

Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						5	5	4	0	H	/	3	H	Signature

Paper Reference(s)

5540H/3H

Edexcel GCSE

Mathematics A (Linear) – 2540

Paper 3 (Non-Calculator)

Higher Tier

Monday 19 May 2008 – Morning

Time: 1 hour 45 minutes

Examiner's use only

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Team Leader's use only

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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 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 28 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 must not be used.

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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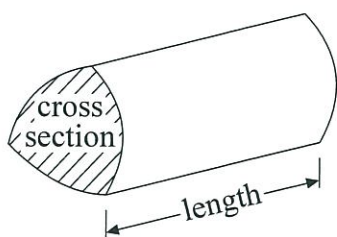
GCSE Mathematics (Linear) 2540

Formulae: Higher Tier

You must not write on this formulae page.

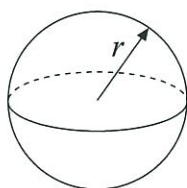
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section \times length



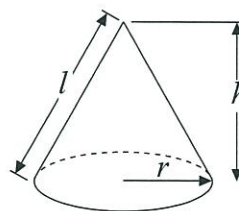
Volume of sphere = $\frac{4}{3}\pi r^3$

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

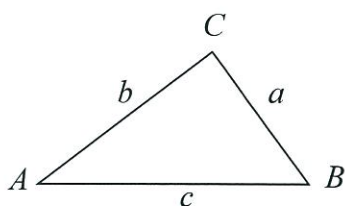


Volume of cone = $\frac{1}{3}\pi r^2 h$

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



In any triangle ABC



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 TWENTY EIGHT questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1. Here are the ingredients needed to make 8 pancakes.

Pancakes
Ingredients to make 8 pancakes

300 ml milk
1 egg
120 g flour
5 g butter

Jacob makes 24 pancakes.

- (a) Work out how much milk he needs.

$$\frac{24}{8} \times 300 = 3 \times 300 = 900 \text{ ml}$$

..... 900 ml
(2)

Cathie makes 12 pancakes.

- (b) Work out how much flour she needs.

$$\frac{120}{8} \times 12 = \frac{12}{8} \times 120$$

$$= \frac{3}{2} \times 120 = 60 \times 3 = 180 \text{ g}$$

..... 180 g
(2)

(Total 4 marks)

Q1



2. Kaysha has a part-time job.
She is paid £5.40 for each hour she works.
Last week Kaysha worked for 24 hours.

Work out Kaysha's total pay for last week.

$$\begin{array}{r} 5.40 \\ \times 24 \\ \hline 2160 \\ + 10800 \\ \hline 129.60 \end{array}$$

£ 129.60

Q2

(Total 3 marks)

3. Here are the ages, in years, of 15 teachers.

35 52 42 27 36

23 31 41 50 34

44 28 45 45 53

Draw an ordered stem and leaf diagram to show this information.
You must include a key.

2	3 7 8
3	1 4 5 6
4	1 2 4 5 5
5	0 2 3

Key: 2/3 = 23

Q3

(Total 3 marks)



4. Using the information that

$$4.8 \times 34 = 163.2$$

write down the value of

(a) 48×34

$$(4.8 \times 10) \times 34 = 163.2 \times 10 \\ = 1632$$

$$\underline{1632} \quad (1)$$

(b) 4.8×3.4

$$4.8 \times \frac{34}{10} = \frac{163.2}{10} \\ \Rightarrow 4.8 \times 3.4 = 16.32$$

$$\underline{16.32} \quad (1)$$

(c) $163.2 \div 48$

$$4.8 \times 10 \times \frac{34}{10} = 163.2 \\ \Rightarrow 48 \times 3.4 = 163.2 \\ \Rightarrow 163.2 \div 48 = 3.4$$

$$\underline{3.4} \quad (1)$$

(Total 3 marks)

Q4

5.

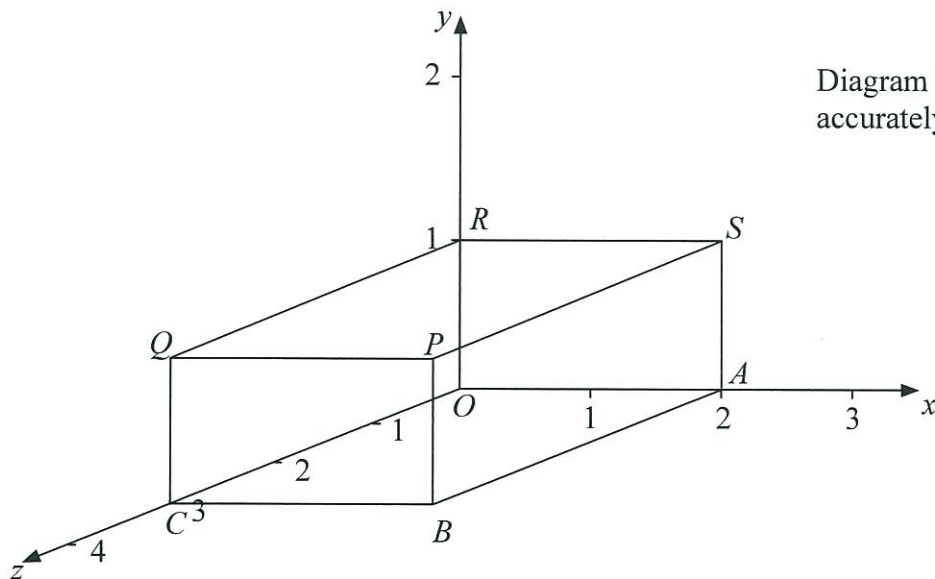


Diagram NOT
accurately drawn

A cuboid is shown on a 3-dimensional grid.

(a) Write down the letter of the point with coordinates (2, 1, 0).

$$\underline{S} \quad (1)$$

(b) Write down the coordinates of the point P.

$$(\underline{2}, \underline{1}, \underline{3}) \quad (1)$$

(Total 2 marks)

Q5



6. This rule is used to work out the total cost, in pounds, of hiring a carpet cleaner.

Multiply the number of days' hire by 4

Add 6 to your answer

Peter hires a carpet cleaner.

The total cost is £18

- (a) Work out for how many days he hires the carpet cleaner.

$$\frac{18 - 6}{4} = \frac{12}{4} = 3$$

..... 3 days
(2)

- (b) Write down an expression, in terms of n , for the total cost, in pounds, of hiring a carpet cleaner for n days.

..... $4n + 6$
(2)

(Total 4 marks)

Q6



7.

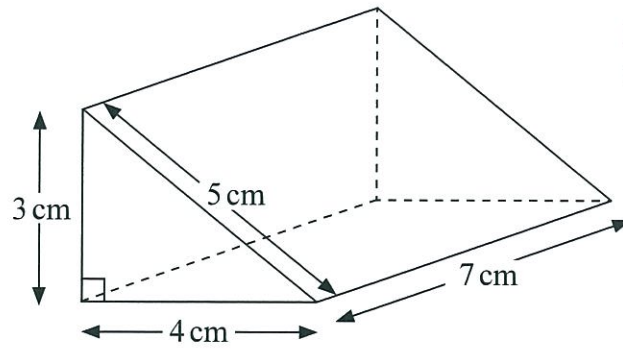


Diagram **NOT**
accurately drawn

Work out the total surface area of the triangular prism.
Give the units with your answer.

$$\frac{3 \times 4}{2} + \frac{3 \times 4}{2} + 7(5) + 7(4) + (7 \times 3)$$

$$= 12 + 35 + 28 + 21$$

$$= 96 \text{ cm}^2$$

$$96 \text{ cm}^2$$

Q7

(Total 4 marks)



8. Work out an estimate for $\frac{302 \times 9.96}{0.51}$

$$\frac{300 \times 10}{0.5} = \frac{3000}{0.5} = 3000 \div \frac{1}{2}$$

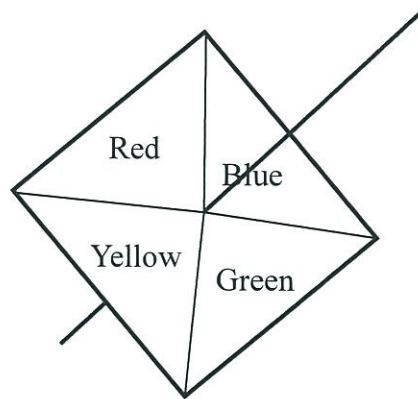
$$= 3000 \times \frac{2}{1} = 6,000$$

6,000

Q8

(Total 3 marks)

9. Here is a 4-sided spinner.



The sides of the spinner are labelled Red, Blue, Green and Yellow.

The spinner is biased.

The table shows the probability that the spinner will land on each of the colours Red, Yellow and Green.

Colour	Red	Blue	Green	Yellow
Probability	0.2		0.3	0.1

Work out the probability the spinner will land on Blue.

$$1 - (0.2 + 0.3 + 0.1) = 1 - 0.6 = 0.4$$

0.4

Q9

(Total 2 marks)



10. (a) Simplify $4p \times 5q$

$$\underline{20pq} \quad (1)$$

(b) Simplify $d \times d \times d \times d$

$$\underline{d^4} \quad (1)$$

(c) Expand $4(3a - 7)$

$$4(3a) - 4(7) = 12a - 28 \quad \underline{12a - 28} \quad (2)$$

(d) Expand and simplify $2(2n + 3) + 3(n + 1)$

$$4n + 6 + 3n + 3 = 7n + 9 \quad \underline{7n + 9} \quad (2)$$

(e) Simplify $t \times t^2$

$$t^1 \times t^2 = t^{(1+2)} = t^3 \quad \underline{t^3} \quad (1)$$

(f) Simplify $m^5 \div m^3$

$$m^{(5-3)} = m^2 \quad \underline{m^2} \quad (1)$$

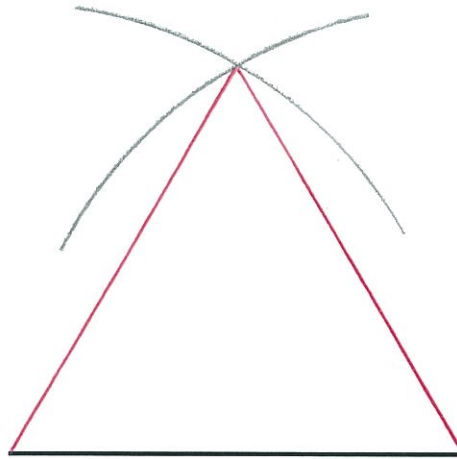
(Total 8 marks)

Q10



11. In the space below, use ruler and compasses to **construct** an equilateral triangle with sides of length 6 centimetres.
You must show all your construction lines.

One side of the triangle has already been drawn for you.



Q11

(Total 2 marks)

12. $-2 \leq x < 3$
 x is an integer.

Write down all the possible values of x .

-2, -1, 0, 1, 2

Q12

(Total 2 marks)



13. (a) Write down the reciprocal of 4

$$\frac{1}{4}$$

(1)

(b) Work out the value of $2\frac{4}{5} - 1\frac{3}{4}$

Give your answer as a fraction in its simplest form.

$$\begin{aligned} & \frac{2(5) + 4}{5} - \frac{1(4) + 3}{4} \\ &= \frac{14}{5} - \frac{7}{4} \\ &= \frac{4(14) - 5(7)}{20} = \frac{56 - 35}{20} \\ &= \frac{21}{20} = 1\frac{1}{20} \end{aligned}$$

(3)

(c) Sundas says that $4\frac{1}{3}$ is equal to 4.3

Sundas is **wrong**.

Explain why.

$4\frac{1}{3} = 4.\dot{3}$, which can be written as 4.3 correct to 1 decimal place. However, Sundas did not state his rounding.

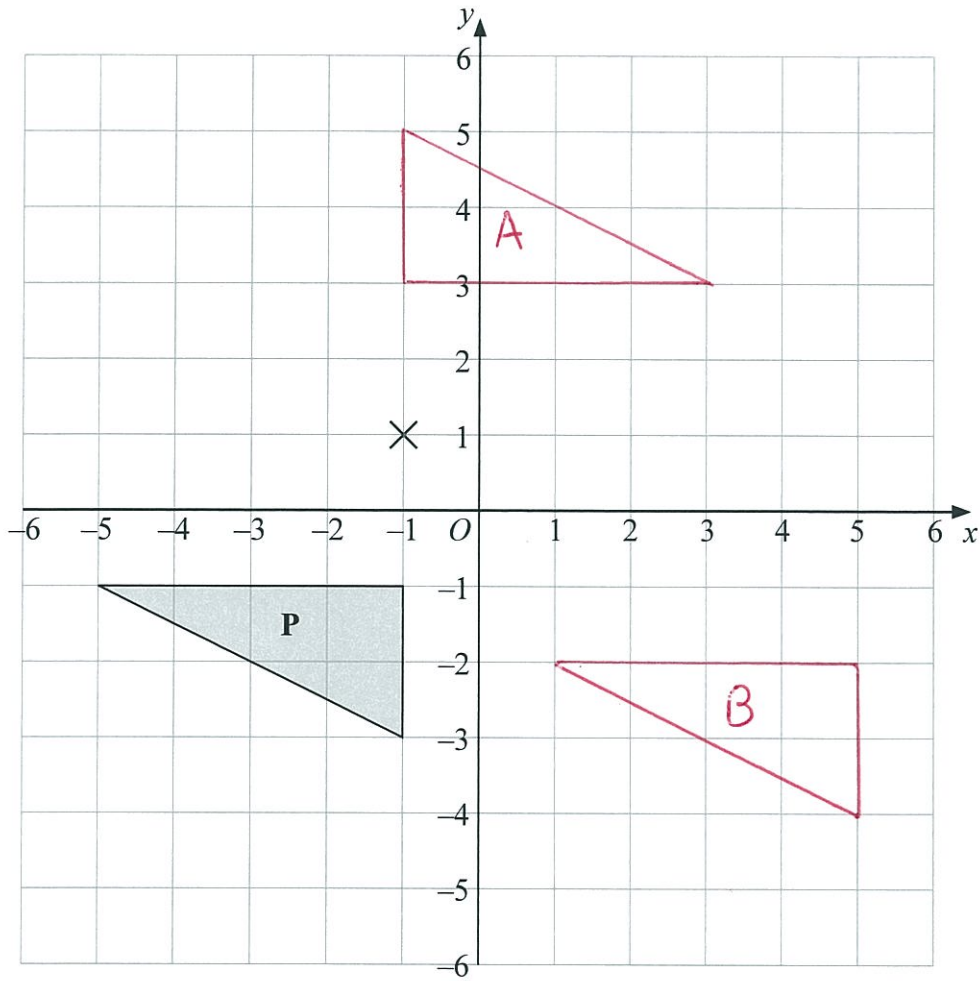
(1)

Q13

(Total 5 marks)



14.



- (a) Rotate triangle **P** 180° about the point $(-1, 1)$.

Label the new triangle **A**.

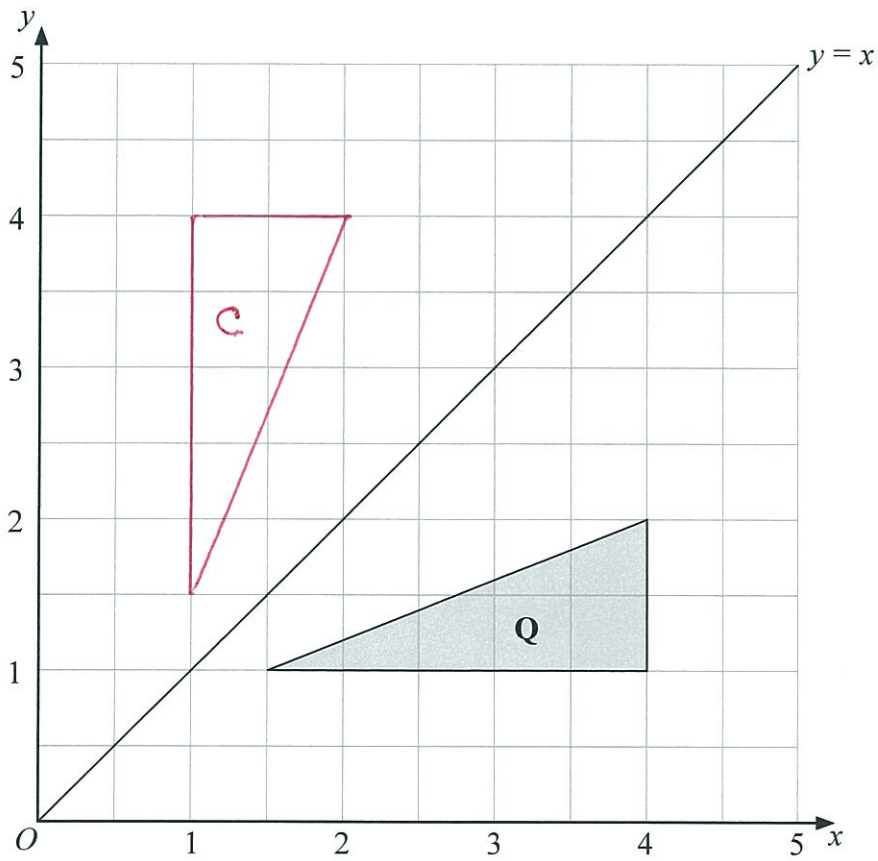
(2)

- (b) Translate triangle **P** by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.

Label the new triangle **B**.

(1)





(c) Reflect triangle **Q** in the line $y = x$.

Label the new triangle **C**.

