

Y10 Higher Number

- 1 The audience in a theatre is made up of the following ratio:

men : women : children = 3 : 4 : 5

- a** There are 348 people in the audience. Calculate the number of men.
b What fraction of the audience are women?
c What percentage are children?
d Another night the audience was made up of the following ratio:

men : women : children = 2 : 5 : 6

One of the officials recorded that there were 310 people in the audience. He made a mistake in writing this figure down. Explain how you know this.

- 2 **a** Rhian measures the height of one of her tomato plants as 20 cm. The next week it is 15% taller. What is its new height?
b Another tomato plant grows from 240 cm to 312 cm. Calculate the percentage change in height.

- 3 Geoff filled the petrol tank in his car with unleaded petrol.

The petrol cost him £52.65.

- a** How many litres did he buy?
b How much more would it have cost Geoff if he had filled his petrol tank with super unleaded instead?

Unleaded Petrol £1.17 per litre Super Unleaded £1.22 per litre

- 4 **a** Write 48, 180 and 108 each as a product of its prime factors.
b Find the highest common factor of 48, 180 and 108.
c What is the lowest common multiple of 48, 180 and 108.
- 5 Show clearly how you would obtain an estimate for this calculation:

$$\frac{607 \times 4.97}{0.214}$$

- 6 Work out each of the following:

a $7\frac{3}{8} + 2\frac{1}{2} - 3\frac{2}{3}$ **b** The reciprocal of 5 divided by the square root of $\frac{1}{4}$.

- 7 Use the rules of indices to simplify the following. Give your answers in index form.

a $4^3 \times 4^5$ **b** $3^8 \div 3^2$ **c** $(t^4)^3$ **d** $\frac{m^9}{m^2 \times m^4}$

- 8 a** The cost of 5 metres of wire is £4.
What is the cost of 8 metres of the same wire?
- b** It takes 3 men 4 days to build a wall.
How long would it take 2 men to build the same wall?
- 9 a** Write down any irrational number.
- b** $\sqrt{30} < x < \sqrt{40}$
 x has a rational value. Write down a possible value for x .
- c** $2 < y < 3$
 y has an irrational value. Write down a possible value for y .
- 10 a** Express $\frac{5}{11}$ as a recurring decimal.
- b** Which of the following fractions are recurring decimals?

$$\frac{7}{18} \quad \frac{13}{20} \quad \frac{2}{35} \quad \frac{19}{25} \quad \frac{11}{16}$$

- 11 a** Write each of the following in standard index form
- i** 27 300 000 **ii** 0.00000000006
- b** Find, in standard index form, the value of each of the following
- i** $(1.25 \times 10^{-4}) \times (9.4 \times 10^{-5})$ **ii** $\frac{8.88 \times 10^4}{1.2 \times 10^{-3}}$

- 12** Luke buys a new car for £35 000.
By the end of each year the car has lost 20% of its value at the beginning of that year.
- a** How much is the car worth when it is one year old?
- b** How much is the car worth when it is four years old?
- 13** A dealer buys items from auctions and sells them via the internet.
- a** He buys a painting for £56 and makes a profit of 65% when he sells it.
What does he sell it for?
- b** Another time he makes a profit of 40% on a table which he sells for £112.
What did he buy the table for?
- c** Once he made a loss of 55% when he sold a bureau for £162.
What had he paid for the bureau?
- 14** The power, P , of a car is proportional to the velocity, v .
When $P = 3000$ watts, $v = 8$ metres per second.
- a** Find a formula for P in terms of v .
- b** Find the power, P , when $v = 5.2$ metres per second.
- 15** The length and width of a rectangle are 8 cm and 5 cm, each measured to the nearest centimetre.
- a** Write down the upper and lower bounds of the length of the rectangle.
- b** Write down the upper and lower bounds of the width of the rectangle.
- c** Find the difference between the maximum and minimum possible areas.
- 16** Calculate the value of $(4.41 \times 10^{-2})^{\frac{1}{2}}$

17 Simplify:

a 8^0 **b** 3^{-2} **c** $25^{\frac{1}{2}}$ **d** $27^{\frac{2}{3}}$ **e** $625^{\frac{2}{4}}$

18 Simplify each of these expressions containing surds:

a $\sqrt{3} \times \sqrt{5}$ **b** $5\sqrt{3} \times \sqrt{3}$ **c** $\sqrt{28}$ **d** $\sqrt{2\frac{1}{4}}$ **e** $\frac{6}{\sqrt{2}}$

19 Write the recurring decimal 0.4444... as a fraction.

Y10 Higher Statistics

- 1 Shelley is doing a survey to find out how many people eat five portions of fruit or vegetables every day.
She decides to ask 10 people as they come out of a local gym.
Give two different reasons why Shelley's method might not give very good data.
- 2 Asmat conducted a survey about how accurately people could guess the length of a piece of string to the nearest centimetre.
The results of the survey are given in the stem-and-leaf diagram.

