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

Entering this into a calculator, we see

$$\frac{707 + 7007}{7 \times (600 - 7^2)} - 7 + 5 = \underline{0}$$

Question 2

$\left(x^{-\frac{8}{3}} \right)^{\frac{5}{4}} \equiv \dfrac{1}{\sqrt[3]{x^k}}$, where k is some constant. Find the value of k.

$$\left(x^{-\frac{8}{3}} \right)^{\frac{5}{4}} \equiv x^{\frac{-40}{12}} \equiv x^{\frac{-10}{3}} \equiv \frac{1}{\sqrt[3]{x^{10}}}$$

So $\underline{k = 10}$

Question 3

(a) 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	$\xleftarrow{\div 5}$ 605
12	144	$\xleftarrow{\div 5}$ 720

When $y = 720$, $x = 12$

(b) p is inversely proportional to q. When $p = 14.5$, $q = 2$. Find the value of q when $p = 580$.

$pq = k = 14.5 \times 2 = 29$

Solving $580q = 29$

$q = \dfrac{29}{580} = \dfrac{1}{20}$ or 0.05

Question 4

(a) Factorise $17x^2 + 2x - 19$

$(17x + 19)(x - 1)$

(b) Expand and simplify $(8t + 3)(8t - 3) - (5t + 1)(5t - 9)$
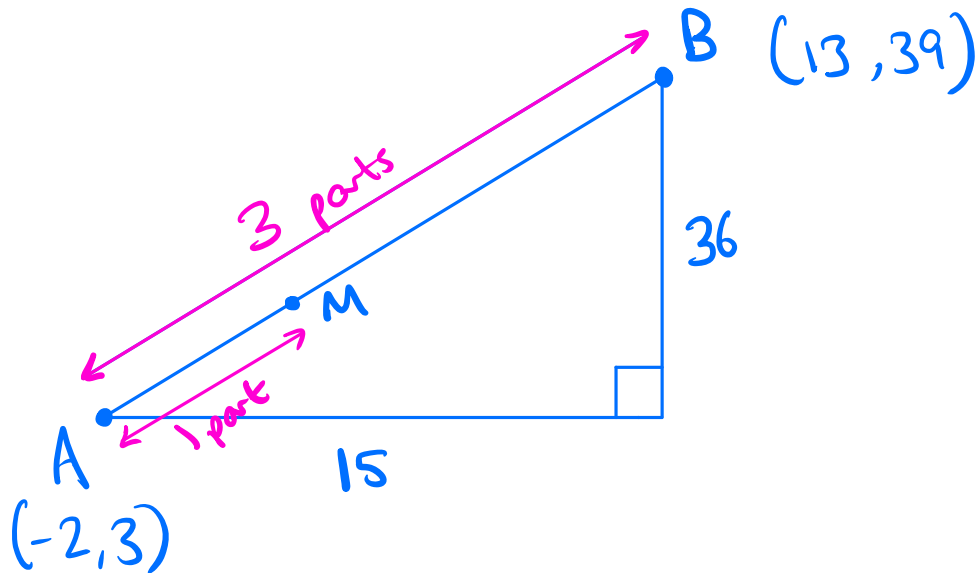
$(64t^2 - 9) - (25t^2 - 40t - 9)$

$= 39t^2 + 40t$

Question 5

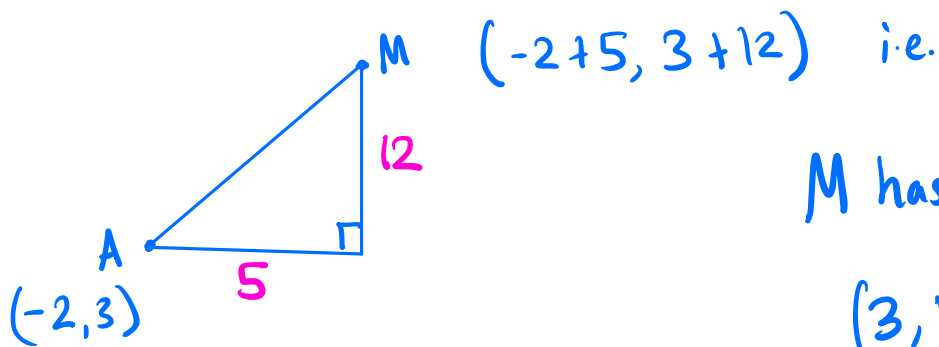The point M lies on the line segment AB

AB:AM is 3:1

A has coordinates (–2, 3) and B has coordinates (13, 39).

Find the coordinates of M.

B (13, 39)

3 parts

M

36

1 part

A

(-2, 3)

15

M is $\frac{1}{3}$ of the way from A to B

So from A, we go 5 right and 12 up to get to M.

M   (-2+5, 3+12)   i.e.

12

A

(-2, 3)   5

M has coordinates

(3, 15)

Question 6

Here are the equations of four lines.

Parallel lines have the same gradient

(a) Circle the equations of the two parallel lines.

$y = -2x + 4$ $\boxed{y = \dfrac{1}{2}x + 4}$ $-2x + y + 8 = 0$ $\boxed{3x - 6y - 7 = 0}$

gradient
= -2

gradient
= 1/2

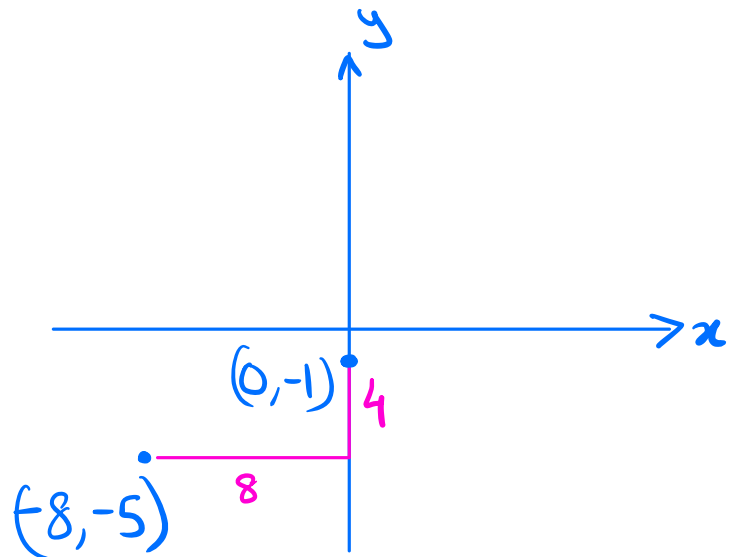$y = 2x - 8$
gradient = 2

$3x - 7 = 6y$
$\dfrac{1}{2}x - \dfrac{7}{6} = y$
gradient = 1/2

(b) Find the equation of the line that passes through the point $(-8, -5)$ and is parallel to those you circled in (a).
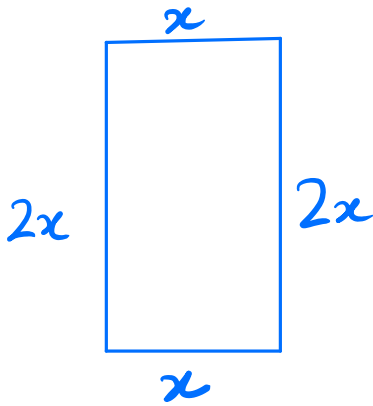
$$y = \frac{1}{2}x + c$$

$$c = -1$$

$$y = \frac{1}{2}x - 1$$

$(0, -1)$ 4

$(-8, -5)$ 8

Question 7

A rectangle's length is double its width. The perimeter of this rectangle is 330 cm.
Work the area of the rectangle, giving your answer in m².

Say width = x cm. Then length = $2x$ cm.

Perimeter = $6x$ = 330

$\Rightarrow \quad x = \dfrac{330}{6} = 55$

So width = 55 cm and length = 110 cm

Area = $55 \times 110 = 6050$ cm²

$= \dfrac{6050}{10,000}$ m²

0.605 .... m²

Question 8

A force of x newtons initially acts on an area of 15 cm².

The force is increased by 20% while the area is reduced until the pressure has doubled.

By how much is the area reduced?

