

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

**Pearson Edexcel**

**Level 1/Level 2 GCSE (9-1)**

**Tuesday 5 November 2019**

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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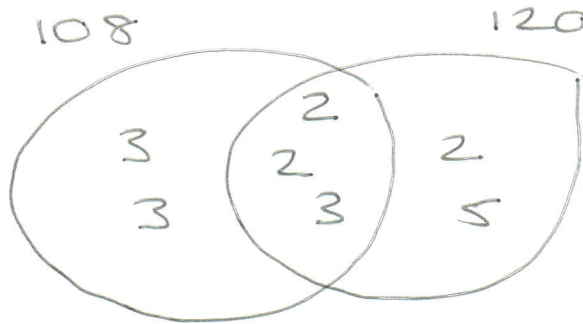
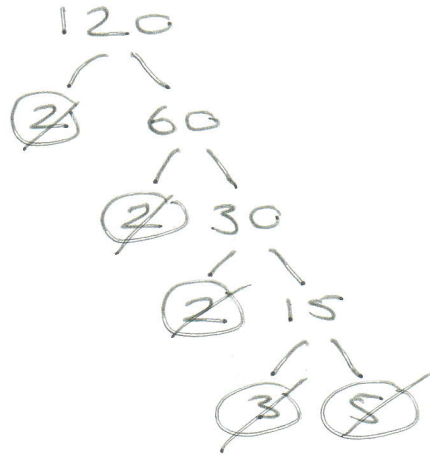
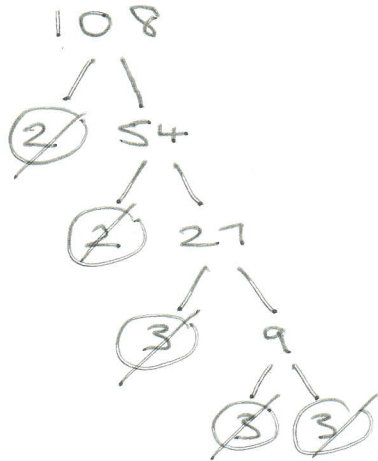
  
**Pearson**

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Find the Lowest Common Multiple (LCM) of 108 and 120



$$9 \times 12 \times 10 \\ = 108 \times 10$$

1080

(Total for Question 1 is 3 marks)

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- 2 There are 60 people in a choir.

Half of the people in the choir are women.

$$30 \quad \text{---} \quad 10$$

The number of women in the choir is 3 times the number of men in the choir.

The rest of the people in the choir are children.

$$20 \text{ children}$$

the number of children in the choir : the number of men in the choir =  $n : 1$

Work out the value of  $n$ .

You must show how you get your answer.

$$\text{Women } 60 \div 2 = 30$$

$$\text{Men } 30 \div 3 = 10$$

$$\text{Children} = 60 - 40 = 20$$

$$\begin{array}{l} C : M \\ 20 : 10 \\ 2 : 1 \end{array}$$

$$n = 2$$

(Total for Question 2 is 4 marks)

- 3 Work out  $1\frac{3}{4} \times 1\frac{1}{3}$

Give your answer as a mixed number.

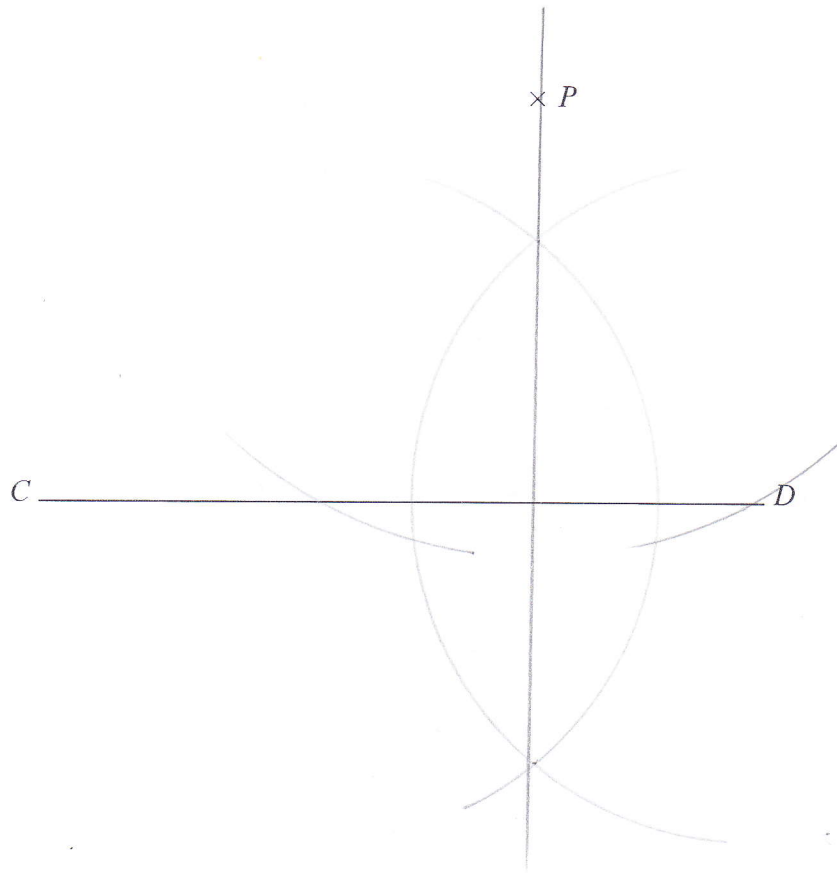
$$\frac{7}{4} \times \frac{4}{3} = \frac{7}{3} = 2\frac{1}{3}$$

$$2\frac{1}{3}$$

(Total for Question 3 is 3 marks)



- 4 Use a ruler and compasses to construct the line from the point  $P$  perpendicular to the line  $CD$ . You must show **all** construction lines.



(Total for Question 4 is 2 marks)

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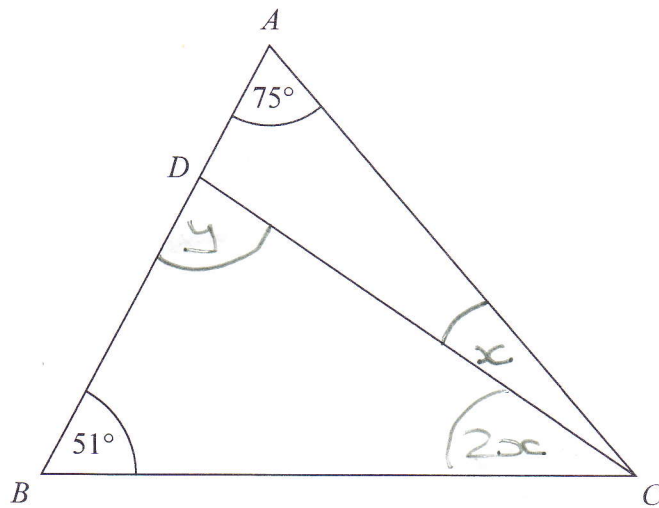


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5 The diagram shows triangle  $ABC$ .



$ADB$  is a straight line.

the size of angle  $\overset{2x}{DCB}$  : the size of angle  $\overset{x}{ACD} = 2 : 1$

Work out the size of angle  $\underline{BDC}$ .

$$75 + 51 = 126$$

$$180 - 126 = 54$$

$$x = 54 \div 3 = 18$$

$$2x = 36$$

$$36 + 51 = 87^\circ$$

$$y = 180 - 87$$

$$= 93^\circ$$

93

(Total for Question 5 is 4 marks)



P 5 8 8 6 6 A 0 5 2 4

- 6 4 red bricks have a mean weight of 5 kg.  
5 blue bricks have a mean weight of 9 kg.  
1 green brick has a weight of 6 kg.

Donna says,

“The mean weight of the 10 bricks is less than 7 kg.”

Is Donna correct?

You must show how you get your answer.

Red  $4 \times 5 = 20$

Blue  $5 \times 9 = 45$

Green  $\frac{6}{71} \text{ kg}$

Mean =  $71 \div 10 = 7.1 \text{ kg}$

Donna is incorrect

(Total for Question 6 is 3 marks)

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7 (a) Simplify  $(p^2)^5$

$$p^{10}$$

---

(1)

(b) Simplify  $12x^7y^3 \div 6x^3y$

$$2x^4y^2$$

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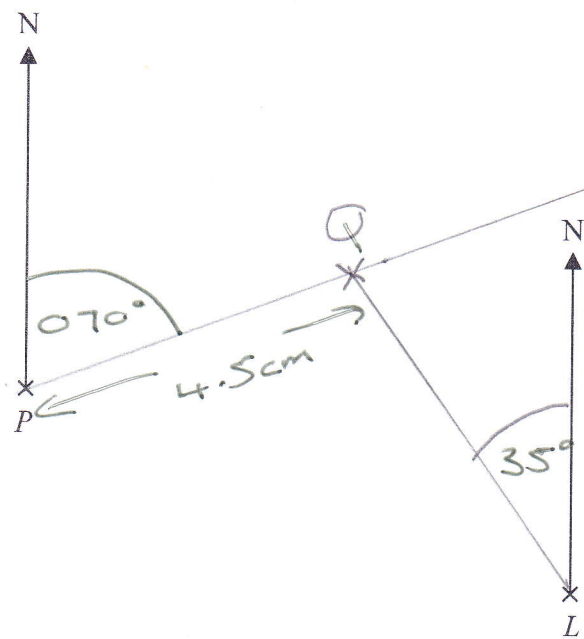
(2)

(Total for Question 7 is 3 marks)



P 5 8 8 6 6 A 0 7 2 4

8 The accurate scale drawing shows the positions of port  $P$  and a lighthouse  $L$ .



Scale: 1 cm represents 4 km.

Aleena sails her boat from port  $P$  on a bearing of  $070^\circ$

She sails for  $1\frac{1}{2}$  hours at an average speed of 12 km/h to a port  $Q$ .

$$1.5 \times 12 = 18 \text{ km}$$

Find

- (i) the distance, in km, of port  $Q$  from lighthouse  $L$ ,
- (ii) the bearing of port  $Q$  from lighthouse  $L$ .

$$\begin{aligned} 1 \text{ cm} &: 4 \text{ km} \\ 4.5 \text{ cm} &: 18 \text{ km} \\ &\div 4 \end{aligned}$$

Bearing  $Q$  from  $L$

$$360 - 35 = 325$$

$$\begin{aligned} QL &= 5 \text{ cm} \\ 5 \times 4 &= 20 \text{ km} \end{aligned}$$

distance  $QL = 20$  km

bearing of  $Q$  from  $L = 325^\circ$

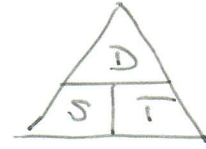
(Total for Question 8 is 5 marks)





9 A car travels for 18 minutes at an average speed of 72 km/h.

(a) How far will the car travel in these 18 minutes?



$$D = S \times \frac{T}{60}$$

$$= 72 \times \frac{18}{60}$$

$$\begin{array}{r} 18 \\ \times 72 \\ \hline 36 \\ 1260 \\ \hline 1296 \end{array}$$

$$\begin{array}{r} 21.6 \\ 5 \overline{) 108.30} \\ \underline{5} \phantom{0} \\ 58 \\ \underline{50} \\ 83 \\ \underline{80} \\ 30 \\ \underline{30} \\ 0 \end{array}$$

$$18 \text{ minutes}$$

$$= \frac{18}{60} \text{ hours}$$

$$\frac{21.6}{(2)} \text{ km}$$

David says,

“72 kilometres per hour is faster than 20 metres per second.”

(b) Is David correct?

You must show how you get your answer.

72 km in 1 hour

72000 m in 3600 seconds

$$\frac{72000}{3600} = 20 \text{ m/s}$$

David is wrong as 72 km/h  
is the same as 20 m/s

(2)

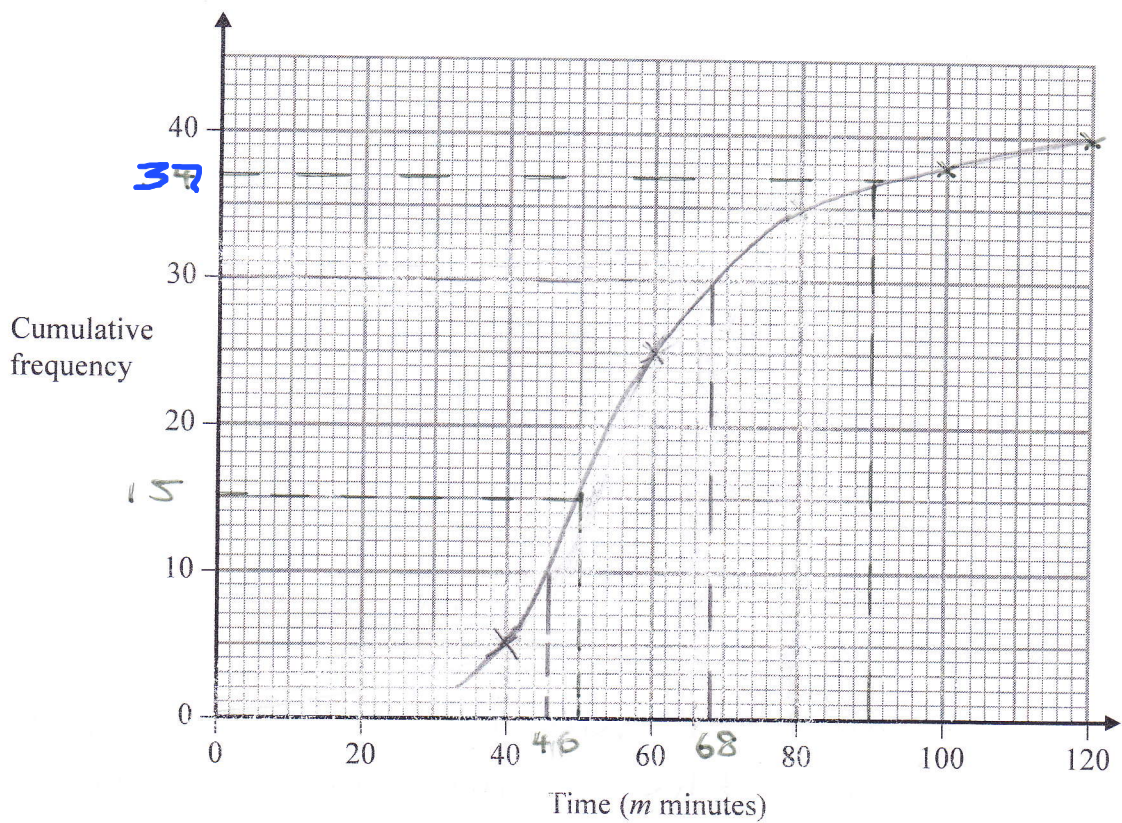
(Total for Question 9 is 4 marks)



- 10 The cumulative frequency table shows information about the times, in minutes, taken by 40 people to complete a puzzle.

Time ( $m$ minutes)	Cumulative frequency
$20 < m \leq 40$	5
$20 < m \leq 60$	25
$20 < m \leq 80$	35
$20 < m \leq 100$	38
$20 < m \leq 120$	40

- (a) On the grid below, draw a cumulative frequency graph for this information.



(2)



(b) Use your graph to find an estimate for the interquartile range.

$$68 - 46 = 22$$

22 minutes  
(2)

One of the 40 people is chosen at random.

(c) Use your graph to find an estimate for the probability that this person took between 50 minutes and 90 minutes to complete the puzzle.

$$37 - 15 = 22$$

$$\frac{22}{40} \times 100\%$$

22  
40  
(2)

(Total for Question 10 is 6 marks)



- 11 There are  $p$  counters in a bag.  
12 of the counters are yellow.

Shafiq takes at random 30 counters from the bag.  
5 of these 30 counters are yellow.

Work out an estimate for the value of  $p$ .

$$P(Y) = \frac{12}{p}$$

$$\frac{5}{30} = \frac{12}{p}$$

$$5 \overline{) 360} \begin{array}{r} 72 \\ \end{array}$$

$$Sp = 30 \times 12$$

$$Sp = 360$$

$$p = 72$$

72

(Total for Question 11 is 2 marks)

12  $T = \frac{q}{2} + 5$

Here is Spencer's method to make  $q$  the subject of the formula.

$$2 \times T = q + 5$$

$$q = 2T - 5$$

What mistake did Spencer make in the first line of his method?

All 3 terms should have  
been multiplied by 2, not just  
2 of them

(Total for Question 12 is 1 mark)



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13 (a) Write  $\frac{5}{x+1} + \frac{2}{3x}$  as a single fraction in its simplest form.

$$\frac{5 \times 3x + 2(x+1)}{3x(x+1)}$$

$$= \frac{15x + 2x + 2}{3x(x+1)} = \frac{17x + 2}{3x(x+1)}$$

$$\frac{17x + 2}{3x(x+1)}$$

(2)

(b) Factorise  $(x+y)^2 + 3(x+y)$

$$(x+y)[(x+y) + 3]$$

$$(x+y)(x+y+3)$$

(1)

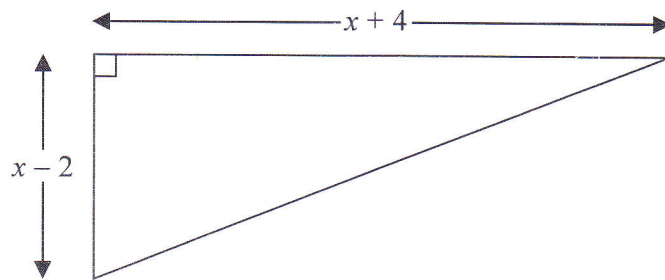
(Total for Question 13 is 3 marks)

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P 5 8 8 6 6 A 0 1 3 2 4

14 The diagram shows a right-angled triangle.



All the measurements are in centimetres.

The area of the triangle is  $27.5 \text{ cm}^2$

Work out the length of the shortest side of the triangle.  
You must show all your working.

$$\frac{1}{2} (x-2)(x+4) = 27.5$$

$$\frac{1}{2} (x^2 + 4x - 2x - 8) = 27.5$$

$$\frac{1}{2} (x^2 + 2x - 8) = 27.5$$

$$x^2 + 2x - 8 = 55$$

$$x^2 + 2x - 8 - 55 = 0$$

$$x^2 + 2x - 63 = 0$$

$$(x+9)(x-7) = 0$$

$$x = -9 \quad \text{or} \quad x = 7$$

↑  
impossible

$$\text{if } x = 7 \quad \begin{array}{l} 7+4 = 11 \\ 7-2 = 5 \end{array}$$

5 cm

(Total for Question 14 is 4 marks)



- 15 Express  $0.4\dot{1}\dot{8}$  as a fraction.  
You must show all your working.

$$x = 0.41818\dots$$

$$10x = 4.1818\dots \quad (1)$$

$$1000x = 418.1818\dots \quad (2)$$

$$\begin{aligned} (2) - (1) \quad 990x &= 414 \\ x &= \frac{414}{990} \end{aligned}$$

$$\frac{414}{990}$$

(Total for Question 15 is 3 marks)

- 16 (a) Rationalise the denominator of  $\frac{22}{\sqrt{11}}$

Give your answer in its simplest form.

$$\frac{22}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{22\sqrt{11}}{11}$$

$$\frac{2\sqrt{11}}{(2)}$$

- (b) Show that  $\frac{\sqrt{3}}{2\sqrt{3}-1}$  can be written in the form  $\frac{a+\sqrt{3}}{b}$  where  $a$  and  $b$  are integers.

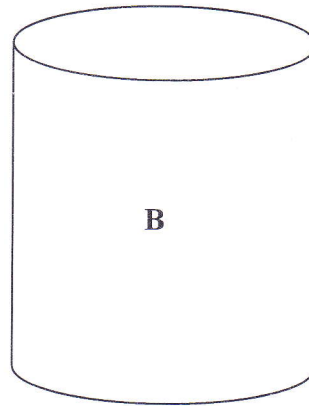
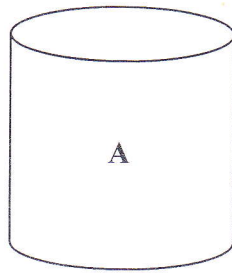
$$\begin{aligned} \frac{\sqrt{3}}{(2\sqrt{3}-1)} \times \frac{(2\sqrt{3}+1)}{(2\sqrt{3}+1)} &= \frac{6+\sqrt{3}}{12+2\sqrt{3}-2\sqrt{3}-1} \\ &= \frac{6+\sqrt{3}}{11} \end{aligned}$$

(3)

(Total for Question 16 is 5 marks)



17 A and B are two similar cylindrical containers.



the surface area of container A : the surface area of container B = 4 : 9

Tyler fills container A with water.

She then pours all the water into container B.

Tyler repeats this and stops when container B is full of water.

Work out the number of times that Tyler fills container A with water.

You must show all your working.

If ratio of areas is 4:9  
ratio of lengths is 2:3  
ratio of volumes is 8:27

Assume volume A = 8 litres  
B = 27 litres

$3 \times 8 = 24$  (not enough)  
Fill 1 more time

4

(Total for Question 17 is 4 marks)





18 The function  $f$  is given by

$$f(x) = 2x^3 - 4$$

(a) Show that  $f^{-1}(50) = 3$

$$\begin{aligned}
 y &= 2x^3 - 4 \\
 y + 4 &= 2x^3 \\
 \frac{y + 4}{2} &= x^3 \\
 \sqrt[3]{\frac{y + 4}{2}} &= x
 \end{aligned}
 \quad \left. \vphantom{\begin{aligned} y &= 2x^3 - 4 \\ y + 4 &= 2x^3 \\ \frac{y + 4}{2} &= x^3 \\ \sqrt[3]{\frac{y + 4}{2}} &= x \end{aligned}} \right\}
 \begin{aligned}
 f^{-1}(x) &= \sqrt[3]{\frac{x + 4}{2}} \\
 f^{-1}(50) &= \sqrt[3]{\frac{50 + 4}{2}} \\
 &= \sqrt[3]{27} = 3
 \end{aligned}
 \quad (2)$$

The functions  $g$  and  $h$  are given by

$$g(x) = x + 2 \text{ and } h(x) = x^2$$

(b) Find the values of  $x$  for which

$$hg(x) = 3x^2 + x - 1$$

$$hg(x) = (x + 2)^2$$

$$(x + 2)^2 = 3x^2 + x - 1$$

$$x^2 + 4x + 4 = 3x^2 + x - 1$$

$$0 = 2x^2 - 3x - 5$$

$$0 = (2x - 5)(x + 1)$$

$$\text{Either } 2x - 5 = 0 \text{ or } x + 1 = 0$$

$$x = 2.5 \quad x = -1$$

$$x = 2.5 \text{ or } x = -1$$

(4)

(Total for Question 18 is 6 marks)



- 19 Given that  $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$   
find the exact value of  $x$ .

$$9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$$

$$(3^2)^{-\frac{1}{2}} = (3^3)^{\frac{1}{4}} \div 3^{x+1}$$

$$3^{-1} = 3^{\frac{3}{4}} \div 3^{x+1}$$

$\therefore$

$$-1 = \frac{3}{4} - (x+1)$$

$$-1 = \frac{3}{4} - x - 1$$

$$-1 = -\frac{1}{4} - x$$

$$x = 1 - \frac{1}{4}$$

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

(Total for Question 19 is 3 marks)

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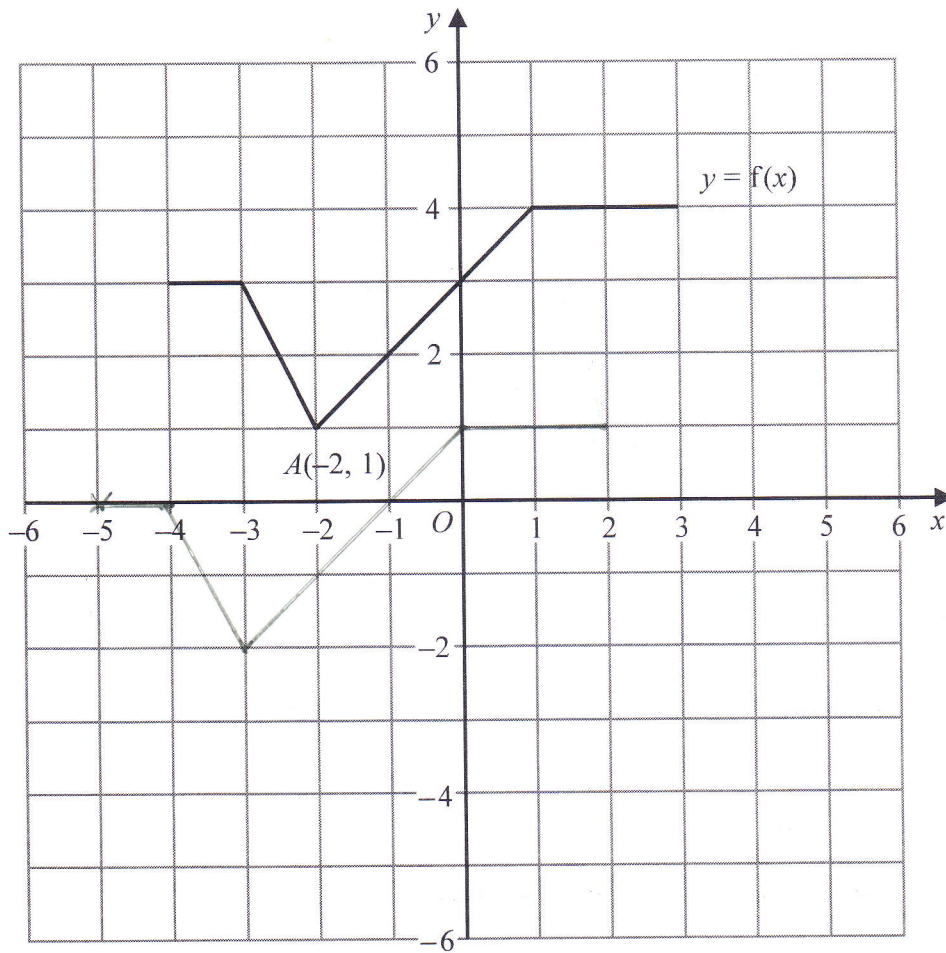


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20 The graph of  $y = f(x)$  is shown on the grid.



(a) On the grid, draw the graph with equation  $y = f(x + 1) - 3$  (2)

Point  $A(-2, 1)$  lies on the graph of  $y = f(x)$ .

*↑ one unit left*  
*↖ 3 units down*

When the graph of  $y = f(x)$  is transformed to the graph with equation  $y = f(-x)$ , point  $A$  is mapped to point  $B$ .

(b) Write down the coordinates of point  $B$ .

*↑ reflection in y-axis*

( 2 , 1 )  
 (1)

(Total for Question 20 is 3 marks)



21 Sketch the graph of

$$y = 2x^2 - 8x - 5$$

showing the coordinates of the turning point and the exact coordinates of any intercepts with the coordinate axes.

Meets  $x$  axis

Quadratic formula

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4 \times 2 \times -5}}{4}$$

$$x = \frac{4 + \sqrt{26}}{2} \quad \text{or} \quad \frac{4 - \sqrt{26}}{2}$$

$$8 + \sqrt{104}$$

$$= \frac{4}{4} \times \frac{8 + \sqrt{4 \times 26}}{4}$$

$$= \frac{8 + 2\sqrt{26}}{4}$$

$$\div \text{ by } 2$$

when  $x = 0$ ,  $y = -5$   $(0, -5)$

Minimum point - complete the square

$$2x^2 - 8x - 5$$

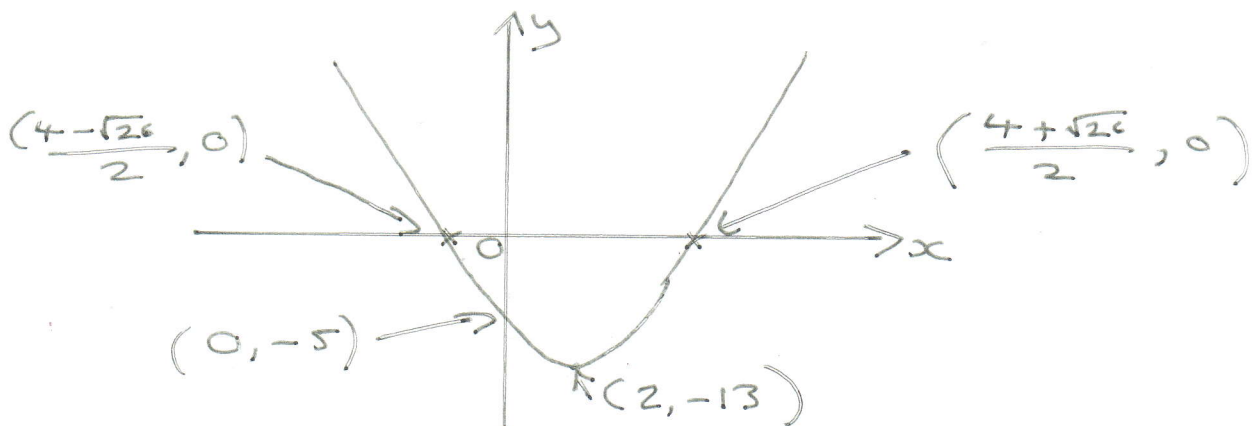
$$= 2 \left( x^2 - 4x - \frac{5}{2} \right)$$

$$= 2 \left[ (x-2)^2 - 2^2 - \frac{5}{2} \right]$$

$$= 2 \left[ (x-2)^2 - 6.5 \right]$$

$$= 2(x-2)^2 - 13$$

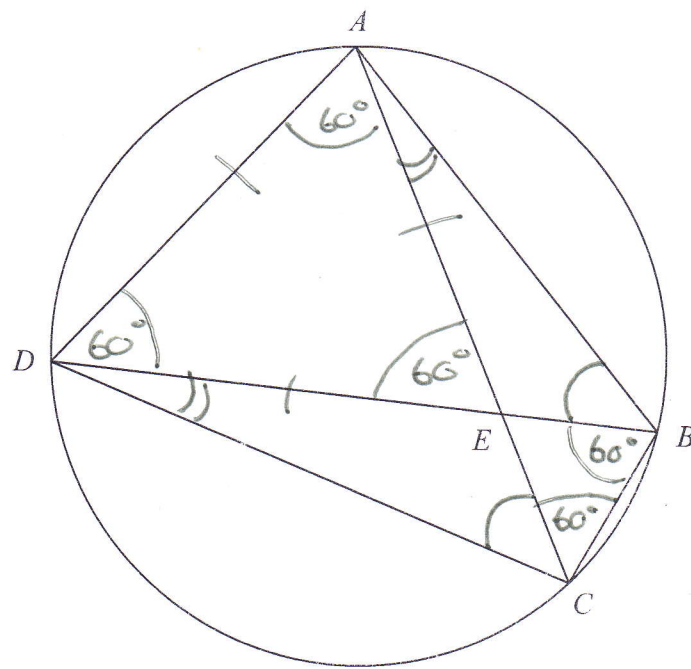
min pt at  $(2, -13)$



(Total for Question 21 is 5 marks)



22  $A, B, C$  and  $D$  are four points on a circle.



$AEC$  and  $DEB$  are straight lines.

Triangle  $AED$  is an equilateral triangle.

Prove that triangle  $ABC$  is congruent to triangle  $DCB$ .

$$\angle ABD = \angle ACD \quad (\text{angles on same arc})$$

$$\angle BAC = \angle BDC \quad (\text{angles on same arc})$$

$$\angle DAE = \angle AED = \angle ADE \quad (\text{equilateral triangle } ADE)$$

Using triangles

$ABC$  and  $DCB$

$BC$  is a common side \* Side

$$\angle DBC = 60^\circ \quad (\text{angles on same arc}) \quad * \text{ Angle}$$

$$\angle DCB = 60^\circ \quad (\text{angles on same arc}) \quad * \text{ Angle}$$

$\therefore \Delta ABC$  and  $DCB$  congruent using ASA

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