(2)

Q14

(Total 5 marks)



15. (a) Expand $x(3x - 5y)$

$$\underline{3x^2 - 5xy} \quad (2)$$

(b) Factorise $x^2 - 36$

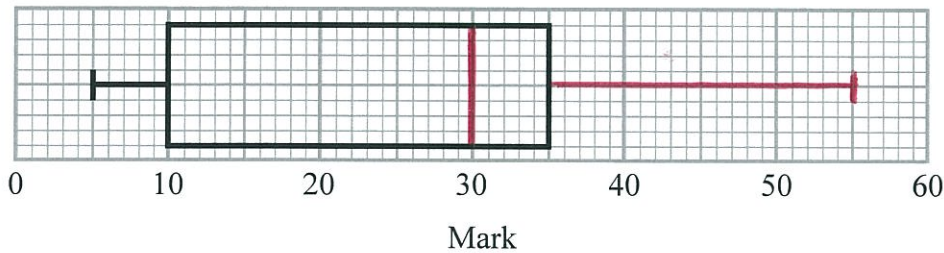
Difference of two squares rule: $a^2 - b^2 \equiv (a + b)(a - b)$

$$x^2 - 36 \equiv x^2 - 6^2 \equiv (x + 6)(x - 6) \quad \underline{(x + 6)(x - 6)} \quad (1)$$

(Total 3 marks)

Q15

16. The incomplete box plot and table show some information about some marks.



	Mark
Lowest mark	5
Lower quartile	10
Median	30
Upper quartile	35
Highest mark	55

(a) Use the information in the table to complete the box plot.

(2)

(b) Use the information in the box plot to complete the table.

(1)

Q16

(Total 3 marks)



17. (a) Write 6.4×10^4 as an ordinary number.

64,000
(1)

(b) Write 0.0039 in standard form.

3.9×10^{-3}
(1)

(c) Write 0.25×10^7 in standard form.

2.5×10^6
(1)

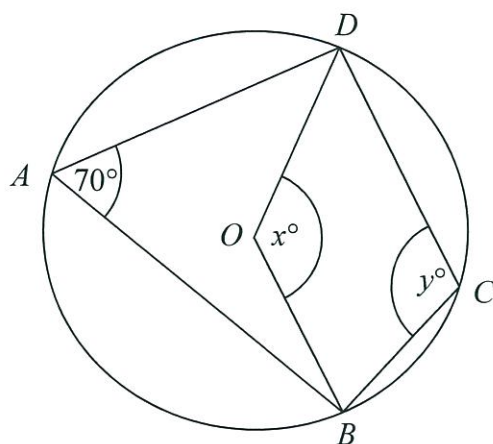
(Total 3 marks)

Q17



18.

Diagram **NOT**
accurately drawn



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

Angle $BAD = 70^\circ$.

Angle $BOD = x^\circ$.

Angle $BCD = y^\circ$.

(a) (i) Work out the value of x .

$$2(70) = 140^\circ$$

$$x = 140^\circ$$

(ii) Give a reason for your answer.

Angle subtended by an arc at the centre is
twice the angle subtended by the same arc at a
point on the circumference. (2)

(b) (i) Work out the value of y .

$$180 - 70 = 110^\circ$$

$$y = 110^\circ$$

(ii) Give a reason for your answer.

Opposite angles of a cyclic quadrilateral
add to 180° (i.e. are supplementary). (2)

(Total 4 marks)

Q18



19. Solve the simultaneous equations.

$$\begin{aligned} 2x + 3y &= 0 \\ x - 3y &= 9 \end{aligned}$$

$$(2x + 3y) + (x - 3y) = 0 + 9$$

$$\Rightarrow 3x = 9$$

$$x = \frac{9}{3} = 3$$

From equation 2: $x - 3y = 9$

$$\Rightarrow 3 - 3y = 9$$

$$3y = 3 - 9 = -6$$

$$\Rightarrow y = -\frac{6}{3} = -2$$

$$x = \underline{3}, y = \underline{-2}$$

(Total 3 marks)