Initial pressure $= \dfrac{x}{15}$ N/cm²

Later pressure $= \dfrac{1.2x}{\text{new area}}$ N/cm² $= 2 \times$ initial pressure

$\Rightarrow \quad \dfrac{1.2x}{\text{new area}} = \dfrac{2x}{15}$

×0.6

×0.6

So new area $= 9$ cm²

i.e. a reduction of 6 cm²

6

.... cm²

Question 9

List all the integer solutions of $x^2 < 6x + 27$

$$x^2 < 6x + 27$$

$$\Rightarrow \quad x^2 - 6x - 27 < 0$$

$$\Rightarrow \quad -3 < x < 9$$

The integer solutions are

$$-2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8$$

Question 10

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

Find the error interval 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 p

$= \quad 1.25 \quad - 0.295$

$= \quad 0.955$

Lower bound for $q - p$

$= $ lower bound for q $-$ upper bound for p

$= \quad 1.15 \quad - 0.305$

$= \quad 0.845$

Error interval $\quad 0.845 < q - p < 0.955$
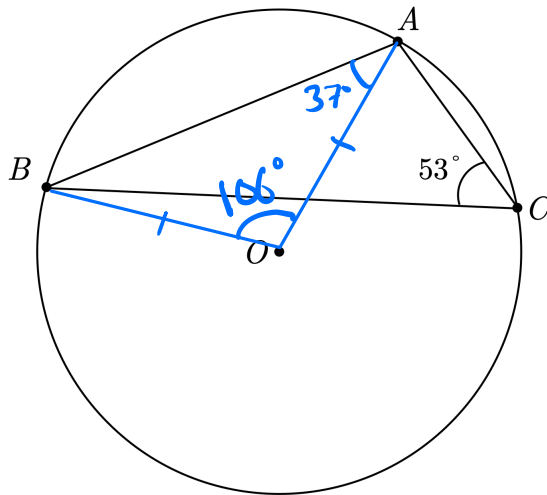
The diagram shows a circle, with centre O, and points A, B, and C marked on the circumference.

Given that angle $ACB = 53°$, calculate the size of angle OAB.

$\angle AOB = 106°$ (angle at centre is the angle at the circumference)

Triangle AOB is isosceles, since OA = OB (radii)

So $\angle OAB = \dfrac{180 - 106}{2} = 37°$

Question 12

George buys a new car. The car's value decreases by a fixed percentage each year.
After 3 years, the car is worth £14,580, and after after 5 years, it is worth £11,809.80
Work out the value of the car two years after George bought it.

Car	Value
when new	
after 1 year	
after 2 years	
after 3 years	£14,580
after 4 years	
after 5 years	£11,809.80

$\times r$
$\times r$
$\times r$
$\times r$
$\times r$

$\times \dfrac{11809.80}{14580}$
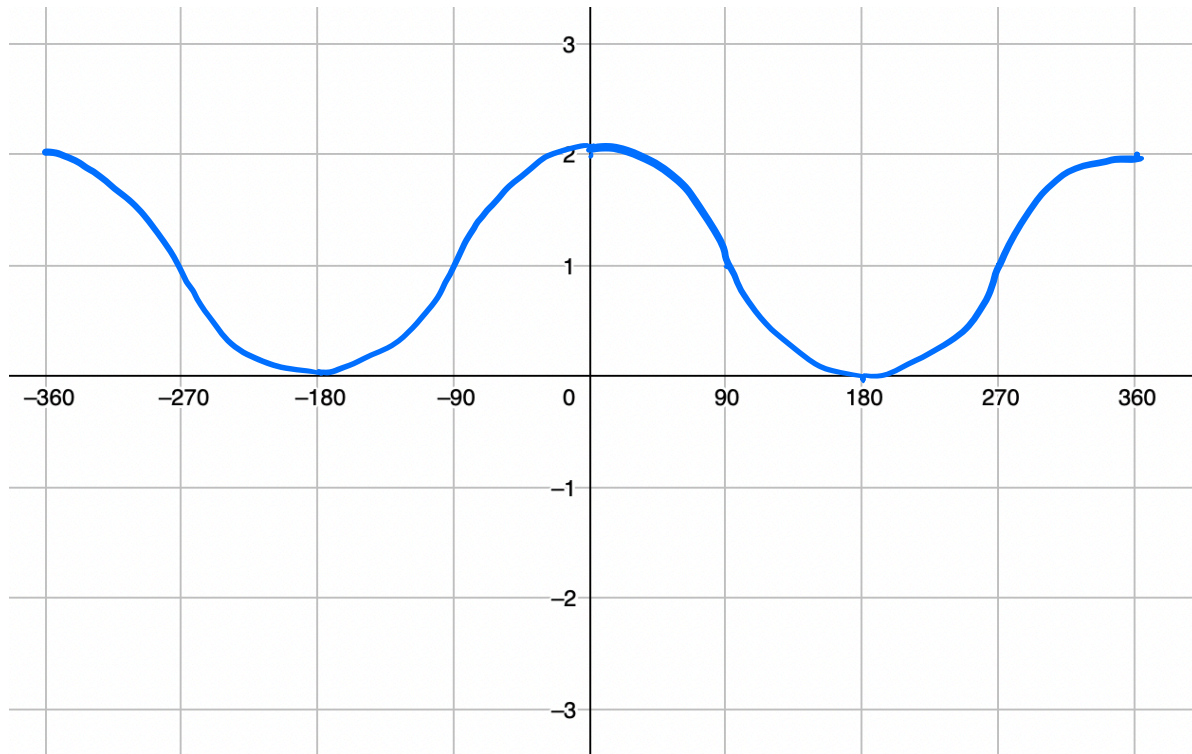
$$r^2 = \frac{11809.80}{14580} \implies r = \sqrt{\frac{11809.80}{14580}}$$

$$= 0.9$$

$$\text{Year 2 value} = \frac{\text{Year 3 value}}{r} = \frac{14580}{0.9}$$

$$= £16200$$

Question 13

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

Question 14

A hemisphere of radius 10 cm and a cone are attached to form a solid. The circular base of the cone perfectly fits onto the circular face of the hemisphere. The solid has a volume of 1200π cm³.

Find l, the slant height of the cone.
Round your answer to 3 significant figures.
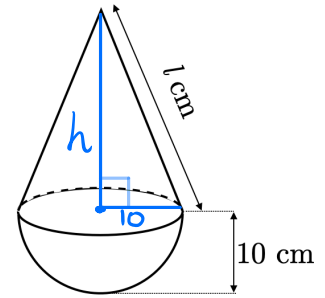
Volume of hemisphere $= \frac{2}{3}\pi r^3 = \frac{2000\pi}{3}$ cm³

Volume of cone $= \frac{1}{3}\pi r^2 h = \frac{100\pi h}{3}$ cm³

So $\quad \frac{2000\pi}{3} + \frac{100\pi h}{3} = 1200\pi$

$\Rightarrow 2000 + 100h = 3600$

$\Rightarrow \qquad\qquad 100h = 1600$

$\Rightarrow \qquad\qquad\quad h = 16$ cm

Using Pythagoras, $\quad l = \sqrt{10^2 + 16^2}$

$\qquad\qquad\qquad\qquad = \underline{18.9 \text{ cm}}$ to 3 s.f.

Question 15

A laptop costs £1249 in the UK and €1399 in Europe. The laptop costs $1648.90 in the United States.

You are given the following exchange rates:

$1 = £0.75 and $1 = €0.84

In which location is the laptop cheapest?

UK

£	$
0.75 $\xrightarrow{\div 0.75}$	1
1249 $\xrightarrow{\div 0.75}$	1665.33

Europe

€	$
0.84 $\xrightarrow{\div 0.84}$	1
1399 $\xrightarrow{\div 0.84}$	1665.47

USA $ 1648.90

USA is cheapest

Question 16

ABCD is a quadrilateral.

DIAGRAM NOT
ACCURATELY DRAWN
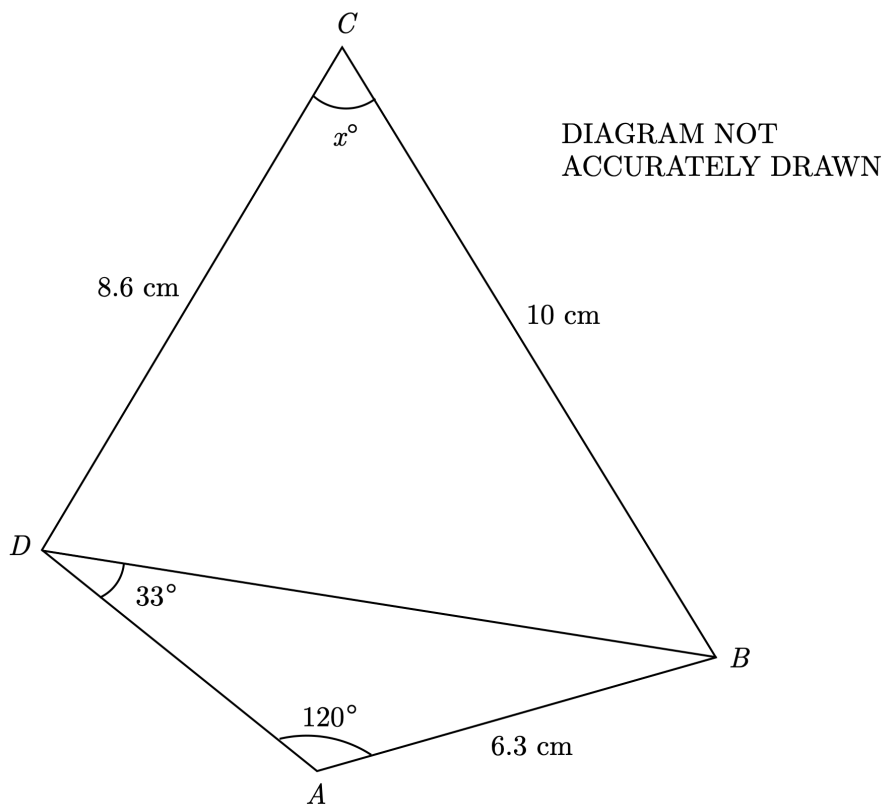
Find the value of x.

Find BD

$$\frac{BD}{\sin(120)} = \frac{6.3}{\sin(33)} \Rightarrow BD = \frac{6.3 \sin(120)}{\sin(33)}$$

$$= 10.01.... \text{ cm}$$

Find x

$$BD^2 = 8.6^2 + 10^2 - 2 \times 8.6 \times 10 \cos(x)$$

$$\Rightarrow \cos(x) = \frac{8.6^2 + 10^2 - BD^2}{2 \times 8.6 \times 10} = 0.427...$$

$$x = \cos^{-1}(0.427) = \underline{64.7°} \text{ to 3 s.f.}$$

Question 17

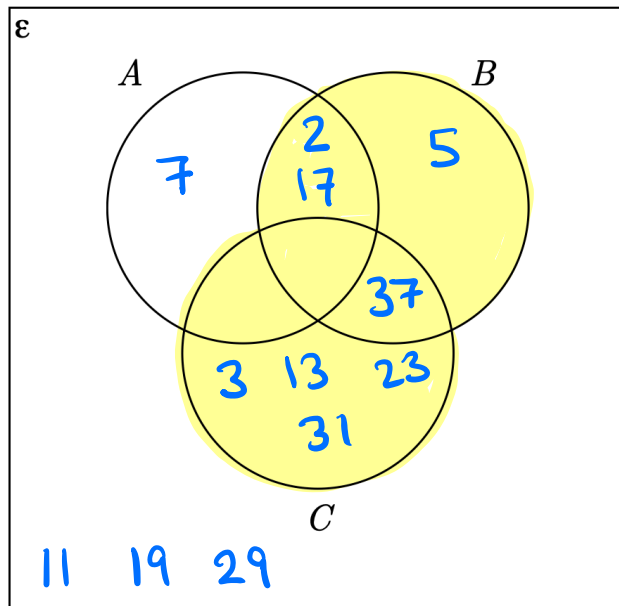ε = {prime numbers between 1 and 40}
A = {2, 7, 17}
B = {2, 5, 17, 37}
C = {3, 13, 23, 31, 37}

(a)   Complete the Venn digram for this information.

(b)   A number is chosen at random from ε. Find the probability that the number is a member of B ∪ C.
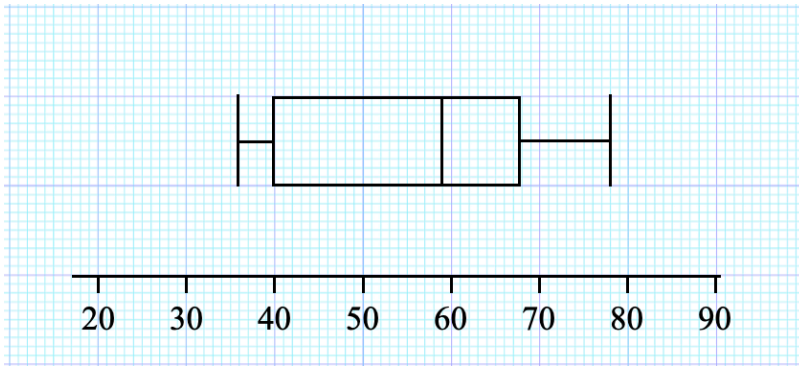
$$\frac{8}{12} = \frac{2}{3}$$

Question 18

A group of Year 10 students sit a test. The lowest mark achieved is 22. The median mark achieved is 50. The range in marks is 54. The upper quartile 68 and the interquartile range was 38.

(a)   Draw a box plot showing this information.
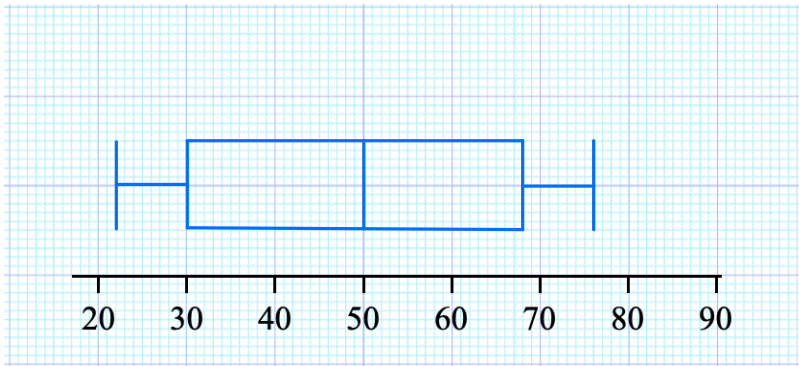
(b)   This box plot shows the marks achieved by Year 11 students on the same test.

For these Qs:
① Compare an average— in this case, the median
② Compare a measure of spread— either the range or the IQR

Compare the distribution of marks obtained by Year 10 with the distribution of marks obtained by Year 11.

The median mark in Y11 was higher than the median in Y10.

The range and interquartile range of marks was greater in Y10 than Y11.

You don't need to mention both. You can just compare one measure of spread.

Question 19

$f(x) = \dfrac{x+3}{7}$ and $g(x) = px + 5$ where p is a constant.

Given that $g(3) = 11$, find an expression for $f^{-1}g(x)$

Find p

$$g(3) = 3p + 5 = 11$$

$$\Rightarrow \quad p = \frac{11-5}{3} = 2 \qquad \text{so} \quad g(x) = 2x + 5$$

Find $f^{-1}(x)$

$$f(x) = \frac{x+3}{7} \quad \Rightarrow \quad f(f^{-1}(x)) = \frac{f^{-1}(x) + 3}{7}$$

$$\Rightarrow \quad x = \frac{f^{-1}(x) + 3}{7}$$

$$\Rightarrow \quad 7x - 3 = f^{-1}(x)$$

Find $f^{-1}(g(x))$

$$f^{-1}(x) = 7x - 3$$

$$\text{so} \quad f^{-1}(g(x)) = 7g(x) - 3 = 7(2x + 5) - 3$$

$$= 14x + 35 - 3$$

$$= 14x + 32$$

Question 20

Lucy estimated the number of rooks in a colony as follows:

First she caught 80 rooks and attached a ring to one of the legs of each rook. She then released them back into the colony. } Capture

After they had enough time to mix, Lucy caught 55 rooks. Some of these rooks were birds that she had previously attached rings to. Lucy used this information to estimate that there were 440 rooks in the colony. } Recapture

Of the 55 rooks she caught, how many had rings attached?

Based on her estimate, she captured $\frac{80}{440} = \frac{2}{11}$ of the rooks initially.

To have come up with her estimate, she should have found the same fraction of the recaptured rooks to have rings attached to them.

$\frac{2}{11}$ of 55 = $\underline{10}$ of the 55 rooks already had rings attached.