

# 91 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# CUMULATIVE

# FREQUENCY & BOX

# PLOTS

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.

Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

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Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

### Information

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The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

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Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. All the students in Mathstown school had a test.

The lowest mark was 18

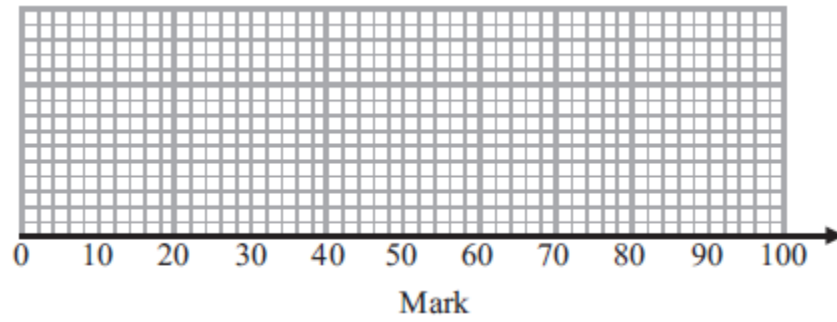
The highest mark was 86

The median was 57

The lower quartile was 32

The interquartile range was 38

On the grid, draw a box plot to show this information.



(3 marks)

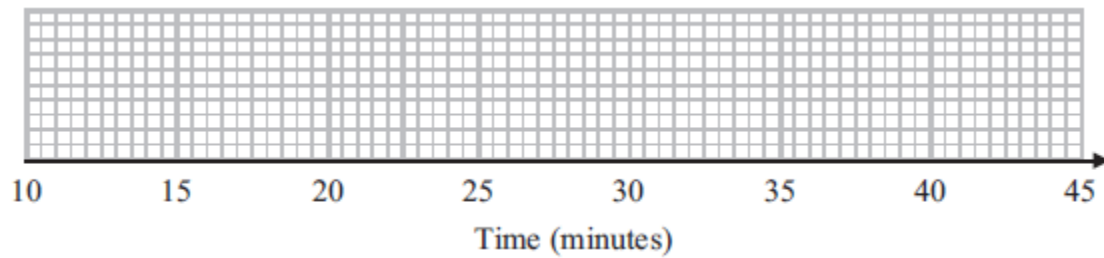
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2. Sameena recorded the times, in minutes, some girls took to do a jigsaw puzzle.

Sameena used her results to work out the information in this table.

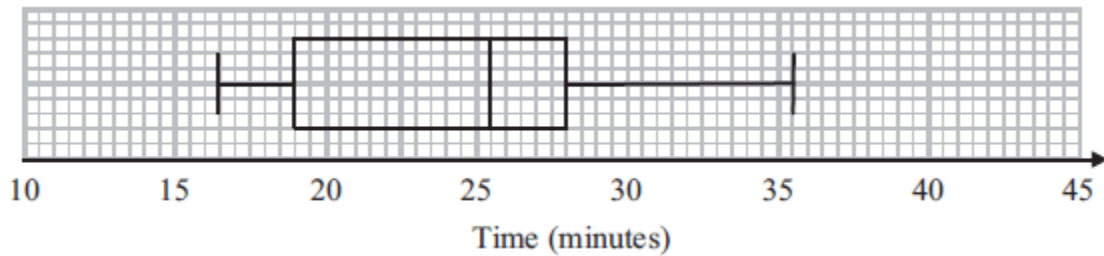
|                | Minutes |
|----------------|---------|
| Shortest time  | 18      |
| Lower quartile | 25      |
| Median         | 29      |
| Upper quartile | 33      |
| Longest time   | 44      |

(a) On the grid, draw a box plot to show the information in the table.



(2)

The box plot below shows information about the times, in minutes, some boys took to do the same jigsaw puzzle.



(b) Compare the distributions of the girls' times and the boys' times.

.....

.....

.....

.....

(2)

(4 marks)

3. This frequency table gives information about the ages of 60 teachers.

| Age (A) in years | Frequency |
|------------------|-----------|
| $20 < A \leq 30$ | 12        |
| $30 < A \leq 40$ | 15        |
| $40 < A \leq 50$ | 18        |
| $50 < A \leq 60$ | 12        |
| $60 < A \leq 70$ | 3         |

(a) Complete the cumulative frequency table.

| Age (A) in years | Cumulative frequency |
|------------------|----------------------|
| $20 < A \leq 30$ |                      |
| $20 < A \leq 40$ |                      |
| $20 < A \leq 50$ |                      |
| $20 < A \leq 60$ |                      |
| $20 < A \leq 70$ |                      |

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

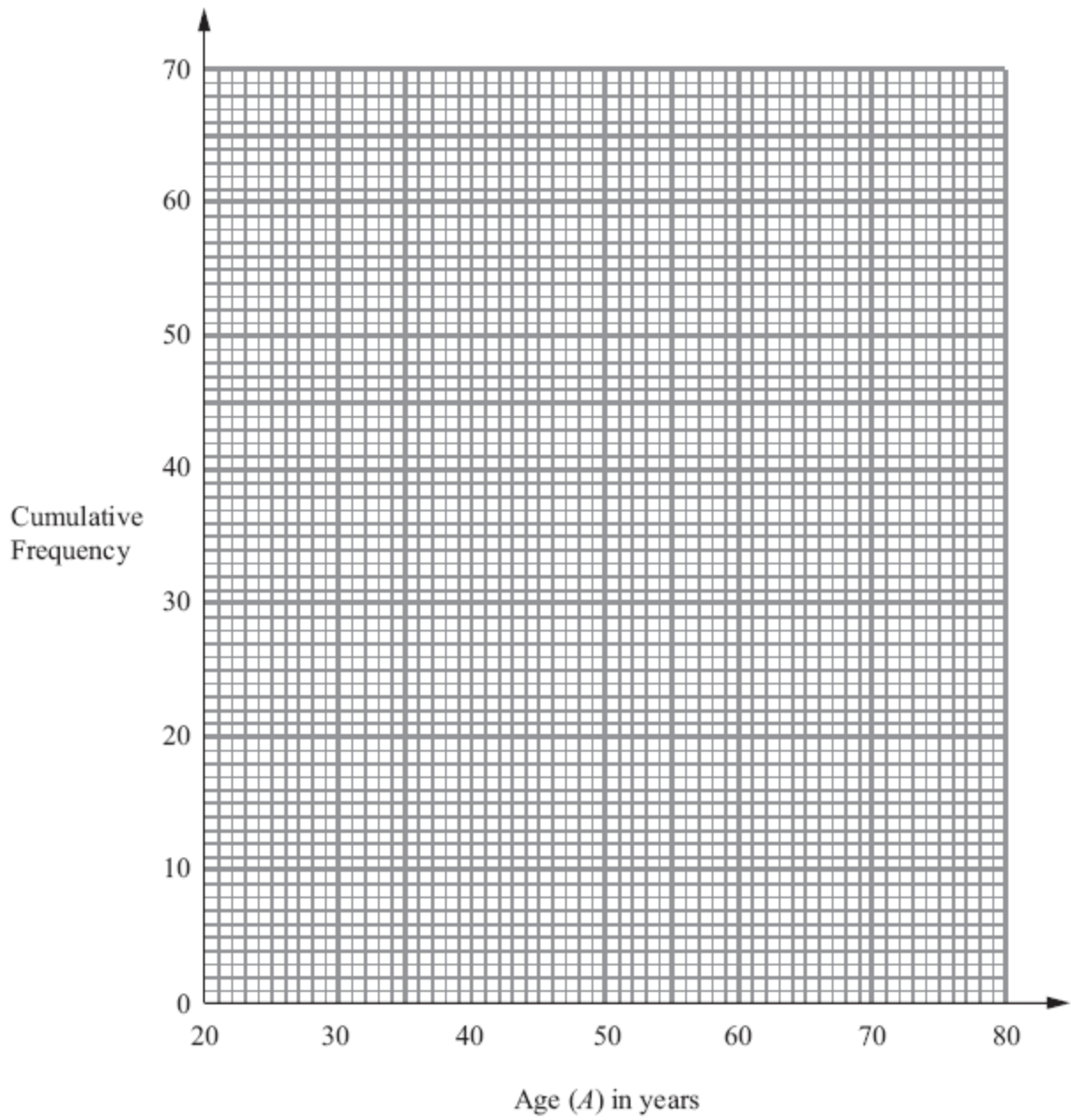
(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... years  
(2)

