



Please write clearly in block capitals.

Centre number

Candidate number

Surname MODEL SOLUTIONS

Forename(s) _____

Candidate signature _____

GCSE MATHEMATICS

H

Higher Tier Paper 1 Non-Calculator

Tuesday 5 November 2019 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- mathematical instruments



You must **not** use a calculator.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

For Examiner's Use	
Pages	Mark
2-3	
4-5	
6-7	
8-9	
10-11	
12-13	
14-15	
16-17	
18-19	
20-21	
22-23	
24-25	
26	
TOTAL	

Advice

In all calculations, show clearly how you work out your answer.



N 0 V 1 9 8 3 0 0 1 H 0 1

Answer all questions in the spaces provided

- 1 Circle the calculation that decreases 250 by 15%

[1 mark]

$250 \div 1.15$

250×0.15

250×0.85

$250 \div 0.85$

- 2 Solve $3x = 2x$

Circle your answer.

[1 mark]

$x = -1$

$x = 0$

$x = \frac{2}{3}$

$x = \frac{3}{2}$



3 A is (2, 13) and B is (10, 1)

Circle the midpoint of AB.

[1 mark]

(4, 6)

(5, 6.5)

(6, 7)

(8, 12)

4 Circle the expression equivalent to $(2x)^4$

[1 mark]

$2x^4$

$6x^4$

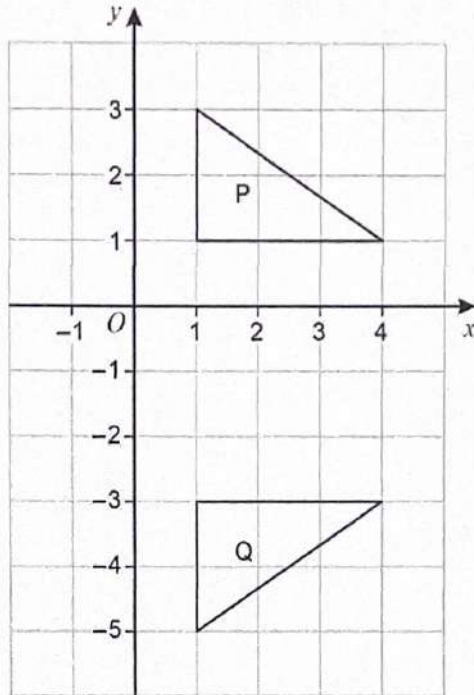
$8x^4$

$16x^4$

Turn over for the next question



- 5 (a) Here are two triangles, P and Q.



Here is a statement.

A transformation that maps P to Q is a reflection in the line $x = -1$

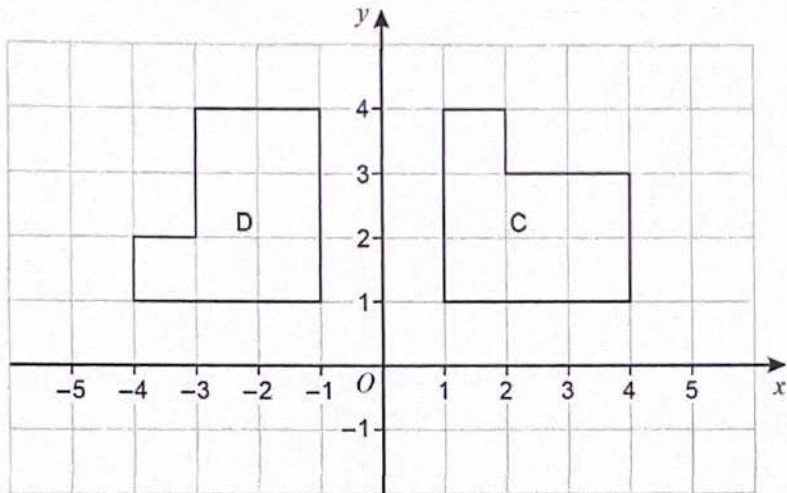
Make **one** criticism of the statement.

[1 mark]

the line should be $y = -1$



5 (b) Here are two shapes, C and D.



Here is a statement.

A transformation that maps C to D is a rotation through 90° anticlockwise.

Make **one** criticism of the statement.

[1 mark]

It should say the centre of rotation is (0,0)

Turn over for the next question

Turn over ►



- 6 (a) A geometric progression starts 4 16

Work out the next term.

[1 mark]

Answer 64

- 6 (b) A Fibonacci-type sequence starts 3 -8

The sequence is continued by adding the previous two terms.

Work out the next **two** terms.

[2 marks]

$$3rd = 3 + -8 = -5$$

$$4th = -8 + -5 = -13$$

Answer -5 and -13



7 Given that $a \times 60 = b$ work out the value of $\frac{4b}{a}$

[2 marks]

$$60a = b \quad \frac{240a}{a}$$

Answer 240

8 Write $27 \times (3^2)^7$ as a single power of 3

[3 marks]

$$3^3 \times 3^{14} = 3^{17}$$

Answer 3^{17}

Turn over for the next question

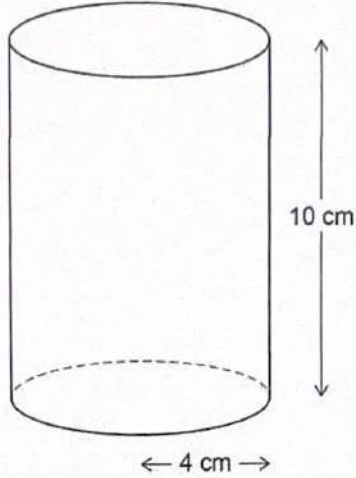


9

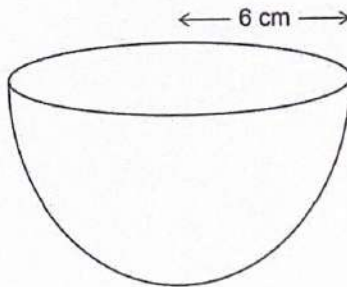
Here are two solids.

Cylinder

radius 4 cm height 10 cm

**Hemisphere**

radius 6 cm



volume of a hemisphere = $\frac{2}{3} \pi r^3$ where r is the radius



Which solid has the greater volume?

You **must** show your working.

[4 marks]

$$\text{cylinder} = \pi \times 4^2 \times 10 = 160\pi$$

$$\text{hemisphere} = \frac{2}{3} \pi 6^3 = 144\pi$$

Answer cylinder has greater volume

Turn over for the next question



10

Saj makes Rose Pink paint and Cherry Pink paint.

He mixes red paint with white paint as shown.

Rose Pink

red : white = 1 : 2

Cherry Pink

red : white = 4 : 3

He makes 60 litres of Rose Pink paint.

To this Rose Pink paint he adds

80 litres of red paint and 28 litres of white paint.

Has he now made Cherry Pink paint?

You **must** show your working.

[4 marks]

$$\begin{array}{r}
 60\text{L} = 20\text{L red} \quad 40\text{L white} \\
 + \quad 80\text{L} \quad 28\text{L} \\
 \hline
 100\text{L} \quad 68\text{L}
 \end{array}$$

No he has not made cherry pink paint



11 (a) Work out $\frac{2 \times 10^{14}}{8 \times 10^9}$

Give your answer in standard form.

[2 marks]

$$\frac{1}{4} (10^5) = 25000$$

Answer 25000

11 (b) $6200.07 = 6.2 \times 10^c + 7 \times 10^d$

Work out the values of c and d .

[2 marks]

$$c = \underline{3} \quad d = \underline{-2}$$

Turn over for the next question



12

$$V = \frac{k}{H} \quad \text{where } k \text{ is a constant.}$$

Which **two** statements are correct?

Tick **two** boxes.

[1 mark]

V is directly proportional to H

V is inversely proportional to H

V is directly proportional to $\frac{1}{H}$

V is inversely proportional to $\frac{1}{H}$



- 13 The n th term of a sequence is $\frac{n(n-4)}{\sqrt{n+3}}$

Work out the sum of the 1st and 6th terms.

[3 marks]

$$n=1 \quad \frac{1(1-4)}{\sqrt{1+3}} = -3/2$$

$$n=6 \quad \frac{6(6-4)}{\sqrt{6+3}} = 4$$

$$4 + -3/2 = 5/2$$

Answer $= 5/2$

- 14 $8300 = 100 \times 83$

Circle the number that is closest in value to $\sqrt{8300}$

[1 mark]

19

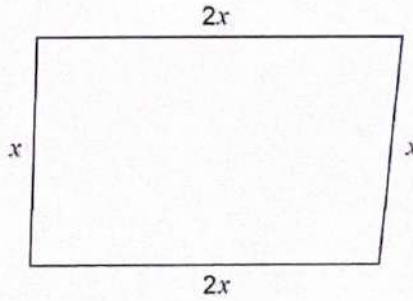
90

830

900



- 15 Here is a **sketch** of a quadrilateral.
All lengths are in centimetres.



Not drawn
accurately

Tick **one** box for each statement.

[3 marks]

	True	May be true	Not true
The quadrilateral is a rectangle		✓	
The quadrilateral is a parallelogram	✓		
The quadrilateral is a rhombus			✓
The quadrilateral is a kite			✓



16

In a box there are some buttons.

45 are large and the rest are small.

Some are yellow and the rest are green.

The number of small is $\frac{5}{3}$ of the number of large.

The number of green is 300% of the number of yellow.

There are 12 small yellow buttons.

How many large green buttons are there?

You may use the two-way table to help you.

[4 marks]

	Large	Small	
Yellow	18	12	30
Green	27	63	90
	45	75	

$$\text{no. small} = 45 \times \frac{5}{3} = 75$$

$$\text{no. small green} = 75 - 12 = 63$$

$$\text{Total} = 45 + 75 = 120.$$

$$120 \div 4 = 30 \text{ yellow}$$

$$\text{large yellow} = 18$$

$$\text{Large green} = 45 - 18 = 27$$

Answer 27



17 $\mathbf{a} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 1 \\ -5 \end{pmatrix}$

Work out $\mathbf{a} - 3\mathbf{b}$

Circle your answer.

[1 mark]

$$\begin{pmatrix} -6 \\ 17 \end{pmatrix}$$

$$\begin{pmatrix} -6 \\ -13 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ 17 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ -13 \end{pmatrix}$$

18 Solve $\frac{x+15}{3} = 2(x+10)$

[4 marks]

$$x + 15 = 6(x + 10)$$

$$x + 15 = 6x + 60$$

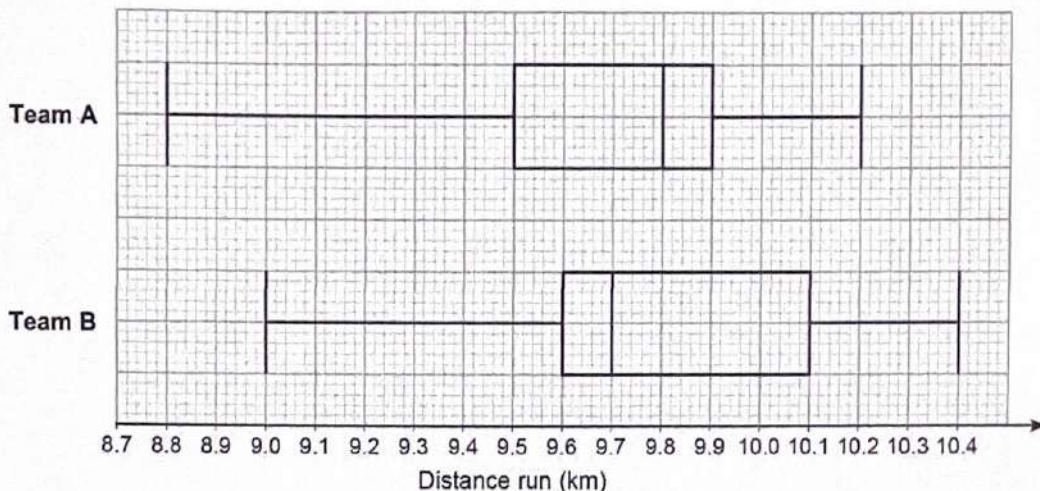
$$-45 = 5x$$

$$x = -9$$

$$x = \underline{\quad -9 \quad}$$



- 19 The box plots represent the distances run by the players in a football match.



- 19 (a) On average, which team's players ran further?

Tick a box.

Team A

Team B

Give a reason for your answer.

[1 mark]

The median is higher.

- 19 (b) The players in Team A ran more consistent distances.

How do the box plots show this?

[1 mark]

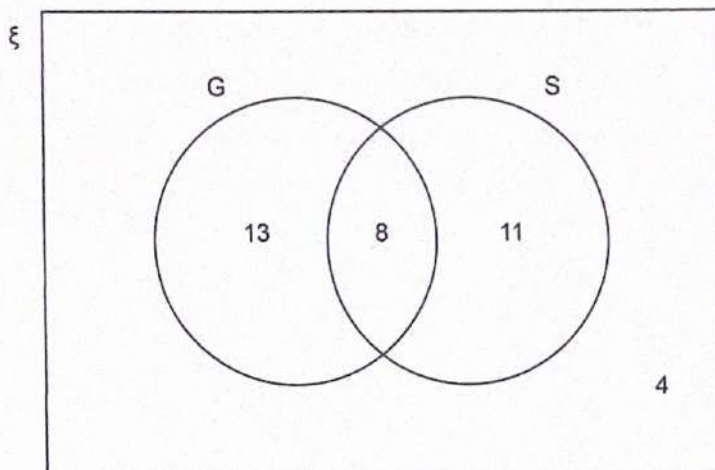
The interquartile range is smaller in team A than B.



- 20 The Venn diagram shows information about some houses.

G = houses with a garage

S = houses with a shed



A house is chosen at random.

- 20 (a) The house has a garage.

What is the probability that it has a shed?

[1 mark]

Answer 8/21

- 20 (b) The house does **not** have a garage.

What is the probability that it does **not** have a shed?

[1 mark]

Answer 4/15



20 (c) Show that $P(G \cap S)' > P(G \cup S)'$

[2 marks]

$$\frac{28}{36} > \frac{25}{36}$$

$$28 > 25$$

21 Work out $0.70\ddot{4}\ddot{8} - 0.001$
Circle your answer.

[1 mark]

0.703 $\ddot{8}$ 0.703 $\ddot{8}$ 0.703 $\ddot{8}\ddot{3}$ 0.703 $\ddot{8}\ddot{4}$

Turn over for the next question

Turn over ►

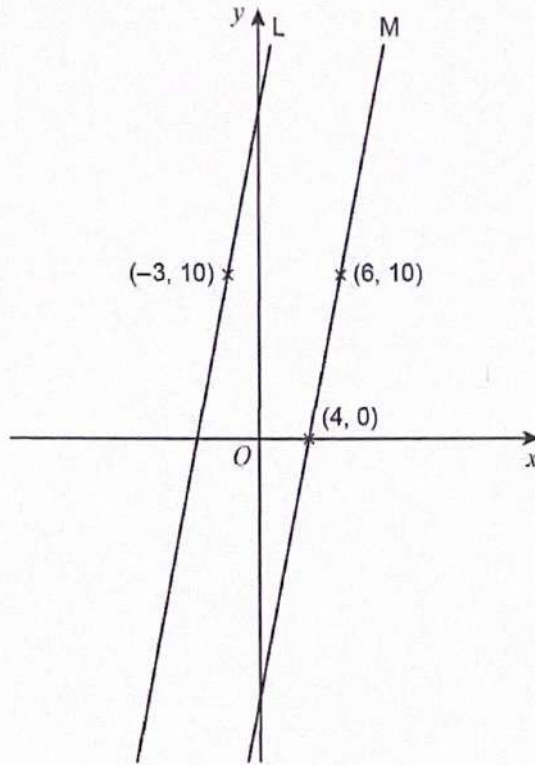


22

$(-3, 10)$ is a point on line L.

$(4, 0)$ and $(6, 10)$ are points on line M.

L and M are parallel.



Not drawn
accurately

Work out the equation of line L.

Give your answer in the form $y = mx + c$

[3 marks]

$$\text{gradient: } \frac{10-0}{6-4} = \frac{10}{2}$$

$$10 = 5(-3) + c$$

$$10 = -15 + c \quad c = 25$$

Answer $y = 5x + 25$



23 (a) Factorise $5x^2 + 6x - 8$

[2 marks]

Answer $(5x - 4)(x + 2)$

23 (b) Simplify fully

$$\frac{x^2 + 9x + 14}{x^2 - 4}$$

[3 marks]

$$\frac{(x + \cancel{2})(x + 7)}{(x + \cancel{2})(x - 2)}$$

Answer $\frac{x + 7}{x - 2}$

Turn over for the next question

Turn over ►



24

Work out $\sqrt{18} - \frac{28}{\sqrt{50}}$ Give your answer in the form $\frac{\sqrt{a}}{b}$ where a and b are integers.

[4 marks]

$$\sqrt{18} = 3\sqrt{2}$$

$$\sqrt{50} = 5\sqrt{2}$$

$$\frac{28}{\sqrt{50}} \times \frac{\sqrt{50}}{\sqrt{50}} = \frac{28\sqrt{50}}{50}$$

$$3\sqrt{2} - \frac{140\sqrt{2}}{50}$$

$$= \frac{150\sqrt{2} - 140\sqrt{2}}{50} = \frac{10\sqrt{2}}{50}$$

$$= \frac{\sqrt{2}}{5} \quad a=2 \quad b=5$$

Answer $a=2 \quad b=5 \quad \frac{\sqrt{2}}{5}$



- 25 A bag contains 8 balls.
3 are red and 5 are blue.
2 balls are taken from the bag at random without replacement.

25 (a) Write down the probability that there is **at least** 1 red ball still in the bag.

[1 mark]

Answer 100%

25 (b) Work out the probability that there are **at least** 2 red balls still in the bag.

[3 marks]

$\frac{3}{8}$ red $\frac{5}{8}$ blue.

⊗ Probability of only 1 red ball left:

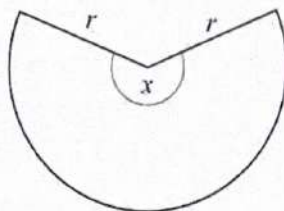
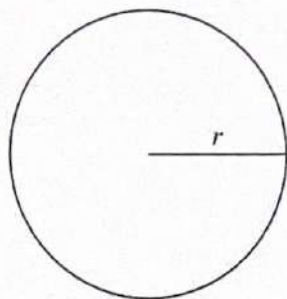
$$\frac{3}{8} \times \frac{2}{7} = \frac{6}{56}$$

$$1 - \frac{6}{56} = \frac{50}{56}$$

Answer $\frac{50}{56}$



- 26 Here are a circle and a sector of the circle.
They each have radius r .



Not drawn
accurately

circumference of circle = perimeter of sector

Work out the size of angle x .

Give your answer in terms of π

[4 marks]

$$2\pi r$$

$$2\pi r \times \frac{x}{360}$$

$$2\pi r = 2\pi r \times \frac{x}{360} + 2r$$

$$\pi = \frac{\pi x}{360} + 1$$

$$\frac{360(\pi - 1)}{\pi} = 360 - \frac{360}{\pi}$$

Answer $\frac{360 - 360}{\pi}$ degrees



27 A curve has the equation $y = x^2 - 6x + 17$

The turning point of the curve is at $(a, 8)$

27 (a) By completing the square, or otherwise, work out the value of a .

[2 marks]

$$(x - 3)^2 \quad x = 3$$

Answer 3

27 (b) The turning point of the curve $y = x^2 + 4x + b$ also has y -coordinate 8

Work out the value of b .

[2 marks]

$$(x + 2)^2 - 4 + b$$

$$-4 + b = 8$$

$$b = 12$$

Answer 12



- 28 Work out the value of $100^{-\frac{1}{2}}$ [2 marks]

Answer $\frac{1}{10}$

- 29 Show that the value of $5 \sin 30^\circ \times \cos 30^\circ \times 8 \tan 30^\circ$ is an integer. [4 marks]

$$\sin 30 = \frac{1}{2} \quad \cos 30 = \frac{\sqrt{3}}{2} \quad \tan 30 = \frac{1}{\sqrt{3}}$$

$$\frac{5}{2} \times \frac{\sqrt{3}}{2} \times \frac{8}{\sqrt{3}}$$

$$\frac{5}{2} \times \frac{\sqrt{3}}{2} \times \frac{8\sqrt{3}}{3} = \frac{40\sqrt{3}}{4\sqrt{3}}$$

$$= 10$$

END OF QUESTIONS

