

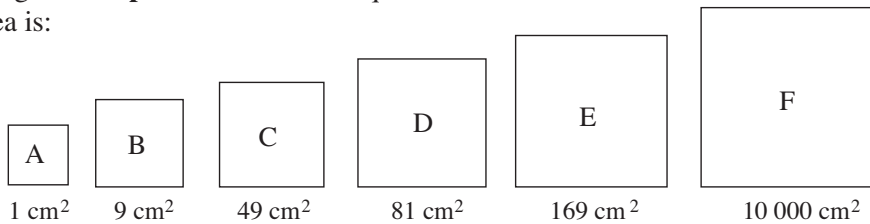
Mathematics Enhancement Programme

TEACHING SUPPORT: Year 6

EXERCISES

The following exercises are taken from Year 6 Practice Books 6a and 6b. They illustrate more of the problem-solving questions rather than the routine ones. Do try these questions before looking at the solutions and suggested strategies.

1. What length is the **perimeter** of each square if its area is:



A: $P = \square$ cm, B: $P = \square$ cm C: $P = \square$ cm
 D: $P = \square$ cm E: $P = \square$ cm F: $P = \square$ cm

Which squares are similar?

(p10, Q4)

2. Write a plan, estimate, calculate and check your answer in your exercise book. Write the answer in a sentence here. Underline any data not needed in the calculation.

- a) Christopher bought a painting for £2600. Then he sold it 3 weeks later for £2800. After another 2 weeks, he changed his mind and bought the painting back for £3100. After 1 week, he sold the painting again for £3200. Did he make a profit or a loss on the painting and how much was it?

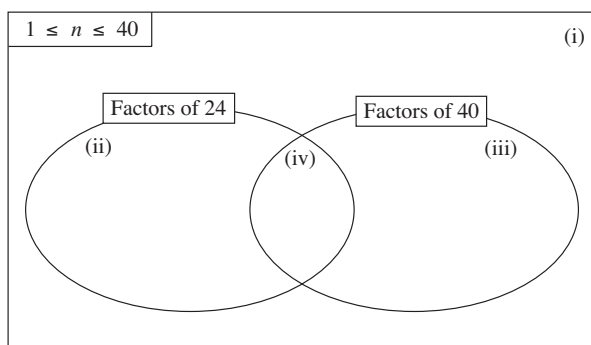
Answer:

- b) A box 15 cm deep holds 13 kg of tomatoes and a box 20 cm deep holds 17 kg of tomatoes. What is the total price of all the tomatoes in the 2 boxes if 1 kg of tomatoes costs £2.25.

Answer:

(p14, Q2)

3. a) Write the natural numbers from 1 to 40 in the Venn diagram.



- b) What is the **greatest common factor** of 24 and 40?
 c) What is the **lowest common multiple** of 24 and 40?
 d) What kind of numbers are in the parts of the diagram labelled i), ii), iii) and iv)?

Write a sentence to describe each set.

(p20, Q4)

4. Solve these equations and inequalities. Check your results.

- a) $0.332 + a = 10$ b) $5 \times b - 4.07 = 5$ c) $c - 92.7 = 3.8$
 d) $d \div 100 = 0.054$ e) $8 \times (e \div 10) = 2.5$ f) $(76.4 - f) + 5 = 80$
 g) $0.1 \times 100 < g \leq 1.5 \times 10$ h) $h \div 10 < 2.2 - h$

(p25, Q5)

5. a) Convert these fractions to 24ths and write them in increasing order in your exercise book.

$$\frac{1}{2}, \frac{3}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{4}, \frac{4}{3}, \frac{7}{24}, \frac{16}{8}, \frac{5}{6}, 1\frac{5}{12}$$

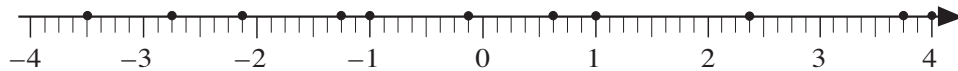
b) Convert each fraction to an equivalent fraction with numerator 12. Write them in increasing order in your exercise book.

$$\frac{3}{4}, \frac{2}{11}, \frac{6}{5}, \frac{1}{3}, \frac{6}{7}, \frac{5}{10}, \frac{9}{6}, \frac{4}{5}, \frac{4}{3}, \frac{3}{2}$$

(p31, Q5)

6. A **rational** number is any number which can be written as a fraction, where the numerator and denominator are whole numbers but the denominator is *not* zero.

a) Label in fraction form the **rational** numbers marked on the number line.

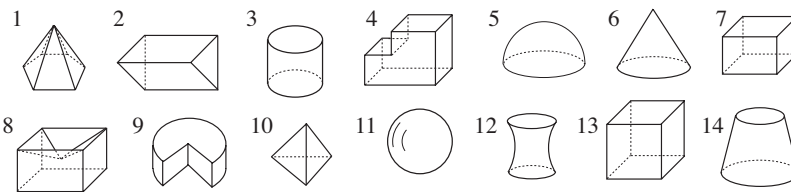


b) Mark the **opposite** value of each number in *red*.

c) Write each of the marked numbers as a decimal. d) What is their sum?

(p40, Q1)

7.



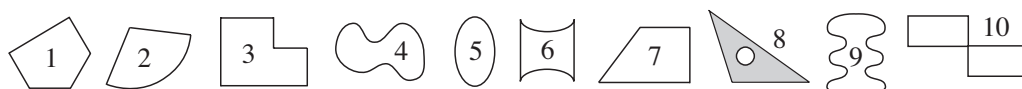
Count the faces, edges and vertices of the solids shown above which have **only** plane faces.

Complete the table.

Solid	1							
Number of faces								
Number of edges								
Number of vertices								

(p41, Q2)

8. Study these plane shapes. What do some of them have in common?



What do the shapes listed below have in common? Write a sentence about each set.

- a) 1, 3, 7
- b) 4, 5, 9
- c) 2, 4, 5, 6, 8, 9.....
- d) 1, 3, 6, 7, 10.....
- e) 1, 3, 7, 10
- f) 3, 4, 6, 8, 9, 10.....
- g) 1, 2, 5, 6, 9
- h) Make up a set which is different from those given. Write a sentence about it.

(p45, Q1)

9. Precise measurements are important in design, technology, engineering, chemistry, medicine, etc. In everyday life, it is enough to use rough estimates and conversions.

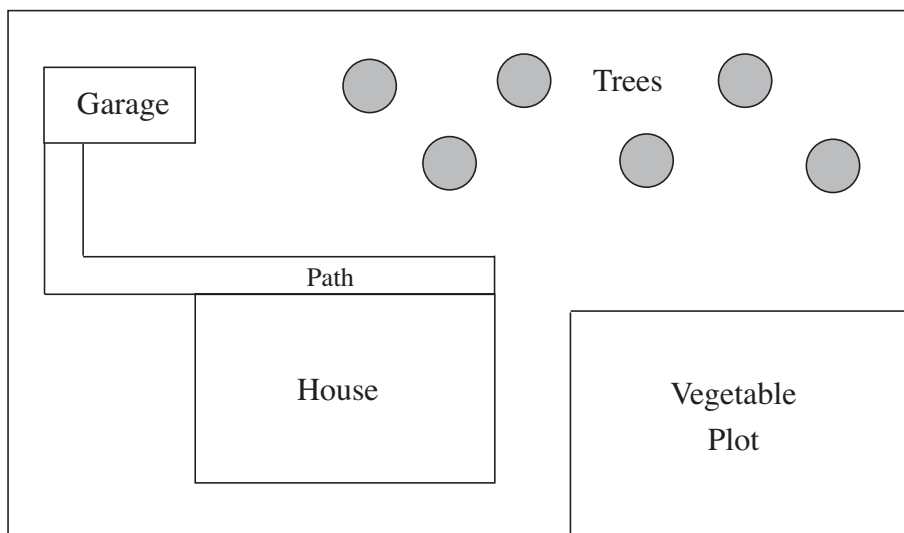
Complete the missing items. Write as fractions and as decimals.

- a) If 1 inch \approx 2.5 cm, then 1 cm \approx in \approx inches
- b) If 1 foot \approx 0.3 m, then 1 m \approx ft \approx feet
- c) If 1 metre \approx 1.1 yards, then 1 yard \approx m \approx metres
- d) If 1 mile \approx 1.6 km, then 1 km \approx miles \approx miles
- e) If 1 ounce \approx 28 g, then 1 g \approx oz \approx ounce
- f) If 1 kg \approx 2.2 lb, then 1 lb \approx kg \approx kilograms
- g) If 1 pint \approx 0.57 litres, then 1 litre \approx pt \approx pints
- h) If 1 gallon \approx 4.5 litres, then 1 litre \approx gal \approx gallons

(p47, Q1)

10. This is the plan of a house and its garden.

Scale: 1 : 400



- a) Measure on the plan, then calculate the real lengths and widths of:
 - i) the house ii) the garage iii) the vegetable plot iv) the whole garden.
- b) Calculate: i) the perimeter of the vegetable plot ii) the area of the garden.

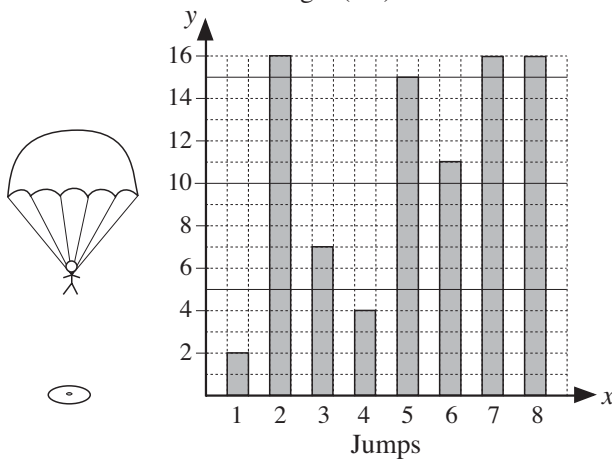
(p49, Q1)

11. In a parachute target jumping competition, each competitor makes 8 jumps. The target is a circle with radius 16 cm. The scores range from 0 cm to 16 cm, depending on how far away from the centre of the target circle the parachutist lands.

If the parachutist misses the target completely, the lowest score they can get is 16 cm.

The bar chart shows the scores of one competitor.

Distance from centre of target (cm)



- a) Write the scores in decreasing order in your exercise book.
- b) What is the range of the data?
Range: cm
- c) What is the mode of the data?
Mode: cm
- d) Calculate the mean value.
Mean: cm
- e) Calculate the mean of the two middle scores.
Median: cm

(p52, Q1)

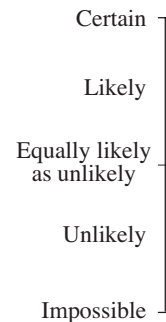
12.



A bag contains 2 *red*, 3 *yellow* and 5 *green* marbles. If you took out a marble with your eyes closed, what chance would you give to each of these outcomes?

Join each outcome to the appropriate level of chance.

- a) The marble taken out is *green*.
- b) The marble taken out is *red*.
- c) The marble taken out is either *red* **or** *yellow*.
- d) The marble taken out is **not** *yellow*.
- e) The marble taken out is *black*.
- f) The marble taken out is **not** *black*.



(p60, Q1)

13. Do the multiplications in your exercise book. **Simplify** the fractions first if possible.

- a) i) $\frac{3}{4} \times \frac{2}{9}$ ii) $\frac{3}{4} \times \frac{9}{2}$ iii) $\frac{4}{3} \times \frac{2}{9}$ iv) $\frac{4}{3} \times \frac{9}{2}$
- b) i) $\frac{4}{15} \times \frac{12}{5}$ ii) $\frac{15}{4} \times \frac{12}{5}$ iii) $\frac{4}{15} \times \frac{5}{12}$ iv) $\frac{15}{4} \times \frac{5}{12}$
- c) i) $\frac{1}{3} \times \frac{3}{5} \times \frac{5}{7} \times \frac{7}{9}$ ii) $\frac{1}{2} \times \frac{4}{8} \times \frac{8}{16} \times \frac{32}{64} \times \frac{128}{256}$

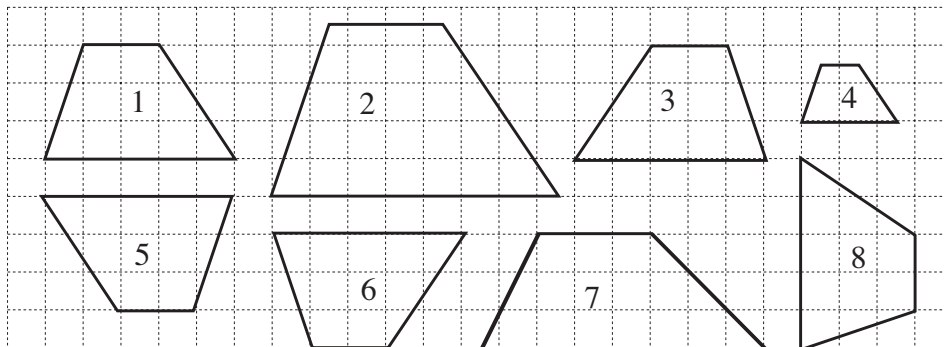
(p70, Q5)

14. Solve these problems in your exercise book.

- a) What is $\frac{5}{6}$ of 45.6 kg? b) What is 70% of 45.6 kg?
- c) $\frac{5}{8}$ of a quantity is 450 m. What is the whole quantity?
- d) 62.5% of a quantity is 450 m. What is the whole quantity?

(p80, Q3)

15. What has been done to Shape 1 to form the other shapes? Describe each **transformation** in your exercise book. Colour the shape which is **not** similar.



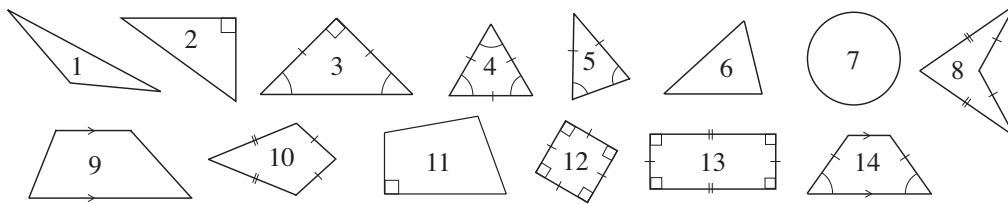
(p85, Q1)

16. Fill in the missing words.

- a) An **equilateral** triangle has angles of ° and has three sides.
- b) An **isosceles** triangle has at least equal .
- c) An **equilateral** triangle is also an triangle.
- d) A triangle which has sides in the ratio of 3 : 4 : 5 is a triangle.
- e) A triangle with 3 different sides is called a triangle.
- f) There is no triangle which has a angle.
- g) The sum of the angles of any triangle is °.

(p90, Q4)

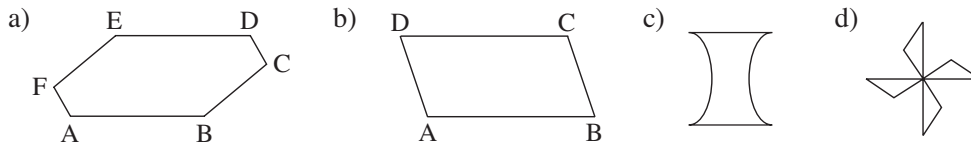
17. List the numbers of the shapes which match the descriptions.



- a) It has line symmetry.
- b) It has rotational symmetry.
- c) It is a regular shape.
- d) It has an obtuse angle.
- e) It has **only** acute angles.
- f) It is a trapezium.
- g) It is a deltoid.
- h) It is a rhombus.
- i) It is **not** a polygon.

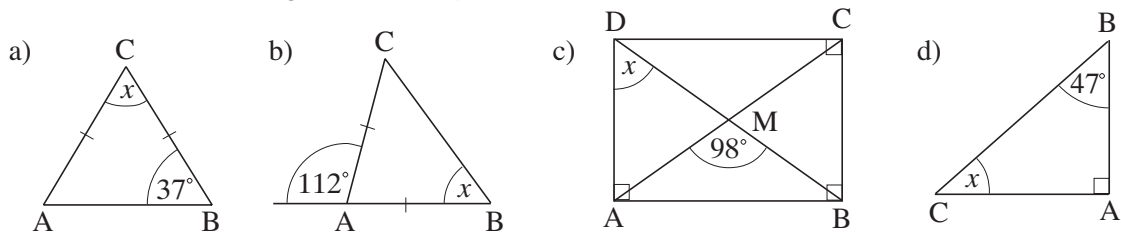
(p95, Q1)

18. Draw any lines of symmetry and mark the centres of rotation.



(p96, Q4)

19. Calculate the size of angle x . *The diagrams are not drawn to scale.*



(p100, Q4)

20. Use a calculator to work out the missing values.

- a) If £1 \approx 1.43 Euros,
1 Euro \approx £
- b) If 1 Euro \approx 7.47 Danish Kroner,
1 DK \approx EUR
- c) If 1 USD \approx 0.62 GBP,
1 GBP \approx USD
- d) If £1 \approx 183.2 JPY,
1 JPY \approx £

(p105, Q1)

21. a) The surface area of each face of an ice cube is 49 cm^2 . Calculate:
- i) the volume of the ice cube
 - ii) its mass, if 1 cm^3 of ice weighs 0.91 g .
- b) The surface area of a square-based prism is 64 cm^2 and its base edge is 2 cm .
What is the volume of the prism?

(p107, Q6)

22. Solve these problems in your exercise book.

- a) Tom had blackcurrants, gooseberries, loganberries, raspberries and strawberries in his garden. One summer he gathered all the fruit and put it in his freezer.
This is the ratio of the fruit in Tom's freezer. $B : G : L : R : S = 6 : 7 : 5 : 4 : 2$
If there are 36 lbs of fruit in the freezer, how many lbs of each type of fruit did Tom pick?
- b) In a school with 1350 pupils, the ratio of boys to girls is $11 : 14$ and the ratio of teachers to pupils is $2 : 45$.
- i) How many girls and how many boys are in the school?
 - ii) How many teachers are in the school?
- c) The ratio of *red* to *blue* to *green* beads in a jar is $7 : 13 : 17$. If there are 126 *red* beads, how many *blue* and how many *green* beads are in the jar?

(p115, Q2)

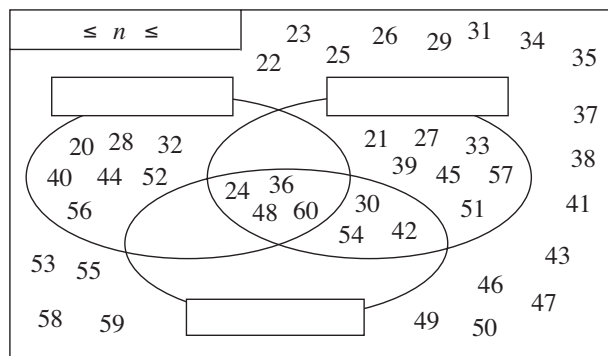
23. In a pack of 52 playing cards, there are **13** cards (Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King) in each of **4** suites: Diamonds and Hearts (*red*), Clubs and Spades (*black*).

If you take a card from the pack at random, what is the probability that the card is:

- a) an Ace
- b) a 9
- c) a Club
- d) a *red* card
- e) a Queen of Diamonds
- f) the Jack **or** King of Spades
- g) an Ace of Clubs **or** a King of Hearts
- h) **not** an Ace?

(p117, Q3)

24. a) Write the missing labels in the Venn diagram.



b) Complete this sentence about what the diagram shows.

A number which is divisible by and by and by is also divisible by .

c) Write true statements about the different sections, including the empty areas.

(p125, Q3)

25. Solve the equations.

- a) $a + 3.26 = 8.2$ b) $b - \frac{3}{5} = 4\frac{6}{7}$ c) $0.91 - c = 1$
- d) $\frac{2}{9} \times d = \frac{1}{27}$ e) $\frac{3}{4}$ of $e = e - 25$ f) $f \times 2.7 = \frac{27}{100}$
- g) $g \div 9 + 2 = \sqrt{49}$ h) $\frac{8}{15} \div h = 2 \div 5$ i) $6.3 \div i = \sqrt{81}$

(p130, Q4)

26. The sum of the digits of a 4-digit number is 15. The digits in the greatest and smallest place values are the same but are less than the two middle digits. The two middle digits have a difference of 1.

What could the 4-digit number be?

(p135, Q5)

27. Write a formula about the relationship between the data for:

- a) the area of a rectangle with sides a and b
- b) the perimeter of a rectangle with sides e and f
- c) the area of a square with side c
- d) the perimeter of a square with side t
- e) the area of a square with diagonal e
- f) the surface area of a cube with edge c
- g) the volume of a cube with edge a
- h) the volume of a cuboid with edges a, b, c

(p142, Q2)

28. Write a formula about the relationship of the given data.

- a) The **area** of a triangle with base b and height h :
- b) The **perimeter** of a regular octagon with side a :
- c) The **surface area** of a cuboid with edges a, b and c :
- d) The **volume** of a cuboid with edges $a, 2a$ and $3a$:
- e) The **surface area** of a cuboid with edges a, a and $2a$:

(p145, Q2)

29. If the statement is true, write 'T' in the box and if it is false, write 'F'.

- a) Every **isosceles triangle** has angles of 60° .
- b) No **rectangle** has adjacent equal sides.
- c) The **diameter** of a circle is twice the length of its radius.

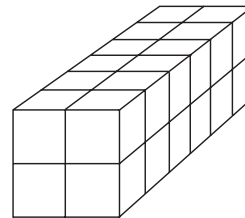
- d) The **circumference** of a circle is its radius multiplied by π .
- e) There is a **prism** which has congruent faces.
- f) A square-based **pyramid** has 5 vertices, 5 faces and 8 edges.
- g) If the diagonals of a quadrilateral **bisect** each other at right angles, the quadrilateral is a **rhombus**.
- h) A **tangent** to a circle can touch the circle at more than 1 point.

(p155, Q1)

30. How many different cuboids could be built from 40 small unit cubes?
(All the unit cubes should be used for each cuboid.)

(p160, Q3)

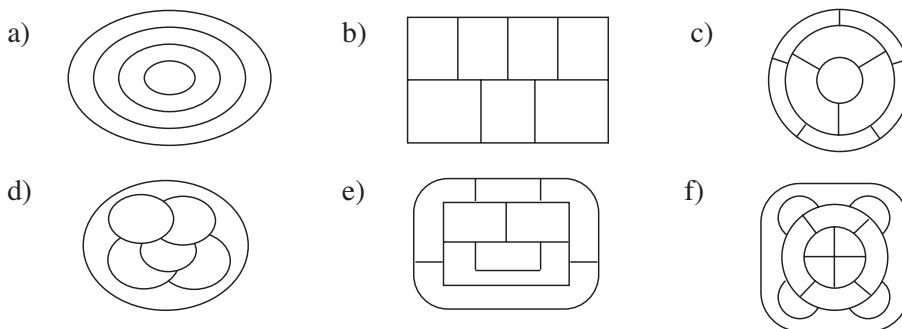
- 31.**
- a) How many unit cubes were needed to make this cuboid?
 - b) What is the surface area of the cuboid?
 - c) What are the dimensions of a cuboid made from 24 unit cubes which has:
 - i) the **smallest** possible surface area
 - ii) the **greatest** possible surface area?



(p165, Q4)





32. Colour these maps using the smallest number of different colours possible.

Adjacent countries must not have the same colour but countries with the same colour can meet at a point.



(p170, Q3)

33. *Braille* is a code system based on a pattern of 6 dots. Each dot can be raised or flat.
How many different codes are possible using:

- a) 2 dots 
- b) 3 dots 
- c) 4 dots 
- d) 6 dots 

(p175, Q4)