Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						1	3	8	0	/	4	H	Signature	

Paper Reference(s)

1380/4H

Examiner's use only

Team Leader's use only

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 4 (Calculator)

Higher Tier

Monday 1 June 2009 – Morning

Time: 1 hour 45 minutes

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
You must NOT write on the formulae page.
Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 26 questions in this question paper. The total mark for this paper is 100.
There are 24 pages in this question paper. Any blank pages are indicated.
Calculators may be used.
If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Advice to Candidates

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

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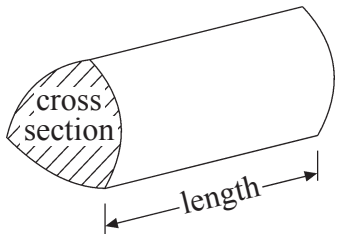
GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

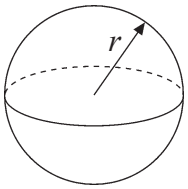
You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length



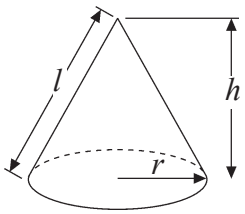
Volume of sphere $= \frac{4}{3}\pi r^3$

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

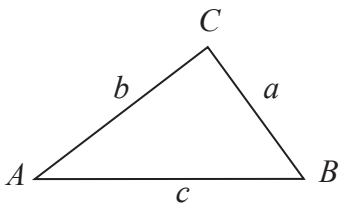


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



In any triangle ABC



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

The Quadratic Equation

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

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

Leave blank

Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. Tania went to Italy.
She changed £325 into euros (€).

The exchange rate was £1 = €1.68

(a) Change £325 into euros (€).

£325 × 1.68 = €546

€ 546 ✓ 2

(2)

When she came home she changed €117 into pounds.

The new exchange rate was £1 = €1.50

(b) Change €117 into pounds.

€117 ÷ 1.50 = £78

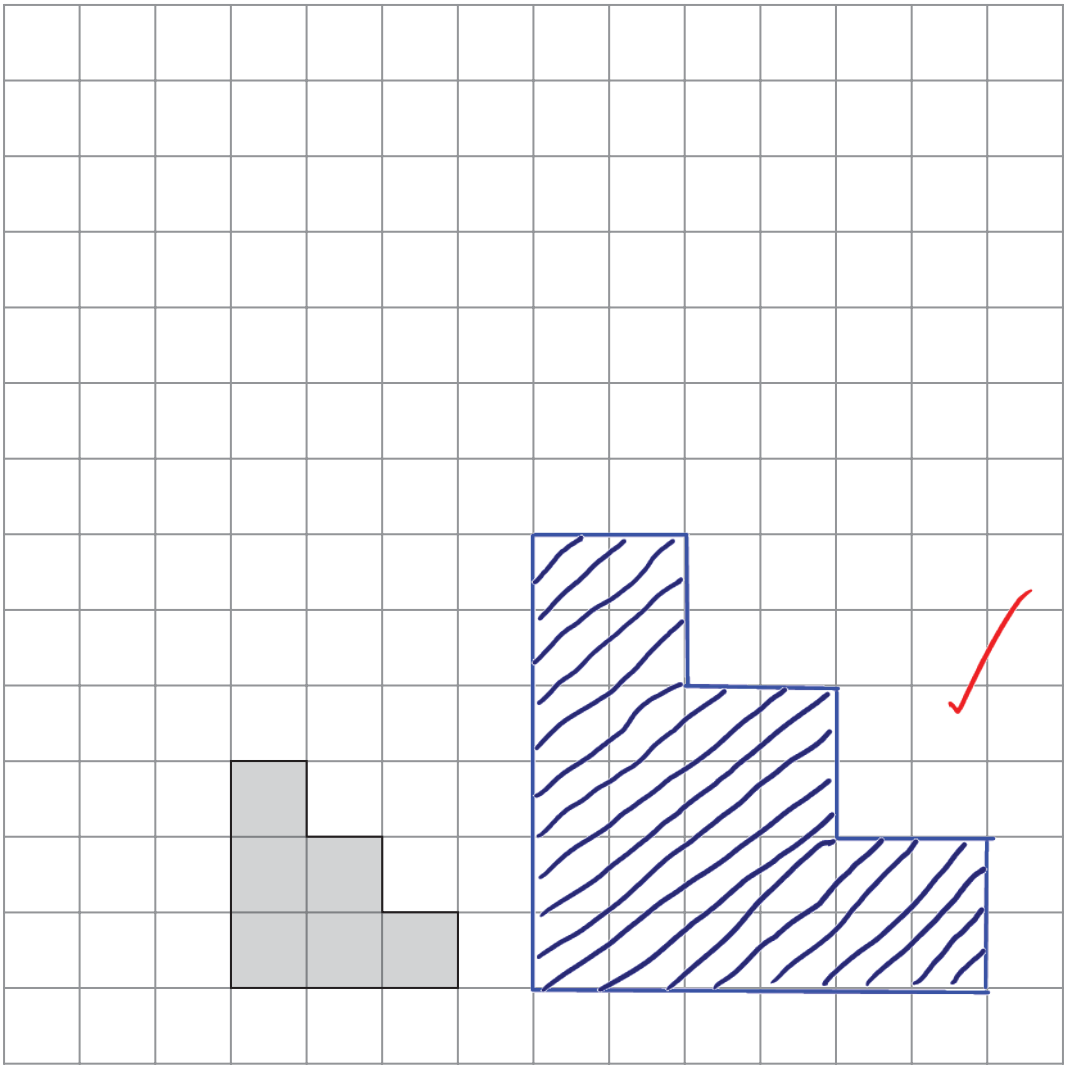
£ 78 ✓ 2

(2) Q1

(Total 4 marks) 4

Leave blank

2.

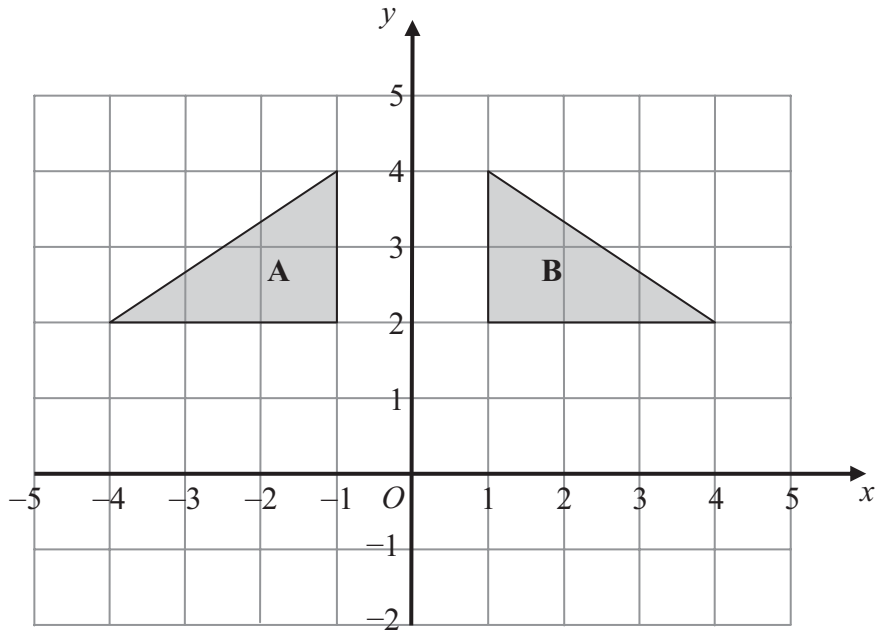


(a) On the grid, draw an enlargement, scale factor 2, of the shaded shape.

(2)

2

Leave blank



(b) Describe fully the single transformation that maps triangle **A** onto triangle **B**.

A REFLECTION in the y-axis (x = 0) ✓

2

(2)

Q2

4

(Total 4 marks)

3. The nth term of a number sequence is $n^2 + 1$

Write down the first three terms of the sequence.

n	1	2	3
n^2	1	4	9
n^2+1	2	5	10

2, 5, 10 ✓

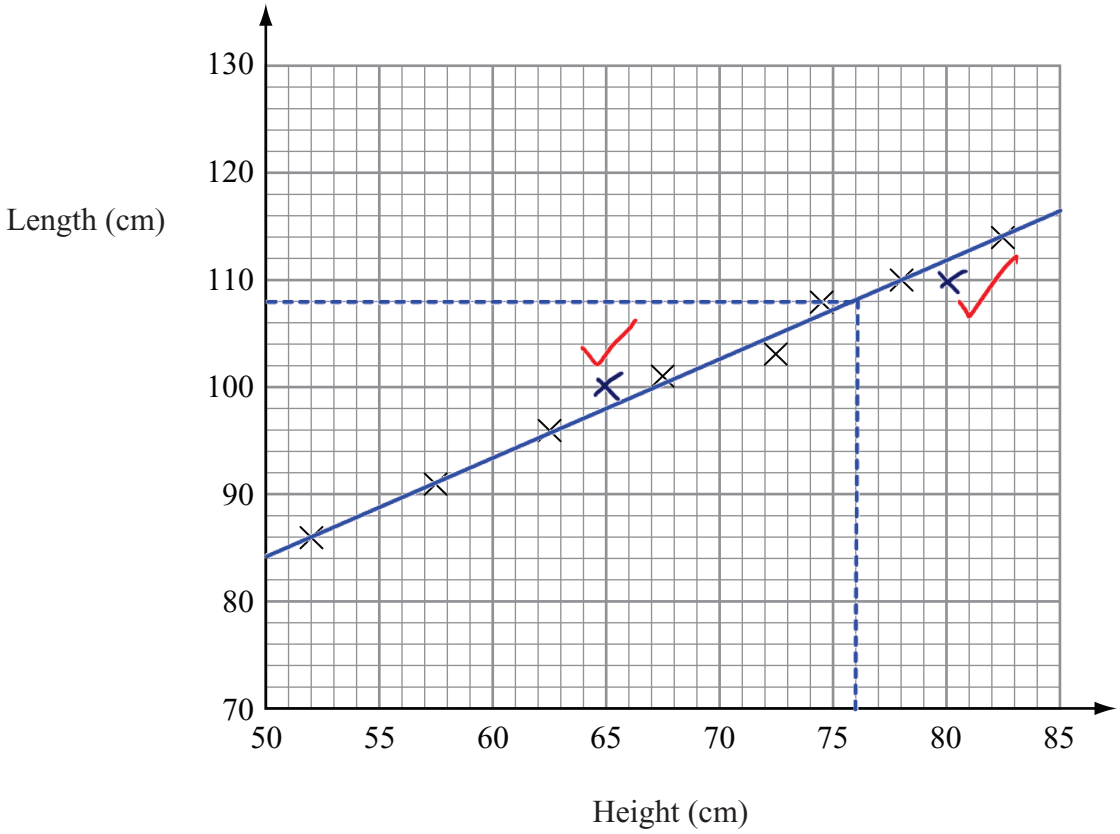
Q3

2

(Total 2 marks)

Leave blank

4. The scatter graph shows information about eight sheep.
It shows the height and the length of each sheep.



The table gives the height and the length of two more sheep.

Height (cm)	65	80
Length (cm)	100	110

(a) On the scatter graph, plot the information from the table.

(1)

1

(b) Describe the relationship between the height and the length of these sheep.

Positive correlation (as height increases so does length)

(1)

1

The height of a sheep is 76 cm.

(c) Estimate the length of this sheep.

108 ✓

.....cm

(2)

2

Q4

(Total 4 marks)

4

Leave blank

5. Julie buys 19 identical calculators.
The total cost is £143.64

Work out the total cost of 31 of these calculators.

£143.64 ÷ 19 = £7.56

£7.56 × 31 = £234.36

£ 234.36 ✓

(Total 3 marks)

Q5 3

6. $F = 1.8C + 32$

(a) Work out the value of F when $C = -8$

F = (1.8 × −8) + 32
= 17.6

17.6°F ✓ 2

(2)

(b) Work out the value of C when $F = 68$

68 = (1.8 × C) + 32
(−32) 36 = 1.8 × C
(÷1.8) $C = \frac{36}{1.8} = 20°C$

20°C ✓ 2

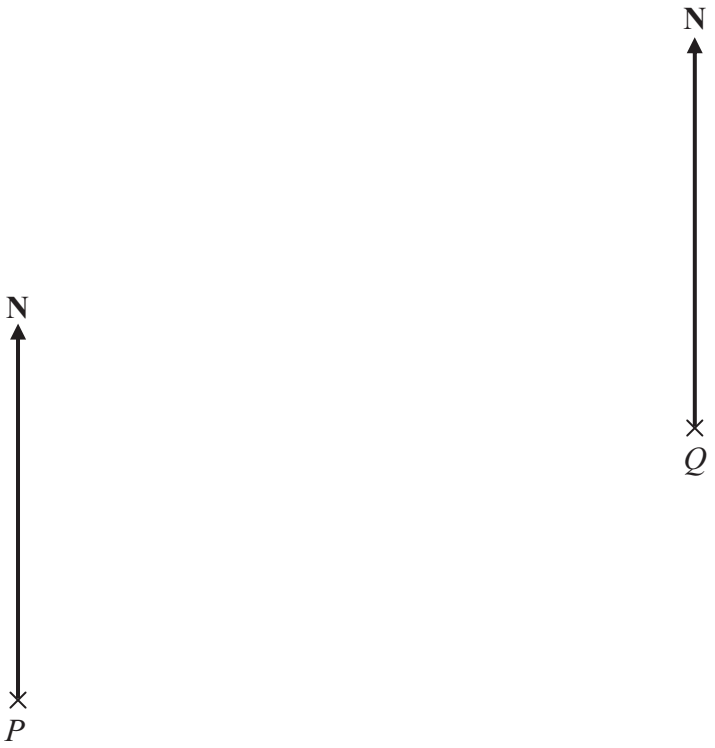
(2)

Q6 4

(Total 4 marks)

Leave blank

7. The diagram shows the position of two boats, *P* and *Q*.



The bearing of a boat *R* from boat *P* is 060°
The bearing of boat *R* from boat *Q* is 310°

In the space above, draw an accurate diagram to show the position of boat *R*.
Mark the position of boat *R* with a cross (×). Label it *R*.

Q7

(Total 3 marks)

Leave blank

8. There are some sweets in a bag.

18 of the sweets are toffees.
12 of the sweets are mints.

(a) Write down the ratio of the number of toffees to the number of mints.
Give your ratio in its simplest form.

T : M

18 : 12
÷6 ↘ ↙ ÷6
3 : 2

3 : 2 ✓ 2

(2)

There are some oranges and apples in a box.
The total number of oranges and apples is 54
The ratio of the number of oranges to the number of apples is 1 : 5

(b) Work out the number of apples in the box.

O + A = 54

O : A
1 : 5
9 : 45

No. of parts = 1 + 5 = 6
1 part = 54 ÷ 6 = 9

45 ✓ 2

(2)

Q8 4

(Total 4 marks)

Leave blank

9. The equation

$$x^3 + 20x = 71$$

has a solution between 2 and 3

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **ALL** your working.

x	x^3	$20x$	$x^3 + 20x$	too big / too small
2	8	40	48	too small
3	27	60	87	too big ✓
2.5	15.625	50	65.625	too small
2.7	19.683	54	73.683	too big
2.6	17.576	52	69.576	too small ✓
2.65	18.609625	53	71.609625	too big ✓

2.6 — 2.65 — 2.7

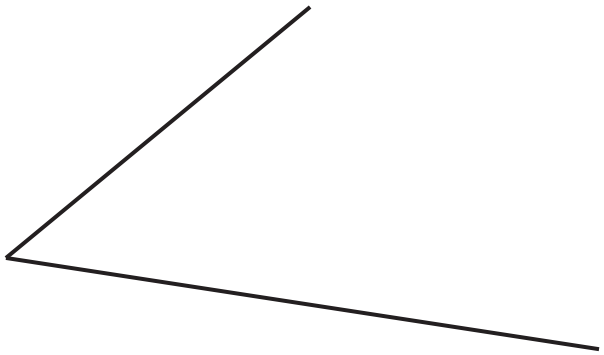
69.576 71 71.609625 73.683

$x =$ 2.6 (1dp) ✓ Q9

(Total 4 marks) 4

Leave blank

10. Use ruler and compasses to **construct** the bisector of this angle.
You must show all your construction lines.



Q10

(Total 2 marks)

11. Tarish says,

'The sum of two prime numbers is always an even number'.

He is **wrong**.
Explain why.

2+3 = 5
2+5 = 7
2+7 = 9

✓

Two is the only even prime number. Adding 2 to another prime number will always result in an odd numbered answer.

Q11

2

(Total 2 marks)

Leave blank

12. Sethina recorded the times, in minutes, taken to repair 80 car tyres.
Information about these times is shown in the table.

