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## N9 Mathematical Symbols

### Answers

- 1) State the meaning of each of the following symbols
  - a)  $=$  Equal
  - b)  $\neq$  Not equal
  - c)  $<$  Less than
  - d)  $>$  Greater than
  - e)  $\leq$  Less than or equal
  - f)  $\geq$  Greater than or equal
- 2) Insert the correct symbol to make these sentences true
  - a)  $4 + 5 > 6 + 2$
  - b)  $10 - 3 < 9 + 1$
  - c)  $6 + 2 = 2 \times 4$
- 3) State whether each statement is TRUE or FALSE
  - a)  $7 < 4$  FALSE
  - b)  $68p = £0.68$  TRUE
  - c)  $11 > 3$  TRUE
- 4) You need to be 1.4 m or taller to ride on a rollercoaster. Write a mathematical statement about the heights of people ( $h$  metres) allowed on the rollercoaster.  $h \geq 1.4 \text{ m}$

1) Write down all the factors of:

a) 6    1 2 3 6

b) 8    1 2 4 8

c) 10    1 2 5 10

d) 12    1 2 3 4 6 12

e) 20    1 2 4 5 10 20

f) 21    1 3 7 21

2) 100 has nine factors.

What are they?

1 2 4 5 10 20 25 50 100

3) The numbers 2, 3, 5 and 7 all have exactly two factors.

Find the next four numbers with only two factors.

11 13 17 19

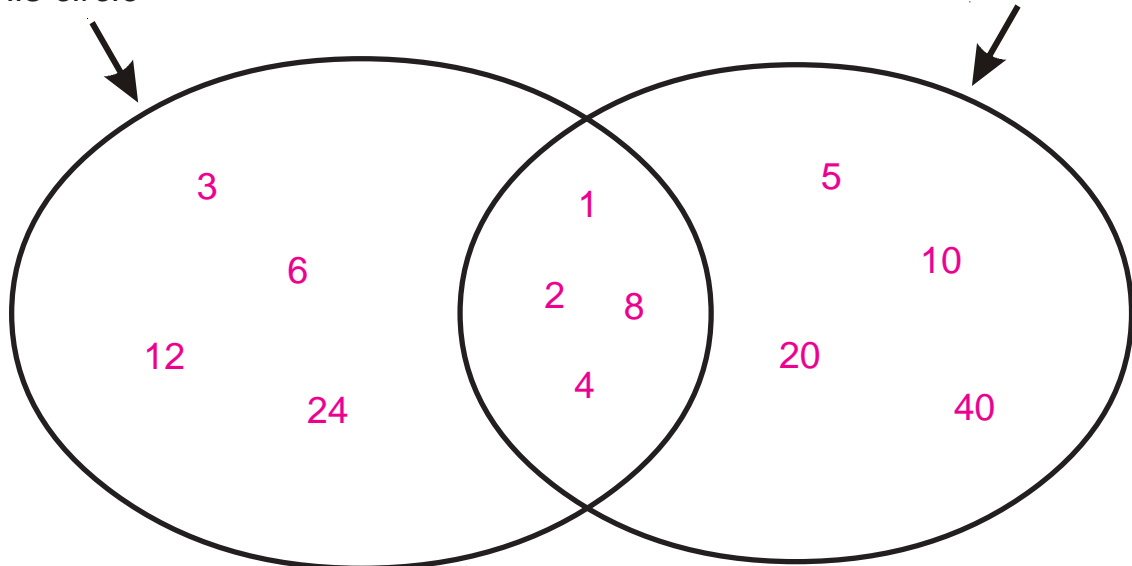
4) The numbers 1, 4, 9 and 16 all have an odd number of factors.

Find the next three numbers which have an odd number of factors. 25 36 49

5) Put the correct numbers in the circles.  
*Be careful of the overlaps.*

Factors of 24 in this circle

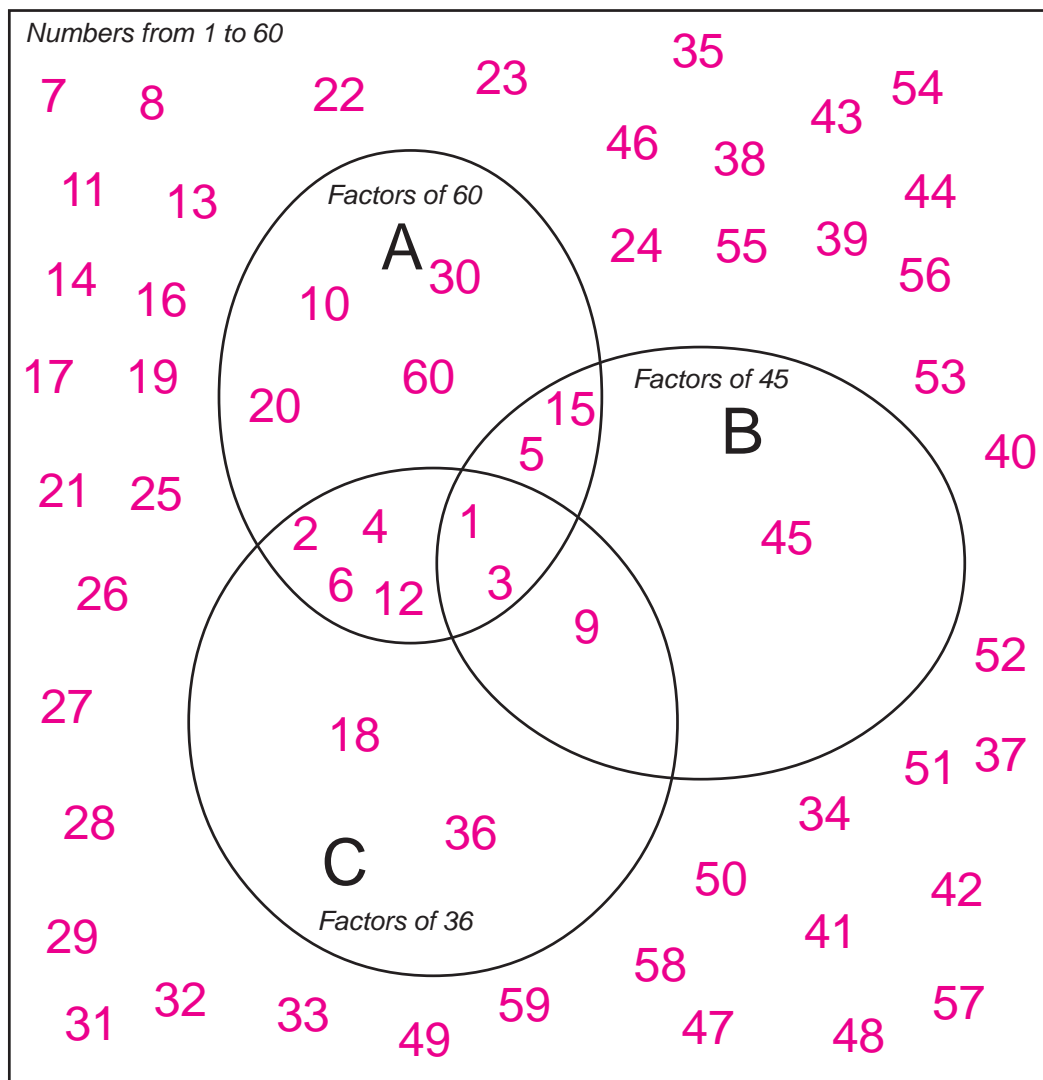
Factors of 40 in this circle



Place all the whole numbers from 1 to 60 in the diagram below.

However, you must stick to these four rules:

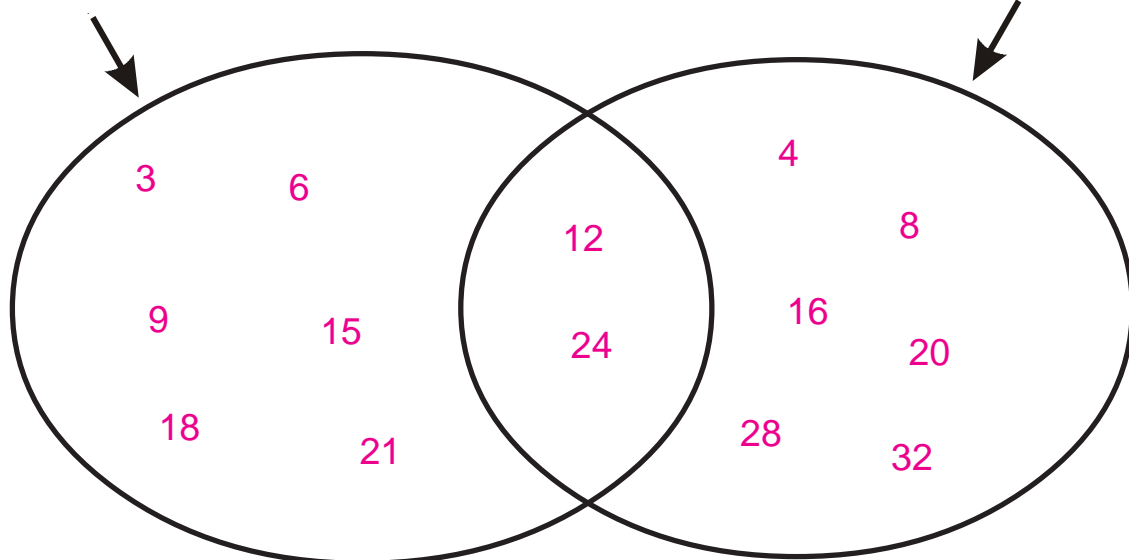
- 1) In the rectangle you must have every whole number from 1 to 60
- 2) In circle A you must have all the factors of 60
- 3) In circle B you must have all the factors of 45
- 4) In circle C you must have all the factors of 36



- 1)
  - a) Write down the first five multiples of 3. **3, 6, 9, 12, 15**
  - b) Write down the first five multiples of 7. **7, 14, 21, 28, 35**
  - c) Write down the first five multiples of 4. **4, 8, 12, 16, 20**
  
- 2) 6, 12, 18, 24, 30 are the first five multiples of which number? **6**
  
- 3) What are the eighth, ninth and tenth multiples of 11? **88, 99, 110**
  
- 4) Put the correct numbers in these circles.  
Be careful of the overlaps.

*First eight multiples  
of 3 in this circle*

*First eight multiples  
of 4 in this circle*



# N11

## Multiples Answers

*The sieve of Eratosthenes*

<del>1</del>	2	3	<del>4</del>	5	<del>6</del>	7	<del>8</del>	<del>9</del>	<del>10</del>
11	<del>12</del>	13	<del>14</del>	<del>15</del>	<del>16</del>	17	<del>18</del>	19	<del>20</del>
<del>21</del>	<del>22</del>	23	<del>24</del>	<del>25</del>	<del>26</del>	<del>27</del>	<del>28</del>	29	<del>30</del>
31	<del>32</del>	<del>33</del>	<del>34</del>	<del>35</del>	<del>36</del>	37	<del>38</del>	<del>39</del>	<del>40</del>
41	<del>42</del>	43	<del>44</del>	<del>45</del>	<del>46</del>	47	<del>48</del>	<del>49</del>	<del>50</del>
<del>51</del>	<del>52</del>	53	<del>54</del>	<del>55</del>	<del>56</del>	<del>57</del>	<del>58</del>	59	<del>60</del>
61	<del>62</del>	<del>63</del>	<del>64</del>	<del>65</del>	<del>66</del>	67	<del>68</del>	<del>69</del>	<del>70</del>
71	<del>72</del>	73	<del>74</del>	<del>75</del>	<del>76</del>	<del>77</del>	<del>78</del>	79	<del>80</del>
<del>81</del>	<del>82</del>	83	<del>84</del>	<del>85</del>	<del>86</del>	<del>87</del>	<del>88</del>	89	<del>90</del>
<del>91</del>	<del>92</del>	<del>93</del>	<del>94</del>	<del>95</del>	<del>96</del>	97	<del>98</del>	<del>99</del>	<del>100</del>

*Just follow these steps:*

- Cross out 1.
- Shade in the square with 2 in it.  
Now cross out all other multiples of 2.
- Shade in the 3 square.  
Cross out all other multiples of 3  
(some will already be crossed out).
- Shade in the 5 square.  
Cross out all other multiples of 5.
- Shade in the 7 square.  
There should be just three  
other multiples of 7 which  
haven't already been crossed out.  
Cross them out.
- Shade in every square that hasn't  
been crossed out.
- Write out the numbers in every  
shaded square.
- Prime numbers**

# N12 Number Patterns

## Answers

1) For each number pattern:

a) Describe the pattern

b) Work out what the next three terms are

*goes up in 2s*

(i) 2, 4, 6, 8, 10, 12, 14, 16, 18

*goes up in 3s*

(ii) 1, 4, 7, 10, 13, 16, 19, 22, 25

*goes up in 7s*

(iii) 5, 12, 19, 26, 33, 40, 47, 54, 61

*goes up in 5s*

(iv) -2, 3, 8, 13, 18, 23, 28, 33, 38

*goes down in 3s*

(v) 36, 33, 30, 27, 24, 21, 18, 15, 12

*goes up in 4s*

(vi) -12, -8, -4, 0, 4, 8, 12, 16, 20

*goes down in 9s*

(vii) 100, 91, 82, 73, 64, 55, 46, 37, 28

*goes up in 1.5s*

(viii) 7, 8.5, 10, 11.5, 13, 14.5, 16, 17.5, 19

*goes up by 3 then 5 then 7 etc OR  
square numbers ( $1 \times 1$ ), ( $2 \times 2$ ), ( $3 \times 3$ ), etc*

*goes up by 2 then 3 then 4 etc OR  
triangle numbers*



# N12 Number Patterns

## Answers

- 1) Work out the next two terms for each of the following number patterns:
  - a) 3, 8, 15, 24, 35, **48, 63**
  - b) 4, 14, 36, 76, 140, **234, 364**
- 2) Work out the next two terms for each of the following number patterns:
  - a) 1, 2, 4, 8, 16, 32, **64, 128**
  - b) 2, 7, 22, 67, 202, **607, 1822**
- 3) Work out the next two terms for each of the following number patterns:
  - a) 1, 1, 2, 3, 5, 8, 13, 21, **34, 55**
  - b) 1, 2, 3, 6, 11, 20, 37, 68, **125, 230**
- 4) Work out the next two terms for each of the following :
  - a) *First letters of 1, 2, 3, 4, etc*  
O, T, T, F, F, S, S, **E, N**
  - b) *First letters of Jan, Feb, Mar, etc*  
J, F, M, A, M, J, J, **A, S**
- 5) Choose any number between 1 and 20.  
 If your number is even, halve it and write down the answer.  
 If your number is odd, multiply it by three and add one. Write down the answer.  
 Look at your answer and follow the same rules:  
*If it is even you halve it and write down the answer.*  
*If it is odd you multiply by three and add one and write down the answer.*  
 Only stop when you get to one.  
 Try more starting numbers (of any size).  
**Do they all go to one?** *Yes, mathematicians think so.*  
**What about if you use 27 as the number to start with?**  
*It does eventually if you make no mistakes.*

- 6) Each row describes the row above.  
 In the first row we have one 1.  
 The second row says this (1 1)  
 The third row describes the second row.  
 We have two 1s and it says this (2 1)  
 We now have one 2 and one 1.  
 The fourth row is therefore 1 2 1 1  
*If you got this right you are one of a select few.*

```

      1
    1 1
   2 1
  1 2 1 1
 1 1 1 2 2 1
3 1 2 2 1 1
1 3 1 1 2 2 2 1
 1 1 1 3 2 1 3 2 1 1
3 1 1 3 1 2 1 1 1 3 1 2 2 1
1 3 2 1 1 3 1 1 1 2 3 1 1 3 1 1 2 2 1 1
  
```

## N13a Addition - Integers

### Answers

$$1) \quad 1524 + 4273 = \underline{5797}$$

$$2) \quad 7452 + 216 = \underline{7668}$$

$$3) \quad 24578 + 1215 = \underline{25793}$$

$$4) \quad 591 + 372 + 85 = \underline{1048}$$

$$5) \quad 9876 + 55 + 1039 = \underline{10970}$$

# N13a Addition - Integers

## Answers

a)

$$\begin{array}{r}
 1 \quad 1 \quad 1 \\
 0 \quad 2 \quad 2 \\
 3 \quad 3 \quad 3 \\
 4 \quad 4 \quad 0 \\
 5 \quad 0 \quad 5 \quad + \\
 \hline
 1 \quad 4 \quad 1 \quad 1
 \end{array}$$

b)

$$\begin{array}{r}
 0 \quad 1 \quad 1 \\
 2 \quad 2 \quad 0 \\
 3 \quad 3 \quad 3 \\
 4 \quad 4 \quad 4 \\
 5 \quad 0 \quad 5 \quad + \\
 \hline
 1 \quad 5 \quad 1 \quad 3
 \end{array}$$

c)

$$\begin{array}{r}
 1 \quad 1 \quad 1 \\
 2 \quad 2 \quad 2 \\
 3 \quad 0 \quad 3 \\
 4 \quad 4 \quad 0 \\
 5 \quad 5 \quad 0 \quad + \\
 \hline
 1 \quad 6 \quad 2 \quad 6
 \end{array}$$

d)

$$\begin{array}{r}
 1 \quad 1 \quad 1 \\
 2 \quad 2 \quad 0 \\
 3 \quad 0 \quad 3 \\
 4 \quad 4 \quad 4 \\
 5 \quad 0 \quad 5 \quad + \\
 \hline
 1 \quad 5 \quad 8 \quad 3
 \end{array}$$

## N13b Addition - Decimals

### Answers

$$1) \quad 59.1 + 37.2 = \underline{96.3}$$

$$2) \quad 24.75 + 9.98 = \underline{34.73}$$

$$3) \quad 94.78 + 104.9 = \underline{199.68}$$

$$4) \quad 309 + 12.5 + 631.4 = \underline{952.9}$$

$$5) \quad 105 + 7.32 + 51.8 + 2804 = \underline{2968.12}$$

# N13b Addition - Decimals

## Answers

Choose a number from a box and a number from a loop to make the totals in a) and b).

