Write your name here

Surname: SOLUTIONS | Other names: WRITTEN

Pearson Edexcel GCSE

Centre Number | Candidate Number

Mathematics A

Paper 1 (Non-Calculator)

Higher Tier

Wednesday 6 November 2013 – Morning
Time: 1 hour 45 minutes

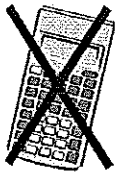
Paper Reference
1MA0/1H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

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 must not be used.**



Information

- The total mark for this paper is 100
- 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.

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.

Turn over ▶

P43383A

4/4/5/2/2/2/2/

P 4 3 3 8 3 A 0 1 2 8

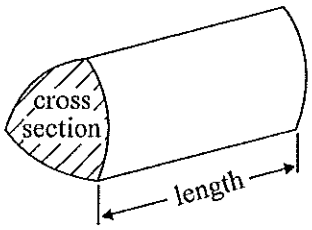
PEARSON

GCSE Mathematics 1MA0

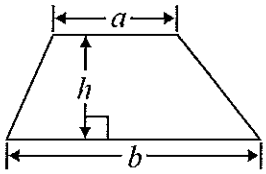
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

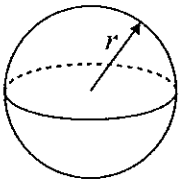


Area of trapezium $= \frac{1}{2}(a + b)h$



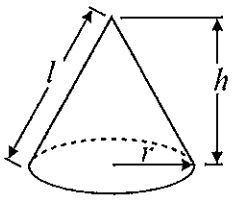
Volume of sphere $= \frac{4}{3}\pi r^3$

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

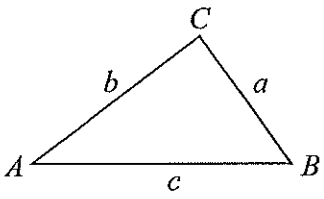


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



In any triangle ABC



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 This is a list of ingredients for making chicken soup for 4 people.

Ingredients for **4** people	
60 g	butter
300 g	chicken
150 m*l*	cream
1	onion
640 m*l*	chicken stock

Bill is going to make chicken soup for 6 people.

Work out the amount of each ingredient he needs.

(×1·5)

2 people

60 ÷ 2 = 30
300 ÷ 2 = 150
150 ÷ 2 = 75
1 ÷ 2 = 0·5
640 ÷ 2 = 320

30 + 60 = 90
150 + 300 = 450
75 + 150 = 225
0·5 + 1 = 1·5
320 + 640 = 960

6 people

90 ..... g butter

450 ..... g chicken

225 ..... m*l* cream

1·5 ..... onion

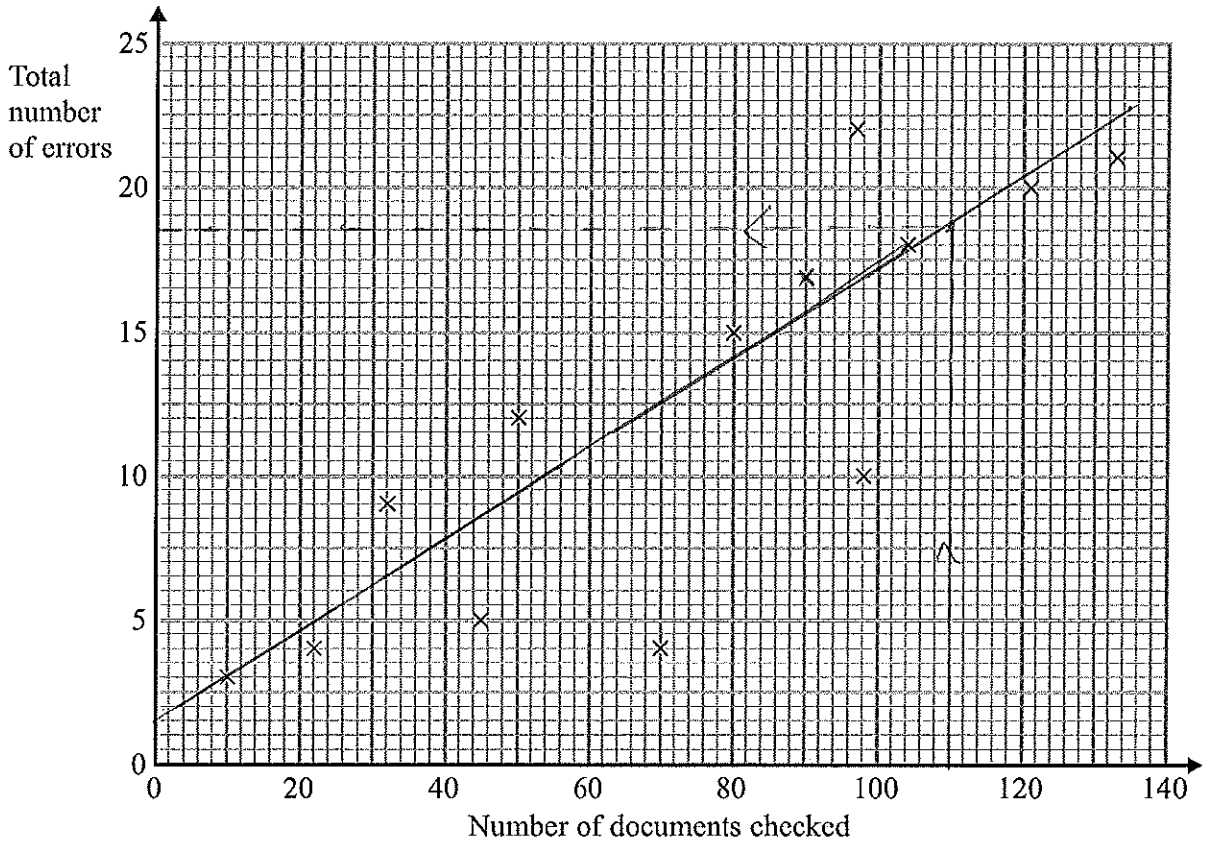
960 ..... m*l* chicken stock

(Total for Question 1 is 3 marks)

2 A publisher checks documents for errors.

He records the number of documents that are checked each day.
He also records the total number of errors in the documents each day.

