Year 11 Maths Homework 9 Key Skills Due Date: _____ Name: _____ Score: /20

Answer all questions, make sure you <u>show all working</u> otherwise you will not be awarded marks. If you write on any other paper, please hand this in with the sheet.

Number

1. Simplify $(2^4)^3$

2. Estimate $\frac{856 \times 195.1}{0.16}$

3. Write 173×10^{-4} in standard form

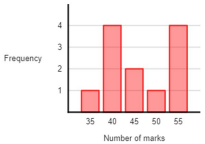
4. Simplify $\sqrt{32}$

5. $\xi = \{\text{even numbers between 16 and 56}\}$
$X = \{20, 28, 30, 32, 36, 40, 42, 44, 54, 56\}$
$Y = \{18, 22, 24, 36, 38, 40, 48, 50, 54\}$

List the elements in $X \cup Y$

Data

6. Find the range of the date



7. The mean of 5 items is 7. 4 of these items are:

9 6 1 3

Find the value of the 5 item

8. Jack collects the lengths of 40 animals and records the data in the table below. Find he median

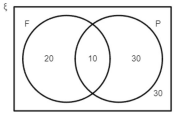
Length (z cm)	Frequency
$30 < z \leq 35$	2
$35 < z \leq 40$	5
$40 < z \leq 45$	26
$45 < z \leq 50$	6
$50 < z \leq 55$	1

9.

Colour	Black	Blue	White	Purple	Yellow
Probability	0.1	0.1	0.15	0.35	0.3

Indigo selects a counter at random 200 times. Work out an estimate for the total number of times the counter will be white.

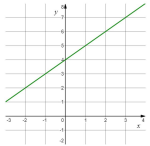
10. There are 90 pupils in a group.
The only languages available for the grou
Portuguese. Find the probability to sele
neither Portuguese nor French.



Algebra

11. Factorise $x^2 - 4x - 60$

12. Solve $6x - 7 = 4x + 1$

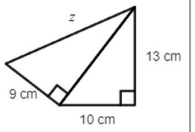
13.  Find the gradient

14. Simplify $(8x^2 + 7x + 2)(3x^2 + 5x)$

15. Solve $3 < 4y - 7 \leq 14$

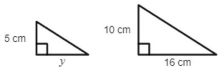
Geometry

16. Find the length of z



17. Bintou has a flower garden in the shape of a circle.
The diameter of the garden is 4.5 feet.Bintou wants to put fencing around the edge of the garden.The fencing costs $1.38 per foot.Work out the total cost of the fencing.

18. The shapes are similar
Find y.



19. Find the midpoint of the line segment AB where
A (0,8) and B (2,-10)

20. Sophie travelled a distance of 644 miles.
Sophie's average speed was 161 mph Find the duration of Sophie's journey.

Mark scheme

Question 1

2^{12}

① Multiply the exponents.

$$\begin{aligned}\left(2^4\right)^3 &= 2^{4\times 3}\\ &= 2^{12}\end{aligned}$$

Question 2

900000

856 rounds to 900 to 1 significant figure.
195.1 rounds to 200 to 1 significant figure.

$$\begin{aligned}\frac{856\times 195.1}{0.16} &\approx \frac{900\times 200}{0.2}\\ &\approx \frac{180000}{0.2}\\ &\approx 900000\end{aligned}$$

Question 3

1.73×10^{-2}

The number to convert is 173×10^{-4}

The first factor, 173, needs to be between 1 and 10. We need to divide 173 by 100 so it becomes 1.73

To compensate, we therefore need to make 10^{-4} 100 times bigger which increases the power by 2.

Therefore the answer is 1.73×10^{-2}

Question 4

$4\sqrt{2}$

① Rewrite $\sqrt{32}$ using the highest square number that goes into 32

$$\begin{aligned}\sqrt{32} &= \sqrt{16\times 2}\\ &= \sqrt{16}\sqrt{2}\end{aligned}$$

② Simplify $\sqrt{16}$ to obtain the final answer.

$\sqrt{16}\sqrt{2} = 4\sqrt{2}$

Question 5

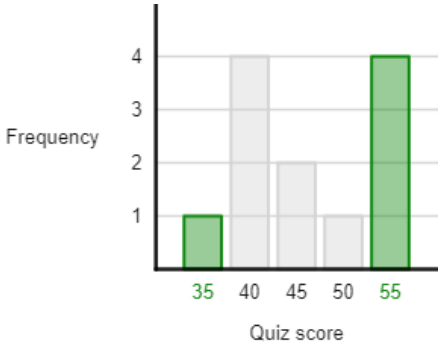
18, 20, 22, 24, 28, 30, 32, 36, 38, 40, 42, 44, 48, 50, 54, 56

$X \cup Y$ contains all elements in X or in Y or in both.

Question 6

20marks

① Identify the column with the lowest value and the column with the highest value.



$\text{Lowest} = 35$
$\text{Highest} = 55$

② Work out the range by finding the difference between these numbers.

$\text{Range} = 55 - 35$
$= 20$

Question 7

16

The mean of the 5 items is 7 therefore all items add up to $5 \times 7 = 35$.

The 4 listed items add up to 19.

$5^{\text{th}}\ \text{item} = 35 - 19$
$= 16$

Question 8

42.5cm

Add a cumulative frequency column.