(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

.....  
(2)



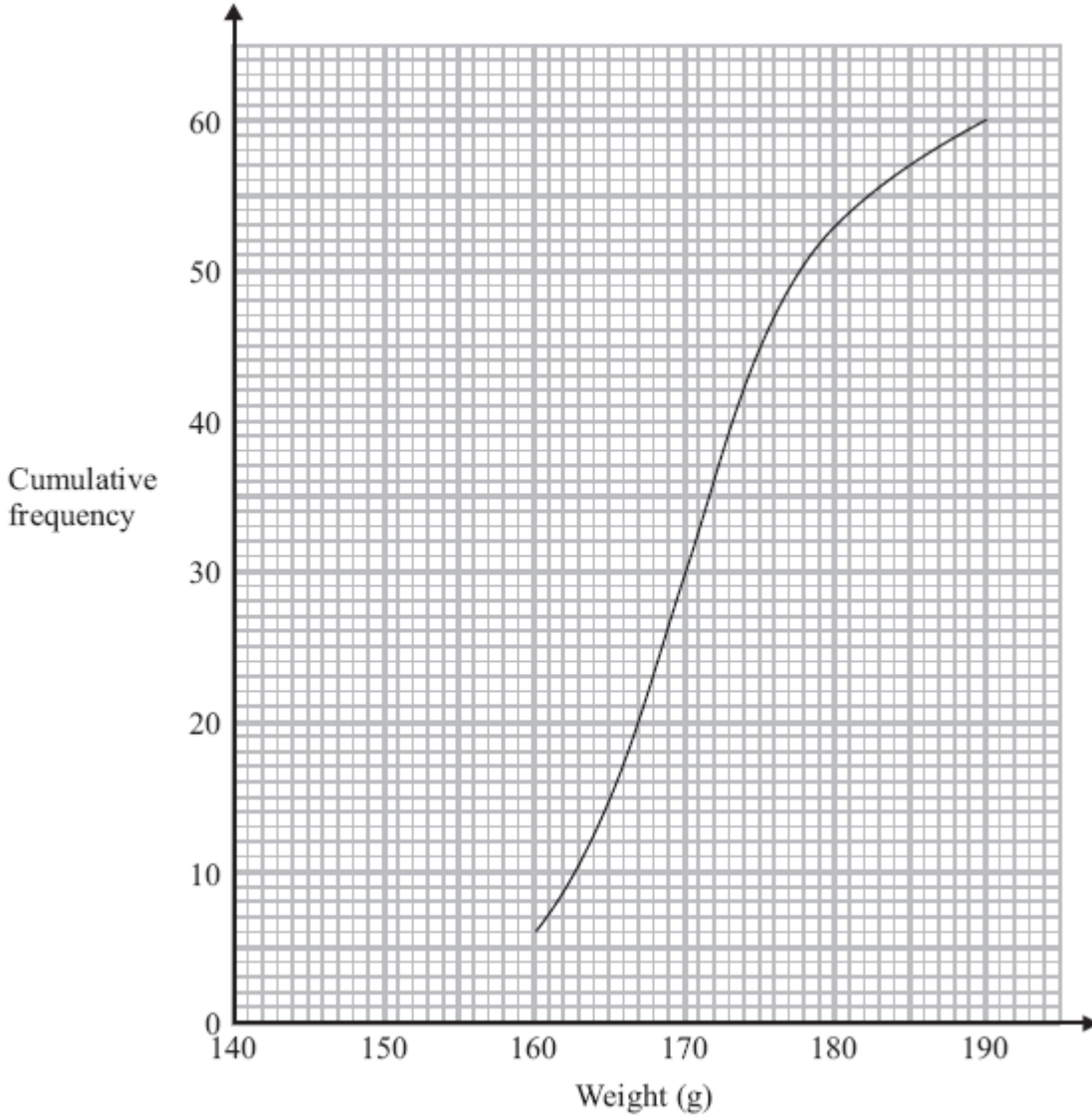
(7 marks)

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4. Harry grows tomatoes.  
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.  
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.  
The cumulative frequency graph shows some information about these weights.

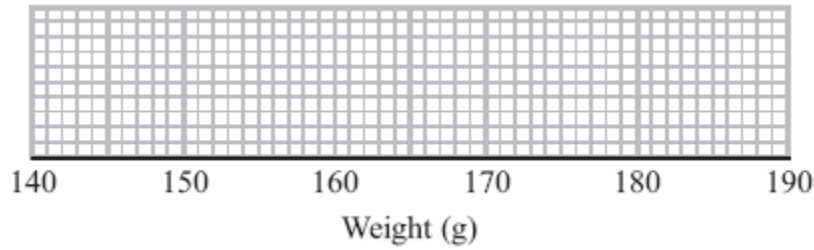


- (a) Use the graph to find an estimate for the median weight.

..... g  
(1)

The 60 tomatoes from group A  
 had a minimum weight of 153 grams  
 and a maximum weight of 186 grams.

- (b) Use this information and the cumulative frequency graph to draw a box plot for the 60 tomatoes from group A.

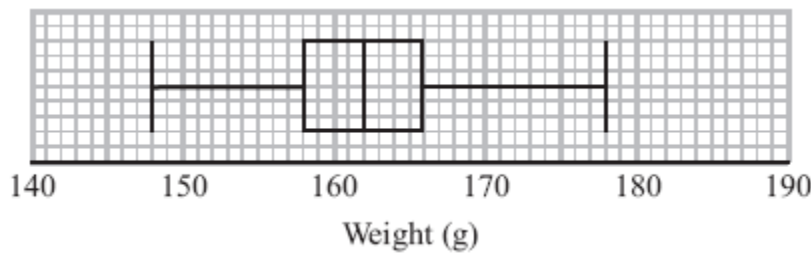


Group A

(3)

Harry did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group B.  
 He drew this box plot for his results.



Group B

- (c) Compare the distribution of the weights of the tomatoes from group A with the distribution of the weights of the tomatoes from group B.

.....

.....

.....

.....

(2)

**(6 marks)**

5. The table shows information about the speeds of 100 lorries.

| Speed ( $s$ ) in km/h | Frequency |
|-----------------------|-----------|
| $0 < s \leq 20$       | 2         |
| $20 < s \leq 40$      | 9         |
| $40 < s \leq 60$      | 23        |
| $60 < s \leq 80$      | 31        |
| $80 < s \leq 100$     | 27        |
| $100 < s \leq 120$    | 8         |

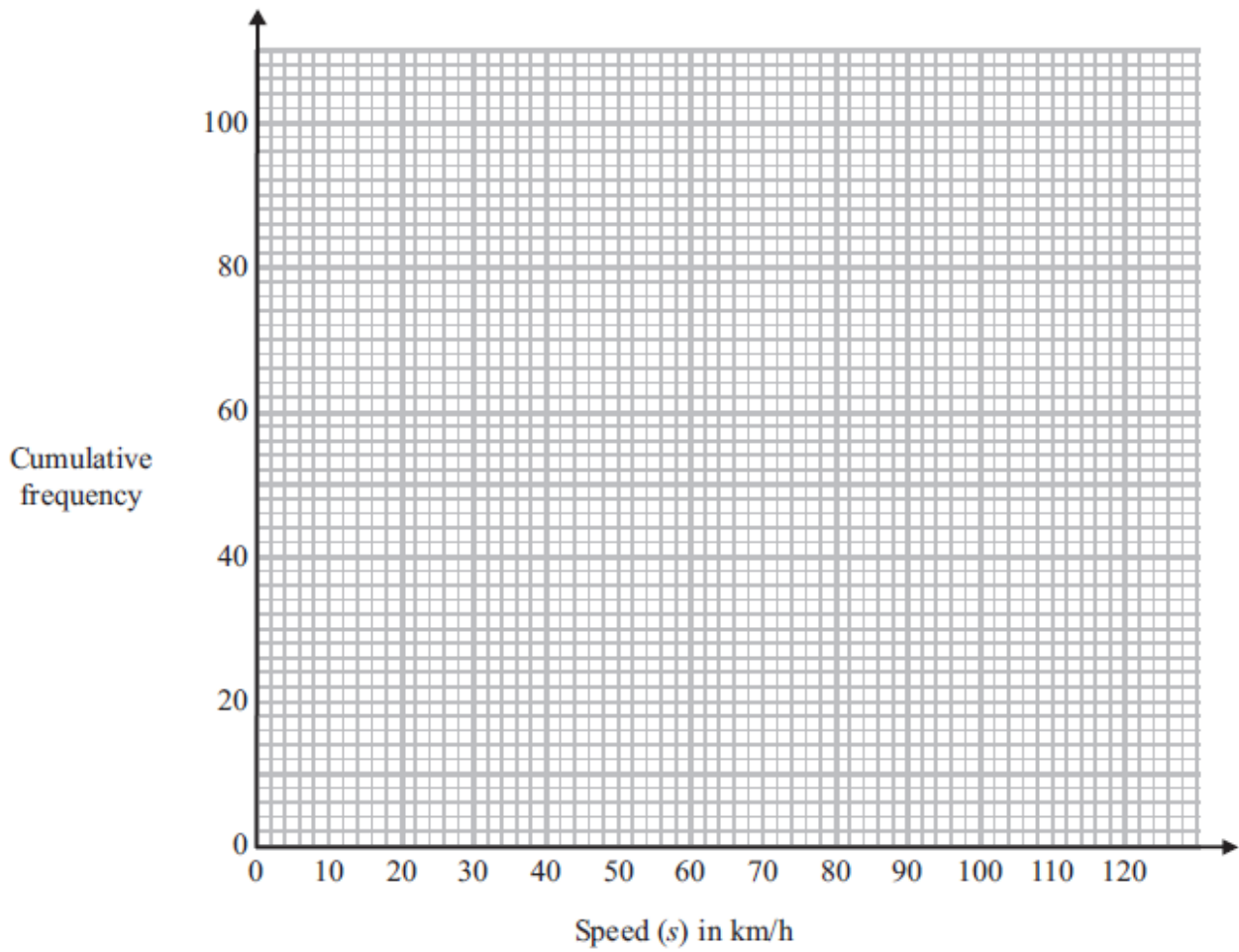
- (a) Complete the cumulative frequency table for this information.

| Speed ( $s$ ) in km/h | Cumulative frequency |
|-----------------------|----------------------|
| $0 < s \leq 20$       | 2                    |
| $0 < s \leq 40$       |                      |
| $0 < s \leq 60$       |                      |
| $0 < s \leq 80$       |                      |
| $0 < s \leq 100$      |                      |
| $0 < s \leq 120$      |                      |

(1)



(b) On the grid, draw a cumulative frequency graph for your table.



(2)

(c) Find an estimate for the number of lorries with a speed of more than 90 km/h.

.....  
(2)

(5 marks)

6. The grouped frequency table shows information about the weekly wages of 80 factory workers.

| Weekly wage (£ $x$ ) | Cumulative Frequency |
|----------------------|----------------------|
| $100 < x \leq 200$   | 8                    |
| $200 < x \leq 300$   | 15                   |
| $300 < x \leq 400$   | 30                   |
| $400 < x \leq 500$   | 17                   |
| $500 < x \leq 600$   | 7                    |
| $600 < x \leq 700$   | 3                    |

(a) Complete the cumulative frequency table.

| Weekly wage (£ $x$ ) | Cumulative Frequency |
|----------------------|----------------------|
| $100 < x \leq 200$   |                      |
| $100 < x \leq 300$   |                      |
| $100 < x \leq 400$   |                      |
| $100 < x \leq 500$   |                      |
| $100 < x \leq 600$   |                      |
| $100 < x \leq 700$   |                      |

(1)

(b) On the grid opposite, draw a cumulative frequency graph for your table.

(2)

(c) Use your graph to find an estimate for the interquartile range.

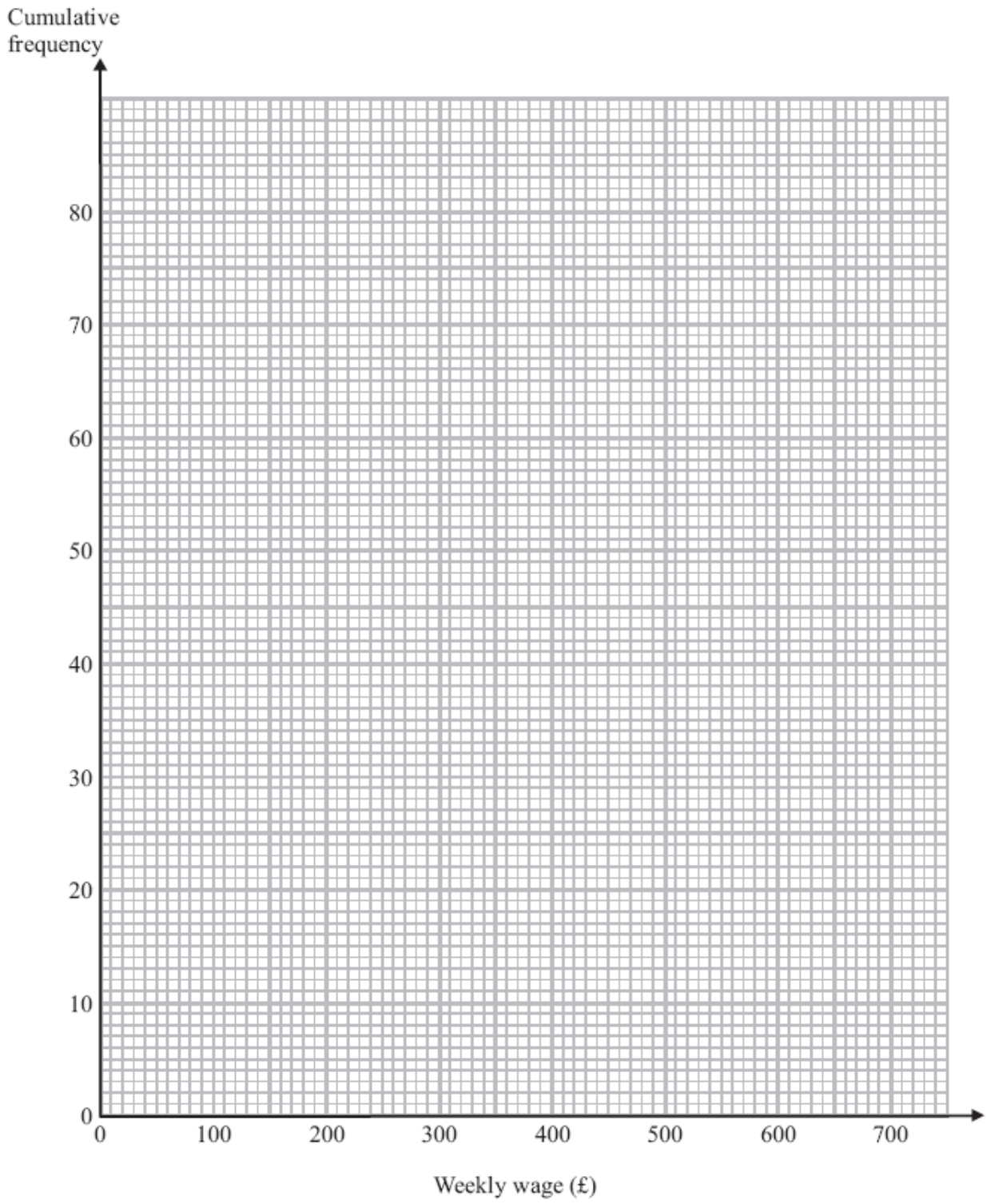
£ .....

