Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel International GCSE

Centre Number

Candidate Number

Monday 7 January 2019

Morning (Time: 1 hour 30 minutes)

Paper Reference **4MB0/01**

Mathematics B

Paper 1

You must have: Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ▶

P 5 5 9 4 2 A 0 1 2 0

Pearson

Answer ALL TWENTY EIGHT questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1   In 1924 the 100 metre world record for men was 10.40 seconds.
    In 2010 it was 9.58 seconds.

    Calculate, to 3 significant figures, the percentage decrease in this world record between 1924 and 2010.

    %

    (Total for Question 1 is 2 marks)

2   Factorise completely $3x^2 - 12y^2$

    (Total for Question 2 is 2 marks)

3 $y = 4x^3 - \dfrac{2}{x}$

Find $\dfrac{dy}{dx}$

$$\dfrac{dy}{dx} =$$

(Total for Question 3 is 2 marks)

4 Find the Highest Common Factor (HCF) of 72, 120 and 264

Show your working clearly.

(Total for Question 4 is 2 marks)

https://xtremepape.rs/

5 John is going to draw a bar chart for the number of red apples and the number of green apples on the trees in his garden.

The height of the bar in the bar chart for the 28 green apples is 7 cm.
There are 50 red apples on the trees in John's garden.

Calculate the height of the bar in the bar chart for the red apples.

cm

(Total for Question 5 is 2 marks)

6 Find the least integer value of n such that $3n + 40 \geqslant 29$

(Total for Question 6 is 2 marks)

7 Find the determinant of the matrix $\begin{pmatrix} 4 & -3 \\ 5 & 6 \end{pmatrix}$

(Total for Question 7 is 2 marks)

8 (a) Write 356 000 000 in standard form.

(1)

(b) The mass of Mercury is 3.302×10^{23} kg.
The mass of Saturn is 5.685×10^{26} kg.

Given that the mass of Saturn = $k \times$ the mass of Mercury,

calculate, to 3 significant figures, the value of k.

$k =$

(2)

(Total for Question 8 is 3 marks)

9 Without using a calculator, find the value of $\dfrac{\sqrt{12} + \sqrt{300}}{\sqrt{27}}$

Show your working clearly.

(Total for Question 9 is 3 marks)

10 A bag of sweets contains only 5 green sweets and 3 yellow sweets.

Kate takes at random a sweet from the bag and eats it.
Kate then takes a second sweet from the bag and eats it.

Calculate the probability that Kate eats at least one green sweet.

(Total for Question 10 is 3 marks)

11 Simplify fully $\dfrac{36xy^2}{12x^5y^7}$

(Total for Question 11 is 3 marks)

12 $\mathbf{A} = \begin{pmatrix} 3 & 0 & 2 \\ 2 & -1 & 3 \\ 0 & 1 & -2 \end{pmatrix}$ $\qquad \mathbf{B} = \begin{pmatrix} 4 & 3 \\ 2 & 1 \\ 0 & -2 \end{pmatrix}$

Calculate the matrix product **AB**.

$\begin{pmatrix} & \\ & \\ & \end{pmatrix}$

(Total for Question 12 is 3 marks)

13 The circumference of the circular base of a right circular cone is 24π cm.
The height of the cone is 40 cm.

Calculate the volume, in cm^3 to 3 significant figures, of the cone.

cm^3

(Total for Question 13 is 3 marks)

14 $a = 2^p + 1$

$b = 2^p - 1$

Show that $\dfrac{a}{b}$ can be written as $\dfrac{4^p + 2^{p+1} + 1}{4^p - 1}$

Show your working clearly.

(Total for Question 14 is 3 marks)

P 5 5 9 4 2 A 0 8 2 0

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15 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
$A = \{2, 4, 6, 8\}$
$B = \{1, 3, 5, 7, 9\}$
$C = \{2, 3, 5, 7\}$

(a) List the elements of the set

　　(i) $B \cup C$

　　(ii) $A' \cap C$

　　(iii) $(A \cap B)'$

(3)

(b) Explain why $A \cap B \cap C = \varnothing$
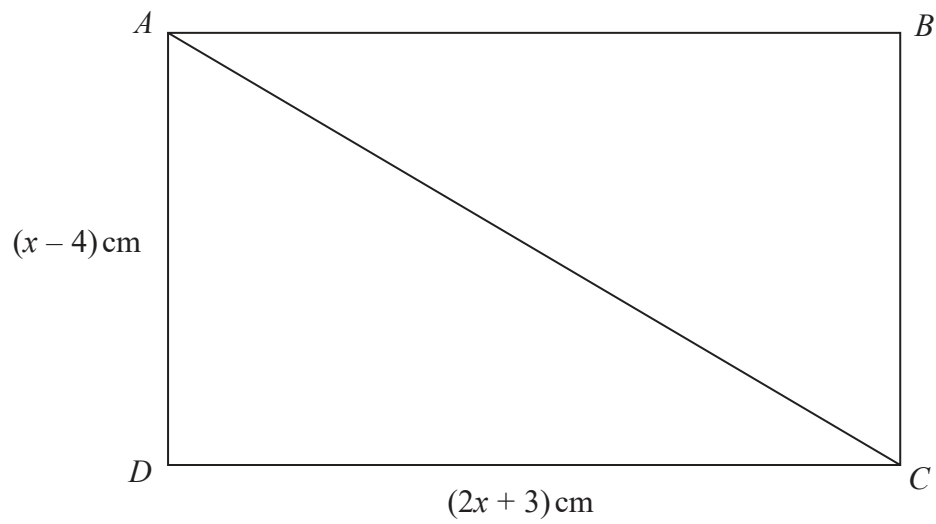
(1)

(Total for Question 15 is 4 marks)

P 5 5 9 4 2 A 0 9 2 0

16

Diagram **NOT** accurately drawn

$(x - 4)$ cm

$(2x + 3)$ cm

The diagram shows quadrilateral *ABCD*.

$AD = BC = (x - 4)$ cm

$DC = AB = (2x + 3)$ cm

$AC = \sqrt{5x^2 + 4x + 25}$ cm

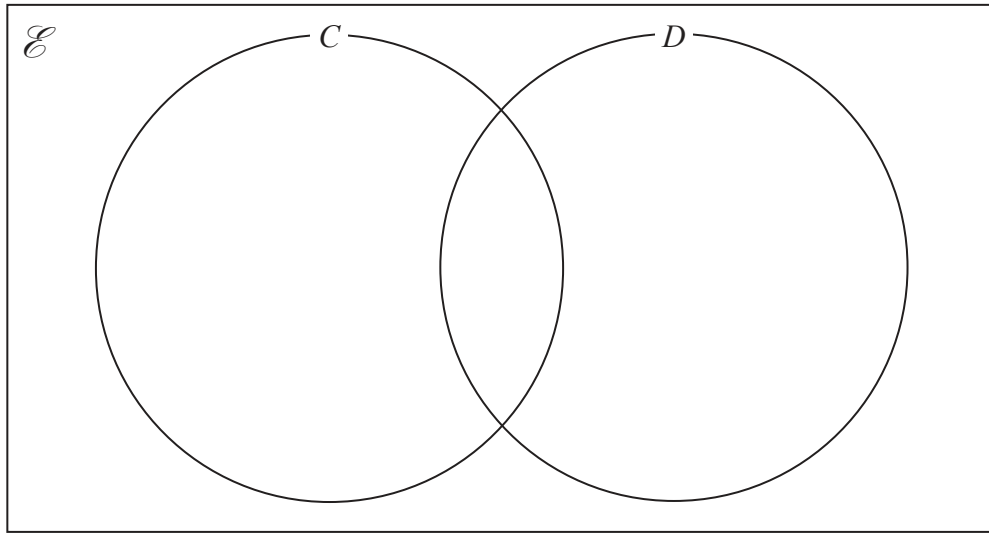Using algebra, show that *ABCD* is a rectangle.

(Total for Question 16 is 4 marks)

17 The 32 students in a class were each asked if they have a cat (*C*) or a dog (*D*) as a pet.
Their answers showed that

      8 students have both a cat and a dog
   12 students have only a cat
   11 students have a dog.

(a) Using this information, complete the Venn diagram to show the number of elements
in each subset.

(2)

A student in the class is chosen at random.

(b) Find the probability that this student does not have a dog as a pet.

(2)

(Total for Question 17 is 4 marks)

Turn over ▶

18 B is inversely proportional to h^3

$B = 24$ when $h = 4$

Find the value of h when $B = 3$

$h = $ ....

(Total for Question 18 is 4 marks)

19 Solve the simultaneous equations

$$x + 2y = -4$$
$$7x - y = 11$$

Show clear algebraic working.

$x = $ ....

$y = $ ....

(Total for Question 19 is 4 marks)

20 The table gives information about the results of a survey of the ages, x years, of 125 members of a dance school.

Age (x years)	$2 < x \leqslant 7$	$7 < x \leqslant 13$	$13 < x \leqslant 20$	$20 < x \leqslant 40$
Frequency	30	40	30	25

Calculate an estimate for the mean age, to the nearest year, of these members of the dance school.

.... years

(Total for Question 20 is 4 marks)

21

$$\mathbf{a} \quad \begin{pmatrix} 3x & 3 \\ & 6 \end{pmatrix} \qquad \mathbf{b} \quad \begin{pmatrix} x + 2 \\ 0.5 \end{pmatrix}$$

$\mathbf{a} = k\mathbf{b}$, where k is a scalar.

Find the value of x.

$x = $ ....

(Total for Question 21 is 4 marks)

22 *D* and *E* are two similar cuboids.

D has surface area $240\,\text{cm}^2$ and volume $600\,\text{cm}^3$
E has surface area $1500\,\text{cm}^2$

Calculate the volume of *E*.

cm^3

(Total for Question 22 is 4 marks)

23 *A*, *B* and *C* are three numbers such that

$$A:B:C = (2x + 1):5:(x - 1)$$

and

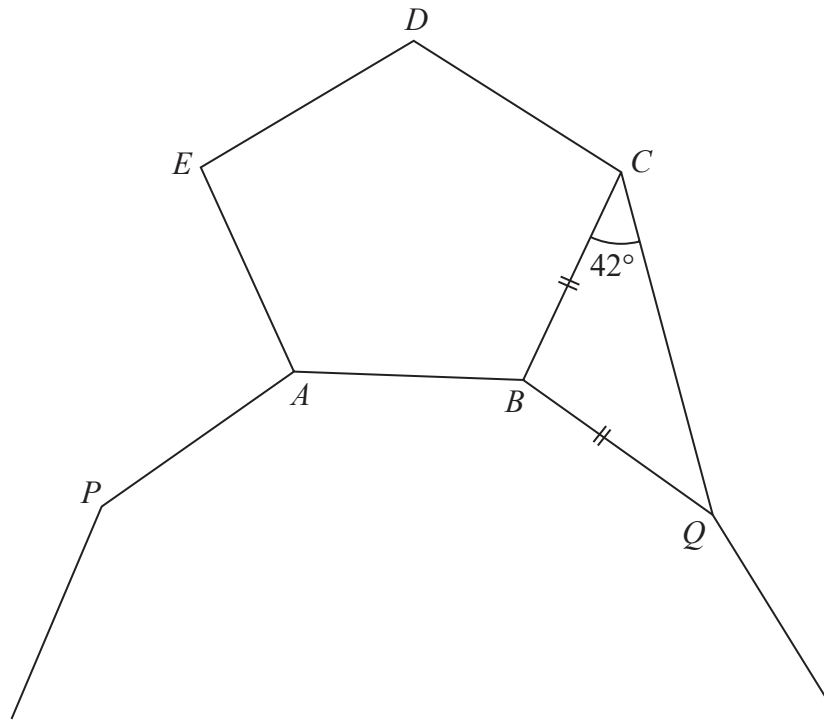$$A + B + C = 20x + 65$$

Given that *B* = 40, find the value of *x*.

$x =$

(Total for Question 23 is 5 marks)

24

Diagram **NOT** accurately drawn

The diagram shows a regular pentagon *ABCDE*, an isosceles triangle *BCQ* and five sides of a regular polygon.

∠*BCQ* = 42°
PA, *AB* and *BQ* are three sides of a regular polygon that has *n* sides.

Find the value of *n*.

n = ...

(Total for Question 24 is 5 marks)

Diagram **NOT** accurately drawn

B

$30°$

$(2x + 1)\,\text{cm}$

$(8x - 4)\,\text{cm}$

C

A

D

$10\,\text{cm}$

E

$(1 - x)\,\text{cm}$

F
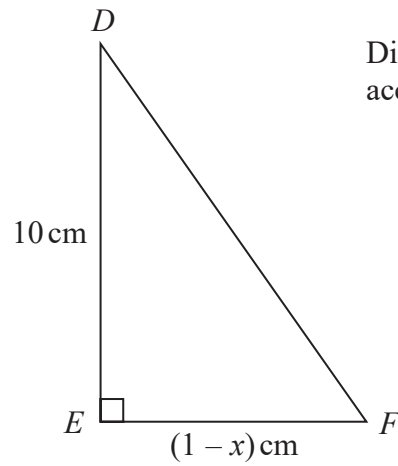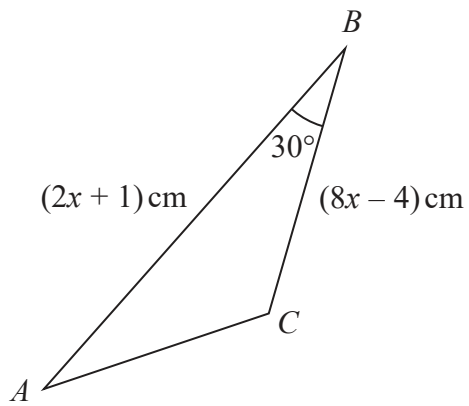
The diagram shows triangle *ABC* and triangle *DEF*.

The area of triangle *ABC* is equal to the area of triangle *DEF*.

Calculate the value of *x*.

