GCSE (9 – 1) Mathematics

J560/04 Paper 4 (Higher Tier)

Question Set 1

1. Calculate.

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

Give your answer correct to 3 significant figures.

$10^2 = 100$
$5^2 = 25$

$\frac{\sqrt[3]{210}}{\sqrt[3]{125}} = \frac{\sqrt[3]{210}}{5} = 1.19$

1.19 ..... [3]

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

Find the value of *n*.

1kg = 1000g

$= 50\left(\frac{50}{1} : \frac{1000}{n}\right) = 50$

$n = \frac{1000}{50}$

$n = 20$

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?

T = 20m LCM = 180m

A = 18m

(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

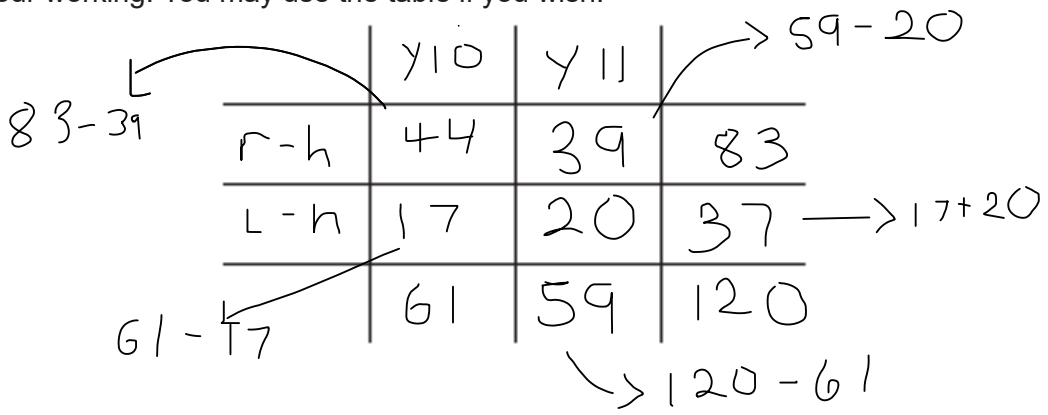
Chloe's age is 32 **[6]**

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

$Y10 = \frac{17}{61}$

$= 0.279$

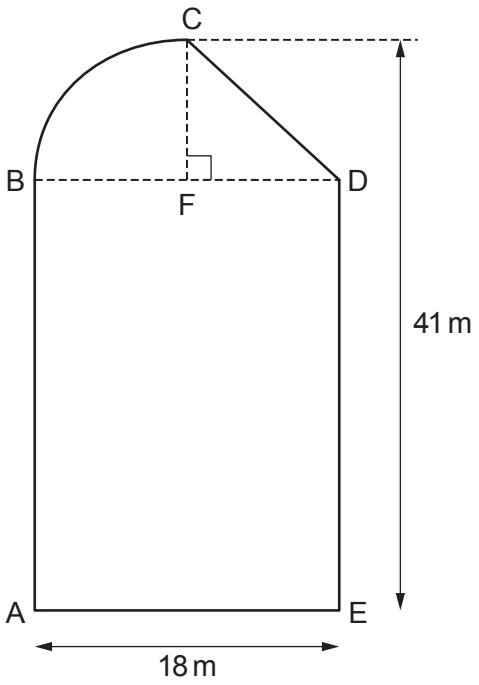
$Y11 = \frac{20}{59}$

$= 0.339$

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

[6]

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



Not to scale

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.

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

$CFD = (\sqrt{9^2+9^2}) = 9\sqrt{2} = 12.73$

$BAED = 32+32+18 = 82$

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

108.9 m [6]

7 Claudia invests £25 000 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.

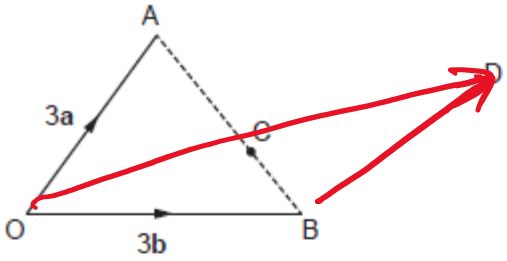
2% = 1.02

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

27602.02008 − 25000 = 2602.02

2602.02 ..... [4]

8



Not to scale

$\overrightarrow{OA} = 3\mathbf{a}$ and $\overrightarrow{OB} = 3\mathbf{b}$.
C lies on AB such that AC = 2CB.
D is such that $\overrightarrow{BD} = 2\mathbf{a} + \mathbf{b}$.

Show, using vectors, that OCD is a straight line. [5]

$\overrightarrow{OD} = 3b + 2a + b$

$= 4b + 2a$

$\overrightarrow{OC} = 3a + 2\overrightarrow{CB}$

$= 3b + \overrightarrow{BC}$

$3a + 2\overrightarrow{CB} = 3b + \overrightarrow{CB}$

$\overrightarrow{CB} = 3b - 3a$

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

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

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]**

$y \propto \frac{1}{\sqrt{x}}$

$y = \frac{k}{\sqrt{x}}$

$6 \times \sqrt{4} = k$

$k = 12$

$3 = \frac{12}{\sqrt{16}}$ ✓

$2 = \frac{12}{\sqrt{36}}$ ✓

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

Find a formula linking a and b.

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

$3.75 = \frac{k}{4^2}$

$60 = k$

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

(b) $a = 60/b^2$ ..... **[3]**

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

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

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

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

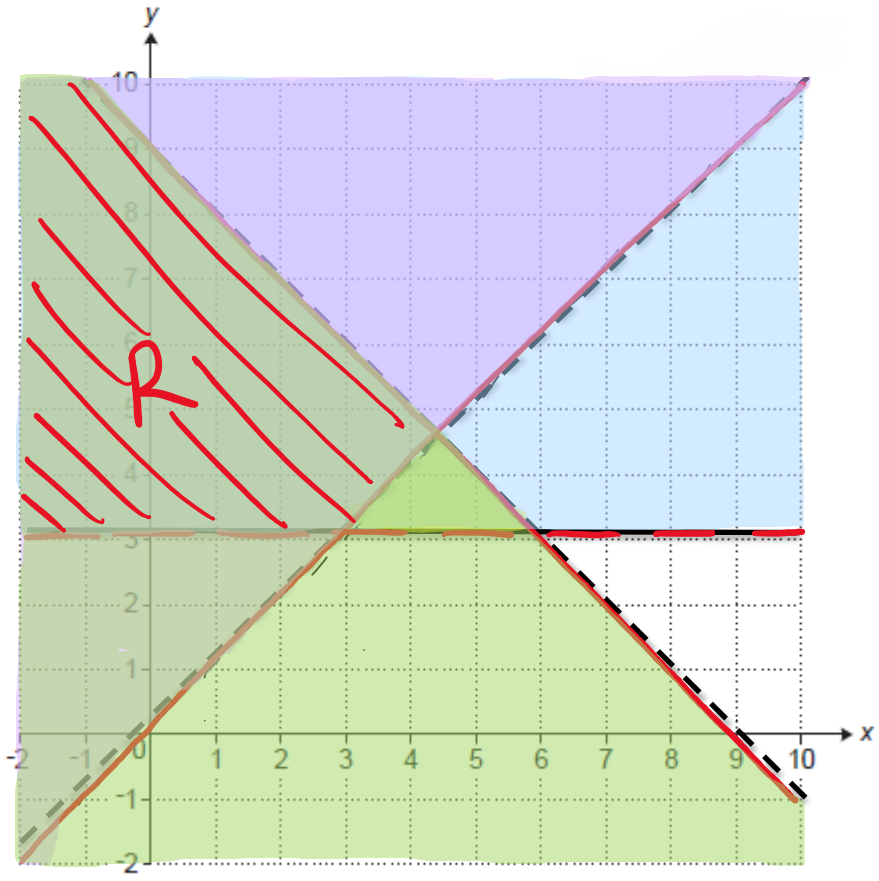
$a^{-1+1} = a^0$

$a^0 = 1$

11 Region **R** satisfies these inequalities.

$$\begin{cases} y > 3 \\ y \geqslant x \\ x + y \leqslant 9 \end{cases}$$

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



[6]

Total Marks for Question Set 1: 51