GCSE (9-1) Mathematics

J560/06 Paper 6 (Higher Tier)

Question Set 4

1 Amrit's income is 32% more than Bethan's income.
Amrit and Bethan's combined income is £54 868.

Calculate Amrit's income.

Amrit = 1.32 x Bethan

A + B = 54868

1.32B + B = 54 868

2.32B = 54 868

B = 23650

A = 1.32 x 23650

= 31218

£ 31218 [5]

2 Jacob, Amelie and Reuben each roll a fair six-sided dice.
What is the probability that all three roll a number less than 3?

Give your answer as a fraction in its simplest form.

$x < 3 = 1, 2 \quad p = \frac{2}{6}$

$\frac{2}{6} \times \frac{2}{6} \times \frac{2}{6} = \frac{1}{27}$

$\frac{1}{27}$ [3]

3 The diagram shows two rectangles, A and B.

Rectangle A has a width of 25 cm and a height of 12 cm.
The width of rectangle B is three times the height of rectangle B.

The area of rectangle A is equal to the area of rectangle B.

Find the perimeter of rectangle B.

Area: A = B

$\frac{12 \times 25}{3} = \frac{36 \times h}{36}$

$h = \frac{25}{3}$

perimeter of B:

$\left(36 + \frac{25}{3}\right) \times 2$

$= 88.\dot{6}$ or $88\frac{2}{3}$

88.67 cm **[5]**

4 (a) **(a)** Complete the table for $y = x^2 - 4x + 1$.

x	-1	0	1	2	3	4	5
y	6	1	-2	-3	-2	1	6

[2]

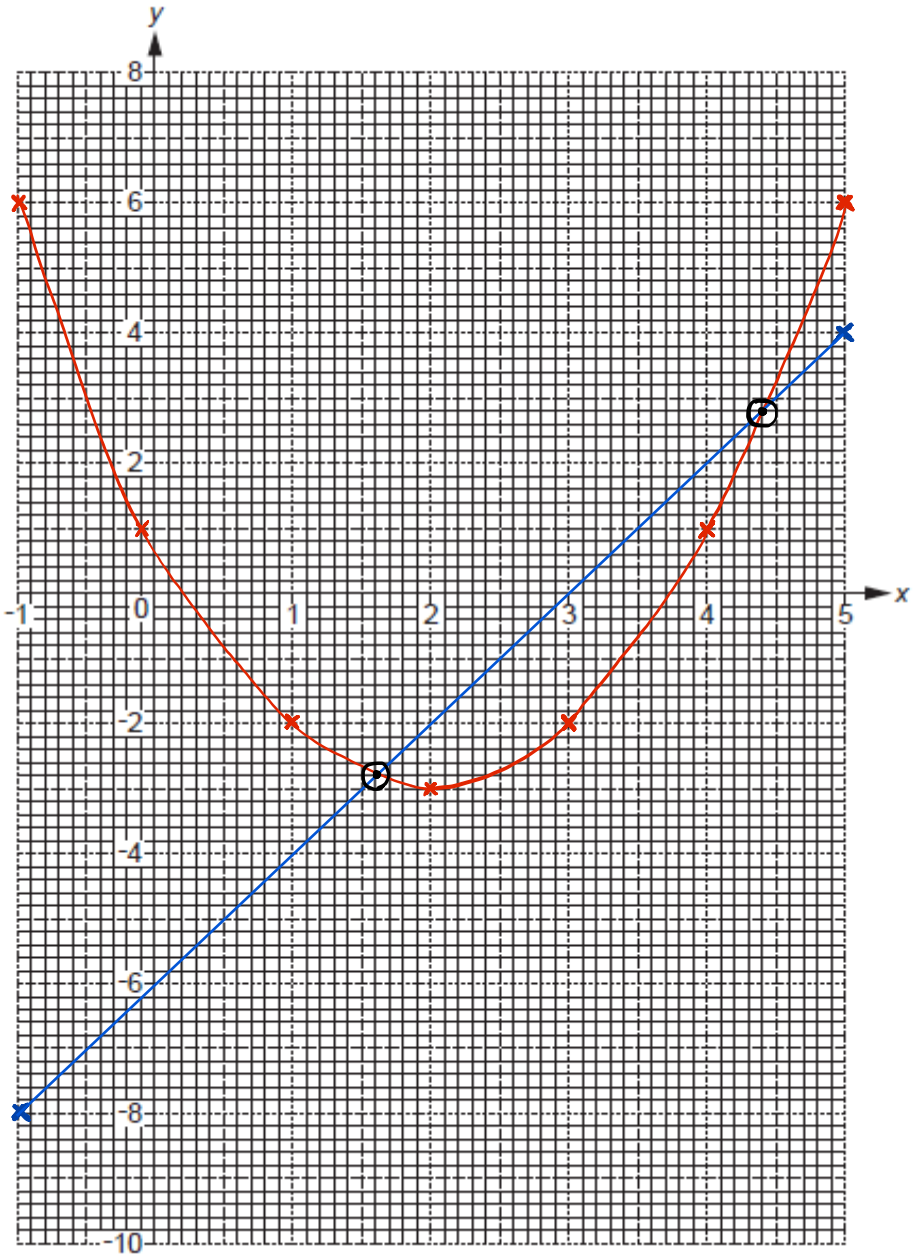
$y = (-1)^2 - 4 \times -1 + 1$
$= 1 + 4 + 1$
$= 6$

$y = 1 - 4 + 1$
$= -3 + 1$
$= -2$

$y = 2^2 - 4 \times 2 + 1$
$= 4 - 8 + 1$
$= -4 + 1$
$= -3$

$y = 4^2 - 4 \times 4 + 1$
$= 16 - 16 + 1$
$= 1$

4 (b) Draw the graph of $y = x^2 - 4x + 1$ for $-1 \leqslant x \leqslant 5$.



[3]

4 (c) (c) On the same grid, draw the graph of $y = 2x - 6$ for $-1 \leqslant x \leqslant 5$. [3]

$x = -1 \quad y = 2 \times -1 - 6 = -2 - 6 = -8$

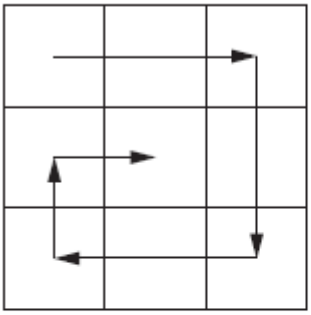
$x = 5 \quad y = 2 \times 5 - 6 = 10 - 6 = 4$

4 (d) **(d)** Use your graphs to solve the equation $x^2 - 4x + 1 = 2x - 6$.

Give your answers to 1 decimal place.

(d) $x =$ 1.6 or $x =$ 4.4 **[2]**

5 (a) Nine consecutive numbers are written on a 3-by-3 grid.
They are arranged, in ascending order, in a spiral as shown.



(a) Karen writes the numbers 3 to 11 on her grid.

3	4	5
10	11	6
9	8	7

The total of the first column is $3 + 10 + 9 = 22$.

Karen says

> The total of the first column is one less than the total of the second column.

Show that this is correct for Karen's grid. **[1]**

$4 + 11 + 8 = 23$

$22 < 23$ by $+1$ so Karen is correct

5 (b)

(b) Victor says

If **any** nine consecutive numbers are arranged in ascending order in this spiral on a 3-by-3 grid, the total of the first column will **always** be one less than the total of the second column.

Prove that Victor is correct. **[5]**

x	$x+1$
$x+7$	$x+8$
$x+6$	$x+5$

$\Downarrow$ $\Downarrow$

$x + x+7 + x+6 = 3x+13$ ← first column

$x+1 + x+8 + x+5 = 3x+14$ ← 2nd column

$3x+13 < 3x+14$ by $+1$

∴ no matter what number we start with (x) we would always have a difference of 1 between the sum of 2 columns

6 (a) **(a)** Arron ran a distance of 5 km at an average speed of 2.2 m/s.

How long did Arron run for?
Give your answer in minutes and seconds, to the nearest second.

$S = \frac{d}{t}$ $\quad 2.2 = \frac{5000}{t}$ $\quad$ 5km = 5000m

$t = \frac{5000}{2.2} = 2272.727...$ s

$\Downarrow \div 60$

37.8787... mins

$0.8787 \times 60 = 52.7$s

(a) 37 minutes 53 seconds **[4]**

6 (b) **(b)** Claudine cycled a distance of 53 km in 2.7 hours.
The distance is measured correct to the nearest km.
The time is given correct to 1 decimal place.

Calculate the lower and upper bounds of her average speed.

Give your answers correct to 2 decimal places.

$S = \frac{d}{t}$

lower bound : d↓ t↑ $\quad \frac{52.5}{2.74} = 19.16$

upper bound : d↑ t↓ $\quad \frac{53.4}{2.65} = 20.15$

(b) lower bound = 19.16 km/h

upper bound = 20.15 km/h **[6]**

7 Dani has a pack of 45 cards.
Each card is either red or black.

One-third of the cards in the pack are **red**.

She picks two cards from the pack, without replacement.

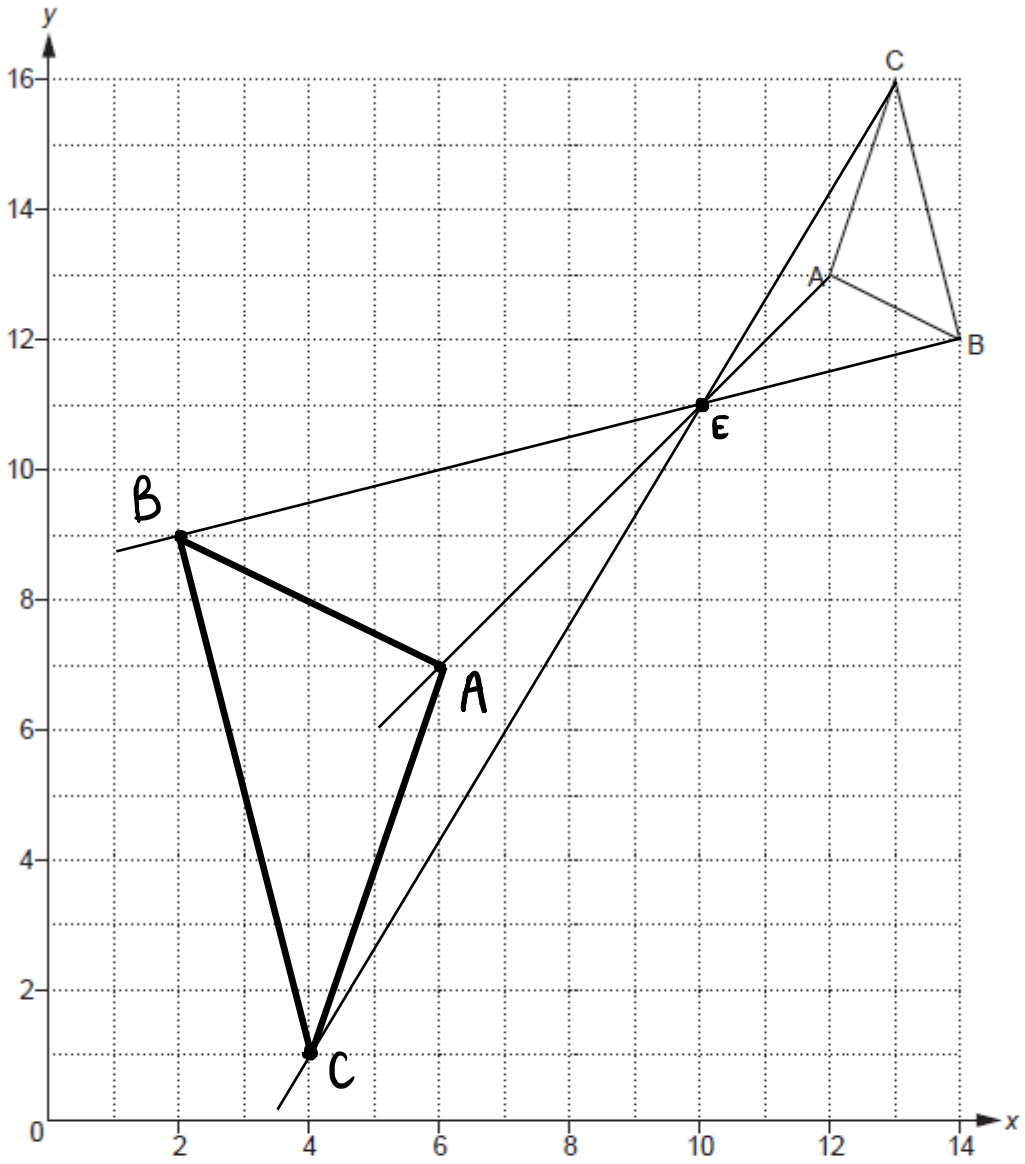
Calculate the probability that Dani picks two **black** cards.

$\frac{2}{3}$ = p of black

$\frac{2}{3} \times \frac{29}{44_{22}} = \boxed{\frac{29}{66}}$

$\frac{29}{66}$ ..... **[5]**

8 (a) A triangle has vertices A, B and C.



The triangle is enlarged with scale factor *f* and centre of enlargement E.

Vertex A maps to (6, 7).
Vertex B maps to (2, 9).

(a) Find the coordinates of the centre of enlargement, E.

(a) (10 , 11) **[2]**

8 (b) (b) Find the scale factor, *f*.

(b) 2 [2]

8 (c) (c) Vertex C maps to the point R.
Find the coordinates of R.

(c) (4 , 1) [2]

Total Marks for Question Set 4: 50