# OCR Paper 6H Practice Booklet

## 22 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

Given that $\dfrac{(x^{-3})^5}{x^{-7}} \times \dfrac{x^{-\frac{1}{2}}}{x} \equiv x^m$, find the value of $m$.

$(a^m)^n \equiv a^{mn}$

$\dfrac{a^m}{a^n} \equiv a^{m-n}$

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### Question 2

(a) Circle the cube number:

9260 5832 4911 2748

Try finding the cube root of each number on your calculator.

(b) A pudding recipe for 4 people requires 120 grams of butter.
Calculate the amount of butter needed to make the pudding for 12 people.

## Question 3

The value of some machinery decreases by a fixed 4.5% every year.
Ten years after its construction, the machinery had a value of £820.31.

What was the value of the machinery 7 years after its construction?

Annual multiplier = 0.955

7 years after construction is 3 years before it is 10 years old.

£.....

## Question 4

(a) Factorise $16x^2 - 9$ Difference of two squares

(b) Expand and simplify $t(7t-4) - 5(7t-4) + t(4-7t) + 3(7t-4)$

There is a shortcut here, but even if you don't spot it, you can just expand and then collect like terms:

$7t^2 - 4t - 35t + 20 + \ldots$

## Question 5

Roberto is $x$ years old.
Diogo is 5 years younger than Roberto. $x - 5$
Mohamed is 4 years older than Diogo. $x - 1$

(a) Write an expression, in terms of $x$, for the sum of the ages, in years, of Roberto, Diogo, and Mohamed.

Moacir is 54 years older than Roberto. $x + 54$
Moacir's age is equal to the sum of the ages of Roberto, Diogo, and Mohamed.

(b) Find Diogo's age.

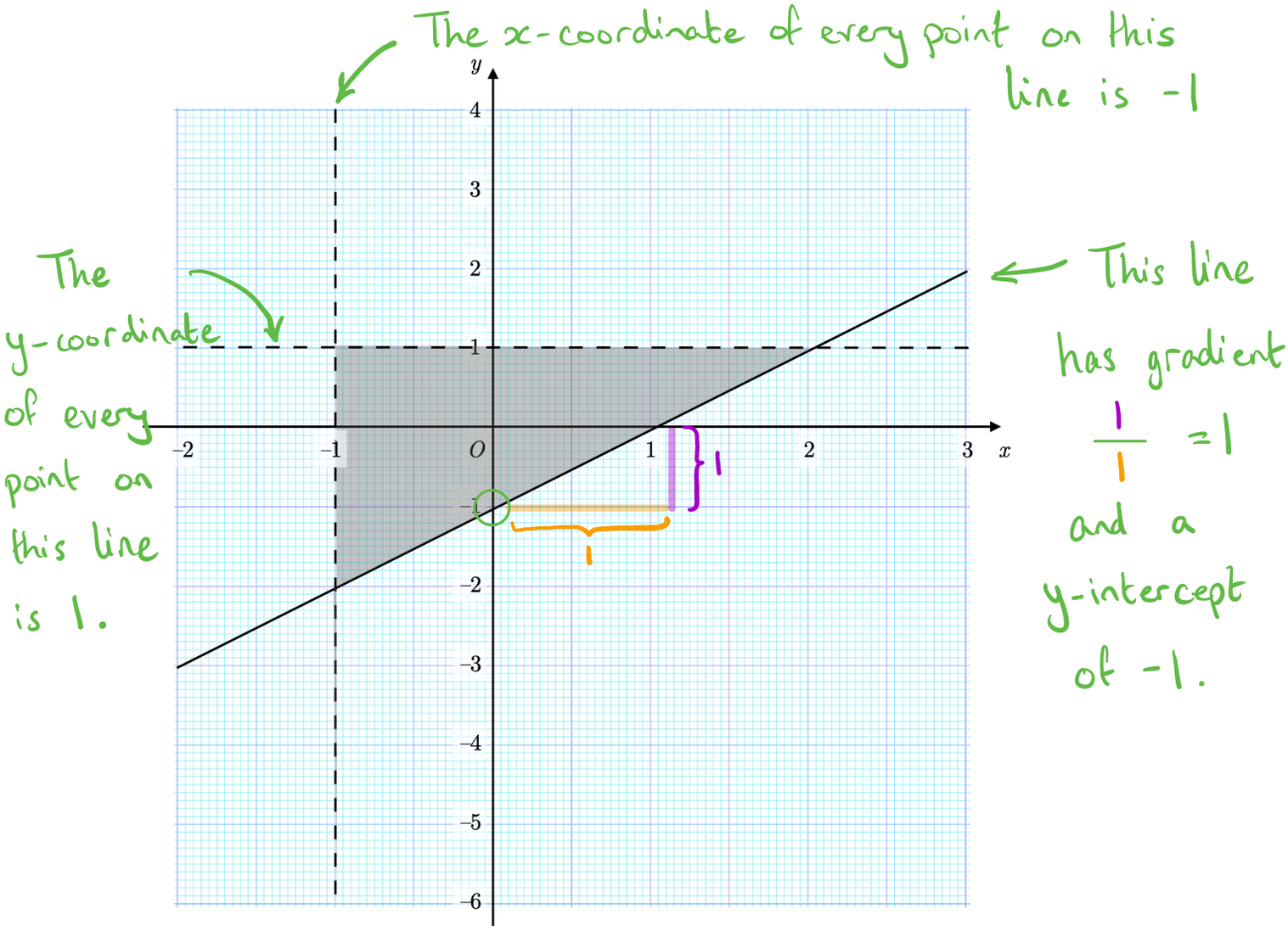
$x + 54$ = your expression from (a)

Solve to find $x$, which is Roberto's age.

Remember to give Diogo's age as your answer.

## Question 6

(a) Write down the three inequalities that define the shaded region.




(b) $x$ and $y$ are integers. On the diagram, mark with a cross each of the three points that satisfy the three inequalities you wrote down in part (a).

## Question 7

① The highest common factor of $m$ and $n$ is 21.
② The lowest common multiple of $m$ and $n$ is 126.
③ $m$ is an even number less than 50.

Find the values of $m$ and $n$.

① m and n are multiples of 21

② m and n are factors of 126

So m and n could be ____, ____, ____, or ____.

m must be ____ because of ③

n must be ____ to make sure ① and ② are true.

## Question 8

The circumference of a circle is 80 cm.
Calculate the area of the circle, correct to 3 significant figures.

$C = 2\pi r \Rightarrow 80 = 2\pi r$

$\Rightarrow r = \ldots$

$A = \pi r^2 = \ldots$

## Question 9

The diagram shows a trapezium $ABCD$ and one of its diagonals, $BD$.

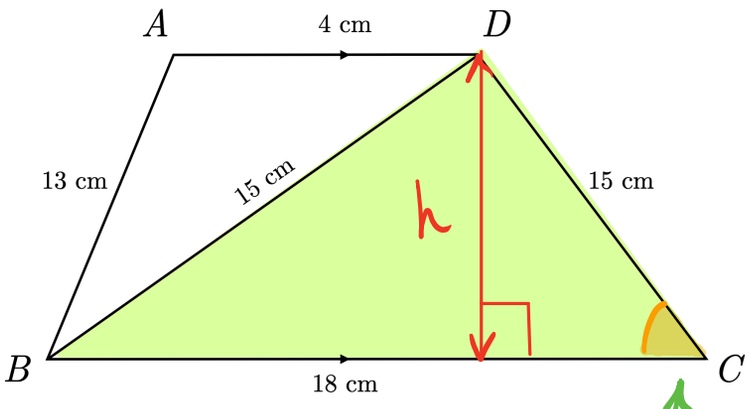



DIAGRAM NOT DRAWN ACCURATELY

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\Rightarrow \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

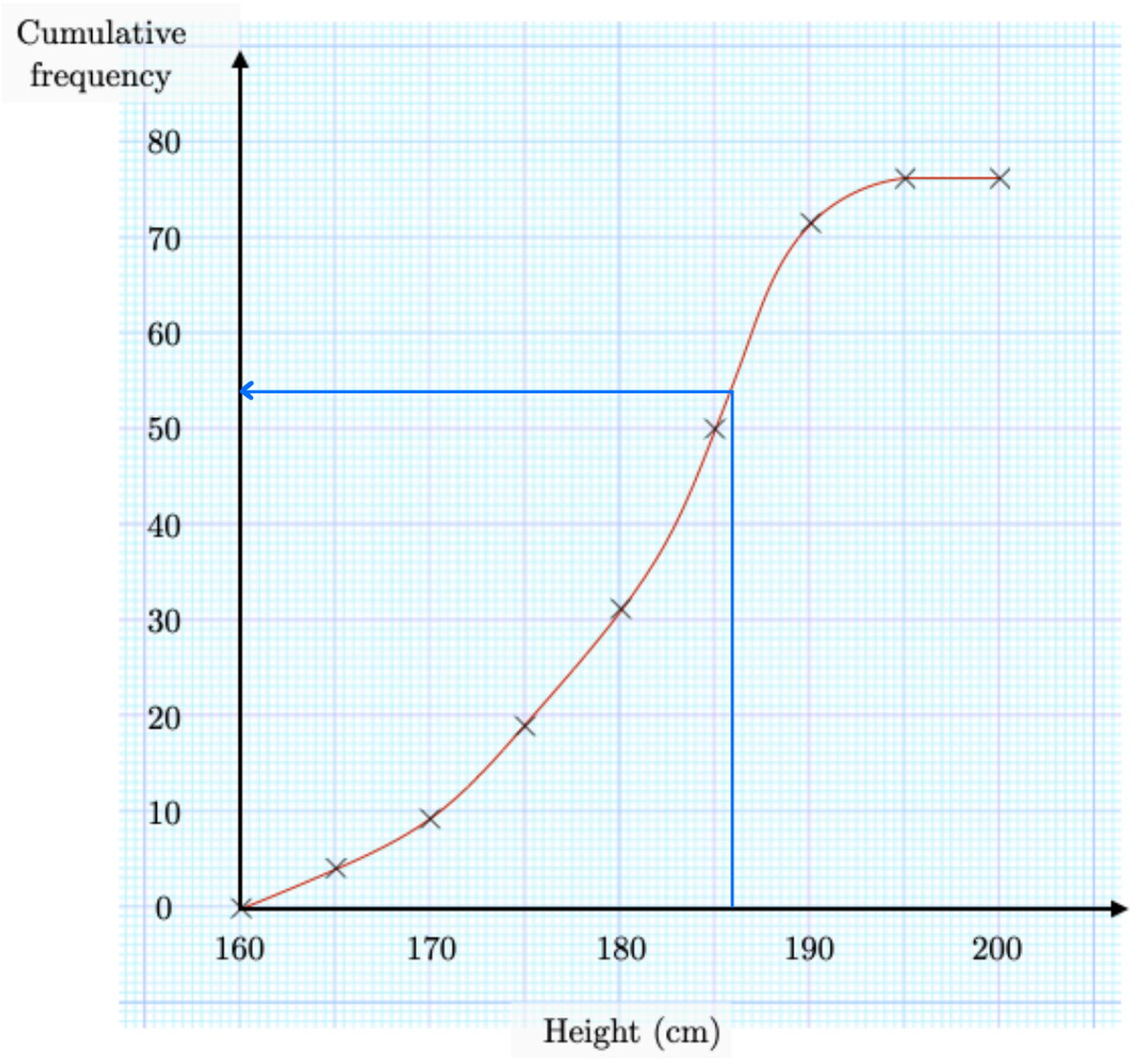
$$\Rightarrow A = \cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right)$$

Find the area of this trapezium.

Use the cosine rule to find this angle.
Then find h.

## Question 10

This cumulative frequency graph shows information about the heights, in cm, of rowers at a rowing club.




A rower is selected at random from the club. Estimate the probability that this rower is more than 186 cm tall.

How many rowers are there in total?

How many can we estimate are over 186 cm?

## Question 11

$y$ is directly proportional to $\sqrt{x}$.

When $x = 4 \times 10^{40}$, $y = 15$.

Find the value of $y$ when $x = 9 \times 10^{26}$. Write your answer in standard form.

| $x$ | $\sqrt{x}$ | $y$ |
| --- | --- | --- |
| $4 \times 10^{40}$ | $2 \times 10^{20}$ | $15$ |
| | $\downarrow \times \ldots$ | $\downarrow \times \ldots$ |
| $9 \times 10^{26}$ | | |

When $x = 9 \times 10^{26}$, $y =$ _____

## Question 12

At the start of an experiment, the mass of the bacteria in a petri dish is 1.35 g.
The mass of the bacteria increases by 5.8% every hour. → hourly multiplier = 1.058
A scientist notes the mass of the bacteria every hour.
After $n$ hours, the scientist recorded a mass of 2.00 grams.
Find the value of $n$.

On a calculator, type 1.35 × 1.058 and press [=]
This gives the mass after 1 hour. It is less than 2.00 grams.

Now hit [ANS] × 1.058 and repeatedly press [=] until the mass reaches 2.00 grams.

Keep count of how many times you press [=] altogether to find $n =$ ▢

## Question 13

Write $x^2 + 10x - 19$ in the form $(x + a)^2 + b$

$$(x+a)(x+a) + b$$

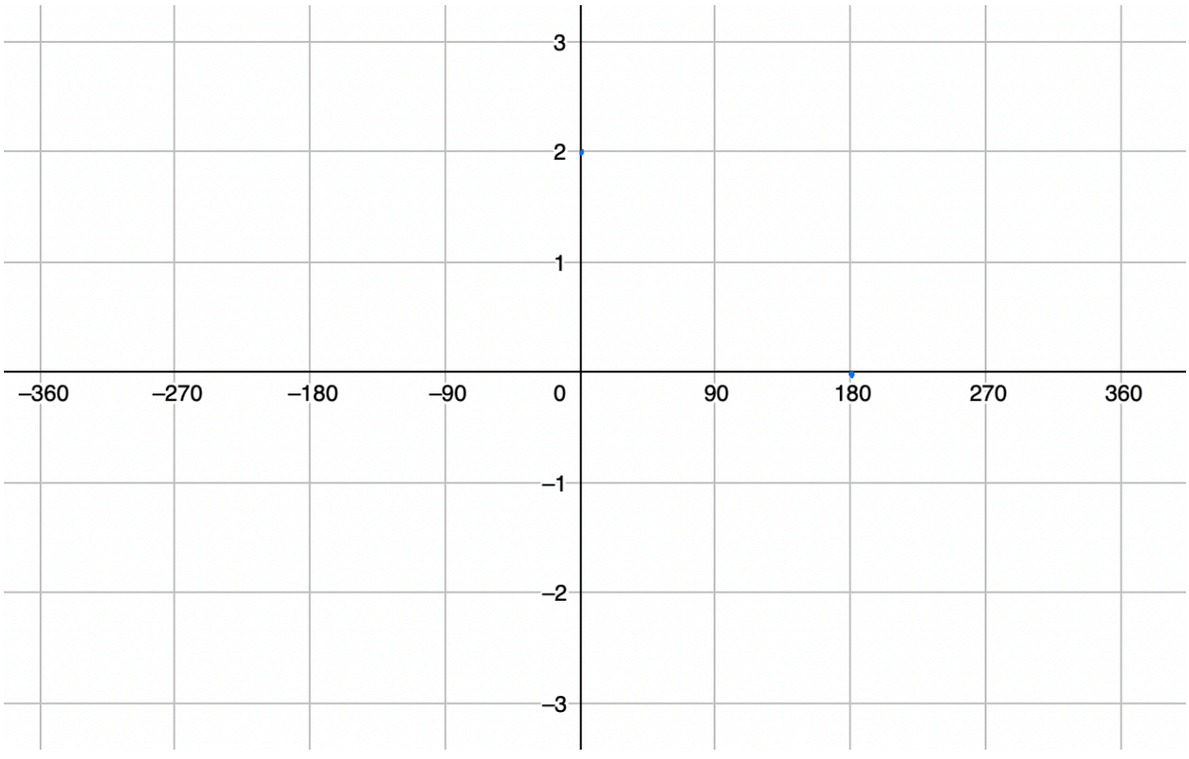
$$= x^2 + ax + ax + a^2 + b$$

$$= x^2 + 2ax + a^2 + b$$

$y = f(x) + a$ is a translation of $y = f(x)$ by $a$ units in the positive $y$-direction.

## Question 14

On the grid, sketch the graph of $y = \cos x° + 1$ for $-360° \leq x \leq 360°$




## Question 15

The chemical element gallium has a density of 5.91 g/cm$^3$.

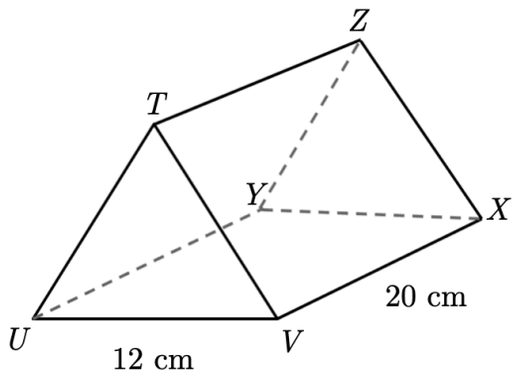
Convert this density into kg/m$^3$.

