

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

Paper Reference(s)

1380/4H

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 4 (Calculator)

Higher Tier

Friday 10 June 2011 – 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, 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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Turn over

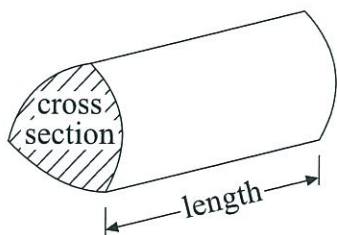
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GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

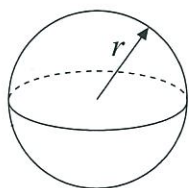
You must not write on this formulae page.
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Volume of a prism = area of cross section \times length



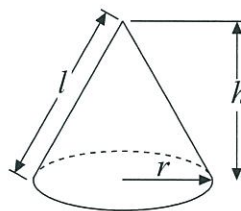
Volume of sphere = $\frac{4}{3}\pi r^3$

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

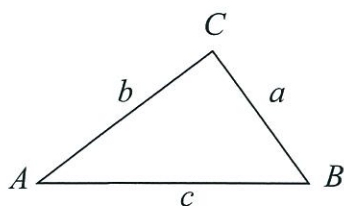


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. Each student at a college studies one of four languages.

The table shows the probability a student chosen at random studies German or Russian or French.

Language	German	Spanish	Russian	French
Probability	0.2		0.1	0.5

A student is chosen at random.

(a) Work out the probability that the student studies Spanish.

$$\begin{aligned}
 P(\text{Spanish}) &= 1 - (0.2 + 0.1 + 0.5) \\
 &= 1 - 0.8 \\
 &= 0.2
 \end{aligned}$$

$\frac{0.2}{\dots\dots\dots}$
 (2)

There are 800 students at the college.

(b) Work out the number of students who study German.

$$\begin{aligned}
 800 \times 0.2 &= 800 \times \frac{2}{10} \\
 &= 80 \times 2 \\
 &= 160
 \end{aligned}$$

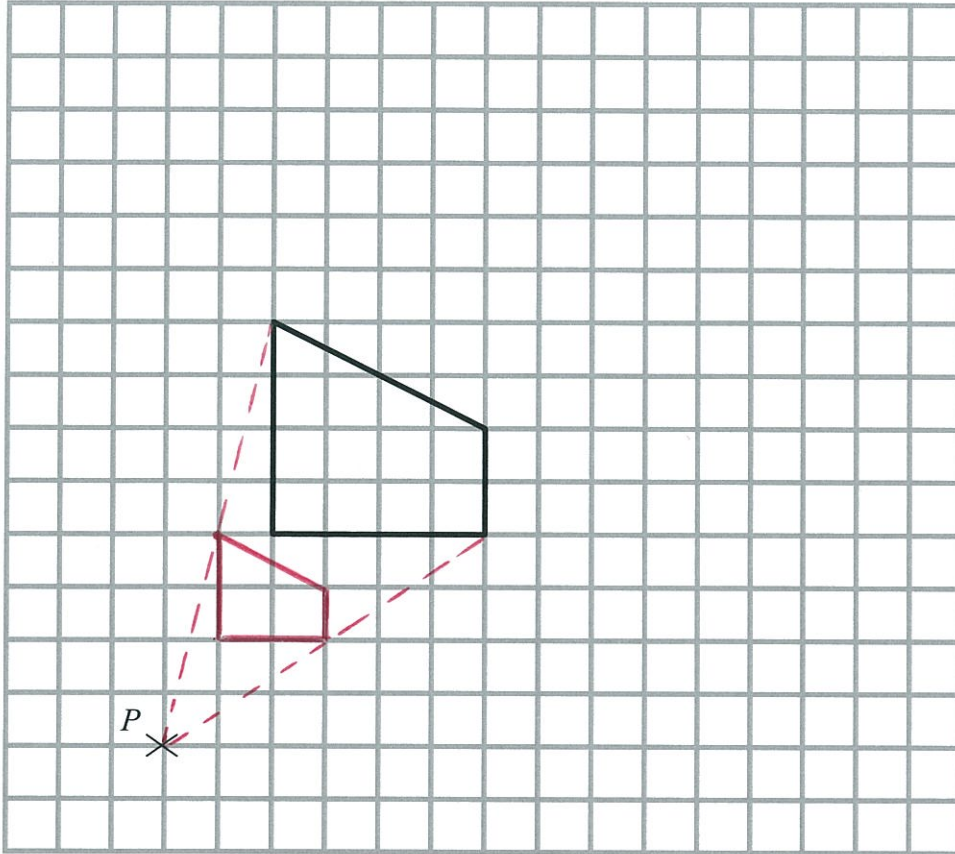
$\frac{160}{\dots\dots\dots}$
 (2)

(Total 4 marks)

Q1



2.



On the grid, enlarge the shape with a scale factor of $\frac{1}{2}$, centre P .

(Total 3 marks)

Q2

3. (a) Express 45 as a product of its prime factors.

$$45 = 3 \times 15$$

$$= 3 \times 3 \times 5$$

$$3^2 \times 5$$

(2)

(b) Find the Highest Common Factor (HCF) of 45 and 30

$$45 = 3 \times 3 \times 5$$

$$30 = 2 \times 3 \times 5$$

$$\text{HCF} \{45, 30\} = 3 \times 5 = 15$$

$$15$$

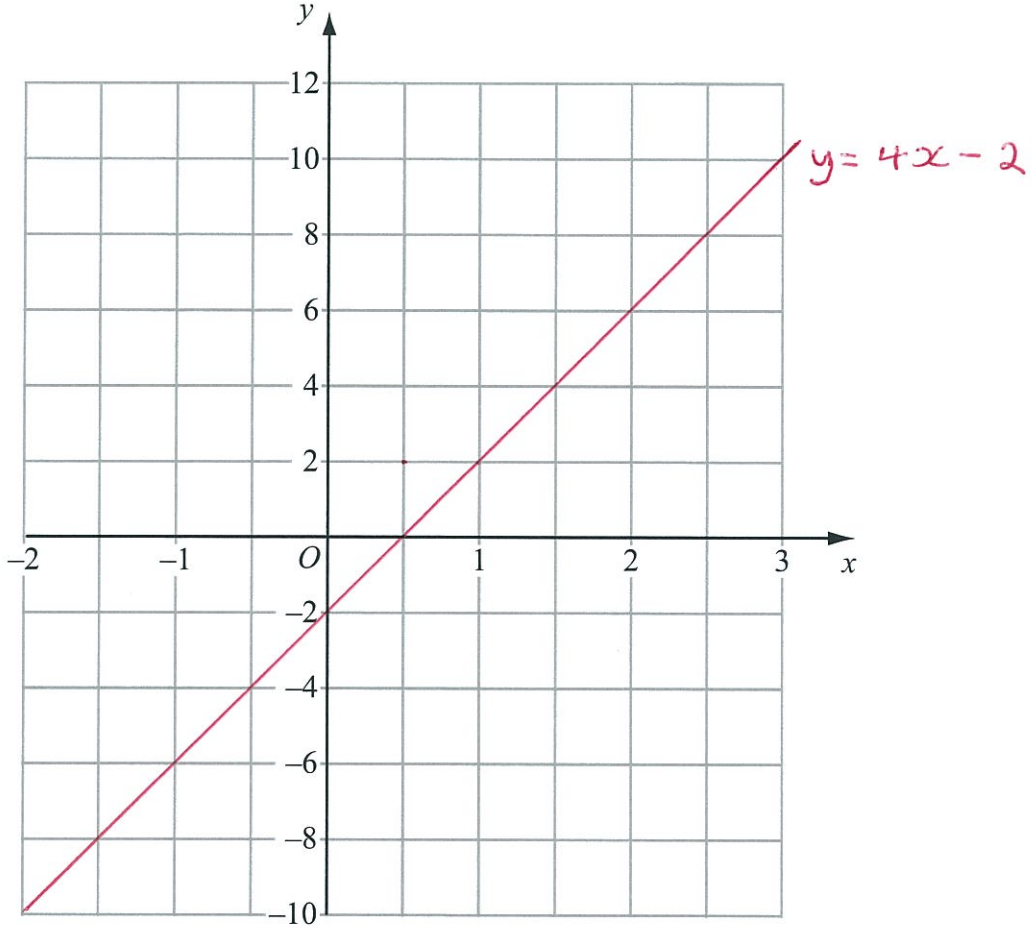
(2)

(Total 4 marks)

Q3



4. On the grid, draw the graph of $y = 4x - 2$



Q4

(Total 3 marks)



5. The diagram shows a circular pond with a path around it.

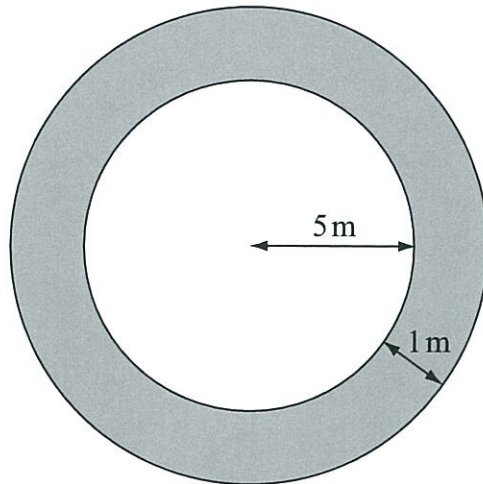


Diagram NOT accurately drawn

The pond has a radius of 5 m.
The path has a width of 1 m.

Work out the area of the path.
Give your answer correct to 3 significant figures.

$$\begin{aligned}
 \text{Area of path} &= \text{Area of large circle} - \text{Area of small circle} \\
 &= \pi(6^2) - \pi(5^2) \\
 &= 36\pi - 25\pi \\
 &= 11\pi \\
 &= 34.6 \text{ m}^2 \text{ (3 s.f.)}
 \end{aligned}$$

..... 34.6 m²

(Total 3 marks)

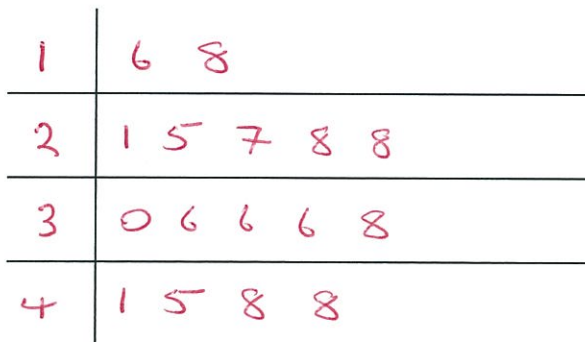
Q5



6. Here are the ages, in years, of 16 people.

36 48 18 25 36 28 45 30
 38 27 41 16 36 48 28 21

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



Key: 1 | 6 = 16

(3)

(b) Find the median age.

$$\frac{30 + 36}{2} = \frac{66}{2} = 33$$

..... 33 years
 (2)

(Total 5 marks)

Q6



7. Bob has 120 beads.
The beads are either red or green.

Bob gives $\frac{3}{4}$ of the beads to his friend.

$\frac{2}{3}$ of the beads Bob now has are red.

Work out how many green beads Bob now has.

No. of red beads Bob now has is given by

$$\frac{2}{3} \text{ of } (120 \times \frac{1}{4})$$

$$= \frac{2}{3} \times 30 = 20$$

\Rightarrow No. of green beads Bob now has is given by

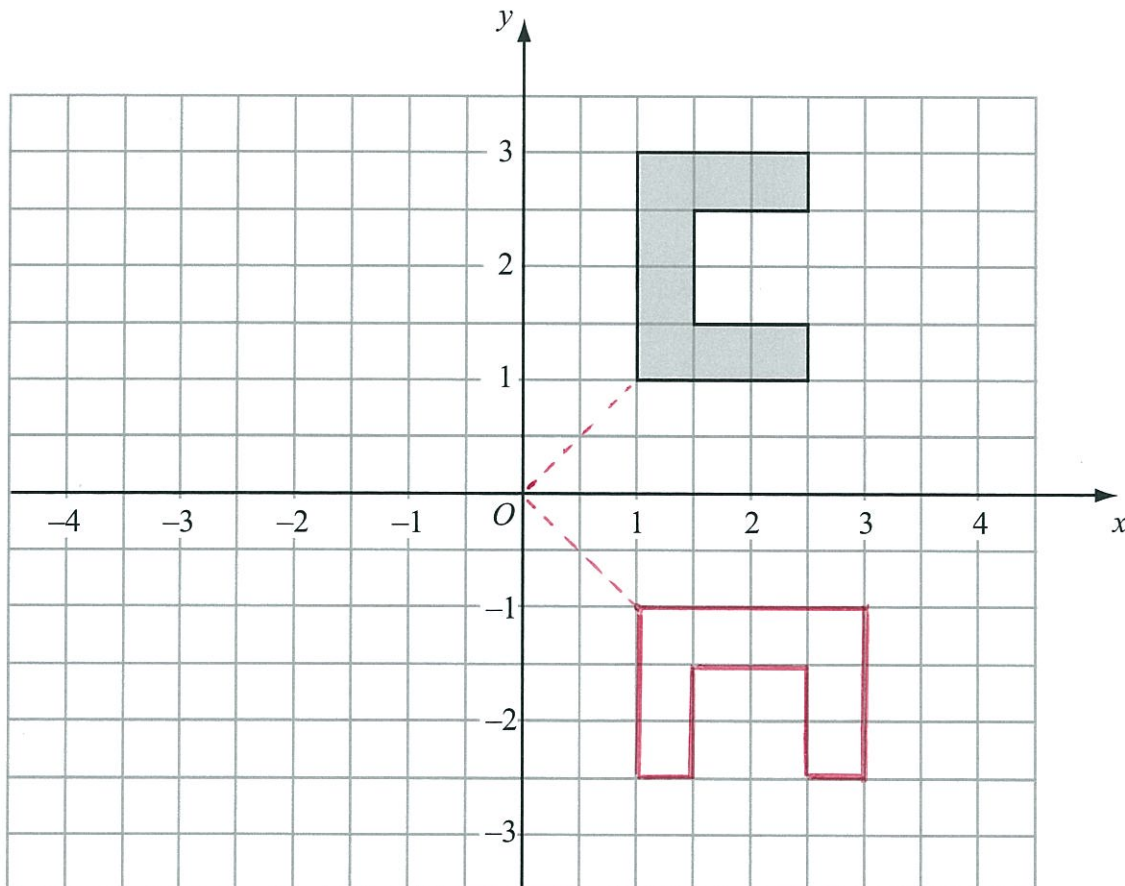
$$30 - 20 = 10$$

10

(Total 3 marks)

Q7

8.



Rotate the shape 90° clockwise, centre O .

(Total 2 marks)

Q8



9.

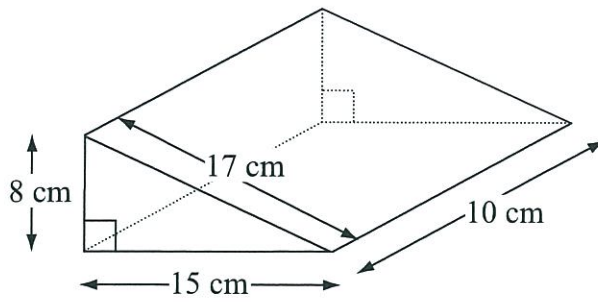


Diagram **NOT** accurately drawn

Work out the **total** surface area of the triangular prism.

$$\frac{8(15)}{2} + \frac{8(15)}{2} + 17(10) + 15(10) + 8(10)$$

$$= 8(15) + 40(10)$$

$$= 120 + 400$$

$$= 520 \text{ cm}^2$$

520 cm²

(Total 4 marks)

Q9



10. (a) Simplify $6e + 5f + e - 3f$

$$\frac{7e + 2f}{\dots\dots\dots} \quad (2)$$

(b) Solve $4(2x - 1) = 3x - 19$

$$\begin{aligned} 8x - 4 &= 3x - 19 \\ 5x &= -15 \\ \Rightarrow x &= \frac{-15}{5} = -3 \end{aligned}$$

$$x = \frac{-3}{\dots\dots\dots} \quad (3)$$

(c) Solve $\frac{y+4}{5} = 30$

$$\begin{aligned} y + 4 &= 30 \times 5 \\ y + 4 &= 150 \\ \Rightarrow y &= 150 - 4 = 146 \end{aligned}$$

$$y = \frac{146}{\dots\dots\dots} \quad (2)$$

(Total 7 marks)

Q10



11. Bianca asked 32 women about the number of children they each had.

The table shows information about her results.

Number of children	Frequency	No. of children x freq.
0	9	0
1	6	6
2	7	14
3	8	24
4	2	8
more than 4	0	0

(a) Find the mode.

0
.....
(1)

(b) Calculate the mean.

$$\begin{aligned} \text{Mean} &= \frac{\sum x}{\sum f} = \frac{0 + 6 + 14 + 24 + 8 + 0}{32} = \frac{52}{32} \\ &= \frac{26}{16} = \frac{13}{8} = 1\frac{5}{8} \text{ or } 1.625 \end{aligned}$$

1.625
.....
(3)

(Total 4 marks)

Q11



12. The equation

$$x^3 + 5x = 67$$

has a solution between 3 and 4

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	$x^3 + 5x$	
3.5	60.375	< 67
3.8	73.872	> 67
3.7	69.153	> 67
3.6	64.656	< 67
3.65	66.877125	< 67

$$\therefore 3.65 < x < 3.7$$

$$\Rightarrow x = 3.7 \text{ (correct to 1 d. p.)}$$

$$x = \underline{\underline{3.7}}$$

(Total 4 marks)

Q12

13. Use your calculator to work out

$$\sqrt{\frac{920 - 170 \tan 65^\circ}{0.012 + 0.034}}$$

- (a) Write down all the figures on your calculator display.
You must write your answer as a decimal.

$$\underline{\underline{109.8847047}} \quad (2)$$

- (b) Give your answer to part (a) correct to 3 significant figures.

$$\underline{\underline{110}} \quad (1)$$

(Total 3 marks)

Q13



14. The table shows six expressions.
 n is a positive integer.

$2n - 3$	$3n - 2$	$3(n + 4)$	$4n + 1$	$4(3n + 1)$	$2n + 1$
----------	----------	------------	----------	-------------	----------

(a) From the table, write the expression whose value is

(i) always even

$4(3n + 1)$

(ii) always a multiple of 3

$3(n + 4)$

(2)

(b) From the table, write the expression which is a factor of $4n^2 - 1$

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

$4n^2 - 1 \equiv (2n)^2 - 1^2$ $2n + 1$

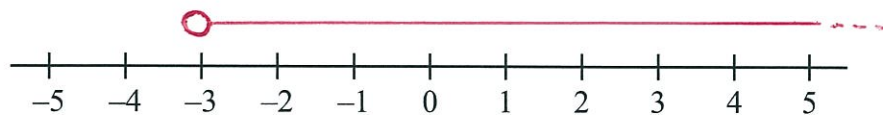
$= (2n + 1)(2n - 1)$ (1)

$\therefore 2n + 1$ is the factor we're looking for (Total 3 marks)

Q14

15. (a) $x > -3$

Show this inequality on the number line.



(2)

(b) Solve the inequality $7y + 36 \leq 8$

$7y \leq 8 - 36$

$y \leq \frac{-28}{7}$

$\Rightarrow y \leq -4$

$y \leq -4$

(2)

Q15

(Total 4 marks)



16. In a sale the normal price of a book is reduced by 10%.
The sale price of the book is £4.86

Calculate the normal price of the book.

Let y = normal price of book.

Reducing by 10% is the equivalent to multiplying by
the single factor multiplier 0.9

$$\text{So } 0.9y = 4.86$$

$$\Rightarrow y = \frac{4.86}{0.9} = \underline{\underline{£5.40}}$$

\therefore Normal price of book = $\underline{\underline{£5.40}}$

£ 5.40

Q16

(Total 3 marks)



17. The diagram shows two similar triangles.

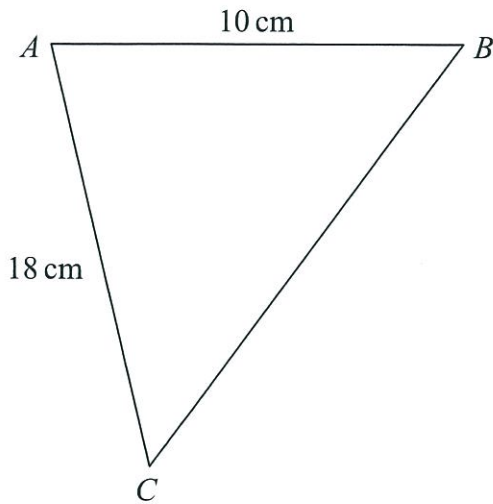
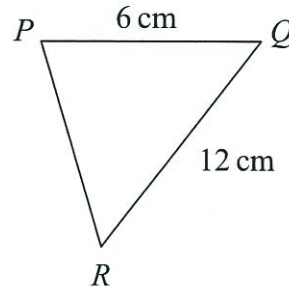


Diagram NOT accurately drawn



In triangle ABC , $AB = 10$ cm and $AC = 18$ cm.
 In triangle PQR , $PQ = 6$ cm and $QR = 12$ cm.

Angle $ABC =$ angle PQR .
 Angle $CAB =$ angle RPQ .

(a) Calculate the length of BC .

$$\frac{BC}{RQ} = \frac{10}{6} = \frac{5}{3}$$

$$\Rightarrow \frac{BC}{12} = \frac{5}{3}$$

$$\Rightarrow BC = \frac{5}{3} \times 12 = 4 \times 5 = 20 \text{ cm}$$

..... 20 cm
(2)

(b) Calculate the length of PR .

$$\frac{18}{PR} = \frac{5}{3}$$

$$\Rightarrow PR = 18 \div \frac{5}{3} = 18 \times \frac{3}{5}$$

$$= \frac{54}{5} = 10\frac{4}{5} \text{ or } 10.8 \text{ cm}$$

..... 10.8 cm
(2)

(Total 4 marks)

Q17



18. (a) Simplify $(c^2 k^5)^4$

$$(c^2)^4 \cdot (k^5)^4 = c^{(2 \times 4)} \times k^{(5 \times 4)}$$

$$= c^8 k^{20}$$

.....
(1)

(b) Expand and simplify $(3x + 5)(4x - 1)$

$$12x^2 - 3x + 20x - 5$$

$$= 12x^2 + 17x - 5$$

.....
(2)

(c) Solve $x^2 - 3x - 10 = 0$

$$(x + 2)(x - 5) = 0$$

$$\Rightarrow x = -2 \text{ or } 5$$

.....
(3)

Q18

(Total 6 marks)

19. The surface area of Earth is $510\,072\,000 \text{ km}^2$.
The surface area of Jupiter is $6.21795 \times 10^{10} \text{ km}^2$.

The surface area of Jupiter is greater than the surface area of Earth.
How many times greater?
Give your answer in standard form.

$$\frac{6.21795 \times 10^{10}}{5.10072 \times 10^8} = 1.219033783 \times 10^2$$

.....
 1.219033783×10^2

Q19

(Total 3 marks)



20. The table shows some expressions.
 a , b , c and d represent lengths.
 π and 2 are numbers that have no dimensions.

$c^2(b + d)$	$\pi a^2 c^2$	$\frac{a^3 b}{c^3}$	$\pi a^2 b$	$\frac{2a^3 d}{c}$	d^2	$2a + b^2$
✓			✓	✓		

Tick (✓) the boxes underneath the **three** expressions which could represent volumes.

Q20

(Total 3 marks)

21.

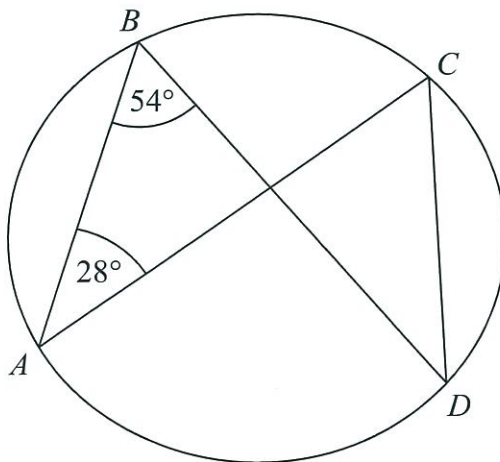


Diagram NOT accurately drawn

A , B , C and D are points on the circumference of a circle.
 Angle $ABD = 54^\circ$.
 Angle $BAC = 28^\circ$.

- (i) Find the size of angle ACD .

54 °
.....

- (ii) Give a reason for your answer.

Angles in the same segment are equal, i.e. triangles drawn from a chord will have the same angle where they touch the circle.

(Total 2 marks)

Q21



22. There are three secondary schools in Banley.
The table shows the number of students in each of these schools.

Adis College	Greslow High	Fripp School
750	700	900

Germaine takes a sample of 50 students stratified by school.

Work out the number of students from Greslow High in the sample.

$$750 + 700 + 900 = 2350$$

$$\frac{700}{2350} \times 50$$

$$= 14.89 \text{ (2d.p.) or } 15 \text{ to the nearest integer.}$$

15

.....

(Total 2 marks)

Q22



23. The diagram below shows a large rectangle of length $(2x + 6)$ cm and width x cm.

A smaller rectangle of length x cm and width 3 cm is cut out and removed.

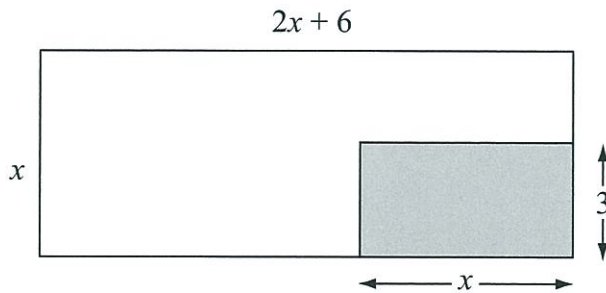


Diagram NOT accurately drawn

The area of the shape that is left is 100 cm^2 .

(a) Show that $2x^2 + 3x - 100 = 0$

$$x(2x+6) - 3x = 100$$

$$\Rightarrow 2x^2 + 6x - 3x = 100$$

$$\Rightarrow 2x^2 + 3x - 100 = 0$$

(3)

(b) Calculate the length of the smaller rectangle.
Give your answer correct to 3 significant figures.

For any quadratic equation of the form $ax^2 + bx + c = 0$

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

For $2x^2 + 3x - 100 = 0$, $(a, b, c) = (2, 3, -100)$

$$\Rightarrow x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-100)}}{2(2)} = \frac{-3 \pm \sqrt{809}}{4}$$

$$= 6.36 \text{ (3 s.f.) or } -7.86 \text{ (3 s.f.)} \dots\dots\dots \text{ cm}$$

We need only concern ourselves with the +ve solution. $\therefore x = 6.36 \text{ cm (3 s.f.)}$

(Total 7 marks)

(4)

Q23



24. There are 5 red pens, 3 blue pens and 2 green pens in a box.

Gary takes at random a pen from the box and gives the pen to his friend.
Gary then takes at random another pen from the box.

Work out the probability that both pens are the same colour.

$$P(\text{same colour}) = P(\text{RR OR BB OR GG})$$

$$= \frac{5}{10} \left(\frac{4}{9} \right) + \frac{3}{10} \left(\frac{2}{9} \right) + \frac{2}{10} \left(\frac{1}{9} \right)$$

$$= \frac{20}{90} + \frac{6}{90} + \frac{2}{90}$$

$$= \frac{28}{90} = \frac{14}{45}$$

$$\frac{14}{45}$$

Q24

(Total 4 marks)



25.

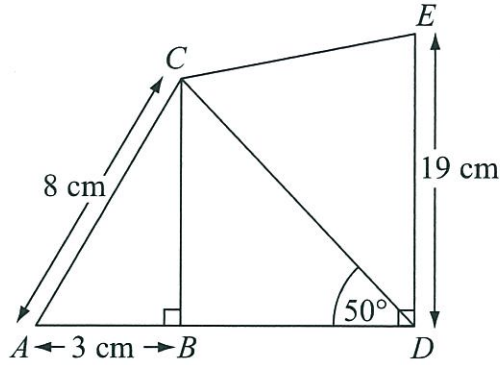


Diagram NOT accurately drawn

- $AC = 8 \text{ cm.}$
- $AB = 3 \text{ cm.}$
- $DE = 19 \text{ cm.}$
- Angle $ABC = \text{angle } CBD = \text{angle } BDE = 90^\circ.$
- Angle $BDC = 50^\circ.$

- (a) Calculate the length of CD .
Give your answer correct to 3 significant figures.

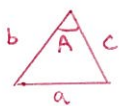
$$BC = \sqrt{8^2 - 3^2} = \sqrt{55}$$

$$\text{and } CD = \frac{BC}{\sin 50^\circ}$$

$$\therefore CD = \frac{\sqrt{55}}{\sin 50^\circ} = 9.68 \text{ cm (3 s.f.)}$$

..... 9.68 cm
(4)

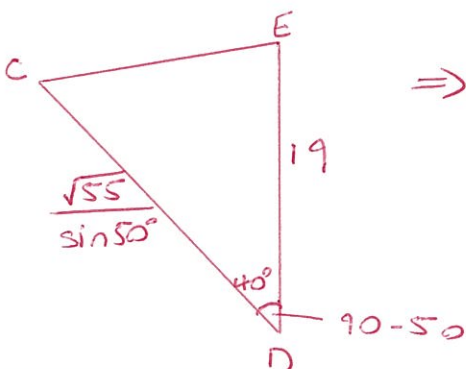
- (b) Calculate the length of CE .
Give your answer correct to 3 significant figures.



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

$$CE^2 = \left(\frac{\sqrt{55}}{\sin 50^\circ}\right)^2 + 19^2 - 2\left(\frac{\sqrt{55}}{\sin 50^\circ}\right)(19) \cos 40^\circ$$

$$\Rightarrow CE = 13.1 \text{ cm (3 s.f.)}$$



..... 13.1 cm
(3)

(Total 7 marks)

Q25



26. The voltage V of an electronic circuit is given by the formula

$$V = IR$$

where I is the current in amps
and R is the resistance in ohms.

Given that $V = 218$ correct to 3 significant figures,
 $R = 12.6$ correct to 3 significant figures,

calculate the lower bound of I .

$$\text{If } V = IR, \text{ then } I = \frac{V}{R}$$

$$\begin{aligned} \text{and Lower bound of } I &= \frac{\text{Lower bound of } V}{\text{Upper bound of } R} \\ &= \frac{217.5}{12.65} = 17.19367589 \end{aligned}$$

17.19367589

Q26

(Total 3 marks)

TOTAL FOR PAPER: 100 MARKS

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