3.61	2.975	2.35	1.3	6.72
3.2	7.65	1.006	3.58	2.25

a)  $2.35 + 2.25 = 4.6$

b)  $3.61 + 7.65 = 11.26$

## N14a

### Subtraction - Integers

#### Answers

$$1) \quad 14562 - 1251 = \underline{13311}$$

$$2) \quad 6652 - 716 = \underline{5936}$$

$$3) \quad 42160 - 39215 = \underline{2945}$$

$$4) \quad 2300 - 934 = \underline{1366}$$

$$5) \quad 50000 - 2166 = \underline{47834}$$

**N14b****Subtraction - Decimals***Answers*

$$1) \quad 68.1 - 27.3 = \underline{40.8}$$

$$2) \quad 24.75 - 0.098 = \underline{24.652}$$

$$3) \quad 94.78 - 36 = \underline{58.78}$$

$$4) \quad 3564 - 1971.6 = \underline{1592.4}$$

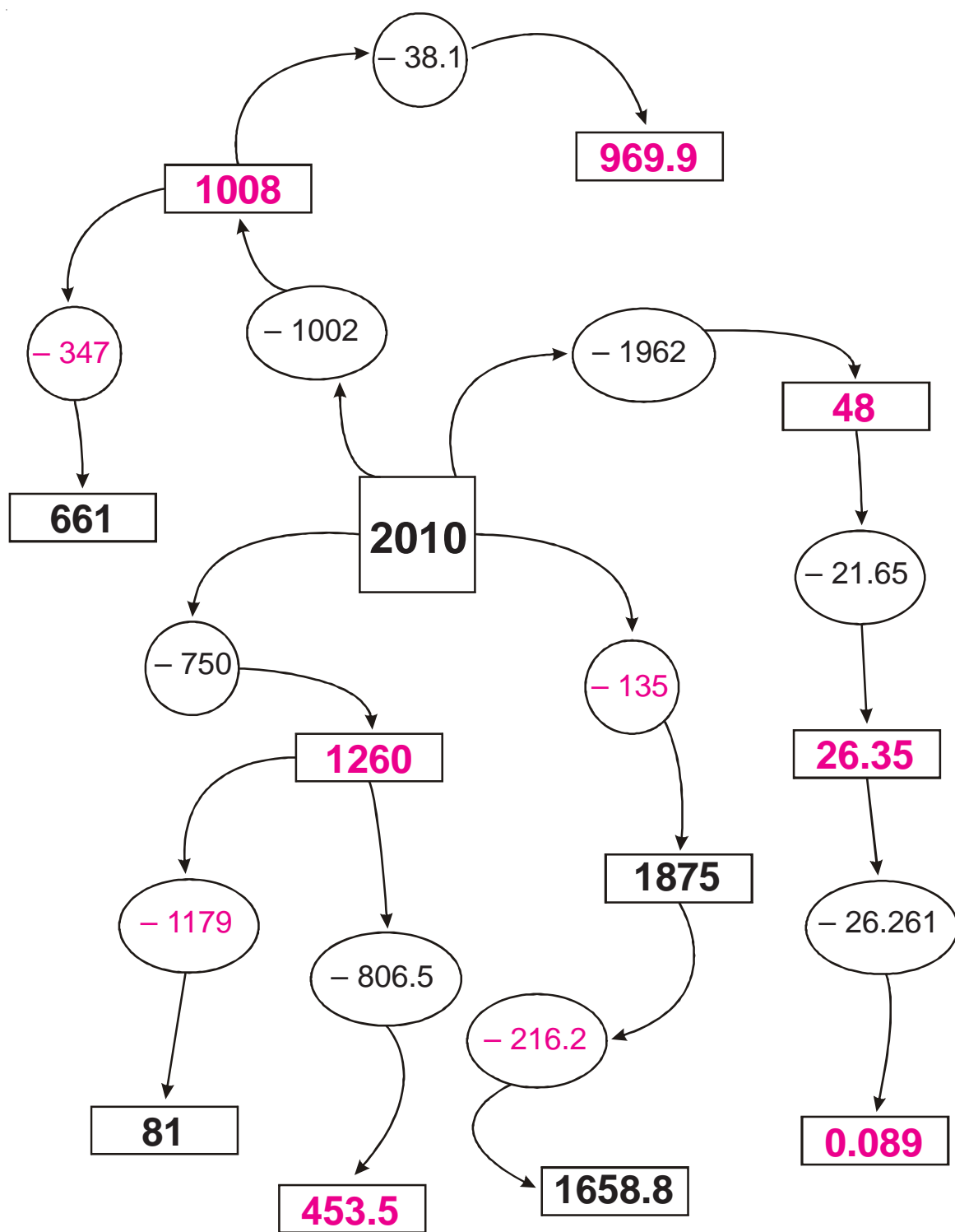
$$5) \quad 800 - 237.62 = \underline{562.38}$$

# N14b

## Subtraction - Decimals

### Answers

Complete the boxes and the circles:





$$1) \quad 3 \times 13 = \underline{39}$$

$$2) \quad 55 \times 4 = \underline{220}$$

$$3) \quad 9 \times 64 = \underline{576}$$

$$4) \quad 92 \times 5 = \underline{460}$$

$$5) \quad 7 \times 87 = \underline{609}$$

$$6) \quad 342 \times 8 = \underline{2736}$$

$$7) \quad 6 \times 208 = \underline{1248}$$

$$8) \quad 745 \times 4 = \underline{2980}$$

$$9) \quad 289 \times 7 = \underline{2023}$$

$$10) \quad 113 \times 9 = \underline{1017}$$

# N15a

## Short Multiplication Integers Answers

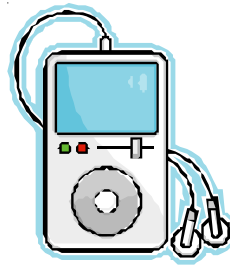
Here are some items available from a local shop:



Jacket: £17



Trainers: £56



MP3 player: £32



Television: £499

Work out the cost of:

a) 5 jackets

£85

b) 6 MP3 players

£192

c) 4 pairs of trainers

£224

d) 7 televisions

£3493

$$1) \quad 4 \times 1.2 = \underline{4.8}$$

$$2) \quad 6.5 \times 3 = \underline{19.5}$$

$$3) \quad 9 \times 18.7 = \underline{168.3}$$

$$4) \quad 3.6 \times 5 = \underline{18}$$

$$5) \quad 7 \times 8.2 = \underline{57.4}$$

$$6) \quad 6 \times 1.39 = \underline{8.34}$$

$$7) \quad 9.2 \times 8 = \underline{73.6}$$

$$8) \quad 8.35 \times 4 = \underline{33.4}$$

$$9) \quad 3.62 \times 7 = \underline{25.34}$$

$$10) \quad 25.3 \times 9 = \underline{227.7}$$

# N15b

## Short Multiplication Decimals Answers

- 1) Here are some items available from a local shop:



Milk: £1.20



Bread: £0.65



Lollies: £0.30



Chocolates: £3.99

Work out the cost of:

- a) 7 lollies, £2.10
- b) 3 bottles of milk, £3.60
- c) 2 loaves of bread, £1.30
- d) 5 boxes of chocolates. £19.95

- 2) Rulers cost £0.25 each.  
Pens cost £0.45 each.  
Kelly buys 3 rulers and 5 pens.  
Work out how much she pays.

£3.00

# N16

## Short Division of Integers *Answers*

$$1) \quad 786 \div 2 = \underline{393}$$

$$2) \quad 465 \div 5 = \underline{93}$$

$$3) \quad 448 \div 8 = \underline{56}$$

$$4) \quad 552 \div 6 = \underline{92}$$

$$5) \quad 801 \div 9 = \underline{89}$$

$$6) \quad 5976 \div 8 = \underline{747}$$

$$7) \quad 9080 \div 5 = \underline{1816}$$

$$8) \quad 17801 \div 7 = \underline{2543}$$

$$9) \quad 18054 \div 6 = \underline{3009}$$

$$10) \quad 374877 \div 9 = \underline{41653}$$

# N16

## Short Division of Integers Answers

- 1) Here are some items available from a local shop:



Watch: £ 48



Camera: £ 76



Camcorder: £ 315



Laptop: £ 1299

Work out the unit price of each item knowing that:

7 watches cost £336,

5 cameras cost £380,

4 camcorders cost £1260,

6 laptops cost £7794.

- 2) a) If 3 chairs cost £17.40,  
how much would one of them cost?

£ 5.80

- b) If 7 shirts cost £34.93,  
how much would one of them cost?

£ 4.99

**N17a** Multiplying and Dividing by  
powers of 10 - Integers  
*Answers*

1)  $75 \times 100 = \underline{7500}$

2)  $102 \times 10 = \underline{1020}$

3)  $9 \times 1000 = \underline{9000}$

4)  $450 \div 10 = \underline{45}$

5)  $3800 \div 10 = \underline{380}$

6)  $9700 \div 100 = \underline{97}$

7)  $60 \times 1000 = \underline{60000}$

8)  $7000 \div 100 = \underline{70}$

9)  $210 \times 1000 = \underline{210000}$

10)  $1050000 \div 1000 = \underline{1050}$

# N17a

Multiplying and Dividing by  
powers of 10 - Integers  
Answers

The table shows the approximate populations of five different places.

Place	Approximate population
London	7 000 000
Glasgow	700 000
Barnsley	70 000
Penkbridge	7 000
High Bickington	700

Complete these sentences:

The population of **Barnsley** is about **10 times** bigger than the population of .....**Penkbridge**.....

The population of .....**London**..... is about **100 times** bigger than the population of **Barnsley**.

The population of Glasgow is about .....**100** times bigger than the population of **Penkbridge**.

The population of **Barnsley** is about **10 times** smaller than the population of .....**Glasgow**.....

The population of .....**High Bickington**..... is about **100 times** smaller than the population of **Barnsley**.

The population of High Bickington is about .....**10** times smaller than the population of **Penkbridge**.



**N17b** Multiplying and Dividing by  
powers of 10 - Decimals  
Answers

1)  $3.6 \times 10 = \underline{36}$

2)  $82.9 \times 100 = \underline{8290}$

3)  $0.5 \times 1000 = \underline{500}$

4)  $47 \div 10 = \underline{4.7}$

5)  $106.4 \div 10 = \underline{10.64}$

6)  $9.9 \div 100 = \underline{0.099}$

7)  $6.2 \times 1000 = \underline{6200}$

8)  $70 \div 1000 = \underline{0.07}$

9)  $0.035 \times 10000 = \underline{350}$

10)  $0.01 \div 100 = \underline{0.0001}$

**N17b** Multiplying and Dividing by  
 powers of 10 - Decimals  
 Answers

1) Fill in the missing box in each case.

a)  $\boxed{12} \rightarrow \boxed{\times 100} \rightarrow \boxed{1200}$     f)  $\boxed{540} \rightarrow \boxed{\div 100} \rightarrow \boxed{5.4}$

b)  $\boxed{7.5} \rightarrow \boxed{\div 10} \rightarrow \boxed{0.75}$     g)  $\boxed{0.6} \rightarrow \boxed{\div 100} \rightarrow \boxed{0.006}$

c)  $\boxed{83.1} \rightarrow \boxed{\times 100} \rightarrow \boxed{8310}$     h)  $\boxed{7370} \rightarrow \boxed{\div 100} \rightarrow \boxed{73.7}$

d)  $\boxed{0.9} \rightarrow \boxed{\times 1000} \rightarrow \boxed{900}$     i)  $\boxed{0.018} \rightarrow \boxed{\times 10} \rightarrow \boxed{0.18}$

e)  $\boxed{662} \rightarrow \boxed{\div 10} \rightarrow \boxed{66.2}$     j)  $\boxed{0.104} \rightarrow \boxed{\times 1000} \rightarrow \boxed{104}$

2) Using the fact below:

$$365 \times 17 = 6205$$

Work out the following

a)  $36.5 \times 17 = \underline{620.5}$     d)  $3650 \times 1.7 = \underline{6205}$

b)  $36.5 \times 1.7 = \underline{62.05}$     e)  $62.05 \div 17 = \underline{3.65}$

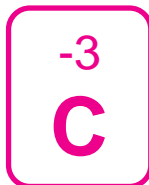
c)  $365 \times 170 = \underline{62050}$     f)  $6.205 \div 36.5 = \underline{0.17}$

# N18

## Negatives in Real-Life

### Answers

- 1) Work out the value of each card and then place the cards in order from lowest to highest.



- 2) Work out the value of each card and then place the cards in order from lowest to highest.



# N18

## Negatives in Real-Life

### Answers

1)



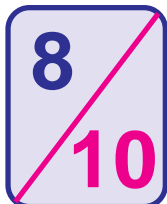
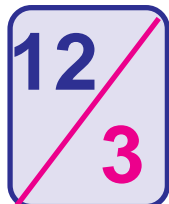
$$2 + 1 = 3$$

$$4 + 1 = 5$$

$$5 + 2 = 7$$

$$5 + 4 = 9$$

2)



$$8 + 3 = 11$$

$$10 + 3 = 13$$

$$12 + 8 = 20$$

$$12 + 10 = 22$$

3)



$$4 + (-2) = 2$$

$$9 + (-2) = 7$$

$$5 + 4 = 9$$

$$9 + 5 = 14$$

4)



$$7 + (-5) = 2$$

$$8 + (-5) = 3$$

$$12 + 7 = 19$$

$$12 + 8 = 20$$

# Directed Numbers

## N19a Addition and Subtraction

### Answers



- 1) The temperature is  $3^{\circ}\text{C}$  at midnight and then falls 8 degrees by 6 a.m.  
What is the temperature at 6 a.m?  $-5^{\circ}\text{C}$

- 2) Tim has only £8 in his bank account but writes a cheque for £15.  
If the cheque is cashed, how much will Tim have in his account?  $-\text{£}7$

- 3) Sue owes £7 to one friend and £6 to another friend.  
She writes this in her diary as  $(-7) + (-6)$   
a) How much does she owe altogether?  
b) What is  $(-7) + (-6)$ ?  $-\text{£}13$   $\text{£}13$

- 4) Sue still owes £7 to one friend and £6 to another friend but her mother decides to take away the £6 debt by paying it off.  
Sue writes this as  $(-7) + (-6) - (-6)$   
a) How much does Sue owe now?  $\text{£}7$   
b) What is  $(-7) + (-6) - (-6)$ ?  $-7$

- 5) Work out the answers to  
a)  $6 - 14$   $-8$   
b)  $2 - 12$   $-10$   
c)  $-1 - 6$   $-7$   
d)  $-3 - 5$   $-8$   
e)  $-7 - 15$   $-22$

- 6) Work out the answers to  
a)  $2 - (-3)$   $5$   
b)  $6 - (-5)$   $11$   
c)  $-3 - (-6)$   $3$   
d)  $-7 - (-2)$   $-5$   
e)  $-20 - (-18)$   $-2$

- 7) Work out the answers to  
a)  $5 + (-2)$   $3$   
b)  $8 + (-6)$   $2$   
c)  $3 + (-8)$   $-5$   
d)  $-4 + (-3)$   $-7$   
e)  $-8 + (-4)$   $-12$

- 8) Work out the answers to  
a)  $4 - (+1)$   $3$   
b)  $7 - (+5)$   $2$   
c)  $1 - (+3)$   $-2$   
d)  $-6 - (+1)$   $-7$   
e)  $-1 - (+6)$   $-7$

# Directed Numbers

## N19a Addition and Subtraction

### Answers

- 1) Each magic square below has a magic number written above it.

You must fill in the blank squares so that the rows, columns and diagonals add up to the magic number.

Magic Number is  
a) **12**

-1	10	3
8	4	0
5	-2	9

Magic Number is  
b) **15**

2	1	12
15	5	-5
-2	9	8

Magic Number is  
c) **-27**

-8	3	-22
-23	-9	5
4	-21	-10

- 2) Work out which numbers should go in the squares to make the sums correct.

a)  $7 + \boxed{2} = 9$

b)  $7 + \boxed{-2} = 5$

c)  $2 - \boxed{8} = -6$

d)  $4 - \boxed{-3} = 7$

e)  $-5 - \boxed{-9} = 4$

f)  $\boxed{-2} + 6 = 4$

g)  $\boxed{-3} - 9 = -12$

h)  $\boxed{-16} - 14 = -30$

## Directed Numbers N19b Multiplication and Division Answers

- 1) a)  $5 \times -7 = -35$   
b)  $-3 \times 6 = -18$   
c)  $-4 \times -8 = 32$   
d)  $2.5 \times -2 = -5$   
e)  $-4 \times -1.5 = 6$
- 2) a)  $3 \times 2 \times -7 = -42$   
b)  $-5 \times -4 \times 3 = 60$   
c)  $9 \times 2 \times -2 = -36$   
d)  $-6 \times -2 \times -3 = -36$   
e)  $5 \times -8 \times -1 \times 2 = 80$
- 3) a)  $8 \div -2 = -4$   
b)  $-16 \div 4 = -4$   
c)  $-20 \div -5 = 4$   
d)  $32 \div -8 = -4$   
e)  $-13 \div -2 = 6.5$
- 4) a)  $-9 \times 7 \times 2 = -126$   
b)  $18 \div -4 = -4.5$   
c)  $-1 \times 2 \times -3 \times 4 \times -5 = -120$   
d)  $(24 \div -4) \times -5 = 30$   
e)  $(-50 \div 5) \times -2 = 20$

1) Work out the following:

- a)  $3 \times 6 - 2 = 16$
- b)  $7 + 2 \times 3 = 13$
- c)  $5 + 3 \times 4 - 1 = 16$
- d)  $(7 + 1) \times 3 = 24$
- e)  $5 - 3 \times 2 = -1$
- f)  $9 - 35 \div 5 = 2$
- g)  $3 \times 2 + 7 + 5 \times 4 = 33$
- h)  $20 - 9 \div 3 + 1 = 18$
- i)  $2 \times (15 - 10) \div 5 = 2$
- j)  $7 + 2 - 3 \times 4 = -3$
- k)  $10 \div (2 + 3) = 2$
- l)  $10 \div 5 - 8 \div 2 = -2$
- m)  $7 \times (5 - 2) + 10 = 31$
- n)  $48 \div (2 + 3 \times 2) = 6$
- o)  $4 \times 12 \div 8 - 6 = 0$

2) Work out the following:

- a)  $3^2 - 2^3 = 1$
- b)  $25 - (3 - 1)^2 = 21$
- c)  $8 \times 7 - \sqrt{16} = 52$
- d)  $36 \div 2^2 - 3 \times 3 = 0$
- e)  $5^3 - (3 \times 15 - 2^5) = 112$
- f)  $((9 + 1) \times 4) \div 2 = 20$

3) Place brackets in the following questions to make the answers correct.

- a)  $3 \times (5 - 1) = 12$
- b)  $(10 + 2) \times 3 = 36$
- c)  $7 \times (5 - 2) \times 2 = 42$
- d)  $24 \div (6 - 2) = 6$
- e)  $(3 + 2) \times 6 \div 10 = 3$
- f)  $5 \times (5 - 3) \div (4 + 1) = 2$

4) If  $x = 3$  and  $y = 7$ , work out the following:

- a)  $2x - y = -1$
- b)  $3y + x^2 = 30$
- c)  $y^2 - x^2 = 40$
- d)  $(x + y)^2 - x^3 = 73$
- e)  $5(y - x) + (y + x) \div 2 = 25$
- f)  $10xy - (2y - x)^2 = 89$



- 1) Use the numbers 6, 3, 2 and 1 plus the operations +, −, ×, ÷ to make the numbers 0 to 9.

*The numbers must be used in the specified order (6, 3, 2, 1).*

*They cannot be put together as in 63 for example.*

*Signs can be used as many times as you like. Brackets can also be used.*

$$0 = 6 - 3 - 2 - 1$$

$$5 = 6 \div 3 + 2 + 1$$

$$1 = 6 - 3 \times 2 + 1$$

$$6 = 6 + 3 - 2 - 1$$

$$2 = 6 - 3 - 2 + 1$$

$$7 = 6 + 3 \div (2 + 1)$$

$$3 = (6 + 3) \div (2 + 1)$$

$$8 = 6 + 3 - 2 + 1$$

$$4 = 6 - 3 + 2 - 1$$

$$9 = (6 - 3) \times (2 + 1)$$

*These are just examples of how to get the answers. You may well have different correct answers.*

- 2) Use four 4s plus the operations +, −, ×, ÷ to make the numbers 0 to 9.

*All four 4s must be used. 4s cannot be put together as in 44.*

*Signs can be used as many times as you like. Brackets can be used.*

*A possible answer for 0 could be  $4 \div 4 - 4 \div 4$*

$$0 = 4 + 4 - 4 - 4$$

$$5 = (4 \times 4 + 4) \div 4$$

$$1 = (4 + 4) \div (4 + 4)$$

$$6 = (4 + 4) \div 4 + 4$$

$$2 = 4 \div 4 + 4 \div 4$$

$$7 = (4 + 4) - (4 \div 4)$$

$$3 = (4 + 4 + 4) \div 4$$

$$8 = 4 \times 4 - 4 - 4$$

$$4 = (4 - 4) \times 4 + 4$$

$$9 = (4 + 4) + (4 \div 4)$$

*These are just examples of how to get the answers. You may well have different correct answers.*

# N21a

## Real-Life Tables Distance Tables Answers

1)

London	<i>All distances are in miles.</i>		
195	Nottingham		
300	100	Manchester	
330	159	56	Liverpool

- Write down the distance between London and Nottingham. **195 miles**
- Write down the names of the two cities which are
  - The furthest apart. **London and Liverpool**
  - The least distance apart. **Manchester and Liverpool**
- Peter travels from London to Manchester where he collects a parcel. He then delivers the Parcel in Nottingham before returning to London. Work out the total distance travelled by Peter. **595 miles**

2)

London	<i>All distances are in miles.</i>			
22	Stevenage			
75	48	Peterborough		
195	165	130	Doncaster	
235	210	170	45	York

Emma lives in Doncaster.

She has to drive to Peterborough to pick up her friend, David, and then continue on to London to attend a graduation ceremony which begins at 11 am.

The ceremony will last two hours and she will then return to Doncaster with David.

- How far does Emma travel in order to get to London with David? **205 miles**
- If Emma averages 50 mph on the return trip, at what time would she be back in Doncaster? **4.54 pm**

1) Here is part of a railway timetable

Stockport	05:26	06:16	06:55	07:15	07:55
Stoke	05:55	06:45	07:24	-	-
Stafford	06:12	-	07:41	-	08:41
Euston	08:09	08:26	-	09:11	10:06

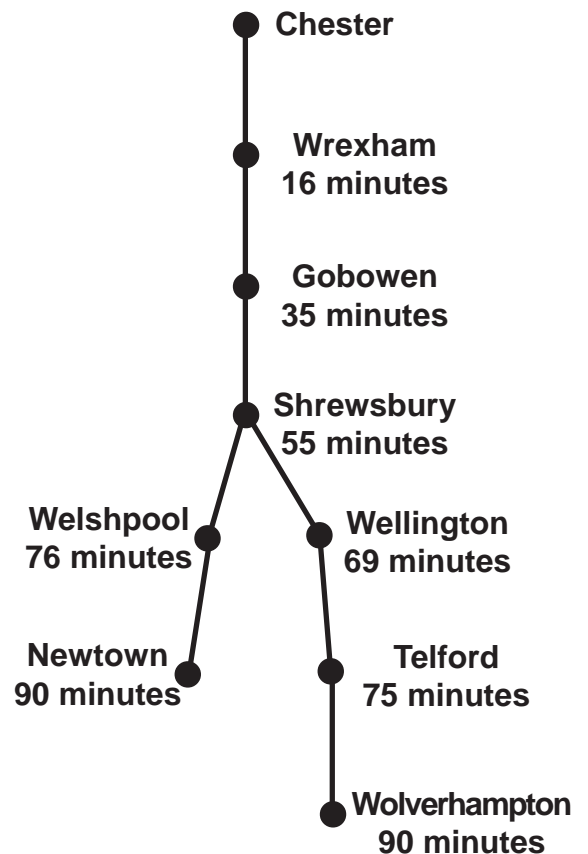
- a) Rosie wants to travel from Stockport to Euston. She must arrive in Euston before 09:00.
- (i) What is the latest time she could depart from Stockport? **06:16**
- (ii) How long will her journey last? **2 hours and 10 minutes**
- b) James gets to Stockport station at 07:00.  
How long will he have to wait for the next train to Stafford? **55 minutes**
- c) Alex travels to Euston.  
She gets on the 07:24 train from Stoke.  
How long will her journey take? **2 hours and 42 minutes**

2) The train route diagram show the times it takes to travel from Chester to other major stations on the line.

Use the information in the diagram to complete the following timetables.

Chester	04:22
Wrexham	<b>04:38</b>
Gobowen	<b>04:57</b>
Shrewsbury	<b>05:17</b>
Welshpool	<b>05:38</b>
Newtown	<b>05:52</b>

Wolverhampton	16:42
Telford	<b>16:57</b>
Wellington	<b>17:03</b>
Shrewsbury	<b>17:17</b>
Gobowen	<b>17:37</b>
Wrexham	<b>17:56</b>
Chester	<b>18:12</b>



- 1) Which four coins make a total of 77p?

50p 20p 5p 2p

- 2) Six bars of metal each weigh 2.75 kg.  
How much do they weigh altogether?

16.5 kg

- 3) At a party for 171 people, 9 guests  
sat at each table.  
How many tables were there?

19 tables

- 4) Coke cans cost 43p each.  
How many cans you buy with £6?

13 cans

- 5) Olivia went to a cafe.  
She ordered:

2 sausages  
Baked beans  
3 coffee  
1 juice

				
<b>Menu</b>				
	Fried eggs	30p		
	Baked beans	45p		
	Sausages	38p		
	Coffee	65p		
	Tea	72p		
	Juice	50p		
				

She paid with a £5 note.

Work out how much change she got. **£1.34 change**

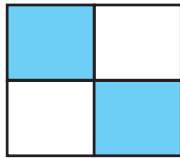
- 1) Cheese is on offer at £3.26 per kilogram.  
Emma buys half a kilogram.  
How much change does she receive from  
a £10 note? **£8.37**
- 2) A mug and a plate together cost £2.90.  
The mug cost 40p more than the plate.  
How much does the plate cost? **£1.25**
- 3) A man is 27 cm taller than his son, who is  
8 cm shorter than his mother. The man was born  
42 years ago and is 1.78 m tall.  
How tall is his wife? **1.59 m**
- 4) A bus starts at Birmingham and makes three stops  
before reaching London.  
At Birmingham, 37 people get on.  
At Rugby, 13 people get off and 6 get on.  
At Willen, 9 people get off and 15 get on.  
At Luton, 24 people get off and 8 get on.  
How many people are on the bus when it  
reaches London? **21** (I hope you remembered to  
count the driver)

- 1) There are 7 people in a team.  
How many teams can you make from 131 people? **18 teams**
  
- 2) A motorist bought 26 litres of petrol at £1.19 per litre.
  - a) How much did it cost? **£30.94**
  - b) What change did he get from £50? **£19.06**
  
- 3) A museum trip is organised for 57 members of a youth club. They go in minibuses that can each seat up to 15 people.  
It costs £42.50 for each minibus and £172 for the group to access the museum.  
How much will the trip cost per person? **£6.00**
  
- 4) Mars Bars cost 35p. Skittles cost 45p.  
Gillian bought 5 bags of Skittles and some Mars Bars.  
She paid with a £5 note and received 30p change.  
How many Mars Bars did she buy? **7 Mars Bars**

- 1) Three consecutive integers have a sum of 105.  
What are they? 34 35 36
- 2) Using the brackets keys of your calculator,  
work out the following.
- a)  $164 - (27 + 56) = \underline{81}$
- b)  $44.8 \div (15.4 - 9.8) = \underline{8}$
- c)  $(19.8 - 3.3) \div (31.2 - 16.2) = \underline{1.1}$
- d)  $(8 \times 14.4) \div (11.1 - 4.7) = \underline{18}$
- 3) If you start with 16 and press the square root key of  
your calculator ( $\sqrt{\phantom{x}}$ ) twice, the answer given is 2.  
If you start with 81 and press the square root key of  
your calculator ( $\sqrt{\phantom{x}}$ ) twice, the answer given is 3.  
Complete the following sentences:
- a) If you start with 1296 and press the square root  
key of your calculator twice, the answer given is  
6 .
- b) If you start with 625 and press the square root  
key of your calculator twice, the answer given is 5 .

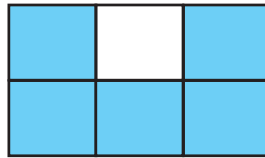
1) What fractions of the following shapes are shaded?

a)



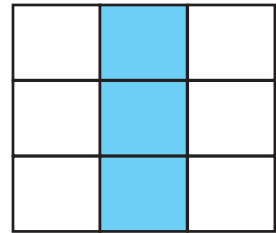
$$\frac{2}{4} \text{ or } \frac{1}{2}$$

b)



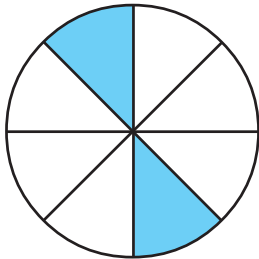
$$\frac{5}{6}$$

c)



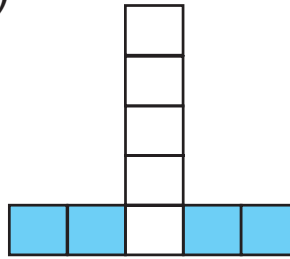
$$\frac{3}{9} \text{ or } \frac{1}{3}$$

d)



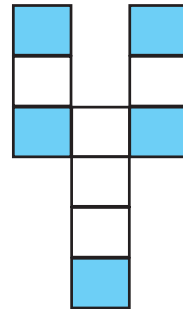
$$\frac{2}{8} \text{ or } \frac{1}{4}$$

e)



$$\frac{4}{9}$$

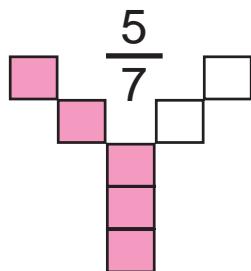
f)



$$\frac{5}{10} \text{ or } \frac{1}{2}$$

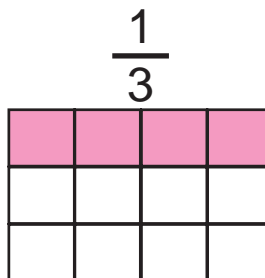
2) Shade the shapes according to the given fractions.

a)



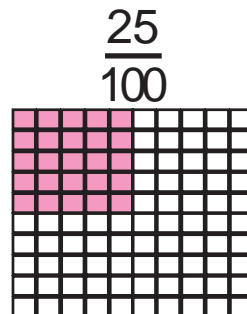
$$\frac{5}{7}$$

b)



$$\frac{1}{3}$$

c)



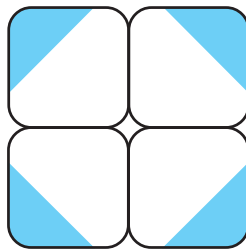
$$\frac{25}{100}$$



1)  $\frac{1}{3}$  of this shape is shaded.



a) What fraction of this diagram is shaded?



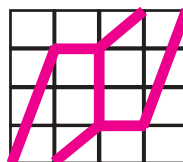
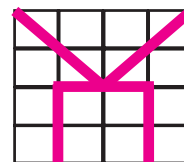
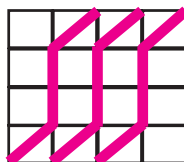
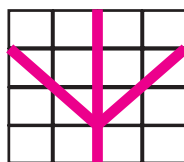
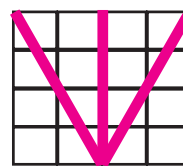
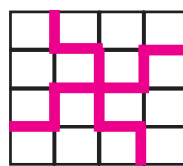
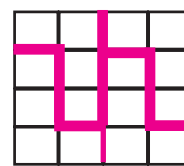
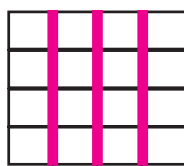
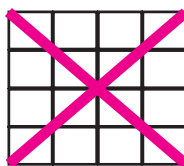
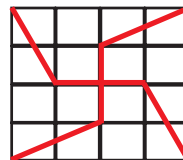
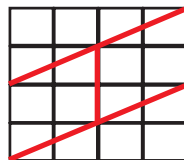
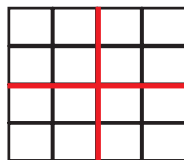
$$\frac{1}{3}$$

b) What fraction of this diagram is shaded?



$$\frac{1}{6}$$

2)



These are a selection of possible answers.  
As long as each of your four sections is comprised of four little squares, your answer is correct.

- 1) Find three equivalent fractions to each of the following:

These are a selection of possible answers. As long as you multiplied the top and bottom by the same number your answer is fine.

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

$\frac{2}{6}$   $\frac{3}{9}$   $\frac{4}{12}$

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

$\frac{2}{8}$   $\frac{3}{12}$   $\frac{4}{16}$

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

$\frac{2}{10}$   $\frac{3}{15}$   $\frac{4}{20}$

d)  $\frac{2}{5}$

$\frac{4}{10}$   $\frac{8}{20}$   $\frac{16}{40}$

e)  $\frac{3}{4}$

$\frac{6}{8}$   $\frac{12}{16}$   $\frac{24}{32}$

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

$\frac{50}{80}$   $\frac{500}{800}$   $\frac{5000}{8000}$

- 2) Fill in the missing number in each of these equivalent fractions.

a)  $\frac{2}{3} = \frac{\boxed{6}}{9}$

b)  $\frac{1}{5} = \frac{\boxed{4}}{20}$

c)  $\frac{3}{11} = \frac{\boxed{6}}{22}$

d)  $\frac{1}{3} = \frac{5}{\boxed{15}}$

e)  $\frac{2}{7} = \frac{10}{\boxed{35}}$

f)  $\frac{4}{9} = \frac{8}{\boxed{18}}$

g)  $\frac{2}{5} = \frac{\boxed{20}}{50}$

h)  $\frac{5}{7} = \frac{\boxed{30}}{42}$

i)  $\frac{9}{10} = \frac{81}{\boxed{90}}$

- 3) Complete the following equivalent fraction series.

a)  $\frac{1}{2} = \frac{2}{\boxed{4}} = \frac{\boxed{3}}{6} = \frac{5}{\boxed{10}} = \frac{\boxed{10}}{20} = \frac{50}{\boxed{100}}$

b)  $\frac{3}{5} = \frac{6}{\boxed{10}} = \frac{\boxed{9}}{15} = \frac{12}{\boxed{20}} = \frac{\boxed{30}}{50} = \frac{300}{\boxed{500}}$

1) Here are six number cards.



a) Choose two of these six cards to make a fraction that is equivalent to  $\frac{1}{6}$ .

$$\frac{2}{12}$$

b) Choose two of these six cards to make a fraction that is equivalent to  $\frac{12}{16}$ .

$$\frac{6}{8}$$

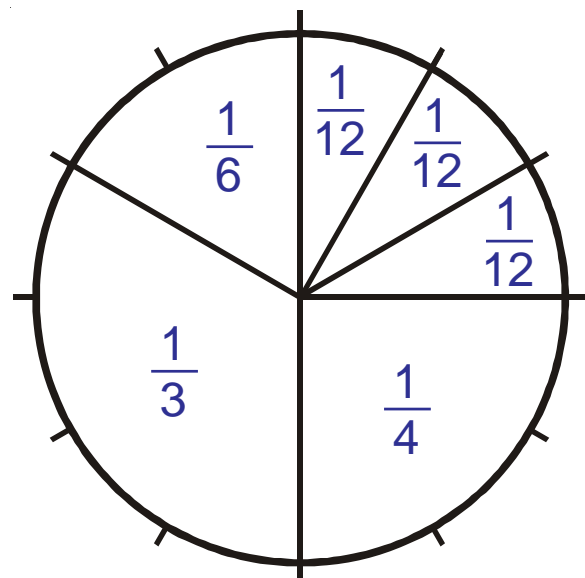
2) Use the diagram below to help you fill in the missing numbers.

a)  $\frac{1}{3} = \frac{1}{4} + \frac{1}{12}$

b)  $\frac{1}{6} = \frac{1}{4} - \frac{1}{12}$

c)  $\frac{1}{6} + \frac{2}{12} = \frac{1}{3}$

d)  $\frac{1}{3} + \frac{1}{6} = \frac{1}{4} + \frac{3}{12}$



1) Cancel each of these fractions to their simplest form:

a)  $\frac{2}{6} = \frac{1}{3}$       b)  $\frac{5}{10} = \frac{1}{2}$       c)  $\frac{3}{12} = \frac{1}{4}$

d)  $\frac{2}{16} = \frac{1}{8}$       e)  $\frac{9}{27} = \frac{1}{3}$       f)  $\frac{20}{80} = \frac{1}{4}$

2) Cancel each of these fractions to their simplest form:

a)  $\frac{4}{14} = \frac{2}{7}$       b)  $\frac{30}{70} = \frac{3}{7}$       c)  $\frac{16}{34} = \frac{8}{17}$

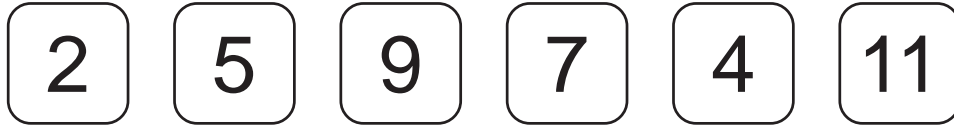
d)  $\frac{24}{42} = \frac{4}{7}$       e)  $\frac{27}{45} = \frac{3}{5}$       f)  $\frac{28}{36} = \frac{7}{9}$

3) Cancel down fully each of these fractions:

a)  $\frac{33}{55} = \frac{3}{5}$       b)  $\frac{72}{96} = \frac{3}{4}$       c)  $\frac{45}{90} = \frac{1}{2}$

d)  $\frac{75}{100} = \frac{3}{4}$       e)  $\frac{40}{180} = \frac{2}{9}$       f)  $\frac{68}{116} = \frac{17}{29}$

Here are six number cards.



- a) Choose two of these six cards  
to make a fraction that is  
equal to  $\frac{45}{99}$

$$\frac{5}{11}$$

- b) Choose two of these six cards  
to make a fraction that is  
equal to  $\frac{112}{144}$

$$\frac{7}{9}$$

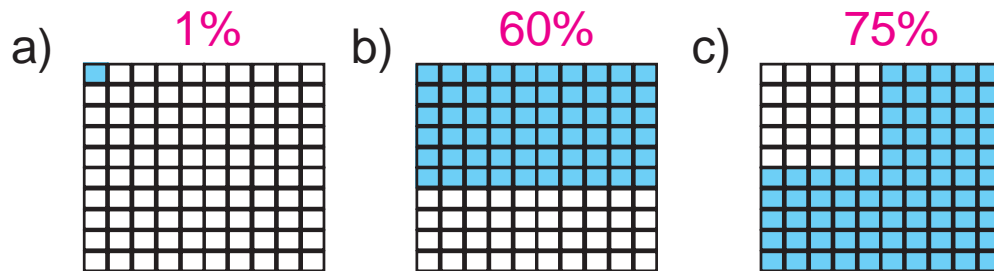
- c) Choose three of these six cards  
to make a fraction that is  
equal to  $\frac{28}{175}$

$$\frac{4}{25}$$

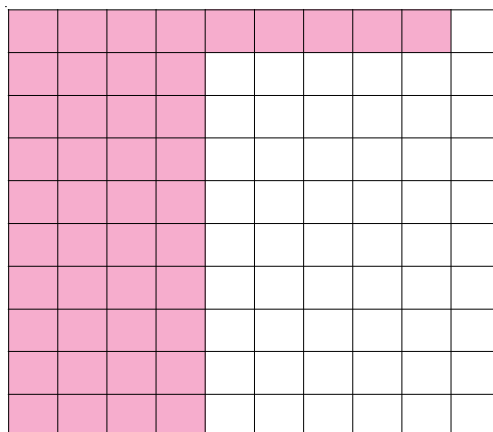
- d) Choose three of these six cards  
to make the smallest  
possible fraction.

$$\frac{2}{91}$$

1) What percentage of the shapes below are shaded?

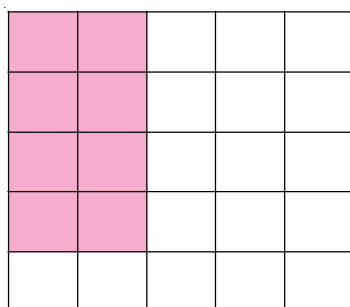


2) Shade in 45% of this grid.



Any 45 squares shaded.

3) Shade in 32% of this grid.



Any 8 squares shaded.

# Percentages

## N24b Percentage of an Amount

### Answers

1) Work out the following:

- a) 50% of 80 = **40**
- b) 50% of 48 = **24**
- c) 50% of 15 = **7.5**
- d) 25% of 120 = **30**
- e) 25% of 90 = **22.5**

2) Work out the following:

- a) 10% of 150 = **15**
- b) 10% of 26 = **2.6**
- c) 50% of 12 = **6**
- d) 25% of 12 = **3**
- e) 75% of 12 = **9**

3) Work out the following:

- a) 10% of £40 = **£4**
- b) 5% of £40 = **£2**
- c) 15% of £40 = **£6**
- d) 5% of £70 = **£3.50**
- e) 15% of £380 = **£57**

4) Work out the following:

- a) 20% of £50 = **£10**
- b) 45% of £9 = **£4.05**
- c) 80% of £11 = **£8.80**
- d) 35% of £6 = **£2.10**
- e) 65% of £824 = **£535.60**

5) Jamie received £26 pocket money last week.

He spent it as follows: \_\_\_ 10% on sweets,  
 \_\_\_ 25% on magazines  
 \_\_\_ 15% on games

How much did Jamie have left? **10% + 25% + 15% = 50%**  
 Show your working. **Therefore he had 50%**  
**left which is £13**

6) Tony had £40 saved up and gave 35% of it to his younger sister, Ella.

Ella gave 20% of what she was given to her younger brother, Ben.

Ben gave 30% of what he was given to his younger brother, Tim.

Tim spent 75% of what he was given on buying a toy for his hamster, Hammy.

How much was the toy for Hammy? **£0.63**

# N25 Powers and Roots

## Answers

- 1) a) Shade all the square numbers in the grid.  
b) Put a circle round all the cube numbers in the grid.

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144

- 2) a) What is the square root of 169? **13**  
b) What is the cube root of 64? **4**
- 3) Add together the square root of 81 with the cube root of 216.  
Now, square the result.  
What is your final answer? **225**



# N26

## Function Machines and Inverse Operations Answers

1) Find the **output** for each of these function machines.

a)  $3 \rightarrow \boxed{\times 5} \rightarrow 15$

b)  $7 \rightarrow \boxed{+ 5} \rightarrow 12$

c)  $6 \rightarrow \boxed{\times 2} \rightarrow \boxed{- 3} \rightarrow 9$

d)  $13 \rightarrow \boxed{+ 5} \rightarrow \boxed{\div 3} \rightarrow 6$

e)  $10 \rightarrow \boxed{\div 2} \rightarrow \boxed{- 7} \rightarrow -2$

f)  $7 \rightarrow \boxed{- 4} \rightarrow \boxed{\times 2.5} \rightarrow 7.5$

2) Find the **input** for each of these function machines.

a)  $13 \rightarrow \boxed{- 5} \rightarrow 8$

b)  $100 \rightarrow \boxed{\div 4} \rightarrow 25$

c)  $10 \rightarrow \boxed{\times 2} \rightarrow \boxed{- 1} \rightarrow 19$

d)  $50 \rightarrow \boxed{\div 5} \rightarrow \boxed{+ 8} \rightarrow 18$

e)  $14 \rightarrow \boxed{- 7} \rightarrow \boxed{\div 2} \rightarrow 3.5$

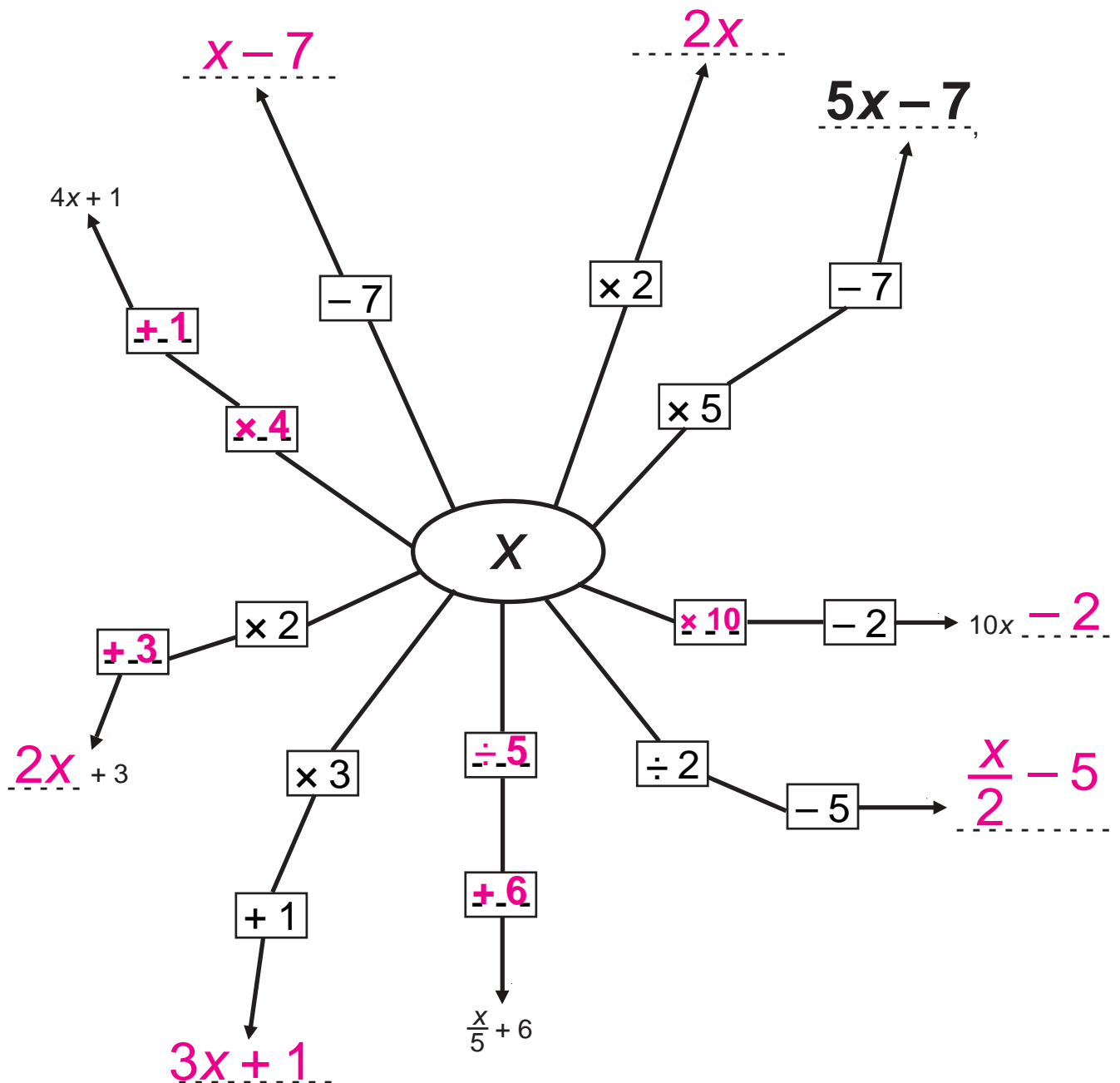
f)  $0 \rightarrow \boxed{\times 19} \rightarrow \boxed{- 4} \rightarrow -4$

# N26

## Function Machines and Inverse Operations Answers

Complete the diagram below. Every time you see dashes like this  $\text{-----}$ , you need to write the correct number or expression.

One of them ( $5x - 7$ ) has already been done for you.



**N27a** Rounding  
Nearest 10, 100, 1000  
*Answers*

Using a calculator, work out the following.  
Give your answers to the nearest 10.

- a)  $24 \times 14$      340 to the nearest 10
- b)  $383 \times 43$      16470 to the nearest 10
- c)  $4088 \div 56$      70 to the nearest 10
- d)  $265364 \div 326$      810 to the nearest 10
- e)  $(42000 + 768) \div 54$      790 to the nearest 10

Round the following numbers to 1 decimal place.

a) 4.21     **4.2**

f) 578.48     **578.5**

b) 53.43     **53.4**

g) 79.035     **79.0**

c) 31.59     **31.6**

h) 3443.77052     **3443.8**

d) 8.827     **8.8**

i) 26.9999     **27.0**

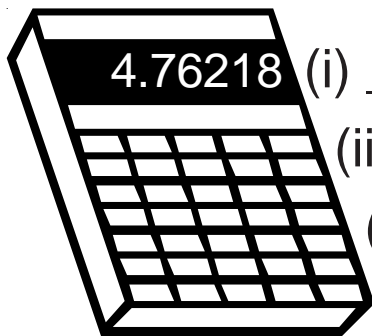
e) 0.653     **0.7**

j) 99.961     **100.0**

Round each of the numbers on the calculators to

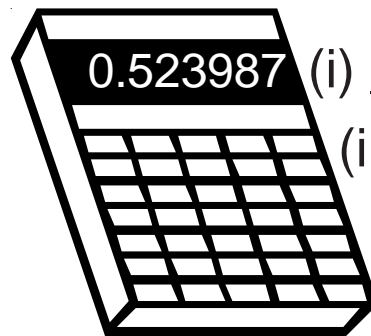
- (i) 1 d.p.
- (ii) 2 d.p.
- (iii) the nearest whole number.

1)



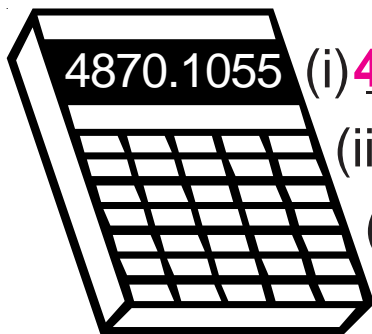
- (i) 4.8
- (ii) 4.76
- (iii) 5

2)



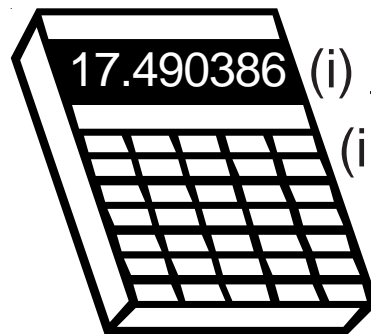
- (i) 0.5
- (ii) 0.52
- (iii) 1

3)



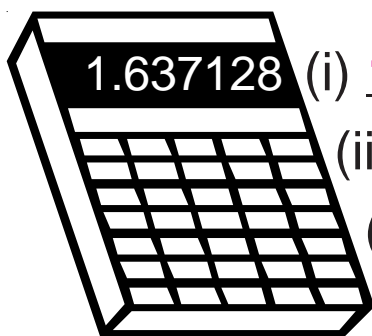
- (i) 4870.1
- (ii) 4870.11
- (iii) 4870

4)



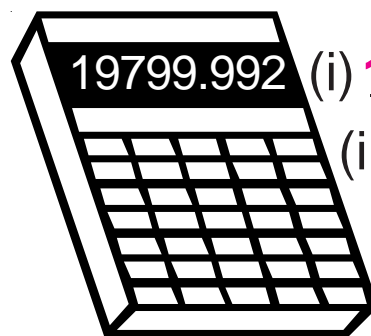
- (i) 17.5
- (ii) 17.49
- (iii) 17

5)



- (i) 1.6
- (ii) 1.64
- (iii) 2

6)



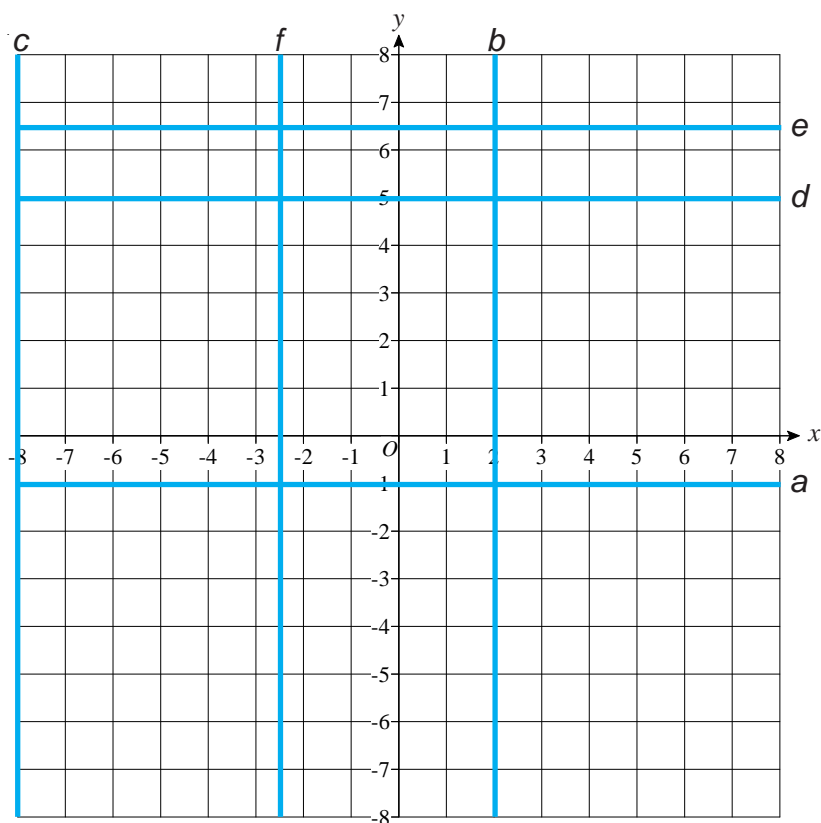
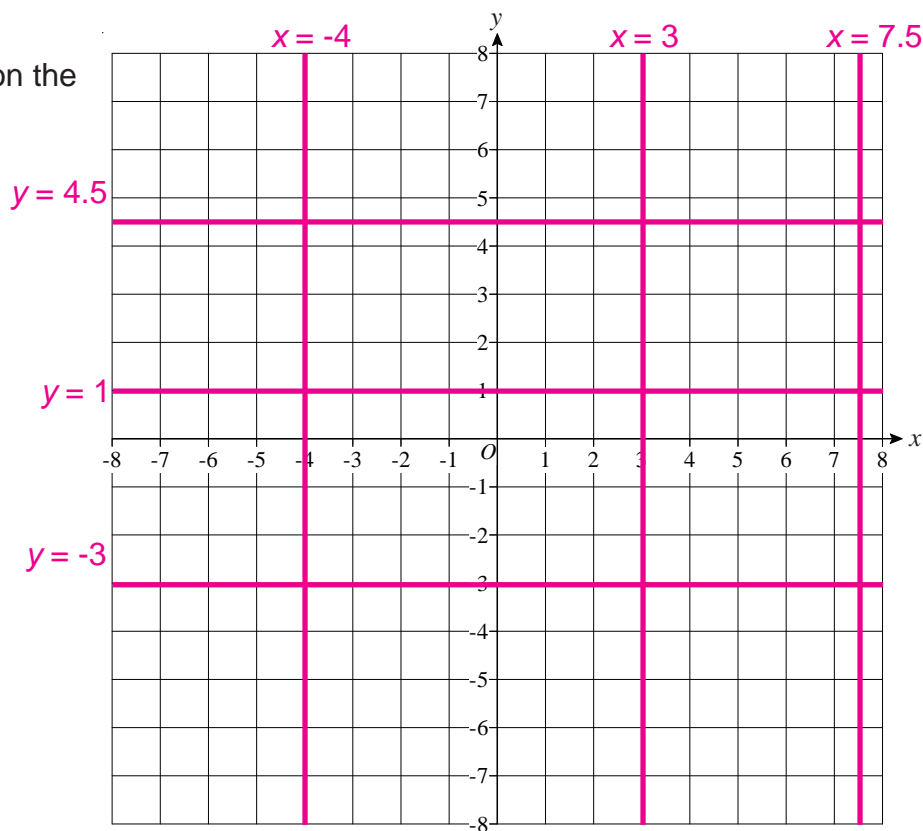
- (i) 19800.0
- (ii) 19799.99
- (iii) 19800

# A5 Horizontal and Vertical Lines

## Answers

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:  $y = -1$

Line  $b$  is:  $x = 2$

Line  $c$  is:  $x = -8$

Line  $d$  is:  $y = 5$

Line  $e$  is:  $y = 6.5$

Line  $f$  is:  $x = -2.5$

# A6

## Collecting Like Terms

### Answers

1) Simplify these expressions

a)  $3a + 4a = 7a$

f)  $3r - 2r + 4r = 5r$

b)  $b + 4b = 5b$

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

c)  $5x - x = 4x$

h)  $7p - p + 2p - 5p = 3p$

d)  $6d + 3d - 2d = 7d$

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

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

j)  $-2c + c - 3c - c = -5c$

2) Simplify these expressions

a)  $a + b + a + b = 2a + 2b$

f)  $6x - 4y + 7y - 2x = 4x + 3y$

b)  $3a + 2a + 4b + b = 5a + 5b$

g)  $2k - 3l - k + 10l = k + 7l$

c)  $7x + 2y + x + 3y = 8x + 5y$

h)  $3m + 5n + 7m - 7n = 10m - 2n$

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

i)  $v - 4w - 5v - 2w = -5v - 6w$

e)  $4c + 8d - 3c + d = c + 9d$

j)  $-3x - y - 3y - x = -4x - 4y$

3) Simplify these expressions

a)  $7xy - 2xy = 5xy$

f)  $6m + 2pr - m + 3rp = 5m - 5pr$

b)  $5cd + 3dc = 8cd$

g)  $10a^2d + 2y - 3da^2 + y^2 = 7a^2d + 2y + y^2$

c)  $x^2 + 4x^2 + 2x^2 = 7x^2$

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

d)  $9y^3 + y - 2y^3 = 7y^3 + y$

i)  $2r^2b + 5r^2 - r + 6br^2 = 8br^2 + 5r^2 - r$

e)  $3ab + 7ab - 2a = 10ab - 2a$

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

# A7a

## Algebraic Simplification Multiplication Answers

1) Simplify the following

- a)  $6 \times x$   $6x$
- b)  $2 \times x \times y$   $2xy$
- c)  $6 \times x \times 3 \times y$   $18xy$
- d)  $s \times t \times u$   $stu$
- e)  $7 \times s \times 2 \times t \times u$   $14stu$

2) Simplify the following

- a)  $x \times x \times x \times x$   $x^4$
- b)  $t \times t \times t \times t \times t \times t \times t$   $t^7$
- c)  $g \times g$   $g^2$
- d)  $x \times x \times x \times y \times y \times y \times y$   $x^3y^4$
- e)  $x \times y \times x \times x \times y \times y$   $x^2y^3$

3) Simplify the following

- a)  $x \times x^2$   $x^3$
- b)  $y^3 \times y^4$   $y^7$
- c)  $x^2 \times x^3 \times x$   $x^6$
- d)  $g \times g \times g^2 \times g^4$   $g^8$
- e)  $x^2 \times x^3 \times x^4 \times x^5$   $x^{14}$

4) Simplify the following

- a)  $3x^2 \times 2x^3$   $6x^5$
- b)  $5x \times 4x^2$   $20x^3$
- c)  $6y^3 \times 2y^4$   $12y^7$
- d)  $9x^2 \times x^3$   $9x^5$
- e)  $4x^3 \times 2x \times 3x^2$   $24x^6$

5) Simplify the following

- a)  $3x^2y^3 \times 2x^3y^4$   $6x^5y^7$
- b)  $2xy^4 \times 3x^2y$   $6x^3y^5$
- c)  $5x^3y^4 \times 2x^2y^2$   $10x^5y^6$
- d)  $2x^2y \times x^4y^2$   $2x^6y^3$
- e)  $3x^3y \times 2xy^2 \times 3x^2y^2$   $18x^6y^5$



# A7b

## Algebraic Simplification Division Answers

1) Simplify the following

- a)  $x^8 \div x^2$   $x^6$
- b)  $9y^6 \div 3y^2$   $3y^4$
- c)  $14y^3 \div 2y^2$   $7y$
- d)  $20x^6 \div 4x$   $5x^5$
- e)  $16x^8 \div 8x^2$   $2x^6$

2) Simplify the following

- a)  $\frac{12x^6}{3x^2}$   $4x^4$
- b)  $\frac{20x^3}{2x}$   $10x^2$
- c)  $\frac{5x^4}{x^2}$   $5x^2$
- d)  $\frac{6x^5}{3x^3}$   $2x^2$
- e)  $\frac{300x^9}{10x^2}$   $30x^7$

3) Simplify the following

- a)  $\frac{12x^3y}{4x}$   $3x^2y$
- b)  $\frac{15x^4y^3}{3xy}$   $5x^3y^2$
- c)  $\frac{20x^3y^6}{4x^2y^3}$   $5xy^3$
- d)  $\frac{14x^2y^2}{7xy}$   $2xy$
- e)  $\frac{30x^2y^3z^6}{3xy^2z^4}$   $10xyz^2$

4) Find the value of

- a)  $4^0$   $1$
- b)  $6^0$   $1$
- c)  $12^0$   $1$
- d)  $z^0$   $1$
- e)  $x^0$   $1$

# A8

## Expanding Brackets

### Answers

1) Expand

- a)  $2(x + 3)$      $2x + 6$
- b)  $2(x - 4)$      $2x - 8$
- c)  $5(2x + 1)$      $10x + 5$
- d)  $7(3x - 1)$      $21x - 7$
- e)  $4(2a + 7)$      $8a + 28$

2) Expand

- a)  $2x(3x + 1)$      $6x^2 + 2x$
- b)  $3x(4x - 2)$      $12x^2 - 6x$
- c)  $2x(x + 1)$      $2x^2 + 2x$
- d)  $3x(2x - y)$      $6x^2 - 3xy$
- e)  $5x(3x + 2y)$      $15x^2 + 10xy$

3) Expand and simplify

- a)  $2(x + 3) + 4(x + 1)$      $6x + 10$
- b)  $3(2x + 1) + 2(5x + 2)$      $16x + 7$
- c)  $4(x + 1) + 3(3x + 4)$      $13x + 16$
- d)  $6(2x + 3) + 5(x + 2)$      $17x + 28$
- e)  $4(3x + 2) + 5(2x + 1)$      $22x + 13$

4) Expand and simplify

- a)  $2(5x + 3) + 3(x - 1)$      $13x + 3$
- b)  $3(4x + 5) + 2(3x - 4)$      $18x + 7$
- c)  $5(2x - 1) + 3(2x + 5)$      $16x + 10$
- d)  $2(3x - 4) + 3(x + 2)$      $9x - 2$
- e)  $3(2x - 1) + 4(3x - 2)$      $18x - 11$

5) Expand and simplify

- a)  $3(x + 2) - 2(x + 3)$      $x$
- b)  $4(2x + 3) - 3(2x + 1)$      $2x + 9$
- c)  $5(3x - 2) - 2(x - 2)$      $13x - 6$
- d)  $2(5x - 1) - 4(2x - 3)$      $2x + 10$
- e)  $3(2x + 7) - 2(3x + 2)$      $17$

# A9

## Factorisation Answers

1) Factorise the following

- a)  $6x - 2$       $2(3x - 1)$
- b)  $8x + 14$       $2(4x + 7)$
- c)  $6x + 9$       $3(2x + 3)$
- d)  $10x - 5$       $5(2x - 1)$
- e)  $12x + 18$       $6(2x + 3)$

2) Factorise the following

- a)  $x^2 + x$       $x(x + 1)$
- b)  $t^2 - t$       $t(t - 1)$
- c)  $x^3 + x$       $x(x^2 + 1)$
- d)  $x^5 - x^2$       $x^2(x^3 - 1)$
- e)  $a^7 + a^4$       $a^4(a^3 + 1)$

3) Factorise the following

- a)  $3x^2 + 6x$       $3x(x + 2)$
- b)  $8x^3 - 2x$       $2x(4x^2 - 1)$
- c)  $12a^2 + 4a^3$       $4a^2(3 + a)$
- d)  $20x^4 - 6x^2$       $2x^2(10x^2 - 3)$
- e)  $7x^3 + 8x$       $x(7x^2 + 8)$

4) Factorise the following

- a)  $6x^2y^4 + 4xy^3$       $2xy^3(3xy + 2)$
- b)  $4x^3y^4 + 2x^2y^2$       $2x^2y^2(2xy^2 + 1)$
- c)  $10x^4y^3z - 5xy^5z$       $5xy^3z(2x^3 - y^2)$
- d)  $16a^2b^3c^4 + 3ab^2c^3$       $ab^2c^3(16abc + 3)$
- e)  $9x^2y^4z - 6xy^2z$       $3xy^2z(3xy^2 - 2)$

5) Factorise the following

- a)  $10x + 4$       $2(5x + 2)$
- b)  $x^4 - x^2$       $x^2(x^2 - 1)$
- c)  $9x^5 - 12x^2$       $3x^2(3x^3 - 4)$
- d)  $12x^2y^3 + 4xy^2$       $4xy^2(3xy + 1)$
- e)  $24x^3yz^4 - 10xz^2$       $2xz^2(12x^2yz^2 - 5)$

# A10

## Substitution Answers

1) Using  $a = 3$ , work out

- |            |           |                       |           |
|------------|-----------|-----------------------|-----------|
| a) $a + 5$ | <b>8</b>  | d) $2a + 1$           | <b>7</b>  |
| b) $7 - a$ | <b>4</b>  | e) $13 - \frac{a}{3}$ | <b>12</b> |
| c) $6a$    | <b>18</b> | f) $a^2 + 2a - 20$    | <b>-5</b> |

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

- |              |           |                        |            |
|--------------|-----------|------------------------|------------|
| a) $x - y$   | <b>3</b>  | d) $5y - 5x$           | <b>-15</b> |
| b) $y - x$   | <b>-3</b> | e) $x^2 + 3y$          | <b>31</b>  |
| c) $3x + 2y$ | <b>19</b> | f) $\frac{4x}{y} - xy$ | <b>0</b>   |

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

- |                |           |                |           |
|----------------|-----------|----------------|-----------|
| a) $a + b + c$ | <b>2</b>  | d) $ab - c$    | <b>5</b>  |
| b) $2b + c$    | <b>0</b>  | e) $ac + 5b$   | <b>-1</b> |
| c) $c - a + b$ | <b>-4</b> | f) $c^2 - 2ab$ | <b>-2</b> |

4) Using  $x = 3$ , work out

- |                     |           |
|---------------------|-----------|
| a) $x^2 - 2x$       | <b>3</b>  |
| b) $2x^2 + x + 1$   | <b>22</b> |
| c) $x^3 - 2x^2 - 5$ | <b>4</b>  |

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

- |              |                |
|--------------|----------------|
| a) $2\pi r$  | <b>56.556</b>  |
| b) $\pi r^2$ | <b>254.502</b> |

# Sequences

## Term-to-Term Rule

### Answers

# A11a

1) Write the first five terms of each sequence

- |   |  |
|---|--|
| <p>a) Start at 1 and add 5<br/><b>1, 6, 11, 16, 21</b></p> <p>b) Start at 30 and subtract 4<br/><b>30, 26, 22, 18, 14</b></p> <p>c) Start at 11 and add 9<br/><b>11, 20, 29, 38, 47</b></p> | <p>d) Start at 8 and subtract 4<br/><b>8, 4, 0, -4, -8</b></p> <p>e) Start at -10 and add 6<br/><b>-10, -4, 2, 8, 14</b></p> <p>f) Start at 4 and subtract 3<br/><b>4, 1, -2, -5, -8</b></p> |
|---|--|

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

- |  |  |
|--|--|
| <p>a) 5, 7, 9, 11, <u>13</u>, <u>15</u><br/><b>Add 2</b></p> <p>b) 11, 16, 21, 26, <u>31</u>, <u>36</u><br/><b>Add 5</b></p> <p>c) 22, 19, 16, 13, <u>10</u>, <u>7</u><br/><b>Subtract 3</b></p> | <p>d) -1, 2, 5, 8, <u>11</u>, <u>14</u><br/><b>Add 3</b></p> <p>e) 6, 2, -2, -6, <u>-10</u>, <u>-14</u><br/><b>Subtract 4</b></p> <p>f) -42, -35, -28, -21, <u>-14</u>, <u>-7</u><br/><b>Add 7</b></p> |
|--|--|

3) Here is a pattern made up of sticks



- a) Write the pattern as a number sequence.  
**5, 9, 13**
- b) Describe the rule.  
**Add 4**
- c) Find the next five terms of the sequence.  
**17, 21, 25, 29, 33**

# **A11b**

## Sequences Position-to-Term Rule Answers

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

a)  $3n - 1$       **2, 5, 8, 11, 14, . . . . ., 29**

b)  $n + 2$       **3, 4, 5, 6, 7, . . . . ., 12**

c)  $5n + 2$       **7, 12, 17, 22, 27, . . . . ., 52**

d)  $4n - 7$       **-3, 1, 5, 9, 13, . . . . ., 33**

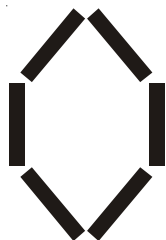
e)  $10n + 9$       **19, 29, 39, 49, 59, . . . . ., 109**

# Sequences

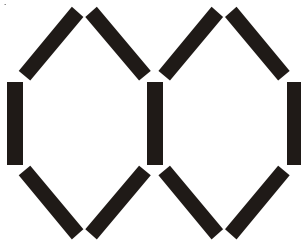
## A11c Finding the $n$ th Term

### Answers

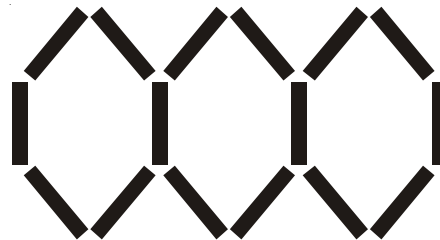
1)



Pattern 1



Pattern 2



Pattern 3



b) How many lines would be in Pattern 6? **31**

c) How many lines would be in Pattern  $n$ ?  **$n \longrightarrow 5n + 1$**

2) Work out the  $n$ th term of the following number patterns.

a) 2, 4, 6, 8, ....  **$n \longrightarrow 2n$**

b) 3, 5, 7, 9, ....  **$n \longrightarrow 2n + 1$**

c) 5, 8, 11, 14, ....  **$n \longrightarrow 3n + 2$**

d) 1, 5, 9, 13, ....  **$n \longrightarrow 4n - 1$**

e) 12, 22, 32, 42, ....  **$n \longrightarrow 10n + 2$**

f) 2, 8, 14, 20, ....  **$n \longrightarrow 6n - 4$**

g) 3, 4.5, 6, 7.5, ....  **$n \longrightarrow 1.5n + 1.5$**

3) Write down the first four terms and the 10th term of the following number patterns.

a)  $n \longrightarrow 3n$  **3, 6, 9, 12, ..... 30**

b)  $n \longrightarrow 3n + 2$  **5, 8, 11, 14, ..... 32**

c)  $n \longrightarrow n - 3$  **-2, -1, 0, 1, ..... 7**

d)  $n \longrightarrow 2n + 5$  **7, 9, 11, 13, ..... 25**

e)  $n \longrightarrow 3n - 7$  **-4, -1, 2, 5, ..... 23**

f)  $n \longrightarrow 5n + 3$  **8, 13, 18, 23, ..... 53**

g)  $n \longrightarrow 4n - 1$  **3, 7, 11, 15, ..... 39**

# A12

## Solving Basic Equations

### Answers

1) Solve

a)  $x + 5 = 8$   **$x = 3$**

f)  $2x = 14$   **$x = 7$**

b)  $x + 7 = 9$   **$x = 2$**

g)  $3x = 30$   **$x = 10$**

c)  $x - 3 = 12$   **$x = 15$**

h)  $\frac{x}{2} = 8$   **$x = 16$**

d)  $x - 6 = 10$   **$x = 16$**

i)  $\frac{x}{5} = 7$   **$x = 35$**

e)  $2 + x = 5$   **$x = 3$**

j)  $\frac{4x}{3} = 8$   **$x = 6$**

2) Solve

a)  $5x + 2 = 17$   **$x = 3$**

f)  $\frac{x}{2} + 3 = 7$   **$x = 8$**

b)  $3x - 1 = 17$   **$x = 6$**

g)  $\frac{x}{5} - 2 = 4$   **$x = 30$**

c)  $2x + 10 = 20$   **$x = 5$**

h)  $\frac{2x}{5} - 1 = 9$   **$x = 25$**

d)  $4x - 7 = 29$   **$x = 9$**

i)  $\frac{3x}{2} + 5 = 11$   **$x = 4$**

e)  $4 + 2x = 14$   **$x = 5$**

j)  $\frac{4x}{5} + 6 = 8$   **$x = 2.5$**



# A13a

## Rearranging Formulae

### Basics Answers

- 1) Rearrange to make  $x$  the subject of the formula

a)  $y = x - 2$        $x = y + 2$   
b)  $y = x + 7$        $x = y - 7$   
c)  $y = x + t$        $x = y - t$   
d)  $y = 5x + 3$        $x = \frac{y-3}{5}$   
e)  $y = 2x - 4$        $x = \frac{y+4}{2}$

- 2) Rearrange to make  $x$  the subject of the formula

a)  $3x + 2 = y$        $x = \frac{y-2}{3}$   
b)  $4x - 1 = y$        $x = \frac{y+1}{4}$   
c)  $ax - 3 = y$        $x = \frac{y+3}{a}$   
d)  $ax + m = t$        $x = \frac{t-m}{a}$   
e)  $x + y = t$        $x = t - y$

- 3) Rearrange to make  $x$  the subject of the formula

a)  $y = x + t - v$        $x = y - t + v$   
b)  $ax - c = y$        $x = \frac{y+c}{a}$   
c)  $y = ax - tv + c$        $x = \frac{y+tv-c}{a}$   
d)  $y + x = ct$        $x = ct - y$   
e)  $c + ax + t = y + m$        $x = \frac{y+m-c-t}{a}$

# Rearranging Formulae

## A13b Harder Questions

### Answers

- 1) Rearrange to make  $x$  the subject of the formula

a)  $\frac{x+2}{3} = y$      $x = 3y - 2$

b)  $y = \frac{x-4}{5}$      $x = 5y + 4$

c)  $\frac{5x-2}{4} = y$      $x = \frac{4y+2}{5}$

d)  $\frac{ax+c}{m} = y$      $x = \frac{my-c}{a}$

e)  $k = \frac{t+mx}{y}$      $x = \frac{yk-t}{m}$

- 2) Rearrange to make  $x$  the subject of the formula

a)  $y = \frac{3x}{4}$      $x = \frac{4y}{3}$

b)  $y = \frac{2x}{5} - 8$      $x = \frac{5(y+8)}{2}$

c)  $y = \frac{cx}{t} + m$      $x = \frac{t(y-m)}{c}$

d)  $y = abx + c$      $x = \frac{y-c}{ab}$

e)  $\frac{mx}{t} + c = y$      $x = \frac{t(y-c)}{m}$

- 3) Rearrange to make  $x$  the subject of the formula

a)  $y = 4(x+t)$      $x = \frac{y}{4} - t$

b)  $y = a(x-m)$      $x = \frac{y}{a} + m$

c)  $at(c+x) = y$      $x = \frac{y}{at} - c$

d)  $y+m = a(c+x)$      $x = \frac{y+m}{a} - c$

e)  $t-v = m(x-y)$      $x = \frac{t-v}{m} + y$

- 4) Rearrange to make  $x$  the subject of the formula

a)  $\frac{x-u}{4} = y$      $x = 4y + u$

b)  $\frac{x+a}{b} = c$      $x = bc - a$

c)  $\frac{3(x+2)}{c} = y$      $x = \frac{cy}{3} - 2$

d)  $\frac{a(x+b)}{c} = d$      $x = \frac{cd}{a} - b$

e)  $\frac{t(x+c)}{d} = e+f$      $x = \frac{d(e+f)}{t} - c$

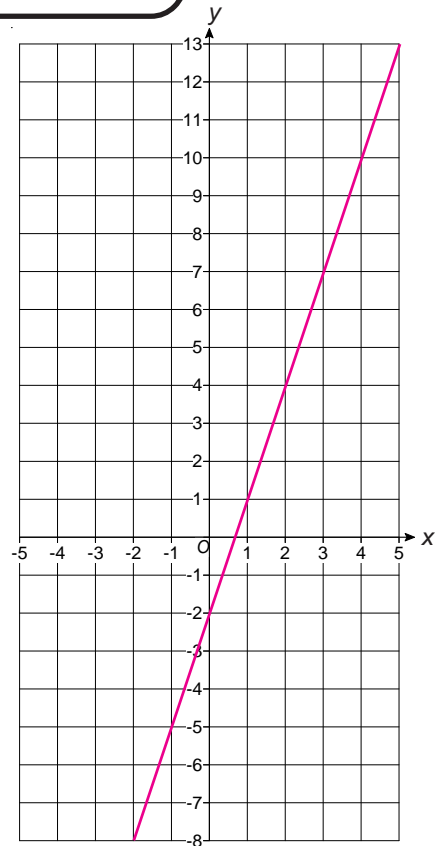
# A14a

## Straight Line Graphs Introduction Answers

- 1) a) Complete the table of values for  $y = 3x - 2$

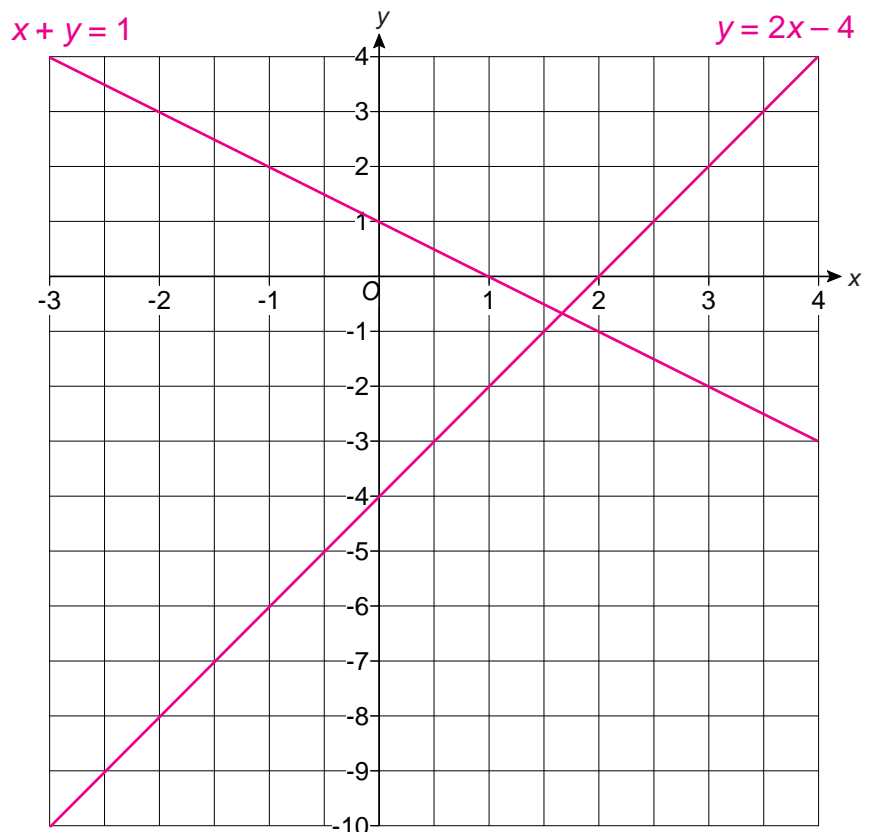
x	-2	-1	0	1	2	3	4	5
y	-8	-5	-2	1	4	7	10	13

- b) Plot the graph of  $y = 3x - 2$
- c) Use your graph to estimate the value of  $x$  when  $y = 2$  **Approximately 1.3**
- d) Use the graph to estimate the value of  $x$  when  $y = -4$  **Approximately -0.7**



- 2) a) Plot the graph of  $y = 2x - 4$

- b) Plot the graph of  $x + y = 1$

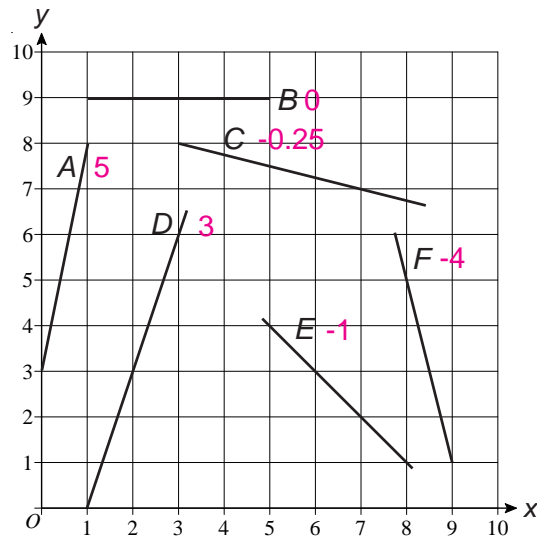


# A14b

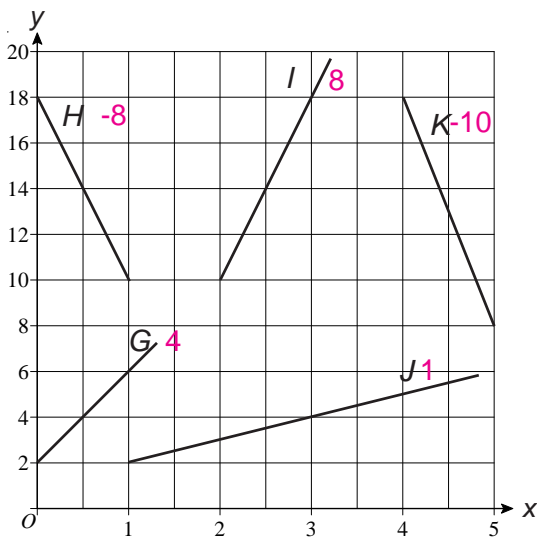
## Straight Line Graphs

### Gradient Answers

- 1) Find the gradients of the lines A to F.



- 2) Find the gradients of the lines G to K.



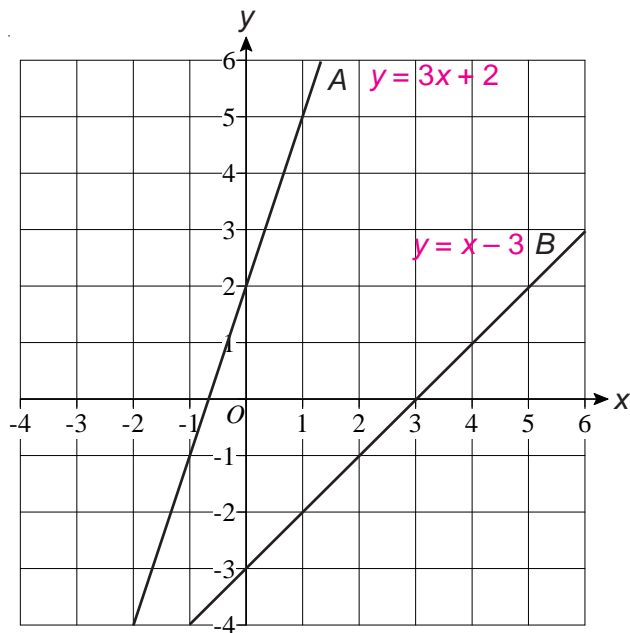
# A14c

## Straight Line Graphs

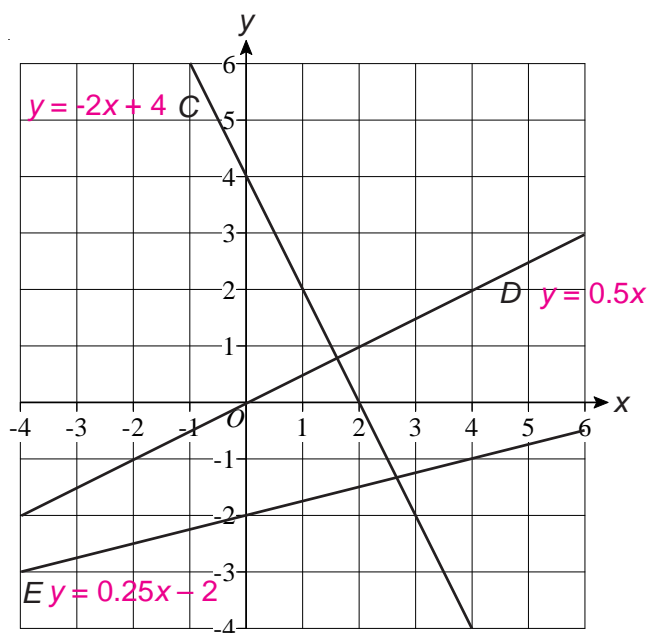
$$y = mx + c$$

### Answers

- 1) Find the equations of lines A and B.



- 2) Find the equations of lines C, D and E.



# A15

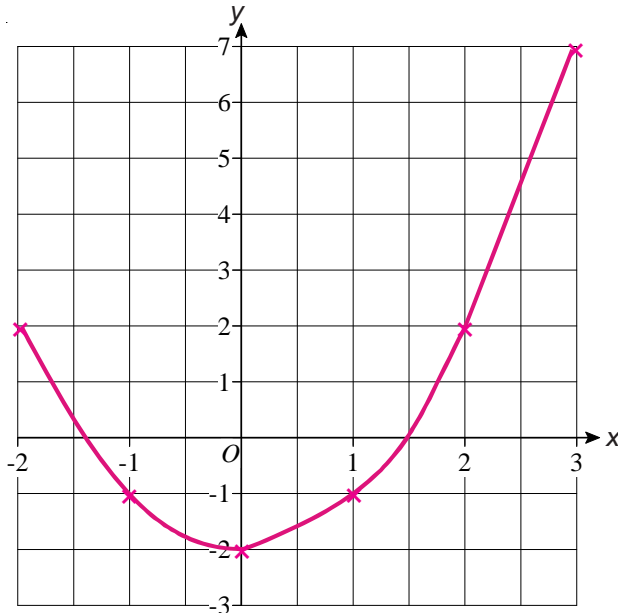
## Draw Quadratic Graphs

### Answers

1) a) Complete the table of values for  $y = x^2 - 2$

x	-2	-1	0	1	2	3
y	2	-1	-2	-1	2	7

b) Draw the graph of  $y = x^2 - 2$



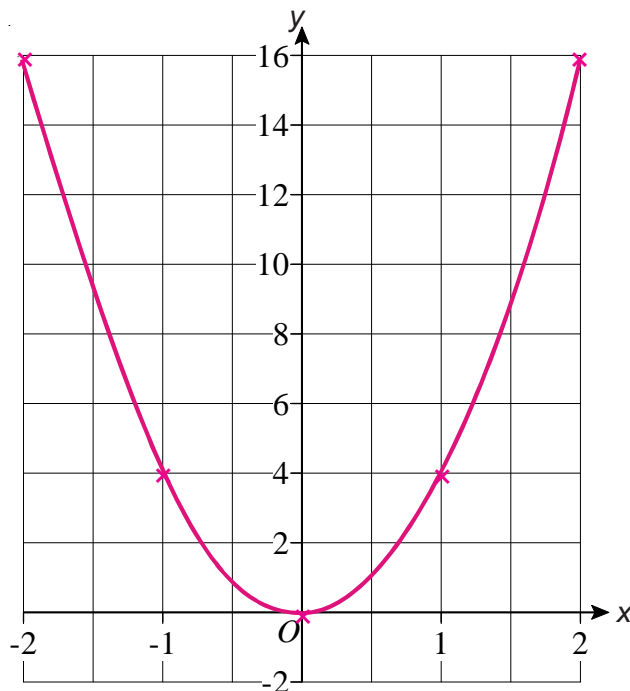
c) Use the graph to estimate the values of  $x$  when  $y = 1$

$x = -1.7, 1.7$

2) a) Complete the table of values for  $y = 4x^2$

x	-2	-1	0	1	2
y	16	4	0	4	16

b) Draw the graph of  $y = 4x^2$



c) Use the graph to estimate the value of  $y$  when  $x = 1.5$

$y = 9$

# R3

## Expressing Quantities as Fractions Answers

- 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.  $\frac{3}{5}$
  
- 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.  $\frac{1}{4}$
  
- 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? 4.5 litres
  - b) What fraction of the pink paint was white paint?  
Give your answer in its simplest form.  $\frac{3}{4}$
  
- 4) Two thirds of the students in a class have a pencil.  
14 students have a pencil.  
How many students are in the class? 21

# R4

## Unit Pricing

### Answers

- 1) A bag of six apples cost £1.08

What is the price per unit? £0.18

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

What is the price per unit? £0.03

- b) A pack of 50 teabags costs £2.00

What is the price per unit? £0.04

- c) Which pack offers better value for money? 40 teabags

*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? Three 8-packs for £7
- b) What is the price per unit, to the nearest penny if Julie buys the yoghurts in the cheapest way? 29p





# R5b

## Ratios - Sharing

### Answers

- 1) Share out £20 between Bill and Sue in the ratio 3 : 2. Bill gets £12, Sue gets £8
  - 2) Divide £60 between Jack and Jill in the ratio 7 : 3. Jack gets £42, Jill gets £18
  - 3) Debbie and Dave share 200 Smarties in the ratio 1 : 4. How many Smarties do they each get? Debbie gets 40, Dave gets 160
  - 4) Alec, Tony and Sara share £720 in the ratio 1 : 2 : 3. How much do they each get? Alec £120, Tony £240, Sara £360
  - 5) If Dave and Sue share £30 in the ratio 2 : 3, how much more than Dave does Sue get? £6 more
  - 6) Divide £12 between Mick and Sharon in the ratio 5 : 3. Mick £7.50, Sharon £4.50
- 
- 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? £50
  - 8) Vicky and John share some sweets in the ratio 2 : 7.  
If Vicky ends up with 12 sweets, how many will John have? 42 sweets
  - 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? 2 of cement and 6 of gravel
  - 10) An old television has a width and height in the ratio 4 : 3. If the width is 48 cm, what is the height? 36 cm

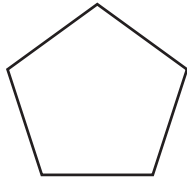
# R5b

## Ratios - Sharing

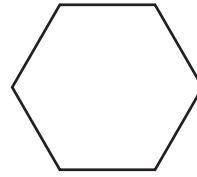
### Answers

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

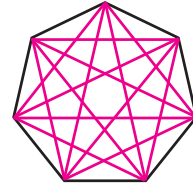
**C Heptagon has 14 diagonals and 7 sides.**



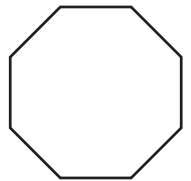
A



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? **42 and 18**

- 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? **1 : 2**

- 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? **Sue is 10, Ben is 20**
  - 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. **3 : 4 : 5**
  - c) In which year was the ratio of Sue, Ted and Ben's age 1 : 2 : 3? **2005**
  - d) How old was Ben when the ratio of the three ages was 1 : 3 : 5? **12.5**
  - e) On what date was the ratio of Sue and Ben's age 1 : 41? **1st April 2000**

# R6

## Scale Factors - Maps

### Answers

- 1) The scale on a map is 1 : 2500
  - a) The school and the church are 8 cm apart on the map.  
How far apart are they in real life?  
Give your answer in metres. **200 m**
  - b) Two villages are 3.2 km apart in real life.  
How far apart would they be on the map?  
Give your answer in centimetres. **128 cm**
  
- 2) The scale on a map is 1 : 10 000
  - a) Two towns are 17 km apart.  
How far apart would they be on the map?  
Give your answer in centimetres. **170 cm**
  - b) The viewpoint and the pier are 7.1 cm apart on the map.  
How far apart would they be in real life?  
Give your answer in kilometres. **0.71 km**
  
- 3) A model car is made with a scale of 1 : 18  
If the model is 25 cm long, how long is the real car?  
Give your answer in metres. **4.5 m**

# R7

## Simple Interest Answers

- 1) Phil saves £800 in his bank account.

The bank pays 2% simple interest per year.

- a) How much interest will he have earned after one year? £16
- b) How much money will he have in the bank after one year? £816

- 2) Nikki saves £350 in her bank account.

The bank pays 2.5% simple interest per year.

- a) How much interest will she have earned after three years? £26.25
- b) How much money will she have in the bank altogether after five years? £393.75

- 3) Jean saves £960 in her bank account.

The bank pays 4% simple interest per year.

- a) How much interest will she have earned after one year? £38.40
- b) How much interest will she have earned after 6 months? £19.20
- c) How much interest will she have earned after 4 months? £12.80

# R8

## Direct Proportion

### Answers

- 1) 4 litres of orange juice cost £3.20.
  - a) What is the cost of 8 litres? £6.40
  - b) How much would 20 litres cost? £16
  - c) How much would you pay for 6 litres? £4.80
  - d) What is the cost of 5 litres? £4
  
- 2) 15 voice minutes cost 45p.  
What is the cost of
  - a) 30 voice minutes? 90p
  - b) 150 voice minutes? £4.50
  
- 3) If £1 is worth 1.12 euros, how many euros would you get for £150? 168 euros
  
- 4) Use direct proportion to solve the following problems:
  - a) 5 litres of water cost £3.00.  
How much would 9 litres cost? £5.40
  - b) A recipe for two people uses 90 g of flour.  
How much flour is needed for 5 people? 225 g
  - c) 20 blank CD-Roms cost £3.20.  
How much do 75 CD-Roms cost? £12
  - d) A litre of water costs 62p.  
What is the cost of 2.5 litres of water? £1.55
  - e) 3 kg of cheese costs £7.50  
What is the cost of 6.5 kg of cheese? £16.25
  - f) 2 litres of smoothie contains 900 ml of orange juice.  
How much orange juice is in 8.5 litres of smoothie? 3.825 litres
  - g) A 120 ml carton of yoghurt contains 12 g of sugar.  
How much sugar would be in a 200 ml carton of yoghurt? 20 g

# R8

## Direct Proportion

### Answers

1)

Miles	Kilometres
5	8
10	<b>16</b>
<b>15</b>	24
<b>20</b>	32
50	<b>80</b>

- Use direct proportion to complete this conversion table.
- The distance between London and Birmingham is 120 miles. Use the table to work out this distance in kilometres. **192 km**
- The distance between London and Paris is 460 kilometres. Use the table to work out this distance in miles. **287.5 miles**

2) Here are three offers for voice minutes on a mobile phone.

**A**

Minutes	Cost
1	£0.04
5	£0.20
40	£1.60

**B**

Minutes	Cost
2	£0.24
10	£1.00
100	£7.00

**C**

Minutes	Cost
10	£0.70
50	£3.50
60	£4.20

In which of the offers are the numbers in direct proportion?

In each case, explain your answer. **A and C are in direct proportion.**

For A the cost of 1 minute is 4p. 5 minutes is  $5 \times 4p = 20p$   
 40 minutes is  $40 \times 4p = £1.60$

For C the cost of 1 minute is 7p.  
 50 minutes is  $50 \times 7p = £3.50$   
 60 minutes is  $60 \times 7p = £4.20$

3) A jar has 200 sleeping flies in it and the lid is firmly on.

The weight of the jar, when empty is 1 kg.

The weight of the jar and sleeping flies is 1.9 kg (1900 g).

a) If all the flies are the same weight, what is the weight of one fly? **4.5 g**

b) Tina shakes the jar so that all the flies are now awake and flying around.

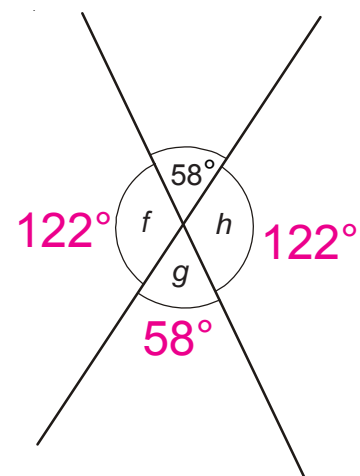
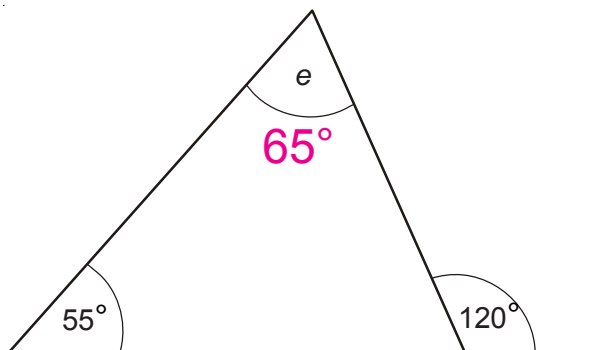
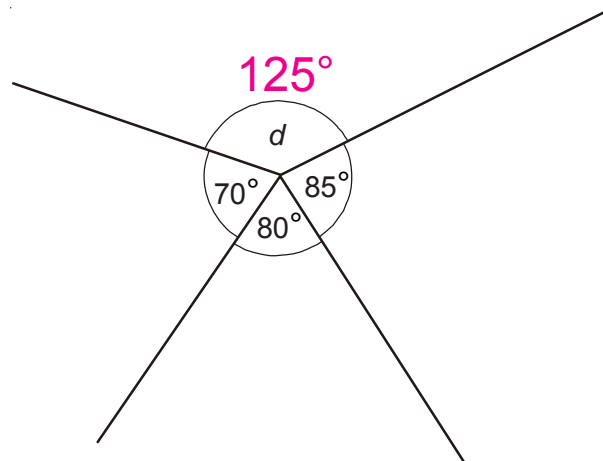
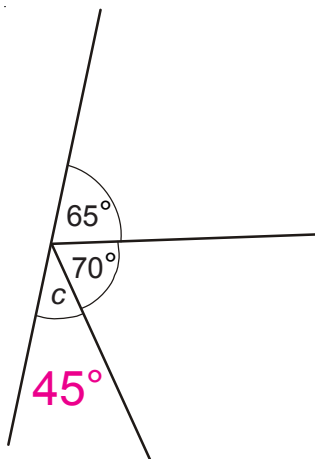
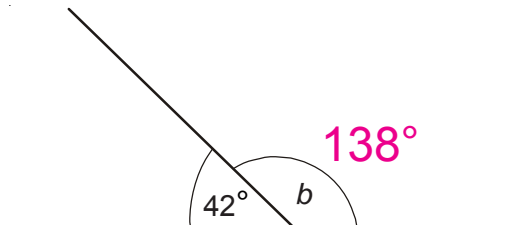
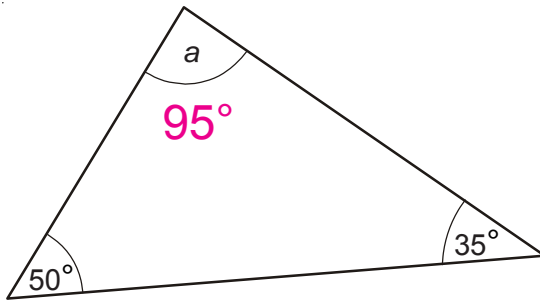
What will the weight of the jar of flies be, now? **Still 1.9 kg**