Q19

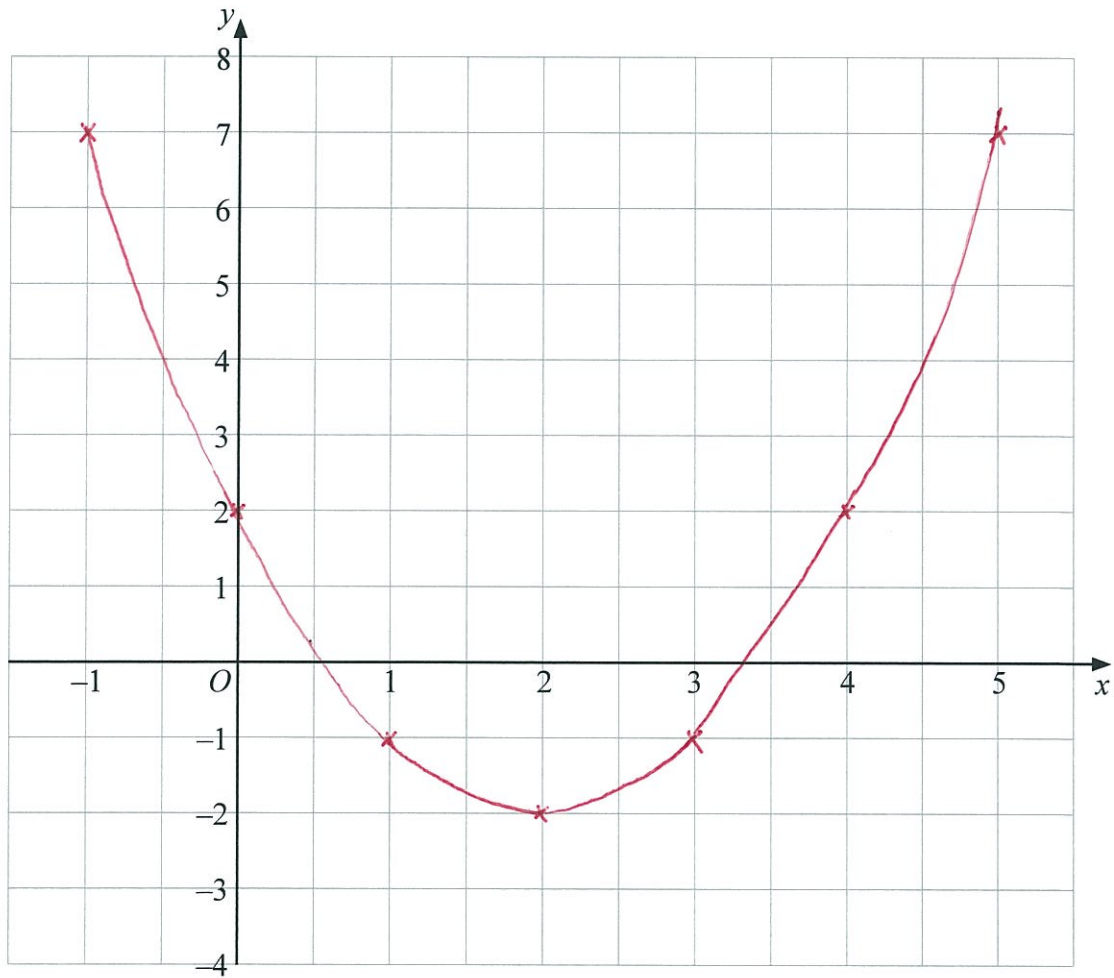


20. (a) Complete the table of values for $y = x^2 - 4x + 2$

x	-1	0	1	2	3	4	5
y	7	2	-1	-2	-1	2	7

(2)

(b) On the grid, draw the graph of $y = x^2 - 4x + 2$



(2)

Q20

(Total 4 marks)

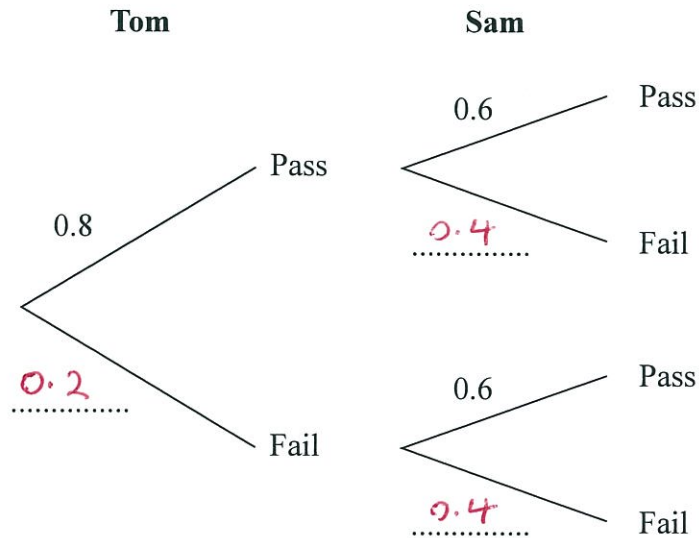


21. Tom and Sam each take a driving test.

The probability that Tom will pass the driving test is 0.8

The probability that Sam will pass the driving test is 0.6

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that both Tom and Sam will pass the driving test.

$$P(\text{Pass \& Pass}) = 0.8 \times 0.6 = 0.48$$

0.48

(2)

(c) Work out the probability that only one of them will pass the driving test.

$$P[(\text{Pass and Fail}) \text{ OR } (\text{Fail and Pass})]$$

$$= 0.8(0.4) + 0.2(0.6)$$

$$= 0.32 + 0.12$$

$$= 0.44$$

0.44

(3)

Q21

(Total 7 marks)



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

$$a(b-5) = 2-7b$$

$$ab - 5a = 2 - 7b$$

$$ab + 7b = 2 + 5a$$

$$b(a+7) = 2+5a$$

$$\Rightarrow b = \frac{2+5a}{a+7}$$

$$b = \frac{2+5a}{a+7}$$

Q22

(Total 4 marks)

23. (a) Rationalise the denominator of $\frac{1}{\sqrt{3}}$

$$\frac{\sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$\frac{\sqrt{3}}{3}$$

(1)

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

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

$$2 + 2\sqrt{3} + \sqrt{3} + 3$$

$$= 5 + 3\sqrt{3}$$

$$5 + 3\sqrt{3}$$

(2)

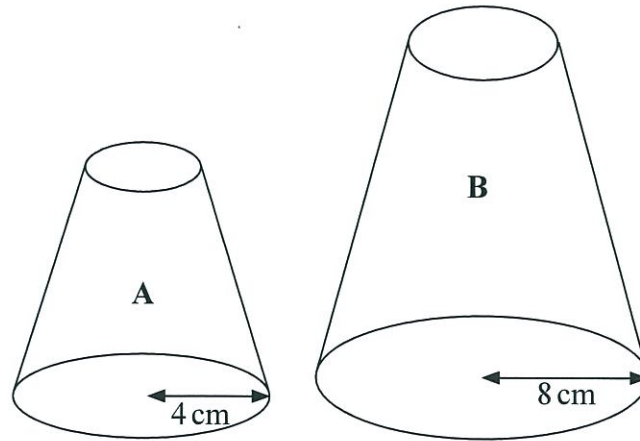
(Total 3 marks)

Q23



24.

Diagrams **NOT**
accurately drawn



Two solid shapes, **A** and **B**, are mathematically similar.
The base of shape **A** is a circle with radius 4 cm.
The base of shape **B** is a circle with radius 8 cm.

The surface area of shape **A** is 80 cm^2 .

(a) Work out the surface area of shape **B**.

$$80 \times \left(\frac{8}{4}\right)^2 = 80 \times 2^2 = 80 \times 4$$

$$= 320 \text{ cm}^2$$

320 cm^2
(2)

The volume of shape **B** is 600 cm^3 .

(b) Work out the volume of shape **A**.

$$\frac{600}{2^3} = \frac{600}{8} = \frac{300}{4} = \frac{150}{2} = 75 \text{ cm}^3$$

75 cm^3
(2)

(Total 4 marks)

Q24



25.

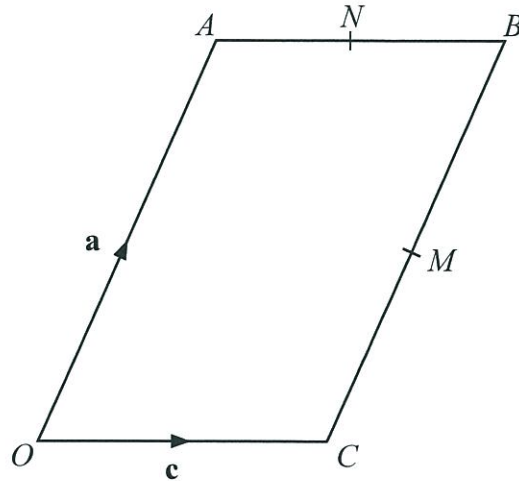


Diagram **NOT**
accurately drawn

$OABC$ is a parallelogram.
 M is the midpoint of CB .
 N is the midpoint of AB .

$$\vec{OA} = \mathbf{a}$$

$$\vec{OC} = \mathbf{c}$$

(a) Find, in terms of \mathbf{a} and/or \mathbf{c} , the vectors

(i) \vec{MB} , $\vec{CB} = \vec{OA}$ and $\vec{MB} = \frac{1}{2} \vec{CB}$
 $\Rightarrow \vec{MB} = \frac{1}{2} \vec{OA} = \frac{1}{2} \mathbf{a}$ $\frac{1}{2} \mathbf{a}$

(ii) \vec{MN} .

$$\vec{MN} = \vec{MB} + \vec{BN} = \frac{1}{2} \mathbf{a} - \frac{1}{2} \mathbf{c} \quad \frac{1}{2} (\mathbf{a} - \mathbf{c})$$

or $\frac{1}{2} (\mathbf{a} - \mathbf{c})$ (2)

(b) Show that CA is parallel to MN .

$$\vec{CA} = \vec{CO} + \vec{OA} = -\mathbf{c} + \mathbf{a} \text{ or } \mathbf{a} - \mathbf{c}.$$

$\therefore \vec{MN} = \frac{1}{2} \vec{CA}$ which means both vectors are
parallel since one is simply a scalar multiplier
of the other.

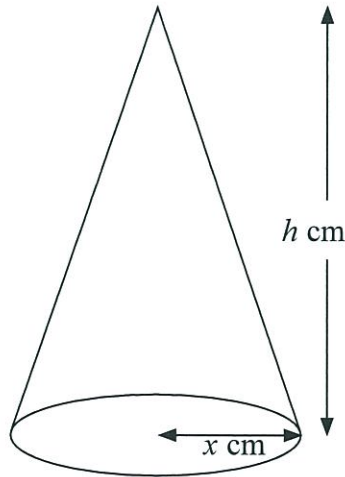
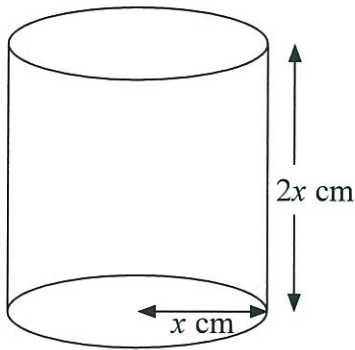
(2)

Q25

(Total 4 marks)



26.



Diagrams **NOT**
accurately drawn

A cylinder has base radius $x \text{ cm}$ and height $2x \text{ cm}$.

A cone has base radius $x \text{ cm}$ and height $h \text{ cm}$.

The volume of the cylinder and the volume of the cone are equal.

Find h in terms of x .

Give your answer in its simplest form.

Volume of cylinder = Volume of cone

$$\Rightarrow 2x(\pi x^2) = \frac{1}{3} \pi x^2 h$$

$$h = \frac{2\pi x^3}{\frac{1}{3}\pi x^2} = \frac{2}{(1/3)} \times \frac{\pi}{\pi} \times \frac{x^3}{x^2} = 6 \times 1 \times x$$

$$= 6x.$$

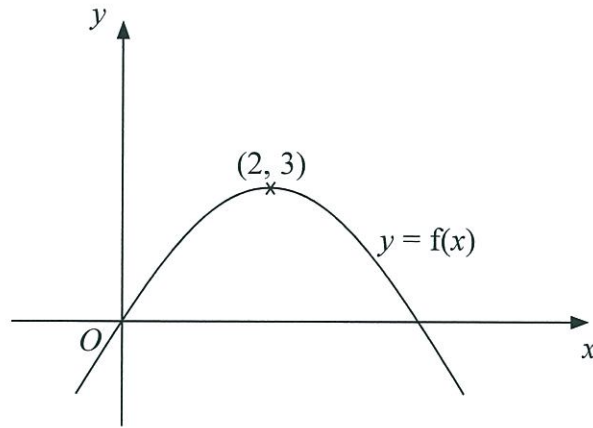
$$h = 6x$$

(Total 3 marks)

Q26



27.



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of this curve are $(2, 3)$.

Write down the coordinates of the maximum point of the curve with equation

(a) $y = f(x - 2)$

(4 , 3)
(1)

(b) $y = 2f(x)$

(2 , 6)
(1)

Q27

(Total 2 marks)

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

$$x^2 + x - 6 \equiv (x + 3)(x - 2)$$

$$x^2 - 7x + 10 \equiv (x - 5)(x - 2)$$

$$\frac{(x + 3)(\cancel{x - 2})}{(x - 5)(\cancel{x - 2})} = \frac{x + 3}{x - 5}$$

$$\frac{x + 3}{x - 5}$$

Q28

(Total 3 marks)

TOTAL FOR PAPER: 100 MARKS

END

