GCSE (9-1) Mathematics

J560/06 Paper 6 (Higher Tier)

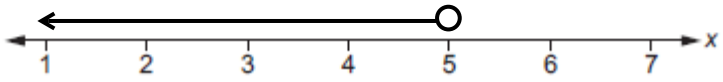
Question Set 6

1 Solve $3x + 4 < 19$.
Show your solution on the number line.

$3x < 19 - 4$

$3x < 15$

$x < 5$



[4]

2 A truck is used to transport some wood panels.
Each wood panel is a cuboid measuring 2.4 m by 1.2 m by 1.8 **cm**.
The density of each wood panel is 750 kg/m^3.

→ ÷100 = 0.018

The truck can carry 15 tonnes of these wood panels.

Calculate the maximum number of wood panels that the truck can carry.
Show how you decide.

$d = \frac{m}{v}$ $V = 2.4 \times 1.2 \times 0.018 = 0.05184\ m^3$

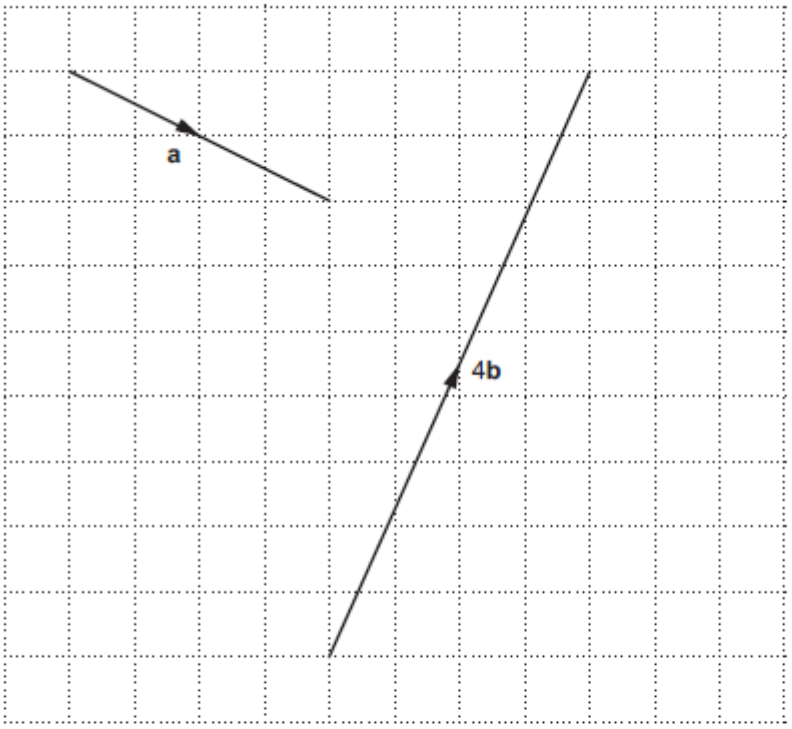
$750 = \frac{m}{0.05184}$ $1st = 15000\ kg$

$m = 38.88\ kg$ $\frac{15000}{38.88} = 385.802...$

Max number : 385

385 wood panels [6]

3 (a) Vectors **a** and 4**b** are drawn on the grid.



(a) Write vector **a** as a column vector.

(a) $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$ **[2]**

3 (b) **(b)** Find vector **b** as a column vector.

(b) $\begin{pmatrix} 1 \\ \frac{9}{4} \end{pmatrix}$ **[2]**

R , $t-R=B$

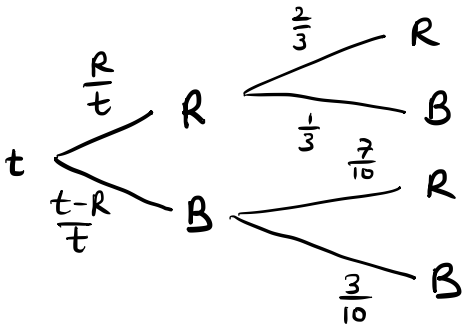
4 Li has t toy bricks.
She only has red bricks and blue bricks.

Li picks two bricks, one after the other.

If the first brick she picks is red, the probability that the second brick is red is $\frac{2}{3}$.

If the first brick she picks is blue, the probability that the second brick is red is $\frac{7}{10}$.

Calculate the value of t.



$\frac{2}{3} = \frac{R-1}{t-1}$

$\frac{7}{10} = \frac{R}{t-1}$

$t-1 = \frac{10}{7}R$

$\frac{2}{3} = \frac{R-1}{\frac{10R}{7}}$

$\frac{2}{3} = R-1 \times \frac{7}{10R}$

$\frac{20R}{21} = R-1$

$\frac{1}{21}R = 1 \times 21$

$R = 21$

$\frac{7}{10} = \frac{21}{t-1} \Rightarrow \frac{t-1}{21} = \frac{10}{7}$ $(\times 3)$

$t-1 = 30$ $\boxed{t = 31}$

$t =$ 31 ..... **[4]**

5 x is directly proportional to y.
y is directly proportional to z.

When $x = 10$, $y = 60$.
When $y = 8$, $z = 1.6$.

Find a formula for z in terms of x.

$x = ky$ $\quad 10 = 60k \quad k = \frac{1}{6}$ $\quad x = \frac{1}{6}y \Rightarrow y = 6x$

$y = gz$ $\quad 8 = 1.6g \quad g = 5$ $\quad y = 5z$

$6x = 5z$

$z = \frac{6x}{5}$

$z = \frac{6}{5}x$

..... **[4]**

6 Paintings are sold in an art gallery.
The cost of a painting has k% commission added to it.
Tax of 15% is then added to the total cost to give the price to pay.

Layla correctly calculates the price to pay by multiplying the cost of the painting by 1.403.

Work out the value of k.

cost of a painting = $x \longrightarrow \frac{100+k}{100}x \longrightarrow \frac{100+k}{100} \times 1.15 \times x$

$= 1.403x$

$\frac{100+k}{100} \times 1.15 = 1.403 \quad \left(\times \frac{100}{1.15}\right)$

$100 + k = 122$

$k = 22$

$k =$ 22 % [3]

7 Students are asked to choose one subject from Option A and one subject from Option B.

Option A
Economics
Geography
History
Media Studies

Option B
Art
Drama
Engineering
German
Graphics
Music
PE

If a student chooses their subjects at random, what is the probability that both subjects have the same first letter?

E
G
H
M

A
D
E
G
G
M
P

$7 \times 4 = 28$ = total number of combinations

E → E
G → G or G
M → M

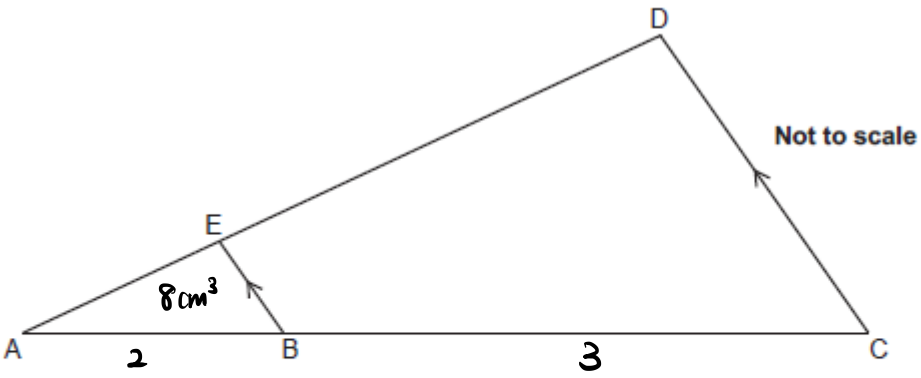
} 4 combinations

$P = \frac{4}{28_7} = \boxed{\frac{1}{7}}$

$\frac{1}{7}$

..... [3]

8 In the diagram, AED and ABC are straight lines and BE is parallel to CD.



The ratio of length AB to length BC is 2 : 3.
Triangle ABE has an area of $8\,cm^2$.

Work out the area of triangle ACD.

2 : 5 → 1 : 2.5 → 8 : 50
×2.5²

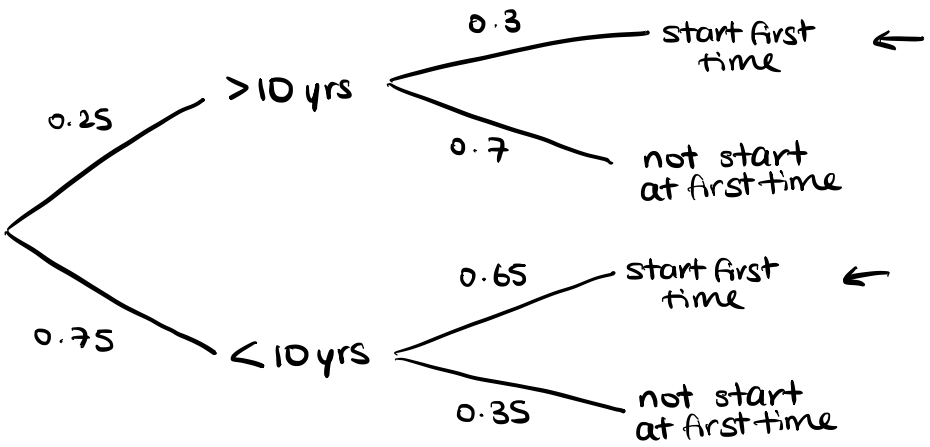
50 ..... cm^2 **[4]**

9 A bus company has a large number of buses.
25% of the buses are more than 10 years old.

If a bus is more than 10 years old, the probability that it will start first time is 0.3.
If a bus is less than 10 years old, the probability that it will start first time is 0.65.

Amir is asked to drive one of the company's buses, chosen at random.

Calculate the probability that the bus starts first time.



$0.25 \times 0.3 + 0.75 \times 0.65$

$= 0.075 + 0.4875$

$= 0.5625$

0.5625 [4]

10 **(a)** Here is a sequence.

3 $\quad 3\sqrt{5}$ $\quad 15$ $\quad 15\sqrt{5}$

(a) Work out the next term.

$3 \xrightarrow{\times\sqrt{5}} 3\sqrt{5} \xrightarrow{\times\sqrt{5}} 15 \xrightarrow{\times\sqrt{5}} 15\sqrt{5} \xrightarrow{\times\sqrt{5}} 15\times5 = 75$

(a) .... 75 .... **[1]**

10 **(b)** **(b)** Find the *n*th term.

1st, 2nd, 3rd, ... nth

$3, \quad 3\sqrt{5}, \quad 15, \quad \ldots \quad 3\times\sqrt{5}^{\,n-1}$

$3\sqrt{5} = 3\times\sqrt{5}$, $\quad 15 = 3\times\sqrt{5}^{\,2}$

(b) .... $3(\sqrt{5})^{n-1}$ .... **[3]**

11 Write $0.4\dot{1}\dot{6}$ as a fraction in its simplest form.
You must **show full working** in support of your answer.

$1000x = 416.1616\ldots$
$-\quad 10x = 4.1616\ldots$
$990x = 412 \rightarrow x = \frac{412}{990} = \boxed{\frac{206}{495}}$

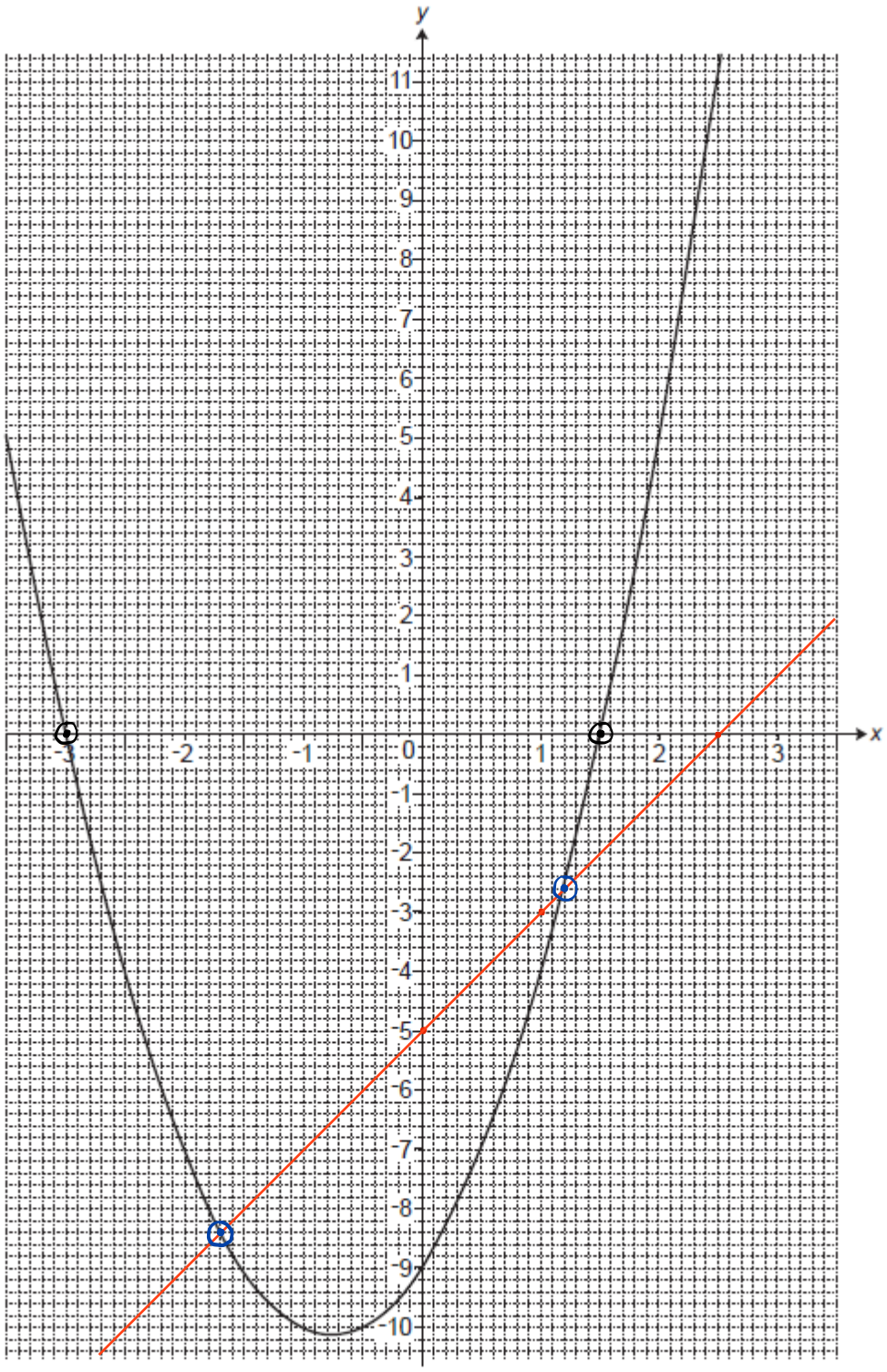
or

$\frac{416-4}{990} = \frac{412}{990} = \boxed{\frac{206}{495}}$

(4 in the numerator: the digit that is not recurring; 99 in 990: two recurring digits; 0 in 990: one digit is not recurring)

.... $\frac{206}{495}$ .... **[3]**

12 **(a)** The graph of $y = 2x^2 + 3x - 9$ is drawn below.



(a) Use the graph to solve $2x^2 + 3x - 9 = 0$. $y = 0$

(a) $x =$ -3 or $x =$ 1.5 **[2]**

12 (b) (b) The equation $2x^2 + x - 4 = 0$ can be solved by finding the intersection of the graph of $y = 2x^2 + 3x - 9$ and the line $y = ax + b$.

(i) Find the value of a and the value of b.

$2x^2 + 3x - 9 = ax + b = 2x^2 + x - 4$

$(3 - a)x - 9 - b = x - 4$

$3 - a = 1$ $a = 2$

$-9 - b = -4$ $b = -5$

(b)(i) $a =$ 2

$b =$ −5 [2]

12 (b) (ii) Hence **use the graph** to solve the equation $2x^2 + x - 4 = 0$.

$y = 2x - 5$ $(0, -5)$

$x = 1$ $2 - 5 = -3$ $(1, -3)$

(ii) $x =$ −1.7 or $x =$ 1.2 [3]

Total Marks for Question Set 6: 50