NEW

1 Lei is in a class of 28 students, 3 of whom are left-handed.
There are 1250 students in the school.

(a) Use this information to estimate how many students in the school are left-handed.

(a) ..... **[3]**

(b) Is your solution to **(a)** likely to be an overestimate or an underestimate?
Explain your reasoning.

.....

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

(c) Vid is at a different school.
He is in a class of 26 students, 6 of whom are left-handed.

Vid says to Lei

In our two classes there are 54 students, 9 of whom are left-handed.
We can use this bigger sample to improve the estimate.

What assumption has Vid made?
Explain whether you think that his argument is correct.

.....

..... **[2]**

Same as Q2 as Draft SAMs

2 18 kg of copper is mixed with 10.5 kg of zinc to make an alloy.

The density of copper is 9 g/cm^3.
The density of zinc is 7 g/cm^3.

(a) Work out the volume of copper used in the alloy.

(a) ..... cm^3 **[2]**

(b) What is the density of the alloy?

3 (a) (i) Solve.

$5x + 1 > x - 18$

(a)(i) ..... [3]

(ii) Write down the largest integer that satisfies $5x - 1 < 10$.

(ii) ..... [1]

(b) Solve.

$3x^2 = 75$

(b) $x =$ ..... [2]

(c) Solve.

$4x + 3y = 5$

$2x + y = 3$

(c) $x =$ .....

$y =$ .....

[3]

Same as Q3 as Draft SAMs

4 Here are the interest rates for two accounts A and B.

Account A	Account B
Interest: 3.5% per year compound interest. No withdrawals until the end of three years.	Interest: 4% for the first year, 3.5% for the second year and 3% for the third year. Withdrawals allowed at any time.

Derrick has £10 000 he wants to invest.

(a) Calculate which account would give him most money if he invests his money for 3 years.
Give the difference in the interest to the nearest penny.

Same as Q4 as Draft SAMs

(a) Account ..... by ..... p **[5]**

(b) Explain why he might **not** want to use Account A.

.....

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

5 **(a)** This expression can be used to generate a sequence of numbers.

$$n^2 - n + 11$$

Some terms of this sequence are prime numbers.

(i) Work out the first three terms of this sequence.

(a)(i) ..... , ... , ... **[2]**

(ii) Show that this expression does not **always** generate prime numbers.

.....

..... **[2]**

(b) Marta thinks

odd square numbers have exactly three factors.

Give one example for this view and one against it.
In each case, write down the number and its factors.

For .....

Against .....

[2]

(c) Here are some properties of a number.

- It is a common factor of 288 and 360.
- It is a common multiple of 4 and 6.
- It is larger than 25.

Find the **two** possible numbers with these properties.

(ii) Explain why square numbers have an odd number of factors.

.....

.....

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

7

(c) The cube of each prime number has exactly four factors.

(i) Show that 2^3 has exactly four factors.

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

(ii) Write down the four factors of n^3, given that n is a prime number.

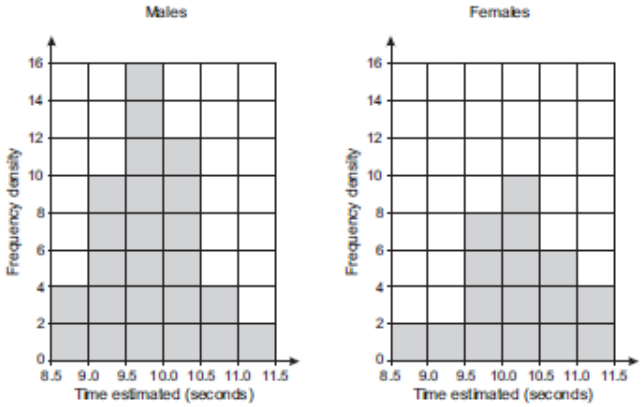
..... **[1]**

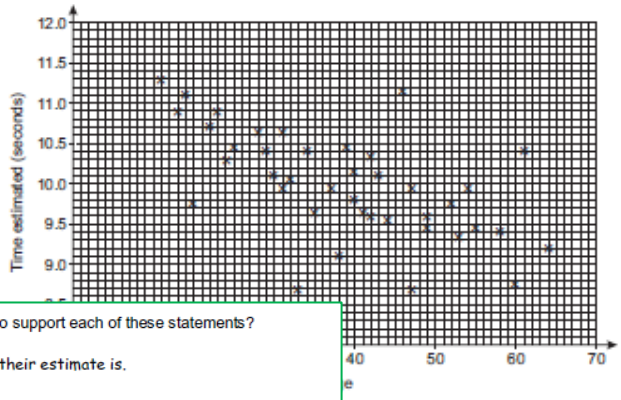
Based on Q5 as Draft SAMs

Parts of the question have been removed

6 John wants to investigate whether men in the UK are better at estimating a time interval of 10 seconds than women in the UK. He decides to sample the population by asking his work colleagues to take the test.

The diagrams below summarise John's results.





(a) What information from the diagrams can be used to support each of these statements?

(i) The older John's colleagues are, the lower their estimate is.

.....

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

(ii) Males in the sample tend to underestimate the interval and females in the sample tend to overestimate the interval.

.....

..... **[2]**

(b) Comment on whether any conclusions can be drawn for the UK population from the results of this sample.

.....

..... **[2]**

Same as Q6 as Draft SAMs

7 Without using a calculator, show clearly that $64^{\frac{2}{3}}$ is equal to 16. **[2]**

Same as Q7 as Draft SAMs

8 The 'rule of nines' states that a whole number will be a multiple of 9 if the sum of its individual digits is divisible by 9.

(a) Use the 'rule of nines' to show that 292 158 is divisible by 9. **[1]**

(b) Any two-digit number with tens digit a and units digit b can be written as $10a + b$.

(i) By writing this as $9a + a + b$, show that the 'rule of nines' works for two-digit whole numbers. **[2]**

(ii) Extend your argument to show that the 'rule of nines' works for three-digit whole numbers. **[2]**

Same as Q8 as Draft SAMs

9 Alexander, Reiner and Wim each watch a different film.
Alexander's film is thirty minutes longer than Wim's film.
Reiner's film is twice as long as Wim's film.
Altogether the films last 390 minutes.

How long is each of their films?

NEW

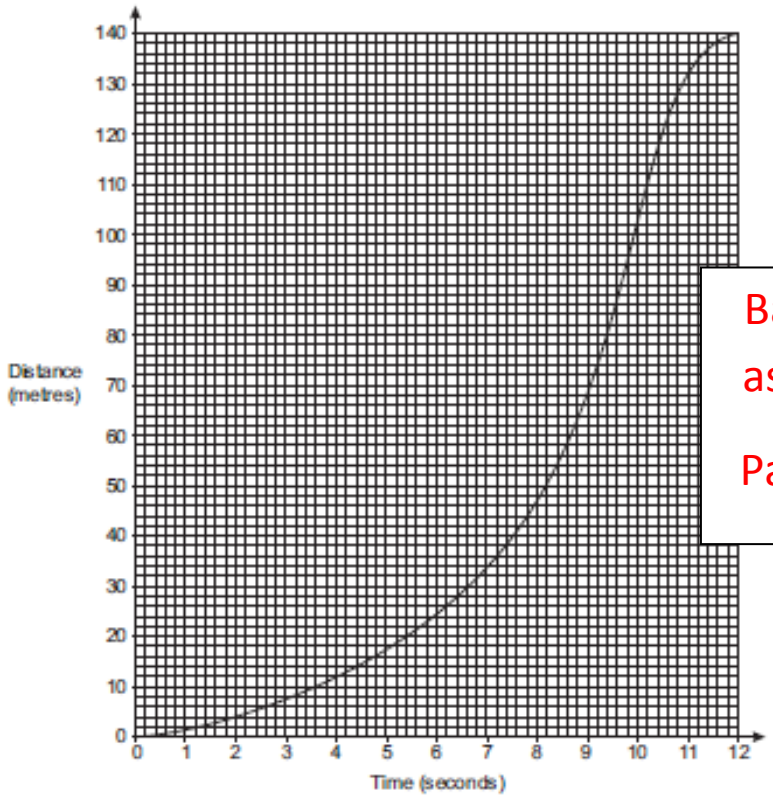
Alexander's film ..... minutes

Reiner's film ..... minutes

Wim's film ..... minutes

[4]

10 The graph shows the distance travelled by an animal over 12 seconds.



Based on Q10 as Draft SAMs

Parts c is NEW

(a) Work out the average speed between 2 and 8 seconds.

(a) ..... m/s **[2]**

(b) Estimate the speed of the animal at 6 seconds.

(b) ..... m/s **[4]**

(c) Nuri says

I think this animal must be able to move at over 20 m/s!

Do you agree with Nuri?
Explain your decision.

.....

..... **[2]**

11 A skills test has two sections, literacy (L) and numeracy (N).
On one day everyone who took the skills test passed at least one section.
88% passed the literacy section and 76% passed the numeracy section.

(a) Represent this information on a Venn diagram.
Show clearly the **percentage** of people in each section of the diagram. **[3]**

Based on Q13 as Draft SAMs

Parts b has been changed

(b) One person is chosen at random from all the people who took the skills test on that day.

What is the probability that this person

(i) passed the numeracy section, given that they passed the literacy section,

(b)(i) ..... **[2]**

(iii) passed the literacy section, given that they passed only one section?

(ii) ..... **[2]**

(b) One person is chosen at random from all the people who took the skills test on that day.

What is the probability that this person

(i) passed both sections,

(b)(i) ..... **[1]**

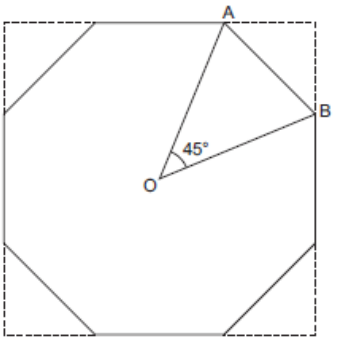
(ii) passed the numeracy section, given that they passed the literacy section,

(ii) ..... **[2]**

(iii) passed the literacy section, given that they passed only one section?

(iii) ..... **[2]**

12 Simon cuts the corners off a square piece of card to leave the regular octagon shown below.
O is the centre of the octagon.
A and B are vertices of the octagon.
OA = OB = 5 cm.
Angle AOB = 45°.



Not to scale

(a) **(i)** Work out the area of the octagon.

..... cm^2 **[3]**

(ii) Work out the area of the original square piece of card.

(ii) ..... cm^2 **[5]**

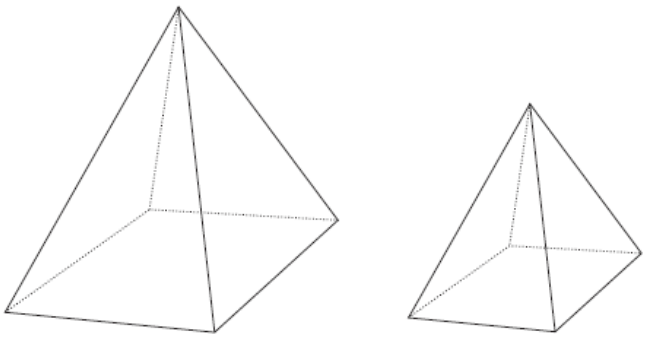
(b) Sally also has a square piece of card.
She also cuts the corners off her card to leave a regular octagon.
The sides of Sally's square piece of card are half as long as the card Simon used.

Find the ratio of the area of Simon's octagon to Sally's octagon.

(b) ..... : ..... **[2]**

Same as Q12 as Draft SAMs

13 Two similar pyramids A and B have surface areas 180 cm^2 and 80 cm^2 respectively.



Pyramid A

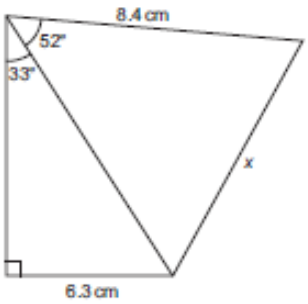
Pyramid B

The volume of pyramid A is 810 cm^3.

Show that the volume of pyramid B is 240 cm^3. **[5]**

Same as Q14 as Draft SAMs

14 Calculate x.



Not to scale

.....

Same as Q15 as Draft SAMs

15 A straight line goes through the points (p, q) and (r, s), where

- $p + 2 = r$
- $q + 4 = s$.

Find the gradient of the line.

NEW

..... **[3]**

16 A unit fraction is the reciprocal of a positive integer, for example $\frac{1}{3}$, $\frac{1}{7}$ and $\frac{1}{25}$ are all unit fractions.

Unit fractions can be written as the sum of two different unit fractions, for example

$$\frac{1}{2} = \frac{1}{3} + \frac{1}{6}.$$

Write the following unit fractions as the sum of two **different** unit fractions.

$\frac{1}{4} = \frac{1}{\square} + \frac{1}{\square}$ $\frac{1}{5} = \frac{1}{\square} + \frac{1}{\square}$ $\frac{1}{6} = \frac{1}{\square} + \frac{1}{\square}$

[3]

NEW

17 $y = 6x^4 + 7x^2$ and $x = \sqrt{w + 1}$.

Find the value of w when $y = 10$.
Show your working.

Same as Q16 as Draft SAMs

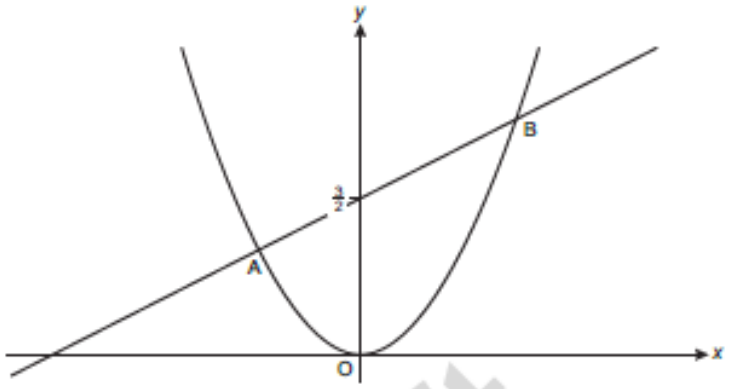
$w =$ ..... **[6]**

THE FOLLOWING HAVE BEEN REMOVED:

9 y is **directly** proportional to x.
$y = 28$ when $x = 4$.

Find an equation linking x and y. **[2]**

11 The diagram shows a sketch of the curve $y = x^2$ and a straight line through $(0, \frac{3}{2})$ with gradient $\frac{1}{2}$.
The line meets the curve at points A and B.



(a) Write down the equation of the straight line.

(a) ..... **[2]**

(b) Find the coordinates of A and B.

A (..... , ...)

B (..... , ...)

[6]

1 A straight line goes through the points $(3, 4)$ and $(8, -6)$.

Find the equation of the line.

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