Script Marks

Component : 4365/2H - MATHEMATICS (LINEAR) PAPER 2 TIER H

Series : 6G13

Candidate Name	Centre Number	Candidate Number
BRUNO REDDY	11294	9000

Total Mark
104

Item	Mark	Comments
1a	2	
1b	3	
2a	1	
2b	2	
2c	1	
2d	1	
3a	1	
3b	2	
4	2	
5	4	
6	4	
7	5	
8a	3	
8b	3	
9	3	
10a	1	
10b	2	
11a	1	
11b	1	
12	4	
13	5	
14a	2	
14b	3	
15a	1	
15b	2	
16	5	
17	4	
18a	3	

Item	Mark	Comments
18b	3	
19a	2	
19b	3	
20	3	
21	3	
22	3	
23	3	
24a	1	
24b	4	
25a	1	
25b	1	
26	6	
Total :	**104**	

Centre Number	1 1 2 9 4	Candidate Number	9 0 0 0
Surname	REDDY		
Other Names	BRUNO		
Candidate Signature			

For Examiner's Use	
Examiner's Initials	
Pages	Mark
2 – 3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
22 – 23	
24 – 25	
26 – 27	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2013

Mathematics (Linear) 43652H

Paper 2

Friday 14 June 2013 9.00 am to 11.00 am

H

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 2 hours

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 105.
- The quality of your written communication is specifically assessed in Questions 5, 7 and 16. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

Advice
- In all calculations, show clearly h

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Date Received 19/06/2013 20:10:54
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Header 1 of 1
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4365/2H-MATHEMATICS (LINEAR)
11294 - KING SOLOMON ACADEMY

JUN134365 2H 0

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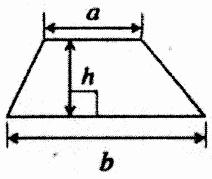
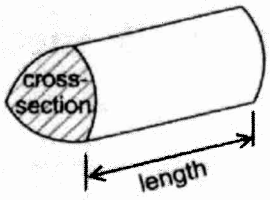
4365 2H

Formulae Sheet: Higher Tier

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

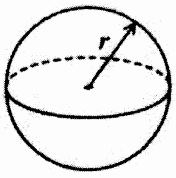


Volume of prism = area of cross-section × length



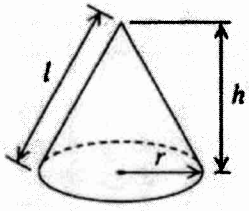
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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

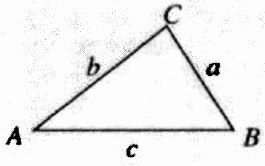


In any triangle ABC

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

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

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



The Quadratic Equation

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

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

Do not write outside the box

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

1 This formula is used for working out the cost, £C, of repairing a car.

$C = nL + 1.2P$

n is the number of hours worked
L is the labour rate (£)
P is the cost of parts (£)

1 (a) Work out the cost of repairing a car when

$n = 3$
$L = 18$
$P = 110$

$C = (3 \times 18) + (1.2 \times 110)$
$= 54 + 132$
$= 186$

Answer £ 186 *(2 marks)*

1a: 2
1b: 3

1 (b) Complete this table for another repair.

C	n	L	P
£235	2.5	£22	£150

$235 = 22n + (1.2 \times 150)$
$22n + 180 = 235$
$22n = 235 - 180 = 55$
$n = 55 \div 22 = 2.5$

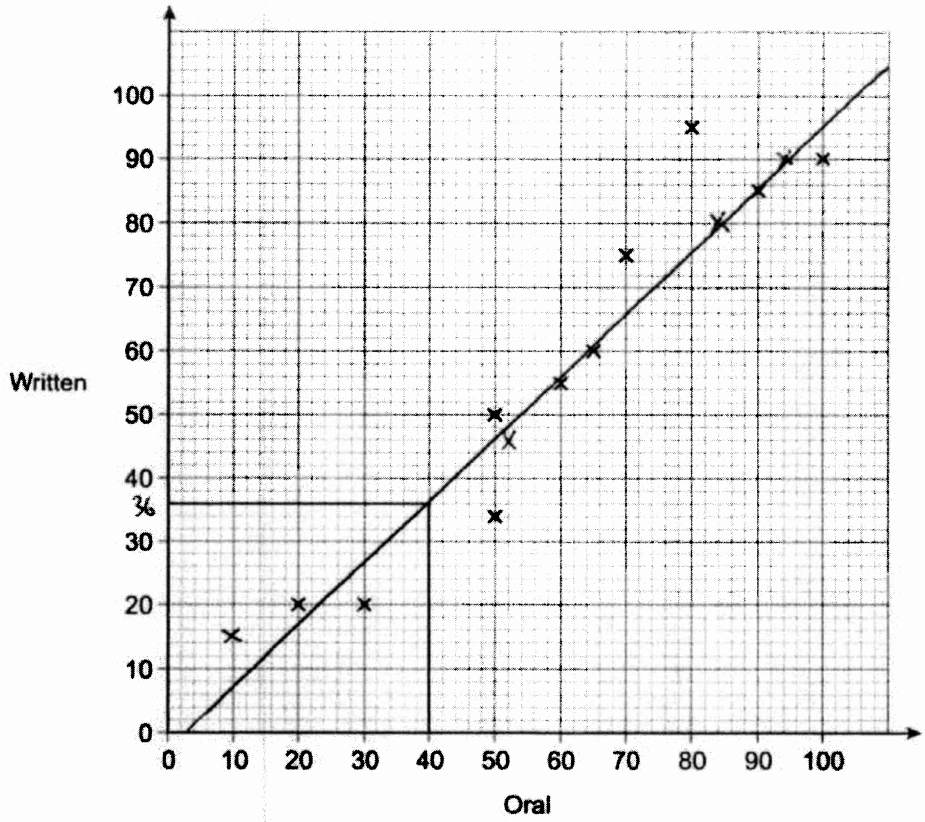
(3 marks)

5

Turn over ▶

Do not write outside the box

2 The scatter diagram shows the scores of 10 students in their Oral and Written tests.



2a: 1
2b: 2

2 (a) How many students scored 50 in their Oral test?

Answer 2 *(1 mark)*

2 (b) Four more students take the same tests.
The table shows their scores.

Oral	10	94	52	84
Written	15	90	46	80

Plot the scores on the scatter diagram.

(2 marks)

Do not write outside the box

2 (c) Draw a line of best fit on the scatter diagram.

(1 mark)

2 (d) Rob scored 40 in the Oral test.
He was absent for the Written test.

Use your line of best fit to estimate a score for him in the Written test.

Answer 36 *(1 mark)*

3 Andrew is planning a survey about his local library.
Here is one of his questions with a response section.

How many times do you go to the library?

1	2	3	5 or more
☐	☐	☐	☐

2c: 1
2d: 1
3a: 1
3b: 2

3 (a) Give **one** criticism of the **question**.

~~If someone do~~ It doesn't specify over what time frame. Could be per week / per month / per year etc

(1 mark)

3 (b) Give **two** criticisms of the **response** section.

Criticism 1 There is no checkbox for people who don't go to the ~~to~~ library at all

Criticism 2 There is no checkbox for people who go 4 times (or who want to respond with a 4).

(2 marks)

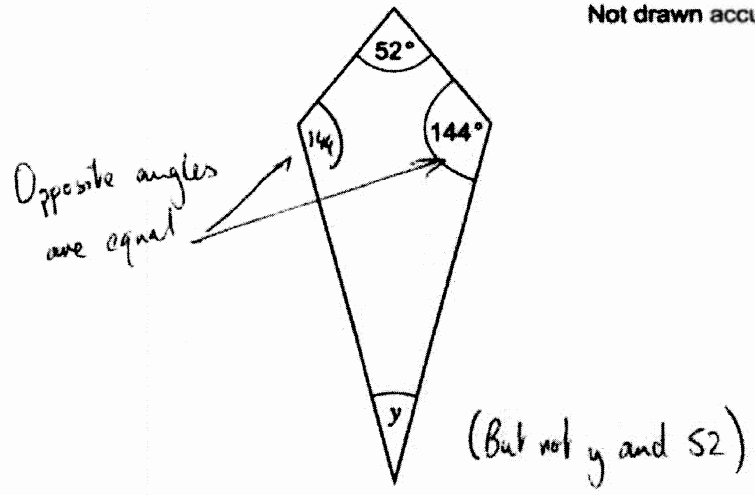
8

Turn over ▶

Do not write outside the box

4 The diagram shows a kite.

Not drawn accurately



Work out the size of angle y.

Angles in a quadrilateral sum to 360°

$360 - (144 \times 2) - 52$

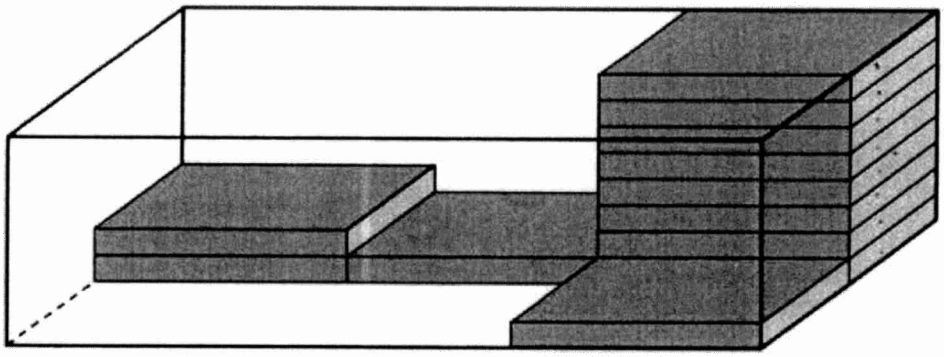
$= 20$

Answer 20 degrees *(2 marks)*

4: 2

Do not write outside the box

***5** DVD cases are packed in this box.



Jenny buys a full box of cases for £2.43
She sells all the cases for 11 pence each.
She saves **two-thirds** of the profit.

How much money does she save?

Total cases in the box = 2 × 3 × 8 = 48

Cost per case = 243p ÷ 48 = 5.0625

Profit per case = 11 − 5.0625 = 5.9375p

Total profit = 48 × 5.9375 = 285

Two thirds of profit = $\frac{285 \times 2}{3}$ = 190

She saves £190.

Answer £ 190 **(5 marks)**

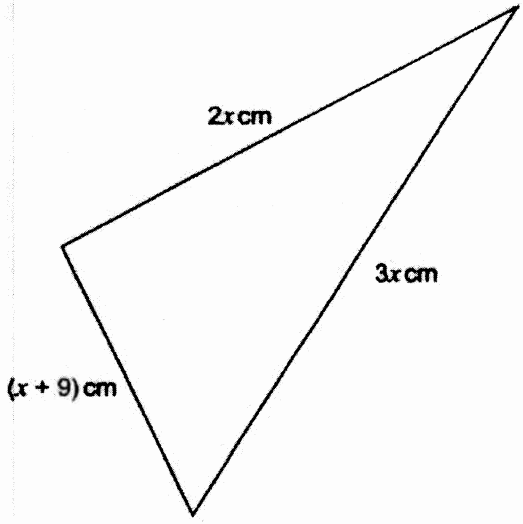
5: 4

7

Turn over ▶

Do not write outside the box

6 The perimeter of this triangle is 48 cm.



Work out the value of x.

$x + 9 + 2x + 3x = 48$

$6x + 9 = 48$

$6x = 48 - 9$

$6x = 39 \quad x = 39 \div 6 = 6.5$

$x =$ 6.5 cm *(4 marks)*

6: 4

Check $2(6.5) + 3(6.5) + 6.5 + 9 = 48$ ✓

Do not write outside the box

***7** Here are two ways of having a car for one year.

Buy and sell	**Rent**
Buy it for £ 12 000	Normal Price: £ 195 per month
Sell it for £ 10 000 after one year	**Special Offer** 15% off

Which way is cheaper?
You must show your working.

B+S = 12000 − 10000
= 2000
Cost after 1 year = £2000

Therefore it is cheaper to rent for 1 year as £1989 is less than £2000.

change month offer
Rent = (195 × 12) × 0.85
= 1989
Cost after 1 year = £1989

Answer Rent *(5 marks)*

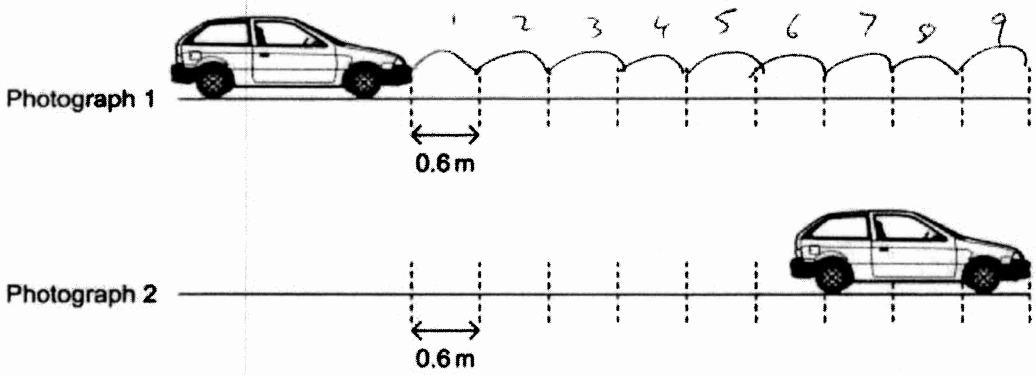
7: 5

Turn over for the next question

9

Do not write outside the box

8 (a) A speed camera takes two photographs of a car.



Photograph 2 was taken 0.5 seconds after Photograph 1.
Marks on the road are 0.6 metres apart.

Calculate the average speed of the car in m/s.

Car travels 0.6 × 9 = 5.4 m in 0.5 secs

∴ in 1 sec it will travel 5.4 × 2 = 10.8 m

Answer 10.8 m/s *(3 marks)*

8a: 3

Do not write outside the box

8 (b) You are given that

1 kilometre = 1000 metres

and

1 hour = 3600 seconds

A lorry is travelling at 13.6 m/s.
The speed limit is 50 km/h.

Show that the lorry is travelling below the speed limit.

Convert lorry's speed to km/h

13.6 m = 0.0136

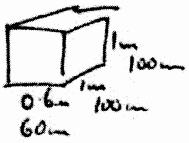
0.0136 × 3600 = 48.96 km/h ← Speed of lorry in km/h

∴ The lorry is travelling below the limit of 50 km/h

(3 marks)

9 A tank contains 0.6 m^3 of water.
The water is used to fill pots.
Each pot can hold 1250 cm^3 of water.

How many pots can be filled?



Tank contains 0.6 m^3 or 600,000 cm^3

600,000 ÷ 1250 = 480

Answer 480 pots *(3 marks)*

8b: 3
9: 3

9

Turn over ▶

Do not write outside the box

10 150 boys and 160 girls sit an examination.
The table shows some of the probabilities that they came with or without a calculator.

	With calculator	Without calculator
Boy	0.92	0.08
Girl	0.95	0·05

10 (a) What is the probability that a girl came **without** a calculator?
Write your answer in the table.

1 - 0·95

(1 mark)

10 (b) How many of the 150 boys came **with** a calculator?

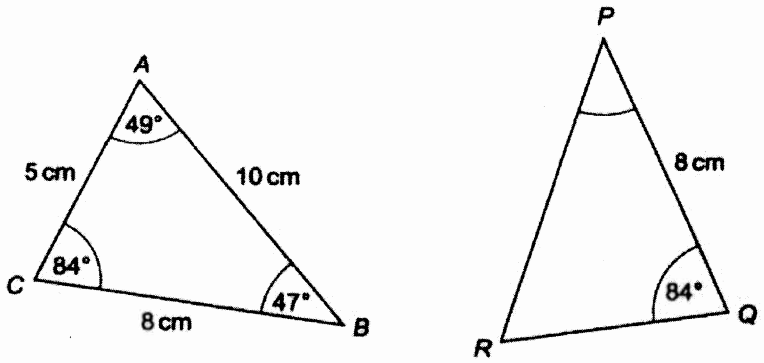
0·92 x 150 = 138

Answer 138 *(2 marks)*

10a: 1
10b: 2

Do not write outside the box

11 These two triangles are congruent.



Not drawn accurately

11 (a) What is the size of angle *P*?
Circle your answer.

47° 49° 84° none of these

(1 mark)

11 (b) What is the length of *PR*?
Circle your answer.

5 cm 8 cm 10 cm none of these

(1 mark)

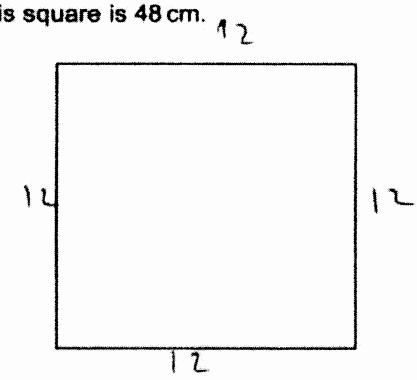
11a: 1
11b: 1

Turn over for the next question

5

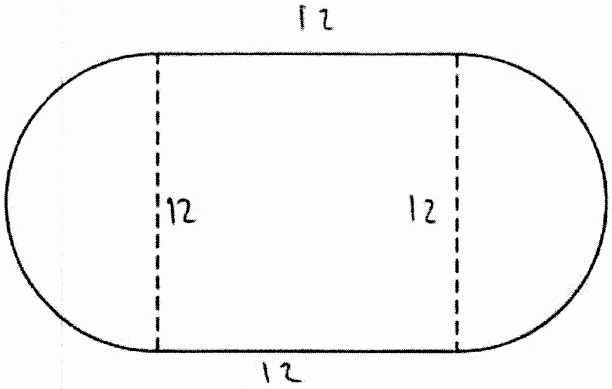
Do not write outside the box

12 The perimeter of this square is 48 cm.



Semicircles are joined to two sides of the square.

Not drawn accurately



Work out the perimeter of this shape.

Perimeter of square = 48 ∴ side length = 48 ÷ 4 = 12cm

Circle has diameter of side length of square, ie. 12cm

Circumference = πd = 12π

2 sides of square = 24

Perimeter of shape = $24 + 12\pi$ = 61.699...

= 61.7 (1dp)

Answer 61.7 (1dp) cm **(4 marks)**

12: 4

Do not write outside the box

13 Amy raised £ n for charity.
Chris raised £ 18 more than Amy. $n + 18$

The mean amount raised by the two of them is £ 45.

Work out how much money each one of them raised.

$\frac{\text{Amy} + \text{Chris}}{2} = 45$

$\frac{n + n + 18}{2} = 45$

$\frac{2n + 18}{2} = 45$

$2n + 18 = 90$

$2n = 72 \quad n = 36$

Amy £ 36

Chris £ 54 *(5 marks)*

13: 5

Turn over for the next question

Check $36 + 54 = 90$

$90 \div 2 = 45$ ✓

9

Do not write outside the box

14 (a) Work out $(6.45 \times 10^6) \times (2.5 \times 10^{-4})$

Check 1612.5

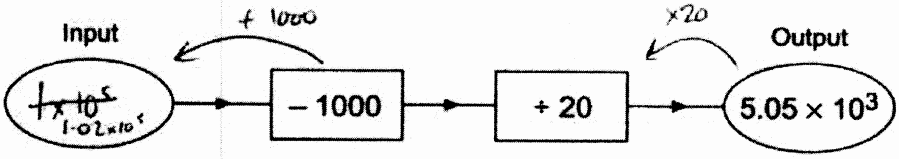
Write your answer in standard form.

$6.45 \times 2.5 \times 10^6 \times 10^{-4} = 6.45 \times 2.5 \times 10^2$

$= 16.125 \times 10^2 = 1.6125 \times 10^3$

Answer 1.6125×10^3 *(2 marks)*

14 (b) Here is a number machine.



Work out the input when the output is 5.05×10^3

Write your answer in standard form.

Check $\frac{(1.02 \times 10^5 - 1000)}{20} = 5050 = 5.05 \times 10^3$ ✓

Answer 1.02×10^5 *(3 marks)*

15 (a) Work out the value of $x^3 - 2x + 7$ when $x = -2.5$

$(-2.5)^3 - 2(-2.5) + 7$

$-15.625 + 5 + 7 = -3.625$

Answer -3.625 *(1 mark)*

15 (b) Factorise fully $4x^2 + 6xy$

Check $2x(x + 3y)$

$2x(x + 3y)$ × $2x^2 + 6xy$ Wrong

$2x(2x + 3y)$ $2x(2x + 3y)$ $4x^2 + 6xy$ Correct

Answer $2x(2x + 3y)$ *(2 marks)*

14a: 2
14b: 3
15a: 1
15b: 2

Do not write outside the box

***16** Here is part of a shopping bill for clothing.

1 jacket at

1 shirt at £29

Total **cost** before discount =

10% discount

Total to pay **after** discount = £80.10

Work out the cost of the jacket **before** the discount.

Let j = jacket and s = shirt

$0.9j + 0.9s = 80.10$

$0.9j + (0.9 \times 29) = 80.10$

$0.9j + 26.1 = 80.10$

$0.9j = 80.10 - 26.1 = 54$

$j = 54 \div 0.9 = 60$

Answer £ 60.00 *(5 marks)*

16: 5

Turn over for the next question

Check 10% of £60 = £54

10% of £29 = £26.10

80.10 ✓

13

Do not write outside the box

17 A is the point with coordinates $(x, 2y)$.
B is the point with coordinates $(3x, 4y)$.
The midpoint of AB has coordinates $(-4, 15)$.

Work out the values of x and y.

Midpoint $= \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$

$= \frac{3x + x}{2}, \frac{4y + 2y}{2}$

$= \cancel{0.5x, 3y}$ $2x, 3y$

From $(-4, 15)$ we get 2 equations to solve

$2x = -4$ $\cancel{y = x - 2}$ $x = \cancel{-8} -2$

$3y = 15$ $\cancel{y = 7.5}$ $y = 5$

$x =$ -2

$y =$ 5 **(4 marks)**

17: 4

Check Point A $(x, 2y)$ Substitute $x = -2$ and $y = 5$

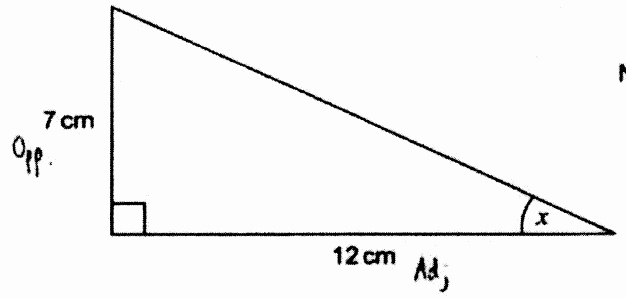
$(-2, 10)$

Point B $(-6, 20)$

Midpoint of AB based on checked coordinates is indeed $(-4, 15)$

Do not write outside the box

18 (a) Work out the size of angle x.



Not drawn accurately

$\tan x = \frac{O}{A} = \frac{7}{12}$

$x = \tan^{-1}\left(\frac{7}{12}\right) = 30.256\ldots$

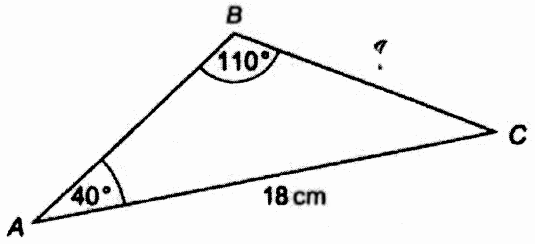
$= 30.3$ (1dp)

Answer 30.3 (1dp) degrees *(3 marks)*

18a: 3

18b: 3

18 (b) Work out the length BC.



Not drawn accurately

$\frac{a}{\sin A} = \frac{b}{\sin B}$

$\frac{a}{\sin 40} = \frac{18}{\sin 110}$ $a = \frac{18 \sin 40}{\sin 110} = 12.312\ldots$

$= 12.3$ (1dp)

Answer 12.3 (1dp) cm *(3 marks)*

10

Turn over ▶

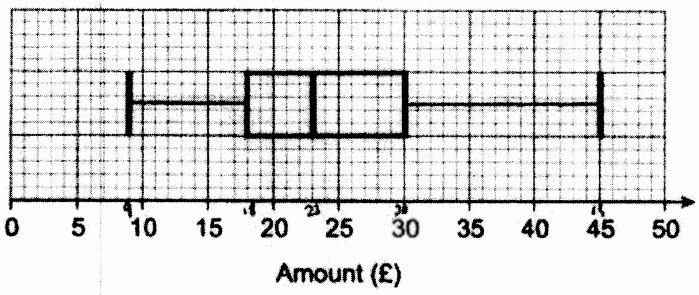
Do not write outside the box

19 (a) The table shows information about the travel expenses of employees at a company.

All amounts are in £.

Minimum	Lower quartile	Median	Upper quartile	Maximum
9	18	23	30	45

Draw a box plot to show this information.



(2 marks)

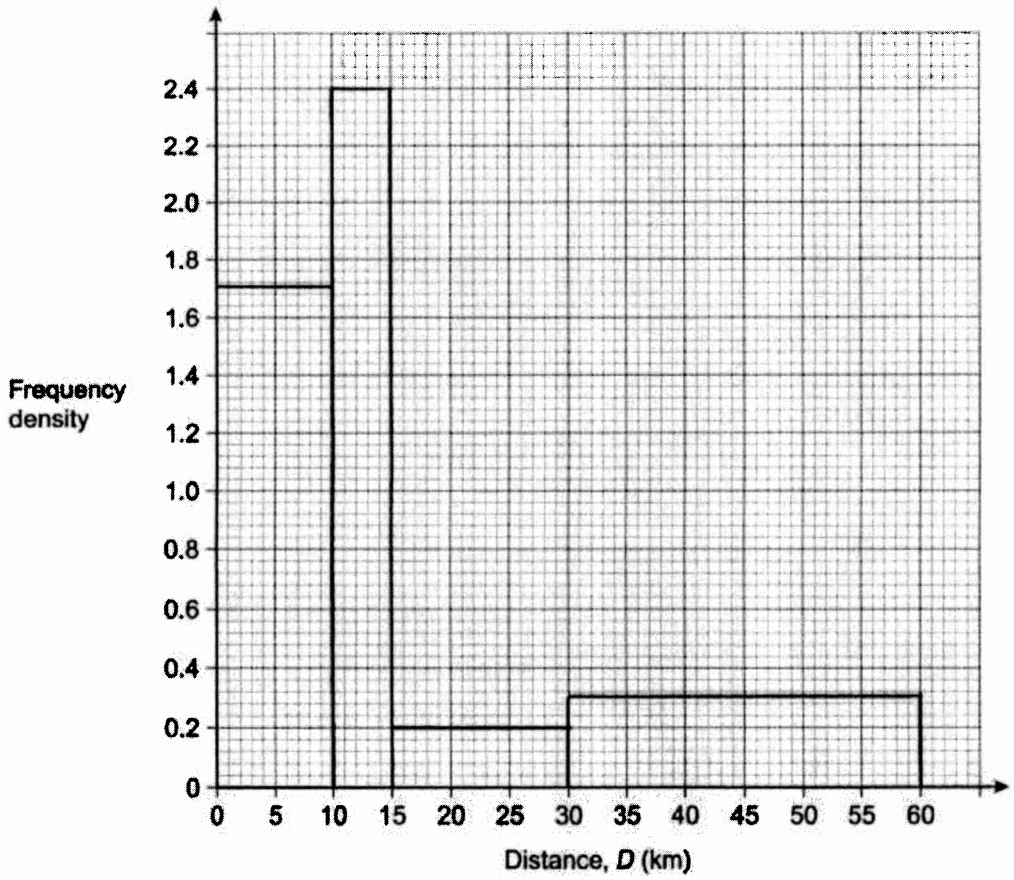
19a: 2

Do not write outside the box

19 (b) This table shows information about the distances the employees travel to work.

Distance, D (km)	Frequency	Class Width	Density
$0 < D \leq 10$	17	10	1·7
$10 < D \leq 15$	12	5	2·4
$15 < D \leq 30$	3	15	0·2
$30 < D \leq 60$	9	30	0·3

Draw a histogram to show this information.



(3 marks)

19b: 3

5

Turn over ▶

Do not write outside the box

20 Solve the equation $2x^2 + 8x + 5 = 0$

Give your answers to 2 decimal places.

$a = 2$
$b = 8$
$c = 5$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-8 \pm \sqrt{8^2 - 4 \times 2 \times 5}}{2 \times 2}$$

$$= \frac{-8 \pm \sqrt{64 - 40}}{4}$$

$$= \frac{-8}{4} \pm \frac{\sqrt{4}\sqrt{6}}{4} = -2 \pm 0.5\sqrt{6}$$

Check by substitution

When $x = -0.77$ (unrounded)

$2(-0.77\ldots)^2 + 8(-0.77\ldots) + 5 = 0$

$2(-3.22)^2 + 8(-3.22\ldots) + 5 = 0$

$-2 + 0.5\sqrt{6} = -0.77525\ldots = -0.78$ (2dp)

$-2 - 0.5\sqrt{6} = -3.2247\ldots = -3.22$ (2dp)

Answer $x = -0.78$ or $x = -3.22$ **(3 marks)**

21 The expression $\dfrac{x^2 - 9}{x^2 + bx - 15}$ simplifies to $\dfrac{x + 3}{x + 5}$

diff of 2 squares. factorises to $(x+3)(x-3)$

Work out the value of b.

$$\frac{x^2 - 9}{x^2 + bx - 15} = \frac{(x+3)\cancel{(x-3)}}{(x+5)\cancel{(x-3)}} = \frac{x+3}{x+5}$$

Expand $(x+5)(x-3) = x^2 + 5x - 3x - 15$

$= x^2 + 2x - 15$

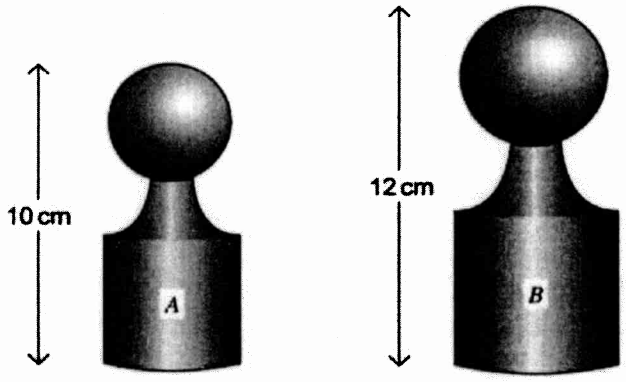
$\therefore b = 2$

$b =$ 2 **(3 marks)**

20: 3
21: 3

Do not write outside the box

22 *A* and *B* are two similar solids.



The volume of *A* is 500 cm^3.

Work out the volume of *B*.

Linear scale factor is 1·2

Volume scale factor is $1.2^3 = 1.728$

Vol. A × VSF = 500 × 1·728

= 864 cm^3

Answer 864 cm^3 *(3 marks)*

22: 3

9

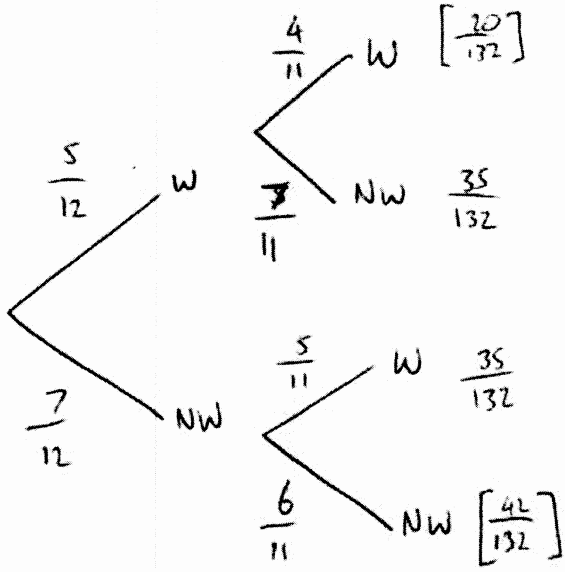
Turn over ▶

Do not write outside the box

23 A bag contains 12 counters.
Five of the counters are white. $p(W) = \frac{5}{12}$

A counter is taken out of the bag at random and **not** replaced.
A second counter is taken out of the bag at random.

Calculate the probability that **only one** of the two counters is white.



23: 3

$p(\text{only 1 white}) = p(W, NW) + p(NW, W)$

$= \frac{35}{132} + \frac{35}{132}$

$= \frac{70}{132} = \frac{35}{66}$

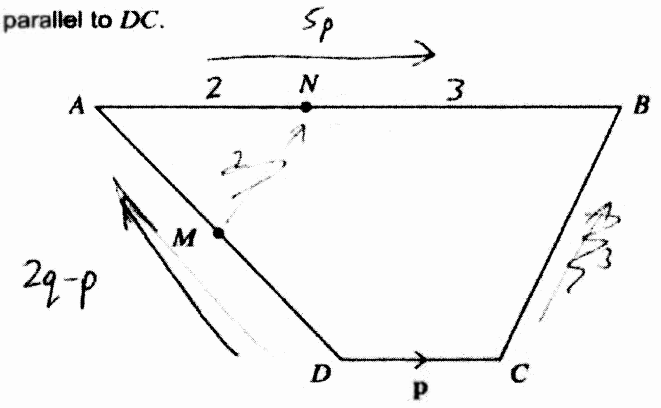
Answer $\frac{35}{66}$ *(3 marks)*

Check $p(2 \text{ whites or } 2 NW) = \frac{20}{132} + \frac{42}{132} = \frac{62}{132}$

Alt. method → $1 - \frac{70}{132} = \frac{62}{132}$ Both give $\frac{62}{132}$ ∴ $\frac{70}{132}$ is correct

Do not write outside the box

24 AB is parallel to DC.



Not drawn accurately

$\overrightarrow{AB} = 5\mathbf{p}$

$\overrightarrow{DC} = \mathbf{p}$

$\overrightarrow{DA} = 2\mathbf{q} - \mathbf{p}$

24 (a) Show that $\overrightarrow{CB} = 2\mathbf{q} + 3\mathbf{p}$

simplify

$\overrightarrow{CB} = \overrightarrow{CD} + \overrightarrow{DA} + \overrightarrow{AB} = -p + 2q - p + 5p = 2q + 3p$

(1 mark)

24a: 1

24b: 4

24 (b) M is the midpoint of AD.

$\overrightarrow{AN} : \overrightarrow{NB} = 2 : 3$

Show that MN is parallel to CB.

For MN and CB to be parallel their vectors must be multiples

$\overrightarrow{CB}$ is $2q + 3p$ from part (a)

$\overrightarrow{MN} = \cancel{\frac{1}{2}(2q-p)}\ \overrightarrow{MA} + \overrightarrow{AN} = \frac{1}{2}(2q-p) + \frac{2}{5}(5p) = q - \frac{p}{2} + 2p$

$= q + 1.5p$

$2q + 3p$ is a multiple of $q + 1.5p$ ∴ MN and CB are parallel.

(4 marks)

Double this to get $2q + 3p$.

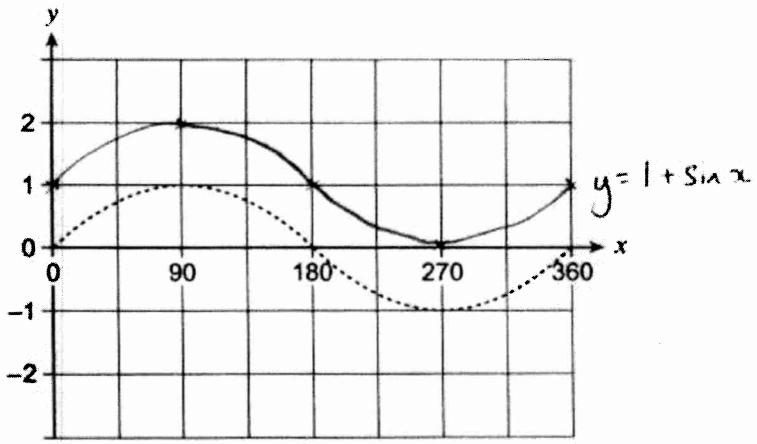
8

Turn over ▶

not write outside the box

25 (a) On this grid draw the graph of $y = 1 + \sin x$ for values of x from 0° to 360°.

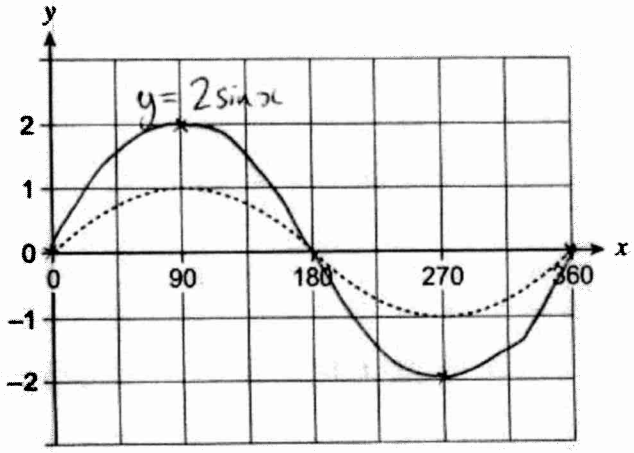
The graph of $y = \sin x$ has been drawn to help you.



(1 mark)

25 (b) On this grid draw the graph of $y = 2 \sin x$ for values of x from 0° to 360°.

The graph of $y = \sin x$ has been drawn to help you.



(1 mark)

25a: 1

25b: 1

Do not write outside the box

26 Solve the equation $\frac{5}{x+2} + \frac{4}{x+1} = 2$

$\frac{5}{x+2} + \frac{4}{x+1} = 2$

$\frac{5(x+1) + 4(x+2)}{(x+2)(x+1)} = 2$

$5x + 5 + 4x + 8 = 2(x+2)(x+1)$

$9x + 13 = 2(x^2 + 3x + 2)$

$9x + 13 = 2x^2 + 6x + 4$

$2x^2 + 6x + 4 = 9x + 13$

$2x^2 - 3x - 9 = 0$

$(2x+3)(x-3) = 0$

$x = \frac{-3}{2}$ or $x = 3$

Check by expanding

$2x^2 - 6x + 3x - 9$

$2x^2 - 3x - 9$ ✓

26: 6

Check by substituting: $\frac{5}{3+2} + \frac{4}{3+1} = \frac{5}{5} + \frac{4}{4} = 2$ ✓

$\frac{5}{2-1.5} + \frac{4}{-0.5} = \frac{5}{0.5} + \frac{4}{-0.5} = 10 - 8 = 2$

Answer $x = \frac{-3}{2}$ or $x = 3$ *(6 marks)*

END OF QUESTIONS

8

There are no questions printed on this page

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