(Total for Question 25 is 5 marks)

P 5 5 9 4 2 A 0 1 6 2 0

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26
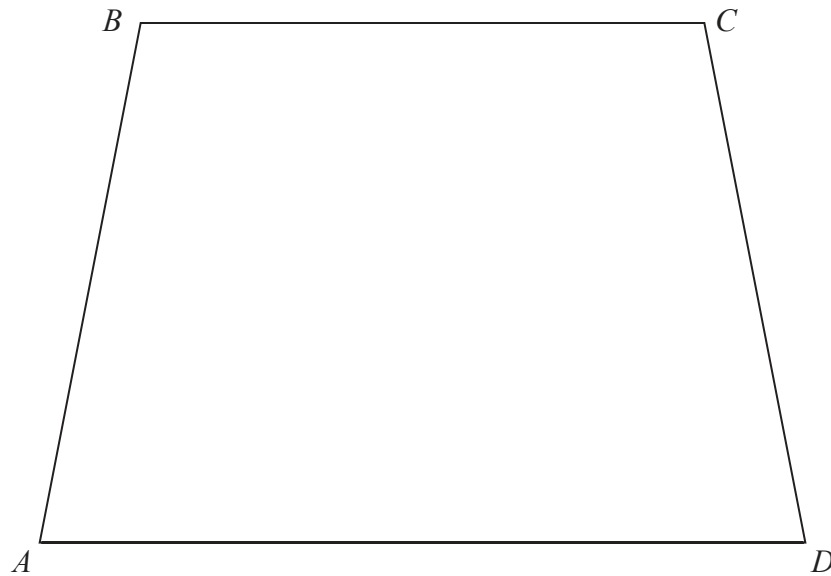
The diagram shows the trapezium *ABCD* in which *AB* = *DC*.

(a) **Showing all your construction lines**, construct

   (i) the perpendicular bisector of *CD*,
  (ii) the locus of all points inside the trapezium that are equidistant from *BA* and *BC*.

(4)

The region *R* consists of all the points inside the trapezium that are closer to *BC* than to *BA*, closer to *C* than to *D* and less than 6 cm from *D*.

(b) Show, by shading, the region *R*.
    Label the region *R*.

(2)

(Total for Question 26 is 6 marks)

Turn over ▶

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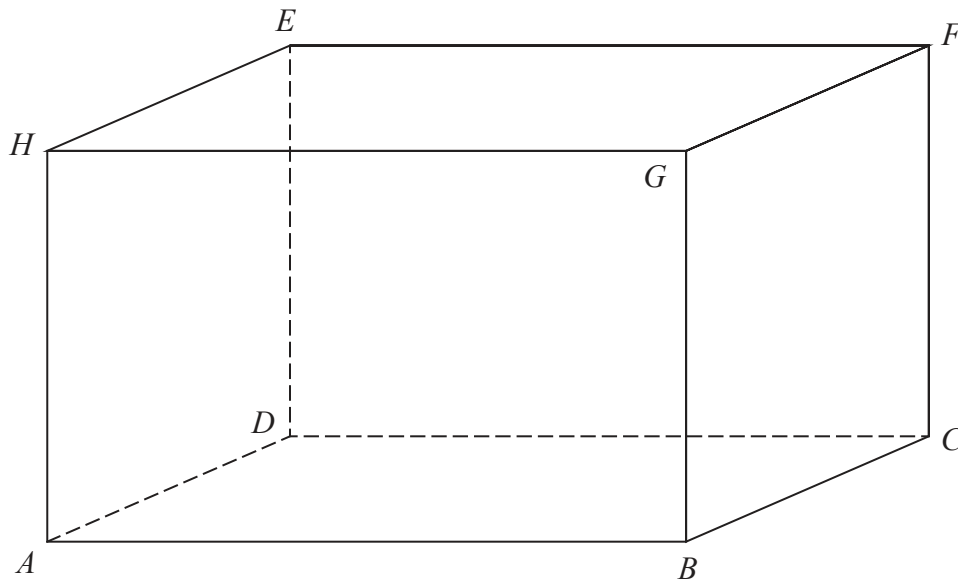DO NOT WRITE IN THIS AREA

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27

Diagram **NOT** accurately drawn

The diagram shows a building in which the owner is proposing to install a zip line.
The building is in the shape of a cuboid, *ABCDEFGH*.

AB = 2*CF*
BC = 60 m
The volume of the cuboid is 27 000 m^3

The zip line will run diagonally in a straight line from *A* to *F*.

To be safe, the zip line must be no longer than 70 m in length
and the size of angle *FAC* must not be greater than 14°

Show that the owner can safely install a zip line.

Question 27 continued

(Total for Question 27 is 6 marks)

28 $(x + 2)$ is a factor of $6x^3 - x^2 + kx - 10$, where k is a constant.

(a) Show that $k = -31$

(2)

(b) Hence, factorise completely $6x^3 - x^2 - 31x - 10$

(4)

(Total for Question 28 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS