

GCSE Mock Test 2023

Subject: MATHEMATICS
Board: Edexcel
Level: GCSE Higher Tier - Paper 1 (Non-Calculator)

Student Name: _____

GENERAL FEED BACK :

School Name: _____

Good attempt!

Date: 15/04/23

Score: 52

Please note :

1)To submit the paper neatly.

Total Marks: 80

2)to include the data given in the question , before you work on it, which will show your comprehension on the question.

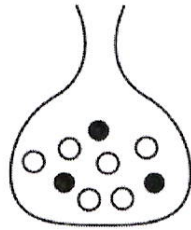
Time Allowed: 1 hour 30 minutes.

Instructions:

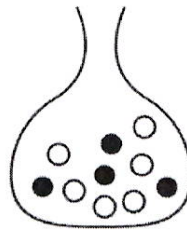
3)To organize the answer space well!

- Please write clearly using a dark-coloured (blue/black) pen. 4) To double check the calculations.
- You must show all your calculations. You **may not** use **calculators**.
- If you need extra space for your answer(s), ask the invigilator for extra paper. Write the question number against your answer(s).
- Do all the rough work in this book. Cross through any work you do not want to be marked.
- Please try all the questions.

1. Bag A contains 6 white beads and 3 black beads. Bag B contains 6 white beads and 4 black beads.



A



B

One bead is chosen at random from each bag.

(a) Find the probability that at least one of the two beads is white.

(2)

$$WW \quad 6/9 \times 6/10 = 36/90$$

$$WB \quad 6/9 \times 4/10 = 24/90$$

$$BW \quad 3/9 \times 6/10 = 18/90$$

$$\underline{78/90}$$

Answer: $78/90$ ✓

(b) The beads are not replaced.

A second bead is chosen at random from each bag.

Find the probability that all four beads are white.

(3)

$$\textcircled{1} \quad WW = 6/9 \times 5/8 \times 6/10 \times 5/9 = 36/90 \times 5/8 = 12/30 = 4/10$$

$$WW = 5/8 \times 5/9 = 25/72$$

$$\begin{array}{r} 4 \overline{) 72} \\ 10 \times 72 \\ \hline 72 \end{array}$$

$$\begin{array}{r} 72 \\ \times 4 \\ \hline 288 \end{array}$$

$$\begin{array}{r} 28.8 + 25 = \\ 25.0 \\ \hline 53.8 \\ \hline 72 \end{array}$$

$$53.8/72$$

Answer: $53.8/72$

$$\begin{array}{r} 7.2 \\ \times 10 \\ \hline 00 \\ 72 \end{array}$$

$$\begin{array}{r} 720 \overline{) 250} \\ 72 \\ \times 2 \\ \hline 144 \\ 720 \overline{) 250.0} \\ 72 \\ \times 3 \\ \hline 216 \end{array}$$

$$P(WW \text{ from bag A and } WW \text{ from bag B}) = 6/9 \times 5/8 \times 6/10 \times 5/9 = 5/36$$

2. If a box has a ratio of black to blue pens as 5:8 and someone removes 20 blue pens to make the ratio 5:6 how many black pens are there? (4)

Black : Blue ✓

5 : 8)

2 parts = 20 ✓

5 : 6

1 part = 10

50 : 60

(H)

Answer: 50 black pens ✓

3. Find the highest common factor (HCF) of 96 and 72

(2)

$$\begin{array}{r}
 96 \\
 \times 3 \\
 \hline
 288
 \end{array}
 \quad
 \begin{array}{r}
 72 \\
 \times 4 \\
 \hline
 288
 \end{array}
 \quad
 \begin{array}{r}
 96 \\
 \div 3 \\
 \hline
 32
 \end{array}
 \quad
 \begin{array}{r}
 72 \\
 \div 3 \\
 \hline
 24
 \end{array}
 \quad
 \begin{array}{r}
 32 \\
 \div 2 \\
 \hline
 16
 \end{array}
 \quad
 \begin{array}{r}
 24 \\
 \div 2 \\
 \hline
 12
 \end{array}
 \quad
 \begin{array}{r}
 16 \\
 \div 2 \\
 \hline
 8
 \end{array}
 \quad
 \begin{array}{r}
 12 \\
 \div 2 \\
 \hline
 6
 \end{array}
 \quad
 \begin{array}{r}
 8 \\
 \div 2 \\
 \hline
 4
 \end{array}
 \quad
 \begin{array}{r}
 6 \\
 \div 2 \\
 \hline
 3
 \end{array}$$

Answer: ~~12~~ ~~24~~ 24 ✓

4. Make y the subject of the formula.

$$x + \frac{\sqrt{y}}{9} = 1$$

(3)

$$\begin{aligned}
 x + \frac{\sqrt{y}}{9} &= 1 \\
 \sqrt{y} &= 9 - x \\
 y &= (9 - x)^2 \\
 y &= 81 - 18x + x^2
 \end{aligned}$$

Answer: ~~y = (9 - x)^2~~ y = (9 - x)²

$$x + \frac{\sqrt{y}}{9} = 1$$

$$\sqrt{y} = (9 - x)(9 - x)$$

$$= 81 - 81x - 81x + 81x^2$$

$$= 81 - 162x + 81x^2$$

$$= 2x + x^2$$

$$x + \sqrt{y}/9 = 1$$

$$\sqrt{y}/9 = 1 - x$$

$$\sqrt{y} = 9(1 - x)$$

$$y = 81(1 - x)^2$$

$$\text{Answer: } y = 81(1 - x)^2$$

Not allowed to do cancellation in subtraction!

$$0.\dot{2}\dot{8} \quad 0.2\dot{8}$$

5. Change the recurring decimal $0.\dot{2}\dot{8}$ to a fraction. You must show all your working. (3)

$$\begin{aligned} x &= 0.282828 \checkmark \\ 10x &= 2.82828 \checkmark \\ 100x &= 28.282828 \checkmark \end{aligned} \quad \begin{aligned} 100x &= 28.2828 \\ -1x &= 0.2828 \\ \hline 99x &= 28 \checkmark \end{aligned}$$

$$x = \frac{28}{99}$$

Answer: $28/99$ ✓

6. The first five terms of an arithmetic sequence are

2, 7, 12, 17, 22,

Write down an expression, in terms of n , for the n th term of this sequence. (2)

$$\begin{aligned} &= 2, 7, 12, 17, 22 \checkmark \\ &\quad +5 \quad +5 \quad +5 \quad +5 \end{aligned}$$

$$5n - 3$$

Answer: $5n - 3$ ✓

You may write in sentence like the following :

Sequence is 2, 7, 12, 17, 22,

$a = 2$

$d = 7 - 2 = 5$

so $5n$ is in the formula.

First term = 2, $n = 1$

$= 5 \times 1 - 3$

$5n - 3$ is the n th term.

7. A student played a computer game 500 times and won 370 of these games. He then won the next x games and lost none. He has now won 75% of the games he has played.

Find the value of x .

(4)

$$\frac{370}{500} = \frac{740}{1000}$$

$$\begin{array}{r} 1 \\ 370 \\ \times 2 \\ \hline 740 \end{array}$$

74% won

75% of $(500 + x \text{ games})$

⑦ $x = 1\%$

$$\frac{3}{4} \text{ of } 550 =$$

$$\begin{array}{r} 135 \\ 4 \overline{) 550} \\ \underline{400} \\ 150 \end{array} \quad \begin{array}{r} 135 \\ \times 3 \\ \hline 405 \end{array}$$

Pls note:

Total number of games he played = $500 + x$

Number of games he won = $370 + x$

Hence $(370 + x)/(500 + x) = 75/100$

$$37000 + 100x = 37500 + 75x$$

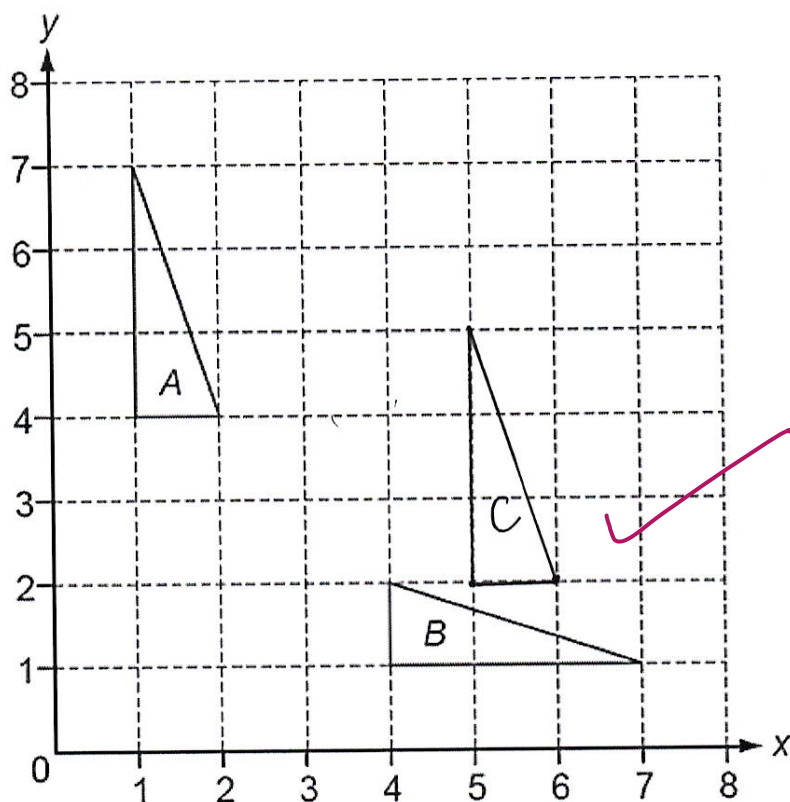
$$25x = 500$$

$$x = (500 \div 25) = 20$$

Answer: 20

Answer: 30 game

8.



(a) Describe fully the single transformation which maps triangle A onto triangle B. (2)

~~Rotate~~ Rotate 90° clockwise and vector $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$.

(a) Reflection in the line $y = x$

Answer:

(b) On the grid, draw the image of triangle A after the translation by the vector $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$.

Label it as C

(2)

9. Show that $3\frac{1}{2} \times 4\frac{2}{3} = 16\frac{1}{3}$

(3)

$$\frac{7}{2} \times \frac{14}{3} = \frac{98}{6}$$

$$= 16\frac{1}{3}$$

$$\begin{array}{r} 2 \\ 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 16 \\ 6 \overline{) 98} \\ \underline{61} \\ 37 \\ \underline{36} \\ 10 \\ \underline{6} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

$$16\frac{2}{6}$$

$$\begin{array}{r} 16 \\ \times 3 \\ \hline 48 \end{array}$$

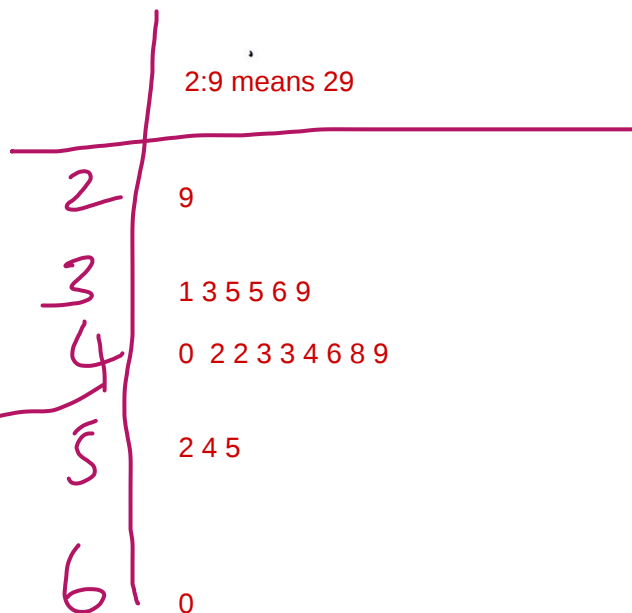
$$16\frac{1}{3}$$

10. Here are the speeds, in kilometres per hour, of 20 cars.

54 31 52 49 42 35 39 36 33 48
44 43 43 46 35 40 60 42 55 29

(a) Draw an ordered stem and leaf diagram for these speeds.

(3)



(b) Work out the percentage of these cars with speed greater than 43 km/hr.

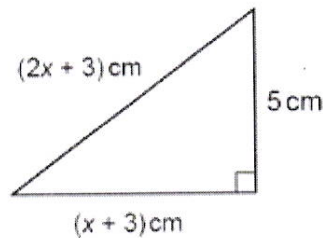
(2)

2

$$\frac{8}{20} = \frac{40}{100}$$

Answer: 40% ✓

11. The diagram shows a right-angled triangle with sides of length 5 cm, $(x + 3)$ cm and $(2x + 3)$ cm.



Show that $3x^2 + 6x - 25 = 0$.

(4)

$$a^2 + b^2 = c^2 \quad \checkmark$$

$$5^2 + (x+3)(x+3) = (2x+3)^2 \quad \checkmark$$

$$25 + x^2 + 3x + 3x + 9 = (2x+3)^2 \quad (2x+3)(2x+3)$$

$$34 + x^2 + 6x = (2x+3)^2 \quad 4x^2 + 6x + 6x + 9$$

$$34 + x^2 + 6x = 4x^2 + 12x + 9 \quad 4x^2 + 12x + 9$$

$$4x^2 + 12x + 9 = 34 + x^2 + 6x$$

$$3x^2 + 6x - 25 = 0 \quad \checkmark$$

12. Write these numbers in order of size. Start with the smallest number.

$$5.73 \times 10^5 \quad 57.3 \times 10^{-4} \quad 573 \times 10^4 \quad 0.000573 \quad (2)$$

① 573000

② 0.00573

③ 5730000

④ 0.000573

②

Answer: 0.000573, 57.3×10^{-4} , 5.73×10^5 , 573×10^4

13. Simplify $(27x^3)^{\frac{2}{3}}$ ^{square} _{cube}

(2)

$$\sqrt[3]{27x^3} = (3x)^2 = 9x^2$$

②

Answer: $9x^2$

14. $p = \frac{4.8 \times 1.98276}{16.83}$

By writing each number to 1 s.f, find an estimate for the value of p .

(2)

$$\frac{5 \times 2}{17} = \frac{10}{17}$$

$$4.8 \sim 5$$

$$17 \overline{) 10}$$

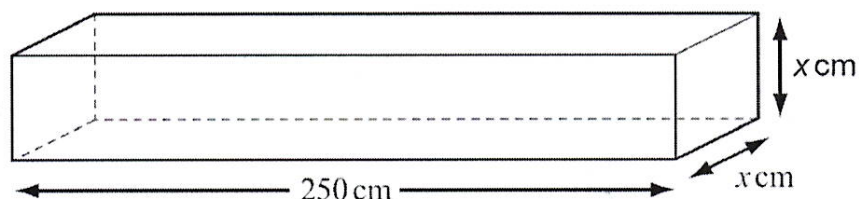
$$1.98276 \sim 2$$

$$16.83 \sim 20$$

$$p = (5 \times 2) / 20 = 5 / 10 = 0.5$$

Answer: $10/17$

15. A solid metal bar is in the shape of a cuboid of length of 250 cm. The cross-section is a square of side x cm. The volume of the cuboid is 6250 cm^3 .



(a) Find the value of x .

(2)

$$250 \times x \times x = 6250$$

$$25 \overline{) 625}$$

$$x^2 = 25$$

$$x = 5$$

Answer: 5 cm

- (b) The mass of 1 cm^3 of the metal is 10 grams. Calculate the mass of the whole metal bar in kilograms. (2)

$$6250 \text{ cm}^3 = 62500 \text{ g}$$

$$1 \text{ cm}^3 = 10 \text{ g}$$

$$1000 \text{ g} \rightarrow 1 \text{ kg}$$

$$62500 \text{ g} \rightarrow 62.5 \text{ kg}$$

Answer: 62.5 kg

- (c) A box, in the shape of a cuboid measures 250 cm by 90 cm by h cm. 144 metal bars fit exactly in the box. Calculate the value of h . (3)

$$144 \times 6250 = 900,000 \text{ cm}^3 = 250 \times 90 \times h$$

$$\frac{900000}{22500} = h$$

$$h = 40 \text{ cm}$$

Answer: 40 cm

Please organise the calculations in one side and statements and answer on the other side.

16. Solve the inequality $\frac{2x-7}{8} > \frac{x+2}{3}$

(3)

$$\frac{2x-7}{8} > \frac{x+2}{3}$$

$$3(2x-7)$$

$$6x-21 > 3x+16$$

$$+ \frac{16}{21}$$

$$\begin{aligned} & \cancel{12x} \\ & \cancel{187} > 42x \end{aligned}$$

$$-2x > 37$$

$$x > \frac{37}{-2}$$

17. The straight line L1 has equation $y = 4x - 5$

The straight line L2 is parallel to L1 and passes through the point (8, 3)

Find an equation of line L2

(3)

$$y = 4x - 5$$

=

.

6

(0, 0)

(8, 3)

$$\text{gradient} = \frac{3}{8}$$

Equation of line L1 : $y = 4x - 5$

Slope of line L1 = 4

Line L1 and L2 are parallel. Hence Slope of line L2 = 4

Equation of line with gradient m and which passes through (h, k) is given by

$$y - k = m(x - h)$$

Equation of line L2 is given by $y - 3 = 4(x - 8)$

$$y - 3 = 4x - 32$$

$$y = 4x - 29$$

Answer: $y = 4x - 29$

Answer:

18. Show that $\frac{\sqrt{108}-2\sqrt{3}}{3\sqrt{3}-3}$ can be written in the form $a + \frac{b}{3}\sqrt{3}$, where a and b are integers. (4)

$$\frac{\sqrt{108} - 2\sqrt{3}}{3\sqrt{3} - 3} \times \frac{(3\sqrt{3} + 3)}{(3\sqrt{3} + 3)} \quad \checkmark$$

$$(3\sqrt{3} - 3)(3\sqrt{3} + 3) = 27 + 9\sqrt{3} - 9\sqrt{3} - 3 = 24$$

$$(\sqrt{108} - 2\sqrt{3})(3\sqrt{3} + 3)$$

$$3 \overline{) 36}$$

$$\sqrt{36} \sqrt{3} \quad \checkmark$$

calculation mistakes

$$(6\sqrt{3} - 2\sqrt{3})(3\sqrt{3} + 3)$$

$$= 54 + 18\sqrt{3} - 18 - 6\sqrt{3}$$

$$= 54 + 12\sqrt{3} - 18$$

$$= (36 + 12\sqrt{3}) \div 18$$

$$\begin{array}{r} 454 \\ -18 \\ \hline 36 \end{array}$$

~~scribbles~~

$$= \frac{36 + 12\sqrt{3}}{24}$$

=

$$(\sqrt{108} - 2\sqrt{3}) / (3\sqrt{3} - 3) = ((36\sqrt{3}) - 2\sqrt{3}) / (3\sqrt{3} - 3)$$

$$= (4\sqrt{3}) / (\sqrt{3} - 1)$$

Rationalising the denominator

$$15 \quad (\sqrt{108} - 2\sqrt{3}) / (3\sqrt{3} - 3) = (4\sqrt{3} (3\sqrt{3} + 3)) / ((3\sqrt{3} - 3)(3\sqrt{3} + 3))$$

$$= (36 + 12\sqrt{3}) / ((3\sqrt{3})^2 - 3^2) = 2 + 2/3\sqrt{3}$$

Answer: $2 + \frac{2}{3}\sqrt{3}$

19. Given that $\frac{a}{b} = \frac{2}{7}$ and $\frac{a}{c} = \frac{3}{4}$, find $a : b : c$. (3)

$$\begin{array}{ccc} a : b & a : c & 2 : 7 \\ 2 : 7 & 3 : 4 & a : b \\ \hline 9 & 7 & c : a \\ & & 4 : 3 : \end{array}$$

$$a : b \quad a : c$$

$$14 : 49 \quad 27 : 36$$

$$\begin{array}{ccc} c : a : b & & 2 \\ 6 : 2 : 7 & & 1.5 \\ 4 : 3 : 1.5 & \times 1.5 & \times 7 \\ & & 10.5 \end{array}$$

$$\begin{array}{r} 1.5 \\ \times 4 \\ \hline 6.0 \end{array}$$

Please note:

$$a : b = 2 : 7 \text{ and } a : c = 3 : 4$$

Interchanging the first ratio

$$b : a = 7 : 2 \text{ and } a : c = 3 : 4$$

LCM of 2 and 3 is 6

$$b : a = 7 \times 3 : 2 \times 3 \text{ and } a : c = 3 \times 2 : 4 \times 2$$

$$b : a = 21 : 6 \text{ and } a : c = 6 : 8$$

$$b : a : c = 21 : 6 : 8$$

$$a : b : c = 6 : 21 : 8$$

$$\text{Answer: } a : b : c = 6 : 21 : 8$$

$$\text{Answer: } 2 : 7 : 6$$

20. The quantity p varies inversely as the square of $(q + 2)$. When $p = 5$, $q = 3$.

Find p when $q = 8$

(4)

$$p \propto \frac{k}{(q+2)^2} \quad \checkmark$$

$$5 = \frac{k}{5^2}$$

$$5 = \frac{k}{25}$$

$$\begin{array}{r} 25 \overline{) 125} \\ \underline{125} \\ 0 \end{array}$$

$$k = 125$$

11

$$p = \frac{125}{10^2}$$

$$p = \frac{125}{100}$$

$$p = 1.25 \quad \checkmark$$

Answer: $p = 1.25 \quad \checkmark$

21. The functions f and g are such that

$$f(x) = \cos x^\circ \text{ and } g(x) = 2x + 4$$

Find:

(a) $f(30)$

(1)

$$30 = \cos x^\circ$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

Answer: ...60...

(b) $fg(88)$

(2)

$$f(42) = \cos x^\circ$$

$$2x + 4 = 88$$

$$x = \frac{84}{2}$$

$$x = 42$$

$$fg(88) = f(180)$$

$$= \cos(180) = -1$$

Answer: ...

(c) $g^{-1}(f(x))$

(3)

$$y = 2x + 4$$

$$2y + 4 = x$$

$$2y = x - 4$$

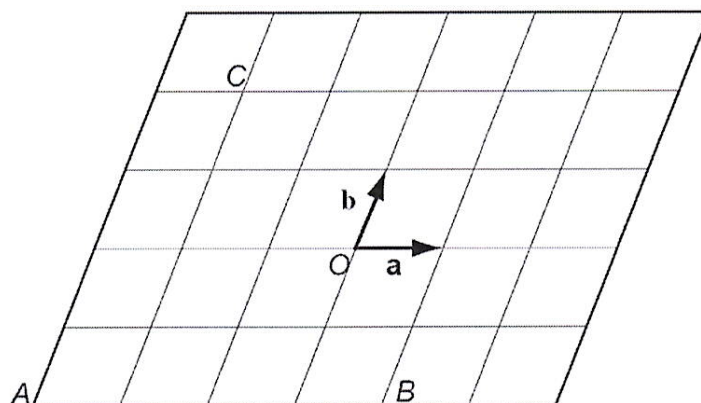
$$y = (x - 4)/2$$

$$g^{-1}(x) = \frac{x-4}{2}$$

$$g^{-1}f(x) = g^{-1}(\cos x) = \frac{\cos x - 4}{2}$$

Answer: ...

22. O is the origin. Vectors **a** and **b** are shown in the diagram.



Write down, in terms of **a** and **b**, in their simplest form,

(a) The position vector $\overrightarrow{OA}$ of the point A.

(1)



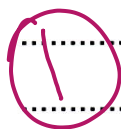
$$-2b - 3a$$

Answer: $-2b - 3a$

(b) $\overrightarrow{BC}$

(1)

$$-3a + 4b$$



Answer: $-3a + 4b$

(c) $\overrightarrow{BC} - \overrightarrow{AC}$

(2)

$$\overrightarrow{BC} = -3a + 4b$$

$$\overrightarrow{AC} = 4b + a$$

①

$$\begin{aligned} -3a + 4b - (4b + a) &= -2a \\ &= -4a \end{aligned}$$

Answer: $-2a$

(d) If $|a| = 3$, write down the value of $|\overrightarrow{AB}|$

(1)

$$\overrightarrow{AB} = 4a$$

$$\begin{matrix} \uparrow \\ 3 \times 4 = 12 \end{matrix}$$

①

Answer: 12