# YEAR 11 MATHS HOMEWORK 11 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  | Data  | Algebra   | Geometry   |
|---|---|---|--|
| 1. Decrease 4629 by 4%  | 6. Find $P(R \cup S)$   | 11. Expand and Simplify $(3x + 1)(x + 6)$   | 16. Find the area of the shaded<br>4 cm region   |
| 2. Adam puts £1355 into an bank account.<br>The account pays 2.25% compound interest each year. Work<br>out how much Adam will have in the account after 5 years. | 7. Here are the lengths, in cm, of eleven pencils.<br>10.7, 11.8, 11, 11.8, 13.8, 4.7, 14, 13.7, 3.4, 15.1, 3.8<br>Work out the range of these lengths.         | 12. Simplify $(2y^6)^4$   | 17. The area of the sector is 12cm <sup>2</sup> , Find x. $y$  |
| 3. Linda and Michael share £36 in the ratio 4:8. Find how much money each of them will receive.   | 8. Find the mean of the data in the table. Give your answer correct to 1 decimal place where appropriate. $\begin{tabular}{lllllllllllllllllllllllllllllllllll$ | 13. Solve the quadratic, give your answer to 2dp.<br>HINT: Rearrange to make =0 first<br>$x^2 + 11x = -3$ | 18. Find the value of x.<br>Give your answer to 1dp  |
| 4. A number y, when rounded to 3 significant figures, is equal to 6490. Find the upper and lower bound of y   | 9. The probability that Lily wins in a game is 0.8. Find the probability that Lily does not win.  | 14. Simplify $\frac{4x+2}{4} + \frac{2x+5}{3}$  | 19.Dave hired a car in the USA.<br>The cost of hiring the car was £546.7.<br>The exchange rate is $1 = £0.71$ .<br>Work out the cost of hiring the car in dollars. |
| 5. $\xi = \{\text{even numbers between 8 and 40}\}$<br>$Q = \{10\}$<br>$Q = \{10, 16, 24, 28, 34, 40\}$<br>Find $n(P \cap Q)$                                     | 10. The probability to roll a 5 on a biased dice is $\frac{5}{21}$ . Find the probability to get a number different to 5 when rolling the dice.                 | 15. Solve $14 + 3(x - 2) < 4(x - 6)$  | 20. The triangles are similar.<br>Find the length of z.  |

## Mark scheme

#### **Question 1**

4443.84

① Find the percentage multiplier for the decrease.

 $\frac{100-4}{100} = 0.96$ 

② Apply the decrease.

 $4629 \times 0.96 = 4443.84$ 

#### **Question 2**

£1514.45

The multiplier is  $\frac{100 + 2.25}{100} = 1.0225$ 

 $1355 \times 1.0225^5 = 1514.45$ 

#### **Question 3**

Lesley: £12 Mike: £24

There are 4 + 8 = 12 parts in the ratio.

Therefore one part in the ratio corresponds to  $36 \div 12 = 3$  of the amount to share.

The final ratio becomes  $4 \times 3: 8 \times 3$  which is equal to 12: 24

#### **Question 4**

Lower bound =6485 Upper bound =6495

This is as if the number had been rounded to the nearest 10.

To find the lower bound you can subtract half the accuracy, 5, from the rounded number.

To find the upper bound you add half the accuracy.

Lower bound = 6490 - 5 = 6485

Upper bound = 6490 + 5 = 6495

### **Question 5**

 $n(P \cap Q) = 1$ 

 $P \cap Q$  contains all elements in P and in Q

The elements in  $P \cap Q$  are 10 which is 1 element.

#### **Question 6**

 $\frac{10}{15}$ 

① Count the number of elements in  $R \cup S$ 



② Form a fraction to represent  $P(R \cup S)$ 

$$P(R \cup S) = \frac{\text{number of elements in } R \cup S}{\text{total number of elements}}$$
$$= \frac{10}{15}$$

#### **Question 7**

11.7cm

① Identify the lowest and highest number in the list.

Lowest = 3.4Highest = 15.1

<sup>②</sup> Work out the range by finding the difference between these numbers.

Range = 15.1 - 3.4= 11.7

#### **Question 8**

19

| Length (y cm)     | Frequency | fy                      |
|-------------------|-----------|-------------------------|
| $5 < y \le 10$    | 2         | $7.5 \times 2 = 15$     |
| $10 < y \leq 15$  | 8         | $12.5 \times 8 = 100$   |
| $15 < y \leq 20$  | 6         | $17.5 \times 6 = 105$   |
| $20 < y \leq 25$  | 7         | $22.5 \times 7 = 157.5$ |
| $25 < y \leq  30$ | 7         | $27.5 \times 7 = 192.5$ |
| Total             | 30        | 570                     |

Therefore the mean is  $\frac{570}{30} = 19$ 

#### Alternative method using a scientific calculator.

Turn on the frequency column (you only need to do this once): SHIFT, MENU/SETUP, Statistics, Frequency on.