2	7 9
3	3 5 5 6 8 9 9 9
4	0 1 1 1 3 4 6 6 7 8 9 9 9
5	0 0 1 2 3 3 5 7 8
6	2 4 9

- a How many people took part in Asmat's survey?
b Find the median length guessed.
c Find the range of lengths guessed.
d The actual length of the string was 44 cm. What percentage of the people surveyed were more than 10cm out on their guess? Give your answer to one decimal place.
- 3 The annual salaries of the workers in a factory are:

20 apprentices	£8500 each
15 semi-skilled workers	£15 000 each
10 skilled workers	£18 500 each
2 foremen	£23 000 each
1 manager	£37 000

The workers were discussing the average earnings in the factory.

- a The union representative quoted the modal salary as the average.
What is the modal salary?
b One of the foremen quoted the median as the average.
What is the median?
c Calculate the mean salary of all the people who work in the factory.
d Why is there a large difference between the modal and mean salaries?
- 4 Twenty people were asked their age and the number of hours of sleep they felt they needed.

The results are shown in the table.

Age	11	17	20	28	27	25	17	19	24	19
No. of hours sleep	10.5	9	8.5	6	5	6.5	8.5	8	6	7.5

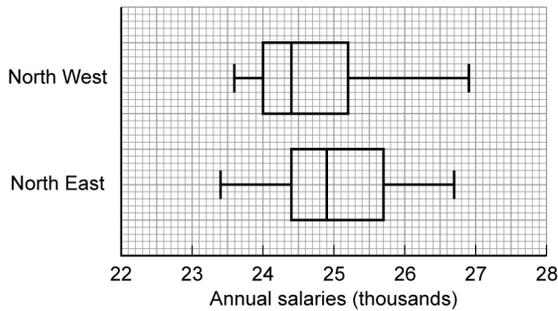
Age	21	16	20	29	22	16	23	15	22	25
No. of	7	10.5	8	5.5	7.5	9.5	7	10	6.5	10

hours sleep										
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- Plot this information on a scatter graph and draw the line of best fit.
- Use your line of best fit to estimate how many hours sleep a person of 26 years of age would need.
- Comment on the relationship between age and the number of hours of sleep needed.

5 James is an unemployed engineer. He is planning to move to the North East, North West or West Midlands region of the UK to find work.

He downloads from the internet details of 25 vacancies for engineers in each region. A summary of the salaries in the North East and North West regions is illustrated in the box plots below.



- What is the range of salaries in the North West?
- Find the inter-quartile range of salaries in the North West region.
- James summarises his results from the West Midlands region.

The median salary is £25 500, the lower quartile salary is £23 800 and the inter-quartile range is £2900.

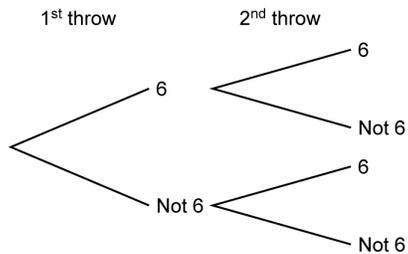
The highest salary is £27 200 and the lowest £22 600.

Use these results to draw a box plot for the West Midlands salaries, using the same scale for the horizontal axis as used on the diagram above.

- Comment on the salaries for engineers in the three regions that James is looking at.

6 Katie has a biased dice. The probability of throwing a six with the dice is 0.4. Katie throws the dice twice.

a Copy and complete the following probability tree diagram.



b What is the probability that Katie does not throw a six in her two throws?
 c What is the probability that Katie throws exactly one six in her two throws?

7 Ewan wants to find out the length of time cars are left in a car park. His results, to the nearest minute, are given in the table

Length of stay (minutes)	Number of cars (frequency)	Cumulative frequency
$0 < t \leq 15$	0	
$15 < t \leq 30$	21	
$30 < t \leq 45$	36	
$45 < t \leq 60$	42	
$60 < t \leq 75$	62	
$75 < t \leq 90$	22	
$90 < t \leq 120$	11	
$120 < t \leq 135$	6	

a Copy and complete the table.
 b Draw a cumulative frequency diagram for the data.
 c Use your diagram to estimate the inter-quartile range.
 d The owners of the car park think that about two-thirds of the cars are parked for between 40 and 80 minutes.

Do Ewan's results support this?
 Give a reason for your answer.

8 A bag contains 4 red balls, 5 blue balls and 3 yellow balls. One ball is selected at random and **not** replaced. A second ball is then selected at random.

a Calculate the probability that both balls are blue.
 b Calculate the probability that the two balls are different colours.
 Show your method.

9 The two-way table shows the number of males and females in a school.

	Staff	Students
Male	57	509
Female	42	592

The headteacher conducts a survey to find the reaction of the school to the introduction of a new uniform.

He decides to ask 200 people in total using stratified sampling.

How many of the sample will be:

a male staff **b** female staff **c** male students **d** female students?

10 A farmer weighs all 55 eggs collected one day.

The results are shown in the grouped frequency table below.

Weight, x grams	Number of eggs, f	Frequency density
$30 \leq x < 50$	5	
$50 \leq x < 60$	15	
$60 \leq x < 90$	30	
$90 \leq x < 110$	10	

- a** Copy the table and complete the frequency density column.
- b** Draw a histogram for the data.
- c** Estimate the mean weight of the eggs collected on that day.