Time (t minutes)	Frequency	midpoint	midpoint × freq.
$0 < t \leqslant 6$	15	3	45
$6 < t \leqslant 12$	25	9	225
$12 < t \leqslant 18$	20	15	300
$18 < t \leqslant 24$	12	21	252
$24 < t \leqslant 30$	8	27	216
	80		1038

Calculate an estimate for the mean time taken to repair each car tyre.

1038 ÷ 80 = 12.975 ✓

12.975 ✓ = 13 (nearest minute) ..... minutes

(Total 4 marks)

Q12 4

Leave blank

13. Here is a tile in the shape of a semicircle.

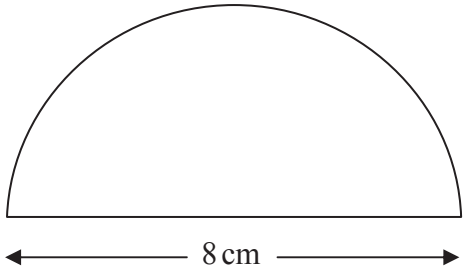


Diagram **NOT** accurately drawn

The diameter of the semicircle is 8 cm.

Work out the perimeter of the tile.
Give your answer correct to 2 decimal places.

Circumference of circle = $\pi d = 8\pi = 23.1327$

Half circumference = 12.5664

Perimeter = 12.5664 + 8

= 20.5664

✓

20.57 (2dp)

..... cm

Q13

3

(Total 3 marks)

Leave blank

14. (a) Simplify $a \times a \times a$

a^3 ✓

.....

(1)

1

(b) Expand $5(3x - 2)$

$5(3x-2) = 15x - 10$

$15x - 10$ ✓

.....

(1)

1

(c) Expand $3y(y + 4)$

$3y(y+4) = 3y^2 + 12y$

$3y^2 + 12y$ ✓

.....

(2)

2

(d) Expand and simplify $2(x - 4) + 3(x + 2)$

$2(x-4) + 3(x+2)$

$= 2x - 8 + 3x + 6$

$= 5x - 2$

$5x - 2$ ✓

.....

(2)

2

(e) Expand and simplify $(x + 4)(x - 3)$

$(x+4)(x-3)$

F x^2
O $-3x$
I $+4x$
L -12

$x^2 - 3x + 4x - 12$

$x^2 + x - 12$

$x^2 + x - 12$ ✓

.....

(2)

2

Q14

8

(Total 8 marks)

Leave blank

15. Work out $\dfrac{4.6+3.85}{3.2^2-6.51}$

Write down all the numbers on your calculator display.

2.265541555 ✓

Q15 2

(Total 2 marks)

16. (a) Simplify $t^6 \times t^2$ $= t^{6+2} = t^8$

t^8 ✓ 1

(1)

(b) Simplify $\dfrac{m^8}{m^3}$ $= m^{8-3} = m^5$

m^5 ✓ 1

(1)

(c) Simplify $(2x)^3$ $= 2^3 \times x^3$

$= 8x^3$

$8x^3$ ✓ 2

(2)

(d) Simplify $3a^2h \times 4a^5h^4$

$= 3 \times a^2 \times h \times 4 \times a^5 \times h^4$

$= 3 \times 4 \times a^2 \times a^5 \times h \times h^4$

$= 12a^7h^5$

$12a^7h^5$ ✓ 2

(2)

Q16 6

(Total 6 marks)

Leave blank

17.

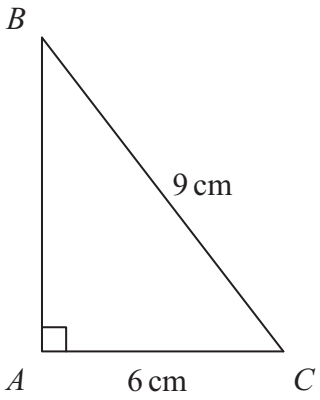


Diagram **NOT** accurately drawn

$c^2 = a^2 + b^2$

$9^2 = 6^2 + b^2$

$81 = 36 + b^2$

$b^2 = 81 - 36$

$b^2 = 45$

ABC is a right-angled triangle.

AC = 6 cm.
BC = 9 cm.

Work out the length of *AB*.
Give your answer correct to 3 significant figures.

