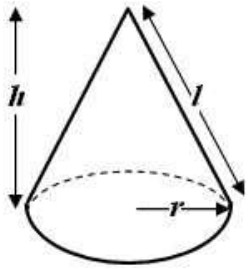
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



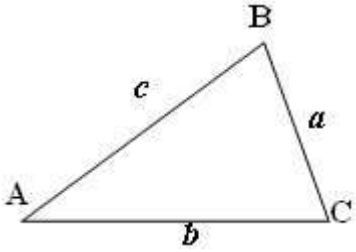
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$

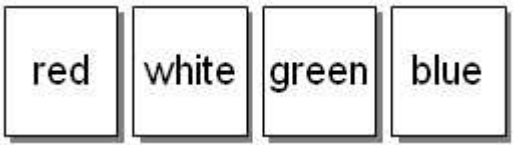
Area of a triangle = $\frac{1}{2}ab\sin C$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Authors Note

1. A box contains red, white, green or blue cards.



The table below show the probability of picking a particular coloured card if one is taken randomly from the box.

Colour	Red	White	Green	Blue
Probability	0.25	0.3		0.15

a) If a card is taken at random from the box what is the probability it will be green.

..... **(2)**

If the box contains 60 cards.

b) Work out how many white cards there are in the box.

..... **(2)**

2. In the sales David buys 2 pens and 4 pencils for £2.80
Jane buys 4 pens and 4 pencils for £4.00

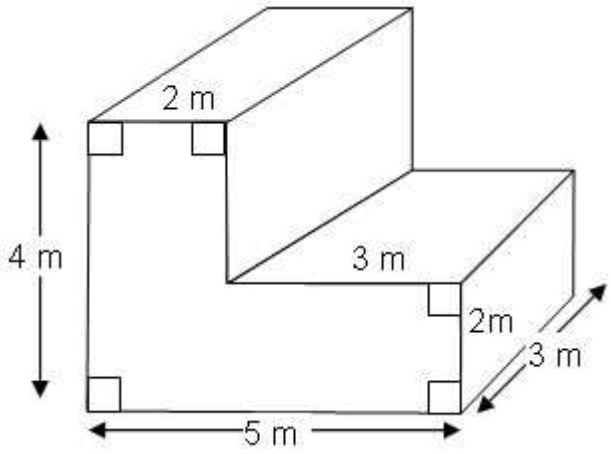
What is the cost of one pen giving your answer in pence.

.....pence **(3)**

3. Stuart needs to collect information about the amount of time his friends spend playing computer games.
Design a suitable question he could use.

(2)

4. Work out the total surface area of the L shaped block below,
Give the units in your answer.



..... **(4)**

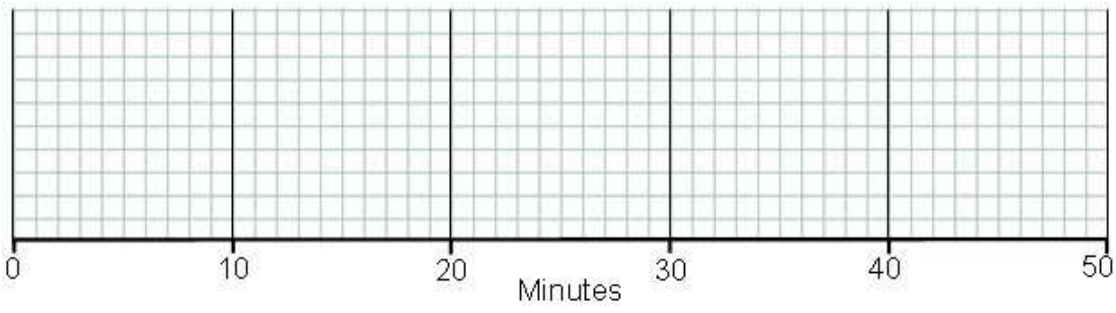
5. A line is shown below drawn between two co-ordinates (-2, 6) and (4, 2). Find the co-ordinates of the midpoint.

(..... , ...) **(2)**

6. Mrs Dew set her students some homework.
Each student recorded the time taken for them to do their homework.
Mrs Dew used this information to work out the following table.

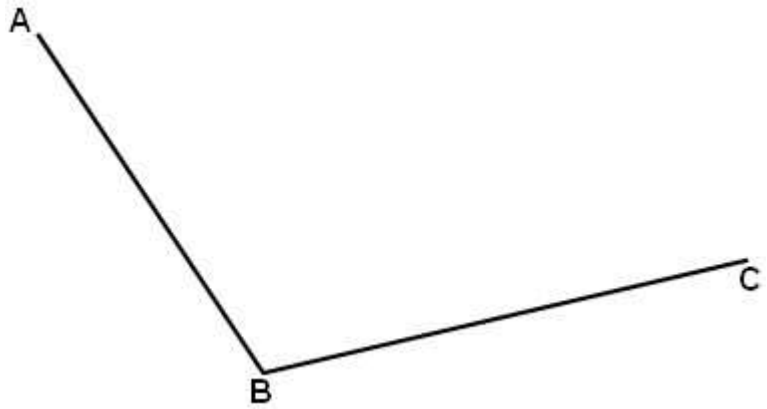
	Minutes
Shortest time	16
Lower quartile	20
Median	28
Upper Quartile	36
Longest time	48

Draw a box plot for this information on the grid below



(2)

7. Construct a bisector of the angle ABC using a ruler and compasses.
Show all your construction lines



(2)

8. a) Write 252 as a product of its prime factors.

..... **(2)**

b) Find the highest Common Factor (HCF) of 72 and 252

..... **(2)**

9. (a) x is an integer where $-3 \leq x < 2$
Write down all the possible values of x.

.....

b) (i) Solve the inequality $4x \geq x + 5$

..... **(2)**

ii) x is a whole number
Write down the smallest whole value of x that satisfies $4x \geq x + 5$

..... **(3)**

10. Write as a power of 6

a) $6^9 \div 6^7$

……

b) $\dfrac{6^7 \times 6^3}{6}$

……

c) Write down the reciprocal of 3

…… **(3)**

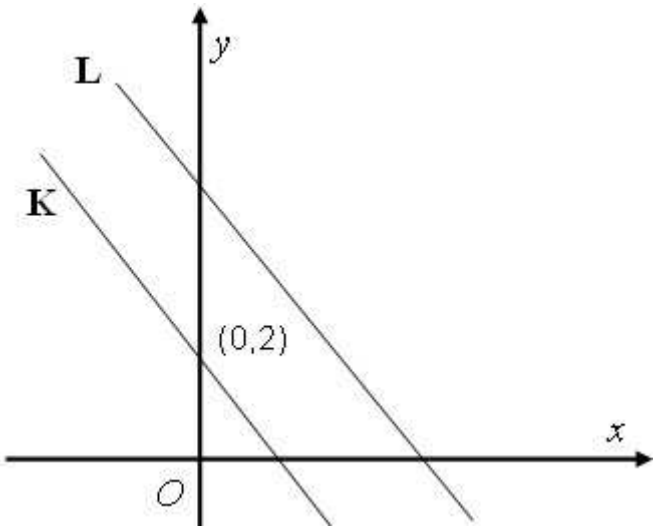
11. a) Make p the subject of the formula $s = 3p - 16$

p =……..…… **(2)**

b) Make b the subject of the formula $3(b - 3c) = 2b + 6$

b =……..…… **(3)**

12.



The straight line **L** has the equation $y = -\frac{5}{2}x + 5$

The straight line **K** is parallel to **L** and passes through the point (0,2)
Write down the equation for the line **K.**

……..……..…… **(2)**

13. (a) Work out the value of $1\frac{3}{4} \times 2\frac{4}{7}$

Give your answer as a fraction in its simplest form.

.....

(3)

14. Solve the simultaneous equations

$$6x - 4y = 19$$
$$12x + 12y = 18$$

x = ...

y = ...

(3)

15.

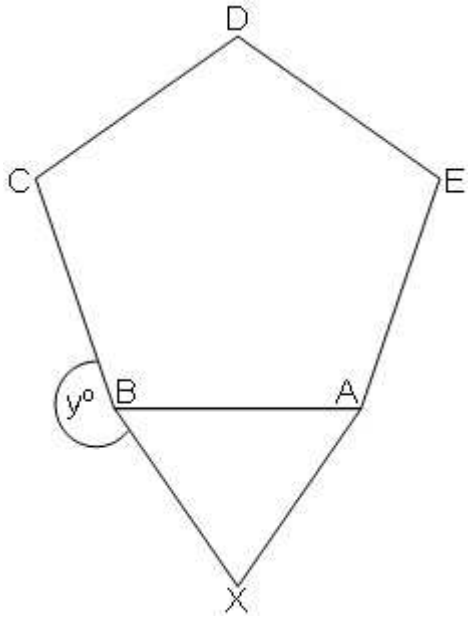


Diagram not drawn accurately

ABCDE is a regular pentagon and ABX is an equilateral triangle.
Work out the value of angle *y*

y = ...

(4)

16. A survey of 100 adults was made to see how long they spent watching TV each week.

The table below shows how long in hours the adults spent.

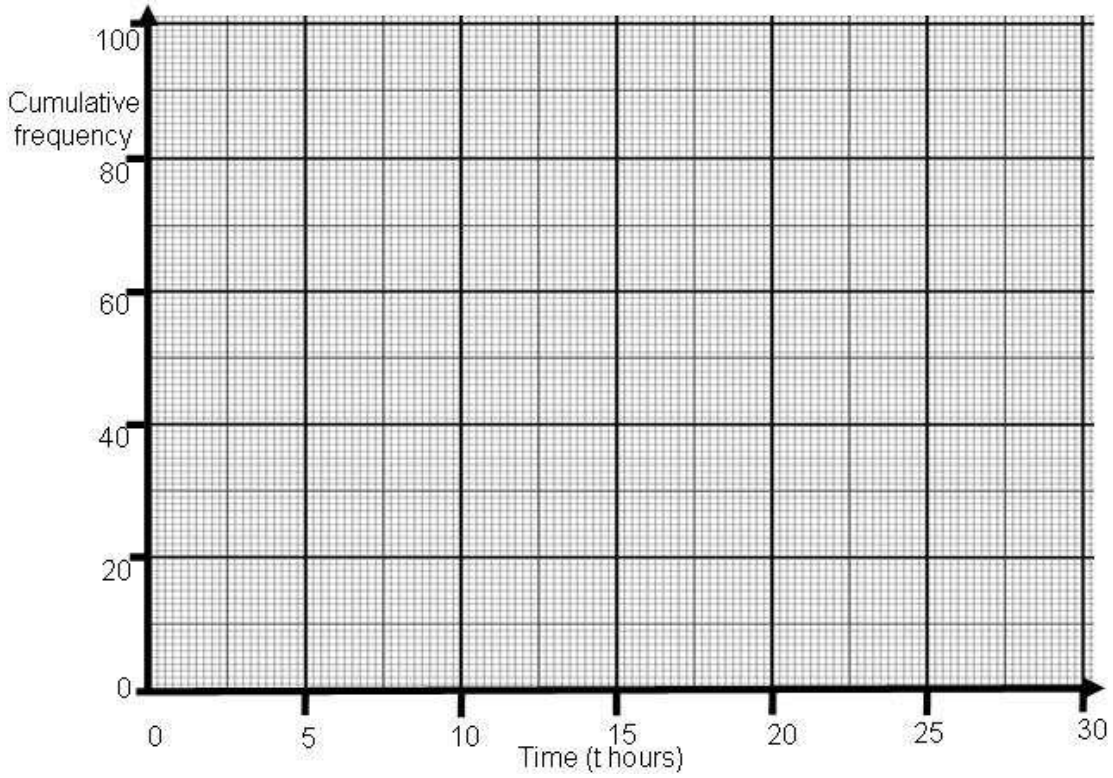
Time (t hours)	Frequency
$0 < t \leq 5$	8
$5 < t \leq 10$	18
$10 < t \leq 15$	26
$15 < t \leq 20$	28
$20 < t \leq 25$	14
$25 < t \leq 30$	6

b) Complete the cumulative frequency table.

Time (t hours)	Frequency
$0 < t \leq 5$	8
$5 < t \leq 10$	
$10 < t \leq 15$	
$15 < t \leq 20$	
$20 < t \leq 25$	
$25 < t \leq 30$	

(1)

16. (cont)



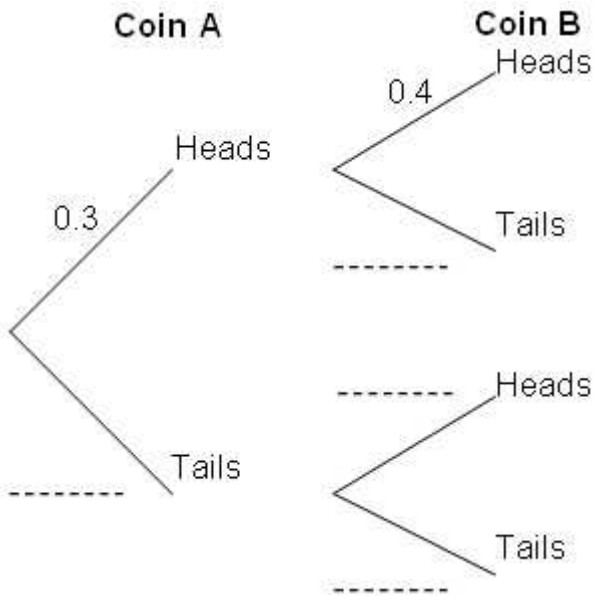
b) On the grid draw a cumulative frequency graph for your table **(2)**

c) Use your graph to estimate how many adults watched ***more*** than 17 hours TV per week.

…… **(2)**

17. Two biased coins A and B are thrown one after the other.
The probability that coin A will land on a head is 0.3.
The probability that coin B will land on a head is 0.4.

a) Complete the probability Tree diagram.



(2)

b) Work out the probability that both coins will land on a head

…… **(2)**

c) Work out the probability that exactly one coin will be heads

…… **(3)**

18. Prove that the recurring decimal $0.\dot{3}\dot{6} = \frac{4}{11}$

…….

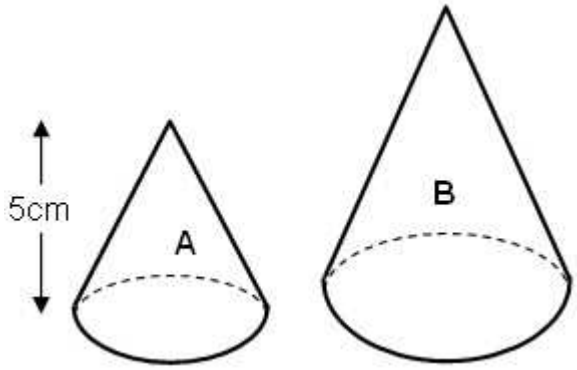
(3)

19. Expand and simplify $(\sqrt{5} - \sqrt{3})(\sqrt{5} - \sqrt{3})$

…….

(2)

20.



Two cones A and B are mathematically similar.
The total surface area of cone A is 12 cm^2
The total surface area of cone B is 48 cm3
The height of cone A is 5cm.

a) Work out the height of cone B

…….cm **(2)**

The volume of cone A is 6 cm^3

b) Work out the volume of cone B

…….cm^3 **(2)**

21. a) Expand $p(4q - 3p^3)$

…… **(1)**

b) Factorise completely $2x^2 y - 8y^4$

…… **(1)**

c) Simplify $\frac{16\,a^3\,b^3}{4\,a^2\,b^4}$

…… **(1)**

d) Expand $(x - y)^2$

…… **(1)**

e) Solve $x^2 + 1 = 5$

x = …… ……. **(1)**

22.

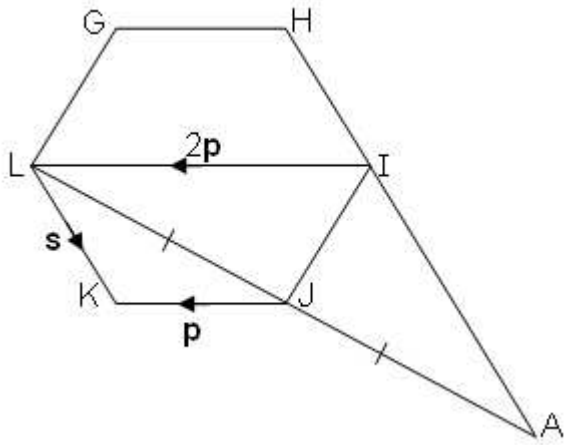


Diagram not drawn accurately

GHIJKL is a regular hexagon.

$\overrightarrow{LK} = \mathbf{s}$ $\overrightarrow{JK} = \mathbf{p}$ $\overrightarrow{IL} = 2\mathbf{p}$

a) What is the vector $\overrightarrow{LJ}$ in terms of **s** and **p**

……. **(1)**

$\overrightarrow{LJ} = \overrightarrow{JA}$

b) Prove that LK is parallel to IA

(3)

23.

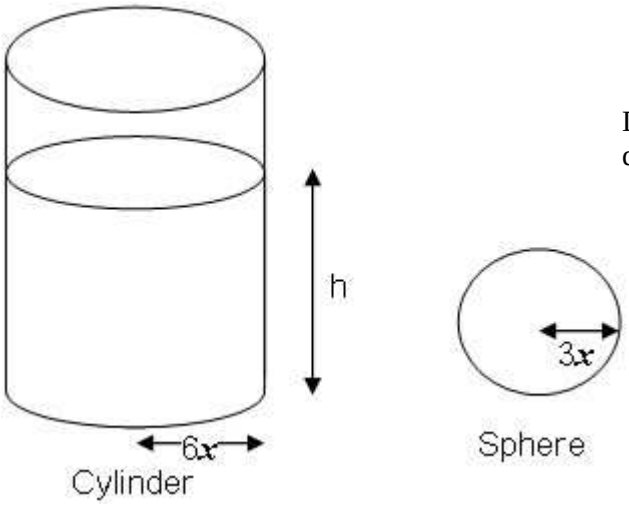


Diagram not drawn accurately

The radius of the base of a cylinder is $6x$ cm.
The cylinder is filled with water to a height of h cm.
The radius of a sphere is $3x$ cm.
The sphere is dropped into the cylinder and is completely immersed.

Find, in terms of x, the increase in the height of the water in the cylinder.
Give your answer in its simplest form.

h = ... **(3)**

24. i) Expand and simplify

$$n^2 + (n + 2)^2$$

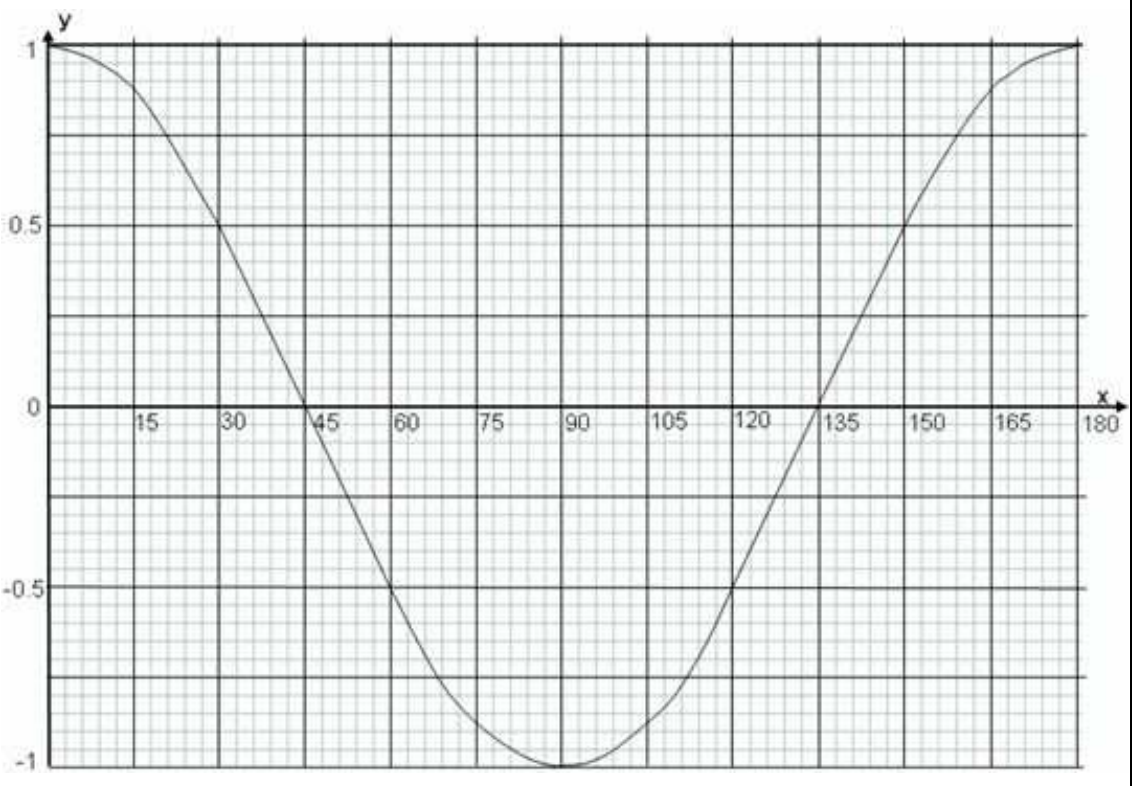
…….....

n is a whole number.

ii) Prove that $n^2 + (n + 2)^2$ is always an even number

(4)

25. The graph of $y = \cos 2x^0$ for $0 \leq x \leq 180$ is shown below.



Use the graph to solve $\cos 2x^\circ = -0.75$ for $0 \leq x \leq 180$

.....

(2)

26. For all values of x:

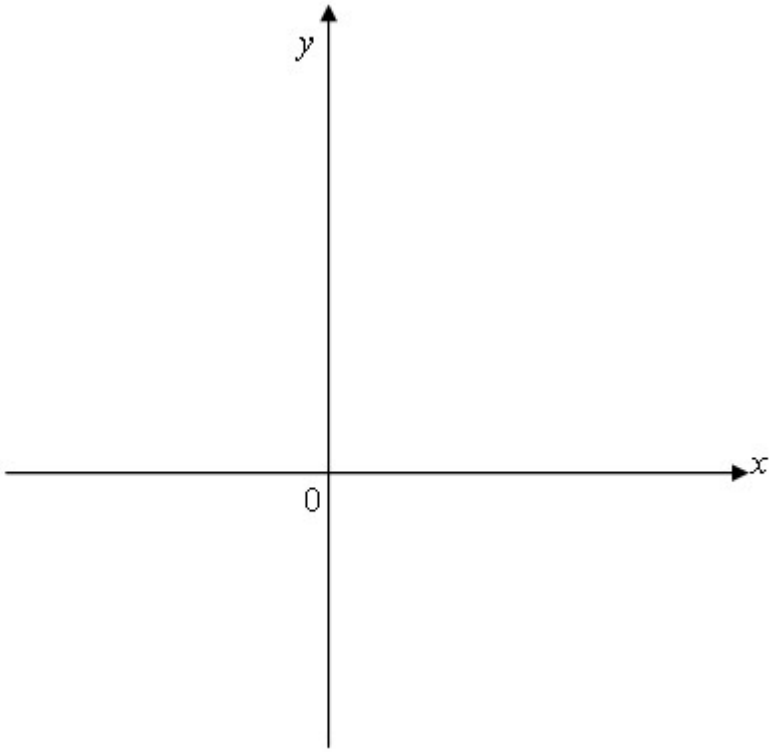
$$x^2 - 4x + 11 = (x - a)^2 + b$$

a) Find the value of a and b

a= ..... b=.....

(2)

b) On the axes below, sketch the graph $x^2 - 4x + 11$



(2)

26b. For all values of x:

