Edexcel GCSE

Mathematics

Paper 3 (Non-Calculator)

Higher Tier

Specimen paper

Time: 1 hour and 45 minutes

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.
If you need more space to complete your answer to any question, use additional answer sheets.
You must NOT write on the formulae page. Anything you write on the formulae page will gain NO credit.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 23 questions in this paper. The total mark for this paper is 100.
There are 20 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.
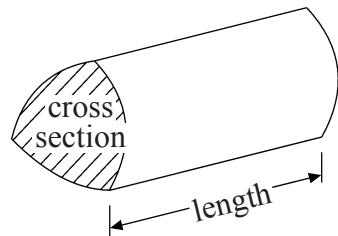Return at the end to those you have left out.

Turn over

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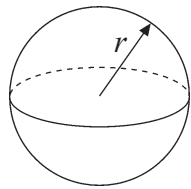
GCSE Mathematics

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 $= \pi r l$
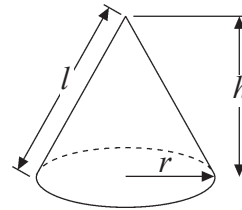
In any triangle ABC
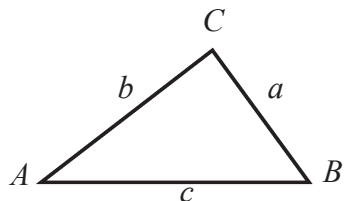
The Quadratic Equation

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 $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1. The diagram shows the plan of a floor.
    There is a carpet in the middle of the floor.

    3 m

    Carpet   2 m   4 m

    5 m
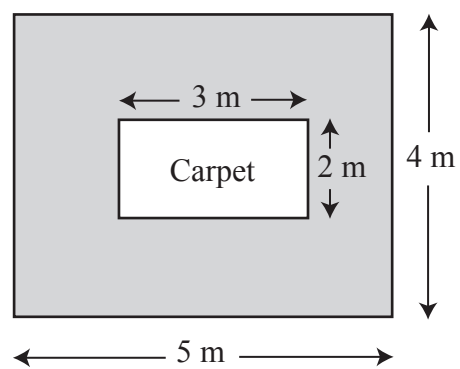
    Diagram **NOT**
    accurately drawn

    Work out the shaded area.

    .... m² $\quad$ **Q1**

    (Total 3 marks)

2. (a) Work out the value of $3a + ac$ when $a = 4$ and $c = -5$

    ....
    (2)

    (b) Work out the value of $3p^2 - 5$ when $p = 2$

    .... $\quad$ **Q2**
    (3)
    (Total 5 marks)

3. The cost of a calculator is £6.79

   (a) Work out the cost of 28 of these calculators.

£ ....
                  (3)

   A college wants to buy 570 calculators.
   They are sold in boxes of 50

   (b) Work out the number of boxes the college should buy.

....
               (2)

   The college decides to increase its order of calculators by 10%.

   (c) Increase 570 by 10%.

....
               (3)   **Q3**

(Total 8 marks)

4. Here are the plan, front elevation and side elevation of a 3-D shape.

plan

front elevation
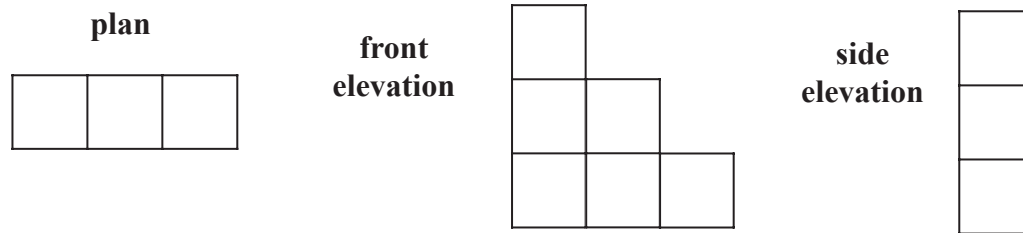
side elevation

(a) In the space below, draw a sketch of the 3-D shape.

(2)

Here is a sketch of a different 3-D shape.
The shape is a cylinder with a cone on top.

Diagram **NOT** accurately drawn

(b) Sketch the front elevation of this 3-D shape.

(2)

(Total 4 marks)

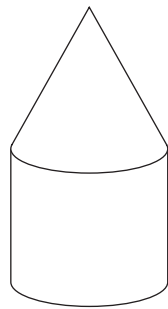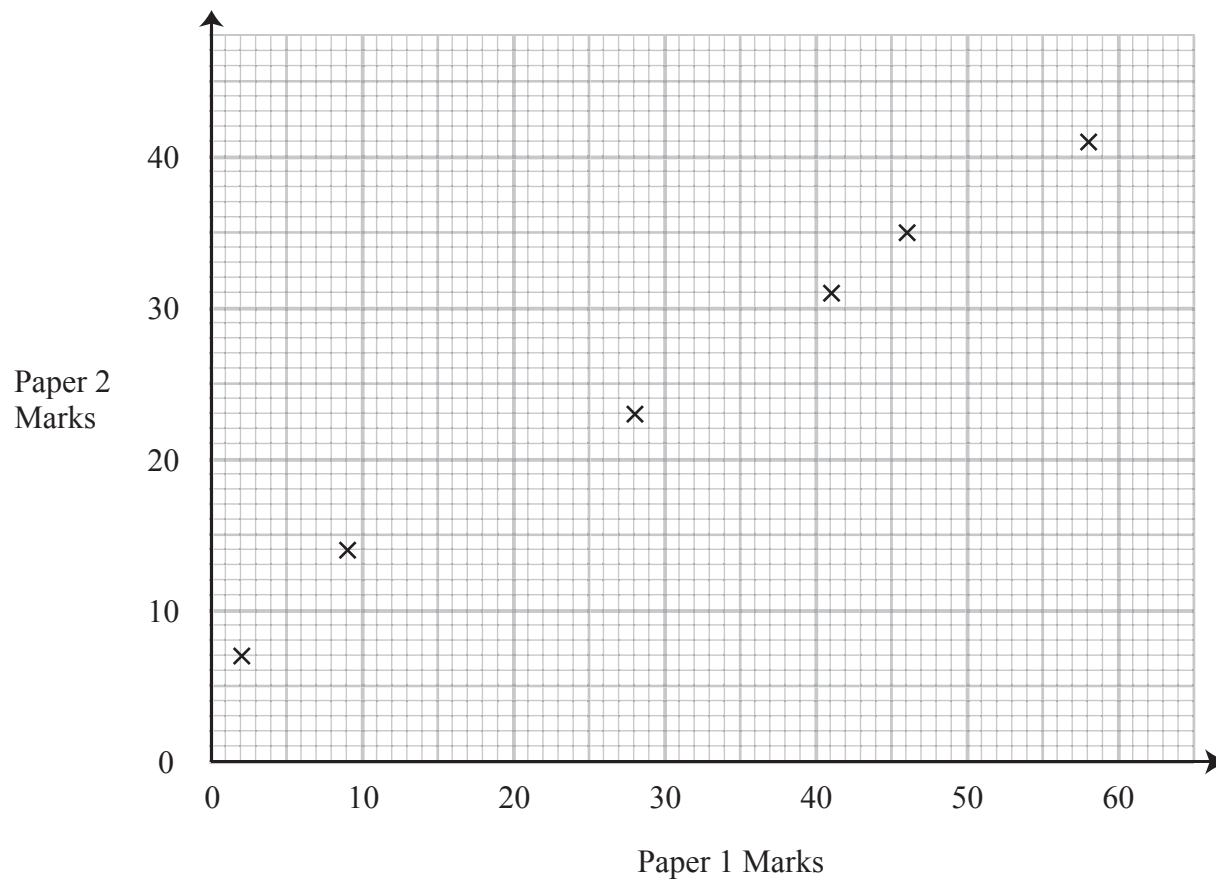**5.** The scatter graph shows some information about the marks of six students.
For each student, it shows the mark on Paper 1 and the mark on Paper 2.

Paper 2 Marks

Paper 1 Marks

The table shows the marks on Paper 1 and Paper 2 for two more students, A and B.

	Student A	Student B
Paper 1 mark	20	50
Paper 2 mark	20	35

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

(1)

(b) Describe the **correlation** between the marks on Paper 1 and the marks on Paper 2.

....

(1)

Another student has a mark of 30 on Paper 2.

(c) Estimate the mark on Paper 1 for this student.

....

(2)

(Total 4 marks)

Q5

6. This rule can be used to work out the cost, in pounds, of buying time on a satellite link.

Add 3 to the number of hours of time bought.

Multiply your answer by 1000

The cost of buying *n* hours of satellite time is *C* pounds.

Write down a formula for *C* in terms of *n*.

....

(Total 3 marks)

Q6

7. (a) Expand $p(p^2 - 3p)$

....

(2)

(b) Factorise $y^2 + 5y$

....

(2)

(c) Factorise completely $2x^2 + 6xy$

....

(2)

(d) Solve $x^2 - 2x - 15 = 0$

....

(2)   **Q7**

(Total 8 marks)

8. Tony wants to collect information about the amount of homework the students in his class get.

Design a suitable question he could use.

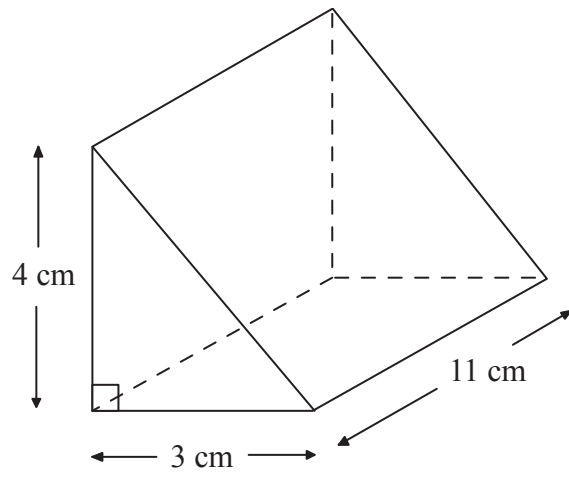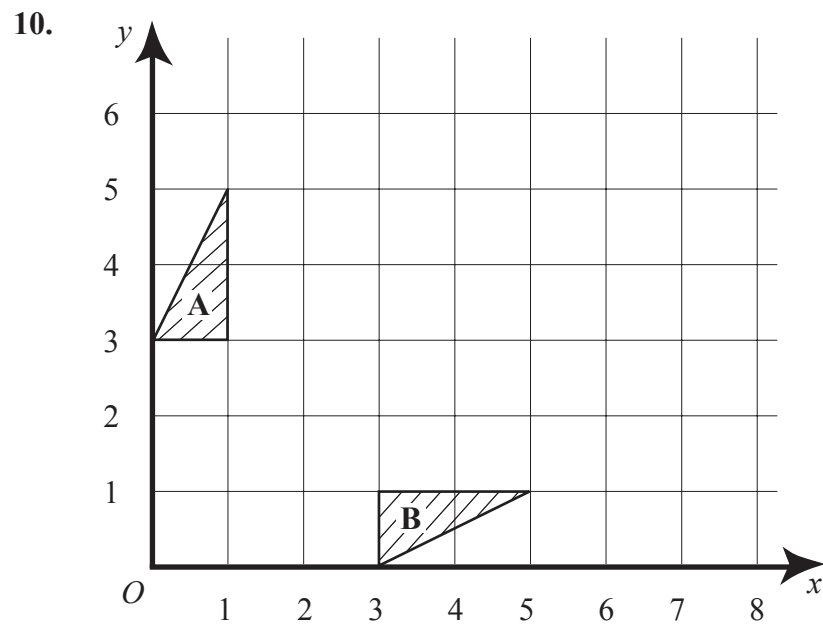You should include response boxes.

Q8

(Total 2 marks)

9.

Diagram **NOT**
accurately drawn

Work out the volume of the triangular prism.
Give the units with your answer.

....

Q9

(Total 4 marks)

10.

Triangle **A** and triangle **B** have been drawn on the grid.

(a) Reflect triangle **B** in the line $y = 2$
Label this image **C**.

(2)

(b) Describe fully the single transformation which will map triangle **B** onto triangle **A**.

....

(2)

(Total 4 marks)

11. (a) Solve $9 - 2x = 3(x + 2)$

$x =$ ....

(3)

(b) $-3 \leqslant y < 2$

y is an integer.

Write down all the possible values of y.

....

(2)

(Total 5 marks)

12. (a) Work out the value of $1\frac{2}{5} + 2\frac{3}{7}$

Give your answer as a fraction in its simplest form.

....
(3)

(b) Work out the value of $\frac{2}{5} \times \frac{3}{7}$

Give your answer as a fraction in its simplest form.

....
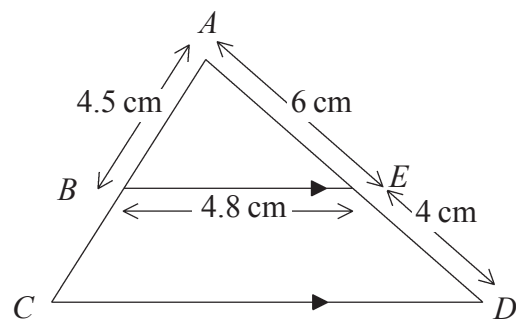**(2)**

(Total 5 marks)

Q12

13.

Diagram **NOT** accurately drawn

BE is parallel to *CD*.
AE = 6 cm, *ED* = 4 cm, *AB* = 4.5 cm, *BE* = 4.8 cm.

Calculate the length of *CD*.

....cm

(Total 2 marks)

14. The table shows some expressions.
a, *b*, *c* and *d* represent lengths.
π and 3 are numbers which have no dimensions.

$3a^2$	$\dfrac{\pi ab^3}{3d}$	πbc	$ac + bd$	$\pi(a+b)$	$3(c+d)^3$	$3\pi bc^2$

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

(Total 3 marks)

15. A spinner has coloured sections.
The sections are different sizes.
When the spinner is spun, the pointer lands on a colour.

RED

YELLOW
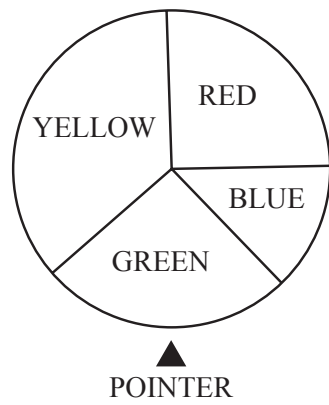
BLUE

GREEN

POINTER

Diagram **NOT**
accurately drawn

The table shows the probability for the pointer landing on yellow and blue.
The probability of the pointer landing on red is equal to the probability of the pointer landing on green.

Number	RED	YELLOW	BLUE	GREEN
Probability	x	0.35	0.15	x

Sarah is going to spin the wheel 400 times.

Work out an estimate for the number of times it will land on GREEN.

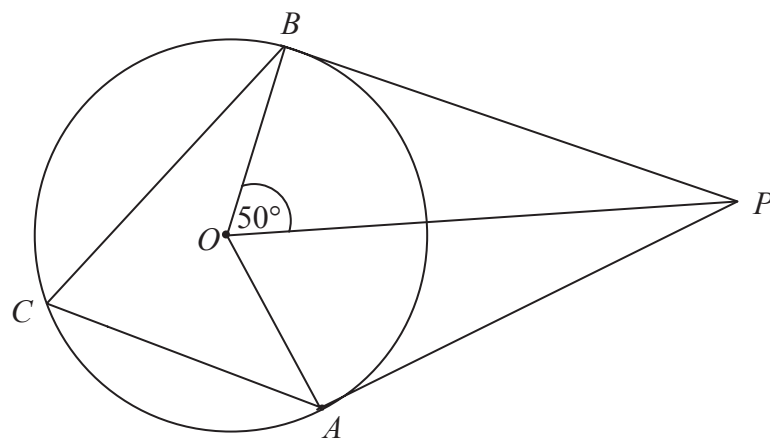..........................

(Total 4 marks)

16.

Diagram **NOT** accurately drawn

In the diagram, *A*, *B* and *C* are points on the circumference of a circle, centre *O*.
PA and *PB* are tangents to the circle.
Angle *POB* = 50°.

(a) (i) Work out the size of angle *BPO*.

.............................°

(ii) Give a reason for your answer.

....

....

(2)

(b) (i) Work out the size of angle *ACB*.

.............................°

(ii) Give a reason for your answer.

....

....
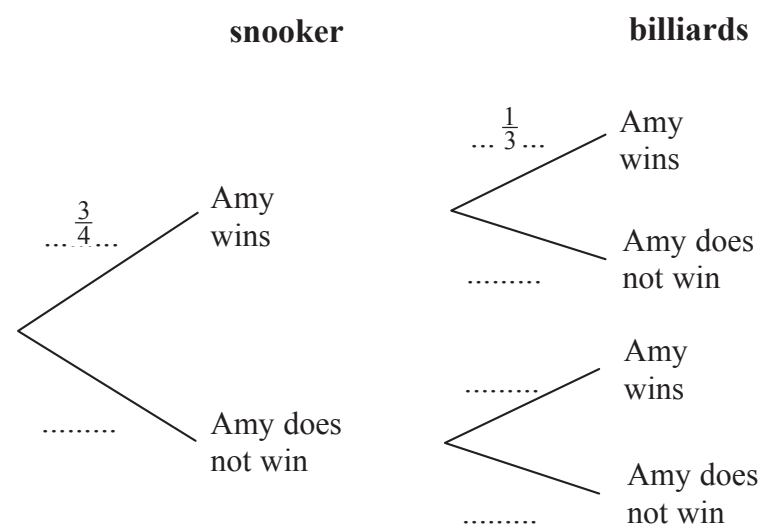
(3)

(Total 5 marks)

Q16

17. Amy is going to play one game of snooker and one game of billiards.

The probability that she will win the game of snooker is $\frac{3}{4}$

The probability that she will win the game of billiards is $\frac{1}{3}$

(a) Complete the probability tree diagram.

snooker   **billiards**

...$\frac{3}{4}$... Amy wins

... $\frac{1}{3}$ ... Amy wins

.... Amy does not win

.... Amy does not win

.... Amy wins

.... Amy does not win

(2)

(b) Work out the probability that Amy will win **exactly** one game.

....

(3)

Amy played one game of snooker and one game of billiards on a number of Fridays.
She won at **both** snooker and billiards on 21 Fridays.

(c) Work out an estimate for the number of Fridays on which Amy did not win either game.

....

(3)   Q17

(Total 8 marks)

18. (a) Change $\frac{5}{6}$ to a decimal.

....
(1)

(b) Prove that the recurring decimal $0.\dot{3}\dot{6} = \frac{4}{11}$

(3)
(Total 4 marks)

19. p is inversely proportional to r.
$p = 7$ when $r = 12$

(a) Work out the value of p when $r = 3$

$p =$ ....
(4)

(b) Work out the value of r when $p = 24$

$r =$ ....
(2)
(Total 6 marks)

20. (a) Find the value of

(i) 81^0

....

(ii) $81^{\frac{1}{2}}$

....

(Total 2 marks)

21. There are 800 pupils at Hightier School.
The table shows information about the pupils.

Year group	Number of boys	Number of girls
7	110	87
8	98	85
9	76	74
10	73	77
11	65	55

An inspector is carrying out a survey into pupils' views about the school.
She takes a sample, stratified both by Year group and by gender,
of 50 of the 800 pupils.

(a) Calculate the number of Year 9 boys to be sampled.

....

(2)

Toni stated "There will be twice as many Year 7 boys as Year 11 girls to be sampled".
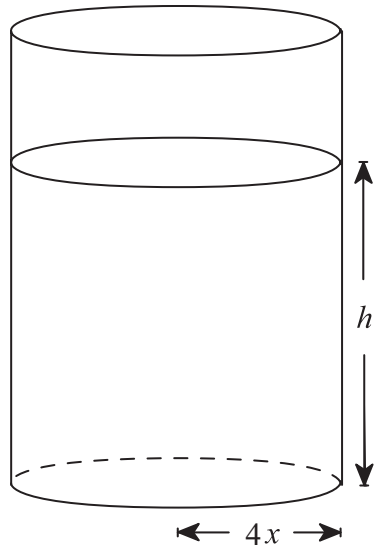
(b) Is Toni's statement correct?
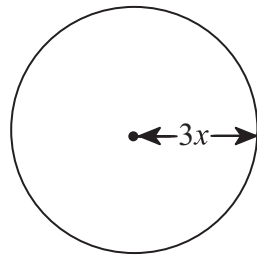You must show how you reached your decision.

(2)

(Total 4 marks)

22.

Cylinder   Sphere

Diagram **NOT**
accurately draw

The radius of the base of a cylinder is $4x$ cm.
The cylinder is filled with water to a height of h cm.
The radius of a sphere is $3x$ cm.
The sphere is dropped into the cylinder and is completely immersed.

Find, in terms of x, the increase in the height of the water in the cylinder.
Give your answer in its simplest form.

.... cm

Q22

(Total 3 marks)

23.
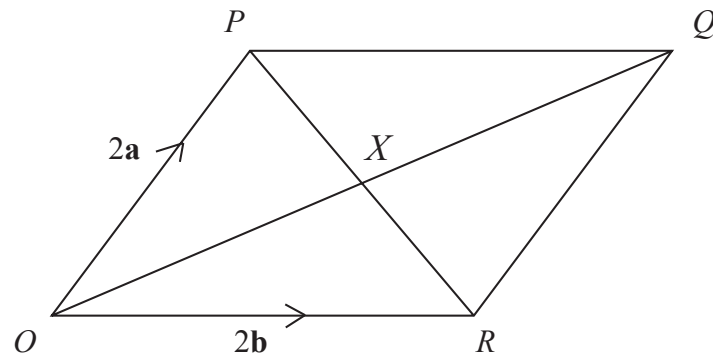
Diagram **NOT** accurately drawn

OPQR is a parallelogram with *PQ* parallel to *OR*.

$$\overrightarrow{OP} = 2\mathbf{a} \qquad \overrightarrow{OR} = 2\mathbf{b}$$

X is the midpoint of *PR*.

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

$\overrightarrow{PX}$ = ...

(2)

(b) Prove that *X* is the midpoint of *OQ*.

(2)

(Total 4 marks)

TOTAL FOR PAPER: 100 MARKS

END

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