Write your name here

Surname	Other names

Pearson Edexcel
Level 1 / Level 2
GCSE (9–1)

Centre Number | Candidate Number

Mathematics

Paper 1 (Non-Calculator)

Higher Tier

Thursday 25 May 2017 – Morning
Time: 1 hour 30 minutes

Paper Reference
1MA1/1H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.
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.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may not be used.**

Information

- The total mark for this paper is 80
- 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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 8 1 4 7 A 0 1 2 0

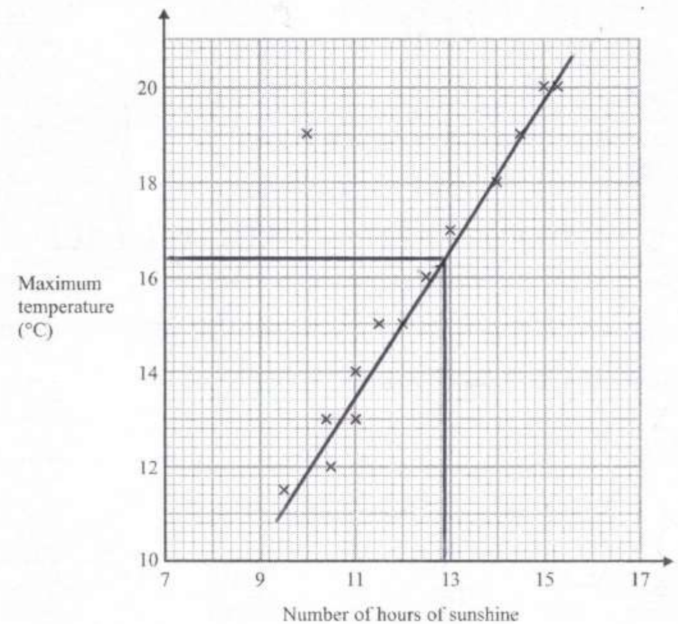
Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The scatter graph shows the maximum temperature and the number of hours of sunshine in fourteen British towns on one day.



One of the points is an outlier.

(a) Write down the coordinates of this point.

(10 , 19)
(1)

(b) For all the other points write down the type of correlation.

positive
(1)

P 4 8 1 4 7 A 0 2 2 0

On the same day, in another British town, the maximum temperature was 16.4 °C.

(c) Estimate the number of hours of sunshine in this town on this day.

(ms 12 → 13)

12.9 hours
(2)

A weatherman says,

"Temperatures are higher on days when there is more sunshine."

(d) Does the scatter graph support what the weatherman says?
Give a reason for your answer.

Yes as there's +ve correlation

(1)

(Total for Question 1 is 5 marks)

2 Express 56 as the product of its prime factors.

7 8

2 2 2

7x2x2x2

(Total for Question 2 is 2 marks)

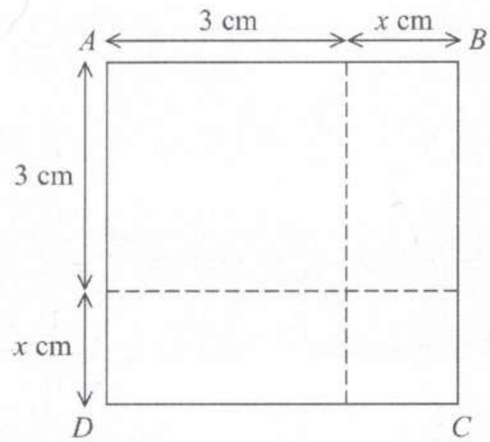
3 Work out 54.6 × 4.3

546
x 43
1638
21840
23478

234.78

(Total for Question 3 is 3 marks)

4



The area of square *ABCD* is 10 cm².

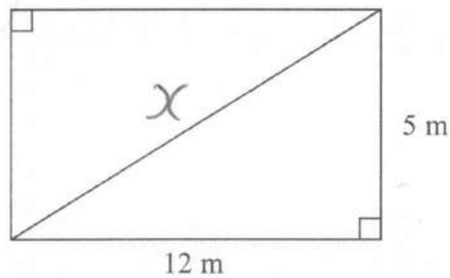
Show that $x^2 + 6x = 1$

$$\text{Area} = (x+3)(x+3) = 10$$
$$x^2 + 3x + 3x + 9 = 10$$
$$x^2 + 6x + 9 = 10$$
$$x^2 + 6x = 1$$

as req^d

(Total for Question 4 is 3 marks)

5 This rectangular frame is made from 5 straight pieces of metal.



The weight of the metal is 1.5 kg per metre.

Work out the total weight of the metal in the frame.

$x = \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$

Frame $= 2 \times 12 + 2 \times 5 + 13$

$= 24 + 10 + 13$

$= 47$m

$47 \times 1 \cdot 5 = \quad 47 + 23 \cdot 5$

70·5 .... kg

(Total for Question 5 is 5 marks)

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P 4 8 1 4 7 A 0 6 2 0

6 The equation of the line L_1 is $y = 3x - 2$
The equation of the line L_2 is $3y - 9x + 5 = 0$

Show that these two lines are parallel.

L_1: $m = 3$

L_2: $3y = 9x + 5$

$y = 3x + \frac{5}{3}$

so $m = 3$

same gradient hence parallel

(Total for Question 6 is 2 marks)

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Turn over

7 There are 10 boys and 20 girls in a class.
The class has a test.

The mean mark for all the class is 60
The mean mark for the girls is 54

Work out the mean mark for the boys.

All total = 60 × 30 = 1800
G total = 20 × 54 = 1080
720 = boys total

720 ÷ 10

72

(Total for Question 7 is 3 marks)

8 (a) Write 7.97×10^{-6} as an ordinary number.

0·00000797

(1)

(b) Work out the value of $(2.52 \times 10^{5}) \div (4 \times 10^{-3})$
Give your answer in standard form.

$4\overline{)2{\cdot}52}$ = 0·63

$0{\cdot}63 \times 10^{8}$

$6{\cdot}3 \times 10^{7}$

(2)

(Total for Question 8 is 3 marks)

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9 Jules buys a washing machine.

20% VAT is added to the price of the washing machine.
Jules then has to pay a total of £600

What is the price of the washing machine with **no** VAT added?

$x \times 1.2 = 600$

$x = \frac{600}{1.2} = \frac{6000}{12} = \frac{2000}{4} = \frac{1000}{2}$

£ 500

(Total for Question 9 is 2 marks)

10 Show that $(x + 1)(x + 2)(x + 3)$ can be written in the form $ax^3 + bx^2 + cx + d$
where a, b, c and d are positive integers.

$x^2 + 3x + 2$

x^2	$3x$	2	
x^3	$3x^2$	$2x$	x
$3x^2$	$9x$	6	$+3$

$= x^3 + 6x^2 + 11x + 6$

(Total for Question 10 is 3 marks)

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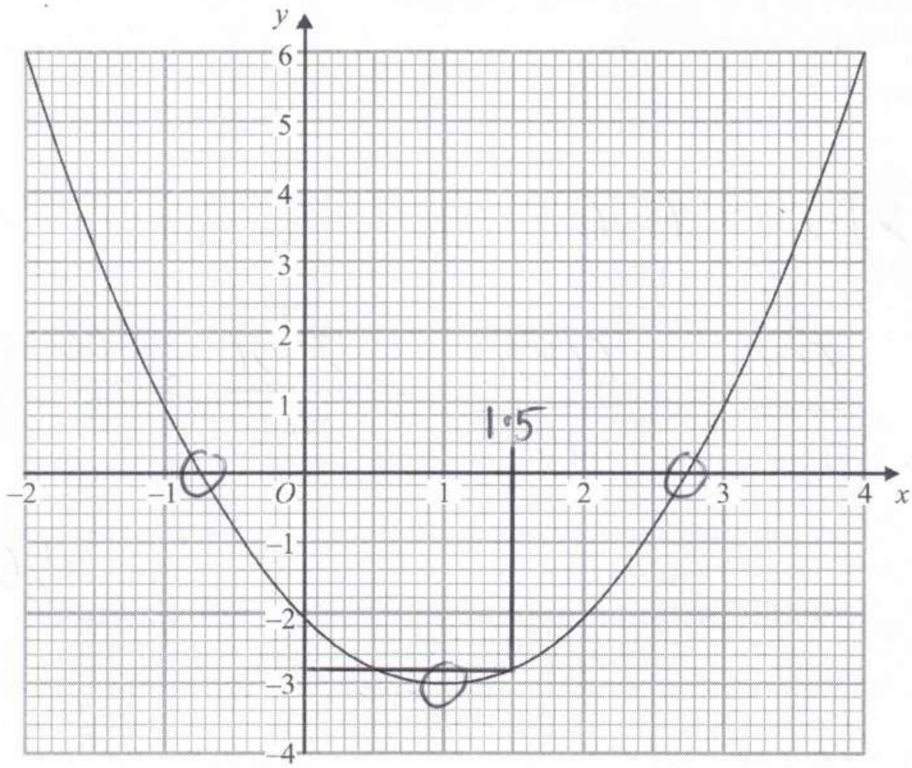
Turn over

11 The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(1 , −3)

(1)

(b) Write down estimates for the roots of $f(x) = 0$

[ms ± 0·05]

2·75, −1·75

(1)

(c) Use the graph to find an estimate for $f(1.5)$

−2·8

(1)

(Total for Question 11 is 3 marks)

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P 4 8 1 4 7 A 0 1 0 2 0

12 (a) Find the value of $81^{-\frac{1}{2}}$

$= \frac{1}{\sqrt{81}}$

$\frac{1}{9}$

(2)

(b) Find the value of $\left(\frac{64}{125}\right)^{\frac{2}{3}}$

$\frac{\sqrt[3]{64}^2}{\sqrt[3]{125}^2} = \frac{4^2}{5^2} = \frac{16}{25}$

$\frac{16}{25}$

(2)

(Total for Question 12 is 4 marks)

13 The table shows a set of values for x and y.

x	1	2	3	4
y	9	$2\frac{1}{4}$	1	$\frac{9}{16}$

y is inversely proportional to the square of x.

(a) Find an equation for y in terms of x.

$y = \frac{K}{x^2}$ $\quad 9 = \frac{K}{1^2}$

$K = 9$

$y = \frac{9}{x^2}$

(2)

(b) Find the positive value of x when $y = 16$

$16 = \frac{9}{x^2}$

$x^2 = \frac{9}{16}$

$x = \frac{3}{4}$

(2)

(Total for Question 13 is 4 marks)

14 White shapes and black shapes are used in a game.
Some of the shapes are circles.
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3:7

The ratio of the number of white circles to the number of white squares is 4:5

The ratio of the number of black circles to the number of black squares is 2:5

Work out what fraction of all the shapes are circles.

W B

3 7

O □ O □

4 5 2 5

$$WO = \frac{3}{10} \times \frac{4}{9} = \frac{12}{90} = \frac{4}{30} = \frac{2}{15}$$

$$BO = \frac{7}{10} \times \frac{2}{7} = \frac{14}{70} = \frac{2}{10} = \frac{1}{5}$$

$$\frac{2}{15} + \frac{3}{15} = \frac{5}{15}$$

$= \frac{1}{3}$ ....

(Total for Question 14 is 4 marks)

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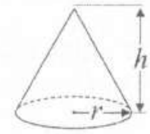
15 A cone has a volume of 98 cm^3.
The radius of the cone is 5.13 cm.

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



(a) Work out an estimate for the height of the cone.

$\cancel{\frac{1}{3}} \times \cancel{\pi} \times 5^2 \times h = 100$

$h = \frac{100}{25}$

[ms 3.5 to 4.5]

4 cm

(3)

John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer?
Give reasons for your answer.

more as $h = \dfrac{\text{rounded up}}{\text{rounded down}}$

(1)

(Total for Question 15 is 4 marks)

16 n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n - 2)^2$ is always an even number.

$\cancel{n^2} - 2 \cancel{- n^2} + 4n - 4$

$4n - 6$

$2(2n - 3)$ is always even

(Total for Question 16 is 4 marks)

17 There are 9 counters in a bag.

7 of the counters are green.
2 of the counters are blue.

Ria takes at random two counters from the bag.

Work out the probability that Ria takes one counter of each colour.
You must show your working.

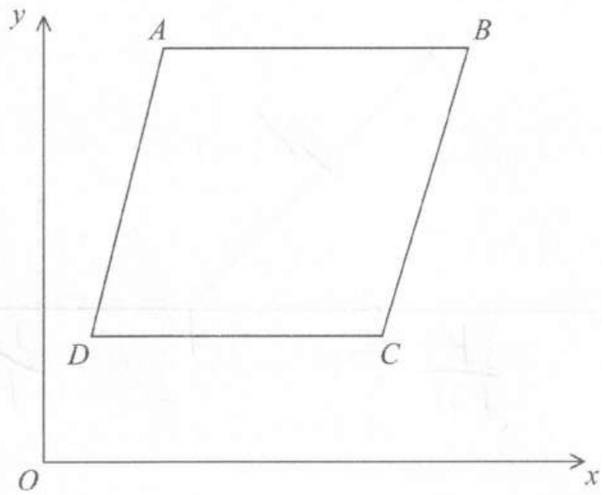
$$GB = \frac{7}{9} \times \frac{2}{8} = \frac{14}{72}$$

$$BG = \frac{2}{9} \times \frac{7}{8} = \frac{14}{72}$$

$\frac{28}{72}$ ....

(Total for Question 17 is 4 marks)

18



ABCD is a rhombus.
The coordinates of *A* are (5,11)
The equation of the diagonal *DB* is $y = \frac{1}{2}x + 6$

$m = \frac{1}{2}$

Find an equation of the diagonal *AC*.

Diagonals intersect at right angles

$m_{AC} = -2$

$y = mx + c$

$\left.\begin{matrix} x = 5 \\ y = 11 \end{matrix}\right\}$ $11 = 5 \times -2 + c$

$c = 21$

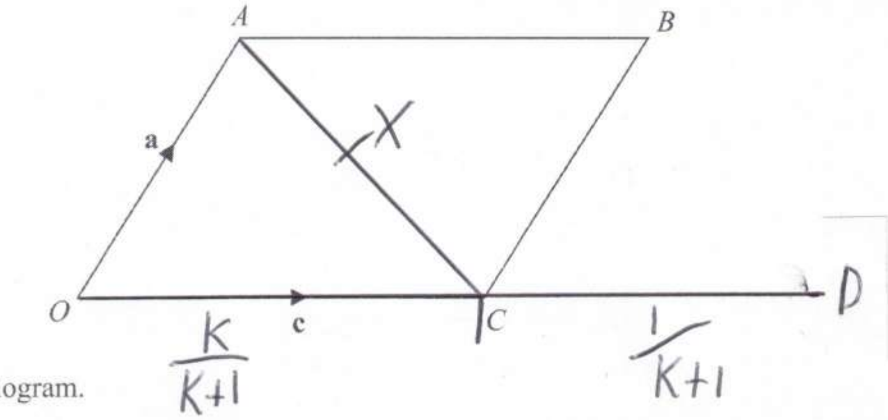
$y = -2x + 21$

(Total for Question 18 is 4 marks)

P 4 8 1 4 7 A 0 1 5 2 0

Turn over

19



OABC is a parallelogram.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$

X is the midpoint of the line *AC*.
OCD is a straight line so that $OC : CD = k : 1$

Given that $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$

find the value of *k*.

$$\overrightarrow{AC} = c - a$$

$$\overrightarrow{CD} = \overrightarrow{CX} + \overrightarrow{XD}$$

$$= \frac{1}{2}(a - c) + 3c - \frac{1}{2}a$$

$$= \cancel{\frac{1}{2}a - \frac{1}{2}a} - \frac{1}{2}c + 3c$$

$$CD = \frac{5}{2}c$$

so $OC : CD$

$c : 2.5c$

$2\cancel{c} : 5\cancel{c}$

$\frac{2}{5} : 1$

$k = \frac{2}{5}$

(Total for Question 19 is 4 marks)

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20 Solve algebraically the simultaneous equations

$$① - x^2 + y^2 = 25$$
$$y - 3x = 13 \Rightarrow y = 3x + 13 \quad -②$$

$$② \text{ in } ① \Rightarrow x^2 + (3x+13)^2 = 25$$

$$x^2 + 9x^2 + 169 + 78x = 25$$

$$10x^2 + 78x + 144 = 0$$

$$5x^2 + 39x + 72 = 0$$

$$(5x+24)(x+3) = 0$$

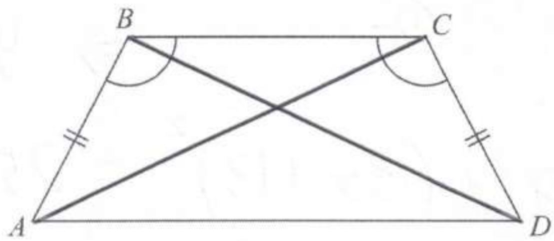
$$x = -3$$
$$y = 3 \times -3 + 13$$
$$y = 4$$

$$x = -\frac{24}{5}$$
$$y = 3 \times \frac{-24}{5} + 13$$
$$y = -\frac{72}{5} + \frac{65}{5}$$
$$y = -\frac{7}{5}$$

$x = -3, y = 4 \mid x = -\frac{24}{5}, y = \frac{-7}{5}$

(Total for Question 20 is 5 marks)

21 *ABCD* is a quadrilateral.



$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

AB = CD (given)
Side BC is common (or AD is common)

< ABC = < BCD (given)

SAS hence triangles are congruent

$\therefore AC = BD$

(Total for Question 21 is 4 marks)

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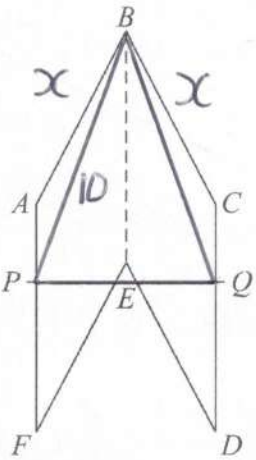
22 The diagram shows a hexagon *ABCDEF*. $\angle = 30$

$\sin 30 = \frac{1}{2}$

$\cos 30 = \frac{\sqrt{3}}{2}$



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

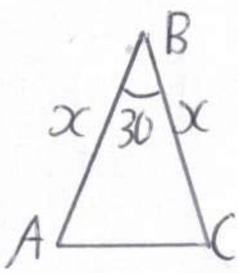
$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

ABEF and *CBED* are congruent parallelograms where $AB = BC = x$ cm.
P is the point on *AF* and *Q* is the point on *CD* such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30°$,

prove that $\cos PBQ = 1 - \frac{(2 - \sqrt{3})}{200}x^2$

$$\cos PBQ = \frac{10^2 + 10^2 - PQ^2}{2 \times 10 \times 10} = \frac{200 - PQ^2}{200} \quad -①$$



$AC = PQ$

$$PQ^2 = x^2 + x^2 - 2x^2\cos 30$$
$$= 2x^2\left(1 - \frac{\sqrt{3}}{2}\right) \quad -②$$

$$② \text{ in } ① \Rightarrow \frac{200}{200} - \frac{2x^2\left(1 - \frac{\sqrt{3}}{2}\right)}{200}$$

$$= 1 - \frac{2x^2 - \sqrt{3}x^2}{200} = 1 - \frac{(2 - \sqrt{3})x^2}{200}$$

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS