Please check the examination details below before entering your candidate information

Candidate surname | Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

Wednesday 15 January 2020

Morning (Time: 2 hours) | Paper Reference **4MA1/2HR**

Mathematics A

Paper 2HR

Higher Tier

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.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – there may be more space than you need.
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

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.

Turn over ▶

P59817A

1/1/1/1/

P 5 9 8 1 7 A 0 1 2 8

Pearson

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Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

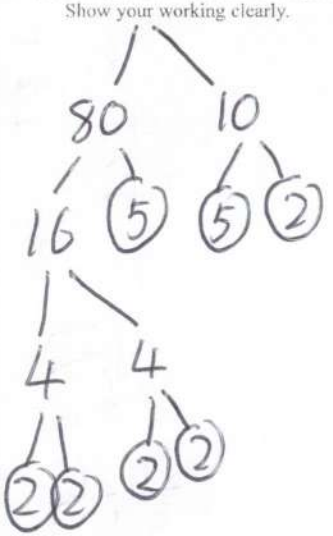
You must write down all the stages in your working.

1 (a) Write $5^{17} \times 5^{2}$ as a single power of 5

5^{19}

(1)

(b) Write 800 as a product of its prime factors.
Show your working clearly.



$2^5 \times 5^2$

(2)

(Total for Question 1 is 3 marks)

P 5 9 8 1 7 A 0 3 2 8

Turn over ▶

2 The table gives information about the amount of money, in £, that Fiona spent in a grocery store each week during 2019

Amount spent (£x)	Frequency
$0 \leqslant x < 20$	5
$20 \leqslant x < 40$	11
$40 \leqslant x < 60$	8
$60 \leqslant x < 80$	19
$80 \leqslant x < 100$	9

Work out an estimate for the total amount of money that Fiona spent in the grocery store during 2019

£ 2920

(Total for Question 2 is 3 marks)

3 Three tins, A, B and C, each contain buttons.

Tin A contains x buttons.
Tin B contains 4 times the number of buttons that tin A contains.
Tin C contains 7 fewer buttons than tin A.

The total number of buttons in the three tins is 137

Work out the number of buttons in tin C.

$x + 4x + x - 7 = 137$

$6x - 7 = 137$

$6x = 144$

$x = 24$

$C = 24 - 7 = 17$

(Total for Question 3 is 4 marks)

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4 The diagram shows a rectangle and a diagonal of the rectangle.

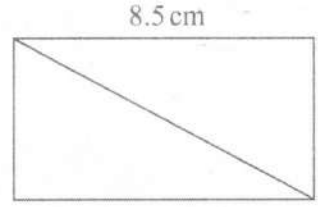


Diagram **NOT** accurately drawn

Work out the length of the diagonal of the rectangle.
Give your answer correct to 1 decimal place.

$\sqrt{8.5^2 + 5.6^2}$

$= \sqrt{103.61}$

$= 10.17...$

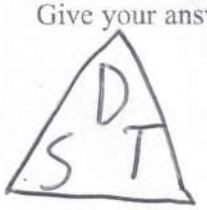
10.2 cm

(Total for Question 4 is 3 marks)

5 A plane takes 3 hours 36 minutes to fly from the Cayman Islands to New York.
The plane flies a distance of 2470 km.

Work out the average speed of the plane in km/h.
Give your answer correct to the nearest whole number.

36 mins $= \frac{3}{5}$ hr $= 0.6$ hr

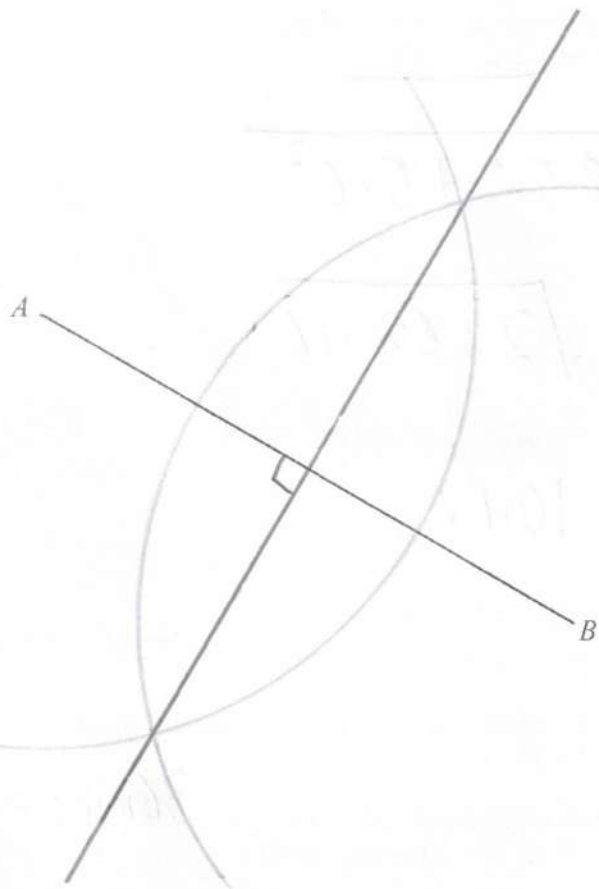


$S = \frac{2470}{3.6} = 686.i$

686 km/h

(Total for Question 5 is 3 marks)

6 Use ruler and compasses only to construct the perpendicular bisector of the line AB.
You must show all your construction lines.



(Total for Question 6 is 2 marks)

7 Solve the simultaneous equations

$$3x + 5y = 6$$
$$7x - 5y = -11$$

Show clear algebraic working.

$$10x = -5$$

$$x = -\frac{5}{10} = -\frac{1}{2}$$

$$① \Rightarrow 3\left(-\frac{1}{2}\right) + 5y = 6$$

$$y = \frac{6 + \frac{3}{2}}{5} = 1.5$$

$x = -0.5$

$y = 1.5$

(Total for Question 7 is 3 marks)

8 Hamish buys a new car for $20 000
The car depreciates in value by 19% each year.

Work out the value of the car at the end of 3 years.
Give your answer to the nearest $.

$$20000 \times 0.81^3 = 10628.82$$

$ 10629

(Total for Question 8 is 3 marks)

9 The diagram shows a box in the shape of a cuboid.

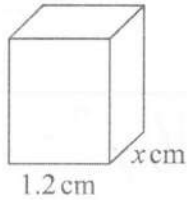


Diagram **NOT** accurately drawn

→ 0.012m

The box is put on a table.
The face of the box in contact with the table has length 1.2 metres and width x metres.

The force exerted by the box on the table is 27 newtons.
The pressure on the table due to the box is 30 newtons/m^2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the value of x.

$$\text{Area} = \frac{F}{P} = \frac{27}{30} = 0.9\text{m}^2$$

$$x \times 0.012 = 0.9$$

$$x = \frac{0.9}{0.012} = 75$$

$x =$ 75cm

(Total for Question 9 is 3 marks)

(0.75m)

10 The table shows information about the surface area of each of the world's oceans.

Ocean	Surface area in square kilometres
Pacific	1.56×10^8
Indian	6.86×10^7
Southern	2.03×10^7
Arctic	1.41×10^7
Atlantic	1.06×10^8

(a) Work out the difference, in square kilometres, between the surface area of the Atlantic Ocean and the surface area of the Indian Ocean.
Give your answer in standard form.

37,400,000

3.74×10^7

..... square kilometres
(2)

The surface area of the Pacific Ocean is k times the surface area of the Arctic Ocean.

(b) Work out the value of k.
Give your answer correct to the nearest whole number.

$\frac{1.56 \times 10^8}{1.41 \times 10^7} = 11.06...$

$k =$ 11
(1)

(Total for Question 10 is 3 marks)

11 (a) Write down the integer values of x that satisfy the inequality $-2 < x \leqslant 4$

$-1, 0, 1, 2, 3, 4$

(2)

The region **R**, shown shaded in the diagram, is bounded by three straight lines.

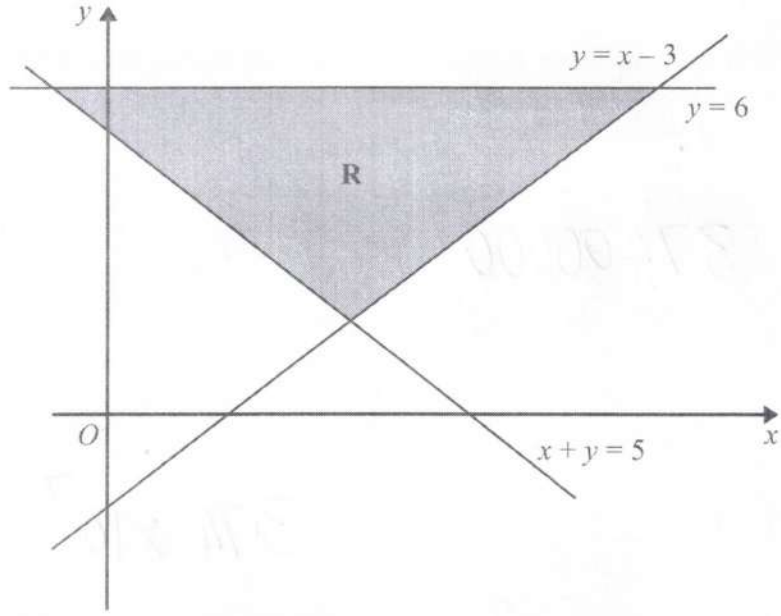


Diagram **NOT** accurately drawn

(b) Write down the three inequalities that define the region **R**.

$x + y \geqslant 5$

$y \leqslant 6$

$y \geqslant x - 3$

(2)

(Total for Question 11 is 4 marks)

12 The diagram shows two congruent isosceles triangles and parts of two congruent regular polygons, **X** and **Y**.

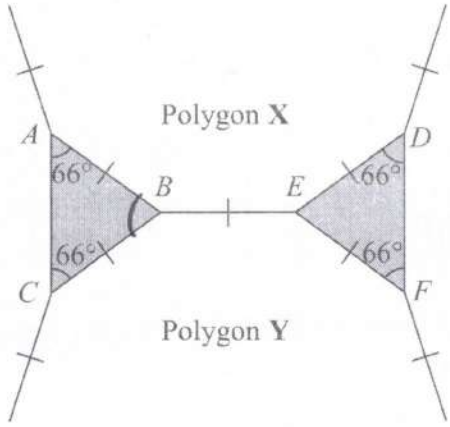


Diagram **NOT** accurately drawn

The two regular polygons each have n sides.

Work out the value of n.

$180 - 132 = 48$

Internal angle $= \frac{360-48}{2} = 156$

External $= 24$

$\frac{360}{n} = 24$

$n = \frac{360}{24}$

$n = 15$

(Total for Question 12 is 3 marks)

13

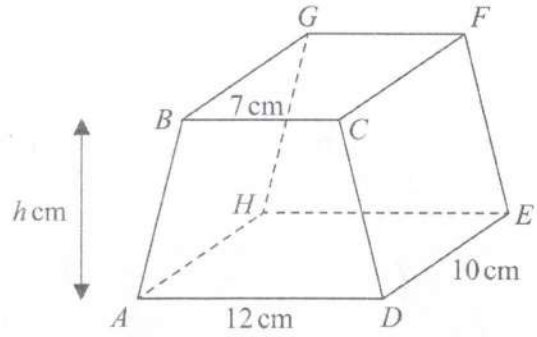


Diagram **NOT** accurately drawn

The diagram shows a prism *ABCDEFGH* in which *ABCD* is a trapezium with *BC* parallel to *AD* and *CDEF* is a rectangle.

BC = 7 cm *AD* = 12 cm *DE* = 10 cm

The height of trapezium *ABCD* is *h* cm
The volume of the prism is 608 cm^3

Work out the value of *h*.

$608 = \frac{1}{2} \times (7+12) \times h \times 10$

$h = \frac{608}{95}$

$h =$ 6.4

(Total for Question 13 is 3 marks)

14 Max kept a record of the marks he scored in each of the 11 spelling tests he took one term.

Here are his marks.

18 5 7 12 11 18 15 16 17 13 14

Find the interquartile range of the marks.

5 7 (11) 12 13 14 15 16 (17) 18 18

3rd 9th

17 − 11 = 6

(Total for Question 14 is 3 marks)

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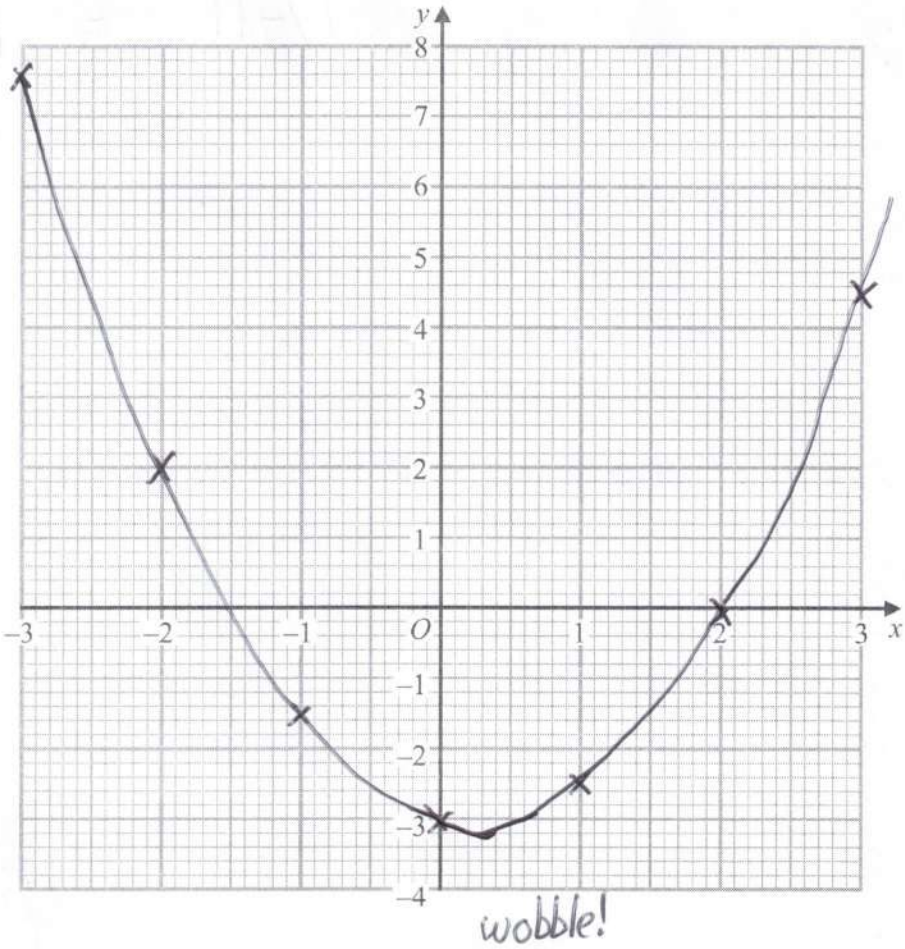
15 (a) Complete the table of values for $y = x^2 - \frac{x}{2} - 3$

x	–3	–2	–1	0	1	2	3
y	7.5	2	-1.5	-3	–2.5	0	4.5

(2)

(b) On the grid, draw the graph of $y = x^2 - \frac{x}{2} - 3$ for values of x from –3 to 3



(2)

(Total for Question 15 is 4 marks)

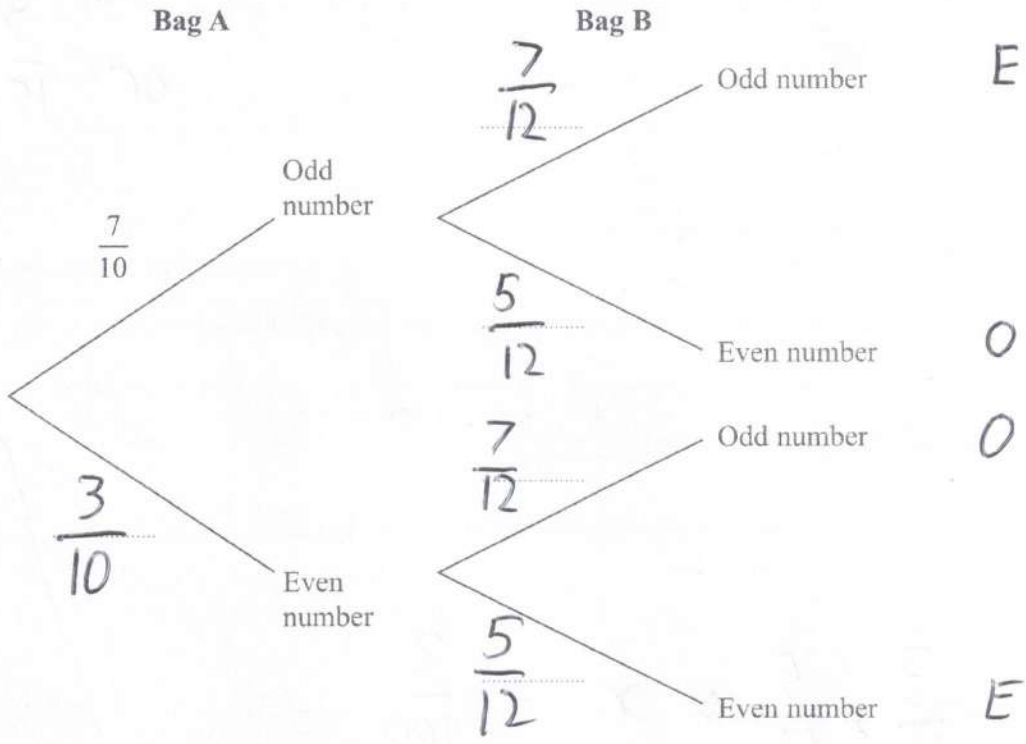
16 Cody has two bags of counters, bag **A** and bag **B**.

Each of the counters has either an odd number or an even number written on it.

There are 10 counters in bag **A** and 7 of these counters have an **odd** number written on them.
There are 12 counters in bag **B** and 7 of these counters have an **odd** number written on them.

Cody is going to take at random a counter from bag **A** and a counter from bag **B**.

(a) Complete the probability tree diagram.



(2)

(b) Calculate the probability that the total of the numbers on the two counters will be an odd number.

$$\left(\frac{7}{10} \times \frac{5}{12}\right) + \left(\frac{3}{10} \times \frac{7}{12}\right) = \frac{56}{120}$$

or $\frac{7}{15}$ oe

(3)

Harriet also has a bag of counters.
Each of her counters also has either an odd number or an even number written on it.

Harriet is going to take at random a counter from her bag of counters.

The probability that the number on each of Cody's two counters **and** the number on Harriet's counter will all be even is $\frac{3}{100}$

(c) Find the least number of counters that Harriet has in her bag.
Show your working clearly.

$$\frac{3}{10} \times \frac{5}{12} \times x = \frac{3}{100}$$

$$x = \frac{6}{25}$$

25

(3)

(Total for Question 16 is 8 marks)

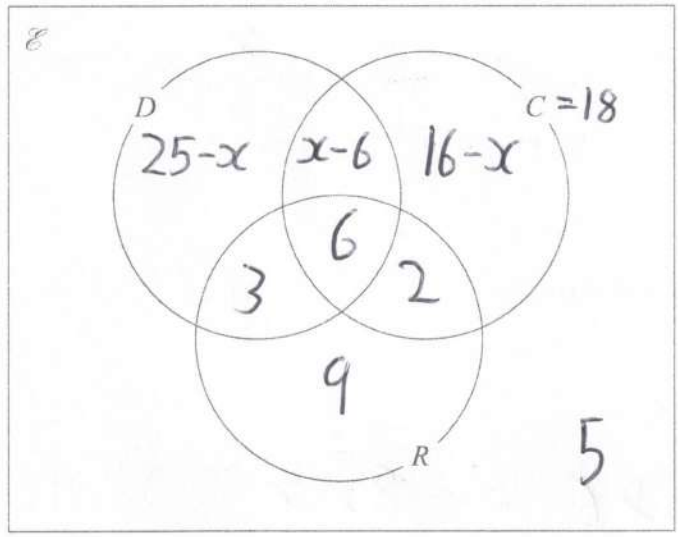
17 Some students in a school were asked the following question.

"Do you have a dog (D), a cat (C) or a rabbit (R)?"

Of these students

28 have a dog
18 have a cat ✓
20 have a rabbit ✓
8 have both a cat and a rabbit ✓
9 have both a dog and a rabbit ✓
x have both a dog and a cat ✓
6 have a dog, a cat and a rabbit ✓
5 have not got a dog or a cat or a rabbit ✓

(a) Using this information, complete the Venn diagram to show the number of students in each appropriate subset.
Give the numbers in terms of x where necessary.



(3)

Given that a total of 50 students answered the question,

(b) work out the value of x.

$25-x+x-6+16-x+25=50$

$-x+60=50$

$10=x$

$x =$ 10

(2)

(c) Find $n(C' \cap D')$

9+5

14

(1)

(Total for Question 17 is 6 marks)

18

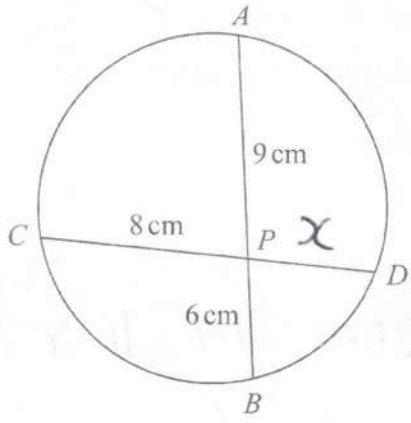


Diagram **NOT** accurately drawn

APB and *CPD* are chords of a circle.

$AP = 9$ cm $PB = 6$ cm $CP = 8$ cm

Calculate the length of *PD*.

$9 \times 6 = 8 \times x$

$x = \frac{54}{8}$ (oe)

6.75 cm

(Total for Question 18 is 2 marks)

19 (a) Solve $\frac{4-3x}{5} - \frac{3x-5}{2} = -3$

(X10)

Show clear algebraic working.

$8 - 6x - 15x + 25 = -30$

$-21x = -63$

$x = \frac{-63}{-21}$

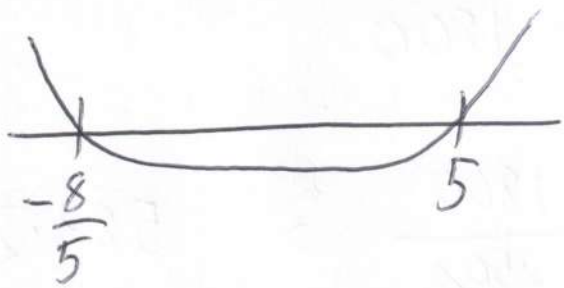
$x = 3$

(3)

(b) Solve the inequality $5y^2 - 17y \leqslant 40$

$5y^2 - 17y - 40 \leqslant 0$

$(5y + 8)(y - 5) \leqslant 0$



$-1.6 \leqslant y \leqslant 5$

(3)

(Total for Question 19 is 6 marks)

20 The diagram shows two similar vases, **A** and **B**.

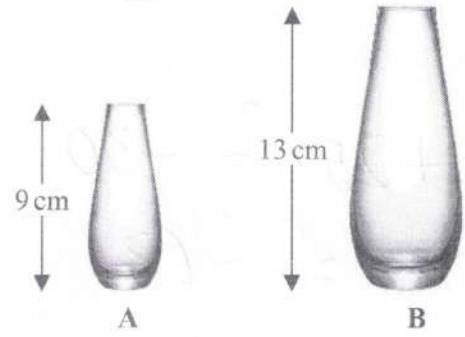


Diagram **NOT** accurately drawn

The height of vase **A** is 9 cm and the height of vase **B** is 13 cm.

Given that

surface area of vase **A** + surface area of vase **B** = 1800 cm^2

calculate the surface area of vase **A**.

Linear sf $= \frac{13}{9}$

Area sf $= \left(\frac{13}{9}\right)^2 = \frac{169}{81}$

$A + \frac{169A}{81} = 1800$

$A\left(1 + \frac{169}{81}\right) = 1800$

$A = \frac{1800}{250/81} = 583.2$

..... cm^2

(Total for Question 20 is 4 marks)

21 (a) Simplify fully $\dfrac{10x^2 + 23x + 12}{4x^2 - 9}$

$$= \frac{(5x+4)(2x+3)}{(2x+3)(2x-3)}$$

$$\frac{5x+4}{2x-3}$$

(3)

$2^{2y} \times 2^{3y+2} = \dfrac{8^{5y}}{4^n}$

(b) Find an expression for n in terms of y.
Show clear algebraic working and simplify your expression.

$$2^{5y+2} = (2^3)^{5y} \div (2^2)^n$$

$$2^{5y+2} = 2^{15y} \div 2^{2n}$$

$$5y+2 = 15y - 2n$$

$$2n = 10y - 2$$

$$n = 5y - 1$$

(4)

(Total for Question 21 is 7 marks)

22 The first term of an arithmetic series S is -6
The sum of the first 30 terms of S is 2865

Find the 9th term of S.

$a = -6$

$S_{30} = \frac{30}{2}[-12 + 29d] = 2865$

$-12 + 29d = 191$

$d = 7$

$t_9 = a + 8d$

$= -6 + 8 \times 7$

50

(Total for Question 22 is 4 marks)

23 Express $7 - 12x - 2x^2$ in the form $a + b(x + c)^2$ where a, b and c are integers.

$-2[x^2 + 6x] + 7$

$-2[(x+3)^2 - 9] + 7$

$-2(x+3)^2 + 18 + 7$

$25 - 2(x+3)^2$

(Total for Question 23 is 3 marks)

24 L_1 and L_2 are two straight lines.
The origin of the coordinate axes is O.

L_1 has equation $5x + 10y = 8$
L_2 is perpendicular to L_1 and passes through the point with coordinates (8, 6)

L_2 crosses the x-axis at the point A.
L_2 intersects the straight line with equation $x = -3$ at the point B.

Find the area of triangle AOB.
Show your working clearly.

L_1: $10y = -5x + 8$

$y = -\frac{1}{2}x + 0.8$ $\quad m = -\frac{1}{2}$

L_2: $m = 2$ $\quad y = mx + c$ $\quad (8, 6)$

$6 = 2 \times 8 + c$

$c = -10$

$y = 2x - 10$

on x-axis, $y = 0 = 2x - 10$ so $x = 5$

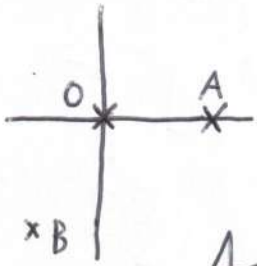
$A(5, 0)$

at $x = -3$, $y = 2x - 3 - 10$

$= -16$

$B(-3, -16)$

$O(0, 0)$



Area $= \frac{1}{2}bh = \frac{1}{2} \times 5 \times 16$

40

(Total for Question 24 is 5 marks)

25 N is a multiple of 5

$A = N + 1$
$B = N - 1$

Prove, using algebra, that $A^2 - B^2$ is always a multiple of 20

$(N+1)^2 - (N-1)^2$

$N^2 + 1 + 2N - N^2 - 1 + 2N$

$= 4N$

as $N = 5x$

$= 4 \times 5x$

$= 20x$

hence always a multiple of 20

(Total for Question 25 is 3 marks)

26 The diagram shows trapezium $OACB$.

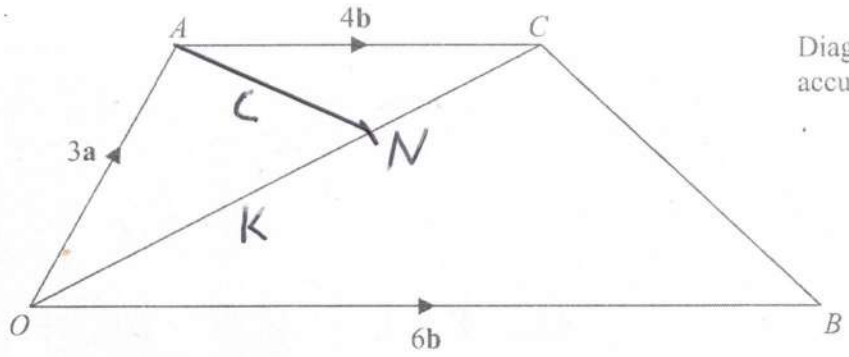


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = 3\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{AC} = 4\mathbf{b}$

N is the point on OC such that ANB is a straight line.

Find $\overrightarrow{ON}$ as a simplified expression in terms of **a** and **b**.

$\overrightarrow{CB} = -4b - 3a + 6b = -3a - 2b$

$\overrightarrow{AB} = -3a + 6b$ so $\overrightarrow{AN} = c(-3a + 6b)$

$\overrightarrow{OC} = 3a + 4b$

$\overrightarrow{AN} = -3a + K(3a + 4b)$

$\therefore -3a + K(3a + 4b) = c(-3a + 6b)$

(a) $-3 + 3K = -3c$

(b) $4K = 6c$ +

(a)x2: $-6 + 6K = -6c$

$-6 + 10K = 0$

$K = \frac{3}{5}$ so $ON = \frac{3}{5}(3a + 4b)$ or $1.8a + 2.4b$

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS