



GCSE MATHEMATICS

S21-C300

With Calculator Assessment Resource P

Higher Tier

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. (a) Emma buys a car for £6500.
She later sells it for £5720.
- Calculate her percentage loss.



[2]

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- (b) Emma buys another car for £8495.
Its value decreases by 16% each year.
- What is the car's value after 11 years?

[3]

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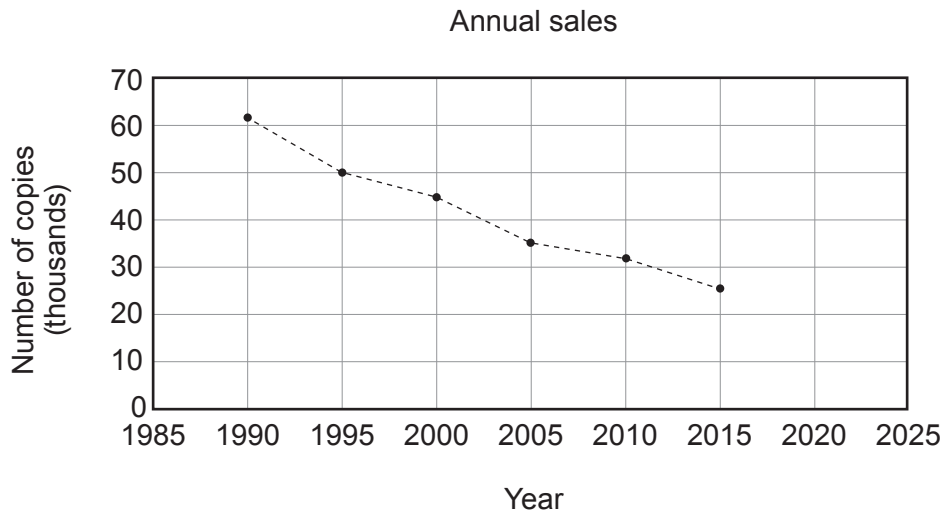
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2. The graph shows the number of copies of a local newspaper sold over a 25-year period.



(a) Eva uses the graph to predict that about 10 thousand newspapers will be sold in 2025.

Explain why her prediction may not be reliable.

[1]

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(b) The ratio of adults who read news online to those who do not is 16 : 9.
The adult population of the UK is about 52 000 000.

Calculate an estimate of the number of adults in the UK who read news online.

[2]

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3. (a) 7476 football supporters watched the first match of the season.

The ratio of men : women : children was 10 : 8 : 3.

Show that 712 more men than women watched the match.

[2]

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(b) At the second match of the season, the ratio of adults : children was 5 : 3.

At the third match, $\frac{2}{3}$ of the supporters were adults.

At which of these two matches was the proportion of adults higher?

You must show your working.

[2]

Second match

Third match

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5. The mass of the planet Mercury is 3.30×10^{23} kg.
The volume of the planet Mercury is 6.08×10^{19} m³.



Calculate the density of the planet Mercury in kg/m³.
Give your answer to 3 significant figures.

[3]

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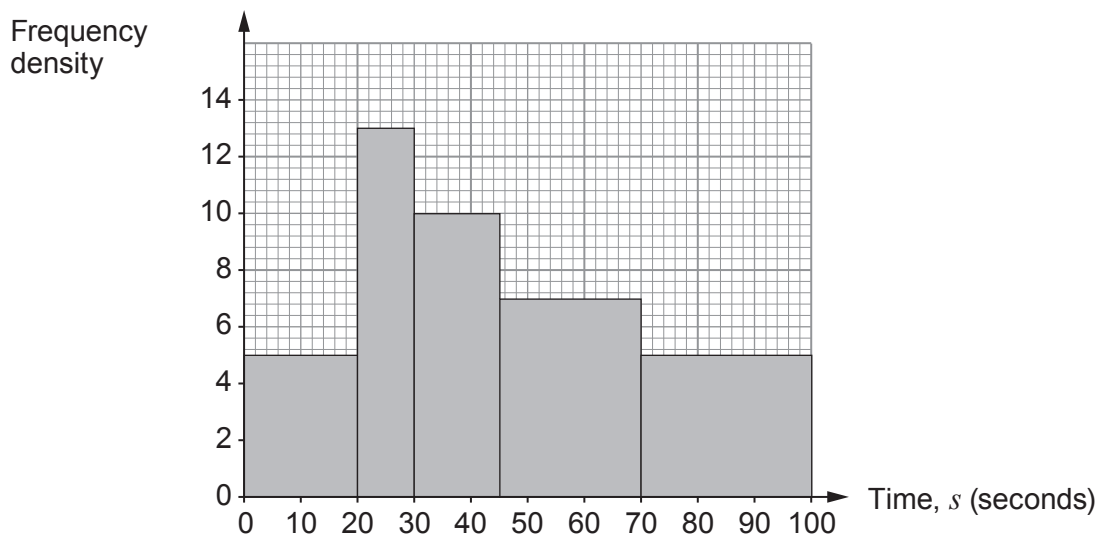
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Density = kg/m³

6. (a) Freya records how long each of 40 people can hold their breath. The results are shown in the table.

Time, s (seconds)	Frequency
$0 < s \leq 20$	5
$20 < s \leq 30$	13
$30 < s \leq 45$	10
$45 < s \leq 70$	7
$70 < s \leq 100$	5

Freya wants to draw a histogram for this data. This is the graph she draws.



Has Freya drawn a histogram?

Yes

No

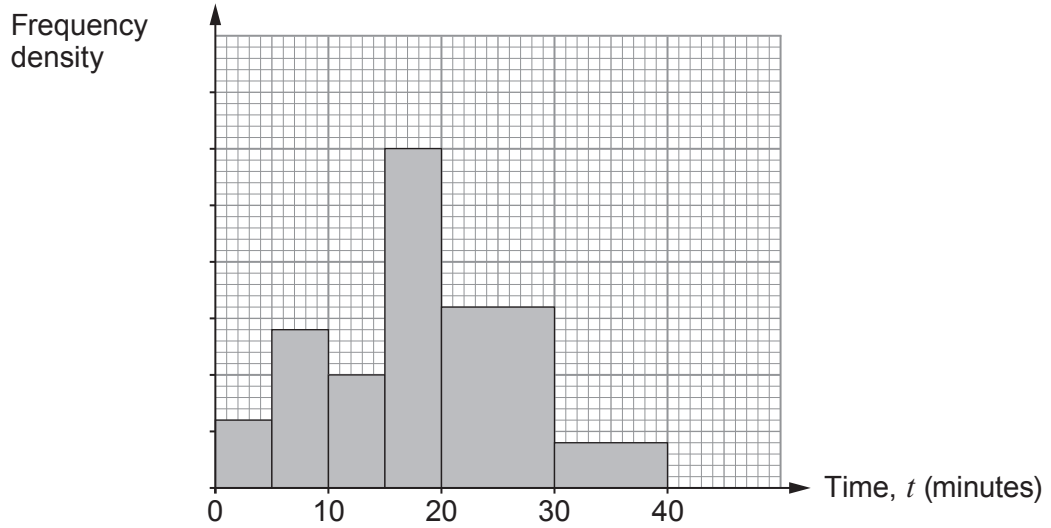
Give a reason for your answer.

[1]

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- (b) In one month, 2000 patients visited a doctors' surgery. This histogram shows information about the length of time, t minutes, these 2000 patients spent at the surgery.



The group $0 < t \leq 5$ represents 120 patients.

How many patients are represented by the group $30 < t \leq 40$?

[2]

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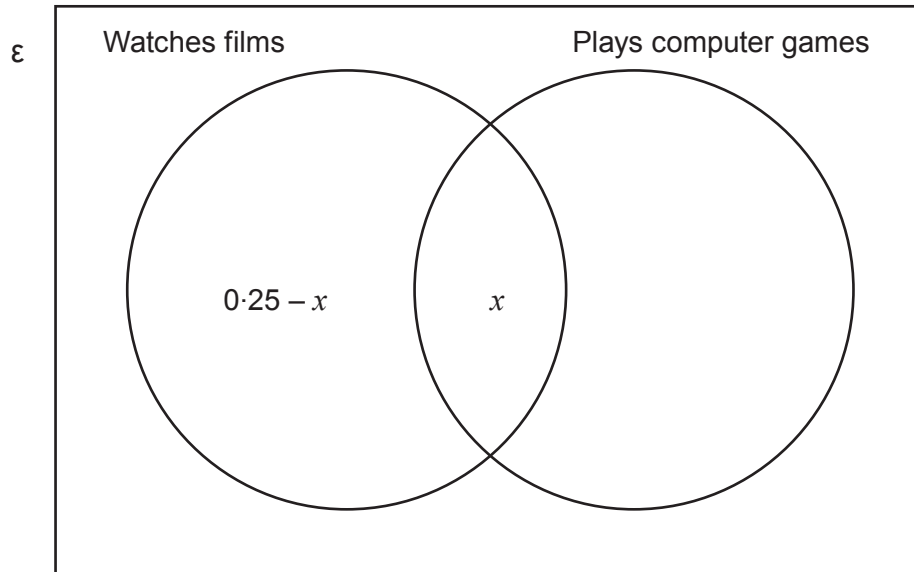
(b) Don sometimes spends his evenings watching films, playing computer games, or doing both.

On any evening the probability that Don:

- watches films is 0.25,
- plays computer games is 0.45,
- does neither is three times the probability that he does both.

(i) Complete the Venn diagram.

[1]



(ii) Work out the probability that, on any randomly chosen evening, Don watches films **and** plays computer games. [2]

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(iii) On the evenings Don watches films, what is the probability that he also plays computer games? [2]

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9. (a) The number of voles, V , on an island t years after the first voles are introduced is given by the formula

$$V = 135 \times 1.06^t.$$



- (i) How many voles were initially introduced? [1]

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- (ii) What is the percentage increase in the number of voles 5 years after they were introduced? [2]

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- (iii) When the number of voles reaches 500, the population starts decreasing at a rate of 5% **per month**.

The formula $V = 500 \times k^T$ is now used to model the number of voles, V , where T is the number of **years** after the population reached 500.

- What value of k should be used? [1]

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- (b) A population of birds on the island has a constant growth rate, $p\%$, per year. There were initially 300 birds. The population doubles in 20 years.



- Calculate the value of p . [3]

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