$b = \sqrt{45}$

$= 6.71$ (3sf)

✓

6.71 (3sf)

..... cm

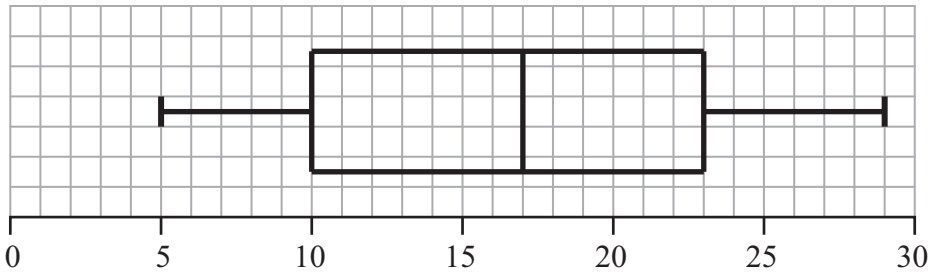
(Total 3 marks)

Q17

3

Leave blank

18. The box plot gives information about the distribution of the weights of bags on a plane.



Weight (kg)

(a) Jean says the heaviest bag weighs 23 kg.

She is **wrong**.
Explain why.

The Box Plot shows that the maximum weight is 29kg. ✓

(1)

(b) Write down the median weight.

17 ✓ kg

(1)

(c) Work out the interquartile range of the weights.

IQR = 23 − 10 = 13 kg

13 ✓ kg

(1)

There are 240 bags on the plane.

(d) Work out the number of bags with a weight of 10 kg or less.

The LQ is 10kg so $\frac{1}{4}$ of bags are less than 10kg

240 ÷ 4 = 60

60 ✓

(2)

Q18

(Total 5 marks)

5

Leave blank

19. Toby invested £4500 for 2 years in a savings account.
He was paid 4% per annum compound interest.

(a) How much did Toby have in his savings account after 2 years?

2 methods

1st Method

4% of 4500 = 180

after 1 year 4500 + 180 = 4680

4% of 4680 = 187.20

after 2 years 4680 + 187.20 = 4867.20

2nd Method

4% percentage multiplier

4% = 0.04

To increase by 4% multiply by 1.04

4500 × 1.04 × 1.04

= 4500 × 1.04^2 ← no. of years

= 4867.20

£ 4867.20 ✓

(3) 3

Jaspir invested £2400 for *n* years in a savings account.
He was paid 7.5% per annum compound interest.

At the end of the *n* years he had £3445.51 in the savings account.

(b) Work out the value of *n*.

7.5% = 0.075 Increase multiplier = 1.075

$2400 \times 1.075^n = 3445.51$

$1.075^n = \frac{3445.51}{2400} = 1.435629167$

T&I

$1.075^2 = 1.155625$

$1.075^3 = 1.242296875$

$1.075^4 = 1.335469141$

$1.075^5 = 1.435629326$ so $n = 5$

$2400 \times 1.075^5 = 3445.51$ so ...

$n = 5$ ✓

(2) 2

Q19 5

(Total 5 marks)

Leave blank

20. Here is a right-angled triangle.

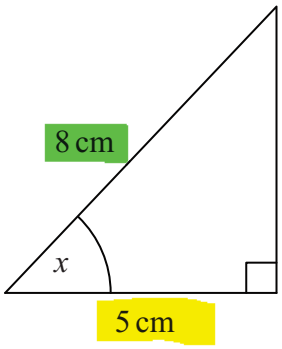


Diagram **NOT** accurately drawn

(a) Calculate the size of the angle marked x.
Give your answer correct to 1 decimal place.

$\cos x = \frac{5}{8} = 0.625$

$x = \cos^{-1}(0.625) = 51.3°$

$x =$ 51.3 ° ✓ 3

(3)

Here is another right-angled triangle.

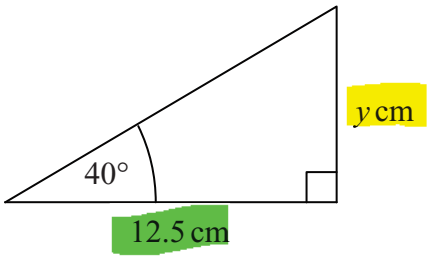


Diagram **NOT** accurately drawn

(b) Calculate the value of y.
Give your answer correct to 1 decimal place.

opposite = tan 40° × 12.5cm

= 10.5cm (1dp)

$y =$ 10.5cm (1dp) ✓ 3

(3) Q20

(Total 6 marks) 6

Leave blank

21. 258 students each study one of three languages.
The table shows information about these students.

25
48
62
135
1

	Language studied		
	German	**French**	**Spanish**
Male	45	52	26
Female	25	48	62

A sample, stratified by the language studied and by gender, of 50 of the 258 students is taken.

(a) Work out the number of male students studying Spanish in the sample.

$\frac{26}{258} \times 50 = 5$ to nearest whole number

5 ✓

.....

(2)

2

(b) Work out the number of female students in the sample.

$\frac{135}{258} \times 50 = 26$ to nearest whole num

26 ✓

.....

(2)

2

Q21

(Total 4 marks)

4

22. Prove that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 4, for all positive integer values of n.

$(3n+1)(3n+1)$

F $9n^2$
O $3n$
I $3n$
L 1
S $9n^2 + 6n + 1$

$(3n-1)(3n-1)$

F $9n^2$
O $-3n$
I $-3n$
L $+1$
S $9n^2 - 6n + 1$

$(9n^2 + 6n + 1) - (9n^2 - 6n + 1)$

For all n, $12n$ is a multiple of 4 ✓

$= 9n^2 + 6n + 1 - 9n^2 + 6n - 1$

$= 9n^2 - 9n^2 + 6n + 6n + 1 - 1 = 12n$ ✓

Q22

(Total 3 marks)

3

Leave blank

23.

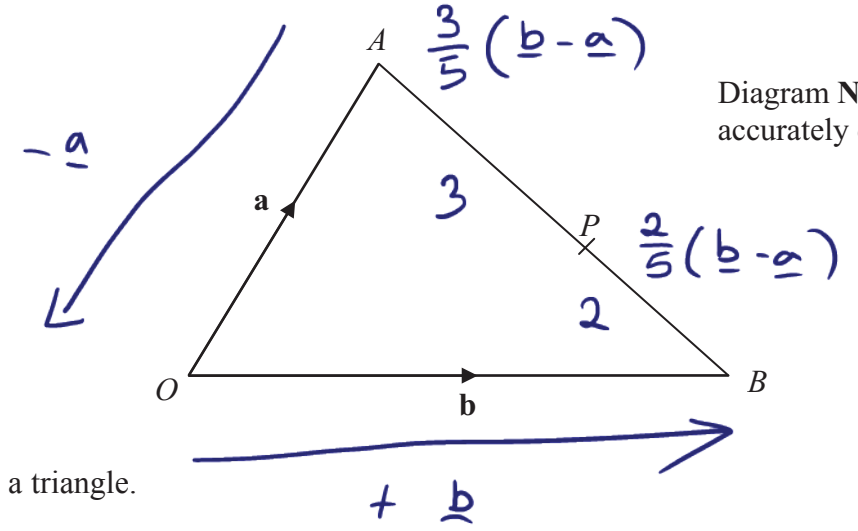


Diagram **NOT** accurately drawn

OAB is a triangle.

$\overrightarrow{OA}$ = **a**

$\overrightarrow{OB}$ = **b**

(a) Find the vector $\overrightarrow{AB}$ in terms of **a** and **b**.

$\overrightarrow{AB}$ = $\mathbf{b} - \mathbf{a}$ ✓

(1)

1

P is the point on *AB* such that *AP* : *PB* = 3 : 2

(b) Show that $\overrightarrow{OP} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$

$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$

$= \mathbf{a} + \frac{3}{5}(\mathbf{b} - \mathbf{a})$

$= \mathbf{a} + \frac{3}{5}\mathbf{b} - \frac{3}{5}\mathbf{a}$ ✓

$= \mathbf{a} - \frac{3}{5}\mathbf{a} + \frac{3}{5}\mathbf{b} = \frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$

(3)

3

Q23

4

(Total 4 marks)

Leave blank

24.

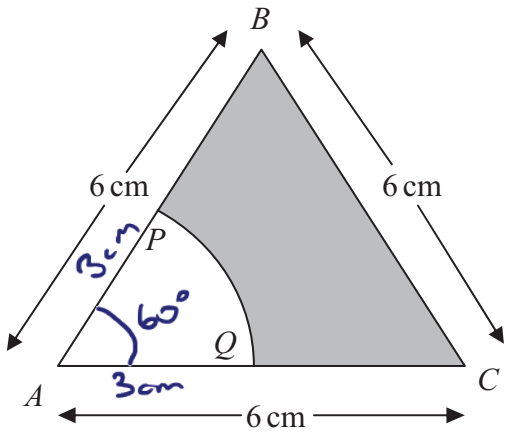


Diagram **NOT** accurately drawn

The diagram shows an equilateral triangle *ABC* with sides of length 6 cm.

