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- 1) Work out the answers to the following:
 - a) 24 × 0.2
 - b) 13 × 0.4
 - c) 60 × 0.7
 - d) 243 × 0.2
 - e) 0.6 × 700
- 2) Work out the answers to the following:
 - a) 314 × 0.02
 - b) 836 × 0.001
 - c) 800 × 0.006
 - d) 418 × 0.003
 - e) 411 × 0.09
- 3) Work out the answers to the following:
 - a) 0.2 × 0.4
 - b) 0.1 × 0.03
 - c) 0.02 × 0.06
 - d) 0.08 × 0.003
 - e) 0.05 × 0.08
- 4) Work out the answers to the following:
 - a) 62 × 0.14
 - b) 2.7 × 2.5
 - c) 613 × 0.042
 - d) 42.3 × 1.8
 - e) 228 × 0.063

Decimals Between 0 and 1 Dividing

- 1) Work out the answers to the following:
 - a) 6 ÷ 0.2

N40b

- b) 8 ÷ 0.1
- c) 9 ÷ 0.3
- d) 4 ÷ 0.02
- e) 7 ÷ 0.002
- 2) Work out the answers to the following:
 - a) 62 ÷ 0.2
 - b) 51 ÷ 0.3
 - c) 4.56 ÷ 0.04
 - d) 22.5 ÷ 0.05
 - e) 14.7 ÷ 0.007
- 3) Work out the answers to the following:
 - a) 7.24 ÷ 0.2
 - b) 8.13 ÷ 0.3
 - c) 1.512 ÷ 0.07
 - d) 0.16 ÷ 0.008
 - e) 0.0732 ÷ 0.04
- 4) Work out the answers to the following:
 - a) 0.718 ÷ 0.2
 - b) 0.0141 ÷ 0.003
 - c) 0.24 ÷ 0.012
 - d) 1.625 ÷ 0.0013
 - e) 47.1 ÷ 0.15

Further Fractions Adding and Subtracting

- 3) 1) Work out Work out Work out 7) Work out 5) a) $1\frac{2}{3} + \frac{3}{4}$ a) $\frac{2}{3} - \frac{1}{2}$ a) $\frac{1}{3} + \frac{1}{2}$ a) $4\frac{1}{2} - 2\frac{1}{2}$ b) $\frac{3}{4} - \frac{2}{3}$ b) $2\frac{1}{2} + \frac{5}{7}$ b) $1\frac{2}{5} - 1\frac{1}{10}$ b) $\frac{3}{5} + \frac{1}{4}$ C) $\frac{2}{7} + \frac{3}{5}$ c) $\frac{2}{5} + 3\frac{1}{2}$ c) $3\frac{2}{3} - 1\frac{11}{15}$ c) $\frac{4}{5} - \frac{3}{4}$ d) $\frac{1}{2} + \frac{2}{9}$ d) $\frac{5}{6} - \frac{2}{3}$ d) $2\frac{3}{4} - 1\frac{5}{8}$ d) $1\frac{7}{10} + \frac{1}{5}$ e) $\frac{3}{10} + \frac{3}{7}$ e) $2\frac{3}{4} + \frac{5}{6}$ e) $5\frac{2}{3} - 1\frac{4}{9}$ e) $\frac{3}{4} - \frac{3}{8}$ Work out Work out 8) 2) 4) Work out 6) Work out a) $1\frac{3}{4} - \frac{1}{2}$ a) $2\frac{1}{2} + 1\frac{1}{5}$ a) $\frac{2}{3} + \frac{1}{6}$ a) $3\frac{4}{5} + 1\frac{1}{2}$ b) $1\frac{3}{4} + 1\frac{2}{3}$ b) $\frac{3}{5} + \frac{3}{10}$ b) $2\frac{4}{5} - \frac{3}{4}$ b) $4\frac{2}{9} - \frac{5}{6}$ C) $\frac{1}{2} + \frac{4}{5}$ c) $3\frac{1}{6} + 1\frac{1}{3}$ c) $3\frac{1}{6} - \frac{2}{3}$ c) $2\frac{3}{8} + 1\frac{5}{6}$ d) $2\frac{2}{9} + 1\frac{2}{3}$ d) $2\frac{2}{9} - \frac{5}{6}$ d) $\frac{5}{6} + \frac{3}{5}$ d) $2 - 1\frac{5}{8}$ e) $\frac{7}{12} + \frac{3}{4}$ e) $4\frac{1}{2} + 2\frac{3}{10}$ e) $6\frac{1}{2} - \frac{7}{8}$ e) $5 - 2\frac{1}{7}$
- 9) Find the perimeter of the rectangle below. Give your answer as a mixed number.
- 10) Find the perimeter of the triangle below. Give your answer as a mixed number.



If a length of copper tubing is $20\frac{1}{4}$ cm long and Jim 11) cuts off a piece that is $17\frac{3}{5}$ cm long, what is the length of the copper tubing left over?



Further Fractions N42a/b Multiplying and Dividing

| 1) | Work out a) $\frac{1}{2} \times \frac{3}{4}$ b) $\frac{2}{3} \times \frac{4}{5}$ c) $\frac{10}{11} \times \frac{2}{3}$ d) $\frac{4}{9} \times \frac{2}{5}$ e) $\frac{4}{7} \times \frac{1}{9}$ | 3) | Work out a) $1\frac{1}{2} \times \frac{8}{9}$ b) $2\frac{2}{3} \times \frac{6}{7}$ c) $\frac{6}{11} \times 1\frac{1}{8}$ d) $4\frac{2}{5} \times \frac{10}{11}$ e) $3\frac{3}{4} \times \frac{8}{9}$ | 5) | Work out a) $\frac{2}{3} \div \frac{1}{2}$ b) $\frac{3}{4} \div \frac{2}{3}$ c) $\frac{2}{5} \div \frac{3}{4}$ d) $\frac{3}{7} \div \frac{6}{11}$ e) $\frac{3}{4} \div \frac{3}{8}$ | 7) | Work out a) $2\frac{1}{2} \div 3\frac{1}{2}$ b) $3\frac{2}{5} \div 1\frac{1}{10}$ c) $4\frac{1}{3} \div 1\frac{11}{15}$ d) $2\frac{3}{4} \div 1\frac{5}{8}$ e) $5\frac{2}{3} \div 1\frac{4}{9}$ |
|----|--|----|---|----|---|--------------------------------------|--|
| 2) | Work out a) $\frac{2}{3} \times \frac{3}{5}$ b) $\frac{3}{7} \times \frac{5}{6}$ c) $\frac{8}{9} \times \frac{6}{10}$ d) $\frac{1}{2} \times \frac{8}{9}$ e) $\frac{7}{10} \times \frac{5}{21}$ | 4) | Work out a) $2\frac{1}{2} \times 2\frac{1}{5}$ b) $3\frac{3}{4} \times 2\frac{2}{3}$ c) $4\frac{1}{6} \times 2\frac{2}{5}$ d) $2\frac{2}{9} \times 1\frac{1}{5}$ e) $3\frac{4}{7} \times 1\frac{13}{15}$ | 6) | Work out a) $\frac{3}{4} \div 1\frac{1}{5}$ b) $\frac{4}{7} \div 1\frac{7}{9}$ c) $2\frac{1}{4} \div \frac{6}{7}$ d) $2\frac{3}{5} \div \frac{9}{10}$ e) $1\frac{1}{2} \div \frac{3}{8}$ | 8) | Work out a) $\frac{2}{3} \div 2$ b) $1\frac{3}{4} \div 14$ c) $4 \div \frac{2}{5}$ d) $5 \div \frac{3}{4}$ e) $3\frac{1}{2} \div 4$ |

- Find the area of the rectangle below.
 Give your answer as a mixed number.
- 10) Find the area of the triangle below. Give your answer as a mixed number.



- $1\frac{1}{2}$ cm $2\frac{1}{2}$ cm
- 11) Jim has a length of copper tubing which is 85 cm long. He wants to cut it into pieces which are $4\frac{1}{4}$ cm long. If there is no wastage, how many pieces will Jim get?



Estimating Answers Multiplication

- 1) Estimate the value of:
 - a) 21 × 34
 - b) 42 × 56
 - c) 17 × 62
 - d) 29 × 78
 - e) 66 × 96
- 2) Estimate the value of:
 - a) 510 × 724
 - b) 86 x 2146
 - c) 753 × 184
 - d) 48 × 6315
 - e) 3642 × 1356

Estimating Answers Division

1) Estimate the value of:

N43b

- a) <u>61</u> 19
- b) $\frac{76}{43}$
- c) $\frac{362}{78}$
- d) $\frac{738}{96}$
- e) $\frac{416}{781}$
- 2) Estimate the value of:
 - a) $\frac{357}{12 \times 23}$
 - b) $\frac{924}{34 \times 13}$
 - c) $\frac{172 \times 411}{430}$
 - d) $\frac{625 \times 43}{16 \times 38}$
 - e) $\frac{972 \times 368}{17 \times 23 \times 18}$
- 3) Estimate the value of:
 - 8 ÷ 0.12 a)
 - b) 6 ÷ 0.24
 - c) 5 ÷ 0.49
 - d) 7 ÷ 0.012
 - e) 23 ÷ 0.18

- 4) Estimate the value of:
 - a) <u>24 × 510</u> 0.53

c)
$$\frac{215 \times 38}{0.183}$$

- d) $\frac{18.3 \times 31.2}{0.017}$
- e) $\frac{405 \times 274}{0.488}$

N44 Using a Calculator

- 1) Using a calculator, work out the value of:
 - a) 24 + 16 ÷ 4
 - b) 3 + 8 ÷ 2 × 3
 - c) 60 × 2 20 ÷ 4
 - d) (2 + 7 × 8) × 4
 - e) (3 + 7) × (8 2)
- 2) Using a calculator, work out the value of:
 - a) $6^3 (2^4 + 3^5)$
 - b) $(3^7 2^6) \div 10^4$
 - c) $2^8 \div 2^3 \times 5^2$
 - d) 5³ × 3⁵
 - e) $2^{20} 3^8$
- 3) Using a calculator, work out the value of:
 - a) $\sqrt{256} \times 2^4 \sqrt{169}$
 - b) $\sqrt{365} \times \sqrt{365}$
 - c) √550 21
 - d) $\sqrt{2^8 + 3^4 13}$
 - e) $\sqrt{4^6 \times 2^8} \div (3^2 1)$
- 4) Using a calculator, work out the value of:
 - a) $\frac{7+4 \times 8}{18-5}$ d) $\frac{62 \times 2^4 + 2^3}{\sqrt{4^3 + 3^2 + 3^3}}$
 - b) $\frac{6^3 2^3}{(3^2 + 7) \div 2}$ e) $\frac{284 \sqrt{2^9 112}}{(3 + 17) \times \sqrt{100}}$

c)
$$\frac{\sqrt{729} + 21}{\sqrt{64}}$$



- 1) Write these numbers in standard form:
 - a) 40 000
 - b) 200 000
 - c) 600
 - d) 9 000 000
- 2) Write these numbers as digits and then in standard form:
 - a) twenty thousand
 - b) eighty million
 - c) three hundred thousand
- 3) Write these as normal numbers:
 - a) 7 × 10⁵
 - b) 6×10^9
 - c) 3×10^{12}
 - d) 2 × 10¹⁴
- 4) Write these as normal numbers:
 - a) 2.4 × 10⁵
 - b) 3.26×10^9
 - c) 4.01 × 10¹²
 - d) 7.115 × 10¹³
- 5) Write these numbers in standard form:
 - a) 45 000
 - b) 607 000 000
 - c) 8 300 000 000
 - d) 910 200

N45b Numbers Between 0 and 1

Standard Form

- 1) Write these as normal numbers:
 - a) 6 × 10⁻⁴
 - b) 7 × 10⁻⁸
 - c) 3×10^{-6}
 - d) 9 × 10⁻¹¹
- 2) Write these as normal numbers:
 - a) 2.6×10^{-3}
 - b) 3.4×10^{-6}
 - c) 5.23 × 10⁻⁵
 - d) 9.806×10^{-9}
- 3) Write these numbers in standard form:
 - a) 0.000 06
 - b) 0.000 007
 - c) 0.000 000 03
 - d) 0.000 000 000 004
- 4) Write these numbers in standard form:
 - a) 0.000 63
 - b) 0.006 024
 - c) 0.000 007 4
 - d) 0.000 000 000 99

Exact Representation of Roots



1) Give two consecutive integers that the answers to these questions lie between.

eg $\sqrt{7}$ is between 2 and 3

N46

- a) $\sqrt{15}$ is between ____ and ____
- b) $\sqrt{23}$ is between ____ and ____
- c) $\sqrt{79}$ is between ____ and ____



- 2) Which of these can be rewritten as an exact answer without the square root symbol? Where possible, write the answer.
 - a) √5
 - b) $\sqrt{25}$
 - c) √10
 - d) $\sqrt{18}$
 - e) $\sqrt{100}$



3) Find the decimal approximations for these, giving your answer to 1 decimal place:

- a) <u>√8</u>
- b) $\sqrt{21}$
- c) √13
- d) $\sqrt{46}$
- e) √65
- f) <u>_____</u>99

25 Trial and Improvement Harder Questions

 The equation x² + 3x = 37 has a solution between 4 and 5. Use a trial and improvement method to find this solution. Give your answer to one decimal place. You must show ALL your working.

2) The equation x² - 4x = 6 has a solution between 5 and 6. Use a trial and improvement method to find this solution. Give your answer to one decimal place. You must show ALL your working.

25 Trial and Improvement Harder Questions

 The equation x³ + 3x = 114 has a solution between 4 and 5. Use a trial and improvement method to find this solution. Give your answer to one decimal place. You must show ALL your working.

2) The equation x³ - 2x = 9 has a solution between 2 and 3.
Use a trial and improvement method to find this solution. Give your answer to one decimal place.
You must show ALL your working.

A26a/b/c

Further Simultaneous Equations

| 1) | Solve | 3x + y = 11 $4x - y = 3$ | 13) | In the first week of opening, a zoo sold 200 adult tickets and 300 child tickets. The takings for that week were £2600. |
|-----|-------|------------------------------|-----|--|
| 2) | Solve | 2x - 5y = 3 $4x + 5y = 21$ | | In the second week, 500 adult tickets were sold and 400 child tickets were sold. The takings for the second week were £5100. |
| 3) | Solve | x - 2y = 3 $3x + 2y = 5$ | | Form two equations and solve them to find the price of an adult ticket and the price of a child ticket. |
| 4) | Solve | x + 3y = 10 $x + y = 6$ | 14) | If you multiply Sid's age by four and Tony's age by five and add the answers together |
| 5) | Solve | 3x + 2y = 3 $2x + 2y = 5$ | | It comes to 259 years. However, if you multiply Sid's age by seven and then take away two times Tony's age the answer is 120 years. |
| 6) | Solve | 5x - 3y = 23 $2x - 3y = 11$ | | Form two equations and solve them to find the ages of Sid and Tony. |
| 7) | Solve | 3x - 2y = 6 $x + y = 7$ | 15) | If nine rats and seven ferrets cost £116.75 and four rats and six ferrets cost £88, how |
| 8) | Solve | 6x + y = 10 $2x - 3y = 10$ | | much would five rats and four ferrets cost? |
| 9) | Solve | 2x + 7y = 11 $3x - 2y = 4$ | 16) | If a mouse and a goldfish cost £1.10 and the mouse costs £1 more than the goldfish, how much does the goldfish cost? |
| 10) | Solve | 4x + 3y = 9 5x + 2y = 13 | | |
| 11) | Solve | 2x + 3y = -7 $7x - 2y = -12$ | | |
| 12) | Solve | 3x - 2y = 5 $9x + 5y = -7$ | | |



a) Shade the region represented by *x* ≤ -1
b) Shade the region represented by *x* > 3



- 2) a) Shade the region represented by y < -1
 - b) Shade the region represented by $y \ge 2$



3) Shade the region represented by $-3 \le x \le 2$



4) Shade the region represented by $1 \le y \le 4$



5) Shade the region where $-1 \le x \le 3$ and $-4 \le y \le -2$



 6) Shade the region where -3 < x < 2 and -1 < y < 4





1) A guitar was valued at £2000 on January 1st 1990.

The value of the guitar is given by $V = 2000 \times 1.03^{t}$ where £*V* is the value *t* years after 1st Jan 1990.

a) Sketch the graph of $V = 2000 \times 1.03^t$ on the axes below, marking clearly where the graph crosses the *y*-axis.



- b) Use your calculator to work out the value of the guitar on 1st January 1995.
- c) Use your calculator to work out the value of the guitar on 1st January 1987.
- 2) Sketch the graph of $y = \frac{1}{x}$ on the axes below.



Compound Measures R11a/b

- 1) A car travels at 60 mph for 3 hours. How far does the car travel?
- A cyclist cycles for 4 hours and covers a distance of 48 miles. What was her average speed in miles per hour?
- 3) How long would it take a train which travels at an average speed of 80 mph to cover a distance of 400 miles?
- 4) A runner runs at a speed of 12 km/h for 3 hours and 15 minutes. How far does he run?
- 5) An aeroplane flies at an average speed of 510 mph. How long would it take to fly a distance of 2720 miles?
- 6) If a worm travels a distance of 8.25 m in 2 hours and 45 minutes, work out his average speed in metres per hour.
- 12.5 cm³ of mercury has a mass of 170 g. Work out the density of mercury.
- Platinum has a density of 21.4 g/cm³.
 What is the mass of 35 cm³ of platinum?
- A quantity of ice had a mass of 62.56 g. Knowing that ice has a density of 0.92 g/cm³, work out how much ice there was, in cm³.
- 15000 cm³ of nitrogen has a mass of 18.765 g.
 Work out the density of nitrogen in g/cm³.
- 15000 cm³ of gold has a mass of 289.5 kg.
 Work out the density of gold in g/cm³.



- A shop has 25% off its prices in a sale.
 Below are the sale prices of some items.
 Find the original price of each item.
 - a) £3.60
 - b) £4.80
 - c) £21.00
 - d) £15.30
 - e) £99.00
 - f) £12.90
- 2) A shop has 20% off its prices in a sale.Below are the sale prices of some items.Find the original price of each item.
 - a) £4.00
 - b) £4.80
 - c) £12.00
 - d) £16.40
 - e) £120.00
 - f) £192.00
- 3) A shop has 15% off its prices in a sale.Below are the sale prices of some items.Find the original price of each item.
 - a) £17.00
 - b) £51.00
 - c) £42.50
 - d) £84.15
 - e) £52.70
 - f) £83.30

R13 Inverse Proportion

- 1) 3 people can paint a room in 2 hours.
 - a) How long would it take 1 person?
 - b) How long would it take 2 people?
 - c) How long would it take 6 people?
 - d) How long would it take 8 people?
- 2) 5 people can harvest all of the apples in an orchard in 12 hours.
 - a) How long would it take 1 person?
 - b) How long would it take 12 people?
 - c) How long would it take 2 people?
 - d) How long would it take 9 people?

G31 Congruent Triangles

1) Sort these six triangles into 3 congruent pairs.



2) Which of the following triangles are congruent to triangle T?





1) Here is a cone.



- a) the volume
- b) the curved surface area
- c) the total surface area
- 2) Here is a cone.



Find the total surface area.

3) A child's rocket is made from a cone and a cylinder.

Find the total volume of the toy rocket.





- 1) Find
 - a) the volume of the sphere
 - b) the surface area of the sphere



- 2) Find the volume of
 - a) a sphere with radius 10 cm
 - b) a sphere with diameter 16 cm
- 3) Find the surface area of
 - a) a sphere with radius 9 cm
 - b) a sphere with diameter 20 cm
- 4) Here is a hemisphere



Find

- a) the volume of the hemisphere
- b) the total surface area of the hemisphere



1) Enlarge line *AB* with scale factor -2 and point (7, 6) as the centre of enlargement.



2) Enlarge line *AB* with scale factor -3 and point (3, 4) as the centre of enlargement.



3) Enlarge triangle *ABC* with scale factor -2 and point (7, 6) as the centre of enlargement.



4) Enlarge triangle *ABC* with scale factor -1.5 and point (4, 5) as the centre of enlargement.





Find the lengths of the missing sides, giving your answers to 1 decimal place,





Find the sizes of the angles marked with letters, giving your answers to 1 decimal place,



Relative Frequency

 Peter bought an unfair dice from a Joke Shop. He didn't know how the dice was biased and so he rolled it 100 times and noted down which numbers came up.

He found that the number 6 occurred 8 times.

- a) What is the relative frequency of getting a six?
- b) If Peter rolls the dice 400 times, estimate how many 6s he will roll.
- Mary had a bag containing four different colour marbles. She chose a marble, noted its colour and then replaced it, 80 times.

ColourNo. of times
chosenRed12Blue24Green18Yellow26

The results can be seen in this table.

- a) Estimate the probability that a blue marble will be chosen on the next pick.
- b) If a marble is chosen and replaced 280 times, estimate how many times you would expect to choose a red marble.
- Benford's law says that if you look at real-life sources of data (heights of mountains, populations of countries, etc) the number 1 will be the first digit with relative frequency 0.3 If you go through any newspaper and write down the first 20 numbers you come across, about how many of the numbers would you expect to begin with a '1'.



Sally conducted a survey to see how many sandwiches each pupil brought to school in her class per day. The results can be seen in the table.

| No. of sandwiches | Frequency |
|-------------------|-----------|
| 0 | 1 |
| 1 | 5 |
| 2 | 6 |
| 3 | 12 |
| 4 | 2 |

- What is the modal number of sandwiches brought to school? a)
- b) What is the median number of sandwiches brought to school?
- C) Work out the mean number of sandwiches brought to school. Give your answer to 1 decimal place.



1) 50 hippos were captured over the course of a year and weighed. The results can be seen in the table, below.

| Weight of hippo | Frequency |
|-------------------|-----------|
| In tonnes | |
| $1.4 \le w < 1.7$ | 5 |
| $1.7 \le w < 2.0$ | 9 |
| $2.0 \le w < 2.3$ | 15 |
| $2.3 \le w < 2.6$ | 12 |
| $2.6 \le w < 2.9$ | 7 |
| $2.9 \le w < 3.2$ | 2 |

Work out an estimate for the mean weight of a hippo. Give your answer to 1 decimal place.

2) Jenny had a theory that if asked to guess the length of a line, children under the age of 10 would overestimate the length but adults would underestimate the length.

To help her decide if she was correct she asked 100 under-10s and 100 adults to guess the length of a 34 cm line.

The results can be seen in the two tables, below.

| Children under the age |
|------------------------|
| of 10 estimates |

| Estimate of length in cm | Frequency |
|-----------------------------|-----------|
| 20 ≤ <i>l</i> < 24 | 4 |
| 24 ≤ <i>l</i> < 28 | 11 |
| 28 ≤ <i>l</i> < 32 | 24 |
| 32 ≤ / < 36 | 39 |
| 36 ≤ <i>l</i> < 40 | 22 |

Adult estimates

| Estimate of length in cm | Frequency |
|-----------------------------|-----------|
| 20 ≤ <i>l</i> < 24 | 2 |
| 24 ≤ <i>l</i> < 28 | 6 |
| 28 ≤ <i>l</i> < 32 | 16 |
| 32 ≤ / < 36 | 62 |
| 36 ≤ / < 40 | 14 |

Use the results in the tables to see if Jenny was correct. Show all your workings.