Take care!

$1\,m^3$ is not $100\,cm^3$

## Question 16

The diagram shows a triangular prism.

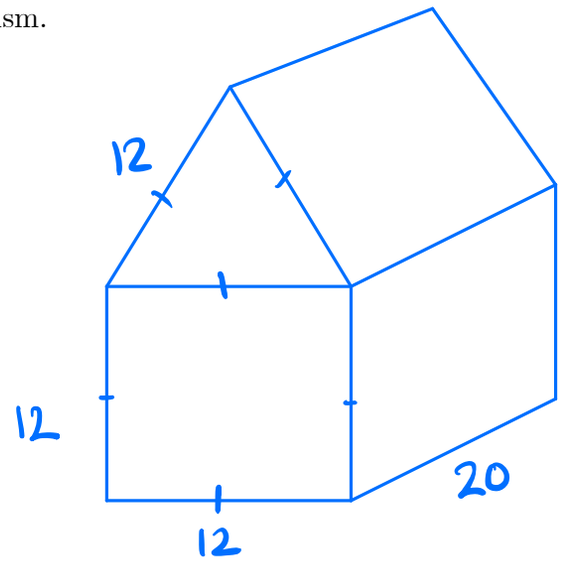



The triangular faces of this prism are equilateral triangles.

A rectangular face of the triangular prism is then glued to a congruent face of a cuboid measuring 12 cm × 12 cm × 20 cm.

Once glued, the resulting solid is a pentagonal prism.

Work out the surface area of this pentagonal prism.
Round your answer to 3 significant figures.



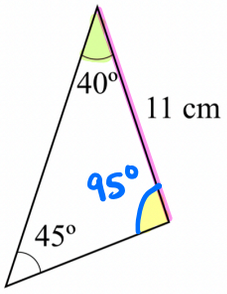

- Each rectangular face is a $20 \times 12 = 240\ cm^2$ rectangle.

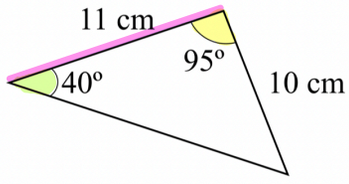
- Each pentagonal face is made up of a $12 \times 12 = 144\ cm^2$ square and an equilateral triangle with side length 12 cm.

  What is the area of this triangle?

## Question 17

Show that these triangles are congruent.



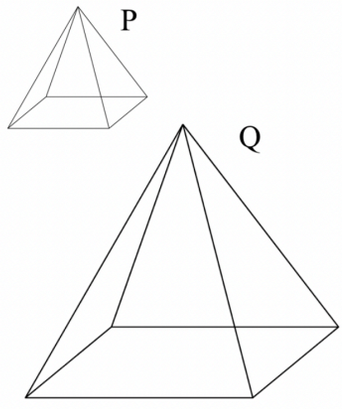




## Question 18

P and Q are two mathematically similar pyramids.

Q has a surface area of 90 $cm^2$ and a volume of 54 $cm^3$.

P has a surface area of 40 $cm^2$. Find the volume of P.




Q → P

Area scale factor = $\frac{40}{90} = \frac{4}{9}$

Length scale factor = ...

Volume scale factor = ...

∴ Volume of P = ...

## Question 19

Solve $x + 4 = \dfrac{10}{x}$

Round your solutions to 3 decimal places.

$$x + 4 = \frac{10}{x}$$

Multiply both sides by $x$

$$x^2 + 4x = 10$$

...

Question 20

(a) Make $p$ the subject of the formula $m = \dfrac{8(q+3p)}{p}$

Multiply both sides by p

$mp = 8q + 24p$

Subtract 24p from both sides

$mp - 24p = 8q$

Factorise out p

$p(m-24) = 8q$

$p =$

(b) Work out the value of $p$ when $q = 0.34$ and $m = 0.7$

## Question 21

Jonny plays a game which involves picking numbered cards.
The first bag contains four cards, numbered from 1 to 3.
The second bag contains six cards, numbered from 1 to 5.

Jonny picks one card at random from each bag and multiplies the numbers on his two cards.

(a) Draw a sample space to show all the possible outcomes.

| Bag 1 \ Bag 2 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |

Players win a prize if the product of the numbers on their cards is even.

(b) Given that Jonny wins a prize, find the probability that the product of his two numbers is greater than 9.

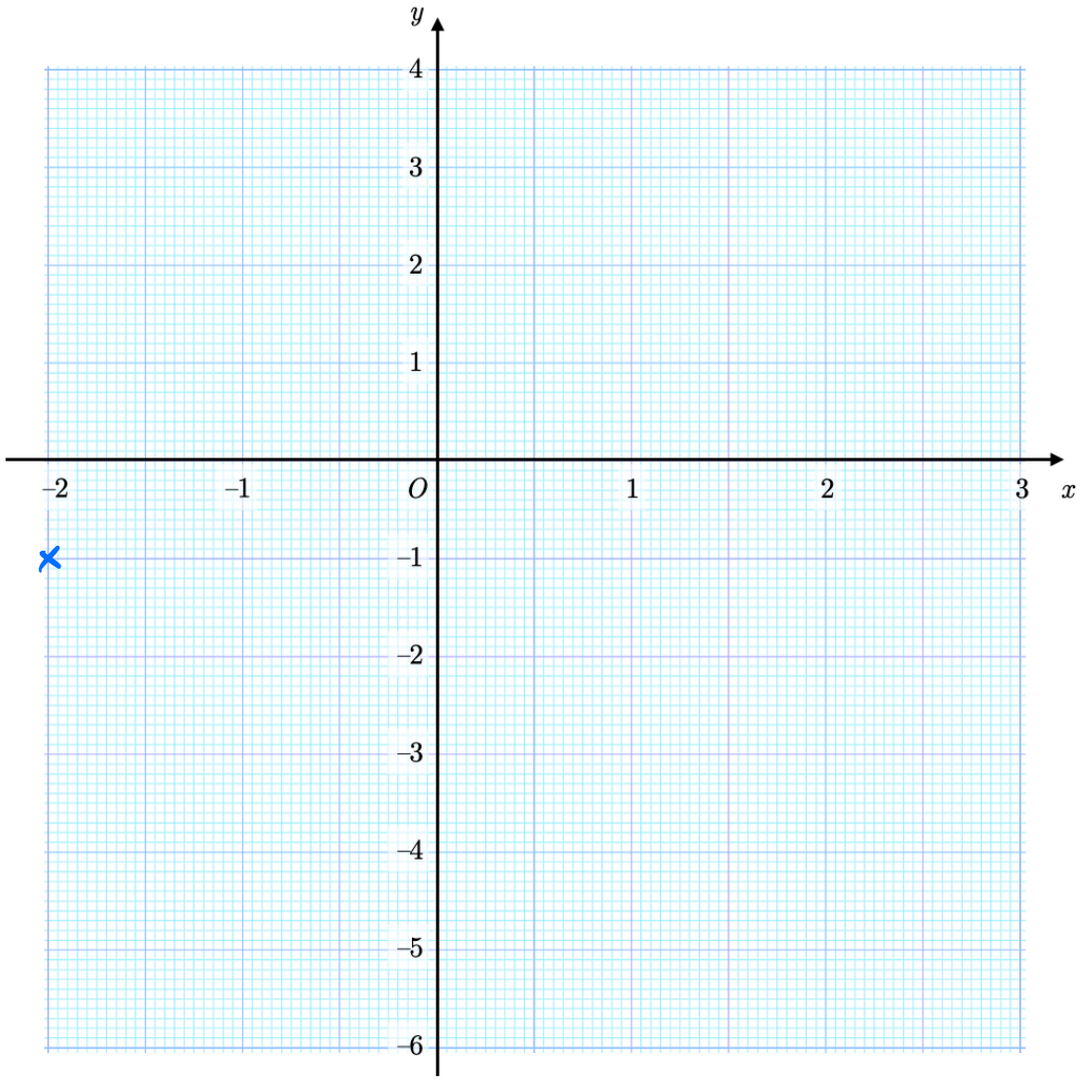
$$\frac{\text{Number of products that are 10 or more}}{\text{Number of even products}}$$

## Question 22

(a) Complete the table of values for $y = x^2 - 5$

| $x$ | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | −1 | | | | | |

(b) On the grid, draw the graph of $y = x^2 - 5$ for values of $x$ from –2 to 3.




(c) Write down the coordinates of the turning point of the graph.