P is the midpoint of *AB*.
Q is the midpoint of *AC*.
APQ is a sector of a circle, centre *A*.

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

from formula sheet

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

$= \frac{1}{2} \times 6 \times 6 \times \sin 60^\circ$

$= 15.59$ ✓

Area of part circle $= \frac{60^\circ}{360^\circ} \times \pi \times 3^2$

$= 4.712$ ✓

Area of shaded area: $15.59 - 4.712 = 10.9\ cm^2$ (3sf)

10.9 (3sf) ✓ ..... cm^2

(Total 4 marks)

Q24

4

ax^2+bx+c

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

FACTORISE BOTH

$x^2-8x+15$ (1×15, −3x−5)

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

$2x^2-7x-15$ EXPECT ONE OF THESE

Look for factors of $a \times c = 2 \times -15 = -30$ that add to b (-7)

-1×30, -2×15, -3×10, -5×6, -6×5, -10×3, -15×2, -30×1

$= 2x^2-10x+3x-15$

$= 2x(x-5)+3(x-5)$

$=(2x+3)(x-5)$

$\dfrac{(x-3)(x-5)}{(2x+3)(x-5)}$

$\dfrac{x-3}{2x+3}$ ✓

(Total 3 marks)

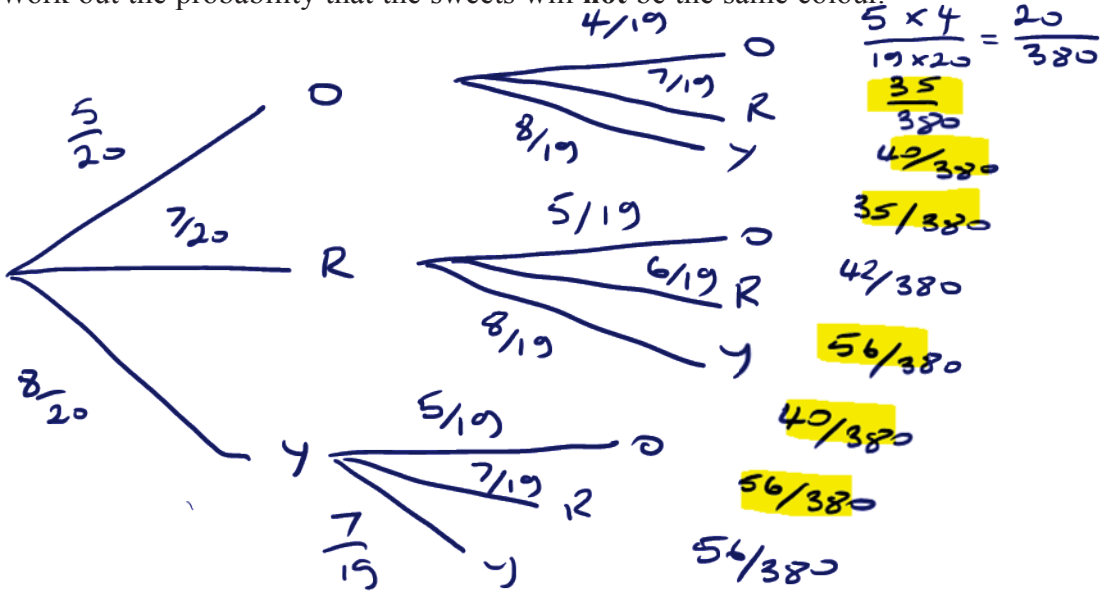
Q25 3

26. Phil has 20 sweets in a bag.

5 of the sweets are orange.
7 of the sweets are red.
8 of the sweets are yellow.

Phil takes at random **two** sweets from the bag.

Work out the probability that the sweets will **not** be the same colour.



$\dfrac{35}{380}+\dfrac{40}{380}+\dfrac{35}{380}+\dfrac{56}{380}+\dfrac{40}{380}+\dfrac{56}{380}$

$=\dfrac{262}{380}=\dfrac{131}{190}=0.689473=0.689\ (3sf)$ ✓

0.689 ✓

Q26 4

(Total 4 marks)

TOTAL FOR PAPER: 100 MARKS

END

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