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 ▶

6/6/6/6/6/7/7/

Pearson

Please note that these worked solutions have neither been provided nor approved by Pearson Education and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

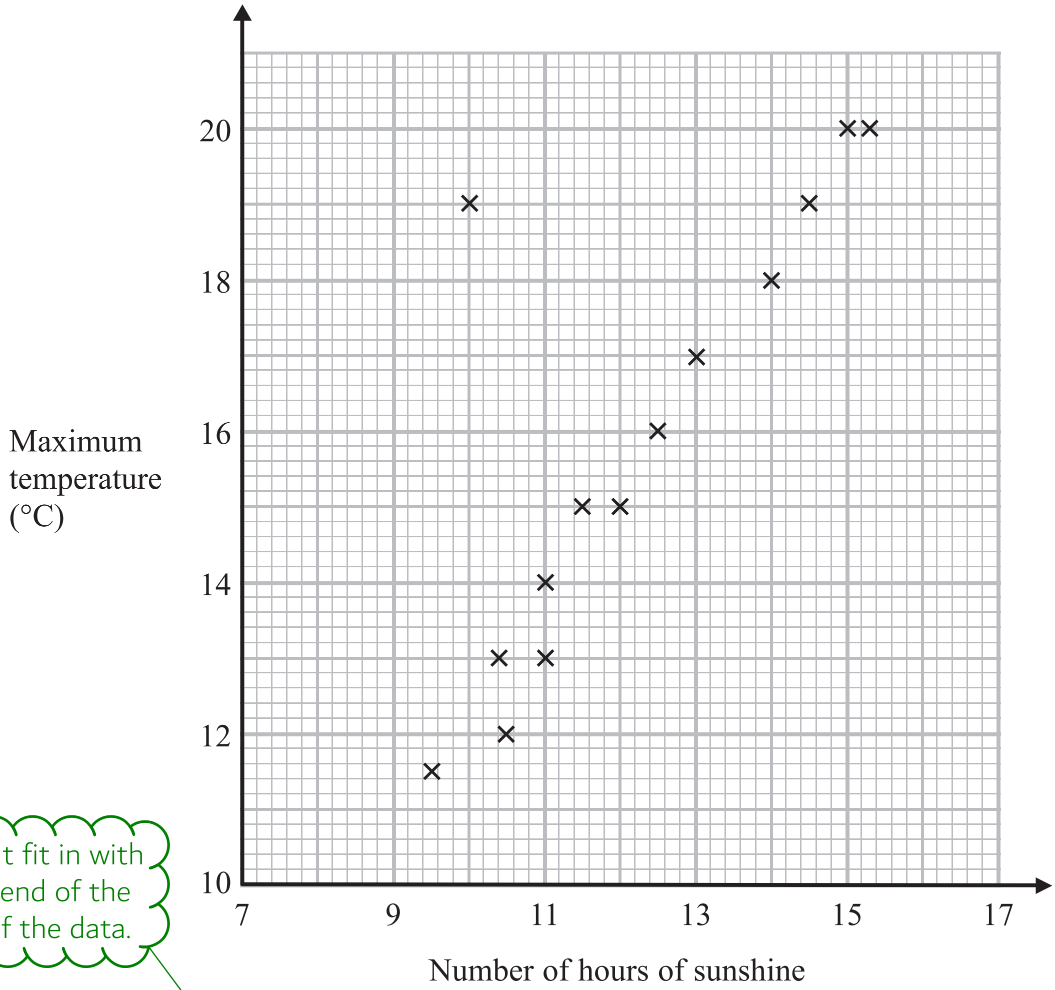
.CG Maths.

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.



Doesn't fit in with the trend of the rest of the data.

One of the points is an outlier.

(a) Write down the coordinates of this point.

(x-coordinate , y-coordinate)

(.......................... , ...)

(1)

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

Positive if both variables increase together. Negative if one increases while the other decreases.

....

(1)

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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.

We can draw a line of best fit and use this to give an estimate. Be careful of the scale. 16.4 is not 4 boxes after 16.

.... 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.

Test the statement against the data. Is it supported by the data?

....

....

(1)

(Total for Question 1 is 5 marks)

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2 Express 56 as the product of its prime factors.

Product: multiplied together.
Prime: positive whole numbers which are only divisible by themselves and 1.
Factors: positive whole numbers which can be multiplied by another whole number to give 56.

A factor tree would help us to find the prime factors.

....

(Total for Question 2 is 2 marks)

3 Work out 54.6×4.3

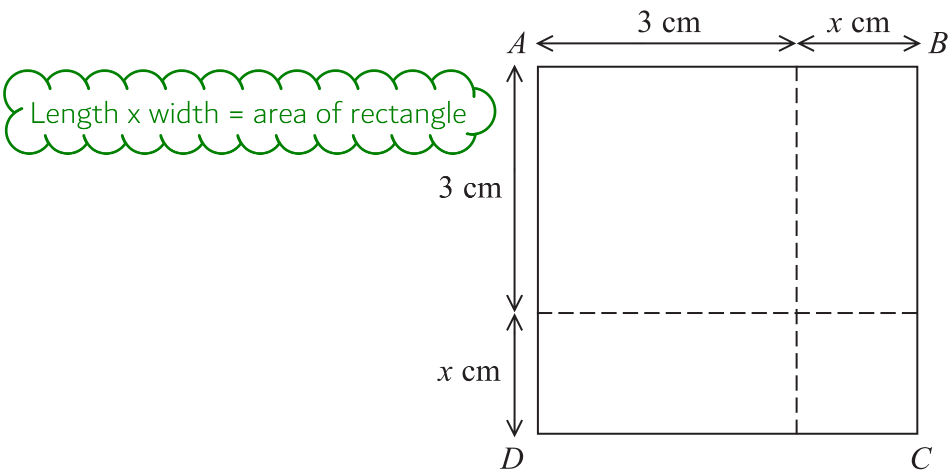
$$\begin{array}{r} 54.6 \\ \times \quad 4.3 \\ \hline \end{array}$$

There is 1 decimal place in 54.6. There is 1 decimal place in 4.3. There are 2 decimal places in total so there must be 2 decimal places in the answer

....

(Total for Question 3 is 3 marks)

4



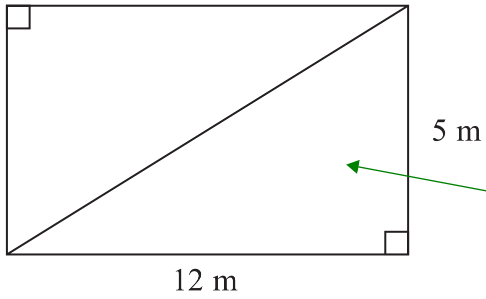
The area of square $ABCD$ is 10 cm^2.

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

Adding up all the individual areas or working out the area of the whole shape gives 10

(Total for Question 4 is 3 marks)

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



This is a right-angled triangle so Pythagoras finds the missing side.
$a^2 + b^2 = c^2$

The weight of the metal is 1.5 kg per metre.

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

Adding together all the lengths and multiplying it by the weight per metre gives the total weight.

.... kg

(Total for Question 5 is 5 marks)

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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.

Parallel lines have the same gradient.
$y = mx + c$ is the general equation for a straight line.
m is the gradient so L_1 must have a gradient of 3.
Rearranging the second equation can put it into the desired form and we can work out the gradient.

(Total for Question 6 is 2 marks)

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.

Mean for boys = total for boys/number of boys
Total for boys = total for class - total for girls
total = mean x number

....

(Total for Question 7 is 3 marks)

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

Convert the standard form to a normal decimal number. x 10^{-6} is dividing by ten six times.

....
(1)

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

$a \times 10^n$, $1 \leq a < 10$, n is integer.

$$\frac{2.52}{4} \times \frac{10^5}{10^{-3}}$$

$a^x/a^y = a^{x-y}$

....
(2)

(Total for Question 8 is 3 marks)

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?

Let x be the original price. Multiplying it by 1.2 increases it by 20% and this gives 600. Decreasing £600 by 20% is not the same as the 20% is of the original price, not of £600.

£..

(Total for Question 9 is 2 marks)

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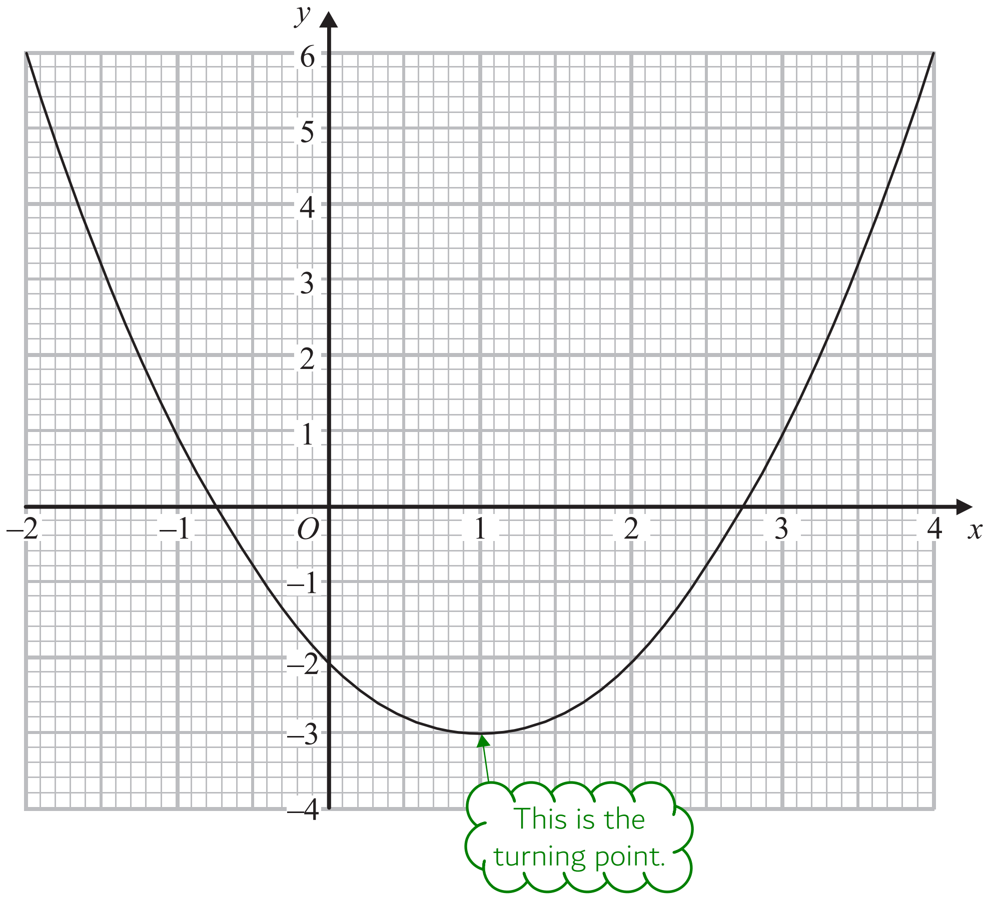
10 Show that $(x + 1)(x + 2)(x + 3)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a, b, c and d are positive integers.

The brackets can be expanded two at a time.
$(a + b)(c + d) = ac + ad + bc + bd$

(Total for Question 10 is 3 marks)

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)

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

The roots are the solutions of x. Basically, what are the x-coordinates when $y = 0$ ($f(x) = y$)

....

(1)

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

Replace x with 1.5 in the function. $x = 1.5$ We can read an estimate off the graph.

....

(1)

(Total for Question 11 is 3 marks)

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

$a^{x/y} = \sqrt[y]{a^x} = (\sqrt[y]{a})^x$ $a^{-x} = 1/a^x$

....

(2)

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

$a^{x/y} = \sqrt[y]{a^x} = (\sqrt[y]{a})^x$

$\sqrt{a}/\sqrt{b} = \sqrt{a/b}$

....

(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.

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

There are values of x and y which we know satisfies the equation. We can substitute these to find k.

....

(2)

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

Rearrange the equation to make x the subject then substitute in $y = 16$

....

(2)

(Total for Question 13 is 4 marks)

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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.

Express the fraction of the white shapes which are circles. Express the fraction of the shapes which are white. Multiplying these fractions gives the fraction of shapes which are white circles.

Express the fraction of the black shapes which are circles. Express the fraction of the shapes which are black. Multiplying these fractions gives the fraction of the shapes which are black circles.

Adding the fraction of shapes which are white circles to the fraction of the shapes which are black circles gives the fraction of the shapes which are circles.

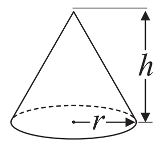
$a : b$ is $a/(a + b)$ and $b/(a + b)$

....

(Total for Question 14 is 4 marks)

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.

Rearrange the formula to make the height the subject.

We are only doing an estimate so we can use rough values to one significant figure.

....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.

Go back to the rearranged formula and consider what either increasing or decreasing the values when rounding will have on the height compared to the true value.

....

....

....

(1)

(Total for Question 15 is 4 marks)

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16 n is an integer greater than 1

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

Expand the bracket and simplify the algebra. Any number multiplied by 2 must be 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.

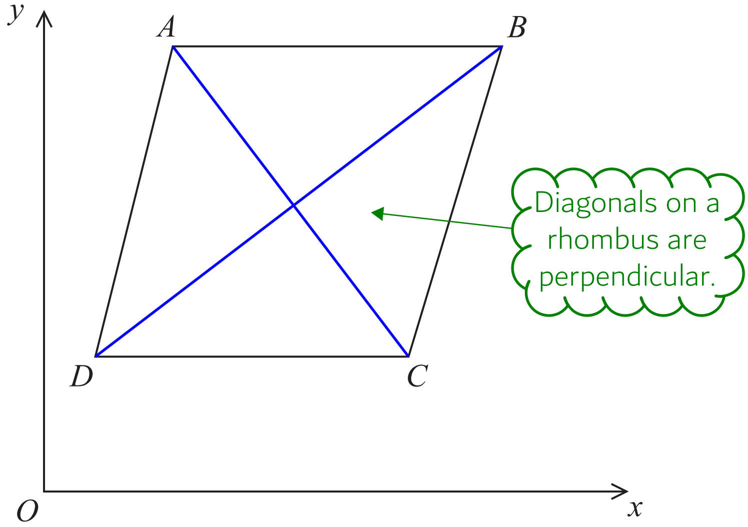
Work out the probability that Ria takes one counter of each colour.
You must show your working.

Green AND blue OR blue AND green. 'AND' means to multiply the probabilities and 'OR' means to add the probabilities. The fraction of the counters in the bag which are of a certain colour is the probability of getting that colour. Remember that after the first counter is taken there is 1 fewer counter in total.

....

(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 $y = \frac{1}{2}x + 6$

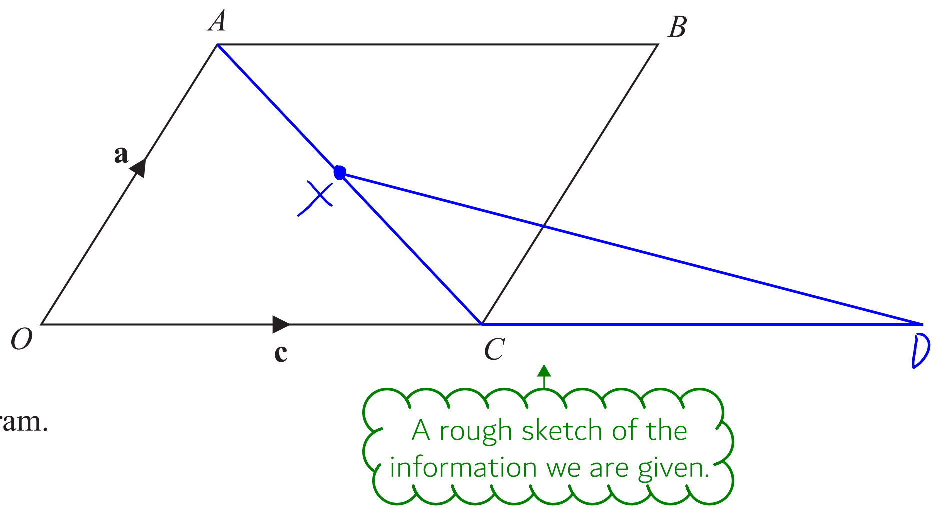
Find an equation of the diagonal *AC*.

$y = mx + c$, where m is gradient and c is y-intercept. The gradient of AC is the negative reciprocal of the gradient of DB.

....

(Total for Question 18 is 4 marks)

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*.

This is half of vector $\overrightarrow{CA}$, which is $\overrightarrow{CO} + \overrightarrow{OA}$.

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

Once $\overrightarrow{CD}$ is found, the ratio of OC : CD can be expressed. To simplify a ratio divide both sides by the same amount. The right side needs to be simplified to 1.

$k =$ ....

(Total for Question 19 is 4 marks)

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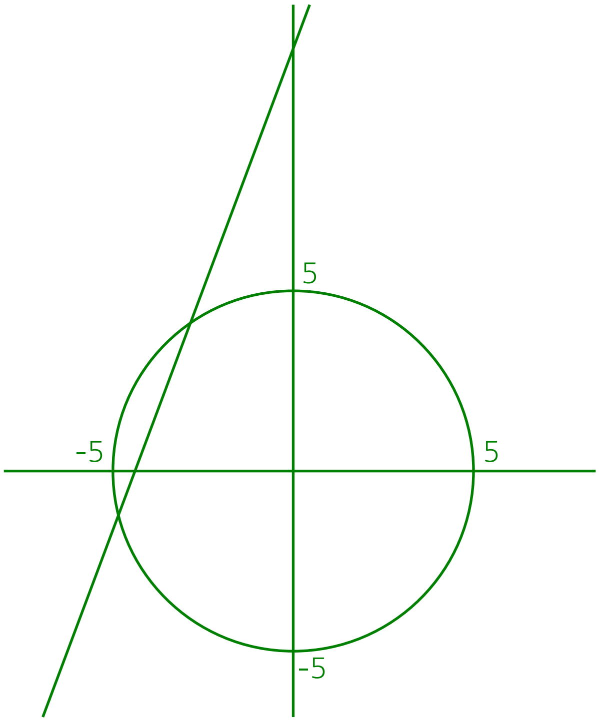
20 Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$
$$y - 3x = 13$$

Rearrange the second equation to make y the subject then substitute the result for y in the second equation to eliminate y as a variable. We should get an equation which can be solved with factorisation. The graphs look something like sketches below so there should be two solutions for x and y where the lines cross (we shouldn't draw an accurate graph to solve this though).



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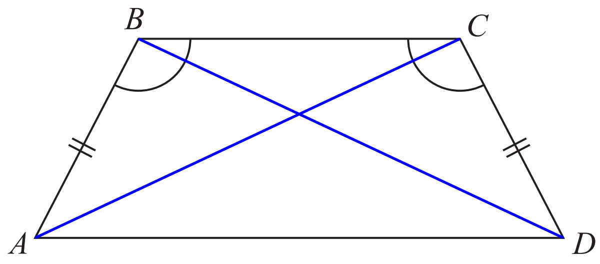
(Total for Question 20 is 5 marks)

21 *ABCD* is a quadrilateral.



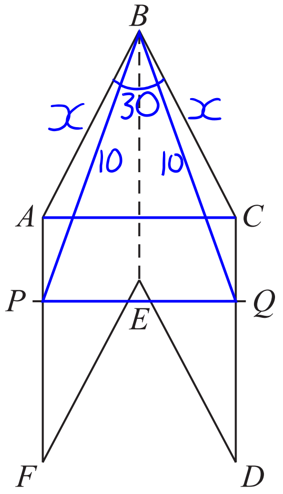
$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

We can prove that triangles ABC and BCD are congruent. AC and BD are sides on that triangle.

(Total for Question 21 is 4 marks)

22 The diagram shows a hexagon *ABCDEF*.



With harder geometry questions, it is always worth sketching what you are given onto a diagram so you can start to make a plan of what to do.

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

We don't have right-angled triangles so we either have to use the sine or cosine rule. We are trying to find an angle and don't have opposite pairs of angles and sides so likely have to use the cosine rule.

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

Rearrange to make cosA the subject then substitute in what we are given. We should find that we need to find side PQ, which is equal to AC. The cosine rule needs to be applied again to find side AC.

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS