Edexcel Paper 3H Practice Booklet

23 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

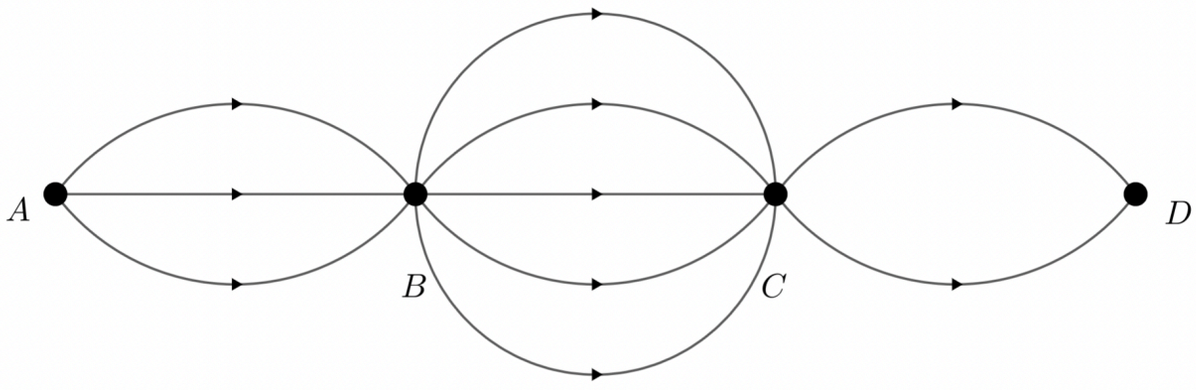
Given that $\frac{(x^{-3})^5}{x^{-7}} \times \frac{x^{-\frac{1}{2}}}{x} \equiv x^m$, find the value of m.

$$\frac{(x^{-3})^5}{x^{-7}} \times \frac{x^{-\frac{1}{2}}}{x} = \frac{x^{-15}}{x^{-7}} \times \frac{x^{-\frac{1}{2}}}{x^1} = x^{-8} \times x^{-\frac{3}{2}} = x^{-\frac{19}{2}}$$

$$m = -\frac{19}{2}$$

Question 2

This diagram shows that there are three possible paths from A to B, five paths from B to C, and two paths from C to D. The arrowheads on each path show the direction of travel allowed on each path.



Assuming it is only possible to travel along each path in the direction of D, how many different routes are there from A to D?

$3 \times 5 \times 2 =$ 30 routes

Question 3

$p = 0.30$ correct to 2 decimal places
$q = 1.2$ correct to 1 decimal place

Work out the upper bound for $q - p$

	UB	LB
p	0.305	0.295
q	1.25	1.15

Upper bound for $q - p$

= upper bound for q − lower bound for q

= $1.25 - 0.295$ = 0.955

Question 4

(a) Factorise $16x^2 - 9$

$(4x + 3)(4x - 3)$

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

$\equiv t(7t-4) - 5(7t-4) - t(7t-4) + 3(7t-4)$

$\equiv (t - 5 - t + 3)(7t-4)$

$\equiv -2(7t-4)$

$\equiv -14t + 8$

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.

$$x + x-5 + x-1 = 3x-6$$

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.

$$3x-6 = x+54$$

$$\Rightarrow 2x = 60$$

$$\Rightarrow x = 30$$

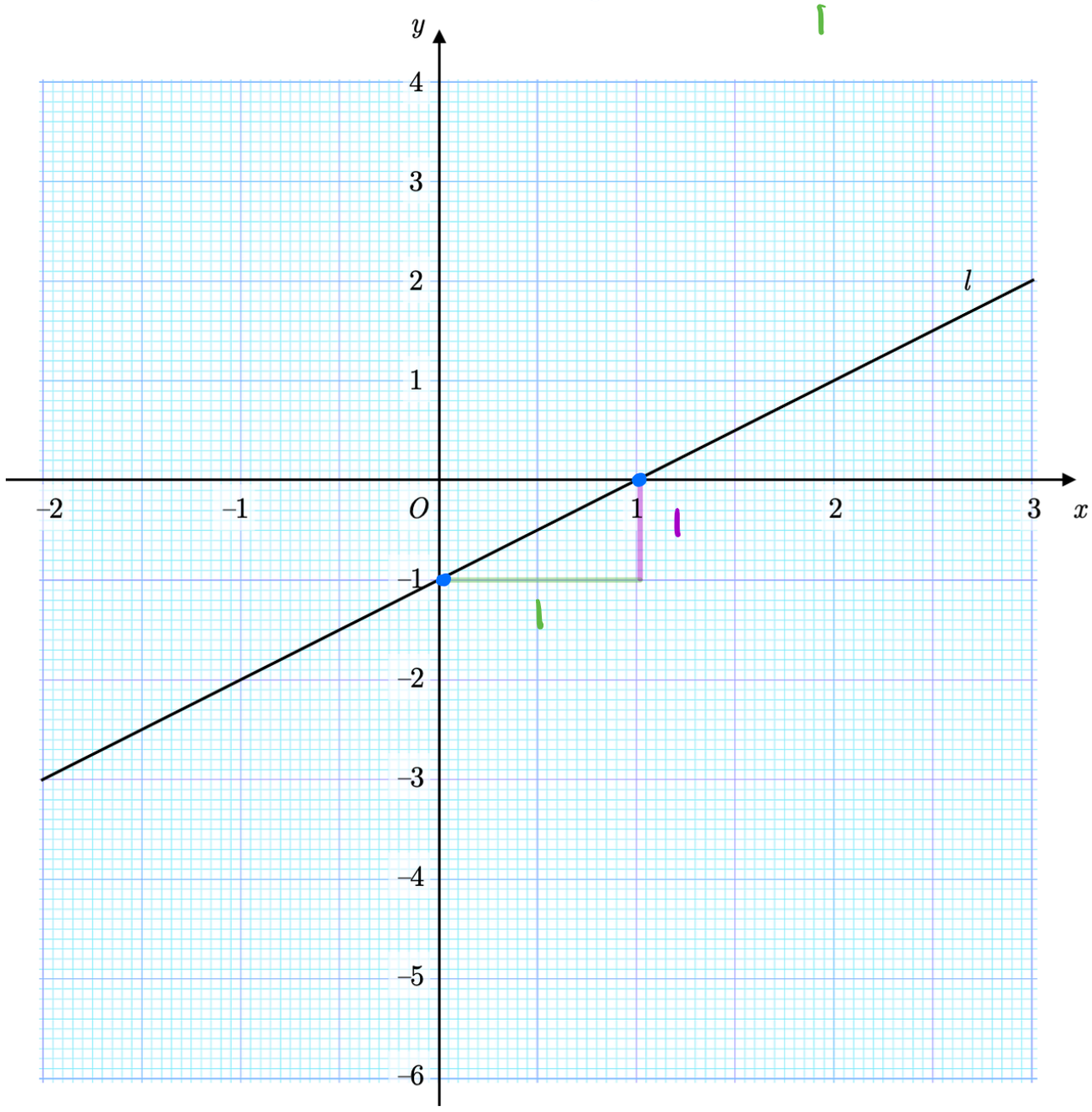
$$\Rightarrow x-5 = 25$$

Diogo is 25.

Question 6

Work out the gradient of line l, shown below.

Gradient $= \frac{1}{1} = 1$



Question 7

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.

Value after 7 years = $\frac{£820.31}{0.955^3}$

= £941.82

£ 941.82

Question 8

Visitors to an office need to record their time of arrival and their time of leaving on a sign-in sheet.

One visitor signs in at 8.34 am and records their time of leaving as 1520 later that day.

How long did this visitor spend at the office? Write your answer in minutes.

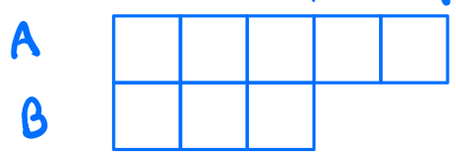
0834 to 1520 is 360 − 14 = 346 min

346 ..... minutes

Question 9

Amy and Bob would like to share some money in the ratio 5 : 3 so that Amy gets £120 more than Bob.

(a) How much money should they each receive?



i.e. each box is worth £60

so Amy gets 5 × £60 = £300

Bob gets 3 × £60 = £180

(b) Rewrite the ratio 4 : 3 : 5 in the form 1 : m : n

$4 : 3 : 5$

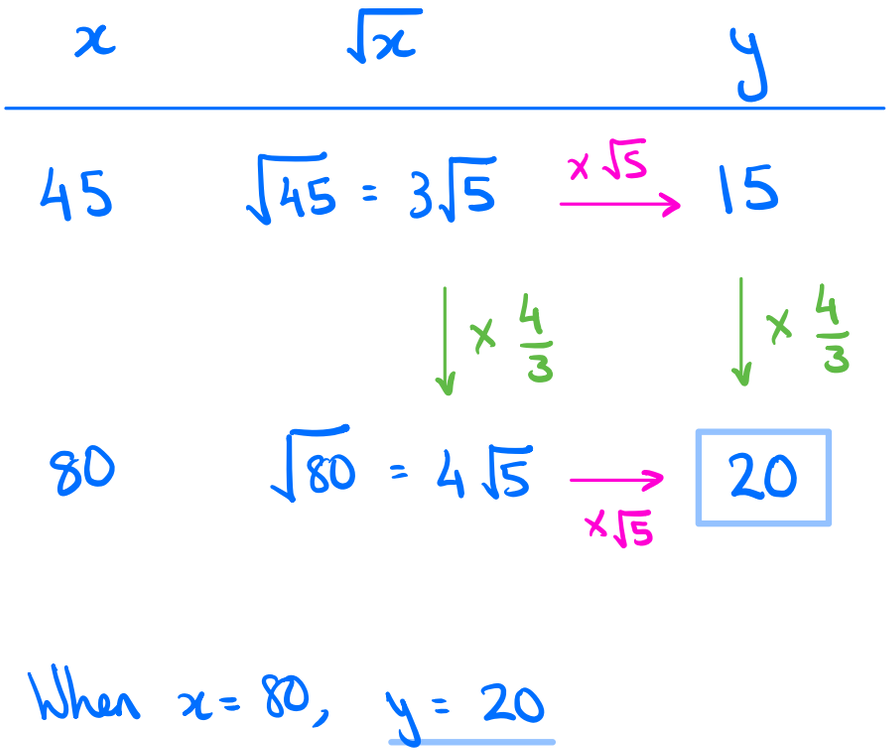
$= 1 : \frac{3}{4} : \frac{5}{4}$ or $1 : 0.75 : 1.25$

Question 10

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

When $x = 45$, $y = 15$.

Find the value of y when $x = 80$.

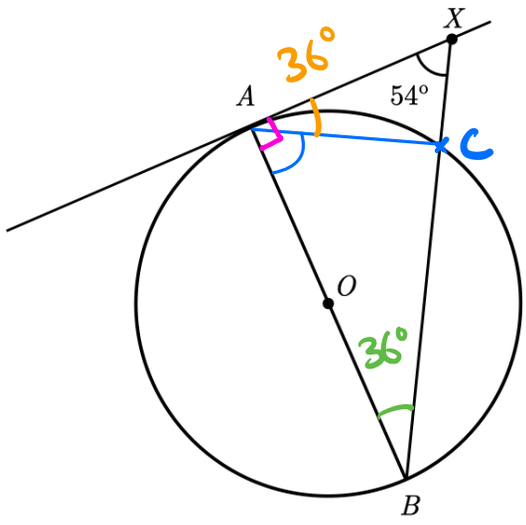


Question 11

The diagram shows a circle with centre O, a tangent to the circle at point A, point X on the tangent, diameter AB, and a line segment BX.

Angle $AXB = 54°$

BX intersects the circle at two points: B and C.



(a) Label the point C on the diagram.

(b) Work out the size of angle BAC. Give reasons for your answer

$\angle XAB = 90°$ (angle between a tangent and diameter or radius)

$\angle ABX = 180 - 90 - 54 = 36°$ (angles in a triangle add up to 180°)

$\angle XAC = 36°$ (alternate segment theorem)

$\angle BAC = 90 - 36 = \underline{54°}$

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 hit [=]
This gives the mass after 1 hour. It is less than 2.00 grams.

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

Keep count of how many times you press [=] altogether to find $n = 7$

Question 13

Simplify fully $\frac{6(x+5)}{8(x+5)^3}$

$$\equiv \frac{^{3}\cancel{6}\,\cancel{(x+5)}}{4\cancel{8}\cancel{(x+5)}(x+5)(x+5)} \equiv \frac{3}{4(x+5)^2}$$

Question 14

Work out $\begin{pmatrix} 5 \\ 7 \end{pmatrix} + \begin{pmatrix} 3 \\ 14 \end{pmatrix}$ $\equiv$ $\begin{pmatrix} 8 \\ 21 \end{pmatrix}$

Question 15

Sarah travels 120 miles from London to Leicester at an average speed of 40 mph.
She later travels 120 miles from Leicester to York at an average speed of 60 mph.

Calculate Sarah's average speed for her journey from London to York.

	Time taken
London – Leicester	$\frac{120 \text{ miles}}{40 \text{ mph}} = 3 \text{ hours}$
Leicester – York	$\frac{120 \text{ miles}}{60 \text{ mph}} = 2 \text{ hours}$

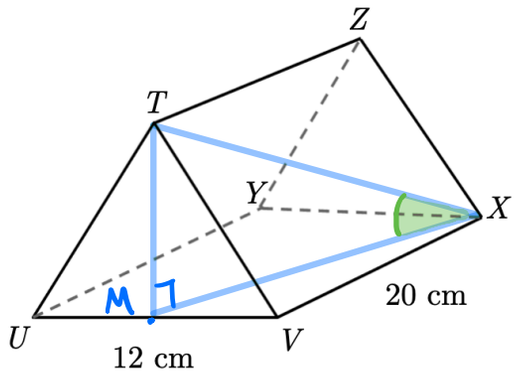
Sarah travels a total of 240 miles in 5 hours.

Overall average speed $= \frac{240 \text{ miles}}{5 \text{ hours}}$

$= 48 \text{ mph}$

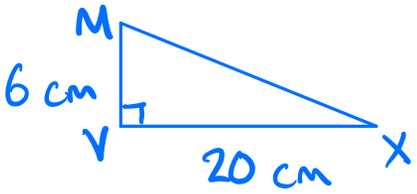
Question 16

The diagram shows a triangular prism.
The triangular faces of this prism are equilateral triangles.

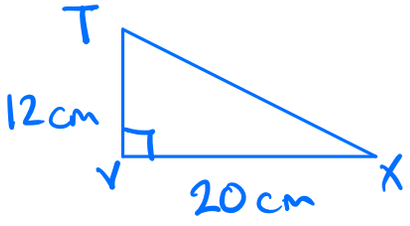


Say M is the midpoint of UV

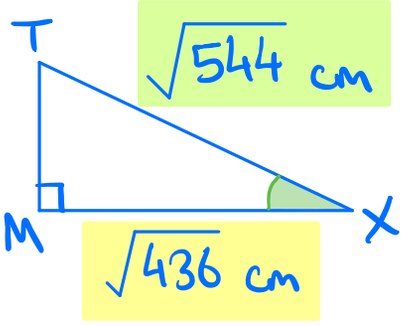
Calculate the angle between TX and the plane $UVXY$. → ∠TXM



Length $MX = \sqrt{6^2+20^2} = \sqrt{436}$ cm



Length $TX = \sqrt{12^2+20^2} = \sqrt{544}$ cm



$$\angle TXM = \cos^{-1}\left(\frac{\sqrt{436}}{\sqrt{544}}\right)$$

$$= 26.459\ldots$$

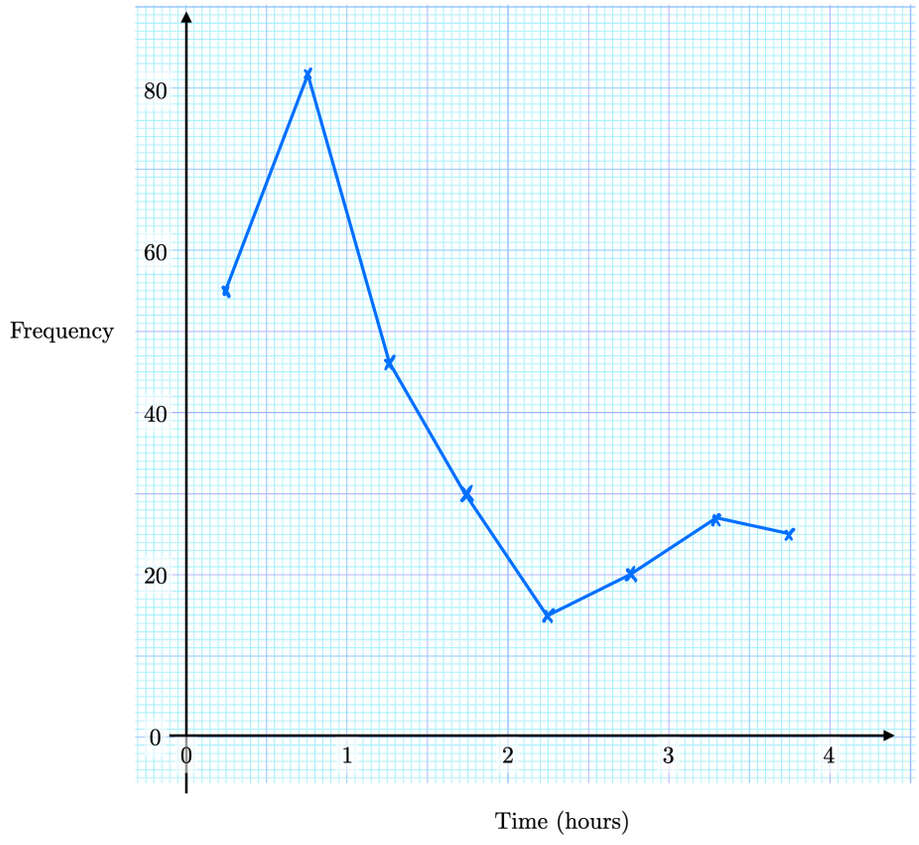
$$= \underline{26.5^\circ} \text{ to 3 s.f.}$$

Question 17

This frequency table shows information about the waiting times for 300 patients at a hospital's Accident & Emergency department.

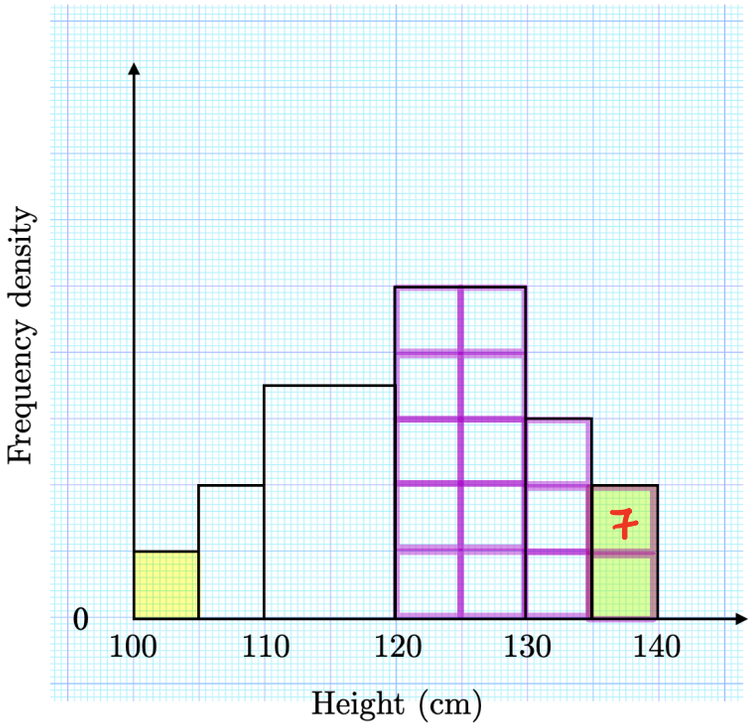
Time (minutes)	Frequency
$0 < t \leq 30$	55
$30 < t \leq 60$	82
$60 < t \leq 90$	46
$90 < t \leq 120$	30
$120 < t \leq 150$	15
$150 < t \leq 180$	20
$180 < t \leq 210$	27
$210 < t \leq 240$	25

Draw a frequency polygon to show this information.



Question 18

This histogram shows information about the heights of a number of children.



The number of children are taller than 135 cm is seven greater than the number of children that are at most 105 cm tall.

How many children are more than 120 cm tall?

15 x 7 = 105 children

Question 19

Solve algebraically the simultaneously equations

$$-6x + 3y = 24$$
$$y = x^2 - 7x + 8$$

$\Rightarrow \quad 3y = 24 + 6x \quad \Rightarrow \quad y = 8 + 2x$

$$8 + 2x = x^2 - 7x + 8$$
$$\Rightarrow \quad 0 = x^2 - 9x$$
$$\Rightarrow \quad 0 = x(x - 9)$$
$$\Rightarrow \quad x = 0, \quad x = 9$$

Substituting these into $y = 8 + 2x$, we get

$x = 0, \; y = 8$

$x = 9, \; y = 26$

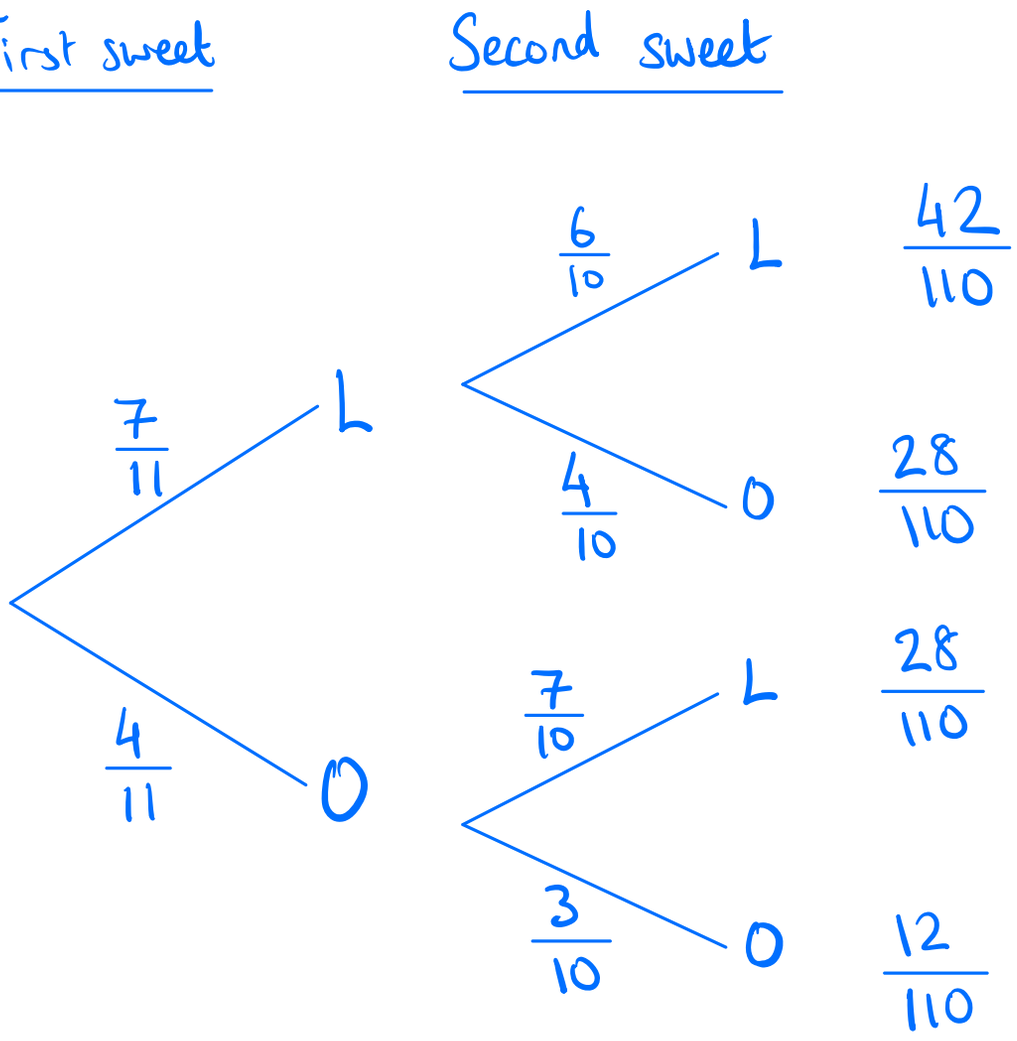
Question 20

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

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

Question 21

A box contains 7 lemon sweets and 4 orange sweets. Anne picks two sweets at random from the box. Find the probability that the two sweets are the same flavour.



$$P(\text{2 lemons}) + P(\text{2 oranges})$$

$$= \frac{42}{110} + \frac{12}{110} = \frac{54}{110} = \frac{27}{55}$$

Question 22

The diagram shows two right-angled triangles.
AB has length 12 cm and AD has length 5 cm. CD has length x cm.

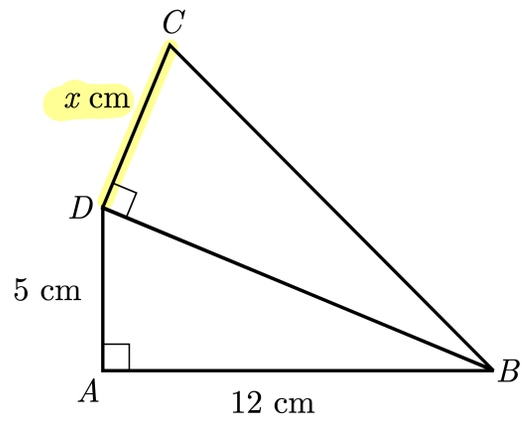
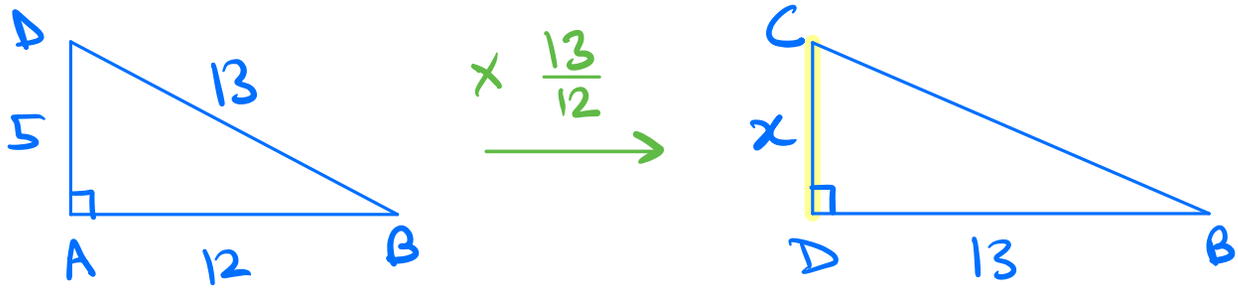


DIAGRAM NOT DRAWN ACCURATELY

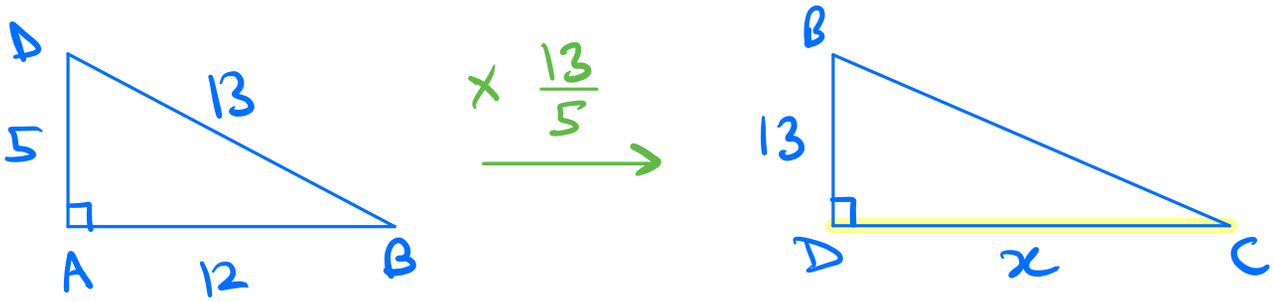
$DB = \sqrt{5^2 + 12^2} = 13$ cm

Given that the two triangles are similar, find the two possible values of x.



A possible value for x is $5 \times \frac{13}{12} = \frac{65}{12}$

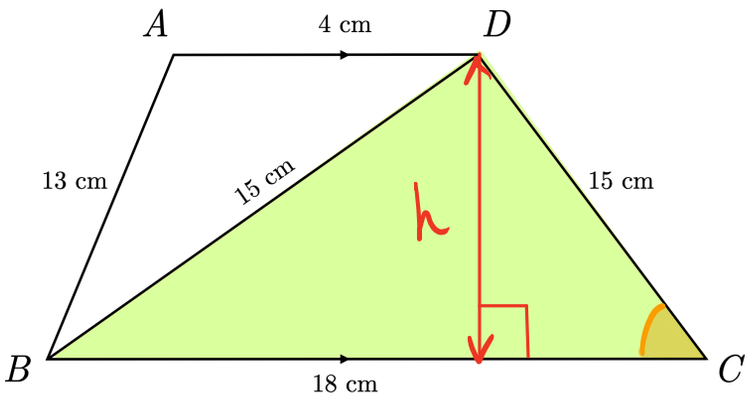
≈ 5.42 cm



The other value for x is $12 \times \frac{13}{5} = 31.2$ cm

Question 23

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



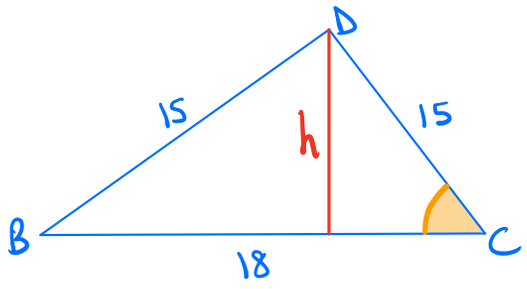
$$a^2 = b^2 + c^2 - 2bc\cos A$$

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

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

DIAGRAM NOT DRAWN ACCURATELY

Find the area of this trapezium.



$$\angle BCD = \cos^{-1}\left(\frac{18^2+15^2-15^2}{2\times 18\times 15}\right)$$

$$= 53.1\ldots°$$

$$h = 15\sin(53.1\ldots) = 12\text{ cm}$$

$$\text{Area of trapezium} = \frac{1}{2}h(a+b)$$

$$= \frac{1}{2}\times 12\times(4+18) = 132\text{ cm}^2$$