$$6x^2 - 3x - \frac{5}{8} = a(x - b)^2 - c$$

a) Find the value of a, b and c

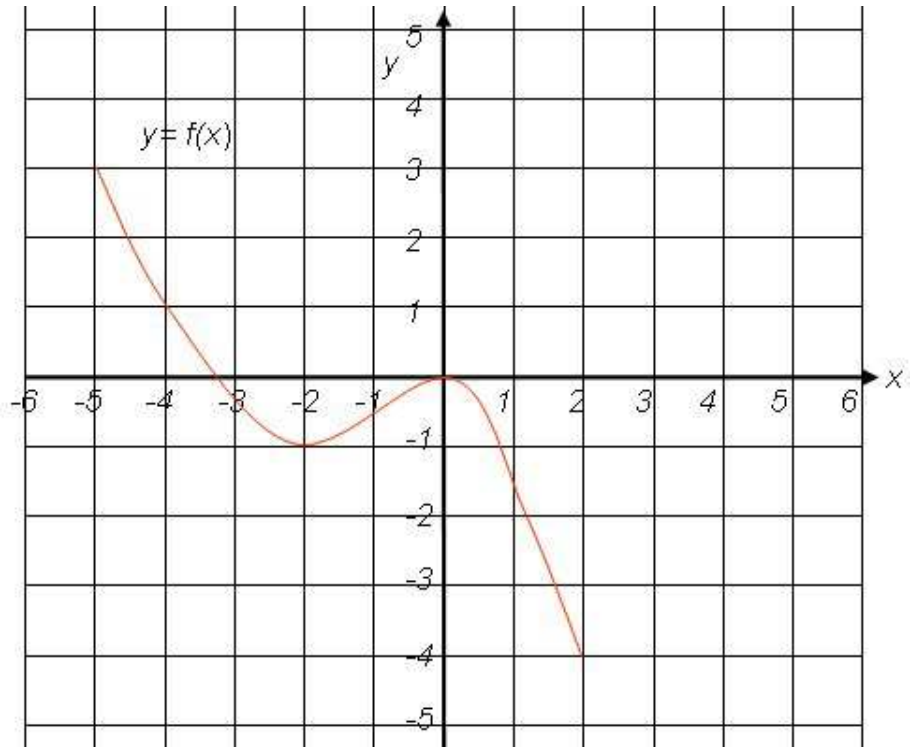
a= ..... b=..... c= ..... **(3)**

b) Hence solve $6x^2 - 3x - \frac{5}{8} = 0$ leaving your answer in surd form.

x = ... **(2)**

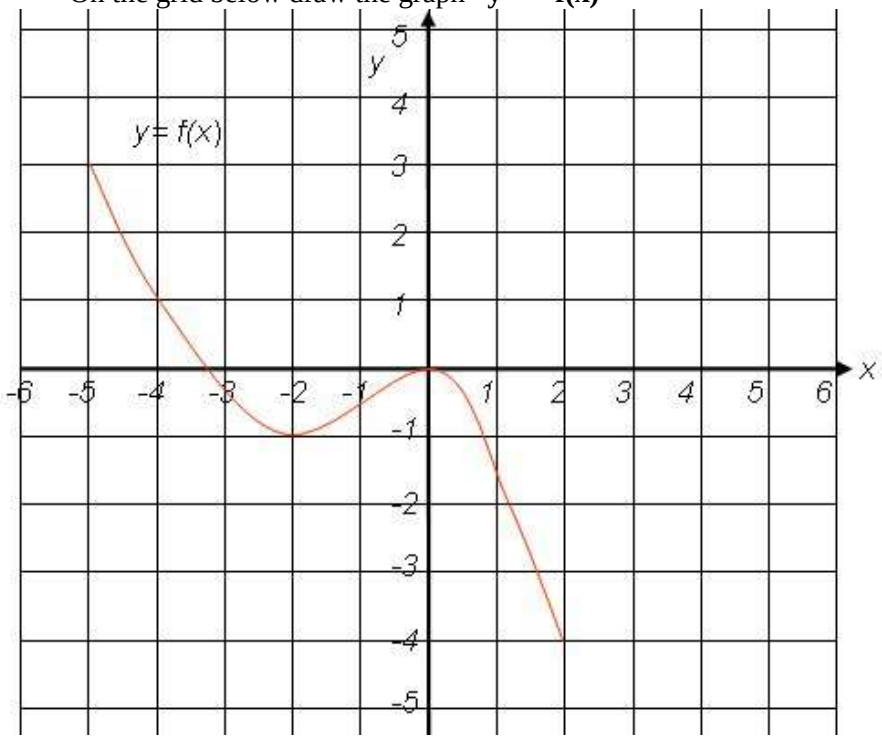
27. The graph is shown below of y = f(x).

a) Sketch the graph of **y = f(x) + 1** on the grid.



(2)

b) On the grid below draw the graph **y = – f(x)**



(2)