CANDIDATE NAME	
CLASS / GROUP	
DATE	

MATHEMATICS

Paper 2 Non-calculator (Extended)

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name and class in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid.
- Do not write on any bar codes.
- You should show all your working in the booklet.
- Calculators must not be used in this paper.
- All answers should be given in their simplest form.
- You must show all the relevant working to gain full marks and you will be given marks for correct methods even if your answer is incorrect.
- The number of marks for each question or part question is shown in brackets [ ].

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].
- This document has 18 pages, including a list of formulas.

For teacher use

Total
/ 100

Questions adapted from Cambridge IGCSE 0580 past papers (© UCLES) for classroom practice.
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List of formulas (Extended)

Area, A, of triangle, base b, height h.	**$A = \frac{1}{2}bh$**
Area, A, of circle of radius r.	**$A = \pi r^2$**
Circumference, C, of circle of radius r.	**$C = 2\pi r$**
Curved surface area, A, of cylinder of radius r, height h.	**$A = 2\pi rh$**
Curved surface area, A, of cone of radius r, sloping edge l.	**$A = \pi rl$**
Surface area, A, of sphere of radius r.	**$A = 4\pi r^2$**
Volume, V, of prism, cross-sectional area A, length l.	**$V = Al$**
Volume, V, of pyramid, base area A, height h.	**$V = \frac{1}{3}Ah$**
Volume, V, of cylinder of radius r, height h.	**$V = \pi r^2 h$**
Volume, V, of cone of radius r, height h.	**$V = \frac{1}{3}\pi r^2 h$**
Volume, V, of sphere of radius r.	**$V = (4/3)\pi r^3$**
Area, A, of parallelogram, base b, perpendicular height h.	**$A = bh$**
Area, A, of trapezium, parallel sides a and b, height h.	**$A = \frac{1}{2}(a + b)h$**
For the equation $ax^2 + bx + c = 0$,	**$x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$**
In any triangle ABC (sine rule)	**$a/\sin A = b/\sin B = c/\sin C$**
Cosine rule	**$a^2 = b^2 + c^2 - 2bc \cos A$**
Area of triangle	**$\text{Area} = \frac{1}{2}ab \sin C$**

1 Write down the next prime number after 89.

Answer ..... [1]

---

2 Work out $2(3 \times 10^8 - 4 \times 10^6)$, giving your answer in standard form.

Answer ..... [2]

---

3 Find the value of $\left(\frac{27}{8}\right)^{-\frac{4}{3}}$.

Give your answer as an exact fraction.

Answer ..... [2]

---

4 Show that $3\frac{3}{4} + 1\frac{1}{3} = 5\frac{1}{12}$.

Write down all the steps in your working.

Answer

[2]

---

5 The temperature decreases from 25 °C to 22 °C.
Calculate the percentage decrease.

Answer ..... % [2]

---

6 $3^x \times 9^4 = 3^n$.

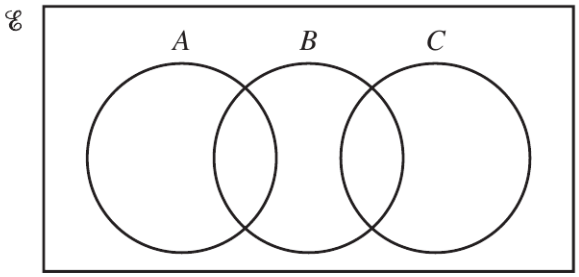
Find n in terms of x.

Answer $n =$ ..... [2]

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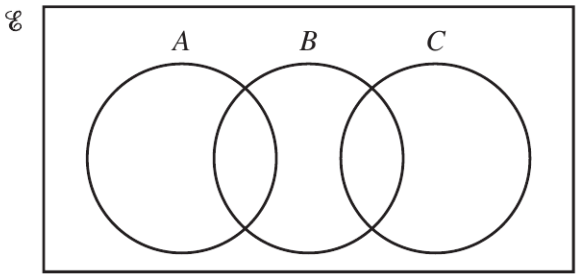
7 On the Venn diagrams shade the regions

(a) $A' \cap C'$,



[1]

(b) $(A \cup C) \cap B$.



[1]

---

8 A rectangular field is 18 metres long and 12 metres wide.
Both measurements are correct to the nearest metre.
Work out exactly the smallest possible area of the field.