The scatter graph shows this information.



On another day 90 documents are checked.
There is a total of 17 errors.

(a) Show this information on the scatter graph.

(1)

(b) Describe the correlation between the number of documents checked and the total number of errors.

positive

(1)

One day 110 documents are checked.

(c) Estimate the total number of errors in these documents.

18.5

(2)

(Total for Question 2 is 4 marks)

3 Here is a triangular prism.

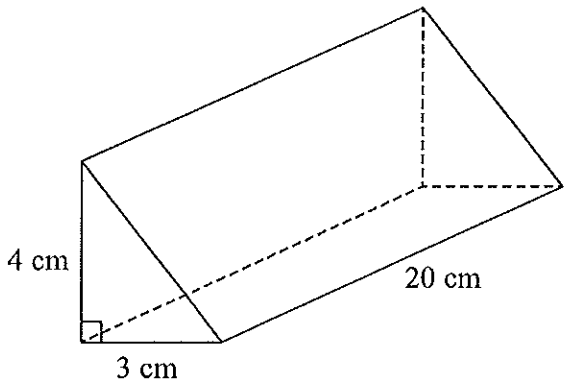


Diagram **NOT** accurately drawn

Work out the volume of this triangular prism.

volume = area of triangle × length

$= \frac{4 \times 3}{2} \times 20$

$= 6 \times 20$

$= 120$

120 cm^3

(Total for Question 3 is 4 marks)

4 (a) Simplify $4y + 2x - 3 + 3x + 8$

$2x + 3x = 5x$

$-3 + 8 = +5$

$4y + 5x + 5$

(2)

(b) Factorise fully $9x^2 - 6xy$

$3x(3x - 2y)$

(2)

(c) Expand $4(x + 2)$

$4x + 8$

(1)

(d) Expand and simplify $(x - 5)(x + 3)$

$x^2 + 3x - 5x - 15$

$x^2 - 2x - 15$

(2)

(Total for Question 4 is 7 marks)

5 Jane has a packet of seeds.
The probability that a seed will grow is 0.75

(a) What is the probability that a seed will **not** grow?

$1 - 0.75$

0.25

(1)

Jane plants 200 of these seeds.

(b) Estimate the number of the seeds that will grow.

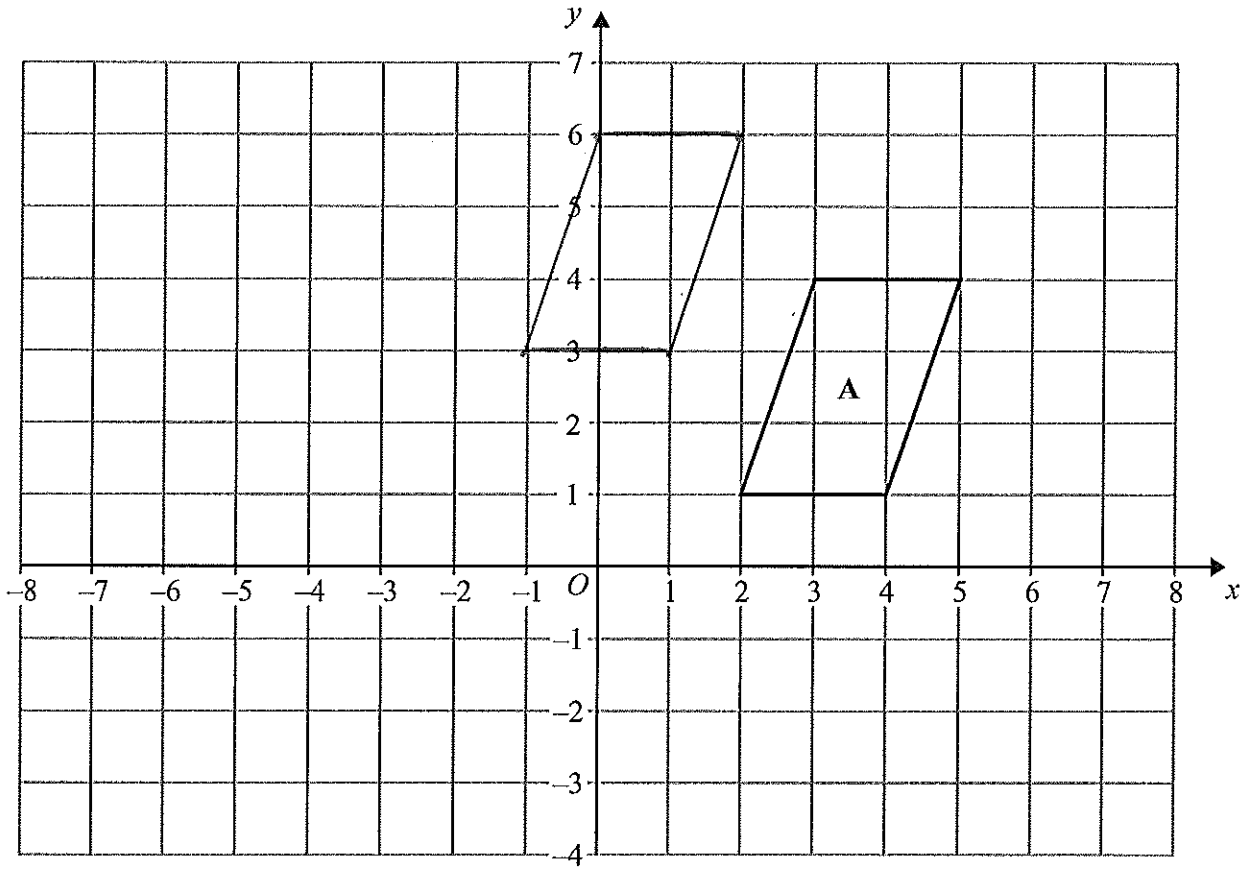
0.75×200

150

(2)

(Total for Question 5 is 3 marks)

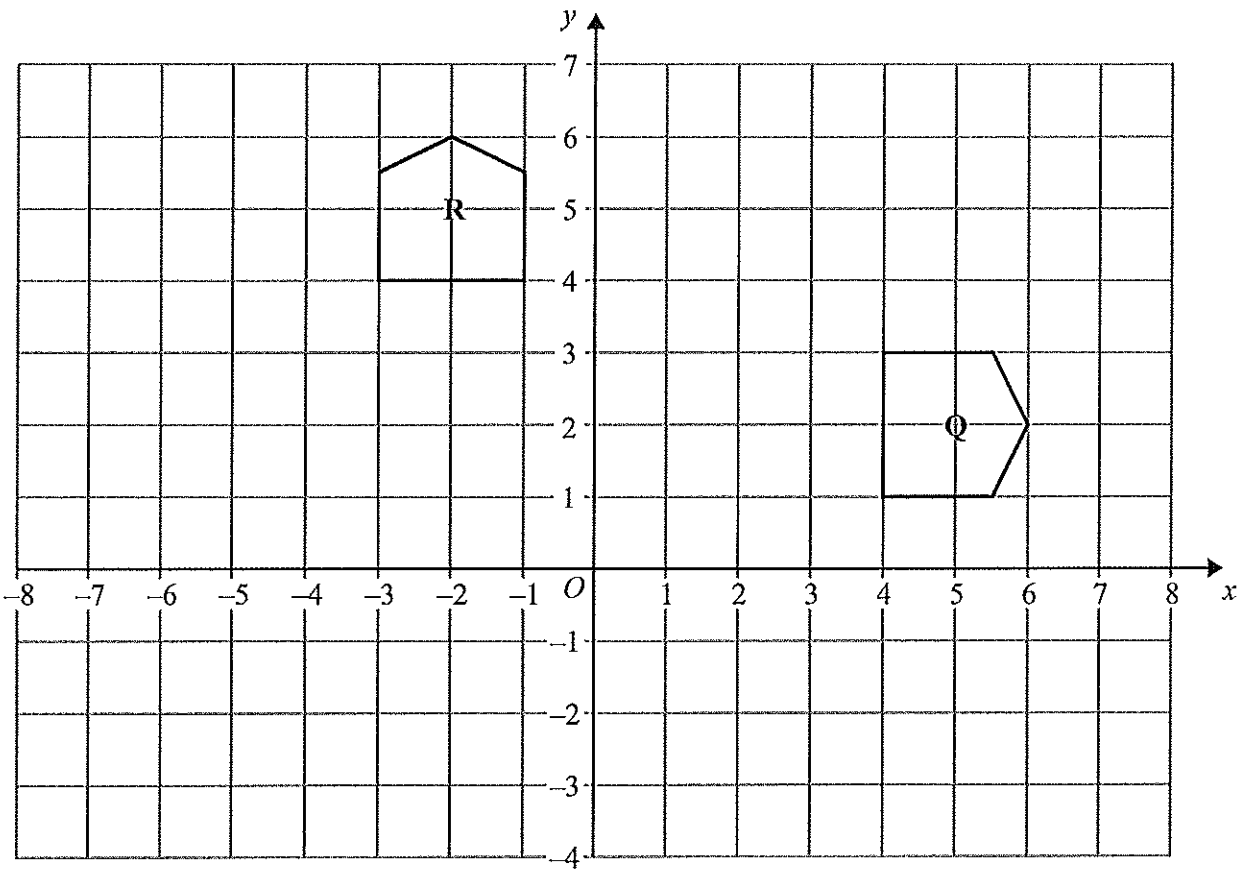
6



(a) Translate shape **A** by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$.

3 left
2 up

(1)



(b) Describe fully the single transformation that maps shape **Q** onto shape **R**.

Rotation, 90° anti-clockwise, centre (0,0)

(3)

(Total for Question 6 is 4 marks)

7 Rita is going to make some cheeseburgers for a party.
She buys some packets of cheese slices and some boxes of burgers.

There are 20 cheese slices in each packet.
There are 12 burgers in each box.

Rita buys exactly the same number of cheese slices and burgers.

(i) How many packets of cheese slices and how many boxes of burgers does she buy?

cheese	burger
20	12
40	24
(60)	36
	48
	(60)

3 packets of cheese slices

5 boxes of burgers

Rita wants to put one cheese slice and one burger into each bread roll.
She wants to use all the cheese slices and all the burgers.

(ii) How many bread rolls does Rita need?

60 bread rolls

(Total for Question 7 is 4 marks)

8 ABC is a triangle.

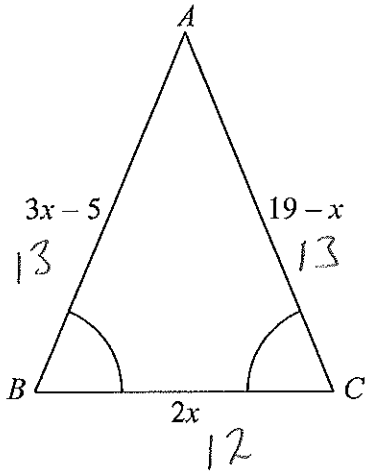


Diagram **NOT** accurately drawn

Angle ABC = angle BCA.

The length of side AB is $(3x - 5)$ cm.
The length of side AC is $(19 - x)$ cm.
The length of side BC is $2x$ cm.

Work out the perimeter of the triangle.
Give your answer as a number of centimetres.

$3x - 5 = 19 - x \quad (+x)$

$4x - 5 = 19 \quad (+5)$

$4x = 24 \quad (\div 4)$

$x = 6$

perimeter $= 13 + 13 + 12$

$= 38$

38 cm

(Total for Question 8 is 5 marks)

9 Julia is investigating how much exercise people do in a week.

She uses these two questions in a questionnaire.

Question 1 What is your age?

☐ Under 15 ☐ 15 to 25 ☐ 25 to 40 ☐ over 40

Question 2 How much exercise do you do?

☐ A bit ☐ Some ☐ A lot

(a) Write down **one** thing wrong with each of these questions.

Question 1

overlaps between the boxes

Question 2

no time scale (in a week)

(could have numbers are more specific than words)

(2)

Julia wants to know how much time people spend exercising.

(b) Design a question Julia could use in her questionnaire.

How many hours exercise do you do in a week?

☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-6 ☐ 7 or more

(2)

(Total for Question 9 is 4 marks)

*10 The diagram shows the floor of a village hall.

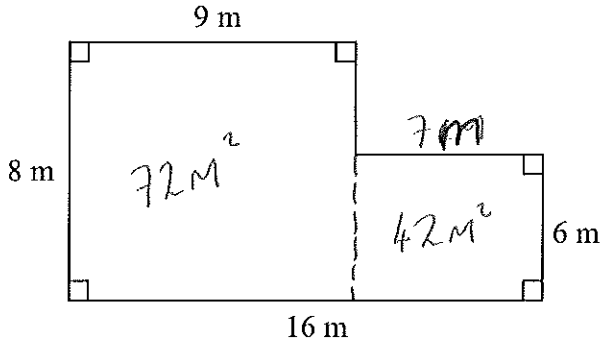


Diagram **NOT** accurately drawn

The caretaker needs to polish the floor.

One tin of polish normally costs £19
One tin of polish covers 12 m² of floor.

There is a discount of 30% off the cost of the polish.

The caretaker has £130

Has the caretaker got enough money to buy the polish for the floor?
You must show all your working.

Total area = 72 + 42
= 114m²

tins of polish = $\frac{114}{12}$ = 9.5

need 10 tins of polish, £19 each

19 x 10 = £190

30% discount :-

10% = £19

30% = £57

Total cost = 190 - 57
= £133

He has £130 so not enough money

(Total for Question 10 is 5 marks)

11 Each day a company posts some small letters and some large letters.

The company posts all the letters by first class post.

The tables show information about the cost of sending a small letter by first class post and the cost of sending a large letter by first class post.

Small Letter

Weight	First Class Post
0–100 g	60p

Large Letter

Weight	First Class Post
0–100 g	£1.00
101–250 g	£1.50
251–500 g	£1.70
501–750 g	£2.50

One day the company wants to post 200 letters.

The ratio of the number of small letters to the number of large letters is 3 : 2

70% of the large letters weigh 0–100 g.

The rest of the large letters weigh 101–250 g.

Work out the total cost of posting the 200 letters by first class post.

S : L
3 : 2

5 parts = 200
1 part = 40

120 small letters
80 large letters

cost of small letters :–
120 x 60p = 7200p
= £72.

cost of large letters :–
70% of 80 = 56
56 x £1.00 = £56
30% = 24
24 x £1.50 = £36
Total large = £92

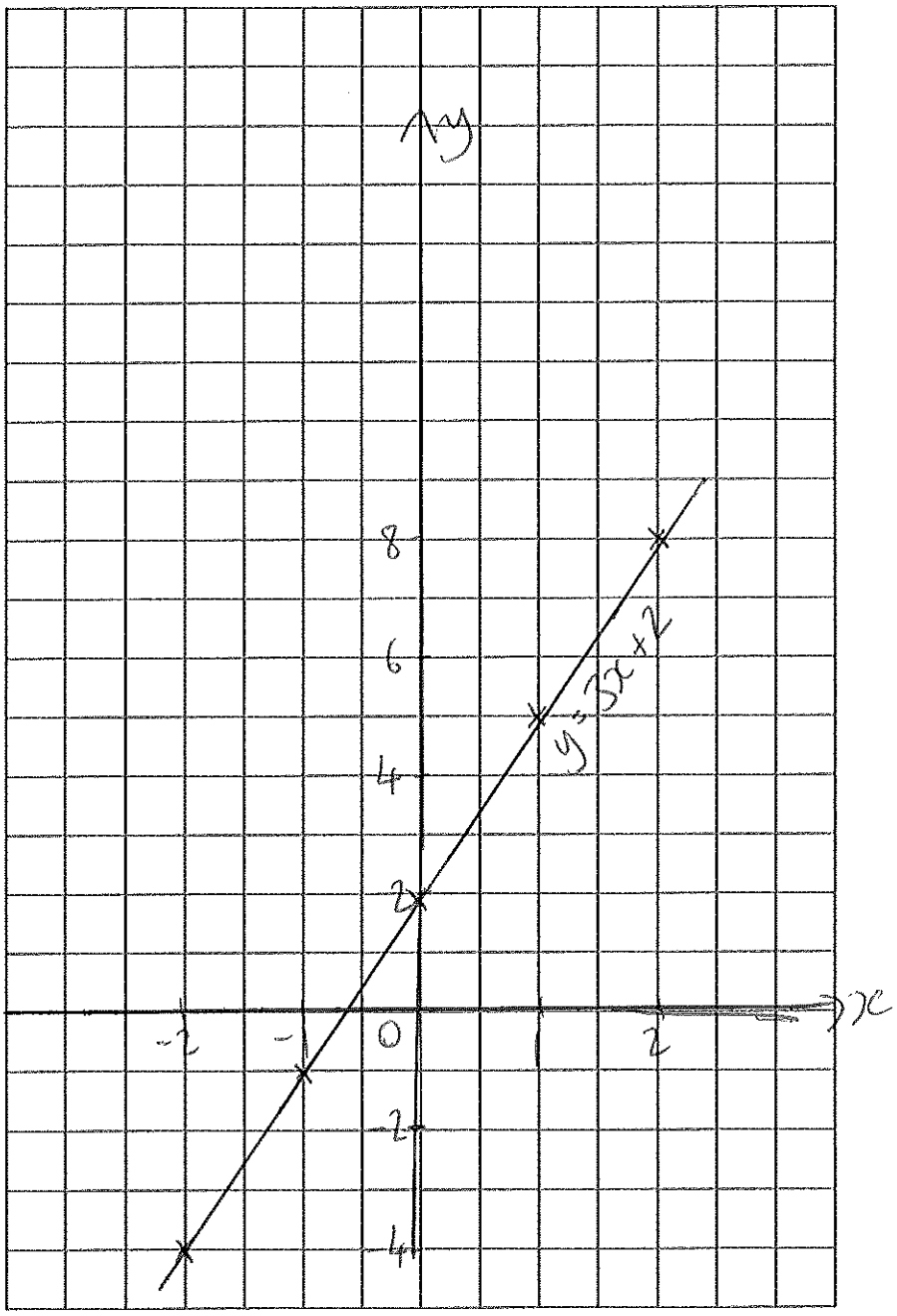
Total cost = £72 + £92
= £164

£ 164

(Total for Question 11 is 5 marks)

12 On the grid, draw the graph of $y = 3x + 2$ for values of x from -2 to 2

x	-2	-1	0	1	2
y	-4	-1	2	5	8



(Total for Question 12 is 4 marks)

13 Hertford Juniors is a basketball team.

At the end of 10 games, their mean score is 35 points per game.
At the end of 11 games, their mean score has gone down to 33 points per game.

How many points did the team score in the 11th game?

mean = total / no of data

10 games: $35 = \frac{\text{total}}{10}$, total = 350

11 games: $33 = \frac{\text{total}}{11}$, total = 33 × 11 = 363

11th game = 363 − 350 = 13

13

(Total for Question 13 is 3 marks)

14 (a) Write down the reciprocal of 5

1/5

(1)

(b) Evaluate 3^{-2} = $\frac{1}{3^2}$

1/9

(1)

(c) Calculate $9 \times 10^4 \times 3 \times 10^3$
Give your answer in standard form.

$9 \times 3 = 27$
$10^4 \times 10^3 = 10^7$
$27 \times 10^7 = 2.7 \times 10^8$

OR

$90000 \times 3000 = 270000000 = 2.7 \times 10^8$

2.7×10^8

(2)

(Total for Question 14 is 4 marks)

15 Solve the simultaneous equations

$3x + 4y = 5$ (×3) ①
$2x - 3y = 9$ (×4) ②

Make the y's the same

$9x + 12y = 15$
$+ \quad 8x - 12y = 36$

DIFFERENT SIGNS = ADD

$17x = 51$

$x = 3$

sub $x = 3$ into ① to find y:-

$9 + 4y = 5$ (−9)

$4y = -4$ (÷4)

$y = -1$

check in ②

$6 - 3(-1) = 9$

$6 + 3 = 9$ ✓

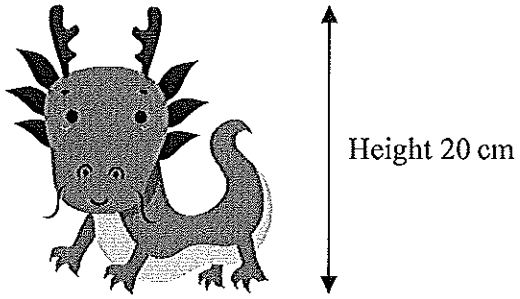
$x =$ 3

$y =$ −1

(Total for Question 15 is 4 marks)

16 A company makes monsters.

The company makes small monsters with a height of 20 cm.



A small monster has a surface area of 300 cm^2.

The company also makes large monsters with a height of 120 cm.

A small monster and a large monster are mathematically similar.

Work out the surface area of a large monster.

length scale factor = $\frac{120}{20} = 6$

area scale factor = $6^2 = 36$

large monster S.A. = 300×36

$= 10800$

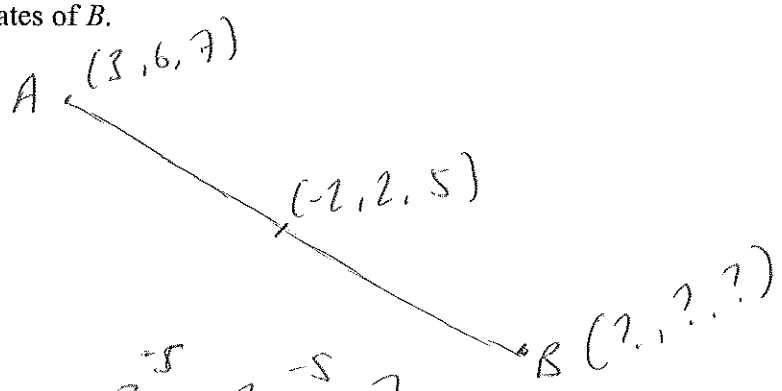
10,800 cm^2

(Total for Question 16 is 3 marks)

17 AB is a line segment.

A is the point with coordinates (3, 6, 7).
The midpoint of AB has coordinates (–2, 2, 5).

Find the coordinates of B.



x value → 3 →(-5) -2 →(-5) -7

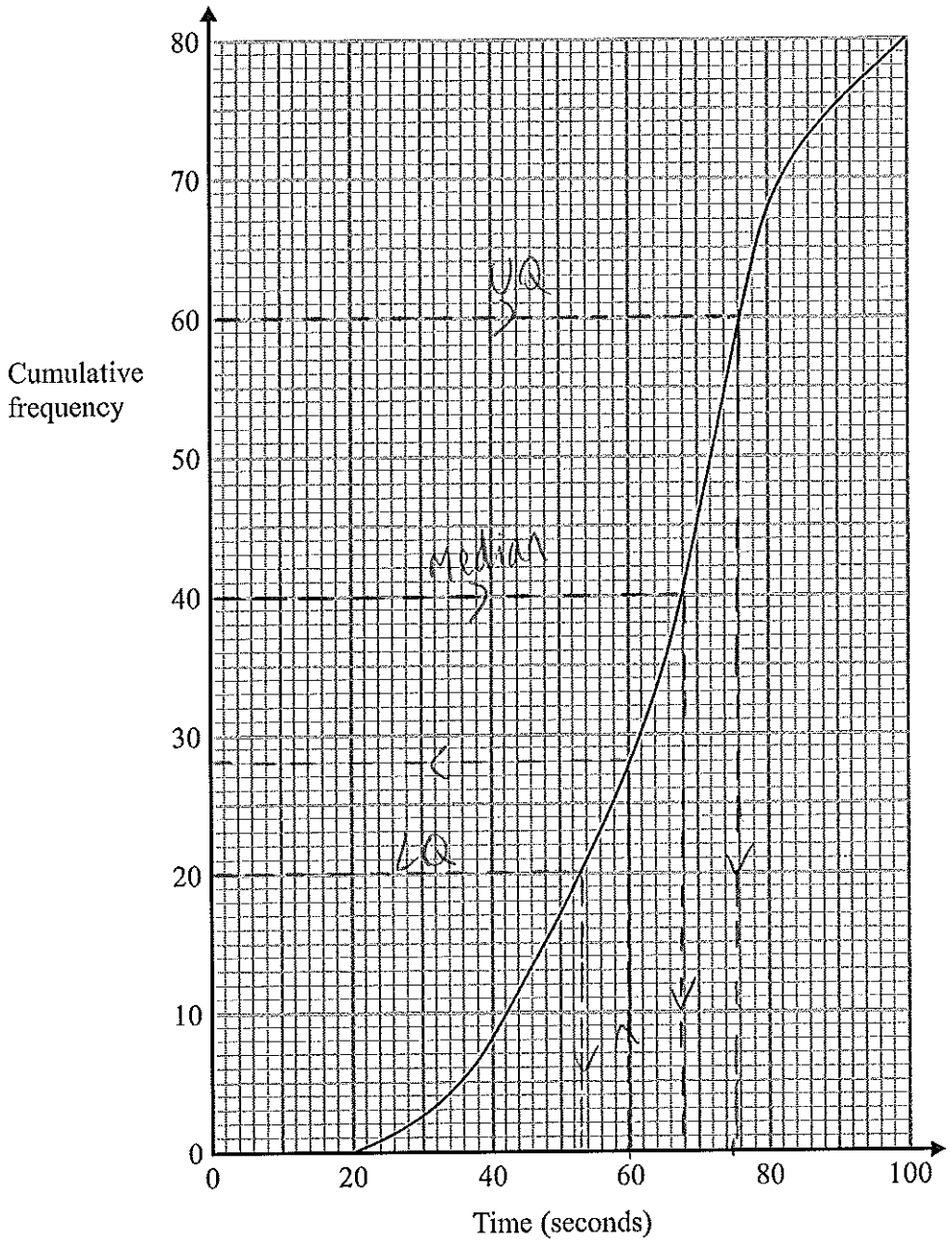
y value → 6 →(-4) 2 →(-4) -2

z value → 7 →(-2) 5 →(-2) 3

(-7, -2, 3)

(Total for Question 17 is 2 marks)

18 The cumulative frequency graph shows information about the times 80 swimmers take to swim 50 metres.



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

68 seconds

(1)

A swimmer has to swim 50 metres in 60 seconds or less to qualify for the swimming team.

The team captain says,

"More than 25% of swimmers have qualified for the swimming team."

*(b) Is the team captain right?

You must show how you got your answer.

28 swimmers swam in 60 seconds or less

25% of 80 = 20

28 > 20, so more than 25% have qualified

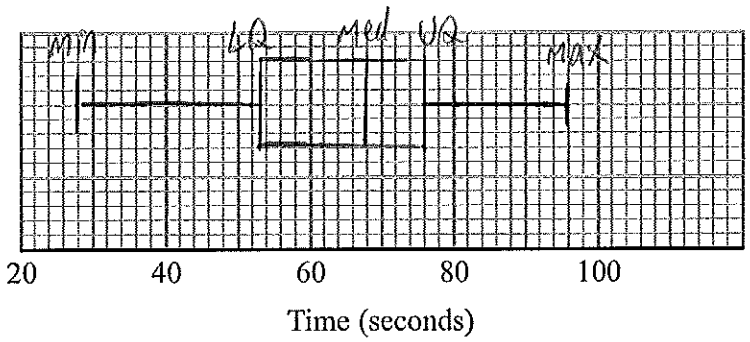
(3)

For these 80 swimmers

the least time taken was 28 seconds
and the greatest time taken was 96 seconds.

(c) Use the cumulative frequency graph and the information above to draw a box plot for the times taken by the swimmers.

min 28
LQ 53
med 68
UQ 76
max 96



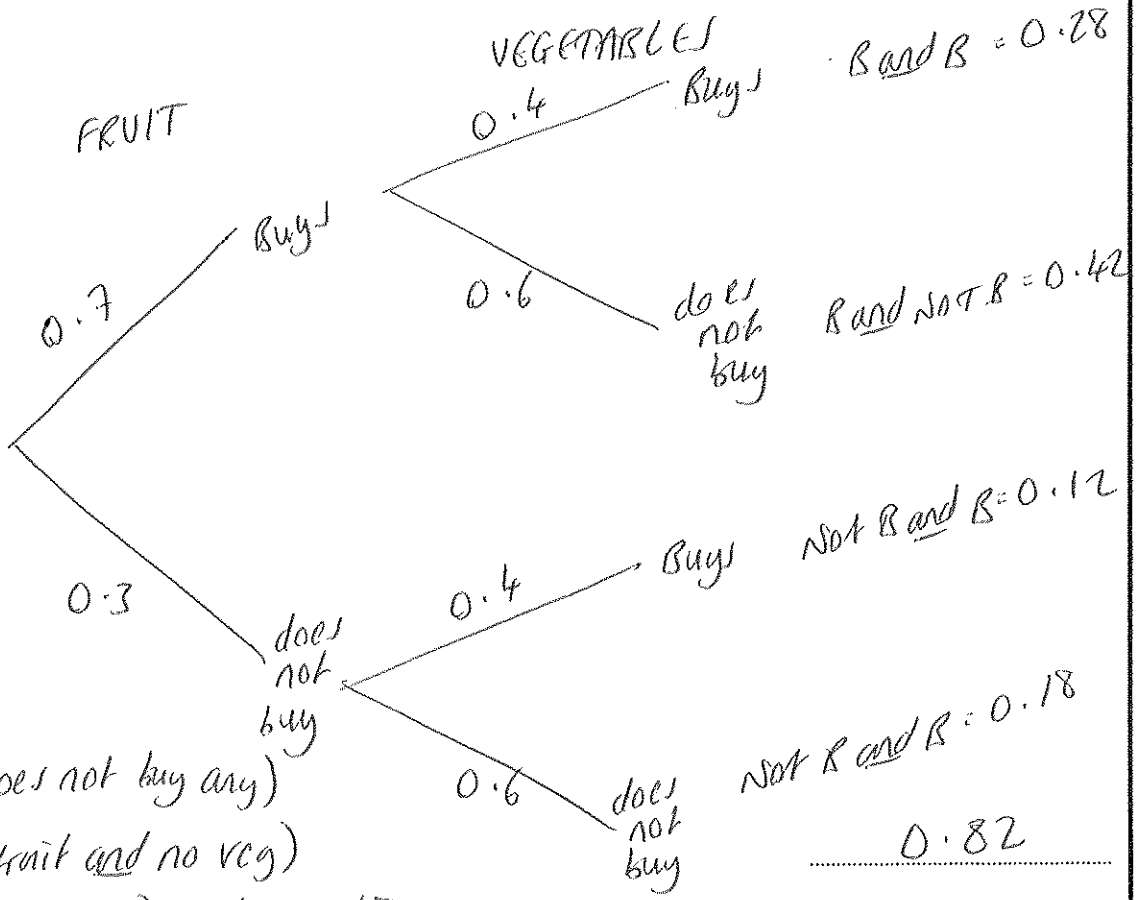
(3)

(Total for Question 18 is 7 marks)

19 In a supermarket, the probability that John buys fruit is 0.7

In the same supermarket, the probability that John independently buys vegetables is 0.4

Work out the probability that John buys fruit or buys vegetables or buys both.



1 - P(does not buy any)

1 - P(no fruit and no veg)

1 - (0.3 × 0.6) = 1 - 0.18

0.82

(Total for Question 19 is 3 marks)

20 (a) Solve $\frac{4(8x-2)}{3x} = 10$ $(\times 3x)$

$4(8x-2) = 30x$ (expand bracket)

$32x - 8 = 30x$ $(-30x)$

$2x - 8 = 0$ $(+8)$

$2x = 8$ $(\div 2)$

$x = 4$

4

(3)

(b) Write as a single fraction in its simplest form

$\frac{2}{y+3} - \frac{1}{y-6}$ → same denominator

$= \frac{2(y-6)}{(y+3)(y-6)} - \frac{1(y+3)}{(y+3)(y-6)}$

$= \frac{2(y-6) - 1(y+3)}{(y+3)(y-6)}$

$= \frac{2y - 12 - y - 3}{(y+3)(y-6)}$

$= \frac{y - 15}{(y+3)(y-6)}$

$\frac{y-15}{(y+3)(y-6)}$

(3)

(Total for Question 20 is 6 marks)

21 y is directly proportional to the square of x.

When $x = 3$, $y = 36$

Find the value of y when $x = 5$

$y = kx^2$

$36 = k \times 3^2$

$36 = 9k \quad (\div 9)$

$k = 4$

$y = 4x^2$

when $x = 5$,

$y = 4 \times 5^2$

$= 100$

100

(Total for Question 21 is 4 marks)

*22

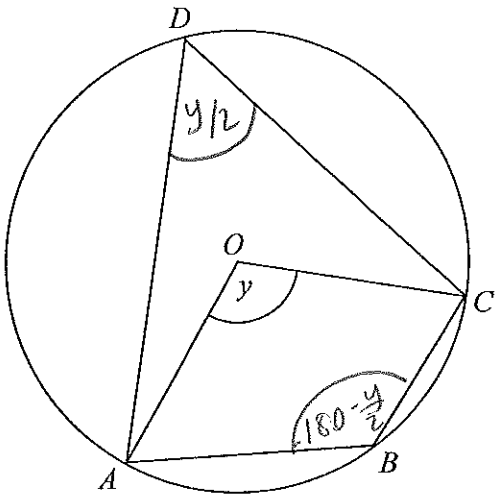


Diagram **NOT** accurately drawn

A, B, C and D are points on the circumference of a circle, centre O.

Angle $AOC = y$.

Find the size of angle ABC in terms of y.
Give a reason for each stage of your working.

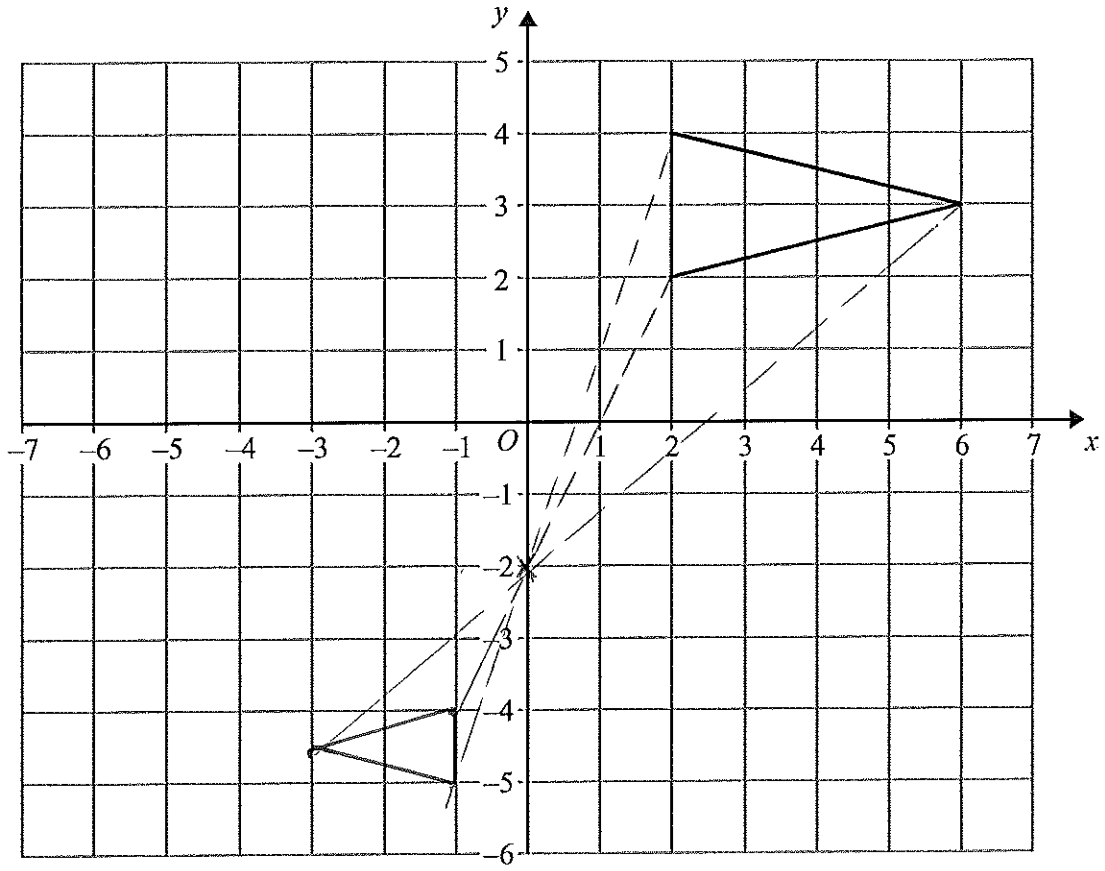
$A\hat{D}C = \frac{y}{2}$ (angle at circumference is half angle at centre)

$A\hat{B}C = 180 - \frac{y}{2}$ (opposite angles of a cyclic quadrilateral add up to 180°)

$A\hat{B}C = 180 - \frac{y}{2}$

(Total for Question 22 is 4 marks)

23



On the grid, enlarge the triangle by scale factor $-\frac{1}{2}$, centre (0, –2).

(Total for Question 23 is 2 marks)

24 *OACB* is a parallelogram.

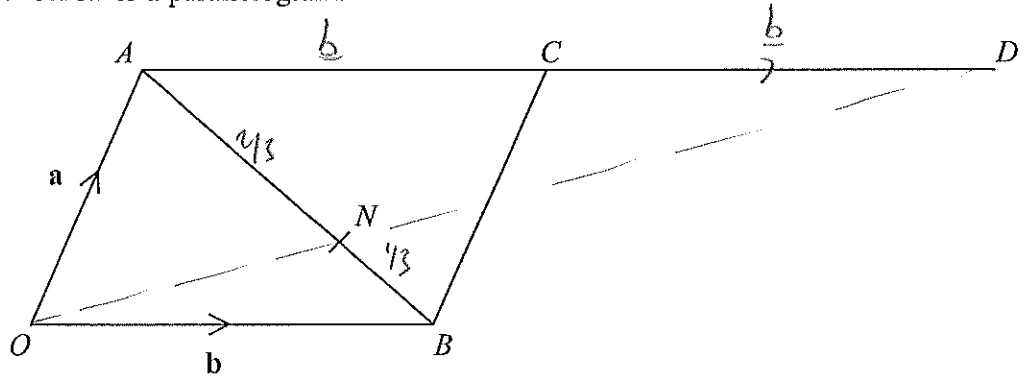


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$
D is the point such that $\overrightarrow{AC} = \overrightarrow{CD}$
The point N divides AB in the ratio 2 : 1

(a) Write an expression for $\overrightarrow{ON}$ in terms of **a** and **b**.

$\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$

$\overrightarrow{AN} = \frac{2}{3}(\overrightarrow{AB})$

$\overrightarrow{AB} = -\underline{a} + \underline{b}$

so, $\overrightarrow{AN} = \frac{2}{3}(-\underline{a} + \underline{b})$

$\overrightarrow{ON} = \underline{a} + \frac{2}{3}(-\underline{a} + \underline{b})$

$= a + \frac{2}{3}\underline{a} + \frac{2}{3}\underline{b}$

$= \frac{1}{3}\underline{a} + \frac{2}{3}\underline{b}$

$\frac{1}{3}\underline{a} + \frac{2}{3}\underline{b}$

(3)

*(b) Prove that *OND* is a straight line.

$\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AD}$

$= \underline{a} + 2\underline{b}$

$\overrightarrow{ON} = \frac{1}{3}\underline{a} + \frac{2}{3}\underline{b}$

$= \frac{1}{3}(\underline{a} + 2\underline{b})$

$\overrightarrow{ND} = \frac{2}{3}(\overrightarrow{NA}) + \overrightarrow{AD}$

$= -\frac{2}{3}(-\underline{a} + \underline{b}) + 2\underline{b}$

$= \frac{2}{3}\underline{a} - \frac{2}{3}\underline{b} + 2\underline{b} = \frac{2}{3}\underline{a} + \frac{4}{3}\underline{b} = \frac{2}{3}(\underline{a} + 2\underline{b})$

$\therefore \overrightarrow{OD} = 3\overrightarrow{ON}$
and $\overrightarrow{ND} = 2\overrightarrow{ON}$
and share point 'N'
therefore on a straight line

(3)

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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