Candidate surname	Other names

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

Centre Number

Candidate Number

Tuesday 6 November 2018

Morning (Time: 1 hour 30 minutes) | Paper Reference **1MA1/1H**

Mathematics
Paper 1 (Non-Calculator)
Higher Tier

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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Hints

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

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1   Work out the value of $\dfrac{3^7 \times 3^{-2}}{3^3}$

$a^x \times a^y = a^{x+y}$
$a^x \div a^y = a^{x-y}$

....

(Total for Question 1 is 2 marks)

2   $v^2 = u^2 + 2as$

$u = 12$ $a = -3$ $s = 18$

(a) Work out a value of v.

Square rooting both sides makes v the subject. Substitute in the values for u, a and s. Follow BIDMAS when evaluating the value

....

(2)

(b) Make s the subject of $v^2 = u^2 + 2as$

s wants to stay where it is. Everything else needs to go. Follow BIDMAS backward to decide what to eliminate first

....

(2)

(Total for Question 2 is 4 marks)

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3 A bonus of £2100 is shared by 10 people who work for a company.
40% of the bonus is shared equally between 3 managers.
The rest of the bonus is shared equally between 7 salesmen.

One of the salesmen says,

"If the bonus is shared equally between all 10 people I will get 25% more money."

Is the salesman correct?
You must show how you get your answer.

Work out how much one salesman gets.
Increase this by 25% and compare it to
the amount they would get if it was
shared equally by the 10 people

(Total for Question 3 is 5 marks)

4 It would take 120 minutes to fill a swimming pool using water from 5 taps.

(a) How many minutes will it take to fill the pool if only 3 of the taps are used?

Work out the total amount of minutes of work done by the 5 taps by doing 120 x 5. Then share the total amount of work by the 3 taps

.... minutes

(2)

(b) State one assumption you made in working out your answer to part (a).

....

There is an assumption that all the taps can be treated as equals

....

(1)

(Total for Question 4 is 3 marks)

5 A plane travels at a speed of 213 miles per hour.

(a) Work out an estimate for the number of seconds the plane takes to travel 1 mile.

$$\frac{d}{s \mid t}$$
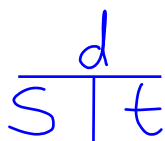
Use the formula triangle (cover what you are trying to find) to find the formula for time. Round the speed to one significant figure. Convert the time in hours to seconds

.... seconds

(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

....

The speed was rounded. What effect does this have?

....

(1)

(Total for Question 5 is 4 marks)

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6 Solve the simultaneous equations

$$5x + y = 21$$
$$x - 3y = 9$$

$x = $ ....

$y = $ ....

(Total for Question 6 is 3 marks)

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7 The diagram shows a square *ABCD* with sides of length 20 cm.
It also shows a semicircle and an arc of a circle.

20 cm
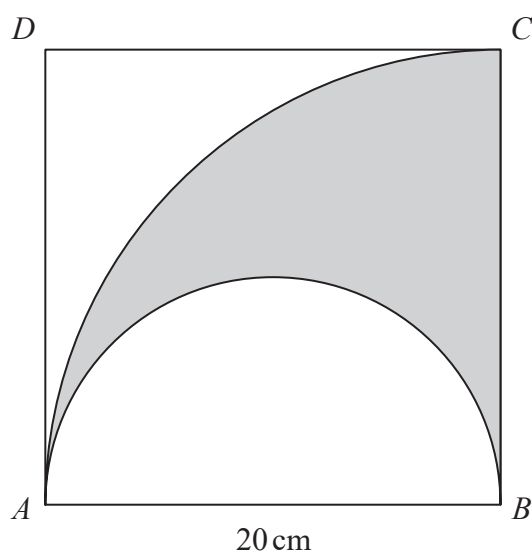
AB is the diameter of the semicircle.
AC is an arc of a circle with centre *B*.

Show that $\dfrac{\text{area of shaded region}}{\text{area of square}} = \dfrac{\pi}{8}$

πr^2 = area of a circle. Subtract the area of the semicircle (half a circle) from the area of the quarter circle ABC to find the area of the shaded region. Length squared works out the area of the square. Once both areas are found, they can be put as a fraction and simplified

(Total for Question 7 is 4 marks)

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8 (a) Write down the exact value of tan 45°

....

(1)

Here is a right-angled triangle.
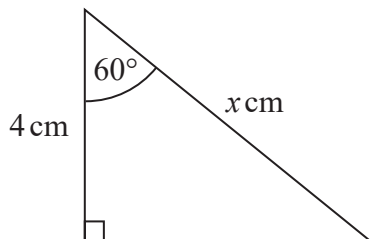
cos 60° = 0.5

(b) Work out the value of *x*.

SOH CAH TOA $\frac{A}{C|H}$
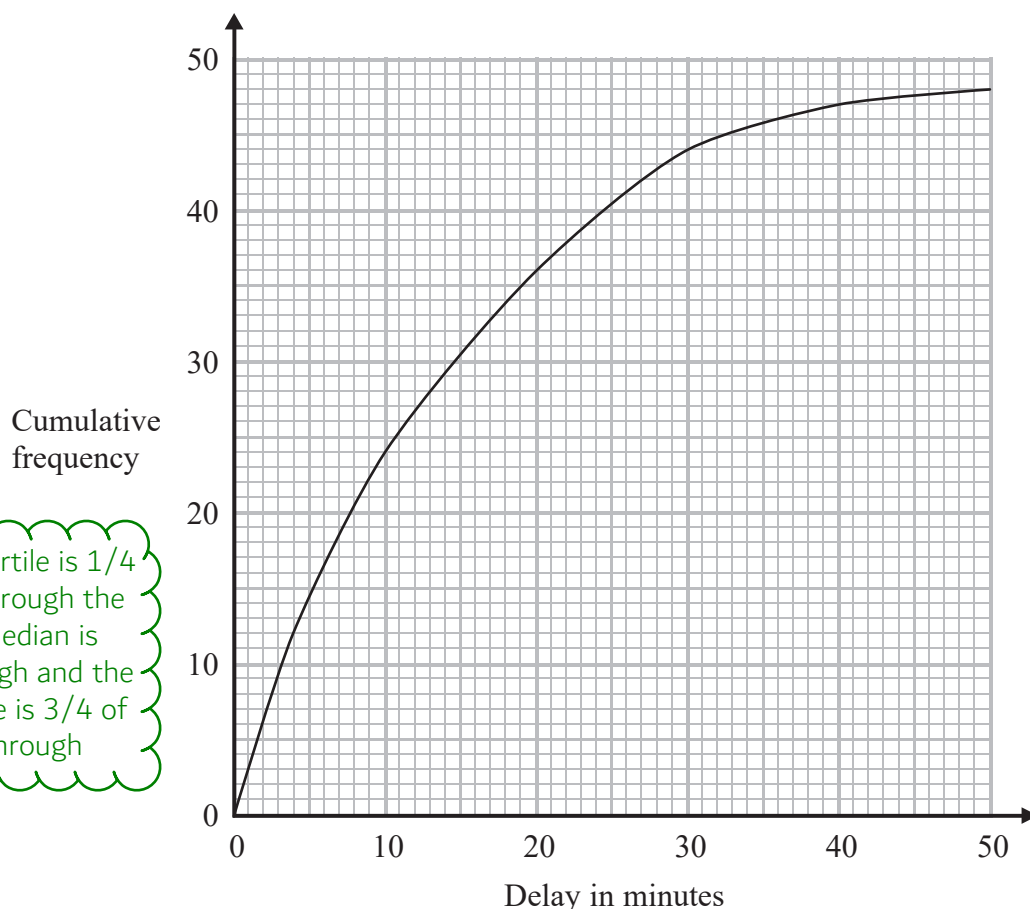
....

(2)

(Total for Question 8 is 3 marks)

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9 The times that 48 trains left a station on Monday were recorded.

The cumulative frequency graph gives information about the numbers of minutes the trains were delayed, correct to the nearest minute.

> The lower quartile is 1/4 of the way through the data, the median is halfway through and the upper quartile is 3/4 of the way through

The shortest delay was 0 minutes.
The longest delay was 42 minutes.

(a) On the grid below, draw a box plot for the information about the delays on Monday.

Monday

Delay in minutes
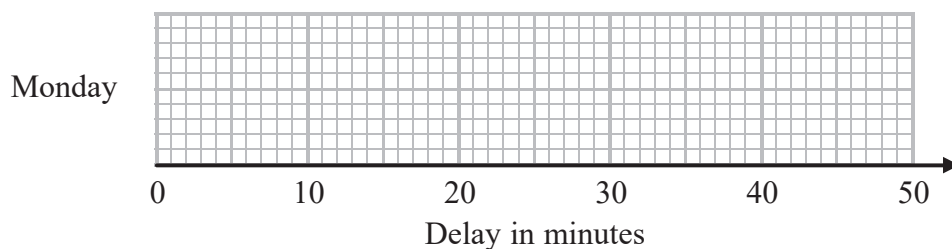
(3)

48 trains left the station on Tuesday.
The box plot below gives information about the delays on Tuesday.

Tuesday

Delay in minutes

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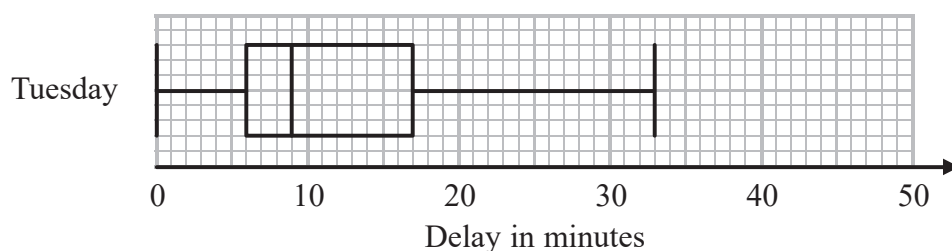(b) Compare the distribution of the delays on Monday with the distribution of the delays on Tuesday.

....

Compare the medians and the
spread (range or interquartile range)

....

....

....

(2)

Mary says,

"The longest delay on Tuesday was 33 minutes.
This means that there must be some delays of between 25 minutes and 30 minutes."

(c) Is Mary right?
You must give a reason for your answer.

....

The highest value is indicated by the box plot
but the next highest value isn't indicated

....

(1)

(Total for Question 9 is 6 marks)

10 (a) Simplify $\dfrac{x-1}{5(x-1)^2}$

The x - 1 on the numerator cancels out
with one of the x - 1 on the denominator

....

(1)

(b) Factorise fully $50 - 2y^2$

Bring out 2 as a common factor
then factorise further by using
the difference of two squares

....

(2)

(Total for Question 10 is 3 marks)

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11 Jack and Sadia work for a company that sells boxes of breakfast cereal.

The company wants to have a special offer.

Here is Jack's idea for the special offer.

> Put 25% more cereal into each box and do **not** change the price.

Here is Sadia's idea.

> Reduce the price and do **not** change the amount of cereal in each box.

Sadia wants her idea to give the same value for money as Jack's idea.

By what percentage does she need to reduce the price?

$x = 1.25y$

Let x be the price and y be the amount of cereal. To increase the amount of cereal by 25%, multiply it by 1.25. For x you get 1.25y. Rearranging to work out x when there is one y works out the proportion of the cost which gives the same value as Jack's offer.

.... %

(Total for Question 11 is 3 marks)

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12
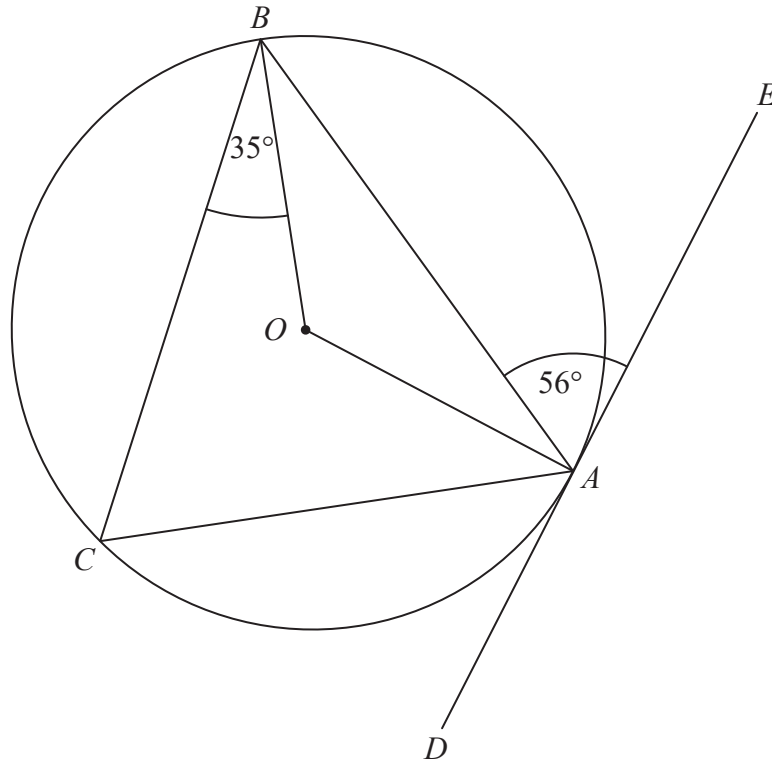
A, *B* and *C* are points on the circumference of a circle, centre *O*.
DAE is the tangent to the circle at *A*.
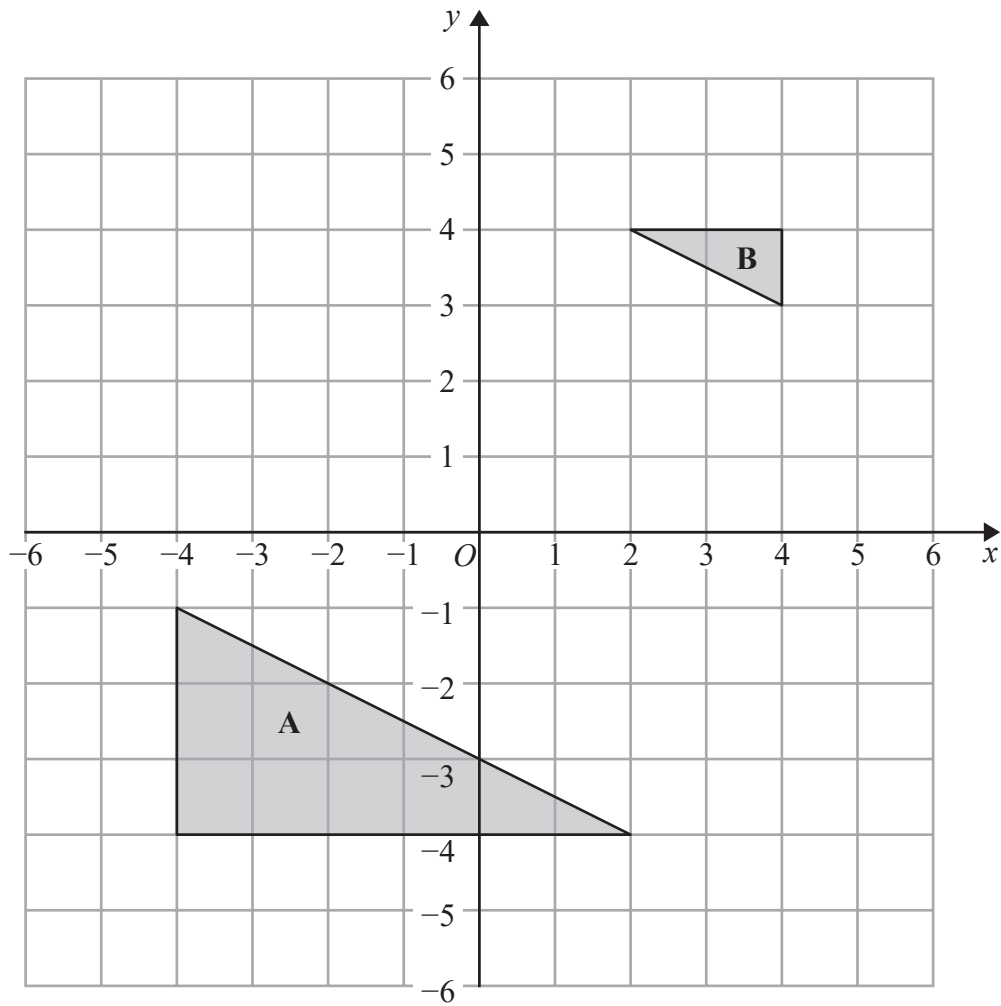
Angle *BAE* = 56°
Angle *CBO* = 35°

Work out the size of angle *CAO*.
You must show all your working.

> The problem could be solved using the following facts: the alternate segment theorem, angles at the centre are double angles at the circumference, angles around a point add to 360 degrees and angles in a quadrilateral add to 360 degrees

....°

(Total for Question 12 is 3 marks)

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13

Describe fully the single transformation that maps triangle **A** onto triangle **B**.

....

(Total for Question 13 is 2 marks)

It changes size and so this can only be one type of transformation. The scale factor can be worked out as the sides have divided by 3 and B isn't the same way up as A. Drawing straight lines from two of the corners to the same corners on the other shape helps

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14 (a) Work out the value of $\left(\dfrac{16}{81}\right)^{\frac{3}{4}}$

> The power means to find the fourth root then cube. The power can apply to the numerator and denominator separately

....

(2)

$$3^a = \dfrac{1}{9} \qquad 3^b = 9\sqrt{3} \qquad 3^c = \dfrac{1}{\sqrt{3}}$$

(b) Work out the value of $a + b + c$

> Negative powers take the reciprocal and square root is to the power of 1/2

....

(2)

(Total for Question 14 is 4 marks)

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15 Three solid shapes **A**, **B** and **C** are similar.

The surface area of shape **A** is $4\,\text{cm}^2$
The surface area of shape **B** is $25\,\text{cm}^2$

The ratio of the volume of shape **B** to the volume of shape **C** is $27:64$

Work out the ratio of the height of shape **A** to the height of shape **C**.
Give your answer in its simplest form.

> The ratio between the surface areas of A and B is 4:25. As area is a squared dimension, we can square root both sides of the ratio to find the ratio of the lengths of A and B. We can cube root both sides of the ratio of the volumes of B and C to work out the ratio of the lengths of B and C. The ratios can be combined by making the same number of parts for B. We can then see the ratio between A and C and simplify the ratio

....

(Total for Question 15 is 4 marks)

16 Prove algebraically that $0.2\dot{5}\dot{6}$ can be written as $\dfrac{127}{495}$

$$x = 0.2\dot{5}\dot{6}$$

> Multiplying by a power of 10 aligns the recurring decimal places so that when x is subtracted the recurring decimal places are eliminated. We can then rearrange to express x as a fraction
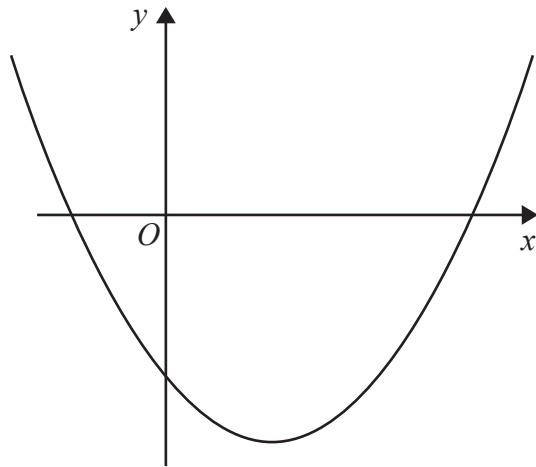
(Total for Question 16 is 3 marks)

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17 Here is a sketch of a curve.

The equation of the curve is $y = x^2 + ax + b$ where a and b are integers.

The points $(0, -5)$ and $(5, 0)$ lie on the curve.

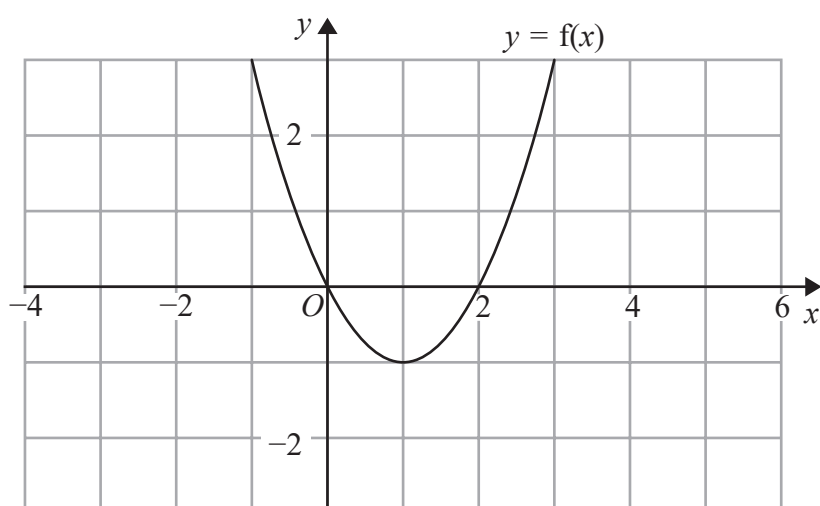Find the coordinates of the turning point of the curve.

> To find the minimum point, we can complete the square on the equation. However, we need to find the values of a and b first. These can be found by substituting in the values of x and y found in the points which lie on the curve

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

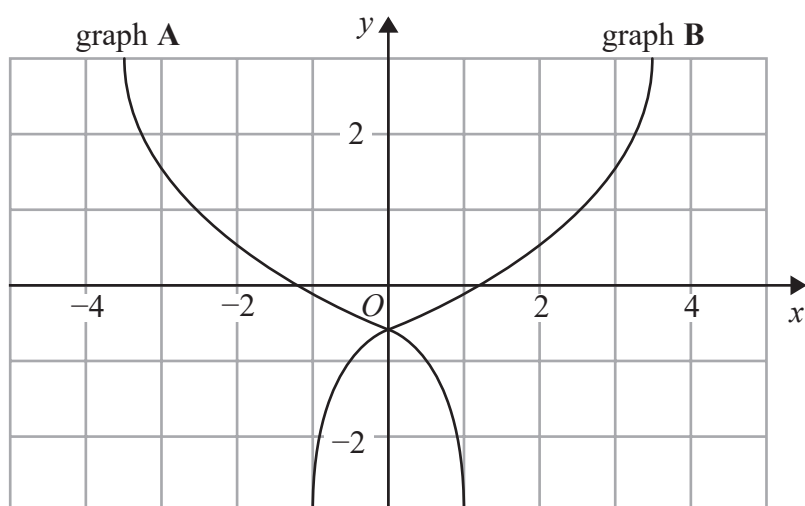**(Total for Question 17 is 4 marks)**

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18 The graph of $y = f(x)$ is shown on the grid below.

(a) On the grid above, sketch the graph of $y = f(x - 2)$

Translates the graph 2 to the right

(1)

On the grid, graph **A** has been reflected to give graph **B**.

The equation of graph **A** is $y = g(x)$

(b) Write down the equation of graph **B**.

The value for -2 becomes the value for 2.
The value for -3 becomes the value for 3.
It is a reflection in the y axis

....

(1)

(Total for Question 18 is 2 marks)

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19 For all values of x

$$f(x) = (x + 1)^2 \quad \text{and} \quad g(x) = 2(x - 1)$$

(a) Show that $gf(x) = 2x(x + 2)$

Substitute f(x), (x + 1)², for x in g(x)

(2)

(b) Find $g^{-1}(7)$

$$x = 2(y - 1)$$

Switch g(x) for x and x for y then rearrange to make y the subject. This finds $g^{-1}(x)$. Then substitute 7 for x

(2)

(Total for Question 19 is 4 marks)

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20 Show that $\dfrac{(\sqrt{18} + \sqrt{2})^2}{\sqrt{8} - 2}$ can be written in the form $a(b + \sqrt{2})$ where a and b are integers.

> Expand out the square bracket and rationalise the denominator.
> $\sqrt{a} \times \sqrt{a} = a$
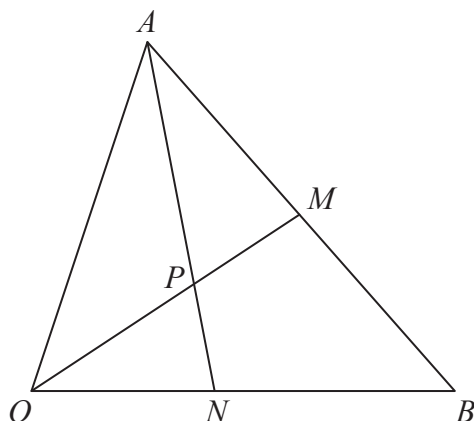> $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$
> Collect like terms and simplify

(Total for Question 20 is 3 marks)

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21

OAB is a triangle.
OPM and *APN* are straight lines.
M is the midpoint of *AB*.

$\overrightarrow{OA} = \mathbf{a}$　　$\overrightarrow{OB} = \mathbf{b}$

$OP:PM = 3:2$

Work out the ratio $ON:NB$

> This question is very difficult... but there are some fairly easy marks to be had by finding vectors AB, OM, OP then AP. Vector AN is a multiple of AP as it is on straight line APN. It can also be expressed as vectors AO + ON and ON is a fraction of OB, which is b

....

(Total for Question 21 is 5 marks)

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22 There are only green pens and blue pens in a box.

There are three more blue pens than green pens in the box.
There are more than 12 pens in the box.

Simon is going to take at random two pens from the box.

The probability that Simon will take two pens of the same colour is $\dfrac{27}{55}$

Work out the number of green pens in the box.

$$\frac{27}{55} = \frac{G}{G+B} \times \frac{G-1}{(G-1)+B} + \frac{B}{G+B} \times \frac{B-1}{G+(B-1)}$$

G is the number of green pens and B is the number of blue pens

$$B = G + 3$$

Substitute B for G + 3 then you have an equation in terms of G which can be solved

....

(Total for Question 22 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS

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