Answer .....m^2 [2]

---

9 Factorise completely.

$$p^2x - 4q^2x$$

Answer ..... [3]

---

10 Make d the subject of the formula $c = \dfrac{5d + 4w}{2w}$.

Answer $d =$

[3]

---

11 p varies directly as the square root of q.
$p = 8$ when $q = 25$.

Find p when $q = 100$.

Answer $p =$ ..... [3]

---

12 For the sequence $5\frac{1}{2}$, 7, $8\frac{1}{2}$, 10, $11\frac{1}{2}$, …

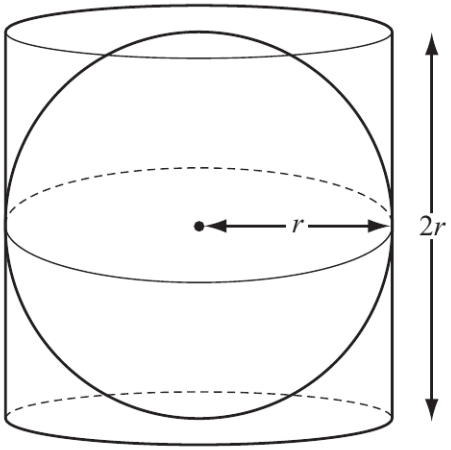
(a) find an expression for the nth term,

Answer(a) ..... [2]

(b) work out the 100th term.

Answer(b) ..... [1]

13



NOT TO SCALE

The sphere of radius r fits exactly inside the cylinder of radius r and height $2r$.
Calculate the percentage of the cylinder occupied by the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer ..... % [3]

---

14 Solve the simultaneous equations.

$$\frac{2x + y}{2} = 7$$

$$\frac{2x - y}{2} = 17$$

Answer $x =$ .....

$y =$ ..... [3]

---

15 Simplify the following.

(a) $(3x^3)^3$

Answer(a) ..... [2]

(b) $(125x^6)^{\frac{2}{3}}$

Answer(b) ..... [2]

---

16 Write as a single fraction, in its simplest form.

$$\frac{1-x}{x} - \frac{2+x}{1-2x}$$

Answer ..... [4]

---

17 Find the values of m and n.

(a) $2^m = 0.125$

Answer(a) $m =$ ..... [2]

(b) $2^{4n} \times 2^{2n} = 512$

Answer(b) $n =$ ..... [2]

---

18 $f(x) = x^2 + 2$ $g(x) = (x + 2)^2$ $h(x) = 3x - 5$

Find

(a) gf(–2),

Answer(a) ..... [2]

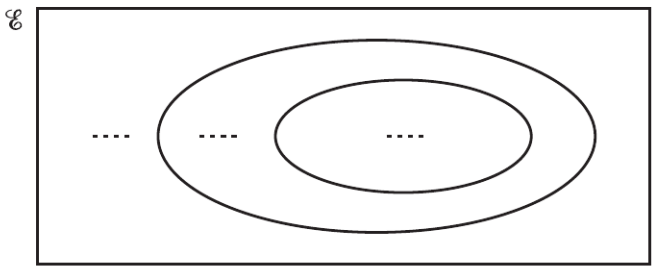
(b) $h^{-1}(22)$.

Answer(b) ..... [2]

---

19 $n(A) = 18$, $n(B) = 11$ and $n(A \cup B)' = 0$.

(a) Label the Venn diagram to show the sets A and B where $n(A \cup B) = 18$.
Write down the number of elements in each region.



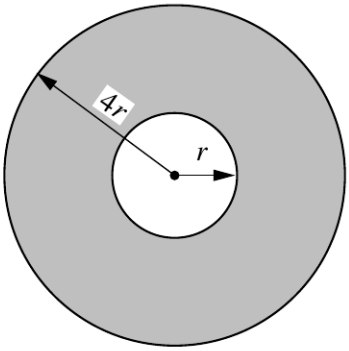
[2]

(b) Draw another Venn diagram to show the sets A and B where $n(A \cup B) = 29$.
Write down the number of elements in each region.



[2]

20



NOT TO SCALE

Two circles have radii r cm and $4r$ cm.
Find, in terms of π and r.

(a) the area of the circle with radius $4r$ cm,

Answer (a) ..... cm^2 [1]

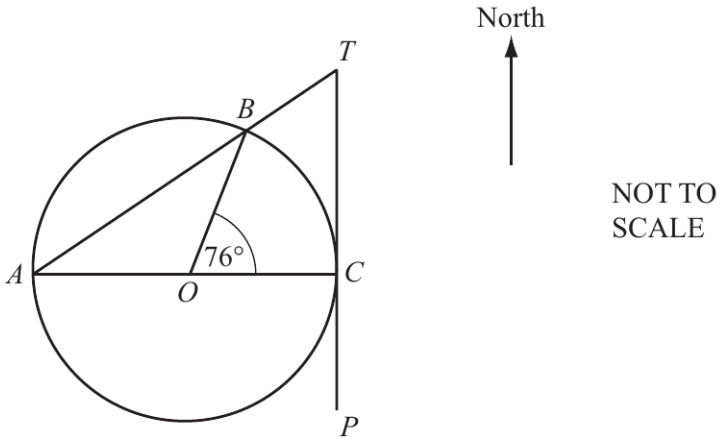
(b) the area of the shaded ring,

Answer (b) ..... cm^2 [1]

(c) the total length of the inner and outer edges of the shaded ring.

Answer (c) ..... cm [2]

21



AOC is a diameter of the circle, centre *O*.
AT is a straight line that cuts the circle at *B*.
PT is the tangent to the circle at *C*.
Angle *COB* = 76°.

(a) Calculate angle *ATC*.

Answer(a) Angle *ATC* = ... [2]

(b) *T* is due north of *C*.

Calculate the bearing of *B* from *C*.

Answer(b) ..... [2]

22 The equation of a straight line can be written in the form $3x + 2y - 8 = 0$.

(a) Rearrange this equation to make y the subject.

Answer(a) $y =$ ..... [2]

(b) Write down the gradient of the line.

Answer(b) ..... [1]

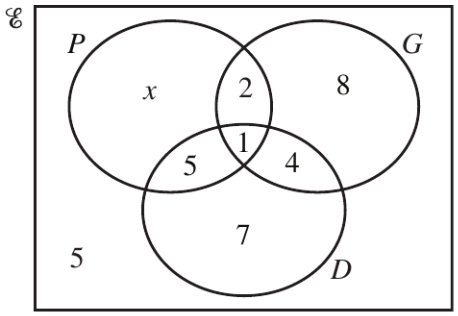
(c) Write down the co-ordinates of the point where the line crosses the y axis.

Answer(c) (..... , ...) [1]

23 A teacher asks 36 students which musical instruments they play.

P = {students who play the piano}
G = {students who play the guitar}
D = {students who play the drums}

The Venn diagram shows the results.



(a) Find the value of x.

Answer(a) x = ... [1]

(b) A student is chosen at random.

Find the probability that this student

(i) plays the drums but **not** the guitar,

Answer(b)(i) ..... [1]

(ii) plays only 2 different instruments.

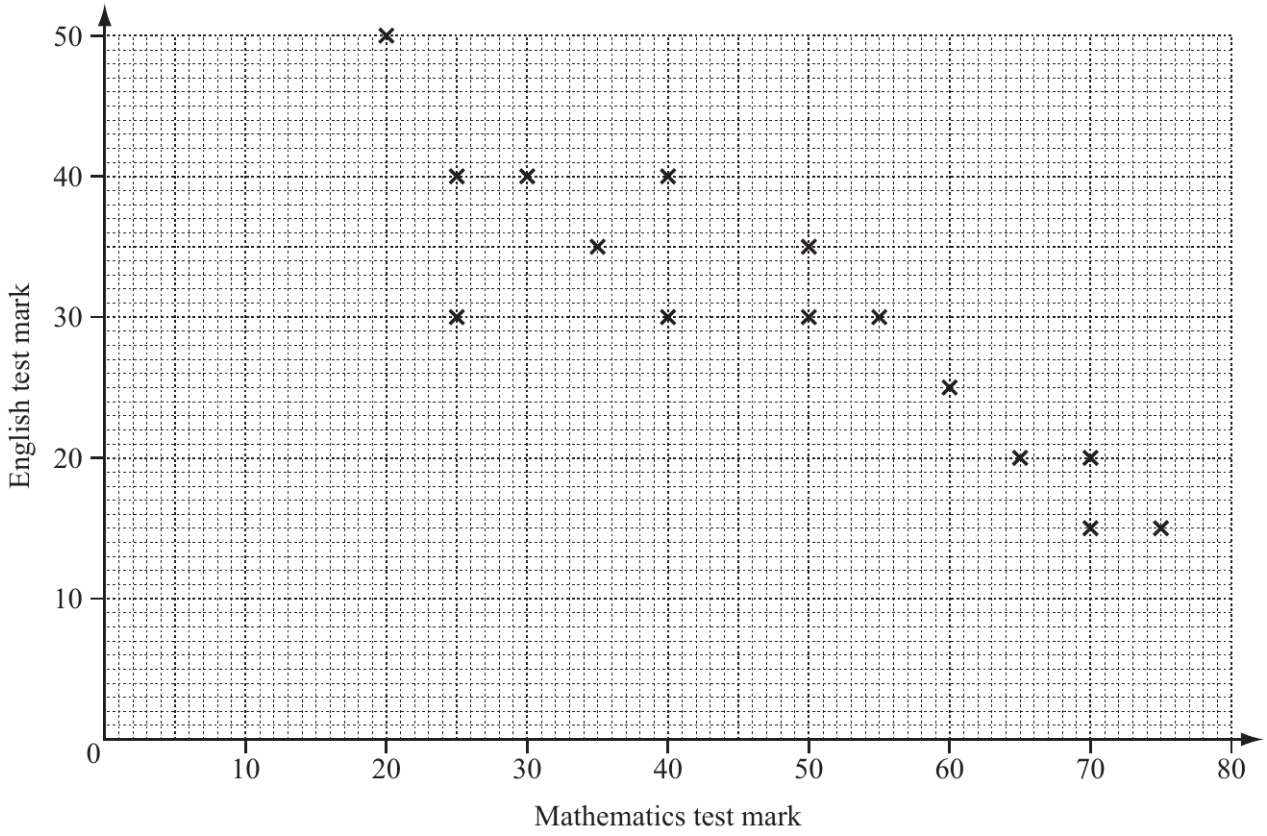
Answer(b)(ii) ..... [1]

(c) A student is chosen at random from those who play the guitar.

Find the probability that this student plays no other instrument.

Answer(c) ..... [1]

24



The scatter diagram shows the marks obtained in a Mathematics test and the marks obtained in an English test by 15 students.

(a) Describe the correlation.

Answer(a) ..... [1]

(b) The mean for the Mathematics test is 47.3 .
The mean for the English test is 30.3 .

Plot the mean point (47.3, 30.3) on the scatter diagram above. [1]

(c) **(i)** Draw the line of best fit on the diagram above. [1]

(ii) One student missed the English test.
She received 45 marks in the Mathematics test.

Use your line to estimate the mark she might have gained in the English test.

Answer(c)(ii) ..... [1]

25 Solve the equations

(a) $0.2x - 3 = 0.5x$,

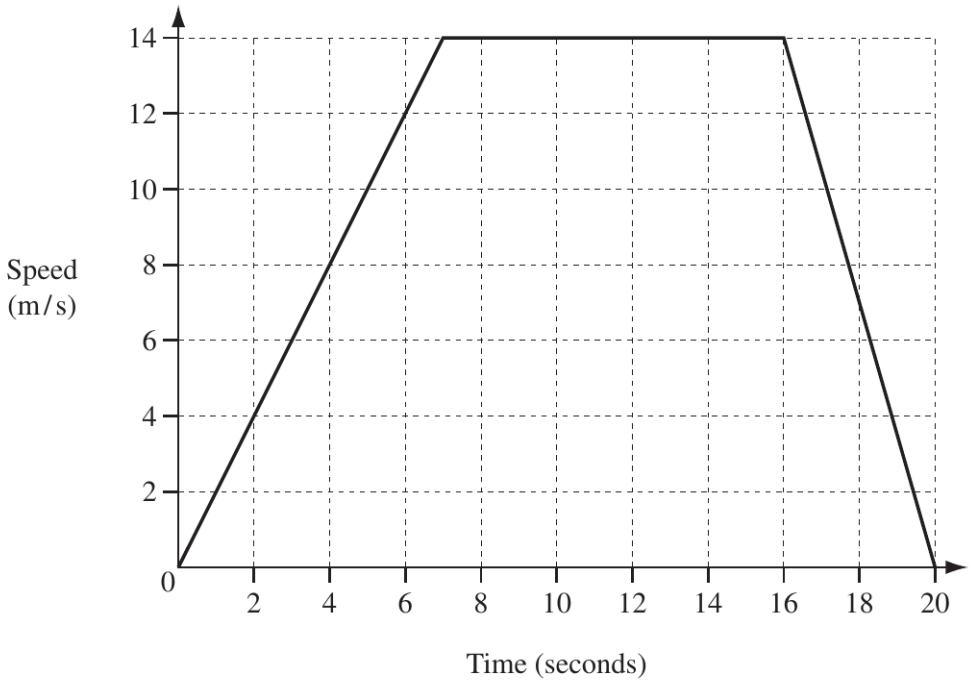
Answer(a) $x =$ ..... [2]

(b) $2x^2 - 11x + 12 = 0$.

Answer(b) $x =$ ..... or $x =$ ..... [3]

26 An animal starts from rest and accelerates to its top speed in 7 seconds. It continues at this speed for 9 seconds and then slows to a stop in a further 4 seconds.

The graph shows this information.



(a) Calculate its acceleration during the first seven seconds.

Answer(a) ..... m/s^2 [1]

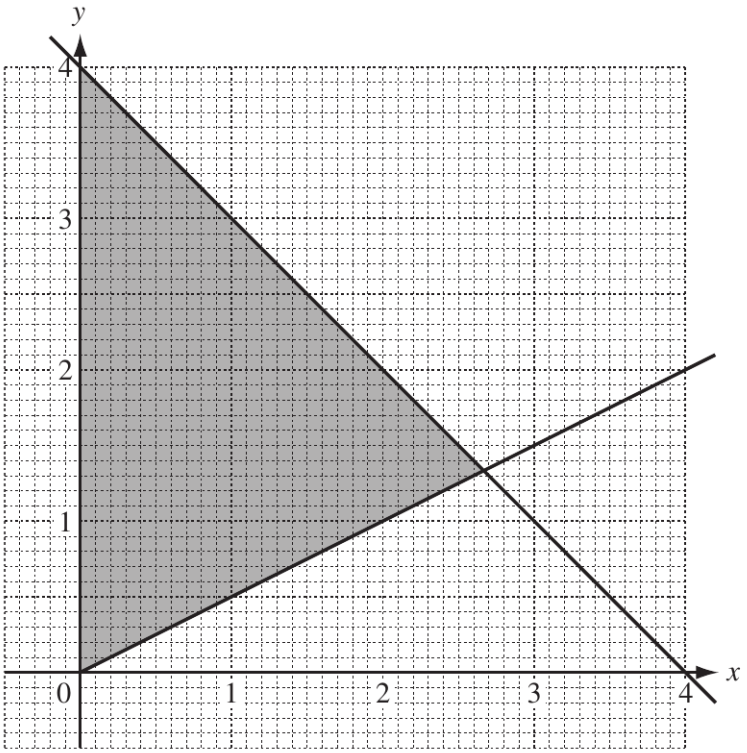
(b) Write down its speed 18 seconds after the start.

Answer(b) ..... m/s [1]

(c) Calculate the total distance that the animal travelled.

Answer(c) ..... m [3]

27



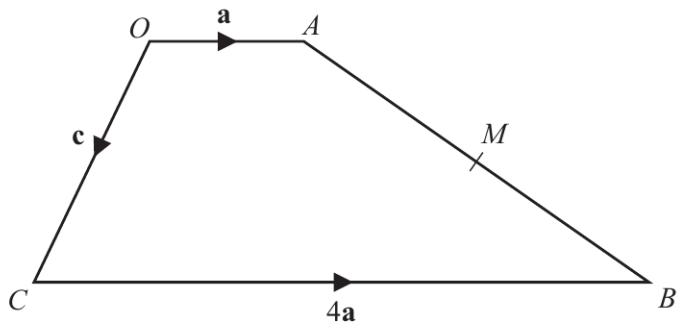
Find the three inequalities which define the shaded region on the grid.

Answer .....

.....

..... [5]

28



O is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 4\mathbf{a}$.
M is the midpoint of AB.

(a) Find, in terms of **a** and **c**, in their simplest form

(i) the vector $\overrightarrow{AB}$,

Answer(a)(i) $\overrightarrow{AB}$ = ... [2]

(ii) the position vector of M.

Answer(a)(ii) ..... [2]

(b) Mark the point D on the diagram where $\overrightarrow{OD} = 3\mathbf{a} + \mathbf{c}$. [2]

---

29 **(a)** Factorise completely $12x^2 - 3y^2$.

Answer(a) ..... [2]

(b) **(i)** Expand $(x-3)^2$.

Answer(b)(i) ..... [2]

(ii) $x^2 - 6x + 10$ is to be written in the form $(x-p)^2 + q$.
Find the values of p and q.

Answer(b)(ii) p = ... q = ... [2]

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