Go to the correct calculator mode: MENU, Statistics, 1-Variable

Input the data below in your calculator.

x Freq
7.5 2
12.5 8
17.5 6
22.5 7
27.5 7

Calculate the mean: OPTN, 1-Variable Calc

 $\therefore \overline{x} = 19$ 

#### **Question 9**

0.2

Probabilities of exhaustive events add up to 1.

1 - 0.8 = 0.2

### **Question 10**

 $\frac{16}{21}$ 

Probabilities of exhaustive events add up to 1.

$$1 - \frac{10}{42} = \frac{16}{21}$$

### **Question 11**

 $3x^2 + 19x + 6$ 

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

$$(+)(+)$$
  
= x + x + x + x  
= 3x<sup>2</sup> + 18x + x + 6

<sup>②</sup> Simplify.

 $= 3x^2 + 19x + 6$ 

#### **Question 12**

 $16y^{24}$ 

① Raise each factor in the bracket to the power of 4

$$(2y^6)^4 = 2^4(y^6)^4$$
  
=  $16y^{24}$ 

**Question 13** 

x = -0.28 or x = -10.72

Method 1: by completing the square.

$$x^{2} + 11x = -3$$

$$\left(x + \frac{11}{2}\right)^{2} - \frac{121}{4} = -3$$

$$\left(x + \frac{11}{2}\right)^{2} = \frac{109}{4}$$

$$x + \frac{11}{2} = \pm \frac{\sqrt{109}}{2}$$

$$x = -\frac{11 + \sqrt{109}}{2} \text{ or } -\frac{11 - \sqrt{109}}{2}$$

Putting this into a calculator, we find that to 2 decimal places,

x = -0.28 or -10.72

Method 2: using the quadratic formula.

We start by rearranging the equation to get all the terms on the left hand side:

$$x^{2} + 11x = -3$$
  
$$x^{2} + 11x + 3 = 0$$

Using a = 1, b = 11 and c = 3

$$x = \frac{-11 \pm \sqrt{11^2 - 4 \times 1 \times 3}}{2 \times 1}$$

Putting this into a calculator, we find that to 2 decimal places,

x = -0.28 or -10.72

#### **Question 14**

 $\frac{10x+13}{6}$ 

① Rewrite both fractions with the lowest common denominator of 4 and 3.

$$\frac{4x+2}{4} + \frac{2x+5}{3} \\ \downarrow \times 3 \downarrow \times 4 \\ = \frac{3(4x+2)}{12} + \frac{4(2x+5)}{12} \\ = \frac{12x+6}{12} + \frac{8x+20}{12}$$

② Add the numerators and simplify.

$$= \frac{20x+26}{12} \\ = \frac{20^{10}x+26^{13}}{12^6} \\ = \frac{10x+13}{6}$$

#### **Question 15**

x > 32

① Expand the brackets and simplify.

14 + 3(x - 2) < 4(x - 6) 14 + 3x - 6 < 4x - 243x + 8 < 4x - 24

② Solve the inequality.

1 Rearrange.

x > 32

#### **Question 16**

39.4cm<sup>2</sup>

① Work out the area.

$$A = 13 \times 4 - \pi \times 2^{2}$$
  
= 39.4 cm<sup>2</sup>

#### **Question 17**

*y* =55 °

The area of a sector is  $\frac{\theta}{360} \times \pi r^2$  where r is the radius and  $\theta$  the angle of the sector.

Substituting gives

$$12 = \frac{y}{360} \times \pi \times 5^2$$

Multiplying both sides by 360 gives

 $12 \times 360 = y \times \pi \times 5^2$ 

Dividing both sides by  $\pi$  imes  $5^2$ 

$$\frac{12 \times 360}{\pi \times 5^2} = y$$

Therefore  $y = 55^{\circ}$ 

### **Question 18**

*x* =10.2cm

Start by calculating the length of *y* marked on the diagram.



Using Pythagoras' theorem,

$$y^2 = 10.5^2 - 7.5^2$$
  
 $y^2 = 54$   
 $y = \sqrt{54}$   
 $= 7.3485$ 

Then calculate x using the sine ratio:



$$\sin 46 = \frac{7.3485}{x}$$
  

$$x = \frac{7.3485}{\sin 46}$$
  

$$= 10.2156 \dots$$
  

$$= 10.2 \text{ cm (to 1 dp)}$$

## **Question 19**

\$770

(Could not display math)

 $546.7 \div 0.71 = \$770$ 

## **Question 20**

z =9.6cm

Tind the scale factor.

$$sf = \frac{5+3}{5}$$
  
= 1.6

 $\bigcirc$  Find z.

$$z = 6 \times 1.6$$
  
= 9.6 cm