Length (z cm)	Cumulative frequency

$30 </th >< td > 2 </td ></tr >< tr >< th > [m]35 </th >< td > 7 </td ><$

Question 9

30

Expected frequency = probability × number of trials

$0.15 \times 200 = 30$

Question 10

$\frac{1}{3}$

There are 30 pupils who study neither Portuguese nor French, out of 90 pupils, therefore the probability is $\frac{30}{90}$

Question 11

$(x - 10)(x + 6)$

We find two numbers that have difference 4 and multiply together to give 60. These are 10 and 6. Using these, we factorise as follows, being very careful to keep track of minus signs:

$x^2 - 4x - 60 = (x - 10)(x + 6)$

Question 12

$x = 4$

We change the equation by doing the same thing to each side with the goal of making it simpler at each step.

Firstly, we remove the x-term from one of the sides. We pick the right hand side because it has the smaller x-term, so we subtract $4x$ from both sides. Next we remove the constant from the left hand side by adding 7 to both sides. Lastly, we divide by the coefficient of the x-term on the left hand side, which is 2.

$$\begin{aligned} 6x - 7 &= 4x + 1 \\ -4x \downarrow \quad &\downarrow -4x \\ 2x - 7 &= 1 \\ +7 \downarrow \quad &\downarrow +7 \\ 2x &= 8 \\ \div 2 \downarrow \quad &\downarrow \div 2 \\ x &= 4 \end{aligned}$$

Question 13

1

$$m = \frac{\text{change in } y}{\text{change in } x}$$

Taking the two opposite ends of the line:

$$\begin{aligned} m &= \frac{7-2}{3--2} \\ &= \frac{5}{5} \\ &= 1 \end{aligned}$$

Question 14

$24x^4 + 61x^3 + 41x^2 + 10x$

① Multiply each term in the first bracket by each term in the second bracket.

$$\begin{aligned} &(+\,+)\,(+) \\ &= \times + \times + \times \\ &\quad + \times + \times + \times \\ &= 24x^4 + 40x^3 + 21x^3 + 35x^2 + 6x^2 + 10x \end{aligned}$$

② Simplify.

$$= 24x^4 + 61x^3 + 41x^2 + 10x$$

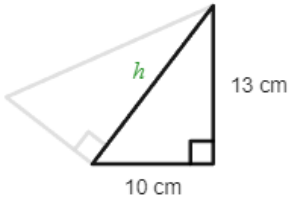
Question 15

$\frac{5}{2} < y \leq \frac{21}{4}$

$$\begin{array}{r} 3 < 4y - 7 \leq 14 \\ +7 \ +7 + 7 \\ 10 < 4y \leq 21 \\ \div 4 \ \ \div 4 \ \div 4 \\ \frac{5}{2} < y \leq \frac{21}{4} \end{array}$$

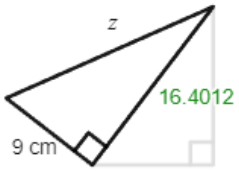
Question 16

$z =$18.7cm



① Start by calculating the length of h marked on the diagram using Pythagoras' theorem,

$$\begin{aligned} h^2 &= 13^2 + 10^2 \\ h^2 &= 269 \\ h &= \sqrt{269} \\ &= 16.4012 \end{aligned}$$



② Then use Pythagoras' theorem again to work out x:

$$\begin{aligned} z^2 &= 9^2 + h^2 \\ z^2 &= 81 + 269 \\ z^2 &= 350 \\ z &= \sqrt{350} \\ z &= 18.708287 \ldots \\ z &= 18.7 \text{ cm (to 1 dp)} \end{aligned}$$

Question 17

$19.51

① Find the circumference.

$C = \pi\, d$
$= \pi \times\ 4.5$
$= 14.14$ feet

② Multiply the circumference by the cost per foot.

$14.14 \times 1.38\ =\ \$19.51$

Question 18

y =8cm

① Find the scale factor.

$sf\ =\ \frac{10}{5}$
$= 2$

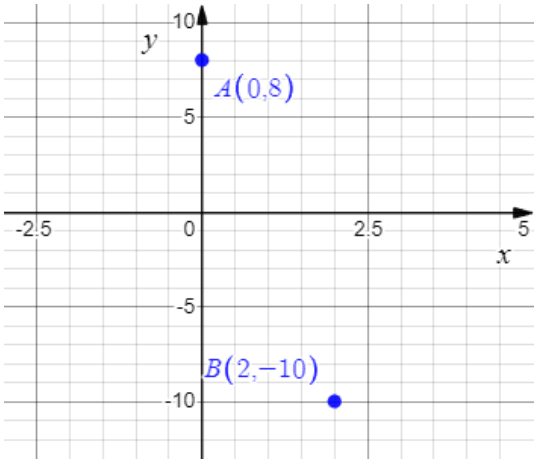
② Use the scale factor to find y.

$y\ =\ \frac{16}{2}$
$=\ 8$ cm

Question 19

$(1, -1)$

① The two points are plotted with a grid below.



② You can find the mean of the x values and the mean of the y values.

$x_M\ =\ \frac{0+2}{2} = 1$

$y_M\ =\ \frac{8+-10}{2} = -1$

Therefore the midpoint is $(1, -1)$

Question 20

4hours

Use the formula speed $= \frac{\text{distance}}{\text{time}}$ which can be rearranged to time $= \frac{\text{distance}}{\text{speed}}$

time $= \frac{644}{161} = 4$ hours.