(2)

(d) Use your graph to find an estimate for the number of workers with a weekly wage of more than £530

.....

(2)



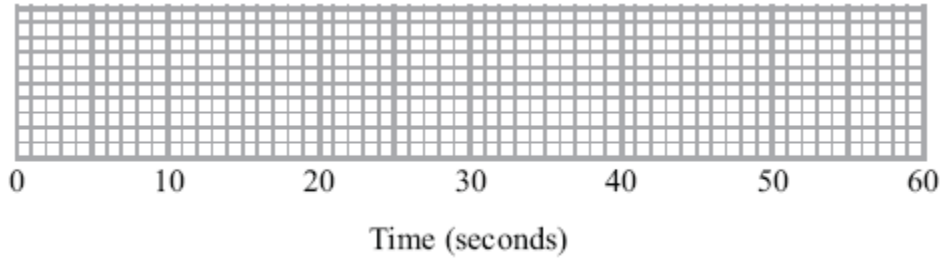
**(7 marks)**

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7. Here are the times, in seconds, that 15 people waited to be served at Rose's garden centre.

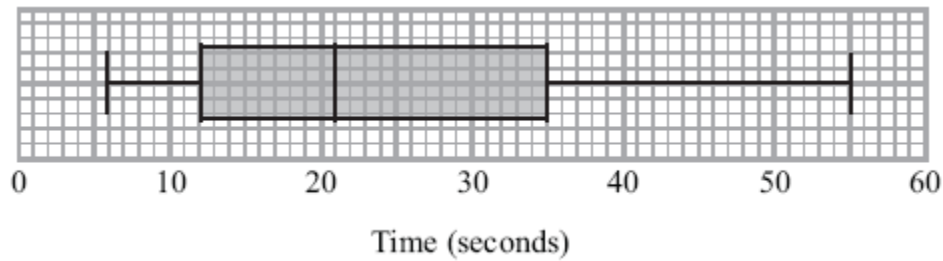
5 9 11 14 15 20 22 25 27 27 28 30 32 35 44

(a) On the grid, draw a box plot for this information.



(3)

The box plot below shows the distribution of the times that people waited to be served at Green's garden centre.



(b) Compare the distribution of the times that people waited at Rose's garden centre and the distribution of the times that people waited at Green's garden centre.

.....

.....

.....

.....

(2)

(5 marks)

# 92 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# PROBABILITY & TREE DIAGRAMS

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

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Calculators may be used.

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### Advice

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Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

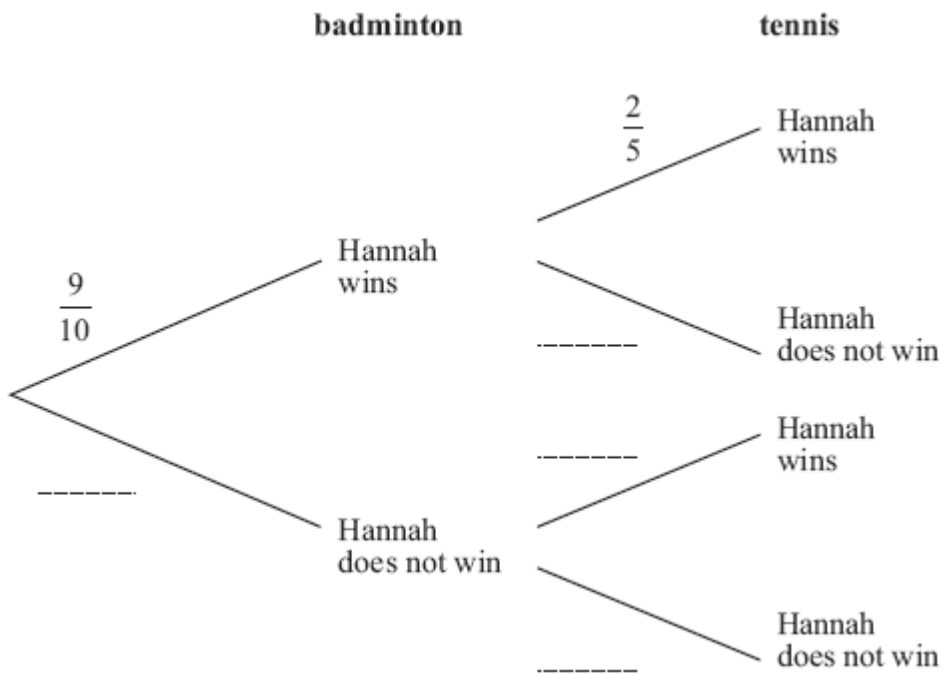
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is  $\frac{9}{10}$

The probability that she will win the tennis match is  $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

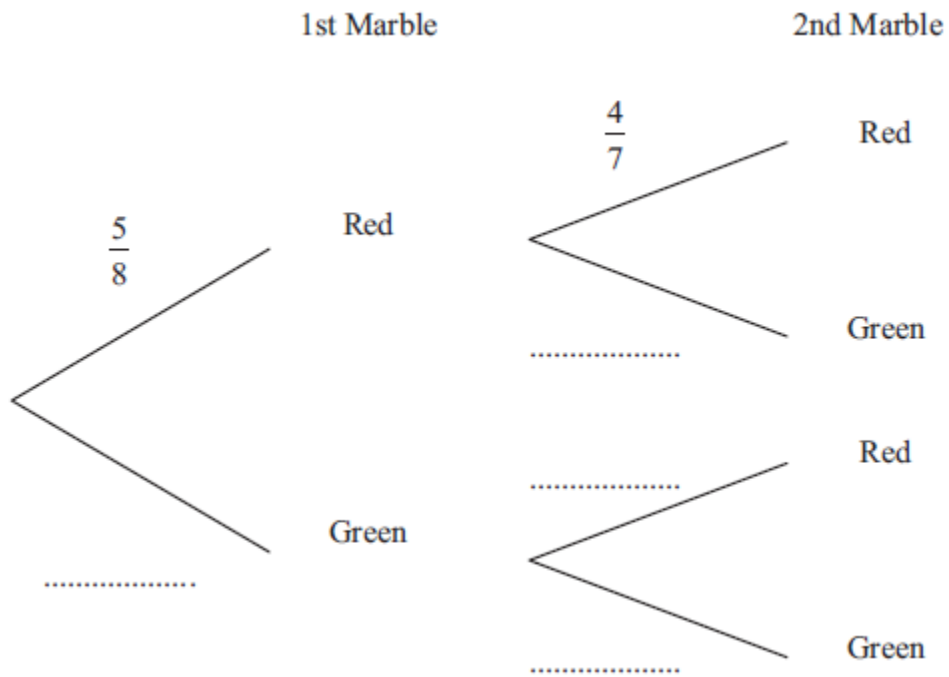
.....  
(4 marks)

2. There are only red marbles and green marbles in a bag.  
There are 5 red marbles and 3 green marbles.

Dwayne takes at random a marble from the bag.  
He does not put the marble back in the bag.

Dwayne takes at random a second marble from the bag.

- (a) Complete the probability tree diagram.



(2)

- (b) Work out the probability that Dwayne takes marbles of different colours.

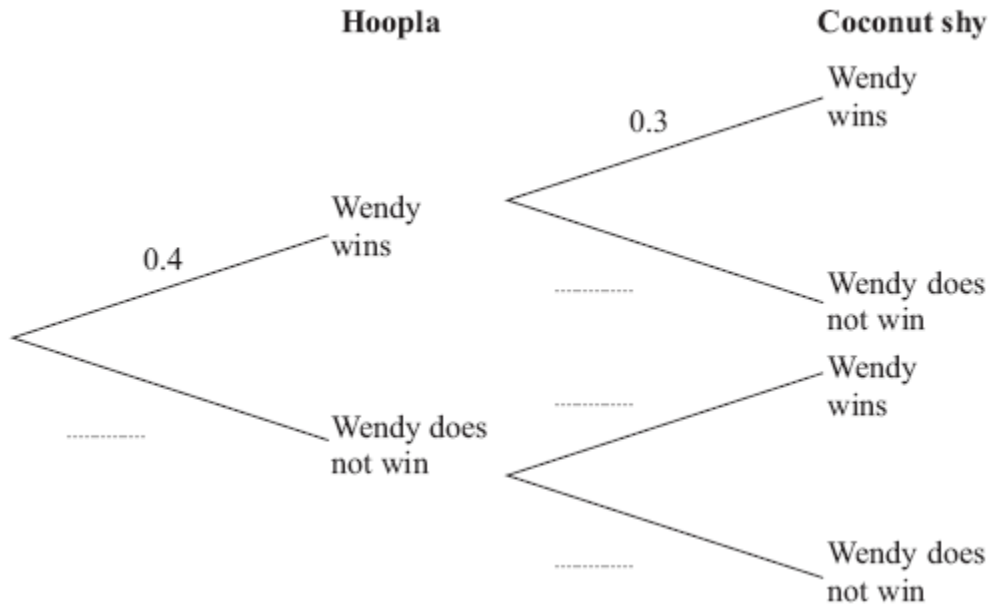
.....  
(3)

(5 marks)

3. Wendy goes to a fun fair.  
 She has one go at Hoopla.  
 She has one go on the Coconut shy.

The probability that she wins at Hoopla is 0.4  
 The probability that she wins on the Coconut shy is 0.3

- (a) Complete the probability tree diagram.



(2)

- (b) Work out the probability that Wendy wins at Hoopla and also wins on the Coconut shy.

.....  
 (2)

**(4 marks)**



4. There are 5 red pens, 3 blue pens and 2 green pens in a box.

Gary takes at random a pen from the box and gives the pen to his friend.  
Gary then takes at random another pen from the box.

Work out the probability that both pens are the same colour.

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

---

5. Carolyn has 20 biscuits in a tin.

She has

- 12 plain biscuits
- 5 chocolate biscuits
- 3 ginger biscuits

Carolyn takes at random two biscuits from the tin.

Work out the probability that the two biscuits were **not** the same type.

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

6. Here are seven tiles.



Jim takes at random a tile.  
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

.....  
(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.

.....  
(3)

(5 marks)

7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,  
5 cheese sandwiches  
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.

.....  
**(5 marks)**

# 93 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# RECURRING DECIMALS INTO FRACTIONS

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

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Calculators may be used.

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### Advice

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Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. (a) Change  $\frac{3}{11}$  to a decimal.

.....

**(1)**

(b) Prove that the recurring decimal  $0.\dot{3}9 = \frac{13}{33}$

**(3)**

**(Total 4 marks)**

2. Prove that the recurring decimal  $0.\dot{4}5 = \frac{15}{33}$

**(Total 3 marks)**

3. Express the recurring decimal  $0.2\dot{1}3$  as a fraction.

.....  
**(Total 3 marks)**

4. Prove that  $0.4\dot{7}3$  can be written as the fraction  $\frac{469}{990}$

**(Total 2 marks)**

5. Prove that the recurring decimal  $0.\dot{1}\dot{7} = \frac{17}{99}$

**(Total 2 marks)**

6. (a) Express  $0.\dot{2}\dot{7}$  as a fraction in its simplest form.

.....

**(3)**



$x$  is an integer such that  $1 \leq x \leq 9$

(b) Prove that  $0.\dot{0}\dot{x} = \frac{x}{99}$

(2)  
(Total 5 marks)

7. Change the recurring decimal  $0.\dot{2}\dot{3}$  to a fraction.

.....  
(Total 2 marks)

8. (i) Convert the recurring decimal  $0.\dot{3}\dot{6}$  to a fraction.

.....

(ii) Convert the recurring decimal  $2.1\dot{3}\dot{6}$  to a mixed number.  
Give your answer in its simplest form.

.....

**(Total 5 marks)**

9. Convert the recurring decimal  $2.14\dot{5}$  to a fraction.

.....

**(Total 3 marks)**

10. Express the recurring decimal  $0.1\dot{2}\dot{6}$  as a fraction.

.....  
**(Total 3 marks)**

11. Express  $0.3\dot{2}\dot{8}$  as a fraction in its simplest form.

.....  
**(Total 3 marks)**

12. The recurring decimal  $0.\dot{7}\dot{2}$  can be written as the fraction  $\frac{8}{11}$

Write the recurring decimal  $0.5\dot{7}\dot{2}$  as a fraction.

.....  
**(Total 2 marks)**

13. Express the recurring decimal  $2.0\dot{6}$  as a fraction.  
Write your answer in its simplest form.

.....  
**(Total 3 marks)**

# 94 Edexcel GCSE Mathematics (Linear) – 1MA0

# FRACTIONAL AND NEGATIVE INDICES

## Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.

Tracing paper may be used.

## Items included with question papers

Nil

## Instructions

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## Advice

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Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. Find the value of

(i)  $36^{\frac{1}{2}}$

.....

(ii)  $3^{-2}$

.....

**(Total 2 marks)**

2. Write down the value of

(a)  $7^0$

.....

**(1)**

(b)  $4^{-1}$

.....

**(1)**

**(Total 2 marks)**

3. (a) Simplify  $2^0$

.....

**(1)**

(b) Simplify  $5^{-1}$

.....

**(1)**

**(Total 2 marks)**

4. (a) Write down the value of  $2^{-1}$

.....

**(1)**

(b) Write down the value of  $64^{\frac{1}{2}}$

.....

**(1)**

**(Total 2 marks)**

5. Write down the value of

(i)  $5^0$

.....

(ii)  $4^{-2}$

.....

(iii)  $100^{\frac{1}{2}}$

.....

**(Total 3 marks)**

6. (a) Write down the value of

(i)  $9^0$

.....

(ii)  $169^{\frac{1}{2}}$

.....

**(2)**

(b) Work out  $64^{\frac{2}{3}}$

.....

**(2)**

**(Total 4 marks)**

7. (a) Find the value of  $36^{\frac{1}{2}}$

.....

**(1)**

(b) Find the value of  $8^{-\frac{2}{3}}$

.....

**(2)**

**(Total 3 marks)**

8. Work out

(i)  $4^0$

.....

(ii)  $4^{-2}$

.....

(iii)  $16^{\frac{3}{2}}$

.....

**(Total 3 marks)**

9. Write down the value of

(a)  $25^{\frac{1}{2}}$

.....

**(1)**

(b)  $9^0$

.....

**(1)**

**(Total 2 marks)**

10. (a) Evaluate

(i)  $3^{-2}$

.....

(ii)  $36^{\frac{1}{2}}$

.....

(iii)  $27^{\frac{2}{3}}$

.....

(iv)  $\left(\frac{16}{81}\right)^{-\frac{3}{4}}$

.....

**(5)**



11. (a) Find the value of

(i)  $64^\circ$

.....

(ii)  $64^{\frac{1}{2}}$

.....

(iii)  $64^{-\frac{2}{3}}$

.....

**(4)**

(b)  $3 \times \sqrt{27} = 3^n$   
Find the value of  $n$ .

$n = \dots\dots\dots$

**(2)**

**(Total 6 marks)**

12. (a) Work out  $3^6 \div 3^{-7}$

.....

**(1)**

(b) Write down the value of  $36^{\frac{1}{2}}$

.....

**(1)**

(c)  $3^n = \frac{1}{9}$

Find the value of  $n$ .

$n = \dots\dots\dots$

**(1)**

**(Total 3 marks)**

13. (a) Simplify

(i)  $(3x^2y)^3$

.....

(ii)  $(2t^{-3})^{-2}$

.....

**(4)**

14.  $x = 2^p, \quad y = 2^q$

(a) Express in terms of  $x$  and/or  $y$ ,

(i)  $2^{p+q}$

.....

(ii)  $2^{2q}$

.....

(iii)  $2^{p-1}$

.....

**(3)**

$$xy = 32$$

and

$$2xy^2 = 32$$

(b) Find the value of  $p$  and the value of  $q$ .

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots$$

**(2)**

**(Total 5 marks)**

16. (a) Write down the value of  $8^{\frac{1}{3}}$

.....

(1)

$8\sqrt{8}$  be written in the form  $8^k$

(b) Find the value of  $k$ .

$k =$  .....

(1)

$8\sqrt{8}$  can also be expressed in the form  $m\sqrt{2}$  where  $m$  is a positive integer.

(c) Express  $8\sqrt{8}$  in the form  $m\sqrt{2}$

.....

(2)

(d) Rationalise the denominator of  $\frac{1}{8\sqrt{8}}$

Give your answer in the form  $\frac{\sqrt{2}}{p}$  where  $p$  is a positive integer.

.....

(2)

(Total 6 marks)

# 95 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# SURDS

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

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Calculators may be used.

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### Advice

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Check your answers if you have time at the end.

1. Express  $\frac{6}{\sqrt{2}}$  in the form  $a\sqrt{b}$ , where  $a$  and  $b$  are positive integers.

.....  
**(Total 2 marks)**

2. Rationalise

$$\frac{1}{\sqrt{7}}$$

.....  
**(Total 2 marks)**

3. Expand and simplify

$$(\sqrt{3} + \sqrt{15})^2$$

Give your answer in the form  $n + m\sqrt{5}$ , where  $n$  and  $m$  are integers.

.....  
**(Total 4 marks)**

4. Expand and simplify  $(\sqrt{3} - \sqrt{2})(\sqrt{3} + \sqrt{2})$

.....  
**(Total 2 marks)**

5. Rationalise the denominator of  $\frac{1}{\sqrt{3}}$

.....

**(Total 2 marks)**

6. Expand  $(2 + \sqrt{3})(1 + \sqrt{3})$

Give your answer in the form  $a + b\sqrt{3}$  where  $a$  and  $b$  are integers.

.....

**(Total 3 marks)**



7. Write  $\frac{\sqrt{18} + 10}{\sqrt{2}}$  in the form  $p + q\sqrt{2}$ , where  $p$  and  $q$  are integers.

$p = \dots\dots\dots$

$q = \dots\dots\dots$

**(Total 4 marks)**

8. Expand and simplify

$$(2 + \sqrt{3})(7 - \sqrt{3})$$

Give your answer in the form  $a + b\sqrt{3}$ , where  $a$  and  $b$  are integers.

.....

**(Total 3 marks)**

9. Work out

$$\frac{(5 + \sqrt{3})(5 - \sqrt{3})}{\sqrt{22}}$$

Give your answer in its simplest form.

.....  
**(Total 3 marks)**

10. (a) Rationalise the denominator of  $\frac{5}{\sqrt{2}}$

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

(b) Expand and simplify  $(2 + \sqrt{3})^2 - (2 - \sqrt{3})^2$

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

**(Total 4 marks)**

# 96 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# DIRECT & INVERSE PROPORTIONALITY

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil

### Instructions

---

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Answer all questions.

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### Advice

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Keep an eye on the time.

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Check your answers if you have time at the end.

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.  
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

..... grams  
**(Total 2 marks)**

2. A ball falls vertically after being dropped.  
The ball falls a distance  $d$  metres in a time of  $t$  seconds.  
 $d$  is directly proportional to the square of  $t$ .

The ball falls 20 metres in a time of 2 seconds.

- (a) Find a formula for  $d$  in terms of  $t$ .

$d = \dots\dots\dots$  **(3)**

- (b) Calculate the distance the ball falls in 3 seconds.

..... m **(1)**

- (c) Calculate the time the ball takes to fall 605 m.

..... seconds **(3)**  
**(Total 7 marks)**

3. The time,  $T$  seconds, it takes a water heater to boil some water is directly proportional to the mass of water,  $m$  kg, in the water heater.

When  $m = 250$ ,  $T = 600$

- (a) Find  $T$  when  $m = 400$

$$T = \dots\dots\dots \quad (3)$$

The time,  $T$  seconds, it takes a water heater to boil a constant mass of water is inversely proportional to the power,  $P$  watts, of the water heater.

When  $P = 1400$ ,  $T = 360$

- (b) Find the value of  $T$  when  $P = 900$

$$T = \dots\dots\dots \quad (3)$$

**(Total 6 marks)**

4.  $D$  is proportional to  $S^2$ .

$D = 900$  when  $S = 20$

Calculate the value of  $D$  when  $S = 25$

$$D = \dots\dots\dots \quad (Total\ 4\ marks)$$

5. In a spring, the tension ( $T$  newtons) is directly proportional to its extension ( $x$  cm).

When the tension is 150 newtons, the extension is 6 cm.

(a) Find a formula for  $T$  in terms of  $x$ .

$$T = \dots\dots\dots \quad (3)$$

(b) Calculate the tension, in newtons, when the extension is 15 cm.

$$\dots\dots\dots \text{ newtons} \quad (1)$$

(c) Calculate the extension, in cm, when the tension is 600 newtons.

$$\dots\dots\dots \text{ cm} \quad (1)$$

**(Total 5 marks)**

6.  $d$  is directly proportional to the square of  $t$ .

$d = 80$  when  $t = 4$

(a) Express  $d$  in terms of  $t$ .

..... (3)

(b) Work out the value of  $d$  when  $t = 7$

$d =$  ..... (1)

(c) Work out the positive value of  $t$  when  $d = 45$

$t =$  ..... (2)

**(Total 6 marks)**

7. The distance,  $D$ , travelled by a particle is directly proportional to the square of the time,  $t$ , taken.

When  $t = 40$ ,  $D = 30$

- (a) Find a formula for  $D$  in terms of  $t$ .

$$D = \dots\dots\dots$$

- (b) Calculate the value of  $D$  when  $t = 64$

.....

**(1)**

- (c) Calculate the value of  $t$  when  $D = 12$   
Give your answer correct to 3 significant figures.

.....

**(2)**

**(Total 6 marks)**



8.  $M$  is directly proportional to  $L^3$ .

When  $L = 2$ ,  $M = 160$

Find the value of  $M$  when  $L = 3$

.....

**(Total 4 marks)**

9.  $p$  is inversely proportional to  $m$ .

$p = 48$  when  $m = 9$

Calculate the value of  $p$  when  $m = 12$

.....

**(Total 2 marks)**

10.  $r$  is inversely proportional to  $t$ .  
 $r = 12$  when  $t = 0.2$

Calculate the value of  $r$  when  $t = 4$ .

.....  
**(Total 3 marks)**

11.  $f$  is inversely proportional to  $d$ .

When  $d = 50$ ,  $f = 256$

Find the value of  $f$  when  $d = 80$

$f =$  .....  
**(Total 3 marks)**

12.  $y$  is inversely proportional to  $x^2$ .

Given that  $y = 2.5$  when  $x = 24$ ,

(i) find an expression for  $y$  in terms of  $x$

$y = \dots\dots\dots$

(ii) find the value of  $y$  when  $x = 20$

$y = \dots\dots\dots$

(iii) find a value of  $x$  when  $y = 1.6$

$x = \dots\dots\dots$

**(Total 6 marks)**

13.  $P$  is inversely proportional to  $d^2$ .

$P = 10\,000$  when  $d = 0.4$

Find the value of  $P$  when  $d = 0.8$

$P = \dots\dots\dots$

**(Total 3 marks)**

14. The shutter speed,  $S$ , of a camera varies inversely as the square of the aperture setting,  $f$ .

When  $f = 8$ ,  $S = 125$

(a) Find a formula for  $S$  in terms of  $f$ .

.....

**(3)**

(b) Hence, or otherwise, calculate the value of  $S$  when  $f = 4$

$S =$  .....

**(1)**

**(Total 4 marks)**

15.  $q$  is inversely proportional to the square of  $t$ .

When  $t = 4$ ,  $q = 8.5$

(a) Find a formula for  $q$  in terms of  $t$ .

$q = \dots\dots\dots$

**(3)**

(b) Calculate the value of  $q$  when  $t = 5$

$\dots\dots\dots$

**(1)**

**(Total 4 marks)**

16.  $P$  is inversely proportional to  $V$ .

When  $V = 8$ ,  $P = 5$

(a) Find a formula for  $P$  in terms of  $V$ .

$P = \dots\dots\dots$   
**(3)**

(b) Calculate the value of  $P$  when  $V = 2$

$\dots\dots\dots$   
**(1)**

**(Total 4 marks)**

17. The force,  $F$ , between two magnets is inversely proportional to the square of the distance,  $x$ , between them.

When  $x = 3$ ,  $F = 4$ .

(a) Calculate  $F$  when  $x = 2$ .

$\dots\dots\dots$   
**(4)**

(b) Calculate  $x$  when  $F = 64$ .

$\dots\dots\dots$   
**(2)**

**(Total 6 marks)**

# 97 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# UPPER AND LOWER BOUNDS

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

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Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

### Information

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The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

---

Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. The weight of a bag of potatoes is 25 kg, correct to the nearest kg.

(a) Write down the smallest possible weight of the bag of potatoes.

..... kg

(1)

(b) Write down the largest possible weight of the bag of potatoes.

..... kg

(1)

**(Total 2 marks)**

2. The length of a line is 63 centimetres, correct to the nearest centimetre.

(a) Write down the **least** possible length of the line.

..... centimetres

(1)

(b) Write down the **greatest** possible length of the line.

..... centimetres

(1)

**(Total 2 marks)**



3. A field is in the shape of a rectangle.

The length of the field is 340 m, to the nearest metre.

The width of the field is 117 m, to the nearest metre.

Calculate the upper bound for the perimeter of the field.

..... m

**(Total 2 marks)**

4. The length of a rectangle is 30 cm, correct to 2 significant figures.

The width of a rectangle is 18 cm, correct to 2 significant figures.

(a) Write down the upper bound of the width.

(1)

..... cm

(b) Calculate the upper bound for the area of the rectangle.

(2)

..... cm

**(Total 3 marks)**

5.

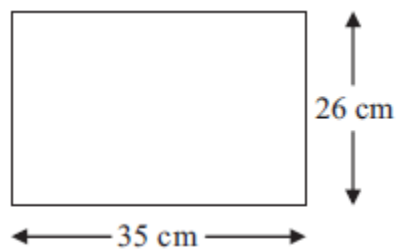


Diagram **NOT**  
accurately drawn

The length of the rectangle is 35 cm correct to the nearest cm.  
The width of the rectangle is 26 cm correct to the nearest cm.

Calculate the upper bound for the area of the rectangle.  
Write down all the figures on your calculator display.

.....cm<sup>2</sup>

**(Total 3 marks)**

6. A field is in the shape of a rectangle.  
The width of the field is 28 metres, measured to the nearest metre.

(a) Work out the upper bound of the width of the field.

..... metres  
**(1)**

The length of the field is 145 metres, measured to the nearest 5 metres.

(b) Work out the upper bound for the perimeter of the field.

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

**(Total 4 marks)**

7. Steve measured the length and the width of a rectangle.  
He measured the length to be 645 mm correct to the nearest 5 mm.  
He measured the width to be 400 mm correct to the nearest 5 mm.

Calculate the lower bound for the area of this rectangle.  
Give your answer correct to 3 significant figures.

..... mm<sup>2</sup>  
**(Total 3 marks)**

8. The average fuel consumption ( $c$ ) of a car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where  $d$  is the distance travelled, in kilometres, and  $f$  is the fuel used, in litres.

$d = 163$  correct to 3 significant figures.

$f = 45.3$  correct to 3 significant figures.

By considering bounds, work out the value of  $c$  to a suitable degree of accuracy. You must show **all** of your working **and** give a reason for your final answer.

$c = \dots\dots\dots$

**(Total 5 marks)**

9. The voltage  $V$  of an electronic circuit is given by the formula

$$V = IR$$

where  $I$  is the current in amps  
and  $R$  is the resistance in ohms.

Given that  $V = 218$  correct to 3 significant figures,  
 $R = 12.6$  correct to 3 significant figures,

calculate the lower bound of  $I$ .

.....  
**(Total 3 marks)**

\*10. 
$$m = \frac{\sqrt{s}}{t}$$

$s = 3.47$  correct to 2 decimal places.

$t = 8.132$  correct to 3 decimal places.

By considering bounds, work out the value of  $m$  to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

**(Total 5 marks)**

# 98 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# QUADRATIC FORMULA

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

---

Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

### Information

---

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

---

Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. Solve  $3x^2 + 7x - 13 = 0$   
Give your solutions correct to 2 decimal places.

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$

---

**(3 marks)**

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$

---

**(3 marks)**



3. Solve  $x^2 + 3x - 5 = 0$   
Give your solutions correct to 4 significant figures.

.....

---

**(3 marks)**

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$

---

**(3 marks)**

5. (a) Solve  $x^2 - 2x - 1 = 0$

Give your solutions correct to 2 decimal places.

.....

**(3)**

(b) Write down the solutions, correct to 2 decimal places, of  $3x^2 - 6x - 3 = 0$

.....

**(2)**

---

**(5 marks)**

6. (a) Solve  $x^2 + x + 11 = 14$   
Give your solutions correct to 3 significant figures.

.....

(3)

$$y = x^2 + x + 11$$

The value of  $y$  is a prime number when  $x = 0, 1, 2$  and  $3$

The following statement is **not** true.

' $y = x^2 + x + 11$  is **always** a prime number when  $x$  is an integer'

- (b) Show that the statement is not true.

.....  
.....

(2)

---

**(5 marks)**

7. The diagram below shows a 6-sided shape.  
 All the corners are right angles.  
 All the measurements are given in centimetres.

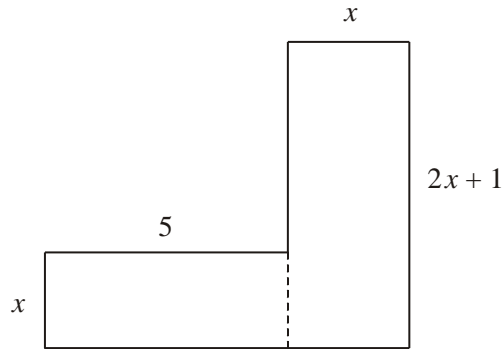


Diagram **NOT** accurately drawn

The area of the shape is  $95 \text{ cm}^2$ .

(a) Show that  $2x^2 + 6x - 95 = 0$

(3)

- (b) Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$x = \dots\dots\dots$  Or  $x = \dots\dots\dots$

(3)

**(6 marks)**

8. The diagram below shows a 6-sided shape.  
 All the corners are right angles.  
 All measurements are given in centimetres.

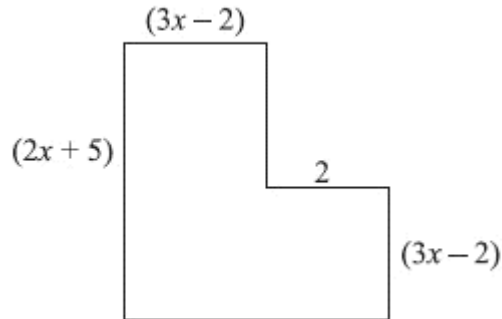


Diagram **NOT**  
 accurately drawn

The area of the shape is  $25 \text{ cm}^2$ .

(a) Show that  $6x^2 + 17x - 39 = 0$

**(3)**

(b) (i) Solve the equation

$$6x^2 + 17x - 39 = 0$$

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots$$

(ii) Hence work out the length of the longest side of the shape.

.....cm

**(4)**

**(7 marks)**

9. The diagram shows a 6-sided shape.  
 All the corners are right angles.  
 All the measurements are given in centimetres.

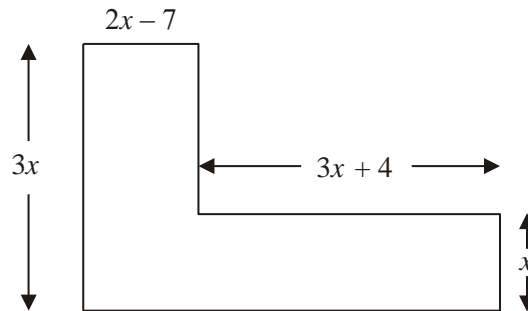


Diagram NOT accurately drawn

The area of the shape is  $85 \text{ cm}^2$ .

(a) Show that  $9x^2 - 17x - 85 = 0$

(3)

(b) (i) Solve  $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$

(ii) Hence, work out the length of the shortest side of the 6-sided shape.

$\dots\dots\dots \text{ cm}$

(4)

**(7 marks)**

# 99 Edexcel GCSE

## Mathematics (Linear) – 1MA0

# ALGEBRAIC FRACTIONS

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil



### Instructions

---

Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

### Information

---

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

---

Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. Simplify fully  $\frac{x^2 + x - 6}{x^2 - 7x + 10}$

.....  
**(Total 3 marks)**



2. Simplify fully  $\frac{x^2 - 8x + 15}{2x^2 - 7x - 15}$

.....  
**(Total 3 marks)**

3. Simplify  $\frac{p^2 - 9}{2p + 6}$

.....  
**(Total 3 marks)**

4. Simplify fully  $\frac{6x^2 + 3x}{4x^2 - 1}$

.....  
**(Total 3 marks)**

5. (a) Simplify  $\frac{2x + 4}{x^2 + 4x + 4}$

.....

**(3)**

(b) Write  $\frac{1}{x+4} + \frac{2}{x-4}$  as a single fraction in its simplest form.

**(3)**

**(Total 6 marks)**

6. Simplify  $\frac{x^2 + 2x + 1}{x^2 + 3x + 2}$

.....  
**(Total 3 marks)**

7. Simplify fully  $\frac{x+3}{4} + \frac{x-5}{3}$

.....  
**(Total 3 marks)**

8. Simplify fully  $\frac{2x^2 + 3x + 1}{x^2 - 3x - 4}$

.....  
**(Total 3 marks)**

# 100 Edexcel GCSE Mathematics (Linear) – 1MA0

# MORE DIFFICULT REARRANGING FORMULAE

## Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.

Tracing paper may be used.

## Items included with question papers

Nil

## Instructions

---

Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

## Information

---

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

## Advice

---

Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1. Rearrange  $a(q - c) = d$  to make  $q$  the subject.

$$q = \dots\dots\dots$$

**(3)**

**(Total 5 marks)**

2. (a) Make  $n$  the subject of the formula  $m = 5n - 21$

$$n = \dots\dots\dots$$

**(2)**



(b) Make  $p$  the subject of the formula  $4(p - 2q) = 3p + 2$

$$p = \dots\dots\dots$$

**(3)**

**(Total 5 marks)**

**3.**

$$P = \pi r + 2r + 2a$$

Make  $r$  the subject of the formula

$$r = \dots\dots\dots$$

**(Total 3 marks)**

4. Make  $a$  the subject of the formula

$$2(3a - c) = 5c + 1$$

.....  
(Total 3 marks)

5. Make  $m$  the subject of the formula  $2(2p + m) = 3 - 5m$

$m =$  .....  
(Total 3 marks)

6. Make  $x$  the subject of

$$5(x - 3) = y(4 - 3x)$$

$$x = \dots\dots\dots$$

**(Total 4 marks)**

7. When you are  $h$  feet above sea level, you can see  $d$  miles to the horizon, where

$$d = \sqrt{\frac{3h}{2}}$$

Make  $h$  the subject of the formula

$$h = \dots\dots\dots$$

**(Total 4 marks)**

8.  $y = \frac{2pt}{p-t}$

Rearrange the formula to make  $t$  the subject.

$t = \dots\dots\dots$

**(Total 4 marks)**

9. Make  $b$  the subject of the formula  $a = \frac{2-7b}{b-5}$

$\dots\dots\dots$

**(Total 4 marks)**

10. 
$$P = \frac{n^2 + a}{n + a}$$

Rearrange the formula to make  $a$  the subject.

$a = \dots\dots\dots$

**(Total 4 marks)**

11. 
$$\frac{x}{x + c} = \frac{p}{q}$$

Make  $x$  the subject of the formula.

$x = \dots\dots\dots$

**(Total 4 marks)**

12. Rearrange  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make  $u$  the subject of the formula.

Give your answer in its simplest form.

.....  
**(Total 5 marks)**