Year 6

Year 6

N28a Long Multiplication Integers

1) $17 \times 32 = \_\_\_\_$

2) $24 \times 62 = \_\_\_\_$

3) $13 \times 156 = \_\_\_\_$

4) $528 \times 16 = \_\_\_\_$

5) $34 \times 466 = \_\_\_\_$

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N28b Long Multiplication Decimals

1) $1.5 \times 22 =$ _____

2) $7.6 \times 2.1 =$ _____

3) $4.5 \times 9.99 =$ _____

4) $19.7 \times 6.3 =$ _____

5) $0.35 \times 0.12 =$ _____

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N28b Long Multiplication Decimals

1) Work out what the ✱ must be.

a)

	1	✱	5
×		✱	2
	✱	7	0
1	3	5	0
✱	✱	✱	0

b)

×	✱✱	3
80	4800	✱✱✱
✱	120	6

answer: ✱✱✱✱

c)

	4	✱	
×		✱	7
	3	✱	3
✱	9	0	
✱	✱	3	

d)

×	✱0	✱
✱✱✱	✱✱✱✱	✱✱✱
40	✱✱00	✱✱✱
✱	450	25

answer: 13775

2) A school organises a trip to a museum.

They set off in 13 minibuses, each minibus containing 24 pupils who will each pay to go into the museum.

Entrance to the museum costs £1.20 per person.

a) How many people made the trip?

b) What was the total cost?

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N29a

Long Division
Integers

1) 288 ÷ 12 = _____

2) 285 ÷ 15 = _____

3) 425 ÷ 25 = _____

4) 784 ÷ 56 = _____

5) 874 ÷ 38 = _____

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N29b Long Division Decimals

1) $79.2 \div 22 = \_\_\_\_$

2) $5.89 \div 19 = \_\_\_\_$

3) $9.87 \div 47 = \_\_\_\_$

4) $330.2 \div 13 = \_\_\_\_$

5) $42.624 \div 16 = \_\_\_\_$

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N29b Long Division Decimals

1) a) If 48 luxurious pens cost £768,
how much would one of them cost?

b) If 25 tee shirts cost £77.50,
how much would one of them cost?

c) If 53 mobile phones cost £2119.47,
how much would one of them cost?

2) Cans of juice cost 24p each.

Wendy has £8.65 to spend.

a) What is the maximum number of cans Wendy can buy?

b) How much change does she get?

3) Find the missing digits.

a)
$$14\overline{)\square 0\ 4}\quad 3\square$$

b)
$$\square 2\overline{)2\square 2}\quad 2\square$$

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N30a/b Prime Numbers Introduction and Factorisation

1) Write down the first 9 prime numbers.

2) Write down the first prime number that comes after 62.

3) Split up the following numbers into the product of their prime factors.

a) 12

b) 45

c) 72

d) 120

e) 550

f) 1296

4) Find the Highest Common Factor (HCF) of the following numbers.

a) 4 and 6

b) 8 and 16

c) 36 and 48

d) 300 and 525

e) 374 and 918

f) 45, 90 and 105

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N31a/b

Highest Common Factor
Lowest Common Multiple

1) Find the Highest Common Factor (HCF) of the following numbers.

a) 4 and 6

b) 8 and 16

c) 36 and 48

d) 300 and 525

e) 374 and 918

f) 45, 90 and 105

2) Find the Lowest Common Multiple (LCM) of the following numbers.

a) 8 and 12

b) 30 and 45

c) 15 and 18

d) 4, 6 and 8

e) 24 and 84

f) 72 and 96

3) The bells at Kings School ring every 6 minutes.

At Queens School the bells ring every 5 minutes.

At Princess School the bells ring every 9 minutes.

All three bells ring together at 8.30 am.

When is the next time the bells of the three schools will ring together?

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N32 Decimals, Fractions and Percentages

1) Complete the tables.

a)

Fraction	Decimal	Percentage
		50%
	0.25	
$\frac{1}{10}$		
$\frac{1}{3}$		
	0.7	
		40%

b)

Fraction	Decimal	Percentage
$\frac{68}{100}$		
		35%
	0.6	
	$0.\dot{6}$	
		5%
$\frac{13}{50}$		

2) Put these fractions, decimals and percentages in order, smallest to largest.

a) $\frac{1}{2}$, 49%, $\frac{3}{5}$, 0.55

b) 27%, 0.2, $\frac{1}{4}$, $\frac{3}{10}$

c) $\frac{9}{10}$, 95%, 0.99, $\frac{97}{100}$

d) $\frac{1}{3}$, 0.6, $\frac{2}{3}$, 30%

e) 0.125, 10%, $\frac{11}{100}$, 0.09

3) Chris says that $\frac{3}{4}$ is halfway between 0.5 and 100%.

Is Chris correct? You must explain your answer.

4) Emily says that 0.2 is halfway between 10% and $\frac{3}{5}$.

Is Emily correct? You must explain your answer.

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N33 Fraction of an Amount

1) Find the following:

a) $\frac{1}{3}$ of 24

b) $\frac{2}{3}$ of 24

c) $\frac{1}{5}$ of 30

d) $\frac{3}{5}$ of 30

e) $\frac{1}{8}$ of 40

f) $\frac{5}{8}$ of 40

2) Work out:

a) $\frac{7}{10}$ of £30

b) $\frac{3}{7}$ of £84

c) $\frac{4}{5}$ of £1.50

d) $\frac{11}{20}$ of £19

e) $\frac{2}{9}$ of £10.98

f) $\frac{8}{13}$ of £31.85

3) Julie has £4.50 pocket money every week.
If she spends $\frac{2}{5}$ of it on a magazine and $\frac{1}{3}$ of it on a dance lesson, how much of the pocket money does she have left?

4) Paul has £7.80 pocket money each week.
He always saves $\frac{1}{3}$ of it.
With the remaining money he spends $\frac{5}{8}$ on comics and the rest on sweets.

(i) How much does he save?

(ii) How much is spent on comics?

(iii) How much does he spend on sweets?

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N33 Fraction of an Amount

1) a) Find $\frac{1}{2}$ of $\left(\frac{2}{3} \text{ of } 60\right)$

b) Find $\frac{3}{4}$ of $\left(\frac{1}{2} \text{ of } 80\right)$

c) Find $\frac{1}{2}$ of $\frac{4}{9}$ of $\frac{3}{4}$ of 42

2) a) If $\frac{3}{4}$ of a number is 60, what is the number?

b) If $\frac{3}{7}$ of a number is 21, what is the number?

c) If $\frac{4}{9}$ of a number is 12.3, what is the number?

3) If $\frac{1}{2}$ of $\frac{1}{5}$ of a number is 6, what is the number?

4) If $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$ of $\frac{1}{5}$ of a number is 2.5, what is the number?

5) If $\frac{3}{5}$ of $\frac{1}{2}$ of $\frac{2}{3}$ of a number is 3.8, what is the number?

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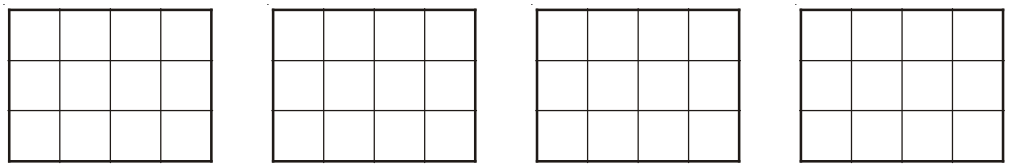
N34 Ordering Fractions

1) Put the following fractions in order of size starting with the smallest.

You can use the grids to help if you wish.

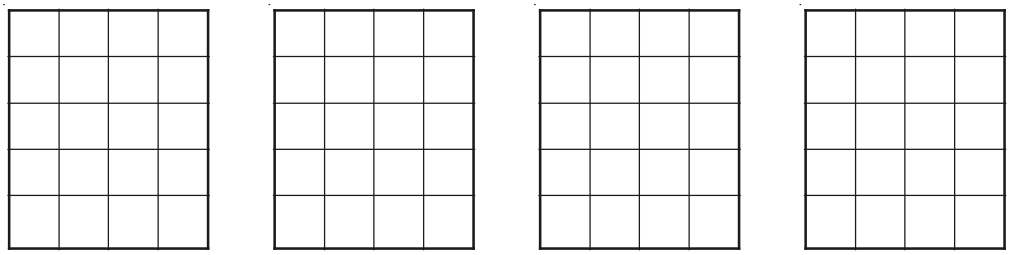
$\frac{3}{4}$ $\frac{5}{6}$ $\frac{2}{3}$ $\frac{7}{12}$



2) Put the following fractions in order of size starting with the smallest.

You can use the grids to help if you wish.

$\frac{13}{20}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{7}{10}$



3) Put the following fractions in order of size starting with the smallest.

$\frac{7}{12}$ $\frac{1}{2}$ $\frac{5}{8}$ $\frac{13}{24}$

4) Put the following fractions in order of size starting with the smallest.

$\frac{2}{5}$ $\frac{3}{10}$ $\frac{1}{3}$ $\frac{1}{6}$

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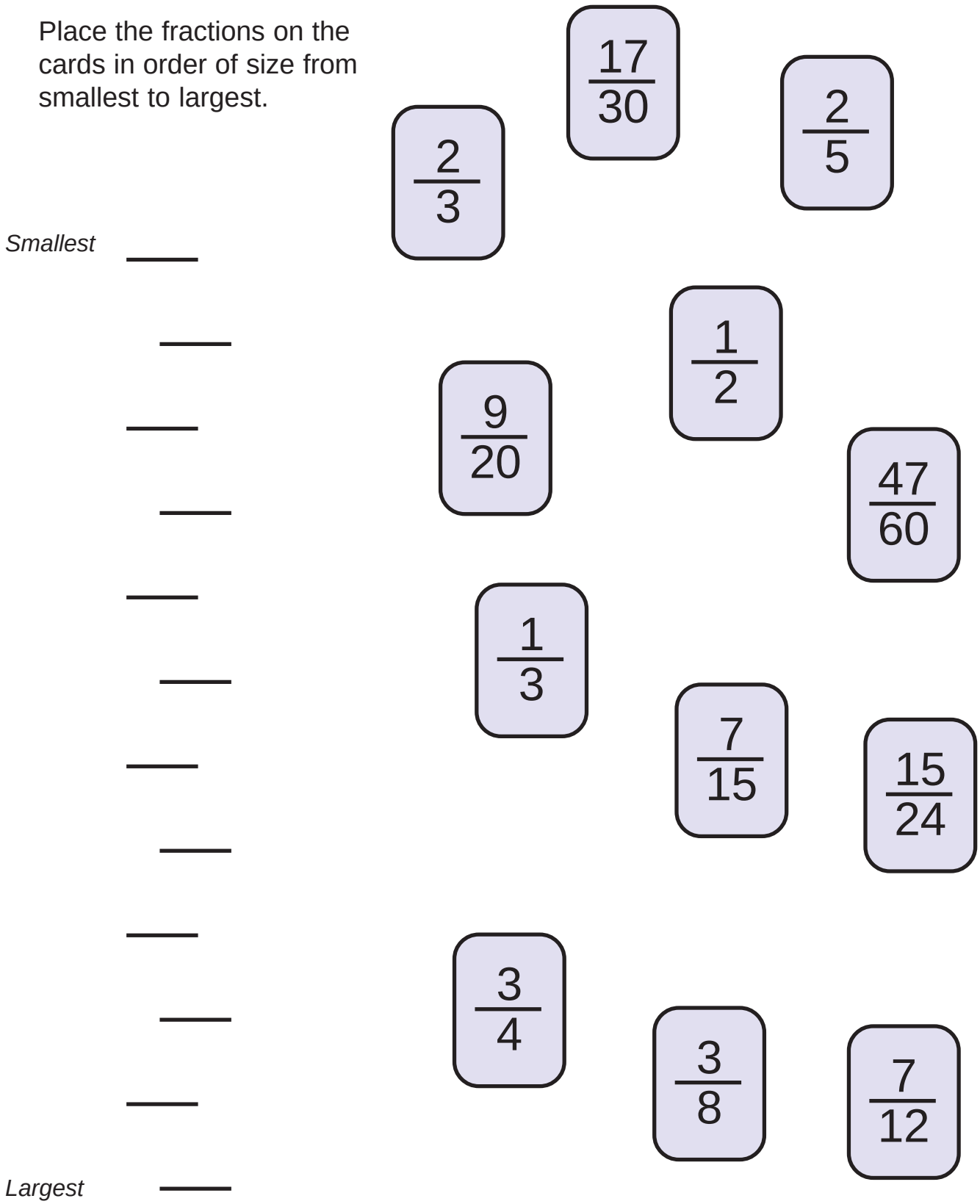
N34 Ordering Fractions

Place the fractions on the cards in order of size from smallest to largest.



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N35 Improper Fractions Mixed Numbers

1) Convert the following improper fractions to mixed numbers.

a) $\frac{5}{4}$

b) $\frac{8}{3}$

c) $\frac{12}{7}$

d) $\frac{20}{9}$

e) $\frac{16}{5}$

f) $\frac{25}{3}$

g) $\frac{30}{7}$

h) $\frac{75}{8}$

i) $\frac{47}{12}$

j) $\frac{100}{9}$

2) Convert the following mixed numbers to improper fractions.

a) $1\frac{3}{5}$

b) $2\frac{1}{4}$

c) $5\frac{2}{3}$

d) $3\frac{3}{5}$

e) $11\frac{2}{7}$

f) $10\frac{1}{9}$

g) $7\frac{5}{8}$

h) $9\frac{4}{5}$

i) $6\frac{3}{11}$

j) $12\frac{3}{4}$

3) Put these numbers in order, lowest to highest.

a) 3.5, $3\frac{1}{5}$, $\frac{11}{3}$

b) $7\frac{1}{4}$, 7.14, $\frac{34}{5}$

c) $1\frac{1}{10}$, 98%, $\frac{5}{4}$, 1

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N36 Fractions Adding and Subtracting

1) Work out the following, simplifying your answers where possible.

a) $\frac{2}{7} + \frac{3}{7} = \frac{\square}{7}$

b) $\frac{3}{8} + \frac{1}{8} =$

c) $\frac{7}{9} - \frac{2}{9} = \frac{\square}{9}$

d) $\frac{5}{10} - \frac{1}{10} =$

e) $\frac{1}{6} + \frac{2}{3} = \frac{\square}{18} + \frac{\square}{18} =$

f) $\frac{1}{6} + \frac{2}{3} = \frac{\square}{6} + \frac{\square}{6} =$

g) $\frac{4}{5} - \frac{1}{2} =$

h) $\frac{14}{15} - \frac{3}{5} = \frac{\square}{15} - \frac{\square}{15} =$

2) Work out the following, simplifying your answers where possible.

a) $\frac{3}{8} + \frac{4}{8} =$

b) $\frac{9}{11} - \frac{5}{11} =$

c) $\frac{1}{2} + \frac{1}{3} =$

d) $\frac{5}{7} - \frac{3}{5} =$

e) $\frac{1}{2} + \frac{2}{5} =$

f) $\frac{5}{6} - \frac{1}{4} =$

g) $\frac{5}{12} + \frac{1}{6} =$

h) $\frac{4}{5} - \frac{1}{10} =$

i) $\frac{3}{8} + \frac{1}{2} =$

j) $\frac{8}{9} - \frac{5}{6} =$

3) Write the missing numbers in each of these fraction sums.

a) $\frac{1}{3} + \frac{\square}{6} = 1$

b) $\frac{3}{7} + \frac{12}{\square} = 1$

c) $\frac{8}{5} - \frac{\square}{15} = 1$

d) $\frac{15}{\square} - \frac{1}{4} = 1$

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N37a/b Fractions - Multiplying and Dividing an Integer

1) Work out the following, giving your answers in their simplest forms

a) $3 \times \frac{1}{4}$

b) $7 \times \frac{1}{7}$

c) $2 \times \frac{4}{5}$

d) $9 \times \frac{1}{3}$

e) $4 \times \frac{4}{9}$

f) $10 \times \frac{3}{8}$

g) $\frac{8}{9} \times 6$

h) $\frac{2}{15} \times 3$

2) Work out the following, giving your answers in their simplest forms

a) $\frac{1}{2}$ of £40

b) $\frac{1}{5}$ of 20 km

c) $\frac{1}{4}$ of 120 kg

d) $\frac{1}{9}$ of £99

e) $\frac{2}{5}$ of 30 cm

f) $\frac{7}{8}$ of £16

g) $\frac{4}{7}$ of 7000 g

h) $\frac{3}{4}$ of £500

3) Work out the following, giving your answers in their simplest forms

a) $3 \div \frac{1}{4}$

b) $7 \div \frac{1}{2}$

c) $12 \div \frac{1}{3}$

d) $9 \div \frac{1}{5}$

e) $10 \div \frac{2}{3}$

f) $8 \div \frac{4}{5}$

g) $3 \div \frac{5}{7}$

h) $15 \div \frac{2}{3}$

4) An industrial machine takes $\frac{3}{4}$ of an hour to produce a very special tool. How long would it take the machine to produce 12 of the tools?

5) A road is 20 km long. Road signs are to be installed every $\frac{2}{3}$ of a kilometre. How many signs will be needed?

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A2 Algebraic Vocabulary

1) State whether each of the following is an expression, an equation or an inequality:

   a) $2x + 4 = 9$

   b) $3x + 4y$

   c) $5a - 1 < 10$

   d) $6b + 7d = 20$

   e) $9 < 5x$

2) How many terms does each of the following have?

   a) $3a + 4$

   b) $2x + 3y - 4z$

   c) $5 + 2n + 3m - 4p$

3) a) Write down any two numbers that are factors of 24

   b) Write down all the factors of 12.

   c) Is 3 a factor of $3x + 9$?

   Explain how you know.

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A3 Formulae Expressed in Words

1) A vintage car hire firm charges £70 for the first day's hire followed by £55 per day for all other days.

   a) How much would it cost to hire a car for 2 days?

   b) How much would it cost to hire a car for 9 days?

   c) When Sue hires a car it costs her £345.
   How many days did she hire the car for?

2) It costs 4p per copy on the school photocopier.

   a) How much would it cost to make 15 single-sided copies?

   b) Jane has to make 6 copies of a document which is double-sided (writing on both sides).
   How much will it cost?

   c) Ted copies a single-sided document but forgets how many copies he has made.
   Rather than counting them he simply looks at the bill and works it out from there.
   The bill was for £2.20.
   How many copies had he made?

Single-sided copies 4p each

Input → Multiply by 2 → Add 3 → Output

3) a) If Simon puts 7 into the number machine, what number comes out?

   b) If 100 goes in, what comes out?

   c) If 5½ goes in, what comes out?

   d) If 2.25 goes in, what comes out?

   e) If 25 comes out, what number was put in?

   f) If 8 comes out, what number was put in?

   g) If x goes in, what comes out?

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A3 Formulae Expressed in Words

1) *Choose any number*.
Add three to it.
Multiply your result by two.
Add six to it.
Halve your answer.
Subtract your original number.

You should be left with six.
Try to find out why you are always left with six.

---

2)

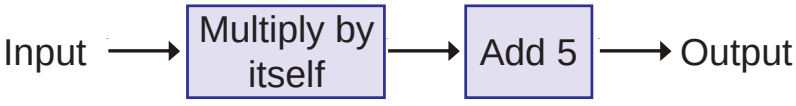
Input	Output
1	___
4	___
10	___
2.5	___
-3	___
___	30
___	48
___	-18
x	$4x - 2$

3)

Input	Output
1	___
4	___
10	___
2.5	___
-3	___
___	30
___	48
___	-18
x	$4(x - 2)$

---

4) Copy the table on the right.
Use this function machine to complete the table.



Input	Output
3	___
10	___
-4	___
___ or ___	54
x	___

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A4 Algebraic Notation

What expression do I have if I think of a number, double it and then add three?

Answer: $2x + 3$

Say what the expression $4x + 17$ means in words.

Answer: Take a number, multiply it by four and then add seventeen.

1) Write down the expression you will have if you think of a number (let x be the number) and then:

   a) add three to it

   b) double it

   c) multiply it by three and then subtract four

   d) multiply it by itself

   e) divide it by two

   f) divide it by two and then add one

   g) add three to it and multiply the result by two

   h) multiply it by five, add four, divide the result by two

2) Say what the following expressions mean in words.

   a) $x + 6$

   b) $x - 7$

   c) $8x$

   d) $4x + 2$

   e) $\frac{x}{5}$

   f) $6(x + 7)$

   g) $4(3x - 1)$

---

3) If $s = 2v$, work out the value of s when $v = 7$

4) If $y = 3t + 4$, work out the value of y when $t = 5$

5) If $g = 2t - 1$, work out the value of g when $t = 9$

6) If $f = 2(t + 8)$ and $t = 3$, find the value of f

7) If $d = 3(2e - 3)$ and $e = 5$, find the value of d

8) If $c = 4$ and $d = 3$, find the value of:

   a) $2c$

   b) $2c - d$

   c) cd

   d) $5c + 2d$

   e) $10cd$

   f) $2(c + d)$

   g) $5(3c - 2d)$

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A4 Algebraic Notation

The body mass index (BMI) is a measure used to show if an adult is at a healthy weight. It doesn't apply to children, only adults.

Here is a formula for calculating BMI

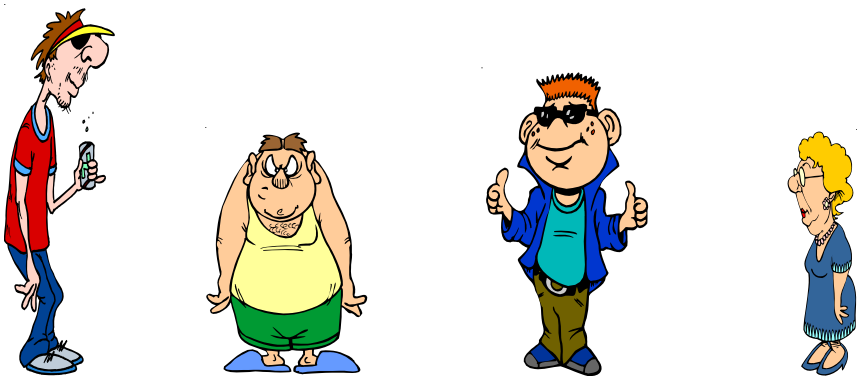
BMI = (weight in kg) ÷ (height in m) ÷ (height in m)

A person with BMI between 18.5 and 25 is at a healthy weight.

A person with BMI less than 18.5 is underweight.

A person with BMI between 25 and 30 is overweight.

A person with BMI over 30 is obese.



Here are the heights and weights of the four people above.
They are in no particular order.

Height (m)	1.74	1.82	1.62	1.62
Weight (kg)	70	57	55	74
BMI				

a) Work out the BMI for each height and weight and put them in the table.
Give your answers to the nearest whole number.

b) Match each height, weight and BMI with the correct person.

c) For each person, decide whether he/she is underweight, healthy, overweight or obese - write the answer next to each person.

d) A woman is 1.65 m tall and weighs 45.6 kg.
She worries that she is overweight.
Is she right?

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A5 Horizontal and Vertical Lines

1) Draw the following lines on the axes to the right:

a) $x = 3$

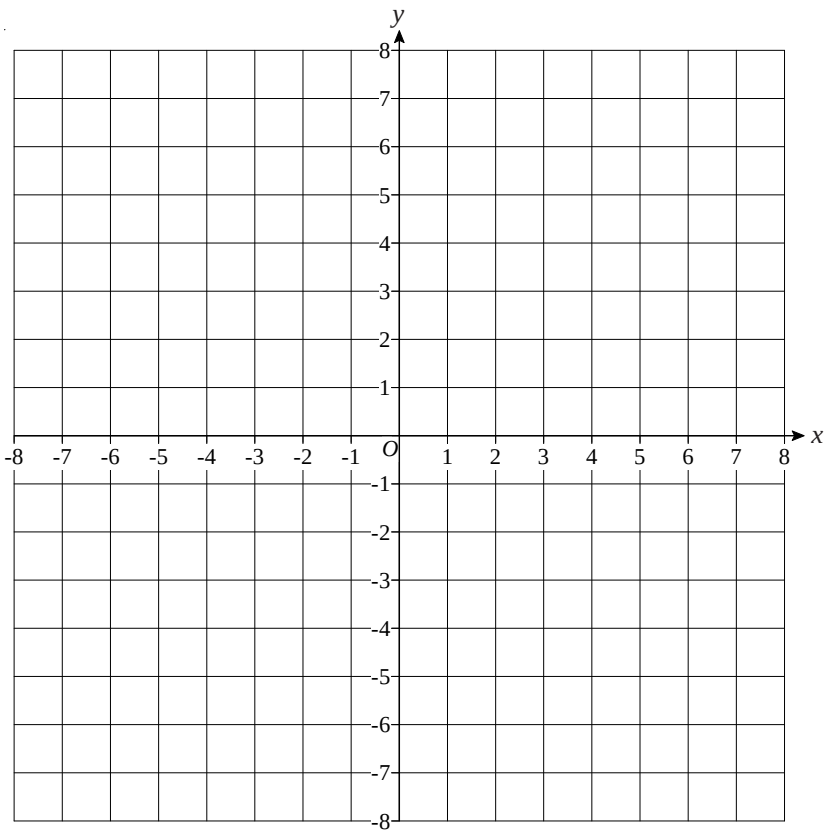
b) $x = -4$

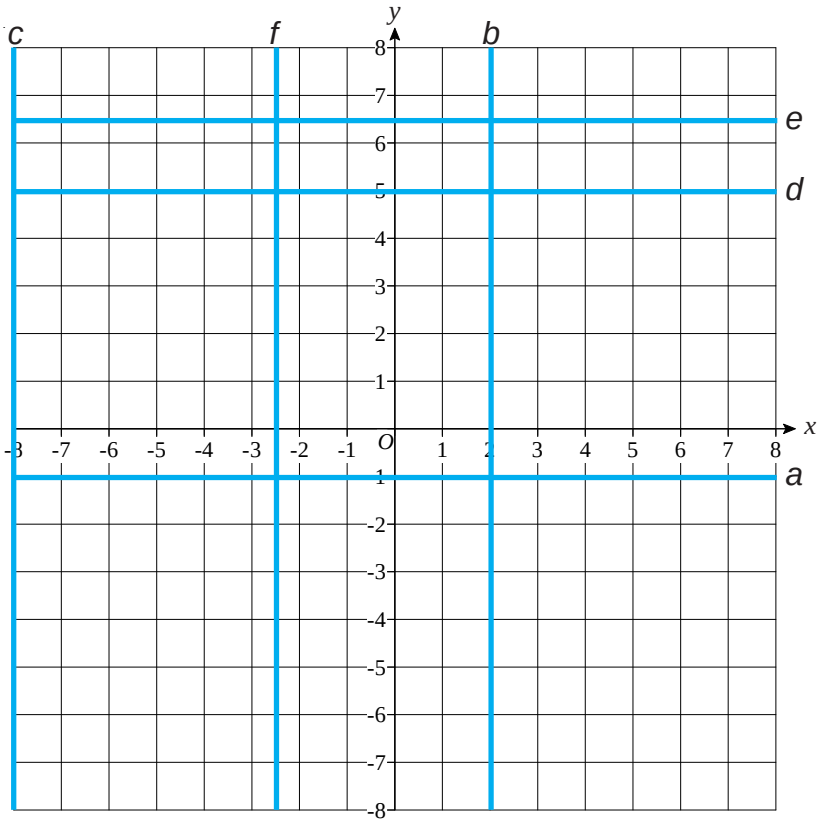
c) $y = 1$

d) $x = 7.5$

e) $y = -3$

f) $y = 4.5$





2) Name all the lines drawn on the axes on the left.

Line *a* is:_____

Line *b* is: _____

Line *c* is: _____

Line *d* is: _____

Line *e* is: _____

Line *f* is: _____

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A6 Collecting Like Terms

1) Simplify these expressions

a) $3a + 4a =$

b) $b + 4b =$

c) $5x - x =$

d) $6d + 3d - 2d =$

e) $2k + k + k - 3k =$

f) $3r - 2r + 4r =$

g) $5t - 3t + t + 2t =$

h) $7p - p + 2p - 5p =$

i) $-4y + 2y - y + 4y =$

j) $-2c + c - 3c - c =$

2) Simplify these expressions

a) $a + b + a + b =$

b) $3a + 2a + 4b + b =$

c) $7x + 2y + x + 3y =$

d) $5r + 6p - 2r - 3p =$

e) $4c + 8d - 3c + d =$

f) $6x - 4y + 7y - 2x =$

g) $2k - 3l - k + 10l =$

h) $3m + 5n + 7m - 7n =$

i) $v - 4w - 5v - 2w =$

j) $-3x - y - 3y - x =$

3) Simplify these expressions

a) $7xy - 2xy =$

b) $5cd + 3dc =$

c) $x^2 + 4x^2 + 2x^2 =$

d) $9y^3 + y - 2y^3 =$

e) $3ab + 7ab - 2a =$

f) $6m + 2pr - m + 3rp =$

g) $10a^2d + 2y - 3da^2 + y^2 =$

h) $bz^2 + 4t^3 - 3t^3 - 5zb^2 =$

i) $2r^2b + 5r^2 - r + 6br^2 =$

j) $8x^3y + 2w - 5w - 3yx^3 =$

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A7a Algebraic Simplification Multiplication

1) Simplify the following

a) $6 \times x$

b) $2 \times x \times y$

c) $6 \times x \times 3 \times y$

d) $s \times t \times u$

e) $7 \times s \times 2 \times t \times u$

2) Simplify the following

a) $x \times x \times x \times x$

b) $t \times t \times t \times t \times t \times t$

c) $g \times g$

d) $x \times x \times x \times y \times y \times y$

e) $x \times y \times x \times y \times y$

3) Simplify the following

a) $x \times x^2$

b) $y^3 \times y^4$

c) $x^2 \times x^3 \times x$

d) $g \times g \times g^2 \times g^4$

e) $x^2 \times x^3 \times x^4 \times x^5$

4) Simplify the following

a) $3x^2 \times 2x^3$

b) $5x \times 4x^2$

c) $6y^3 \times 2y^4$

d) $9x^2 \times x^3$

e) $4x^3 \times 2x \times 3x^2$

5) Simplify the following

a) $3x^2y^3 \times 2x^3y^4$

b) $2xy^4 \times 3x^2y$

c) $5x^3y^4 \times 2x^2y^2$

d) $2x^2y \times x^4y^2$

e) $3x^3y \times 2xy^2 \times 3x^2y^2$

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A7b Algebraic Simplification Division

1) Simplify the following

a) $x^8 \div x^2$

b) $9y^6 \div 3y^2$

c) $14y^3 \div 2y^2$

d) $20x^5 \div 4x$

e) $16x^8 \div 8x^2$

2) Simplify the following

a) $\frac{12x^6}{3x^2}$

b) $\frac{20x^3}{2x}$

c) $\frac{5x^4}{x^2}$

d) $\frac{6x^5}{3x^3}$

e) $\frac{300x^9}{10x^2}$

3) Simplify the following

a) $\frac{12x^3y}{4x}$

b) $\frac{15x^4y^3}{3xy}$

c) $\frac{20x^3y^5}{4x^2y^3}$

d) $\frac{14x^2y^2}{7xy}$

e) $\frac{30x^2y^3z^6}{3xy^2z^4}$

4) Find the value of

a) 4^0

b) 6^0

c) 12^0

d) z^0

e) x^0

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A8 Expanding Brackets

1) Expand

a) $2(x + 3)$

b) $2(x – 4)$

c) $5(2x + 1)$

d) $7(3x – 1)$

e) $4(2a + 7)$

2) Expand

a) $2x(3x + 1)$

b) $3x(4x – 2)$

c) $2x(x + 1)$

d) $3x(2x – y)$

e) $5x(3x + 2y)$

3) Expand and simplify

a) $2(x + 3) + 4(x + 1)$

b) $3(2x + 1) + 2(5x + 2)$

c) $4(x + 1) + 3(3x + 4)$

d) $6(2x + 3) + 5(x + 2)$

e) $4(3x + 2) + 5(2x + 1)$

4) Expand and simplify

a) $2(5x + 3) + 3(x – 1)$

b) $3(4x + 5) + 2(3x – 4)$

c) $5(2x – 1) + 3(2x + 5)$

d) $2(3x – 4) + 3(x + 2)$

e) $3(2x – 1) + 4(3x – 2)$

5) Expand and simplify

a) $3(x + 2) – 2(x + 3)$

b) $4(2x + 3) – 3(2x + 1)$

c) $5(3x – 2) – 2(x – 2)$

d) $2(5x – 1) – 4(2x – 3)$

e) $3(2x + 7) – 2(3x + 2)$

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A9 Factorisation

1) Factorise the following

a) $6x - 2$

b) $8x + 14$

c) $6x + 9$

d) $10x - 5$

e) $12x + 18$

2) Factorise the following

a) $x^2 + x$

b) $t^2 - t$

c) $x^3 + x$

d) $x^5 - x^2$

e) $a^7 + a^4$

3) Factorise the following

a) $3x^2 + 6x$

b) $8x^3 - 2x$

c) $12a^2 + 4a^3$

d) $20x^4 - 6x^2$

e) $7x^3 + 8x$

4) Factorise the following

a) $6x^2y^4 + 4xy^3$

b) $4x^3y^4 + 2x^2y^2$

c) $10x^4y^3z - 5xy^5z$

d) $16a^2b^3c^4 + 3ab^2c^3$

e) $9x^2y^4z - 6xy^2z$

5) Factorise the following

a) $10x + 4$

b) $x^4 - x^2$

c) $9x^5 - 12x^2$

d) $12x^2y^3 + 4xy^2$

e) $24x^3yz^4 - 10xz^2$

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A10 Substitution

1) Using $a = 3$, work out

a) $a + 5$ d) $2a + 1$

b) $7 - a$ e) $13 - \frac{a}{3}$

c) $6a$ f) $a^2 + 2a - 20$

2) Using $x = 5$ and $y = 2$, work out

a) $x - y$ d) $5y - 5x$

b) $y - x$ e) $x^2 + 3y$

c) $3x + 2y$ f) $\frac{4x}{y} - xy$

3) Using $a = 3$, $b = 1$ and $c = -2$, work out

a) $a + b + c$ d) $ab - c$

b) $2b + c$ e) $ac + 5b$

c) $c - a + b$ f) $c^2 - 2ab$

4) Using $x = 3$, work out

a) $x^2 - 2x$

b) $2x^2 + x + 1$

c) $x^3 - 2x^2 - 5$

5) If $\pi = 3.142$ and $r = 9$, work out

a) $2\pi r$

b) πr^2

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A11a Sequences Term-to-Term Rule

1) Write the first five terms of each sequence

a) Start at 1 and add 5

b) Start at 30 and subtract 4

c) Start at 11 and add 9

d) Start at 8 and subtract 4

e) Start at -10 and add 6

f) Start at 4 and subtract 3

2) For each sequence, describe the rule and find the next two terms

a) 5, 7, 9, 11, ___, ___

b) 11, 16, 21, 26, ____, ____

c) 22, 19, 16, 13, ____, ____

d) -1, 2, 5, 8, ___, ___

e) 6, 2, -2, -6, ____, ____

f) -42, -35, -28, -21, ____, ____

3) Here is a pattern made up of sticks

a) Write the pattern as a number sequence.

b) Describe the rule.

c) Find the next five terms of the sequence.

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A11b Sequences
Position-to-Term Rule

For each sequence, find the first 5 terms and the 10th term.

a) $3n - 1$

b) $n + 2$

c) $5n + 2$

d) $4n - 7$

e) $10n + 9$

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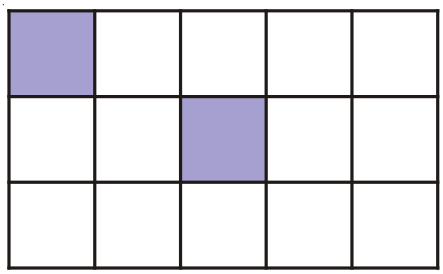
R1a

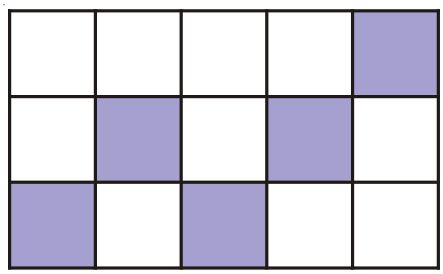
Introduction to Ratio
Real-Life Contexts

1) For each of the three grids below, write down the ratio of shaded squares to unshaded squares.
Simplify the ratios if possible.

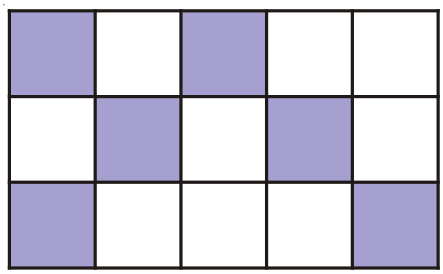
a)



b)



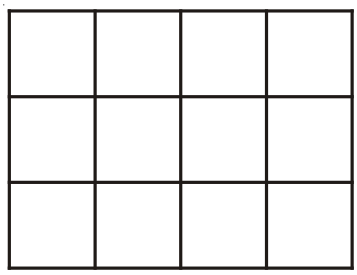
c)



2) Shade in squares for each grid to give the correct ratios.

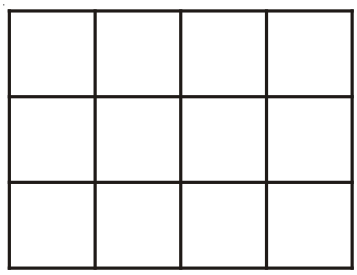
a) Shaded : Unshaded

5 : 7



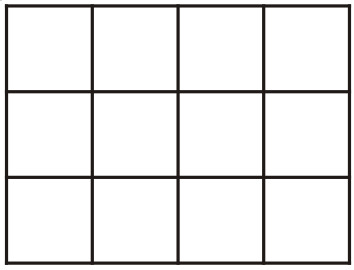
b) Shaded : Unshaded

1 : 2



c) Shaded : Unshaded

5 : 1



3) The instructions on a lemon squash bottle are as follows:

1 part squash to
4 parts water

a) If you put 20 ml of squash in a glass, how much water would you need?

b) If you had used 200 ml of water, how much squash should be in the drink?

c) If you want to make 500 ml of squash drink, how much squash should be used and how much water?

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R1a

Introduction to Ratio
Real-Life Contexts

1) Here we have a fine example of a Vesuvian and a Dragian.

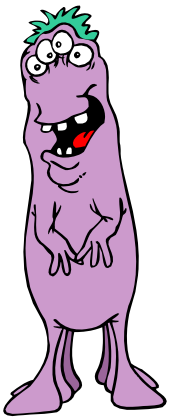
If you count carefully you can see that the ratio of teeth is 5 : 7

a) What is the ratio of feet?

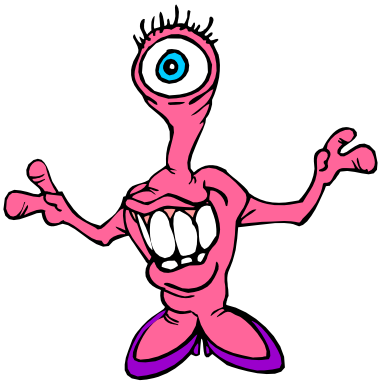
b) What is the ratio of eyes?

c) What is the ratio of fingers?

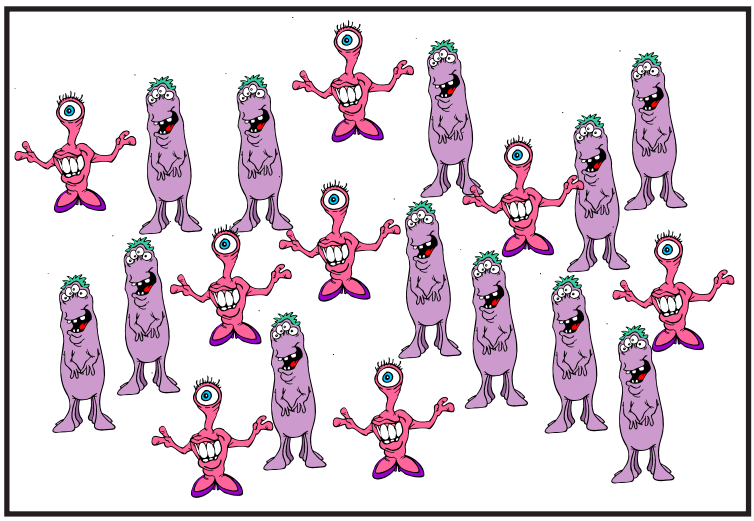
Check that you have given all ratios in the simplest form.



Vesuvian



Dragian



2) Look at this picture of Vesuvians and Dragians and work out the following:

a) The ratio of Vesuvians to Dragians.

b) The ratio of Vesuvian feet in the picture to Dragian feet in the picture.

c) The ratio of Vesuvian eyes in the picture to Dragian eyes in the picture.

3) In another picture of Vesuvians and Dragians we only know two things:

Firstly, there are more Vesuvians than Dragians.
Secondly, there are 46 teeth altogether in the picture.

Work out how many Vesuvians and Dragians there are in the picture.

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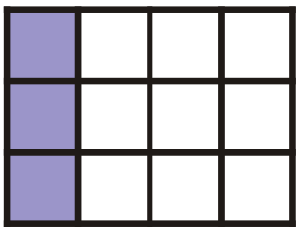
R1b

Introduction to Ratio
Shading

1) Draw ten 4 by 3 rectangles and label them a to j

Shade in the rectangles in the following ratios. →

The first answer is a



The three shaded squares could have been any three of the squares.

	Shaded	: Unshaded
a	1	3
b	1	2
c	1	5
d	5	7
e	1	1
f	1	11
g	2	4
h	0.5	2.5
i	0.2	1
j	9	15

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R2 Unit Conversions

1) a) How many grams are in 3 kg?

b) How many grams are in 4.5 kg?

c) Convert 2 kg to g.

d) Convert 6000 g to kg.

e) How many kg is 1500 g?

2) a) How many millilitres are in 9 litres?

b) How many litres is 7000 ml?

c) Convert 3400 ml to L.

d) Convert 8L to ml.

e) How many ml are in 7.3 L?

3) a) How many cm are in 3 m?

b) How many mm are in 11 centimetres?

c) Convert 400 cm to m.

d) Convert 3 km to m.

e) How many mm are in 5 m?

f) Convert 9600 mm to m.

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R3 Expressing Quantities as Fractions

1) There are 25 apples in a bag.
15 of them are red.
What fraction of the apples are red?
Give your answer in its simplest form.

2) Fishfingers are sold in packets that say ‘minimum 10’ on them.
Here is the number of fishfingers in each of 12 packets.

10, 11, 10, 10, 11, 10, 10, 10, 10, 11, 10, 10

What fraction of the packets have more than 10 fishfingers?
Give your answer in its simplest form.

3) 6 litres of pink paint can be made by mixing 1.5 litres of red paint with the correct amount of white paint.

a) How much white paint is needed?

b) What fraction of the pink paint was white paint?
Give your answer in its simplest form.

4) Two thirds of the students in a class have a pencil.

14 students have a pencil.

How many students are in the class?

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R4 Unit Pricing

1) A bag of six apples cost £1.08

   What is the price per unit?

2) a) A pack of 40 teabags costs £1.20

      What is the price per unit?

   b) A pack of 50 teabags costs £2.00

      What is the price per unit?

   c) Which pack offers better value for money?

A calculator can be used for this question.

3) Julie wants to buy 24 yoghurts.

   The shop sells them in two pack sizes.

   There is a 12-pack at £3.90

   There is an 8-pack at £3 or you can buy two 8-packs for £4.

   a) What is the cheapest way for Julie to buy 24 yoghurts and what will the price be?

   b) What is the price per unit, to the nearest penny if Julie buys the yoghurts in the cheapest way?

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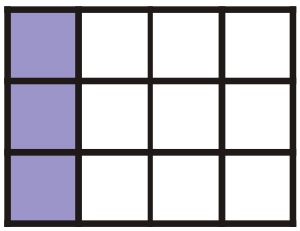
R5a Ratios - Simplifying

1) Draw ten 4 by 3 rectangles and label them a to j

Shade in the rectangles in the following ratios. →

The first answer is a



The three shaded squares could have been any three of the squares.

	Shaded	: Unshaded
a	1	3
b	1	2
c	1	5
d	5	7
e	1	1
f	1	11
g	2	4
h	0.5	2.5
i	0.2	1
j	9	15

2) Write the following ratios in their simplest form:

a) 8 : 12

b) 6 : 10

c) 15 : 10

d) 16 : 4

e) 18 : 16

f) 25 : 15

g) 45 : 15

h) 18 : 27

i) 24 : 30

j) 36 : 48

3) Find the missing numbers in these ratios:

a) 1 : 4 = 2 : ☐

b) 1 : 5 = 6 : ☐

c) 2 : 7 = 8 : ☐

d) 5 : 4 = 15 : ☐

e) 2 : 3 = ☐ : 12

f) 9 : 5 = ☐ : 35

g) 3 : ☐ = 18 : 30

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R5b Ratios - Sharing

1) Share out £20 between Bill and Sue in the ratio 3 : 2.

2) Divide £60 between Jack and Jill in the ratio 7 : 3.

3) Debbie and Dave share 200 Smarties in the ratio 1 : 4. How many Smarties do they each get?

4) Alec, Tony and Sara share £720 in the ratio 1 : 2 : 3. How much do they each get?

5) If Dave and Sue share £30 in the ratio 2 : 3, how much more than Dave does Sue get?

6) Divide £12 between Mick and Sharon in the ratio 5 : 3.

---

7) Pete and Sandra work part-time in a restaurant. They share the tips in the ratio 3 : 5.
If Pete gets £30 at the end of the week, how much will Sandra get?

8) Vicky and John share some sweets in the ratio 2 : 7.
If Vicky ends up with 12 sweets, how many will John have?

9) Len makes some concrete by mixing cement, sand and gravel in the ratio 1 : 4 : 3.
If he uses 8 bags of sand, how many bags of cement and gravel will he use?

10) An old television has a width and height in the ratio 4 : 3. If the width is 48 cm, what is the height?

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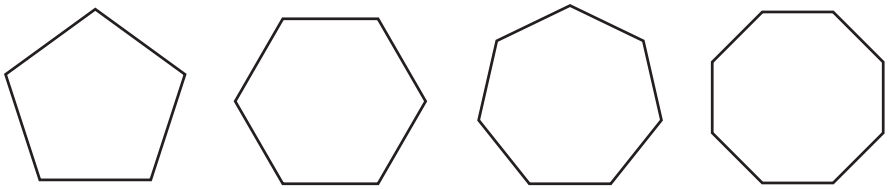
R5b Ratios - Sharing

1) Which one of these regular polygons has the number of diagonals and the number of sides in the ratio 2 : 1?



A B C D

2) Two numbers are in the ratio 7 : 3.
If you take one of the numbers away from the other one you get an answer of 24.
What are the two numbers?

3) In a class of 30 pupils the ratio of boys to girls is 2 : 3.
If 6 girls (but no boys) join the class what is the new ratio of boys to girls?

4) Sue, Ted and Ben all have their birthday on the 1st January.
In 2010, Sue, Ted and Ben have ages in the ratio 2 : 3 : 4.

a) If Ted is 15 years old, how old are Sue and Ben?

b) When Sue, Ted and Ben are all five years older, what will be the ratio of their ages? Write the answer in its simplest form.

c) In which year was the ratio of Sue, Ted and Ben's age 1 : 2 : 3?

d) How old was Ben when the ratio of the three ages was 1 : 3 : 5?

e) On what date was the ratio of Sue and Ben's age 1 : 41?

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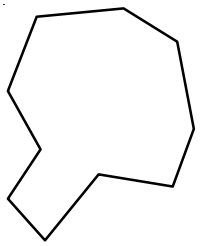
G11 Polygons

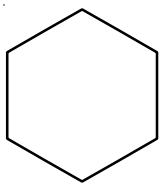
1) How many sides does a pentagon have?

2) Give the two names for a 7-sided polygon _____ and _____

3) Match the shapes to the names

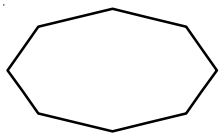


Regular hexagon

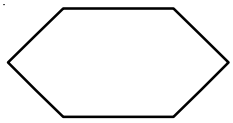


Irregular pentagon

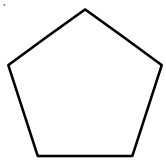
Regular pentagon



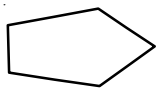
Octagon



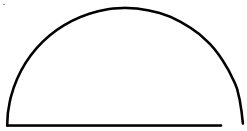
Irregular hexagon



Decagon



4) Give two reasons why this diagram does not show a polygon.



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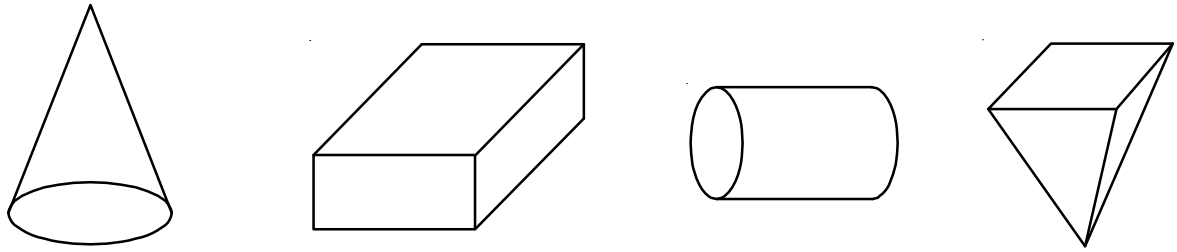
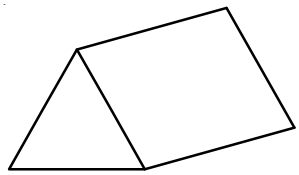
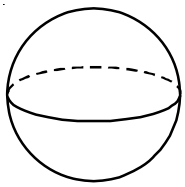
G12a 3D Shapes - Properties

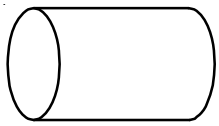
1) Which of these shapes are prisms? Tick them.

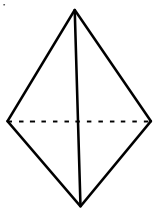


2) Write the names of these shapes.

a) 

b) 

c) 

d) 

3) a) A prism has 5 faces, 9 edges and 6 vertices.
What is its name?

b) A pyramid has 4 faces, 6 edges and 4 vertices.
What shape must its base be?

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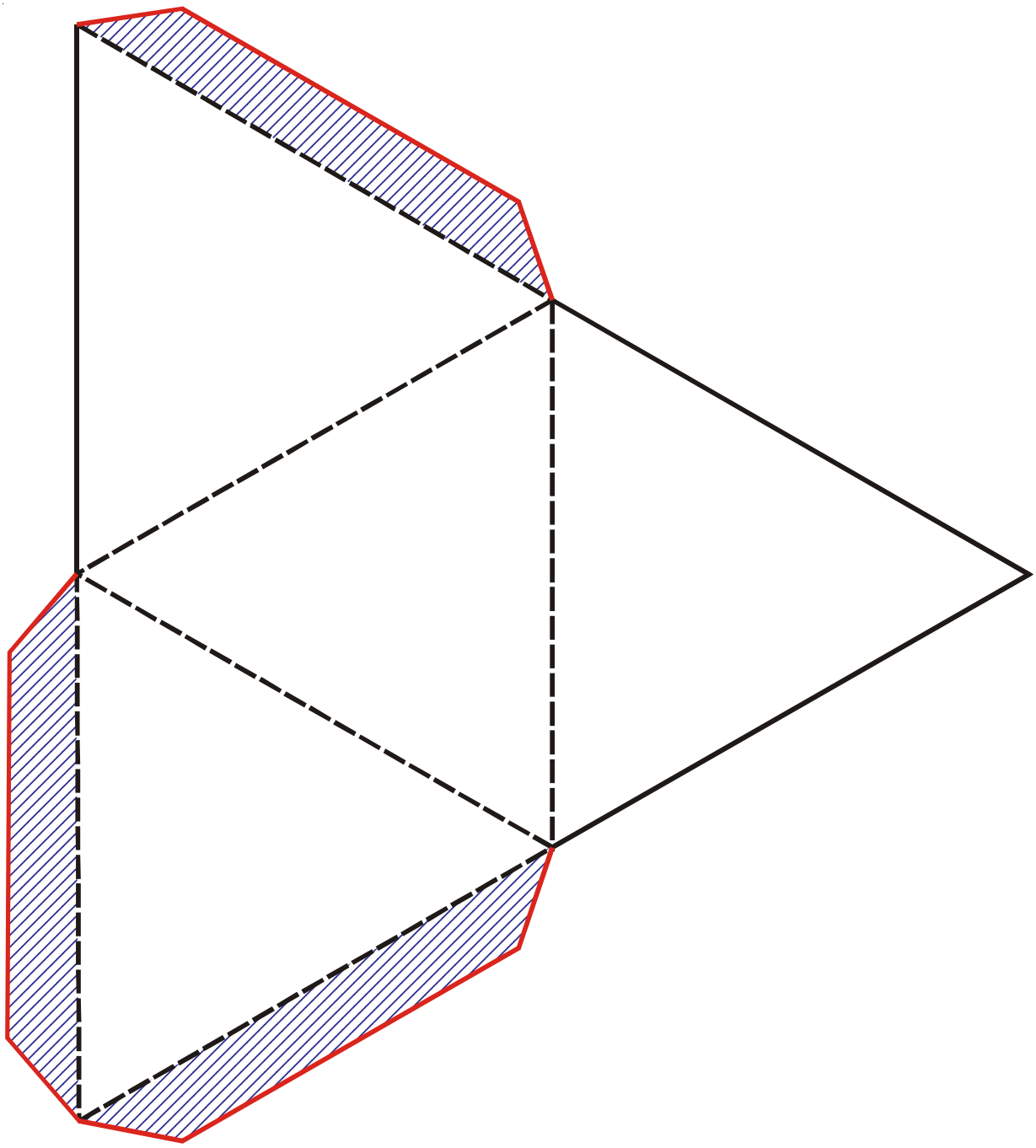
G12b

3D Shapes - Models

Print this page onto card.
Cut out the net and score along all the dotted lines with a compass point.
Put glue on the shaded tabs, fold and stick to make a **TETRAHEDRON**.



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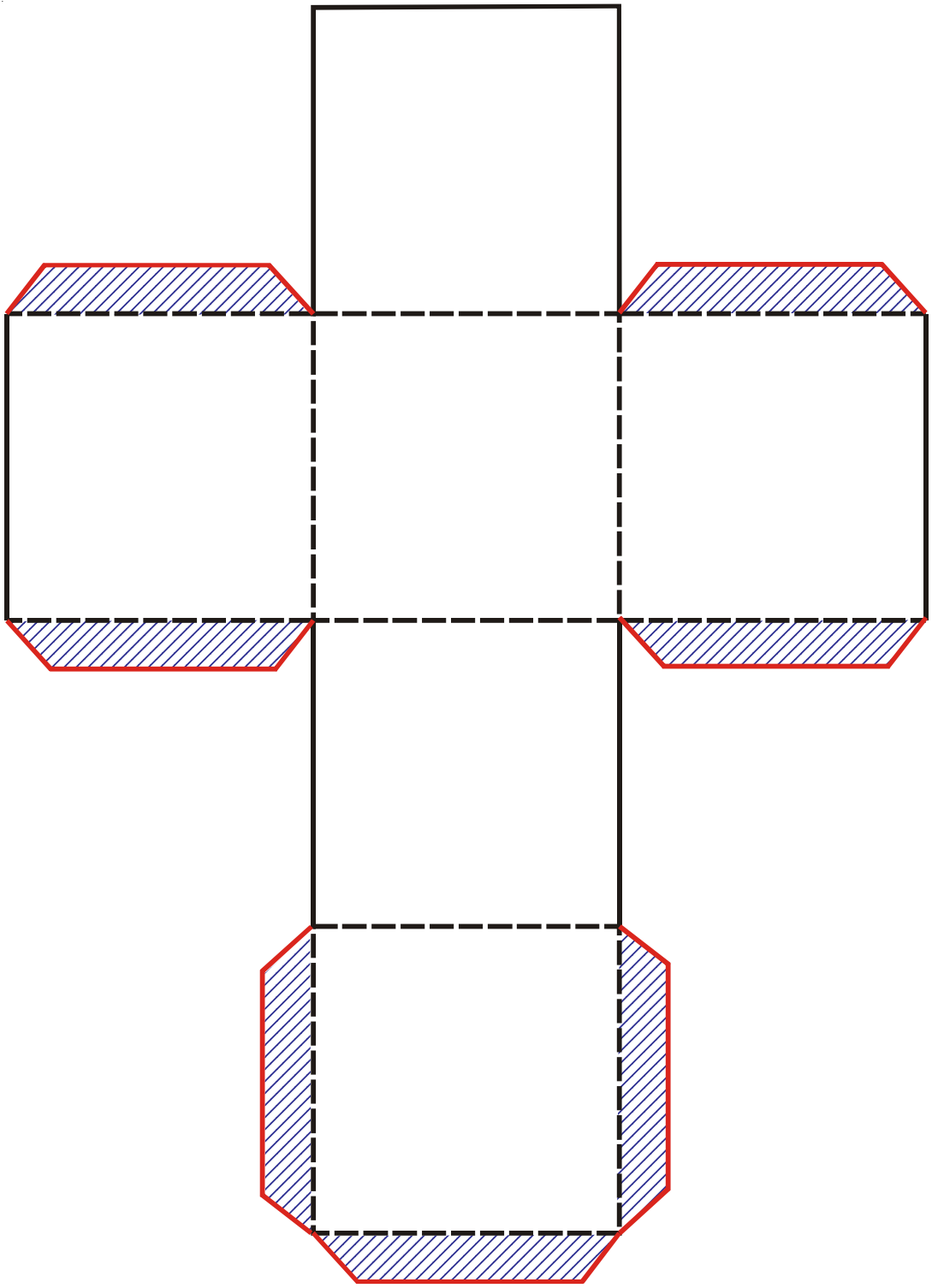
G12b

3D Shapes - Models

Print this page onto card.
Cut out the net and score along all the dotted lines with a compass point.
Put glue on the shaded tabs, fold and stick to make a **CUBE**.



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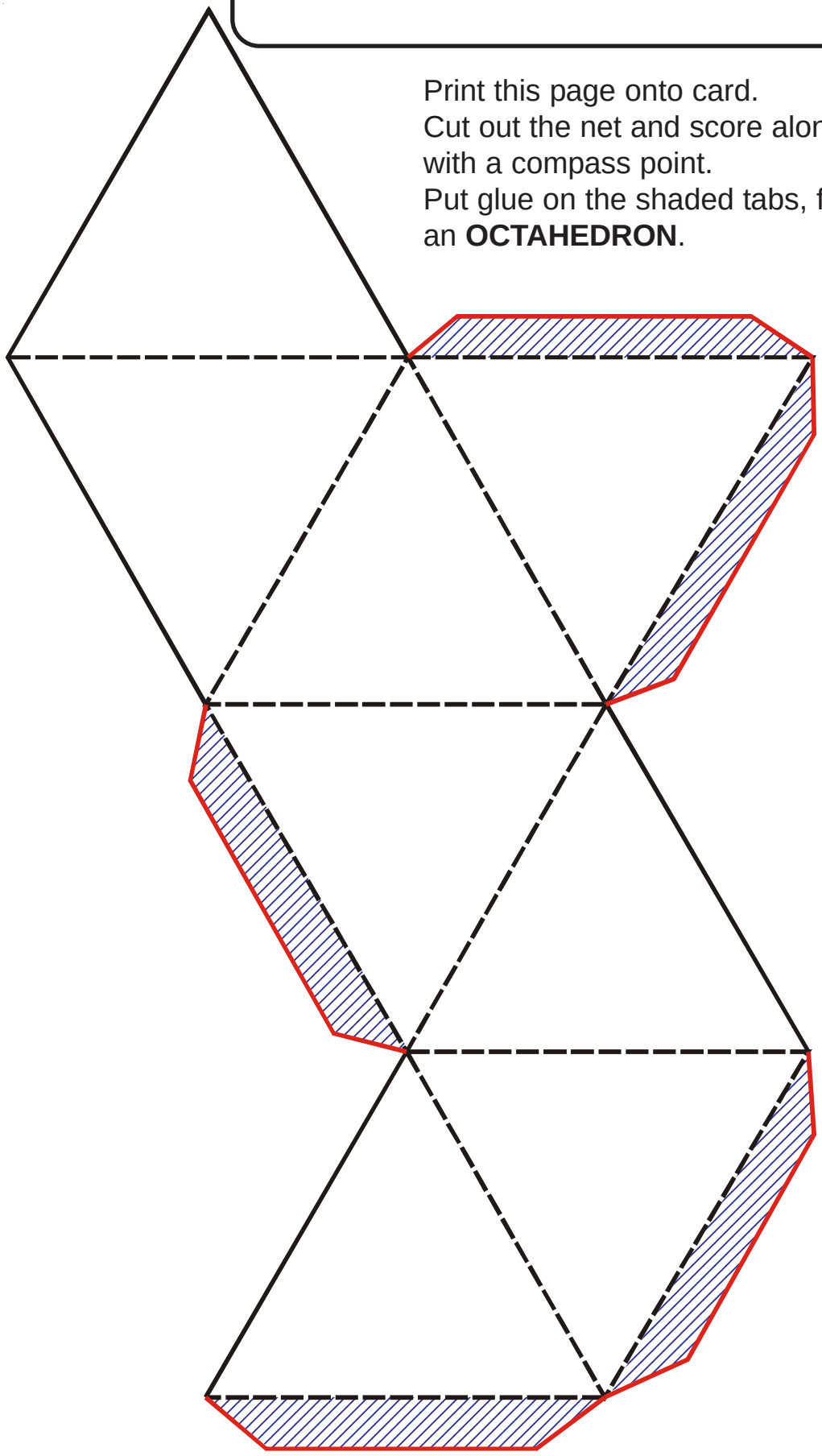
G12b

3D Shapes - Models

Print this page onto card.
Cut out the net and score along all the dotted lines with a compass point.
Put glue on the shaded tabs, fold and stick to make an **OCTAHEDRON**.



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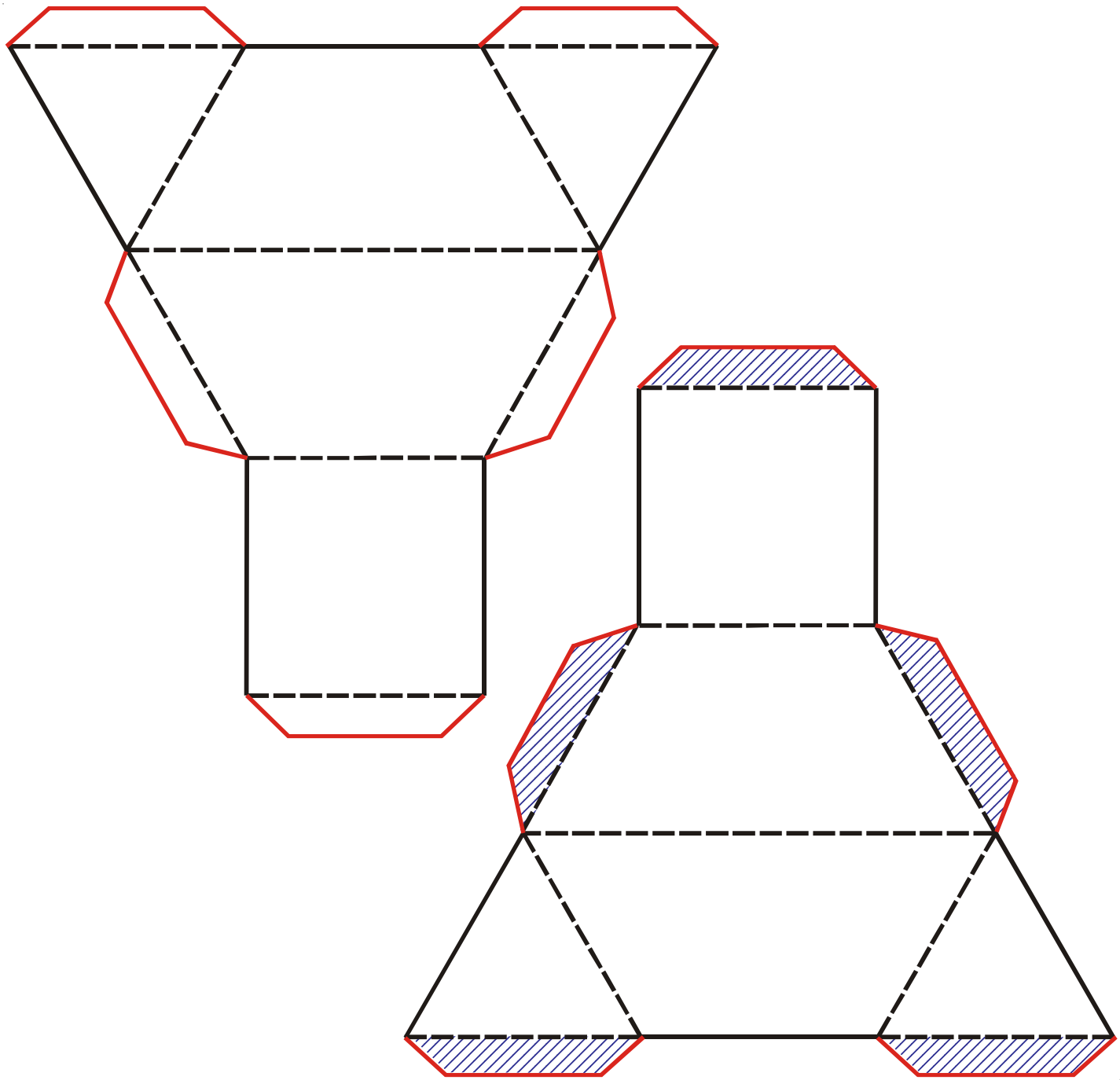
G12b

3D Shapes - Models

Print this page onto card.
Cut out, score and glue each net to make two 3D shapes.
You now have a two-piece jigsaw.
Can you fit both pieces together to make a TETRAHEDRON.
When you can do it, challenge other people to try.



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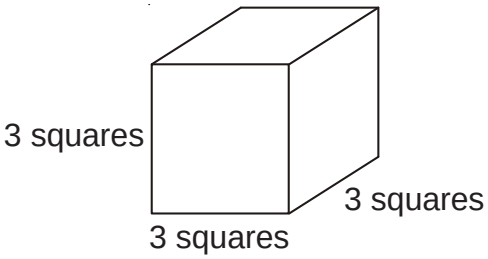
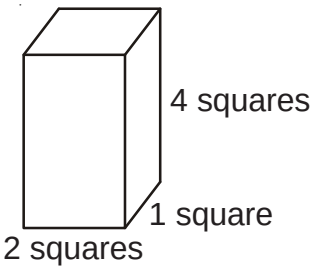
G12c

3D Shapes - Nets

a) Draw a net of this cube.



b) Draw a net of this cuboid.



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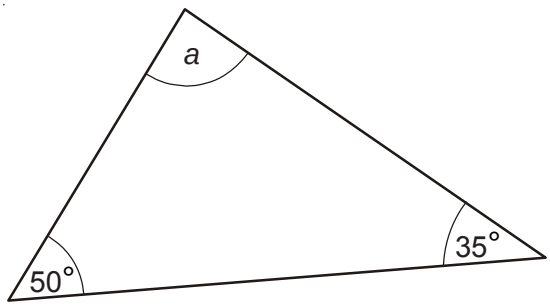
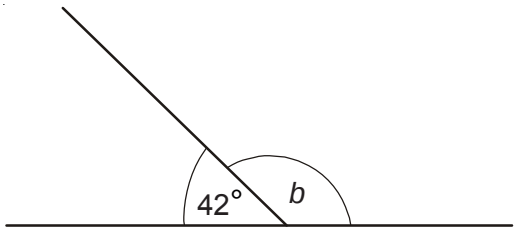
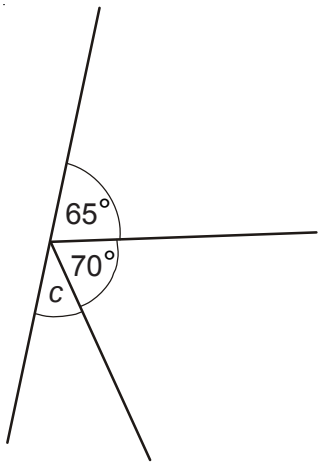
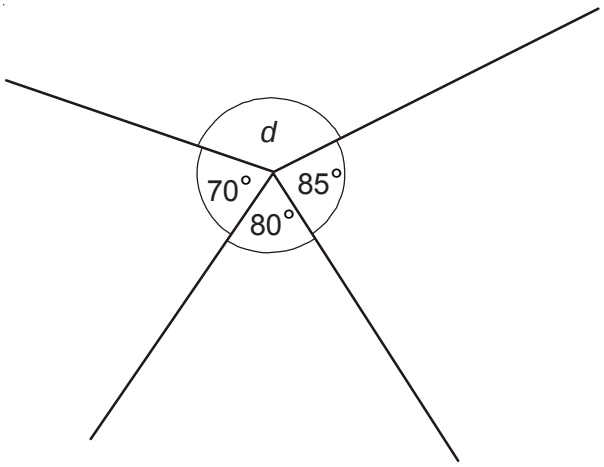
G13 Angle Facts

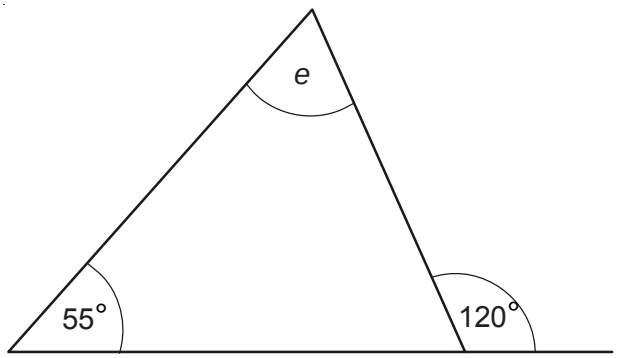
1) Work out the size of angles *a* to *h*.

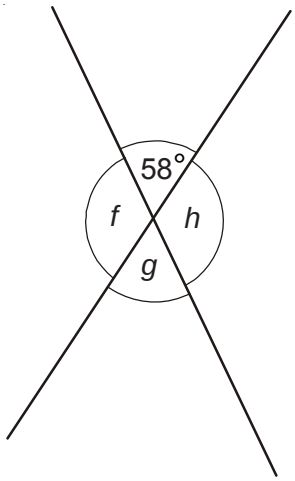












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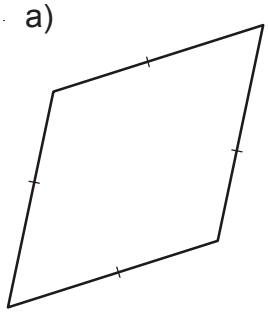
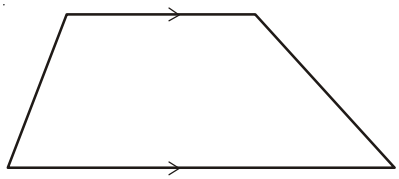
G14 Properties of Quadrilaterals

1) Write down the names of the quadrilaterals a) to g)

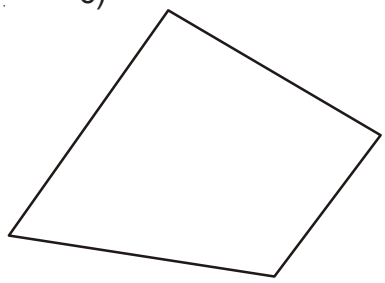
a)



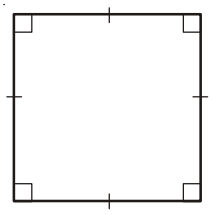
b)



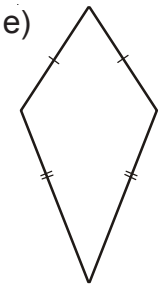
c)



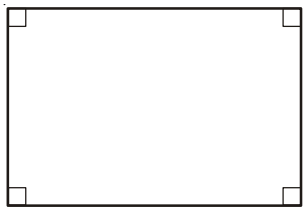
d)



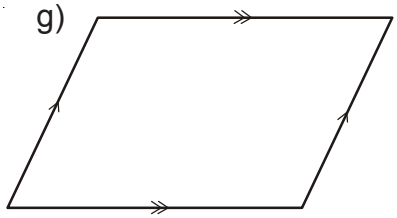
e)



f)



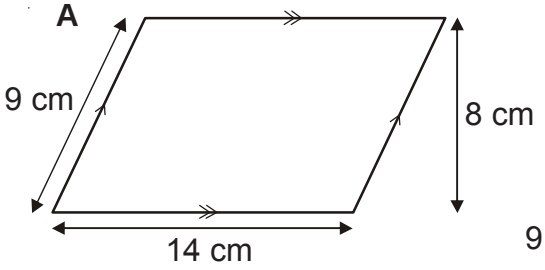
g)



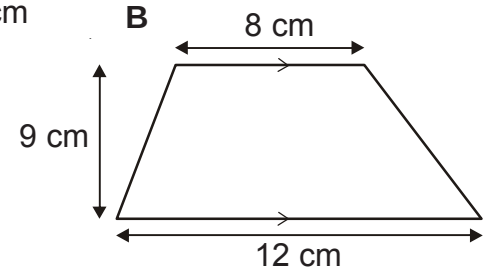
2) Fill in the table for quadrilaterals A, B and C.

Shape	*Number of lines of symmetry*	*Order of rotational symmetry*	*Area*
A			
B			
C			

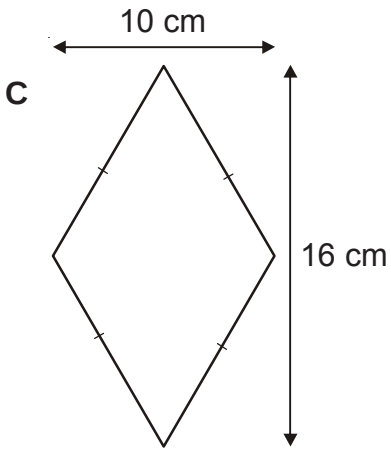
A



B



C



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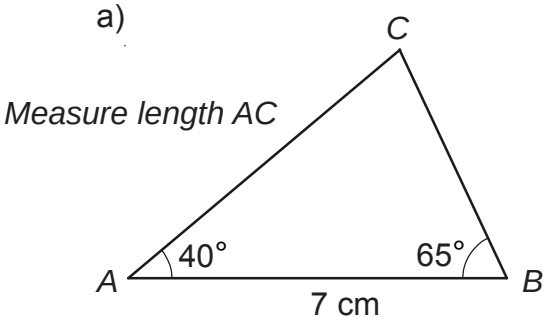
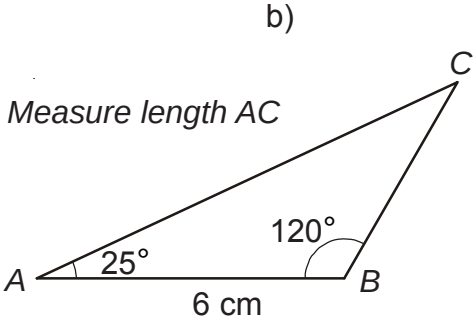
G15 Scale Drawings

1) Using only a ruler, protractor and pencil, draw the following diagrams accurately.
For each diagram measure and write down the side you are asked for.

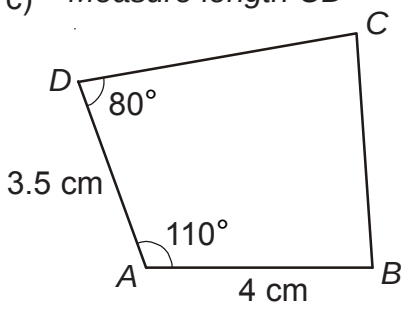
a)



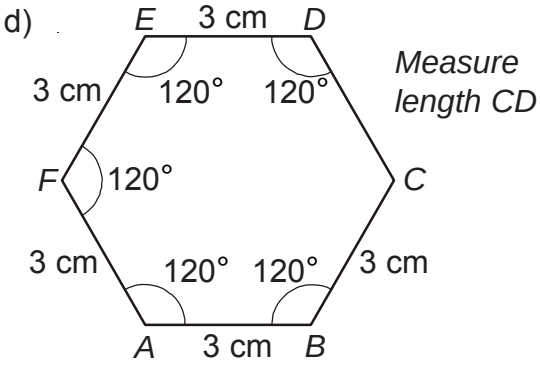
b)



c) Measure length CD

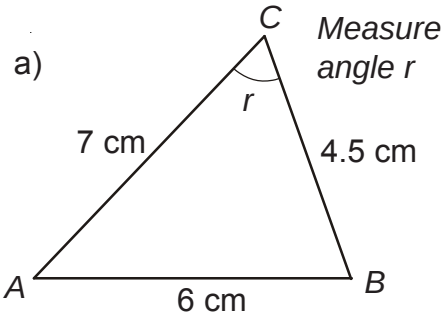


d)

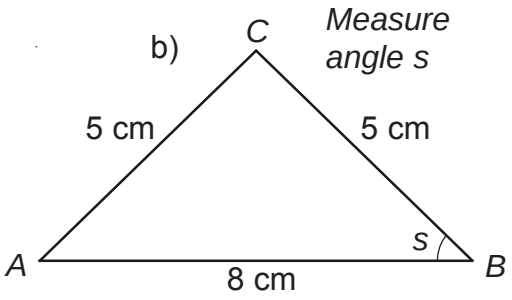


2) Using only a ruler, pencil, compasses and protractor as needed, draw the following diagrams accurately.
For each diagram, measure and write down the angle you are asked for.

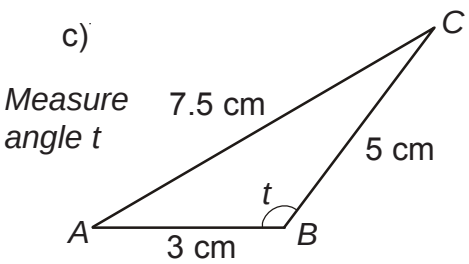
a)



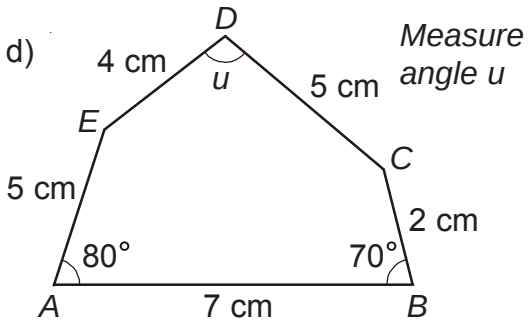
b)



c)



d)



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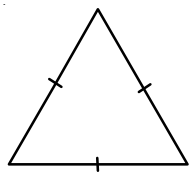
G16 Properties of Special Triangles

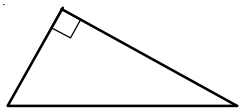
1) Write the special name for each type of triangle next to it and fill in the gaps in the description.

a) 

Name: _ _ _ _ _ _ _ _ _ _

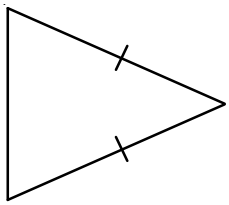
_ _ equal sides

_ _ equal angles

b) 

Name: _ _ _ _ _ _ _ _ _ _

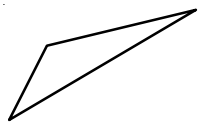
One angle of _ _

c) 

Name: _ _ _ _ _ _ _ _ _ _

_ _ equal sides

_ _ equal angles

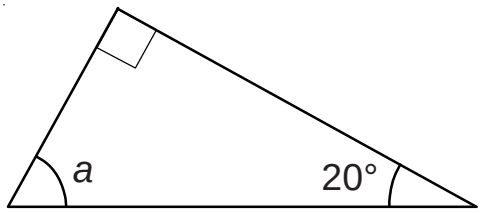
d) 

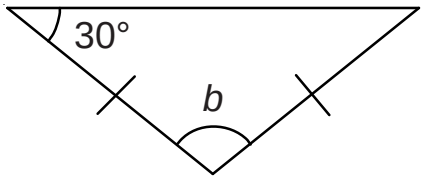
Name: _ _ _ _ _ _ _ _ _ _

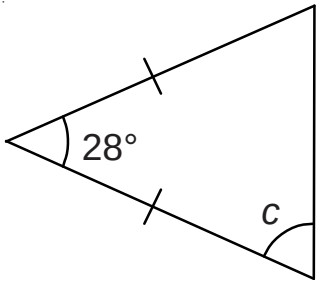
_ _ equal sides

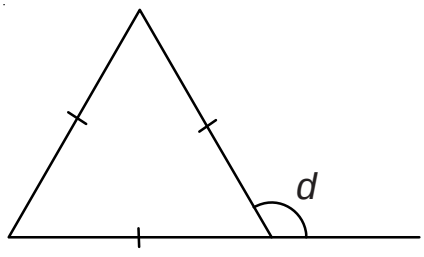
_ _ equal angles

2) Find the missing angles.









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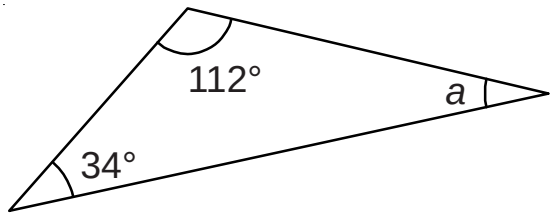
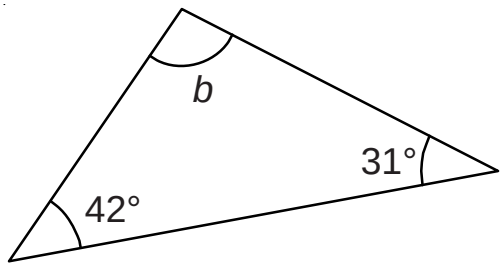
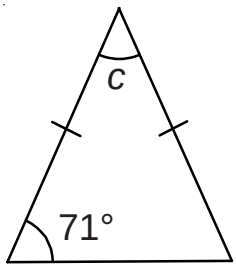
G17 Angles in a Triangle Calculation

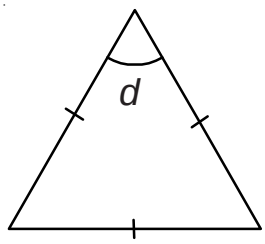
1) Work out the size of the missing angles.

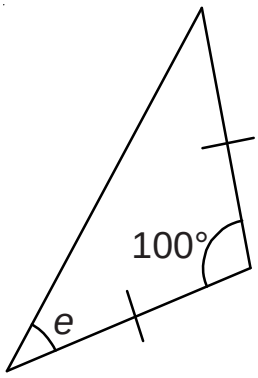




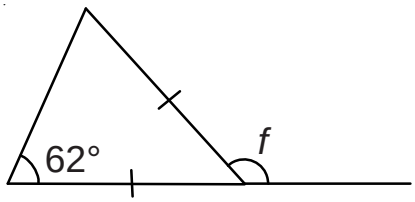
2) Work out the size of the missing angles.

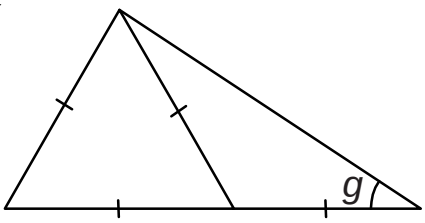


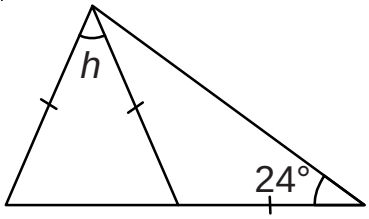




3) Work out the size of the missing angles.







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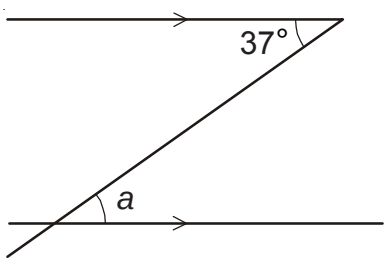
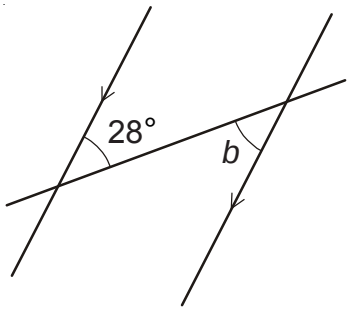
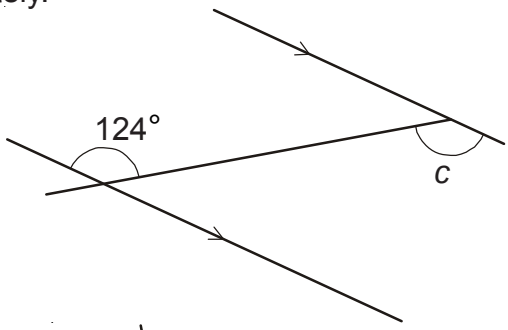
G18 Angles and Parallel Lines

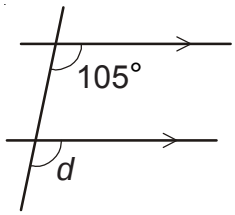
In every question below, calculate the missing angles indicated by the letters. None of the diagrams are drawn accurately.

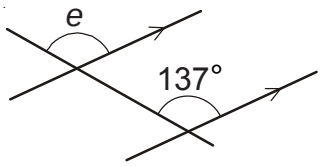
1)

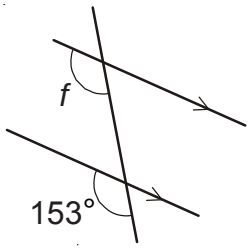




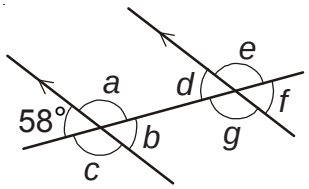


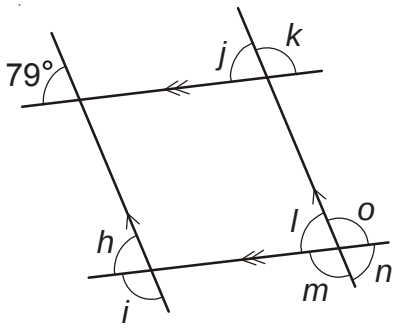


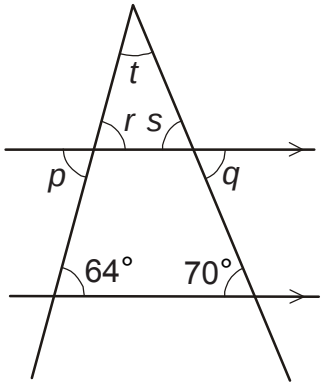




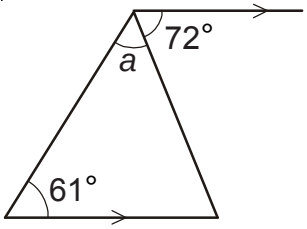
2)

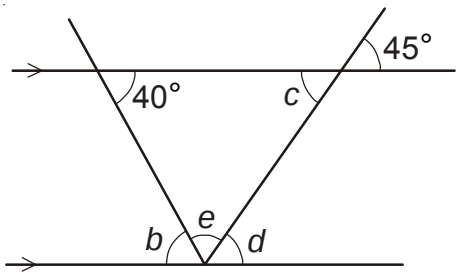




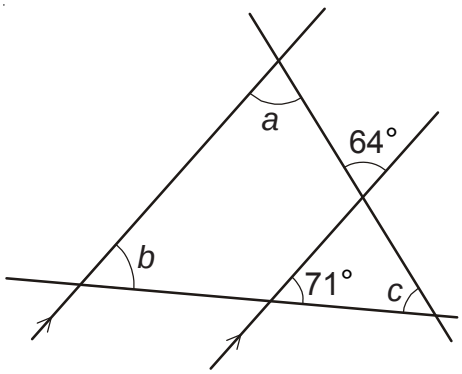


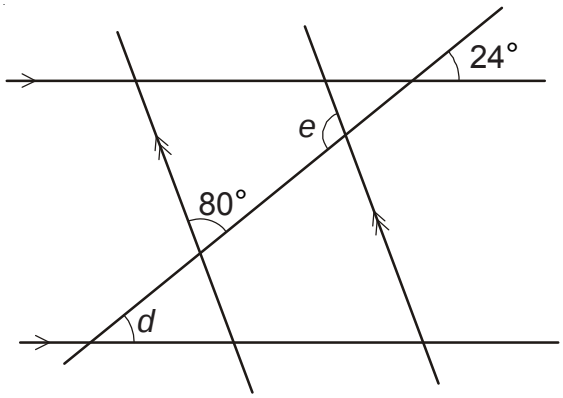
3)





4)





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G19 Angle Sum of Polygons

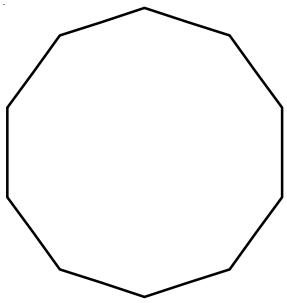
1) Find the sum of the interior angles of a nonagon (a 9-sided shape).

2) Find the sum of the interior angles of a 14-sided shape.

3) The sum of the interior angles of a polygon is 1620°.

   How many sides does it have?

4) Here is a regular decagon.



   a) What is the sum of the interior angles?

   b) Find the size of one interior angle.

   c) Find the size of one exterior angle.

5) A regular polygon has interior angles of size 135°.

   a) How many sides does it have?

   b) What is its name?

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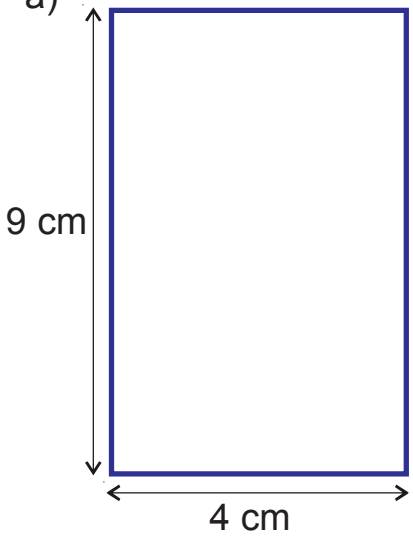
G20a

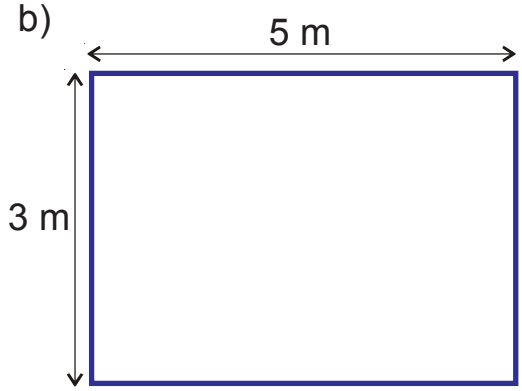
Area - Rectangles

1) Find the areas of the following four rectangles.

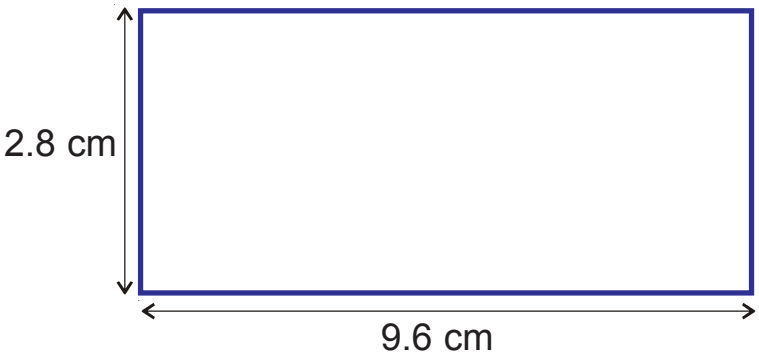
a)



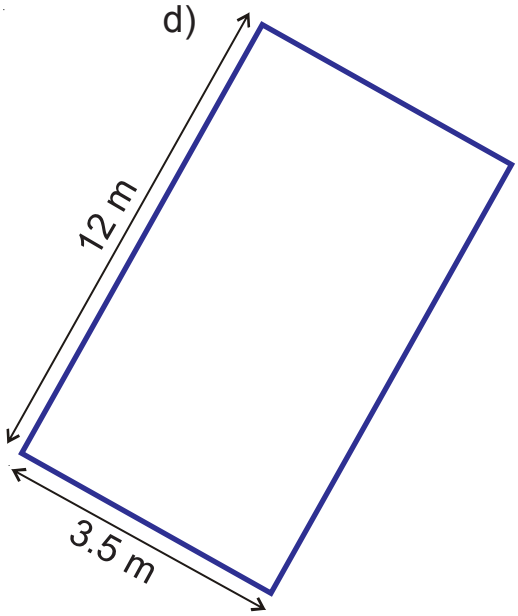
b)



c)

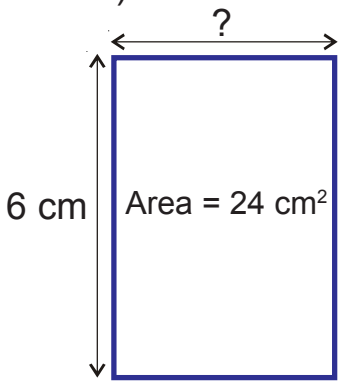


d)

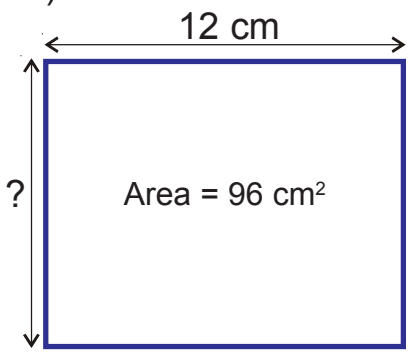


2) Find the lengths of the missing sides.

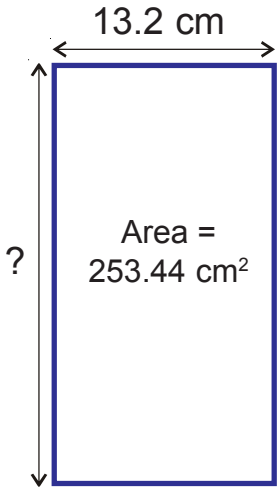
a)



b)



c)



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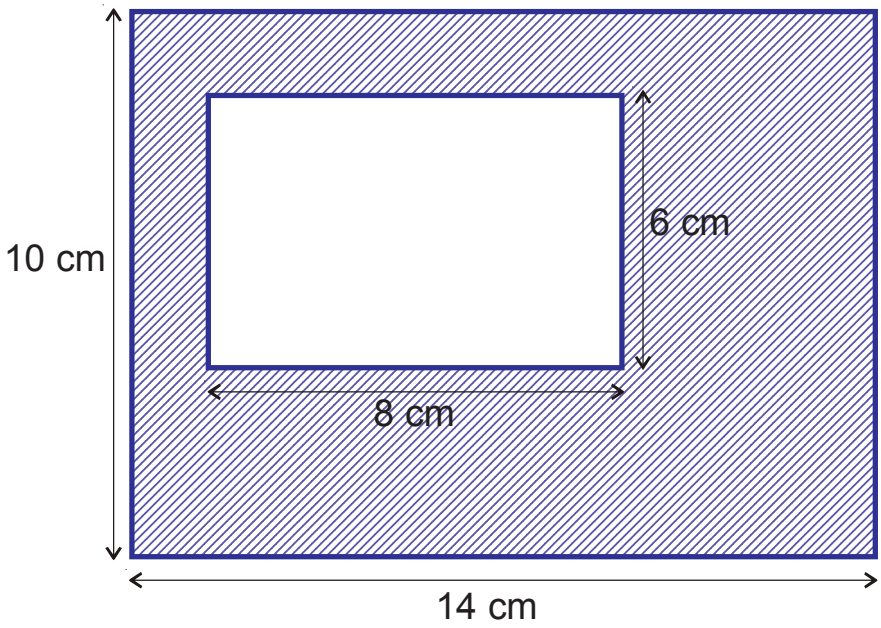
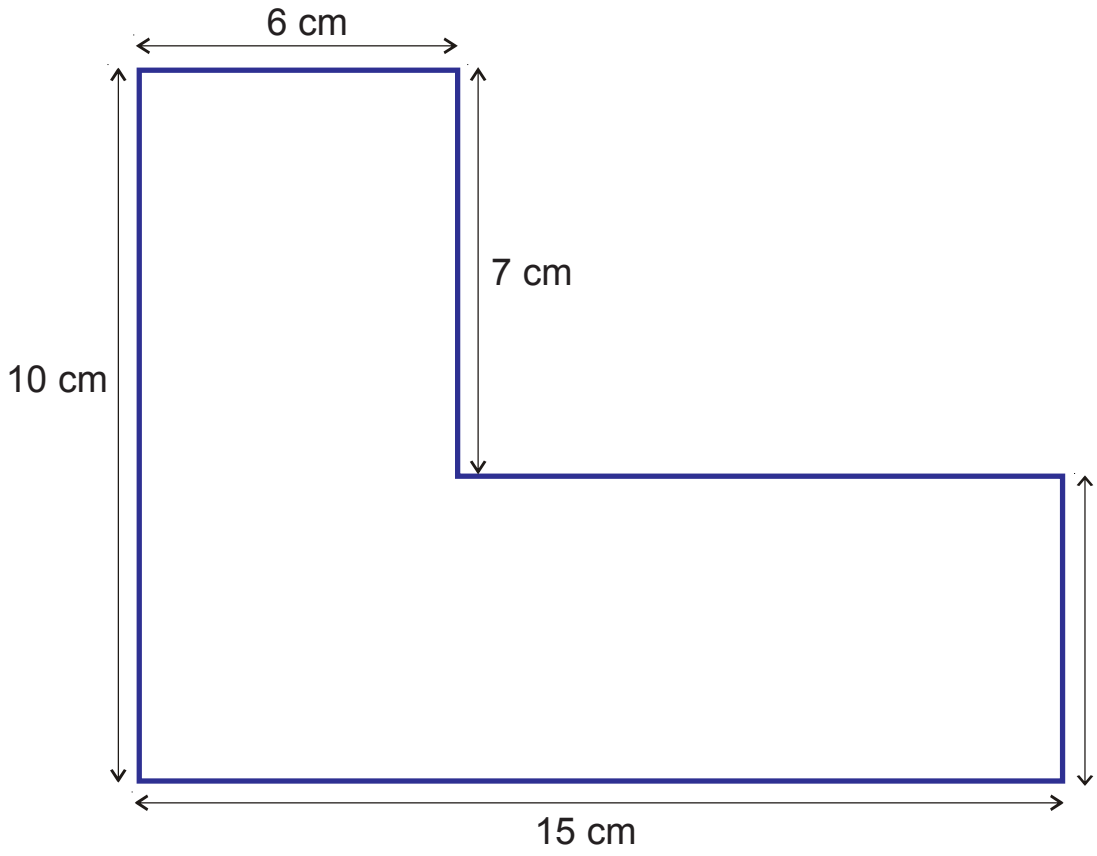
G20a

Area - Rectangles

1) Find the area of the shaded section.



2) Find the area of the shape below.



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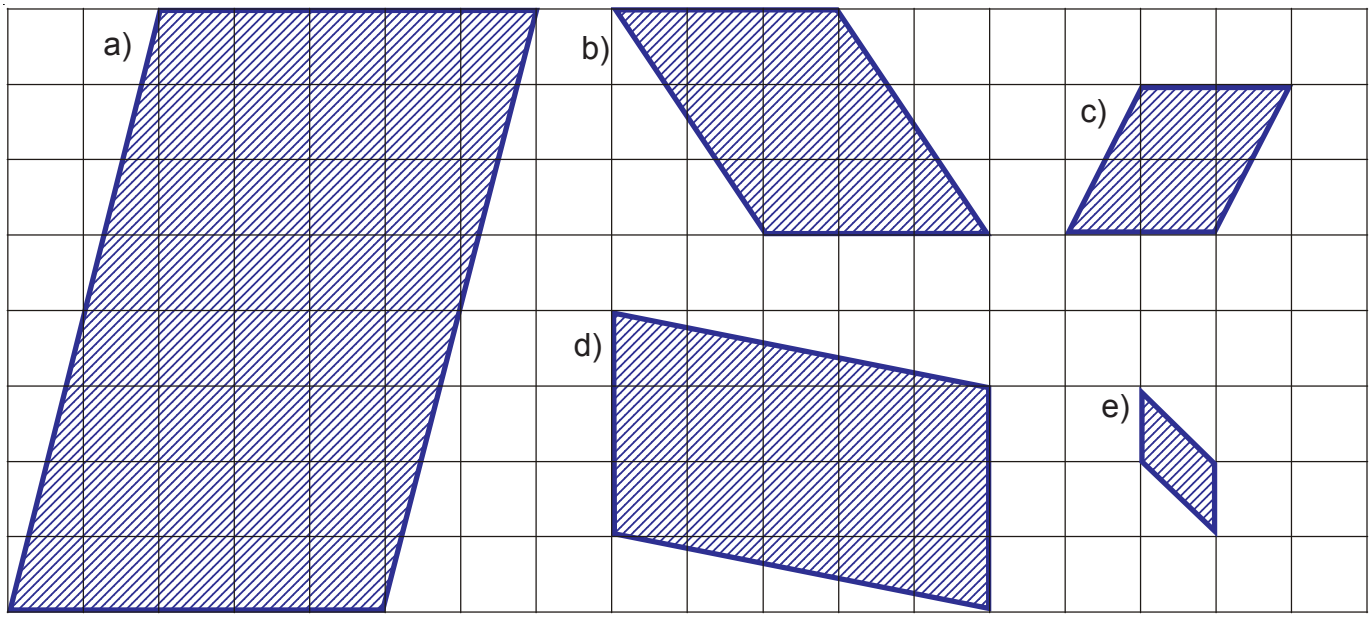
G20b

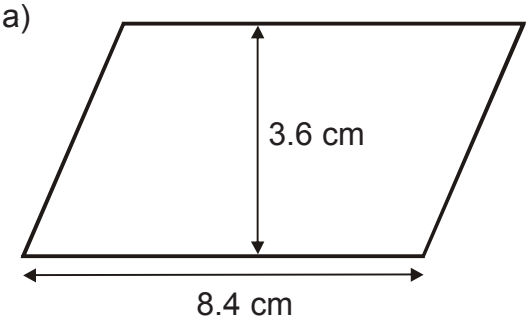
Area - Parallelograms

1) Find the areas of the five parallelograms on this cm square grid.

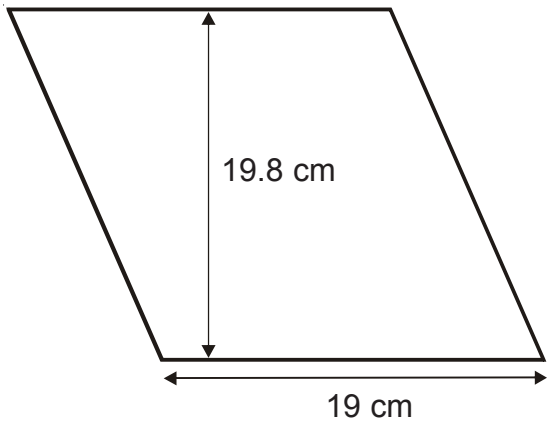


2) Find the areas of these four parallelograms

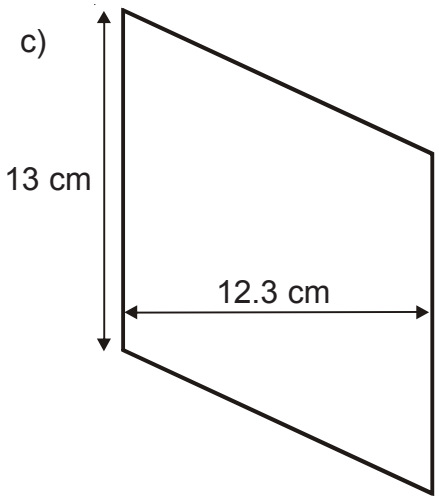
a)



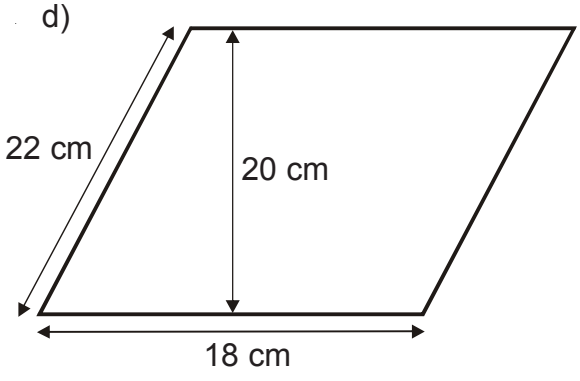
b)



c)



d)



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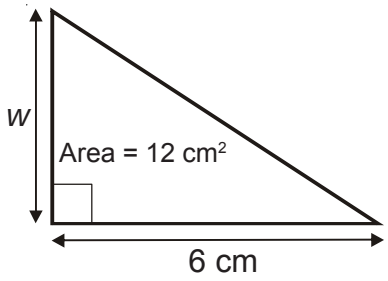
G20c

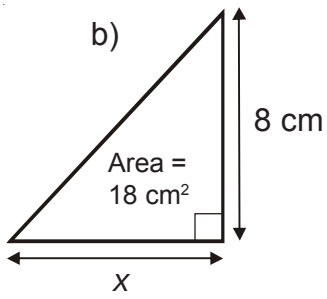
Area - Triangles

1) Find the lengths *w*, *x*, *y* and *z*

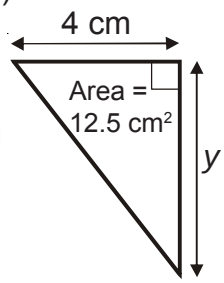
a)



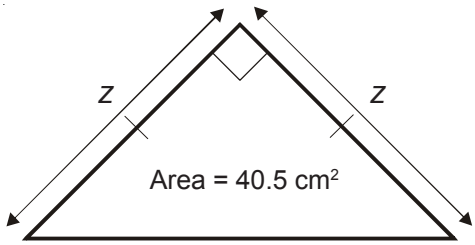
b)



c)

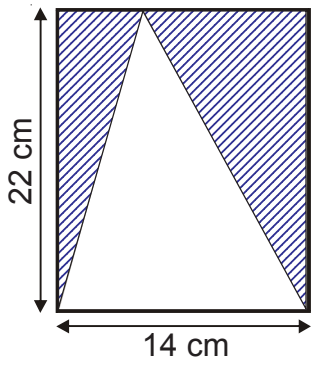


d)

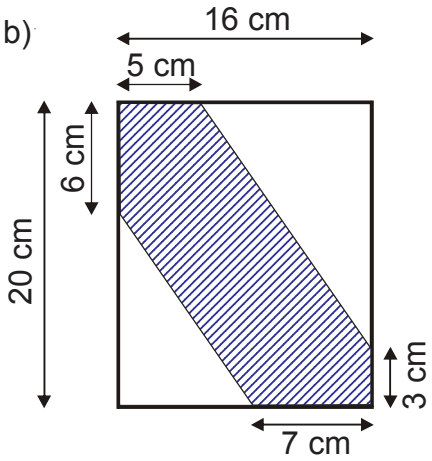


2) Find the areas of the following shaded parts of rectangles

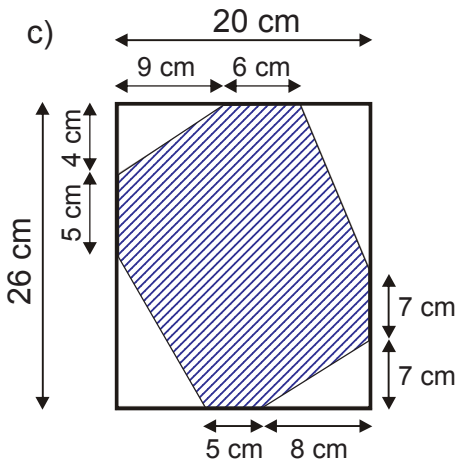
a)



b)

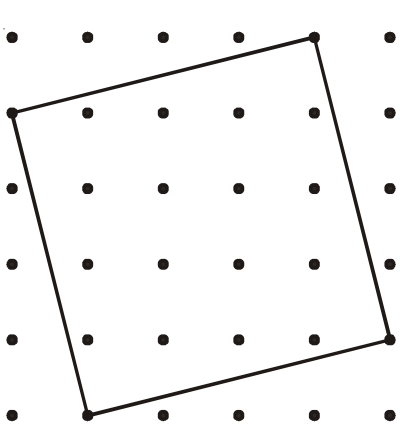


c)

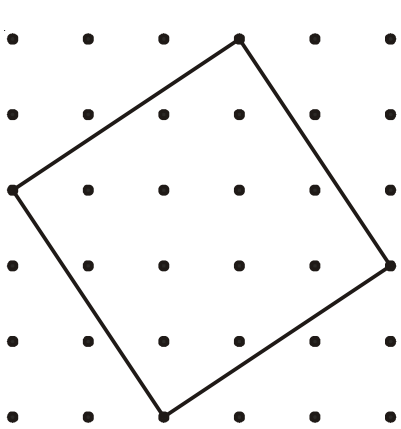


3) The two squares are drawn on 1 cm square grids.
Find the areas of the squares.

a)



b)



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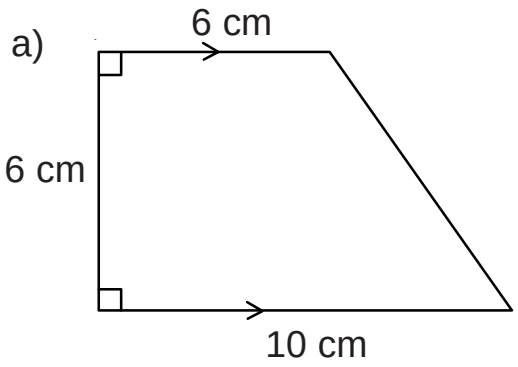
G20d

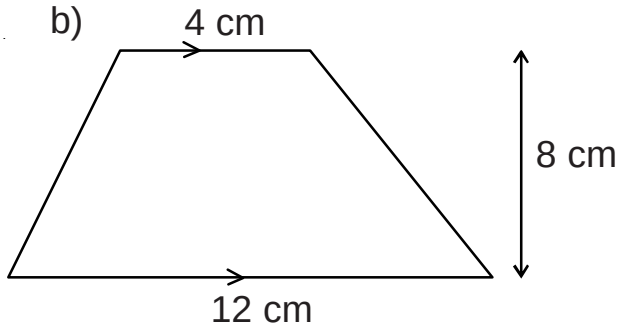
Area - Trapeziums

1) Find the area of the following trapeziums:

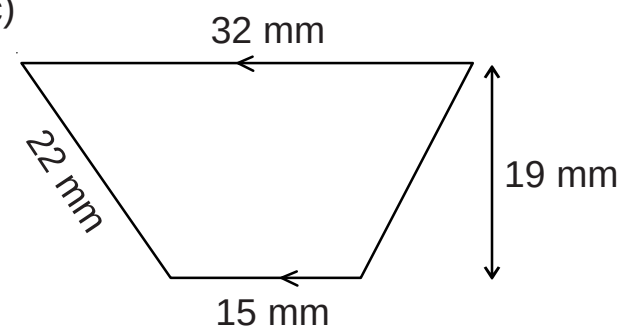
a)



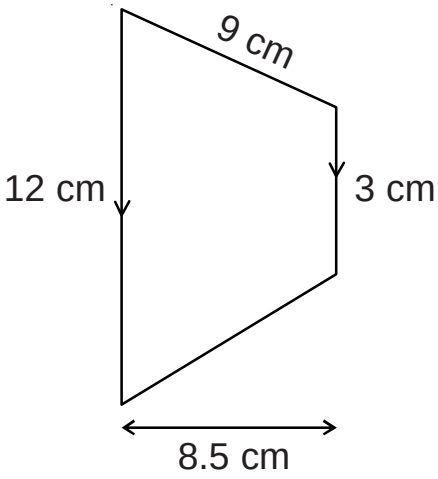
b)



c)

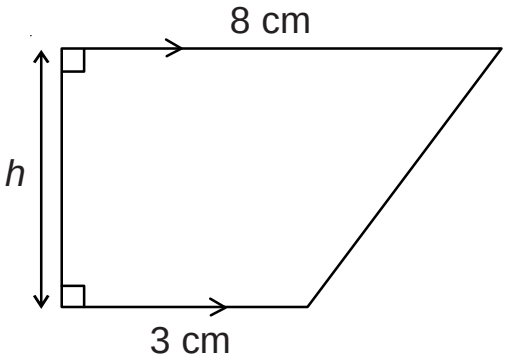


d)

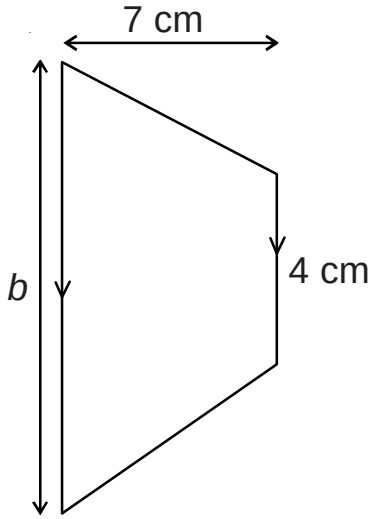


2) Find the missing lengths.

a) area = 38.5 cm^2



b) area = 59.5 cm^2



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P2a Outcomes - Basics

Work out an exact probability (as a fraction) for these events:

a) If you flip a coin you will get a ‘head’.

b) If you flip two coins you will get two ‘heads’.

c) If you roll a dice you will get a 6.

d) If you roll two dice you will get two 6’s.

e) If you flip a coin and roll a dice you will get a ‘head’ and a 6.

f) If you flip three coins you will get three ‘heads’.

g) If you flip three coins you will get two ‘heads’ and a tail in any order.

h) If you flip three coins you will get at least one ‘head’.

i) If you roll two dice and add the scores together you will get a total of 4.

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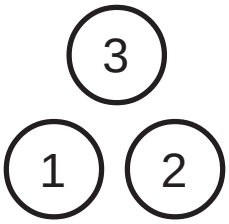
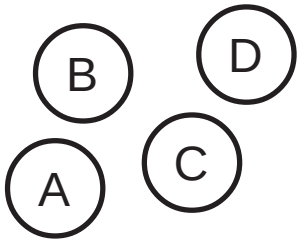
P2b Outcomes Harder Questions

1) A counter is taken at random from set 1 followed by another counter at random from set 2.



Set 1



Set 2

a) Write down all the possible pairs of counters that may be chosen.

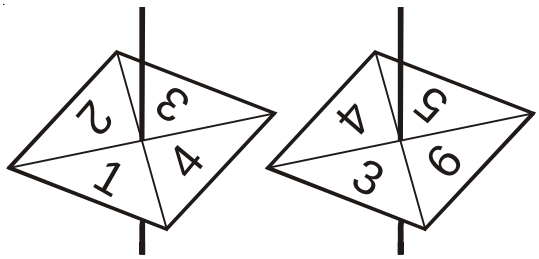
b) What is the probability that 3B will be picked?

c) What is the probability that any pair of counters will be chosen **except** 3B?

d) What is the probability that the pair of counters chosen will include an odd number?

2) The two spinners on the right are spun and their scores added together to give a total.

a) Draw a possibility space to show all the totals.



b) What is the probability of scoring a total which is bigger than 5?

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P3 Mutually Exclusive Events

1) Every Tuesday the main school dinner is either Sausages, Chicken, Pizza or Tuna.

Use the table below to work out the probability that the main dinner will be Pizza next Tuesday.

School dinner	Sausages	Chicken	Pizza	Tuna
Probability	0.24	0.18	?	0.47

2) Every Wednesday the main school dinner is either Sausages, Chicken, Pizza or Tuna.

The probability of it being Sausages is exactly the same as the probability it will be Tuna.

Use the table below to work out the value of the probabilty x.

School dinner	Sausages	Chicken	Pizza	Tuna
Probability	x	0.41	0.35	x

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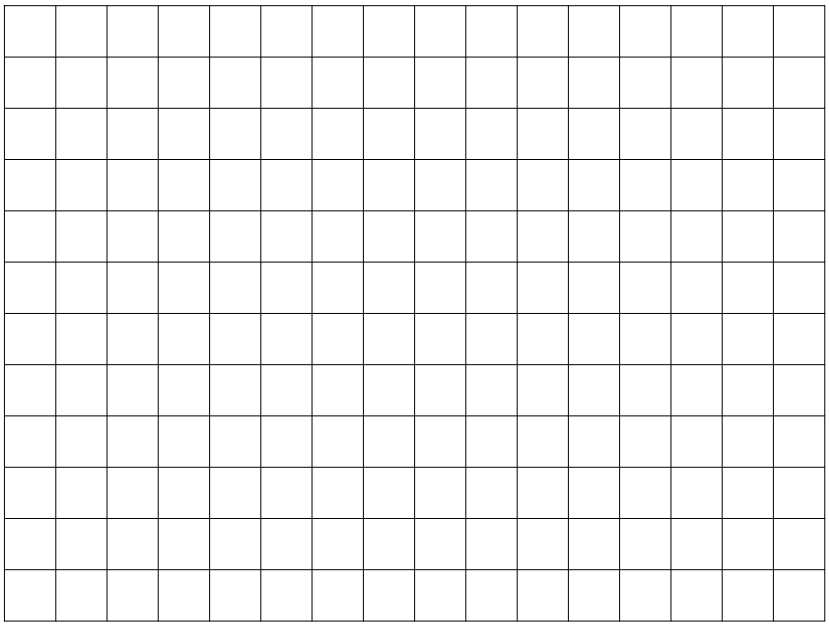
S5 Frequency Diagrams

1) A group of pupils were asked for their favourite colour.
Here are the results.

Draw a suitable chart to show this information.

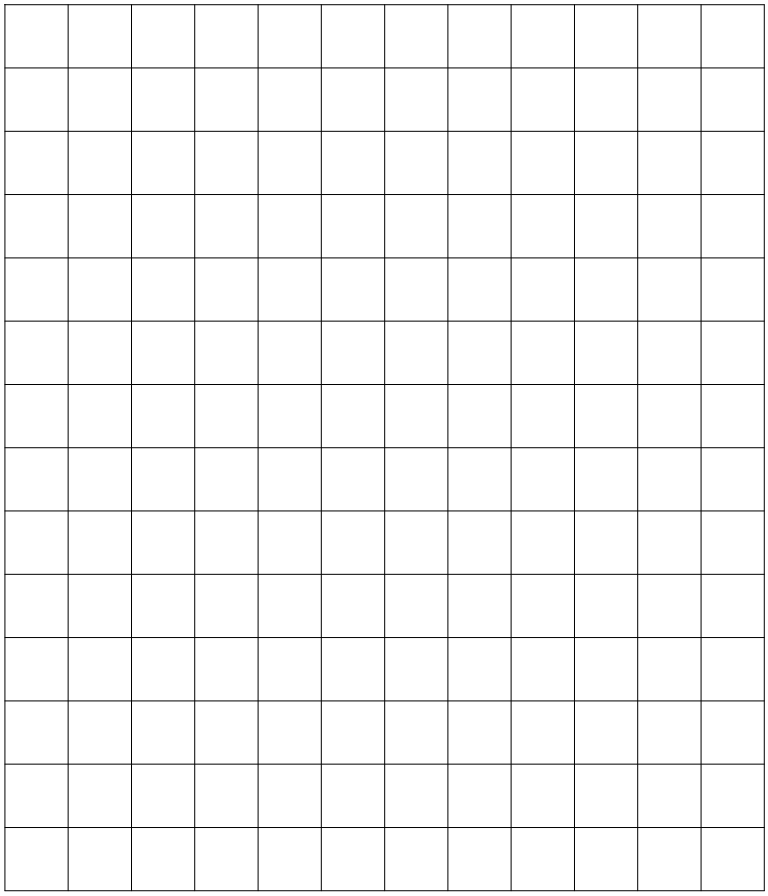
Colour	Frequency
Red	8
Blue	10
Purple	9
Green	4
Yellow	7



2) A group of people were given a puzzle to solve.
The time taken by each individual to complete the puzzle was recorded in the table below.

Draw a suitable chart to show this information.

Time in mins	Frequency
$0 \leqslant t < 10$	5
$10 \leqslant t < 20$	6
$20 \leqslant t < 30$	12
$30 \leqslant t < 40$	11
$40 \leqslant t < 50$	10



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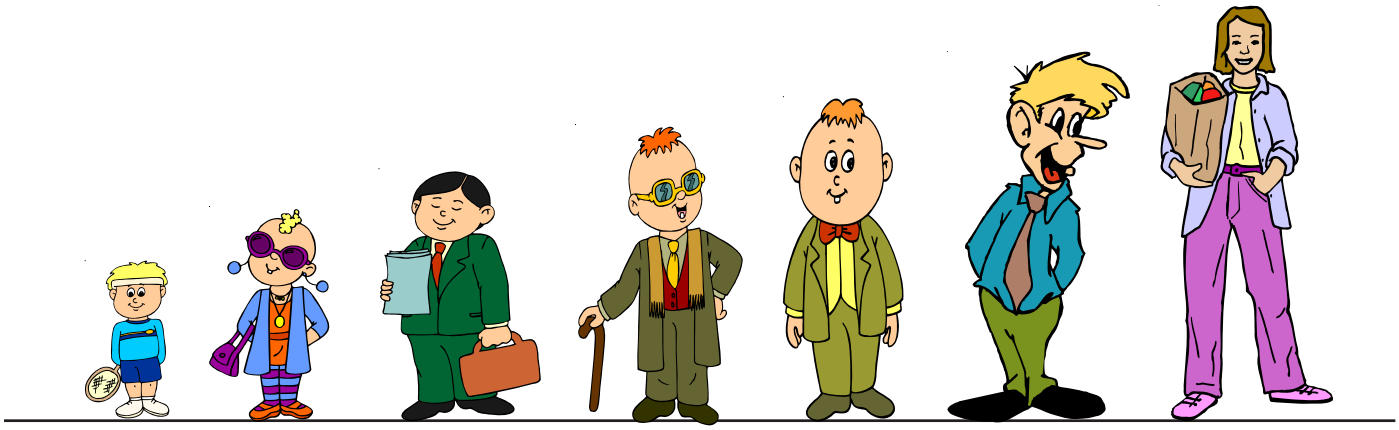
S6 Median, Mode and Range



1) a) In this group of seven people, which one has the median average height?

   b) What are the names of the people who are below the median average height?

   c) To find the range of the heights you would need to measure the height of two people. Which two?

2) A class of students were asked how many pets they own.

   The answers were as follows:

   1, 0, 1, 2, 1, 5, 2, 0, 1, 2, 3, 1, 4

   2, 3, 1, 2, 2, 0, 1, 1, 2, 1, 3, 2

   a) Find the median average number of pets per student.

   b) Which number of pets is the mode?

   c) What is the range of the answers?

3) Twenty children were asked what their favourite colour was.

   Their answers were:

   Blue, Red, Yellow, Red, Green, Red, Green, Blue, Red, Blue

   Green, Blue, Red, Blue, Yellow, Red, Blue, Orange, Red, Red

   a) Which colour is the modal average?

   b) Why can't we find the median colour?

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S6 Median, Mode and Range

1) The heights of 18 plants, to the nearest cm, are as follows:

15, 19, 16, 12, 13, 15, 20, 18, 16, 14, 12, 18, 16, 16, 17, 15, 15, 15

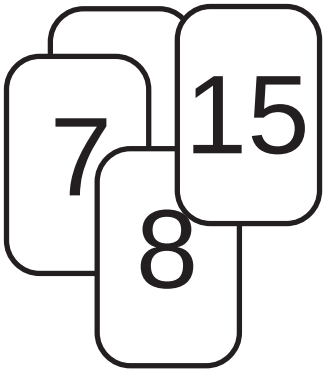
a) Find the modal height of the plants.

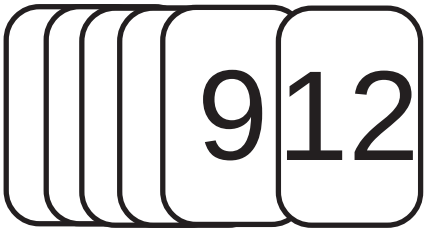
b) Find the median height of the plants.

c) Find the range of the heights.

2) You are told that the median score on these four cards is 9.5

Work out what the number is on the bottom card.





3) We have six cards with numbers on them and we know the following:

the modal average is 3

the median average is 5

the range is 11

Work out the numbers on the other four cards.

4) Sue rolls a dice 23 times and puts her scores into a table.

a) What is Sue's modal score?

b) What is Sue's median score?

c) What is the range of Sue's scores?

Score	Frequency
1	2
2	3
3	3
4	4
5	4
6	7

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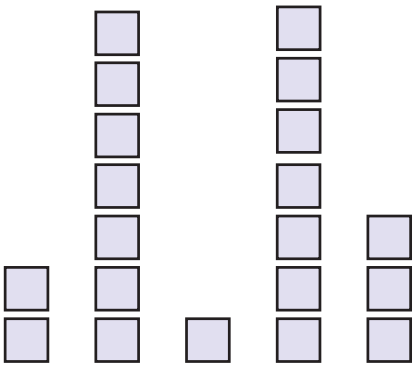
S7 The Mean Average

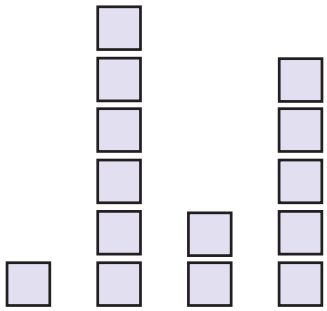
1) a) Move blocks around so that the heights of the five towers are the same.

b) What is the mean average number of blocks in each tower?



2) a) Move blocks around so that the heights of the four towers are the same (you may have to cut some blocks).

b) What is the mean average number of blocks in each tower?



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3) In a spelling test, the results for the class (out of 10) are:

3, 6, 8, 8, 4, 1, 7, 6, 2, 9, 3, 8, 4, 1, 1, 3, 5 and 2

a) Work out the mean average score for the class.

b) How many children had a score below the mean average?

4) Two Year 6 classes had a 'times table test' which was marked out of 20.

The marks in David's class were:

14, 12, 19, 20, 20, 15, 14, 12, 13, 3, 18, 19, 16, 14, 12, 6

Harry was in the other class and the marks were:

9, 12, 17, 17, 16, 14, 18, 20, 8, 13, 16, 14, 18, 8

Use the mean average to work out which class did better in the test.

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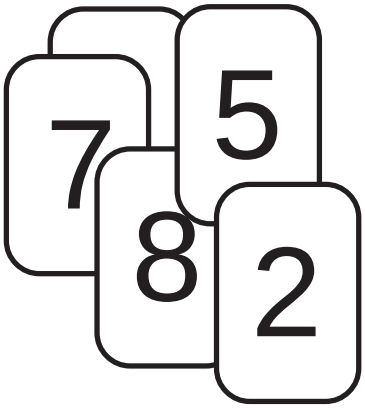
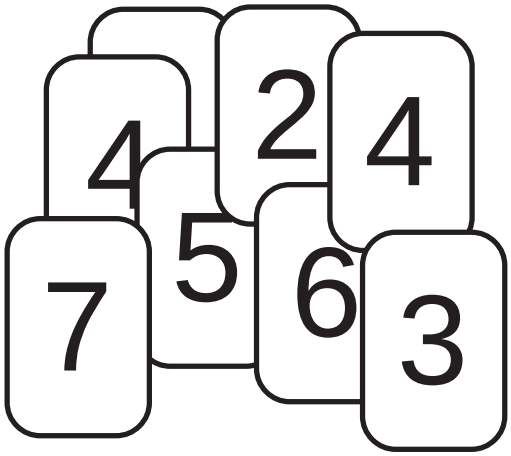
S7 The Mean Average



1) If the mean average number on these five cards is 6, what is the number on the bottom card?



2) If the mean average number on these eight cards is 4.25, what is the number on the bottom card?

3) John rolled a dice thirty times and put the results into this table.

Score	Frequency
1	4
2	3
3	5
4	6
5	4
6	8

Work out his mean average score.

4) What is the mean average number of arms per person in Britain?

5) Can you find out the mean number of children per family in the UK?

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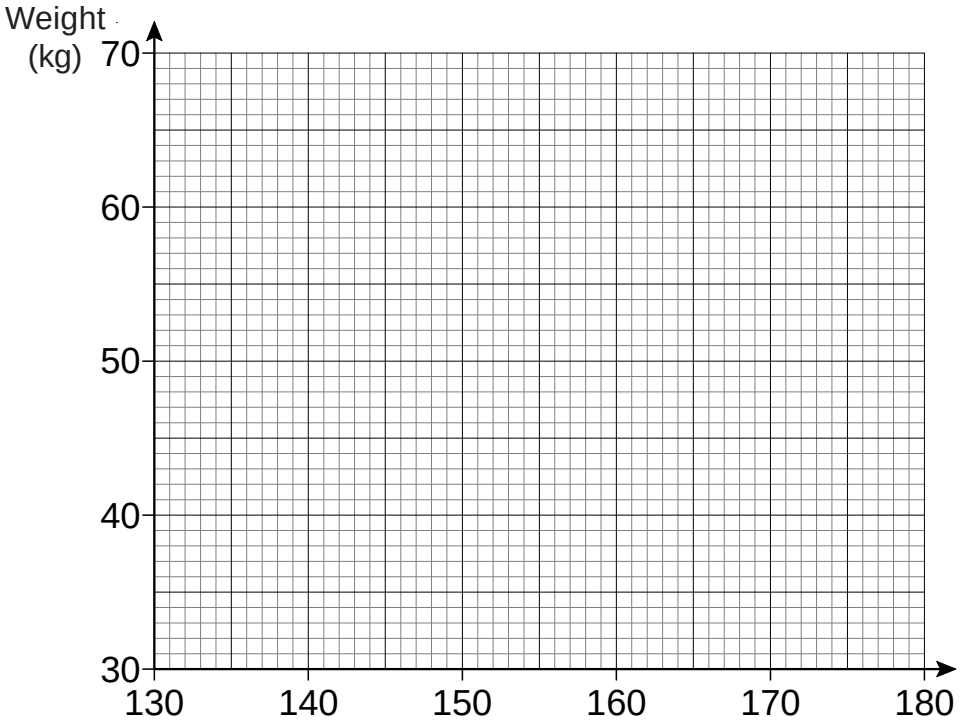
S8 Scatter Diagrams

1) The heights and weights of some children are shown in the table, below.

Height (cm)	132	145	150	140	175	168	177	162	170	162	165	149	150	135	159	160
Weight (kg)	34	40	43	35	60	54	62	51	57	51	58	40	41	33	44	50



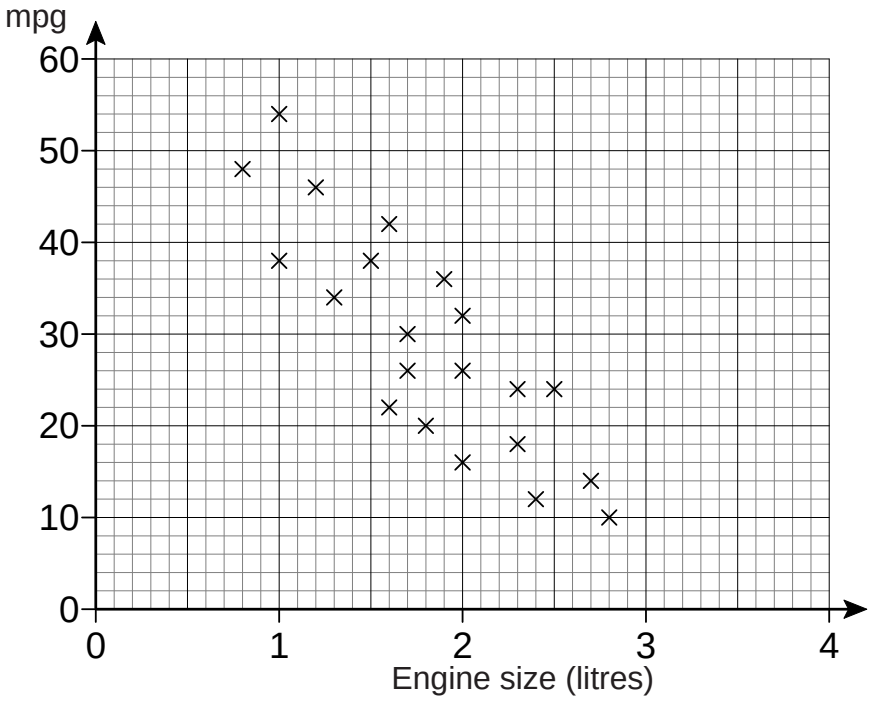
a) Plot the information from the table.

b) Describe the correlation between height and weight.

c) Draw a line of best fit.

d) Estimate the weight of a child of similar age to the group above with a height of 155 cm.

2) The scatter graph below relates car engine sizes to their fuel consumption in mpg.



a) Describe the correlation shown by the data.

b) A car has an mpg of 25. Estimate the engine size.

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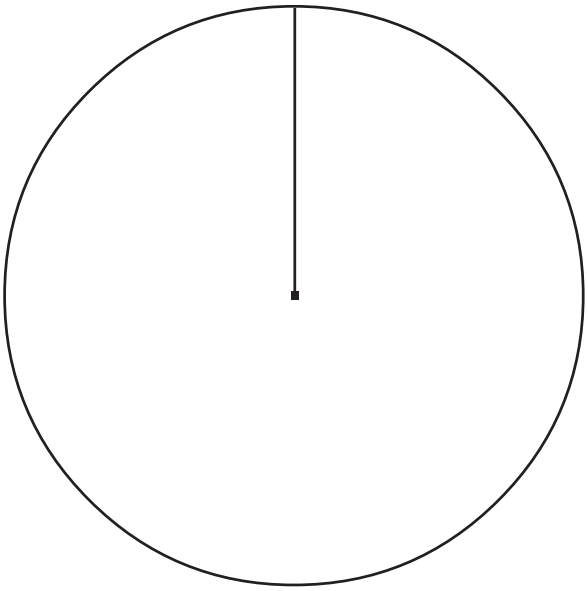
S9 Pie Charts

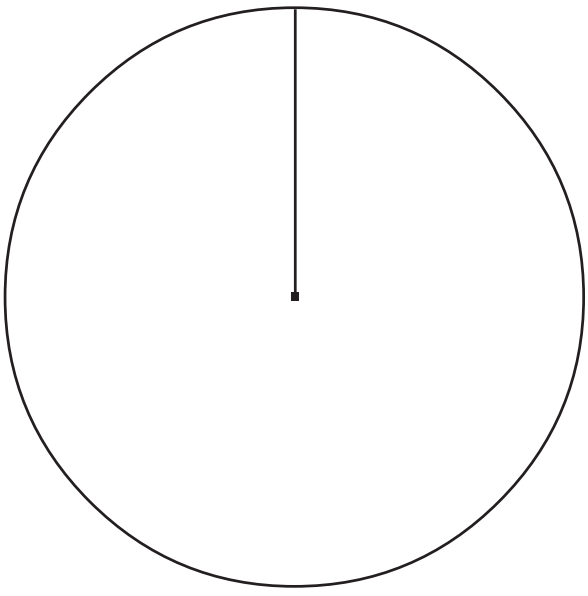
1) The table on the right shows how far 90 visitors to a museum have travelled.
Draw a pie chart to show this information.

Distance	Frequency
Within the city	13
Within 30 miles of the city	9
Over 30 miles from the city	20
Overseas	48



2) The table shows the land usage of a farm.
Draw a pie chart to show this information.

Land usage	Area (hectares)
Arable	80
Pasture	70
Woodland	50
Waste	40



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