WJEC CBAC

GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

P.M. MONDAY, 11 June 2012

2 hours

SOLUTIONS

**CALCULATORS ARE
NOT TO BE USED
FOR THIS PAPER**

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as $3 \cdot 14$.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2**(*a*).

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	4	
2	13	
3	7	
4	11	
5	5	
6	9	
7	4	
8	8	
9	12	
10	7	
11	5	
12	5	
13	2	
14	8	
TOTAL MARK		

1.

Add up to 180°

121° 59°

59° 38

59° z

83

121 w 59°

38 142° x

142°

Add up to 180°

121 y
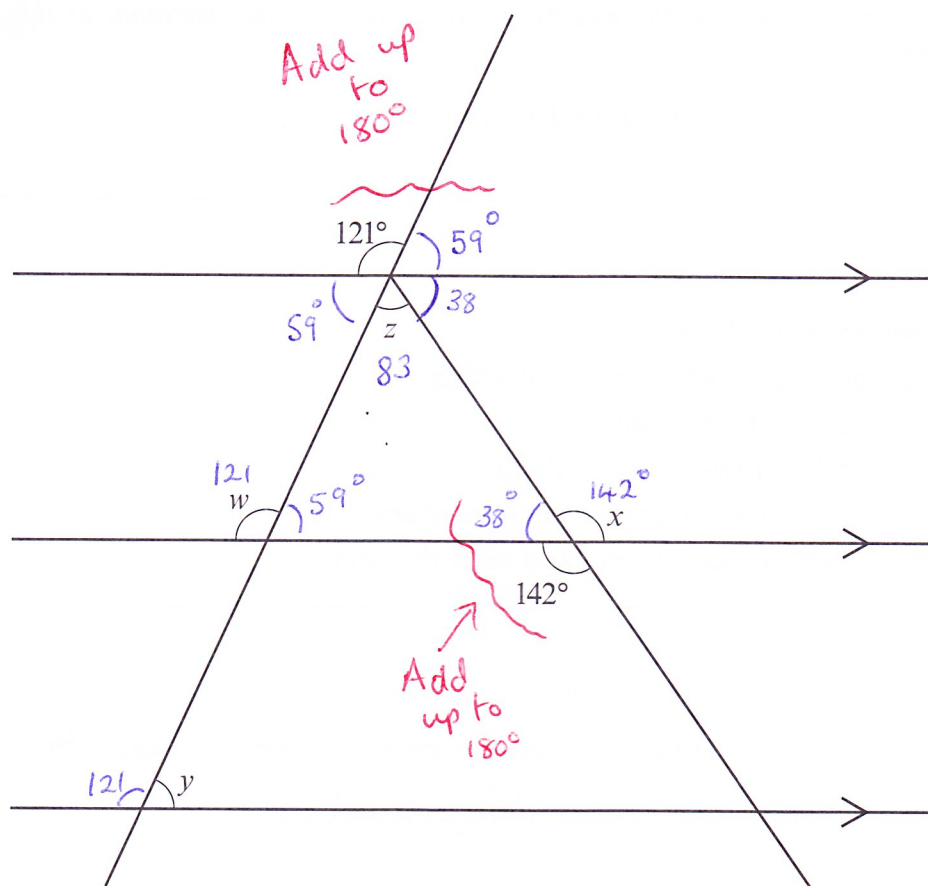
Diagram not drawn to scale

Find the size of each of the angles w, x, y and z.

You need to make use of Z S F ⊣ ⊢

alternate angles   *corresponding angles*

$w = $ 121 °

$x = $ 142° °

$y = $ 59 °

$z = $ 83 °

[4]

© WJEC CBAC Ltd.   (4370-05)   **Turn over.**

2. (a) *You will be assessed on the quality of your written communication in this part of the question.*

Enzo is given clues to help him solve a problem.

Clues:

- The shape is a polygon
- The shape has an odd number of sides
- The shape is not a triangle
- The shape has fewer than 7 sides
- Three of the interior angles each measure 106°
- All the other angles are marked with the letter x

Solve Enzo's problem to find the size of x.

Must be pentagon as odd numbers less than 7 sides and more than 3 must be 5 sides.

5 sides

$3 \times 106° = 318°$

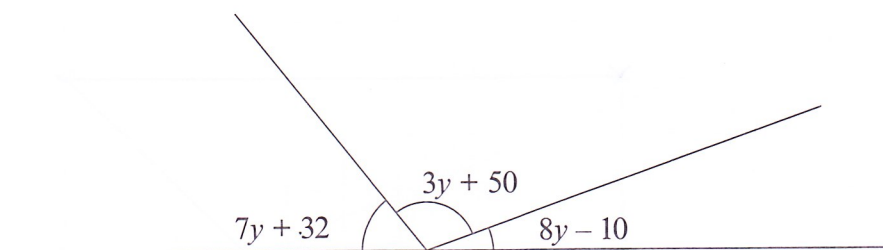Exterior Angles = ~~360~~   Interior add up = $3 \times 180 = 540°$

$\therefore \dfrac{540 - 318}{2} = \dfrac{202}{2} = 101°$

$\therefore x = 101°$

[8]

(4370-05)

(b)

Diagram not drawn to scale

All of the angles are measured in degrees.

Find the size of each of the three angles.

$$7y + 32 + 3y + 50 + 8y - 10 = 180$$

$$18y + 72 = 180$$

$$18y = 180 - 72$$

$$18y = 108$$

$$y = \frac{108}{18} = \frac{12}{2} = 6$$

$7y + 32 =$ ___74___ ° $3y + 50 =$ ___68___ ° $8y - 10 =$ ___38___ °

[5]

© WJEC CBAC Ltd.   (4370-05)   **Turn over.**
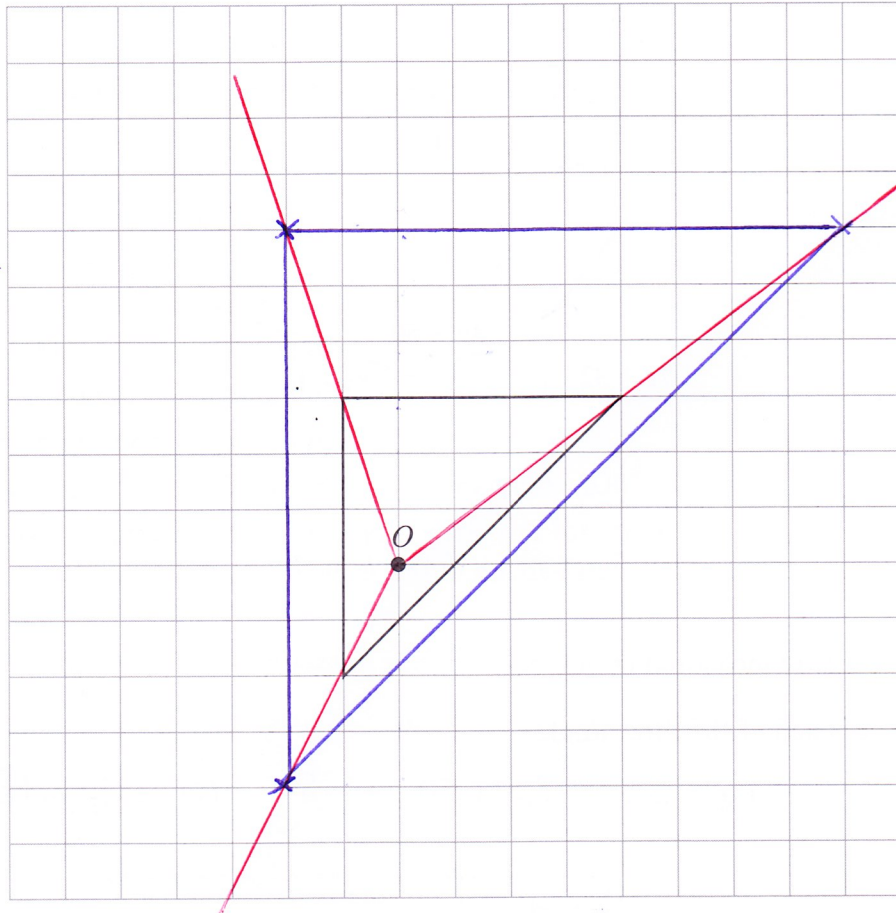
4370
050005

Twice as big and all corners twice as far away from O

3. (a) On the grid below, draw an enlargement of the triangle using a scale factor of 2 and centre O.
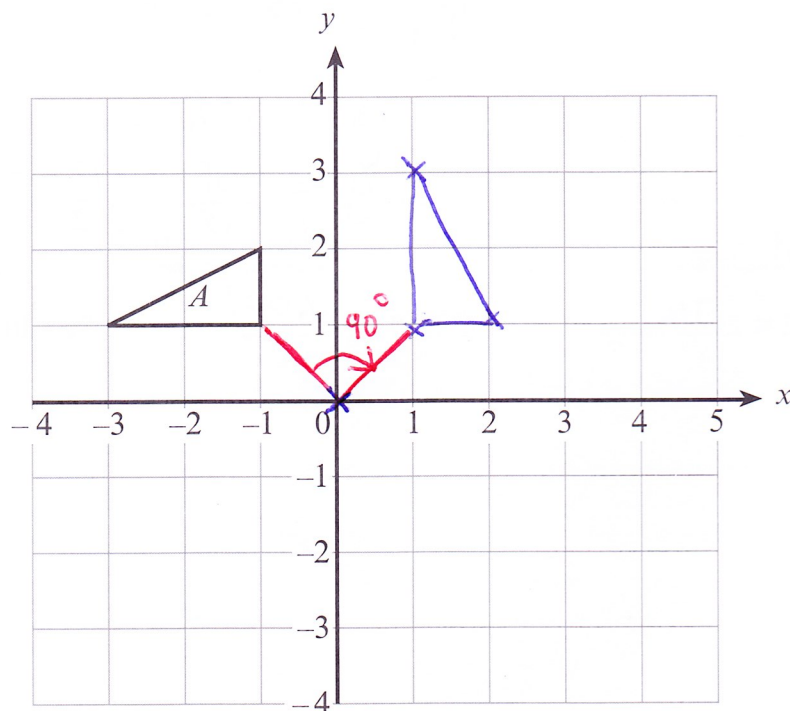
[3]

Because O lies inside the shape you don't get the projector beam affect. BUT the red lines still pass through all the corners of both shapes.
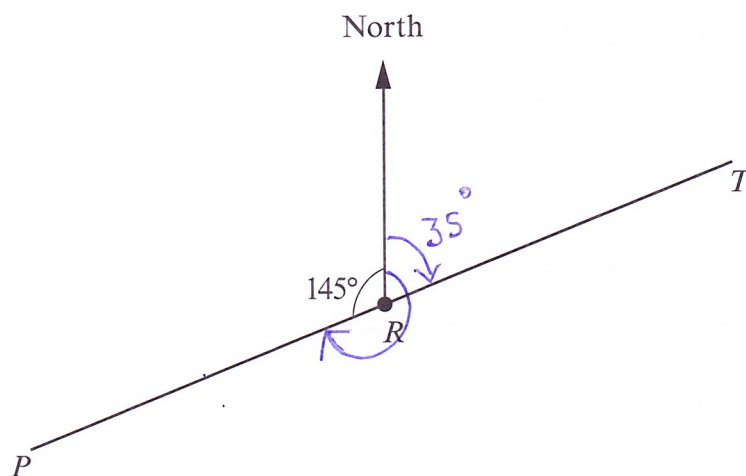

(b) Rotate the triangle A through 90° clockwise about the origin.

[2]

Use tracing paper in the exam

(4370-05)

(c)

North

T

35°

145°

R

P

clockwise from R

Diagram not drawn to scale

The above diagram shows three points P, R and T which lie on a straight line.
The bearing of T from R is 035°.
Calculate the bearing of P from R. ← *clockwise angle of P from R*

360 − 145

= 215°

[2]

© WJEC CBAC Ltd. (4370-05)

Turn over.

4370

4. *(a)* Expand $y(y^3 + 6)$.

$$= y^4 + 6y$$

[2]

(b) Solve $\frac{x}{3} + 54 = 63$.

$\times 3$

$$x + 162 = 189$$
$$x = 189 - 162$$
$$x = 27$$

[2]

(c) Solve $\frac{36 - x}{4} = 10$.

$\times 4$

$$36 - x = 40$$
$$36 - 40 = x$$
$$-4 = x$$

[3]

(d) Factorise $2x^2 - 4x$.

$$2x(x-2)$$

[2]

(e) Write down the *n*th term of the sequence 3, 7, 11, 15, 19, ...

$$+4 +4 +4 +4$$

$$4n - 1$$

[2]

(4370-05)

5. *(a)* Freddy goes to buy a ticket for a concert.
A sign by the ticket office states "20% off all original ticket prices".
Freddy comes away having paid a reduced price of £36.80 for his ticket.
What was the original price of Freddy's ticket?

$$x \times 0.8 = 36.80$$

$$x = \frac{36.80}{0.8} = \frac{368}{8} = £46$$

$$\therefore \text{Original} = £46.$$

[3]

(b) Freddy is paid £x per hour.
How long, in minutes, will Freddy have to work for in order to earn £y? Give your answer in terms of x and y.

£$\dfrac{x}{60}$ per min

$$\therefore \text{Length of time} = \frac{y}{\frac{x}{60}} = \frac{y \times 60}{x} = \frac{60y}{x} \text{ mins}$$
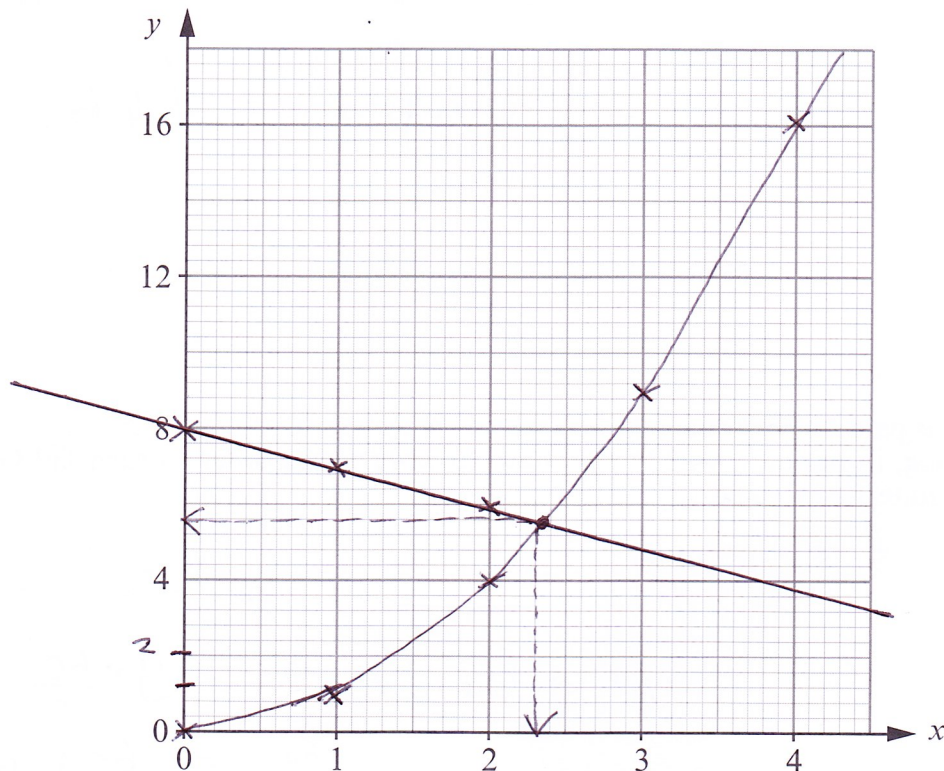
[2]

£2 per min   £10

6. *(a)* Use the graph paper to find the coordinates of the point of intersection of the curve $y = x^2$ and the line $x + y = 8$ in the first quadrant.

$y = 8 - x$

x	0	1	2
y	8	7	6

$(2.3, 5.6)$

[6]

(b) **State** whether or not it is possible to find a point of intersection of the following straight lines. Show how you have made your decision and give a reason for your answer.

$$y = 3x + 4 \quad \text{and} \quad 9x - 3y = 13$$

$9x - 3(3x + 4) = 13$

$9x - 9x - 12 = 13$

$-12 = 13$

FALSE

$\therefore$ No, intersection points

[3]

(4370-05)

7. Sasha works for a garden centre.
In any given week the probability that she works outdoors is 0·7.
The probability that she works during a weekend is 0·2.
Working outdoors and working weekends are independent events.

(a) Complete the following tree diagram.

Works
outdoors

Works
during a
weekend

0·7

Yes

0·2 — Yes

0·8 — No

0·3

No

0·2 — Yes

0·8 — No
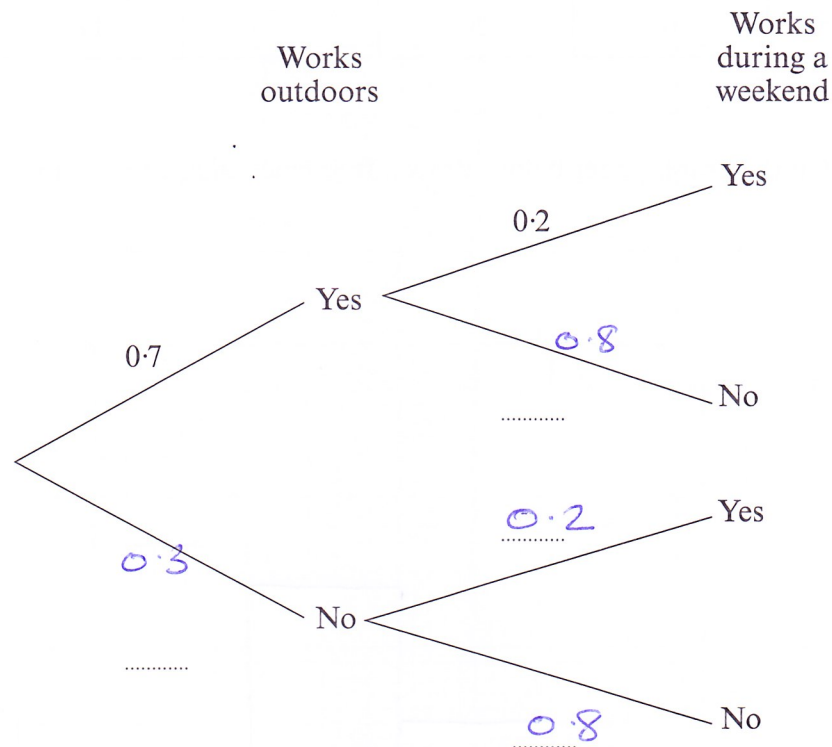
[2]

(b) Calculate the probability that next weekend Sasha will work outdoors.

$0·7 \times 0·2$

$= 0·14$

[2]

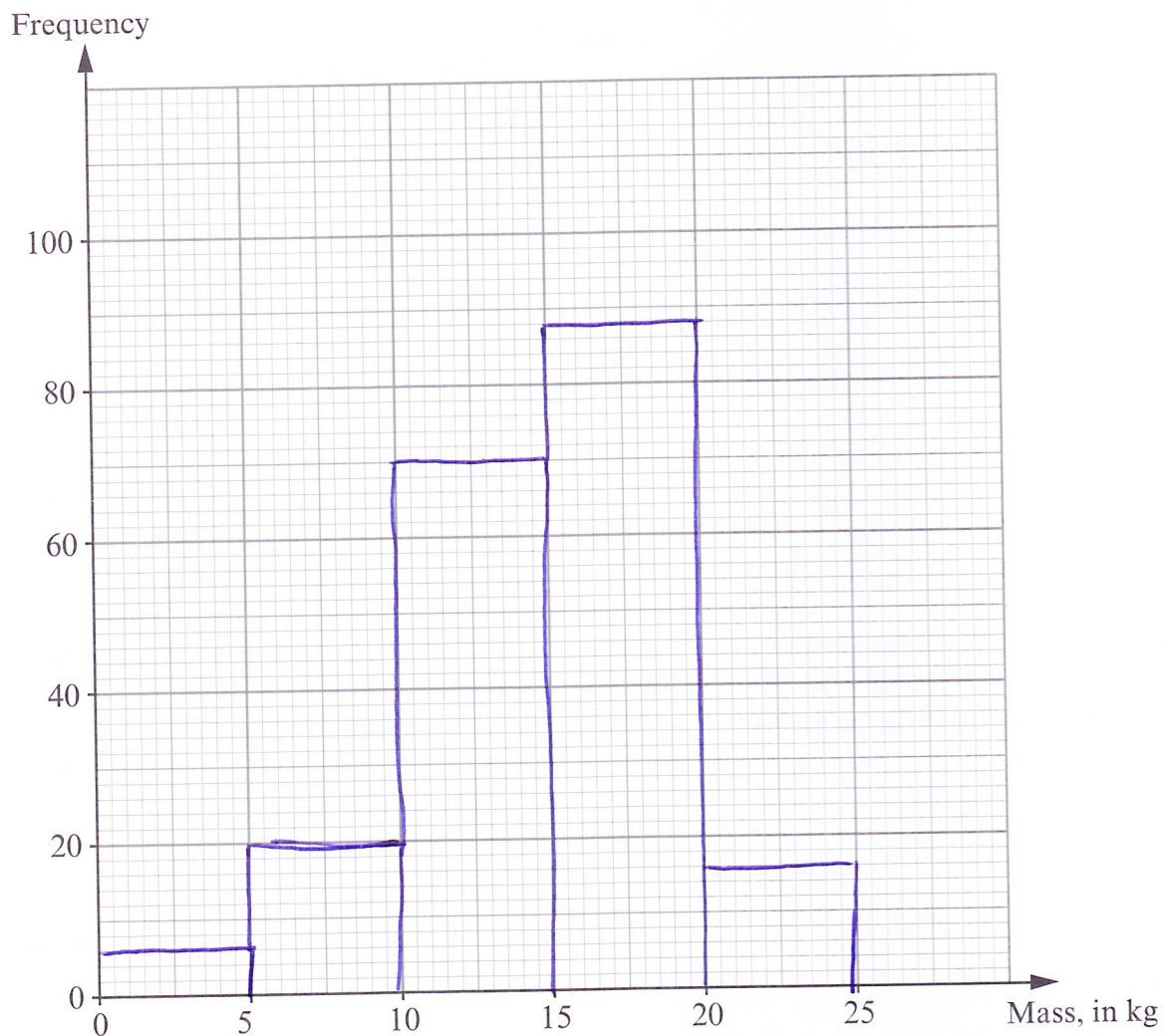© WJEC CBAC Ltd.

(4370-05)

Turn over.

8. *(a)* The total mass of tomatoes, in kg, produced by each of 200 plants in a greenhouse was measured.
The table shows the grouped frequency distribution for the total mass of tomatoes on each of these 200 plants.

Mass, x kg	$0 < x \leqslant 5$	$5 < x \leqslant 10$	$10 < x \leqslant 15$	$15 < x \leqslant 20$	$20 < x \leqslant 25$
Frequency	6	20	70	88	16

(i) On the graph paper below, draw a frequency diagram to show this data. [2]

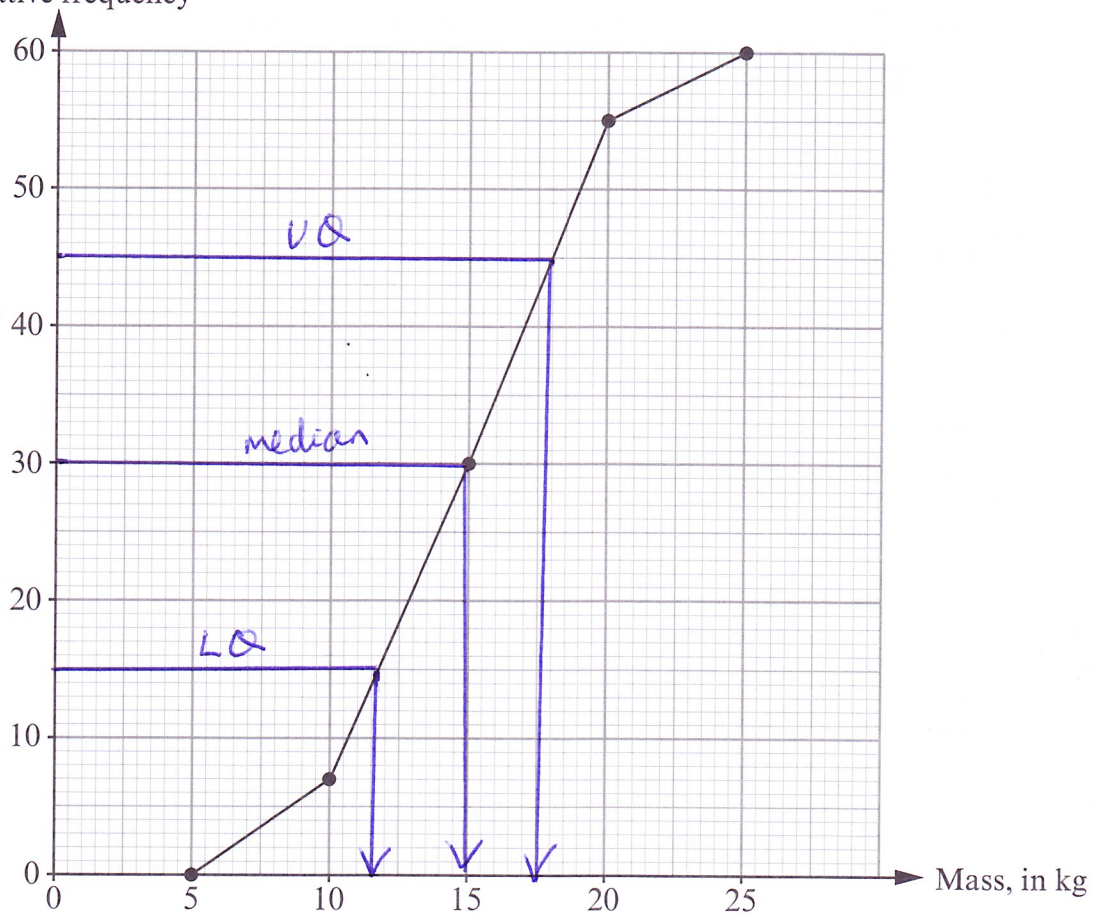(ii) State which class interval contains the median.

100'th result lies in $15 < x \leqslant 20$ [1]

(4370-05)

(b) The total mass of tomatoes produced by each of 60 plants in a different greenhouse was measured. The following cumulative frequency graph illustrates the results.

Cumulative frequency

(i) Complete the grouped frequency table of the total mass of tomatoes on each plant.

Mass, x kg	$0 < x \leqslant 5$	$5 < x \leqslant 10$	$10 < x \leqslant 15$	$15 < x \leqslant 20$	$20 < x \leqslant 25$
Frequency	0	7	30	55	60

....

....

[2]

(ii) Use the cumulative frequency diagram shown above to find estimates for each of the following.

The median.

30'th result   =   15kg

The inter-quartile range.

LQ = 15'th = 11·5 kg

UQ = 45'th = 17·5 kg

∴ IQR = 17·5 − 11·5

= 6 kg .

[3]

© WJEC CBAC Ltd.   (4370-05)   **Turn over.**

9. (a) Evaluate each of the following.

This is not laws of indices because 2 and 11 are different numbers!!
Just work out 2^5 and 11^2

(i) $2^5 - 11^2$

$32 - 121$

$= -189$

[3]

(ii) 28^0

1

[1]

what number to power 4 gives 81

(iii) $81^{\frac{1}{4}} \times 25^{-\frac{1}{2}}$

$= \sqrt[4]{81} \times \frac{1}{25^{1/2}} = \sqrt[4]{81} \times \frac{1}{\sqrt{25}}$

$3 \times \frac{1}{5}$

$= \frac{3}{5}$

[3]

(iv) $3 \cdot 4 \times 10^3 + 1 \cdot 2 \times 10^2$

$3400 + 120$

$= 3520$

[2]

(b) Estimate the value of $\dfrac{19 \cdot 843^2 \times 0 \cdot 249}{0 \cdot 0099}$.

$\approx \dfrac{20^2 \times 0 \cdot 2}{0 \cdot 01}$

$\approx \dfrac{400 \times 0 \cdot 2}{0 \cdot 01}$

$\approx \dfrac{400 \times 0 \cdot 2 \times 100}{1}$

$\approx 400 \times 2 \times 10$

≈ 8000

[3]

10. A cuboid with a volume of $912\,cm^3$ has dimensions $4\,cm$, $(x + 2)\,cm$ and $(x + 9)\,cm$.
Write down an equation in terms of x.
Hence, solve the equation to find the dimensions of the cuboid.

$$4(x+2)(x+9) = 912$$

$$(x+2)(x+9) = 228$$

$$x^2 + 2x + 9x + 18 = 228$$

$$x^2 + 11x - 210 = 0$$

$$(x - 10)(x + 21) = 0$$

$$x = 10 \quad \text{or} \quad x = -21$$

$$\therefore \quad x + 2 = 12$$
$$x + 9 = 19$$

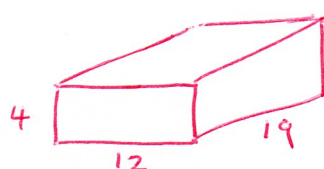$$\therefore \quad 4 \times 12 \times 19$$

[7]

This is how you show the dimensions of a cuboid

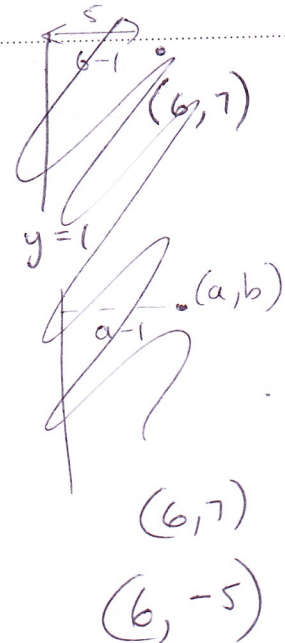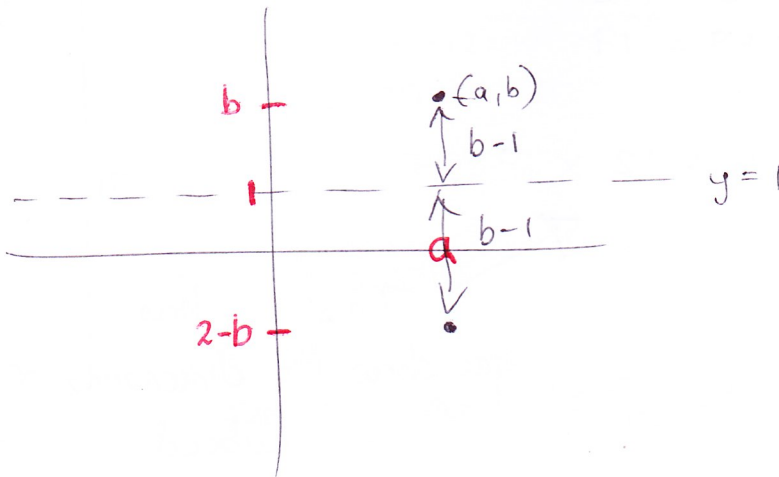$4 \times 12 \times 19$

Means

11. The coordinates of the point R are (a, b) where $a > 5$ and $b > 5$.
The point T is the reflection of the point R in the line $y = 1$.
Find the coordinates of the point T in terms of a and b.

$$1 - b + 1 = 2 - b$$

$$T\left(a, \; 1 - (b-1)\right)$$

$$= T\left(a, \; 2-b\right)$$

[5]

Draw a sketch

$(6, 7)$

$(6, -5)$

(4370-05)

12. *(a)* Find the value of $(\sqrt{45} - \sqrt{5})^2$.

$$= 45 + 5 - 2\sqrt{45}\sqrt{5}$$

$$= 50 - 2\sqrt{225}$$

$$= 50 - 2(15)$$

$$= 50 - 30 = 20$$

[3]

(b) Express $0.4\overset{..}{7}8$ as a fraction.

$$x = 0.4\overset{.}{7}\overset{.}{8}$$

$$10x = 4.\overset{.}{7}\overset{.}{8}$$

$$1000x = 478.\overset{.}{7}\overset{.}{8}$$

You need to get the decimals the same so when you subtract they cancel each other out

SUBTRACT

$$990x = 478 - 4$$

$$x = \frac{474}{990}$$

[2]

Turn over.

Exam
on

13. The points A, B and C lie on the circumference of a circle.
The straight line PBT is a tangent to the circle and $C\hat{B}P = x$, where x is measured in degrees.
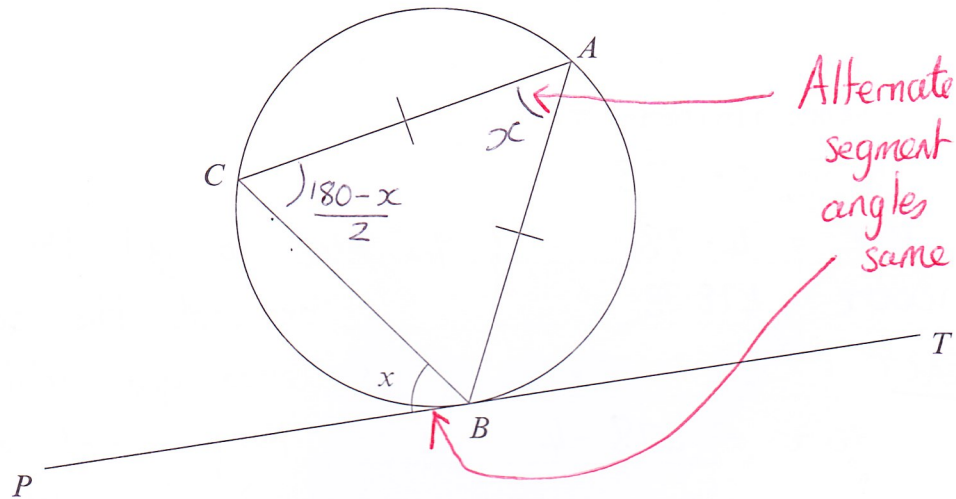

Diagram not drawn to scale

Show, giving reasons in your answer, that the size of $A\hat{B}C$ in degrees is $90 - \frac{1}{2}x$.

$$\frac{180-x}{2} = 90 - \frac{x}{2}$$

Because it is isosceles we know $\hat{B}$ and $\hat{C}$
are the same.

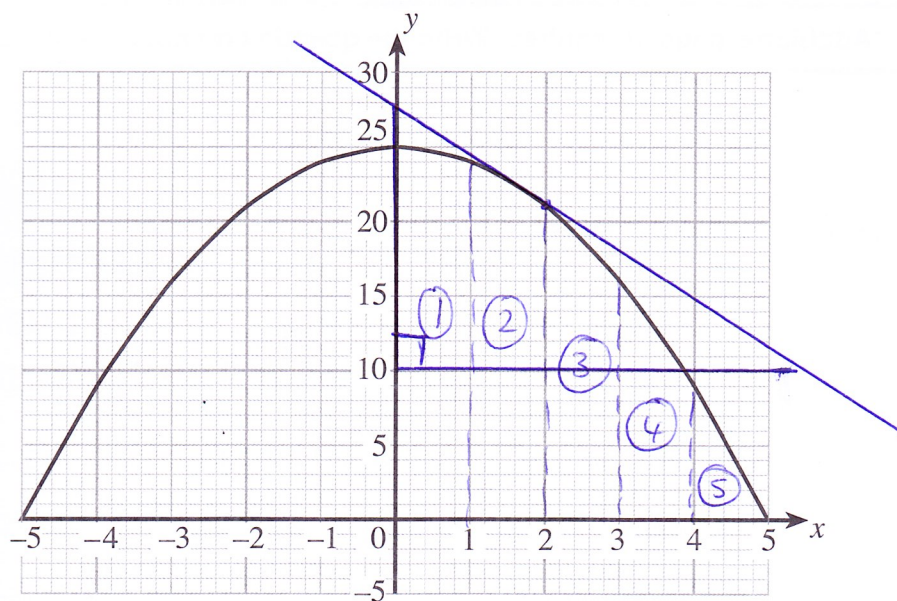For $\triangle ABC$

$$\hat{B} = \hat{C} = \frac{180° - x}{2}$$

whole triangle

top angle

split equally
between
B and C

[2]

$$= 90 - \frac{1}{2}x$$

© WJEC CBAC Ltd.   (4370-05)

14. The graph of $y = 25 - x^2$ has been drawn below.

(a) Write down the gradient of the curve $y = 25 - x^2$ at $x = 0$.

$$M = 0$$

[1]

(b) Find an estimate for the gradient of the curve $y = 25 - x^2$ at $x = 2$.

$$M \simeq \frac{ht}{base} \qquad M \approx -4$$

[3]

(c) Use the trapezium rule, with the ordinates $x = 0$, $x = 1$, $x = 2$, $x = 3$, $x = 4$ and $x = 5$, to estimate the area of the region bounded by the curve, the positive x-axis and the positive y-axis.

triang

$$Area = \textcircled{1} + \textcircled{2} + \textcircled{3} + \textcircled{4} + \textcircled{5}$$

$$\approx \frac{(25+24)}{2} \times 1 + \frac{(24+21)}{2} \times 1 + \frac{(21+16)}{2} \times 1 + \frac{(16+9)}{2} \times 1 +$$

$$= 24.5 + 22.5 + 18.5 + 12.5 + 4.5$$

$$= 82.5 \quad units^2$$

[4]

(4370-05)

Question number	Additional page, if required. Write the question numbers in the left-hand margin	Examiner only

(4370-05)