OCR Paper 4H Practice Booklet

20 practice questions based on the advance information

Copies of this booklet, as well as hints & solutions, are available at bossmaths.com/advanceinfo

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Question 1

Calculate $\dfrac{707 + 7007}{7 \times (600 - 7^2)} - 7 + 5$

Use your calculator!

Type this exactly as it appears.

Question 2

y is directly proportional to x^2. When $x = 11$, $y = 605$. Find the value of x when $y = 720$.

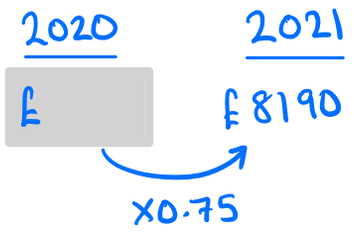
x	x^2	y
11	121	605
		720

Once you find this, you can take the square root to find x.

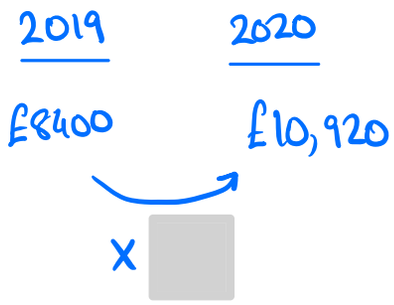
Question 3

An antique vase was worth £8400 on January 1st 2019.
By January 1st 2020, it had increased in value.
By January 1st 2021, however, its value fell by 25% to £8190.

(a) What was the antique worth on January 1st 2020?



(b) By what percentage did the value of the vase increase between January 1st 2019 and January 1st 2020?



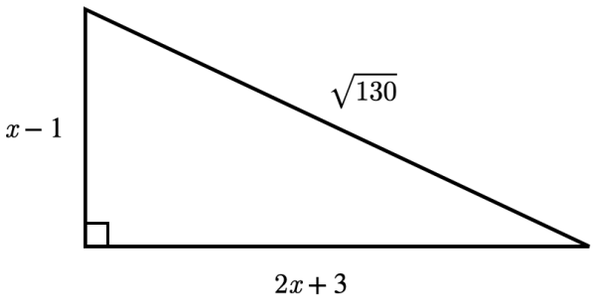
Question 4

Nikolai is conducting a survey to find out how often people attend football matches. He waits outside a football stadium on a match day and asks fans to tell him roughly how many matches they go over a year.

Comment on the suitability of Nikolai's sampling method.

Question 5

The diagram shows the lengths, in centimetres, of the sides of a right-angled triangle.
Show that $x^2 + 2x - 24 = 0$.



Pythagoras' theorem $\Rightarrow (2x+3)^2 + (x-1)^2 = (\sqrt{130})^2$

...

Question 6

(a) Factorise $3x^2 + 16x - 12$

(b) Expand and simplify as far as possible: $-7x - 3(9 - 2x)$

$\equiv -7x + -3(9-2x)$

$\equiv \ldots$

Question 7

Simplify fully $\dfrac{2x^2 + 9x - 5}{(3x + 4) - (x + 5)}$

← Factorise

← Simplify by collecting like terms. Take care with the brackets

Once you've done this, you should see the numerator and denominator share a common factor.

Question 8

Write the number six billion, eleven million and seventy in standard form.

6,011,000,070 = ...

Question 9

An aeroplane lands on runway at a speed of 100 **knots**.

You are given that 1 knot = 1.852 km/h

Calculate the speed of the aircraft in metres per second.

100 knots = 100 x 1.852 km/h

= 185.2 km/h

Try converting this into metres per hour and then metres per second.

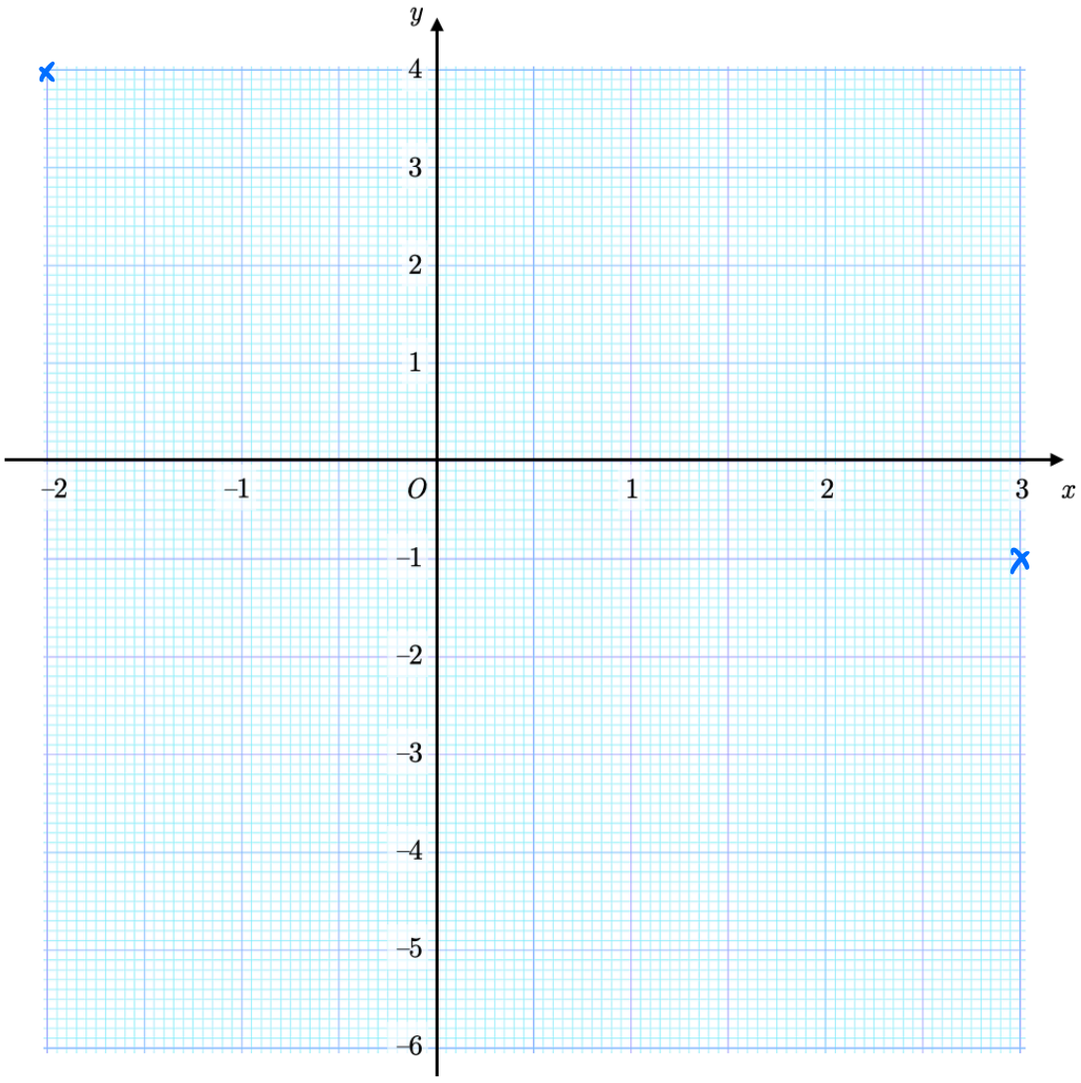
Question 10

(a) $f(x) = x^2 - 2x - 4$

Complete the table of values for $y = f(x)$

x	–2	–1	0	1	2	3
y	4					−1

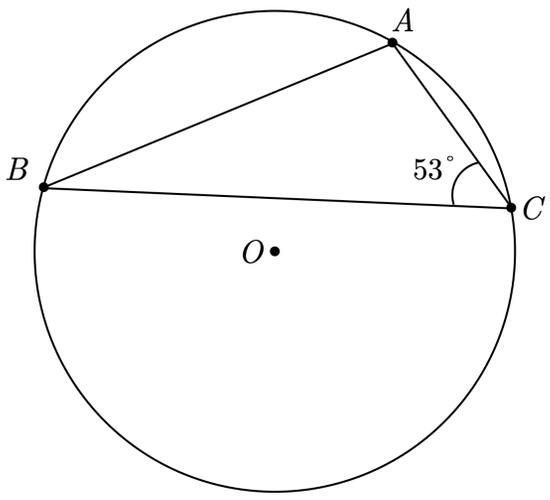
(b) On the grid, draw the graph of $y = f(x)$ for values of x from –2 to 3.



(c) Write down the coordinates of the turning point of $f(x)$.

Question 11

The diagram shows a circle, with centre O, and points A, B, and C marked on the circumference.



(a) Fill in the blank using one of the words from the list below:

The line segment BC is a ..... of the given circle.

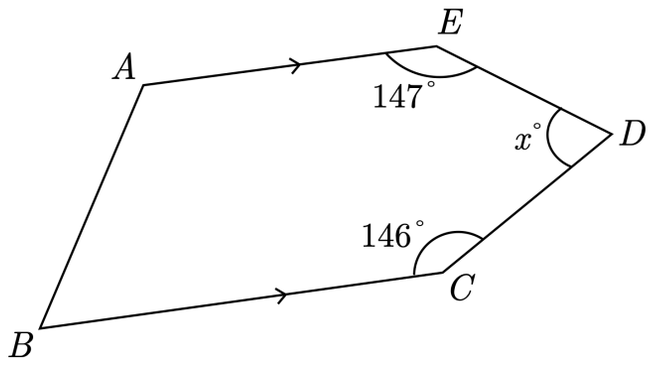
diameter radius segment sector chord

(b) Given that angle $ACB = 53^\circ$, calculate the size of angle OAB.

- Use "the angle at the centre is twice the angle at the circumference."
- Also, what kind of triangle is triangle OAB?

Question 12

The diagram shows pentagon $ABCDE$.
A, B and C lie on a straight line.
AE is parallel to BC.
Angle $DCB = 146^\circ$and angle $AED = 147^\circ$.



Find the value of x.

- Can you spot a pair of co-interior angles here?
- The interior angles of an n-sided polygon add up to $180(n-2)$ or $180n - 360$

Question 13

The following table shows the probabilities of rolling each number on a **biased** dice.

Number	1	2	3	4	5	6
Probability	0.23	b	$2b$	$3a-1$	0.14	0.13

You are given these two facts:
P(rolling a 4) $\geq$ P(rolling a 5).
P(rolling a 4) $\leq$ P(rolling a 1).

(a) Find the minimum and maximum possible values of a.

$P(5) \leq P(4) \leq P(1)$

$\Rightarrow 0.14 \leq 3a-1 \leq 0.23$

Solve this inequality

..... $\leq a \leq$ .....

(b) Find the maximum possible value of b, writing your answer as a fraction in its simplest form.

To maximise b, we need to minimise $3a-1$
i.e. let it equal 0.14.

Question 14

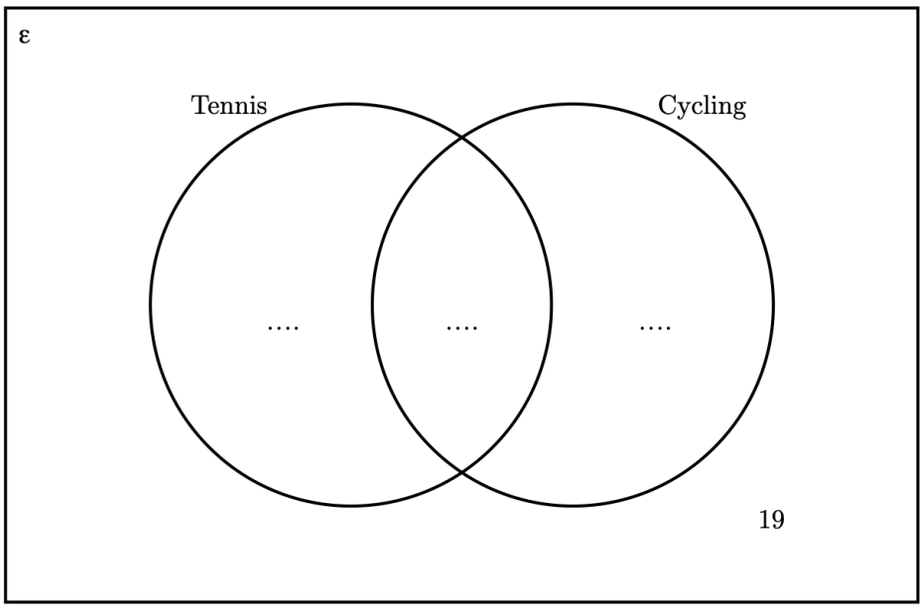
A group of 40 people are asked whether like tennis, cycling, both, or neither.

The probability that a randomly chosen individual likes tennis is $\frac{1}{5}$. } 8 people

The probability that a randomly chosen individual likes cycling is $\frac{3}{8}$. } 15 people

Of the 40 people, 19 said they didn't like either tennis or cycling. } The missing numbers must add up to 40-19 = 21.

(a) Fill in the three blanks in this Venn diagram.



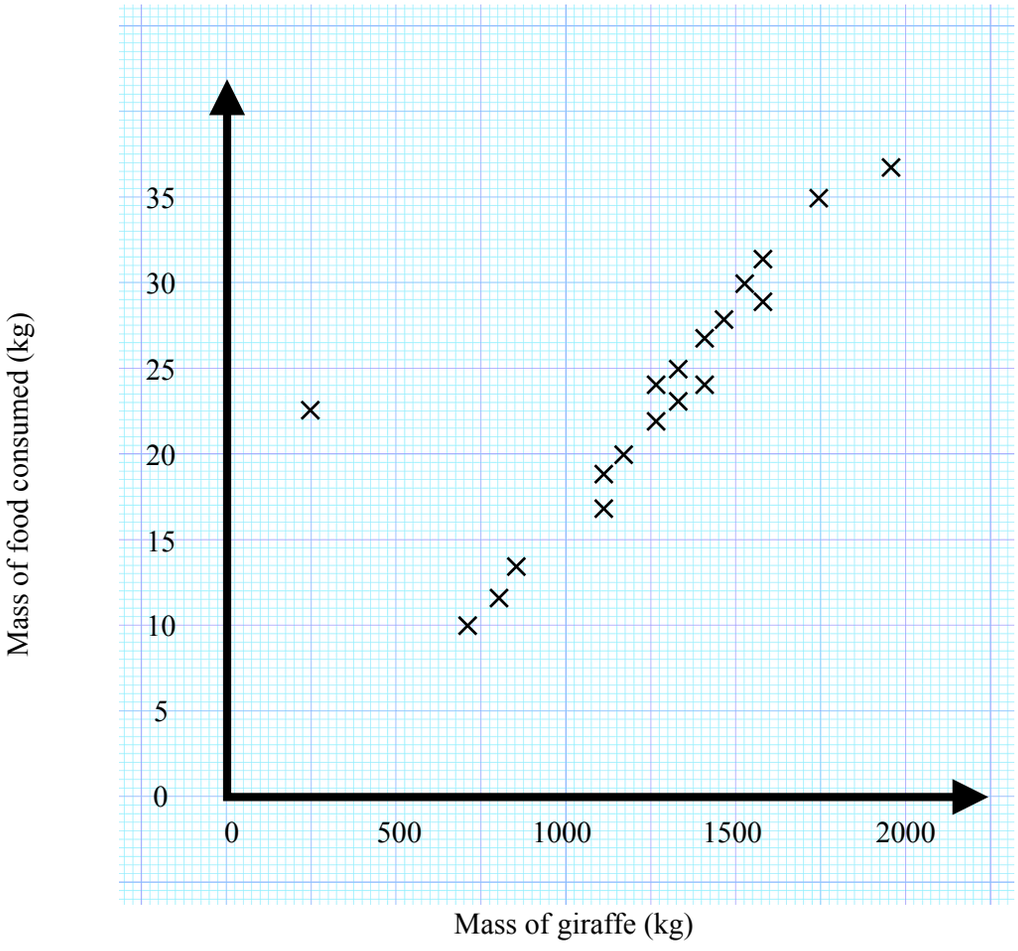
(b) Write down the probability that a randomly chosen individual likes tennis given that they like cycling.

How many like cycling in total?

How many of those like tennis?

Question 15

This scatter diagram shows information on the masses of food consumed in a day by 19 giraffes in a zoo, and the masses of those giraffes.



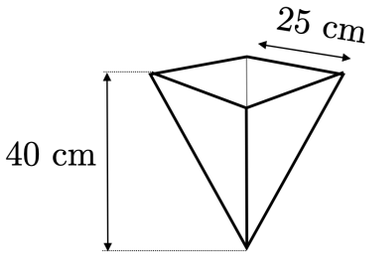
(a) An error was made when recording the mass of one giraffe. On the scatter diagram, circle the plot that is most likely to correspond to this giraffe.

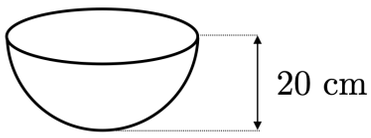
(b) Describe the type and strength of the correlation shown in this diagram.

(c) Another giraffe was recorded as having a mass of 1000 kg. This giraffe consumed 18 kg of food in a day. Plot this result on the scatter diagram.

Question 16

John has two empty containers. He starts to fill them with water at the same time.
One container is a square-based pyramid, and the other is a hemispherical bowl.
The dimensions of the containers are shown:





Volume of a sphere with radius r is $\frac{4}{3}\pi r^3$, but note this is a hemisphere.

The tap being used to fill the pyramid container runs at a rate of 35 cm^3 per second.
The tap being used to fill the hemispherical bowl runs at a rate of 60 cm^3 per second.

State which container will fill up first. You must show your working.

Volume of pyramid = $\frac{1}{3} \times 25^2 \times 40 =$ [redacted] cm^3

This will take [redacted] seconds to fill

Volume of bowl = $\frac{2}{3} \times \pi \times 20^3 =$ [redacted] cm^3

This will take [redacted] seconds to fill

Then clearly state which fills up first

Question 17

Prove that the product of two consecutive odd numbers is always one less than a multiple of 4.

Let n be an integer.

Then $2n+1$ and $2n+3$ are consecutive odd numbers.

Product $= (2n+1)(2n+3)$

$= \ldots$

You eventually need to write this in the form $4(\ldots\ldots)-1$ to show it is 1 less than a multiple of 4.

Question 18

(a) $\frac{x+2}{x-1} - \frac{x+3}{x+1}$ can be written in the form $\frac{x+a}{x^2+b}$, where a and b are integers.

Work out the values of a and b.

Rewrite the fractions so they have a common denominator — in this case $(x-1)(x+1)$:

$$\frac{(x+2)(x+1)}{(x-1)(x+1)} - \frac{(x-1)(x+3)}{(x-1)(x+1)}$$

$= \ldots$

(b) Hence, or otherwise, work out $\frac{1002}{999} - \frac{1003}{1001}$

Substitute $x = 1000$ into your answer to (a)

Question 19

A scientist is growing cells in a petri dish.
He starts his experiment at noon.
The number of cells in the dish increases by 1.9% every hour.
At 8 pm, there are 930 cells in the petri dish.
How many cells would there have been at 3 pm?

} Hourly multiplier = 1.019

5 hours before 8 pm

Question 20

(a) The circle R has equation $x^2 + y^2 = k$. Given that the point with coordinates $(6, 3)$ lies on C, find the value of k.

$x^2 + y^2 = k$

(b) The circle S has centre $(0, 0)$. The point with coordinates $(4, 8)$ lies on S.
Find the ratio of the circumference of R to the circumference of S.

Radius of circle S = ...

Radius of circle R = ...

Since a circle's circumference is directly proportional to its radius, the ratio of the circumferences is equal to the ratio of the radii. ...