

**GCSE (9 – 1) Mathematics**  
**J560/04 Paper 4 (Higher Tier)**

**Question Set 1**

Calculate.

1.

$$\sqrt[3]{\frac{210}{10^2 + 5^2}}$$

Give your answer correct to 3 significant figures.

$$\begin{aligned} 10^2 &= 100 & \frac{\sqrt[3]{210}}{\sqrt[3]{125}} &= \frac{\sqrt[3]{210}}{5} = 1.19 \\ 5^2 &= 25 & & \end{aligned}$$

.....1.19..... [3]

2

The ratio 50 grams to 1 kilogram can be written in the form 1 :  $n$ .

Find the value of  $n$ .

$$\begin{aligned} 1 \text{ kg} &= 1000 \text{ g} \\ &= 50 \left( \begin{array}{l} 50 : 1000 \\ \downarrow \quad \uparrow \\ 1 : \end{array} \right) \div 50 \\ n &= \frac{1000}{50} \\ n &= 20 \end{aligned}$$

$n =$  ..... 20 ..... [2]

3

A bus timetable shows the following information.

- A bus following route T leaves for the train station every 20 minutes.
- A bus following route A leaves for the airport every 18 minutes.
- A bus following route T and a bus following route A both leave at 8.37 am.

(a) When is the next time one of each bus is timetabled to leave at the same time?

$$\begin{aligned} T &= 20 \text{ m} & \text{LCM} &= 180 \text{ m} \\ A &= 18 \text{ m} & & \end{aligned}$$

(a) ..... 11:37 ..... [4]

(b)

Write down one assumption that was necessary to solve this problem.

..... The buses are moving at .....  
..... the same speed ..... [1]

4

Bennie is 7 years older than Ayesha.  
Chloe is twice as old as Bennie.  
The sum of their three ages is 57.

Work out the ages of Ayesha, Bennie and Chloe.

$$B = A + 7 \quad A = B - 7$$

$$C = 2B$$

$$A + B + C = 57$$

$$(B - 7) + B + 2B = 57$$

$$4B - 7 = 57$$

$$4B = 64$$

$$B = 16$$

$$B - 7 = A$$

$$9 = A$$

$$C = 2B$$

$$C = 32$$

Ayesha's age is ..... 9

Bennie's age is ..... 16

Chloe's age is ..... 32 [6]

5 120 students in Year 10 and Year 11 sit a test.

- 61 of the students are in Year 10.
- 83 of the students are right-handed.
- 20 of the students in Year 11 are left-handed.

One of the students in Year 10 and one of the students in Year 11 are chosen at random.

Which one is more likely to be left-handed?

Show your working. You may use the table if you wish.

	Y10	Y11	
r-h	44	39	83
L-h	17	20	37
	61	59	120

Handwritten annotations:

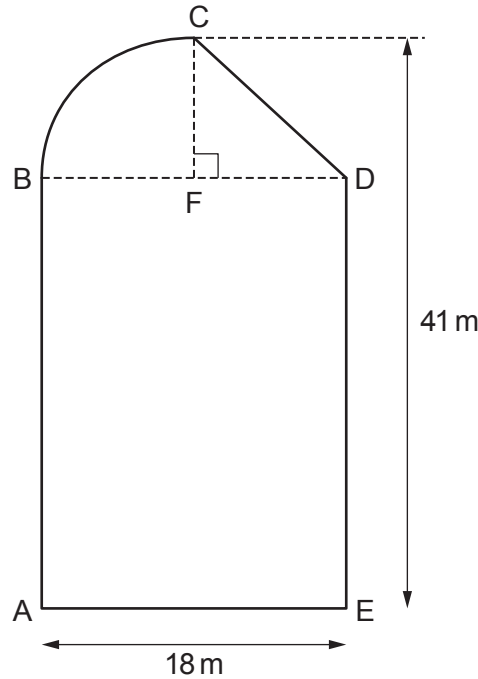
- 83 - 39 (with arrow pointing to 39)
- 59 - 20 (with arrow pointing to 20)
- 61 - 17 (with arrow pointing to 17)
- 120 - 61 (with arrow pointing to 61)
- 17 + 20 (with arrow pointing to 20)

$$P_{10} = \frac{17}{61} = 0.279$$

$$P_{11} = \frac{20}{59} = 0.339$$

The year 11 is more likely to be left handed because  $0.338 > 0.279$

- 6 The diagram shows a shape ABCDE.  
The shape is made from a rectangle, a right-angled triangle and a quarter of a circle.



F is the mid-point of BD.  
AE = 18 m and the perpendicular distance from C to AE is 41 m.

Work out the **perimeter** of the shape ABCDE.

$$BC = \frac{1}{4} (18\pi) = \frac{9}{2}\pi$$

$$CD = \sqrt{9^2 + 9^2} = 9\sqrt{2} = 12.73$$

$$BAED = 32 + 32 + 18 = 82$$

$$\text{total } P = 82 + 12.73 + \frac{9}{2}\pi = 108.9 \quad \boxed{1 \text{ dp}}$$

108.9

m [6]

7

Claudia invests £25000 at a rate of 2% per year compound interest.

Calculate the total amount of **interest** she will have earned after 5 years.

Give your answer correct to the nearest penny.

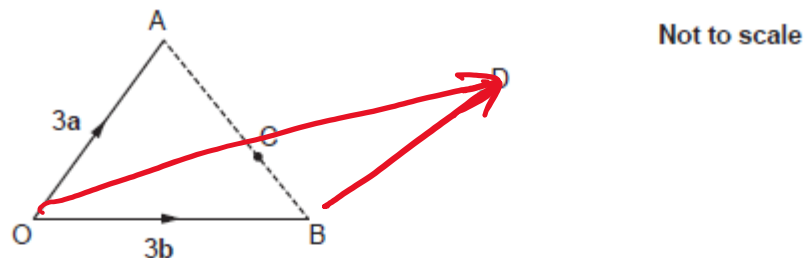
$$2\% = 1.02$$

$$5\% = 1.02^5 \times 25000 = 27602.02008$$

$$27602.02008 - 25000 = 2602.02$$

2602.02 ..... [4]

8



$$\vec{OA} = 3\mathbf{a} \text{ and } \vec{OB} = 3\mathbf{b}.$$

C lies on AB such that  $AC = 2CB$ .

D is such that  $\vec{BD} = 2\mathbf{a} + \mathbf{b}$ .

Show, using vectors, that OCD is a straight line.

[5]

$$\begin{aligned} \vec{OD} &= \vec{OB} + \vec{BD} \\ &= 3\mathbf{b} + 2\mathbf{a} + \mathbf{b} \\ &= 4\mathbf{b} + 2\mathbf{a} \end{aligned}$$

$$\begin{aligned} \vec{OC} &= \vec{OA} + 2\vec{CB} \\ &= 3\mathbf{a} + 2(\vec{OB} - \vec{OC}) \end{aligned}$$

$$3\mathbf{a} + 2\vec{CB} = 3\mathbf{b} + \vec{CB}$$

$$\vec{CB} = 3\mathbf{b} - 3\mathbf{a}$$

$$\vec{OC} = 3\mathbf{a} + 6\mathbf{b} - 6\mathbf{a}$$

$$\vec{OC} = -3\mathbf{a} + 6\mathbf{b}$$

9 (a)

The table shows values of  $x$  and  $y$ .

$x$	4	16	36
$y$	6	3	2

Show that these values fit the relationship that  $y$  is inversely proportional to  $\sqrt{x}$ . [2]

$$y \propto \frac{1}{\sqrt{x}}$$
$$y = \frac{k}{\sqrt{x}}$$
$$6 \times \sqrt{4} = k$$
$$k = 12$$
$$3 = \frac{12}{\sqrt{16}} \quad \checkmark$$
$$2 = \frac{12}{\sqrt{36}} \quad \checkmark$$

(b)

$a$  is inversely proportional to  $b^2$  and  $a = 3.75$  when  $b = 4$ .

Find a formula linking  $a$  and  $b$ .

$$a = \frac{k}{b^2}$$
$$3.75 = \frac{k}{4^2}$$
$$60 = k$$
$$a = \frac{60}{b^2}$$

$$a = \frac{60}{b^2}$$

(b) ..... [3]

10

Show that  $(a^3)^{-\frac{1}{3}} \times (a^2)^{\frac{1}{2}} = 1$ .

[3]

$$(a^3)^{-\frac{1}{3}} \times (a^2)^{\frac{1}{2}} =$$

$$a^{3 \times -\frac{1}{3}} = a^{-1}$$

$$a^{2 \times \frac{1}{2}} = a^1$$

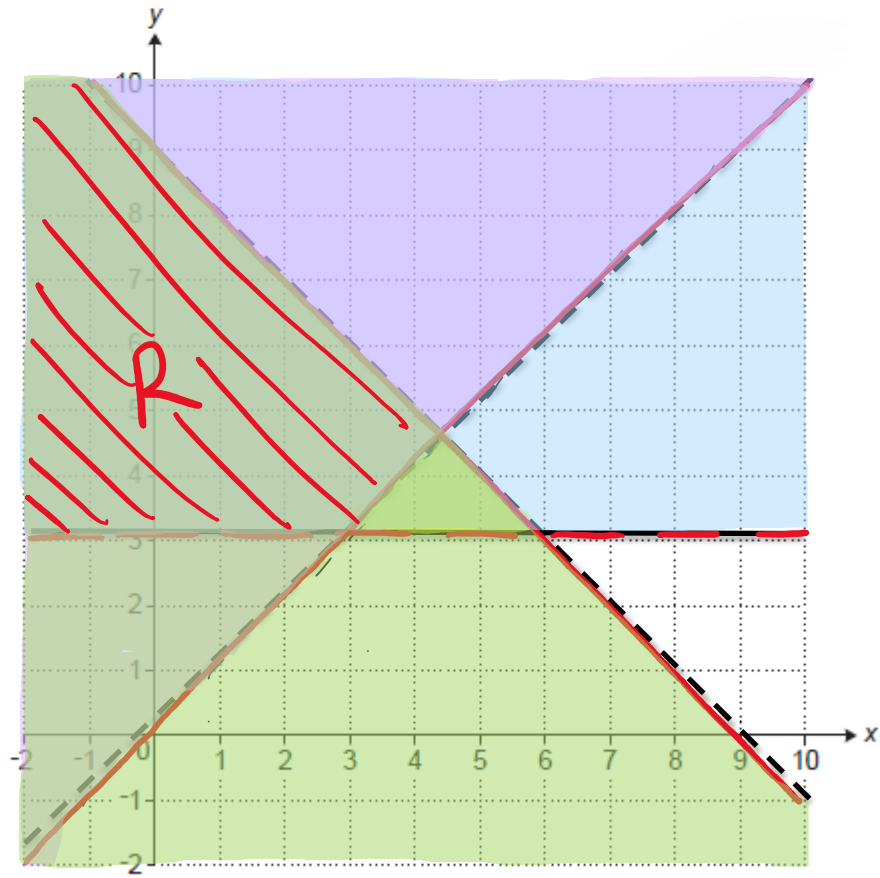
$$a^{-1+1} = a^0$$

$$a^0 = 1$$

Region R satisfies these inequalities.

$$\begin{cases} y > 3 \\ y \geq x \\ x + y \leq 9 \end{cases}$$

By drawing three straight lines on the grid, find and label the region R.



[6]

**Total Marks for Question Set 1: 51**



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