

- 9 James assumes that the population of birds on an island follows this exponential growth model.

$$P = 120r^t$$

P is the population t years after 1st June 2014.

On 1st June 2014 there were 120 birds.

On 1st June 2015 there were 138 birds.

- (a) Show that $r = 1.15$.

[2]

- (b) Calculate the population on 1st June 2025.

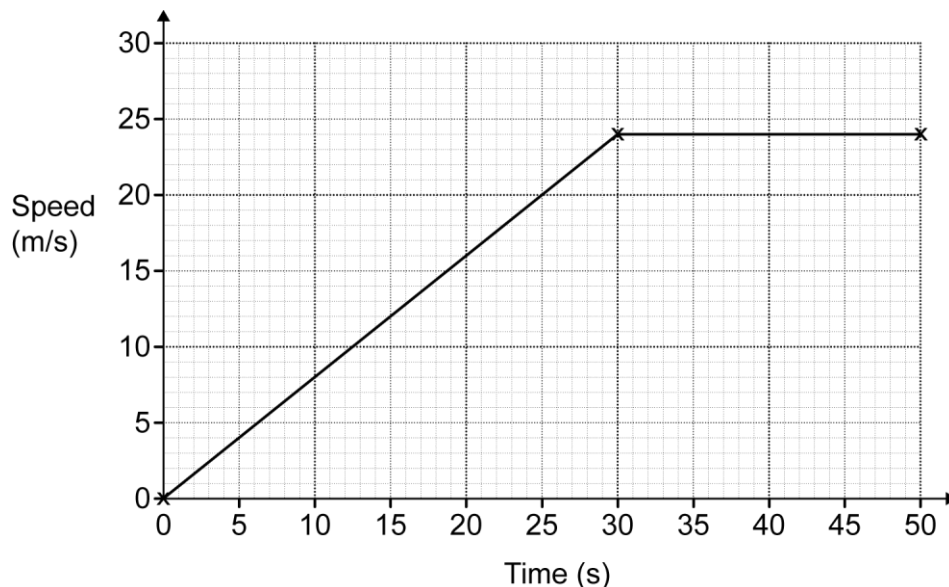
(b).....[2]

- (c) James estimates that the population will be about 6000 by 1st June 2042.

Explain why he might be wrong.

.....
[1]

10 (a) The graph shows the speed of a car during 50 seconds of motion.



(i) What is the speed after 20 seconds?

(a)(i)..... m/s [1]

(ii) Find the acceleration for the first 30 seconds.

(ii) m/s² [2]

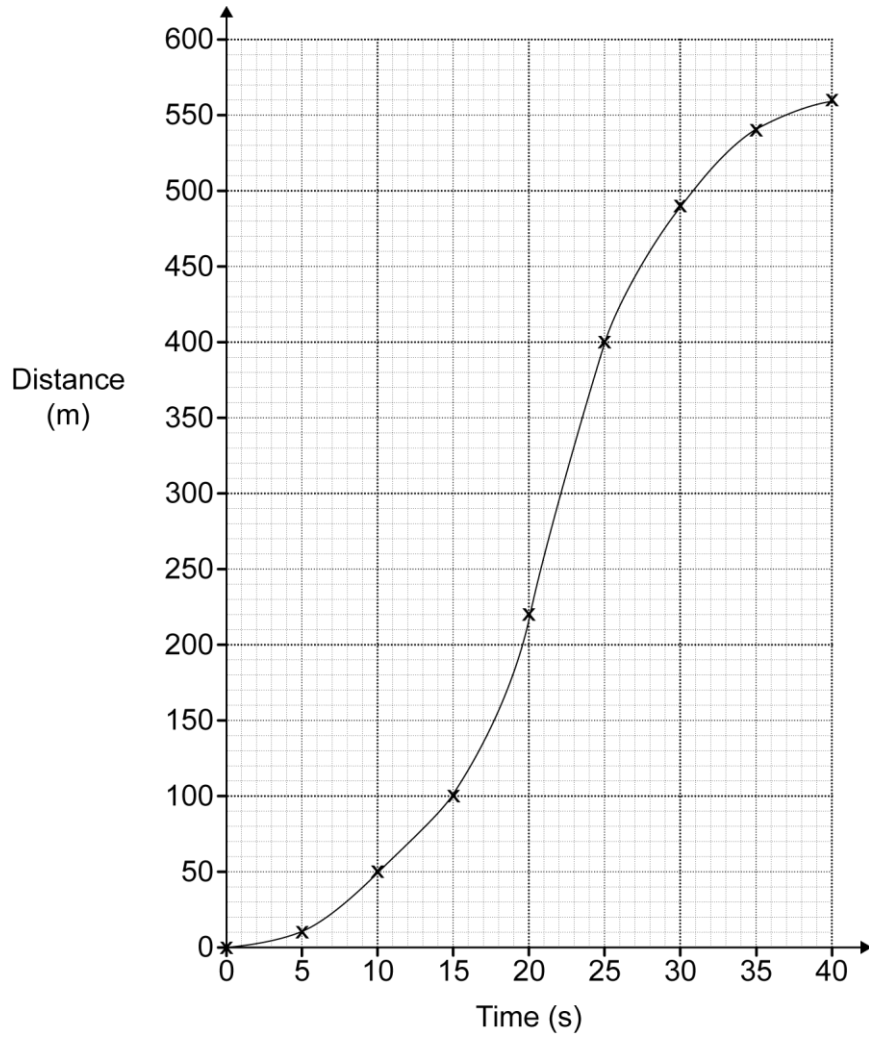
(iii) Work out the distance the car travelled during the 50 seconds.

(iii) m [3]

(iv) Work out the average speed of the car, in kilometres per hour, during the 50 seconds.

(iv) km/h [3]

(b) This graph shows the distance travelled by a van.



- (i) Find the average speed during the 40 seconds.
Give your answer in metres per second.

(b)(i) m/s [2]

- (ii) Show that the van travels at more than 70 miles per hour on at least one occasion.
Use 1 mile = 1.6 kilometres.

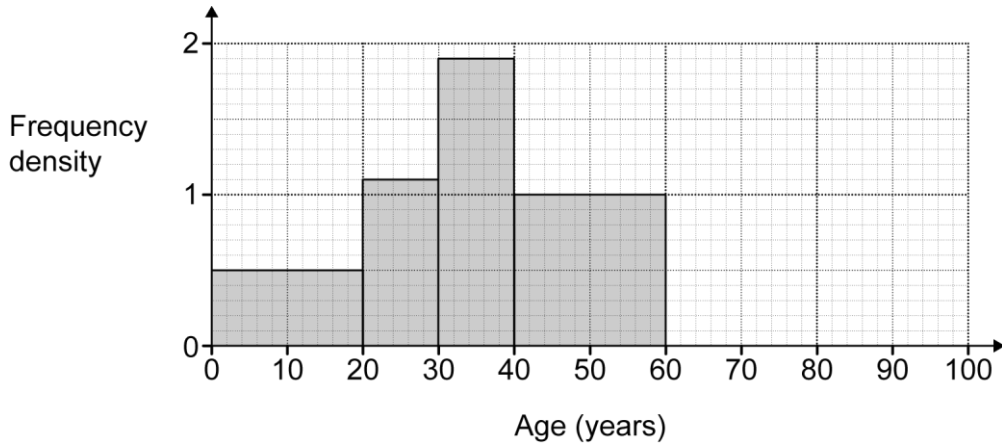
[6]

11 (a) Show that one solution of the equation $x^3 + 2x - 5 = 0$ lies between 1 and 2. [2]

(b) Find this solution correct to 1 decimal place.
Show your working.

(b).....[4]

- 12 Simon records the age of each person entering his village shop one day. Nobody entering his shop was aged over 100. This histogram summarises some of his results.



- (a) 84 people enter his shop that day.

Draw the bar for the 60 to 100 age group.
Show your working.

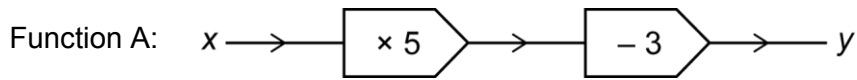
[5]

- (b) The average age in the UK in 2015 was 40.
The mean age of Simon's sample is 47.1.
He concludes that people in his village are older on average than those in the UK.

How reliable is his conclusion?

.....
..... [1]

13 Here is a function.



(a) (i) Work out y when $x = -2$.

(a)(i) [1]

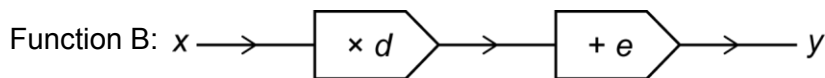
(ii) Work out x when $y = 72$.

(ii) [1]

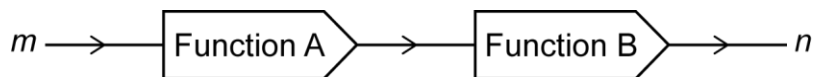
(iii) Find the inverse of function A.

[2]

Here is another function.



(b) The diagram below shows a composite function.



When $m = 4, n = 53$.

When $m = 9, n = 128$.

Find the values of d and e .

(b) $d = \dots\dots\dots$

$e = \dots\dots\dots$ [4]

14 The table shows the membership of a tennis club by category.

	Junior	Adult
Female	5	11
Male	7	14

A junior captain and an adult captain are to be chosen.
It is decided that one should be female and one should be male.

How many different outcomes are possible?

.....[4]

15 (a) Here are the first four terms of a sequence.

$$u_1 = 1 \quad u_2 = \sqrt{3} \quad u_3 = 3 \quad u_4 = 3\sqrt{3}$$

Find the terms u_6 , u_9 and u_{21} .

(a) $u_6 = \dots\dots\dots$

$u_9 = \dots\dots\dots$

$u_{21} = \dots\dots\dots$ [3]

(b) Here are the first four terms of a quadratic sequence.

$$w_1 = 6 \quad w_2 = 14 \quad w_3 = 28 \quad w_4 = 48$$

The n th term is $w_n = an^2 + bn + c$.

Find the values of a , b and c .

(b) $a = \dots\dots\dots$

$b = \dots\dots\dots$

$c = \dots\dots\dots$ [4]

END OF QUESTION PAPER

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