**To stay in the air, each fly must flap its wings which creates a downthrust equal in size to its weight.**

# G13

## Angle Facts Answers

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



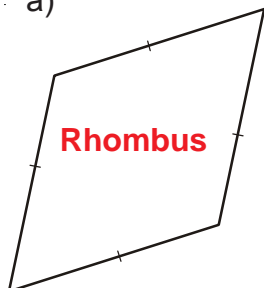


# G14 Properties of Quadrilaterals

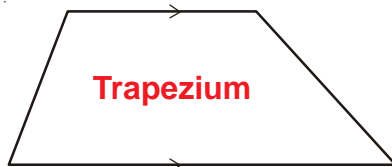
## Answers

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

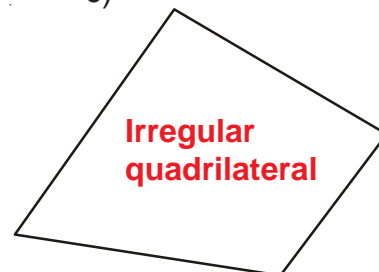
a)



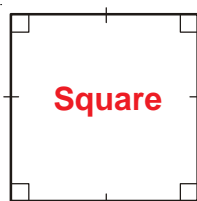
b)



c)



d)



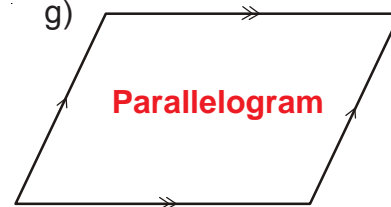
e)



f)

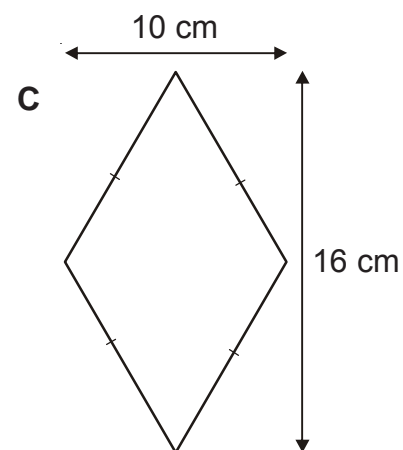
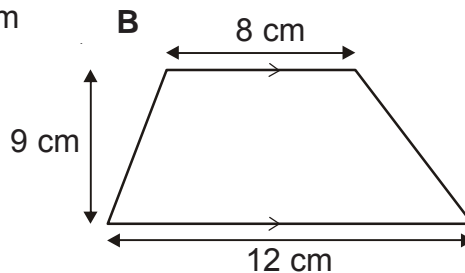
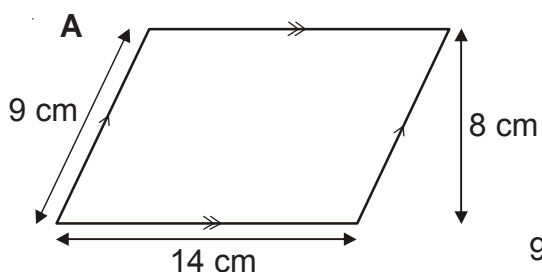


g)



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

Shape	Number of lines of symmetry	Order of rotational symmetry	Area
A	None	2	112 cm <sup>2</sup>
B	None	None	90 cm <sup>2</sup>
C	2	2	80 cm <sup>2</sup>



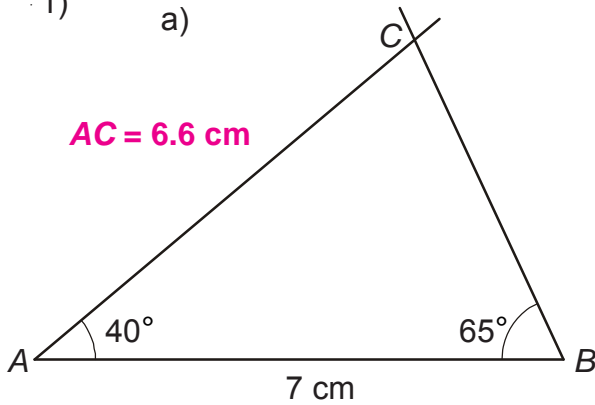
# G15

## Scale Drawings

### Answers

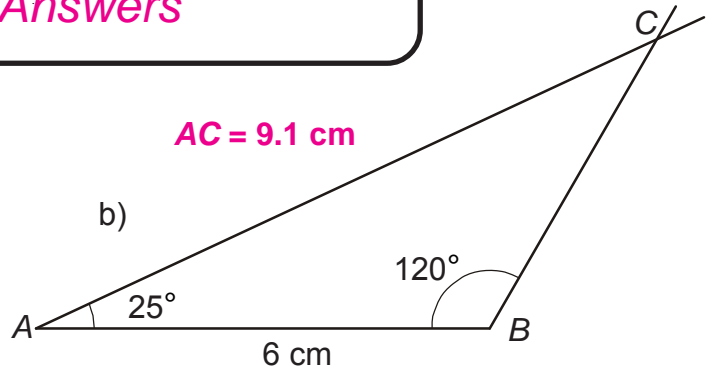
1)

a)

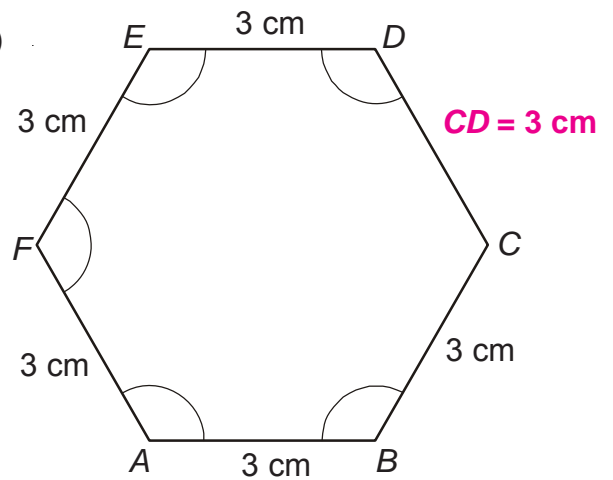


$AC = 9.1 \text{ cm}$

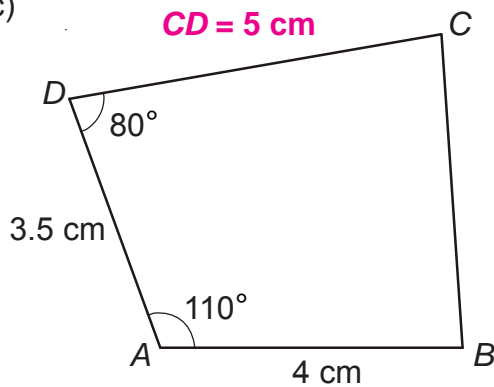
b)



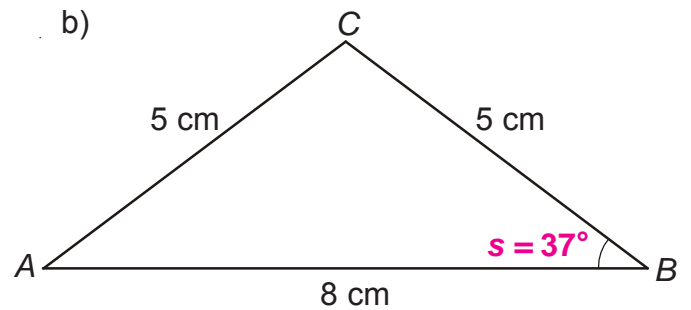
d)



c)

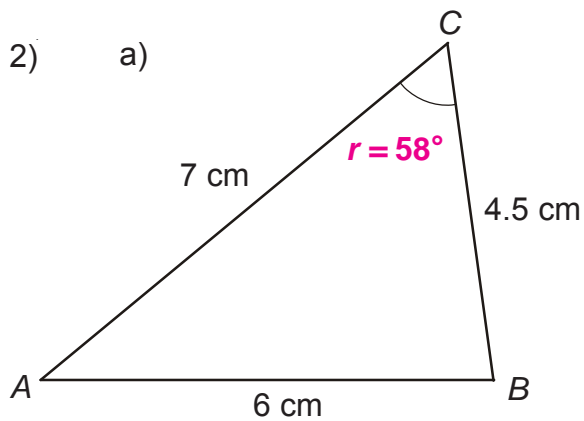


b)

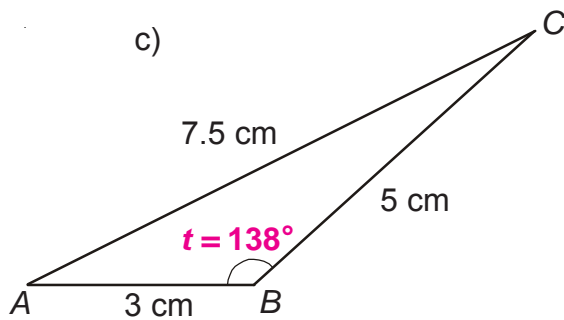


2)

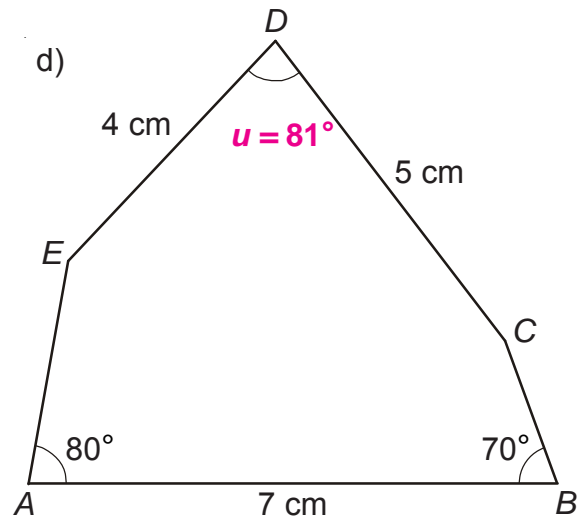
a)



c)



d)



## Properties of Special Triangles

### Answers

a)

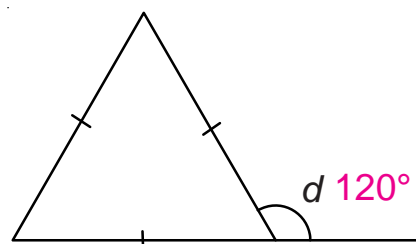
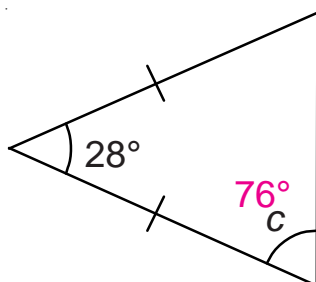
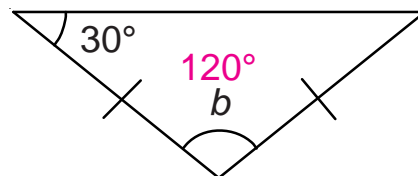


Name: Right-angled triangle One angle of 90°

A diagram of an isosceles triangle. The two slanted sides are marked with single tick marks, indicating they are of equal length. The base is the vertical side on the left.

[illegible]

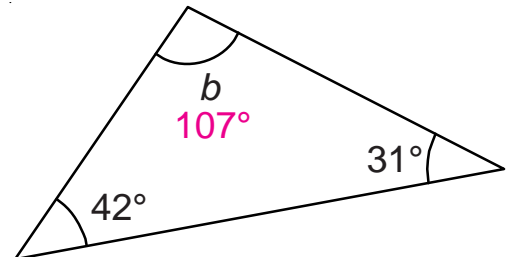
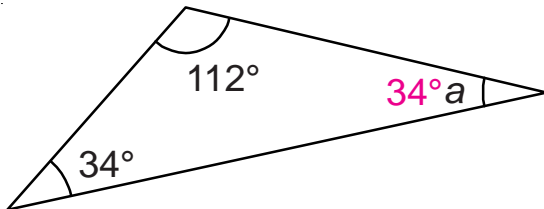
Name: Scalene triangle      0 equal sides  
0 equal angles



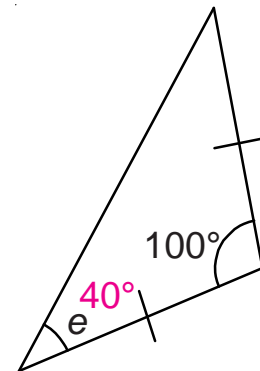
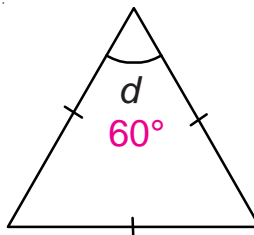
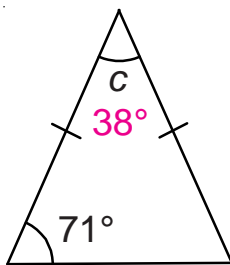
# G17

## Angles in a Triangle Calculation Answers

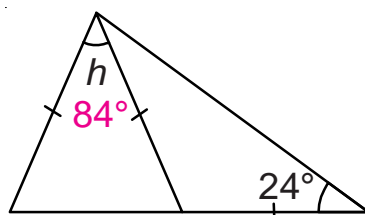
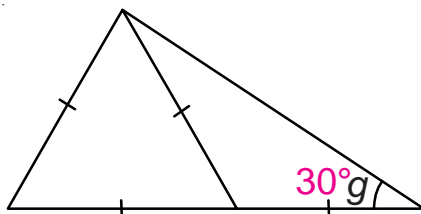
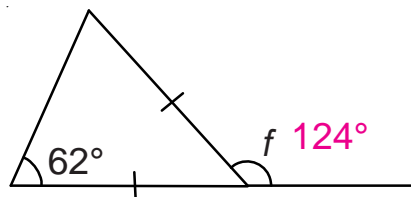
1) Work out the size of the missing angles.



2) Work out the size of the missing angles.



3) Work out the size of the missing angles.



# Angles and Parallel Lines

## G18

### Answers

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

- 1)
- 
- 2)
- 
- 3)
- 
- 4)
-

# G19

## Angle Sum of Polygons

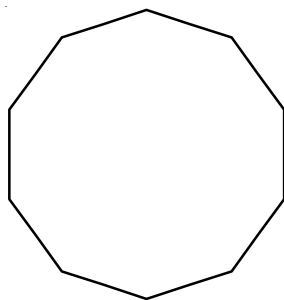
### Answers

1) Find the sum of the interior angles of a nonagon (a 9-sided shape).  
 $1260^\circ$

2) Find the sum of the interior angles of a 14-sided shape.  $2160^\circ$

3) The sum of the interior angles of a polygon is  $1620^\circ$ .  
How many sides does it have?  $11$

4) Here is a regular decagon.



- a) What is the sum of the interior angles?  $1440^\circ$
- b) Find the size of one interior angle.  $144^\circ$
- c) Find the size of one exterior angle.  $36^\circ$

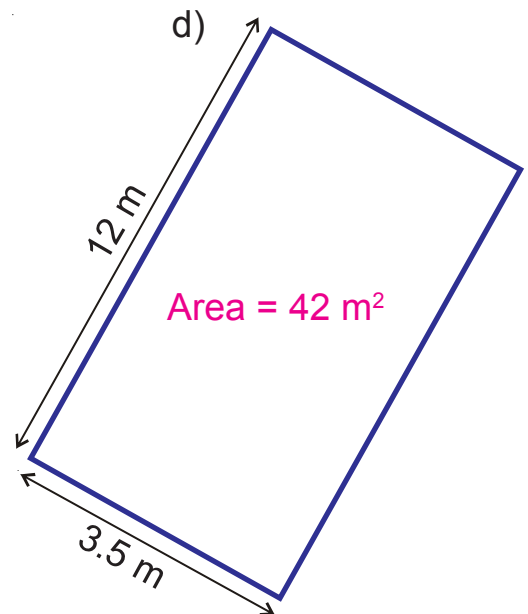
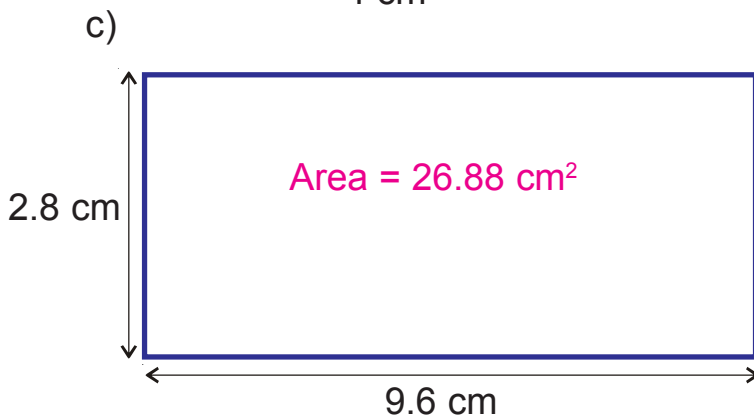
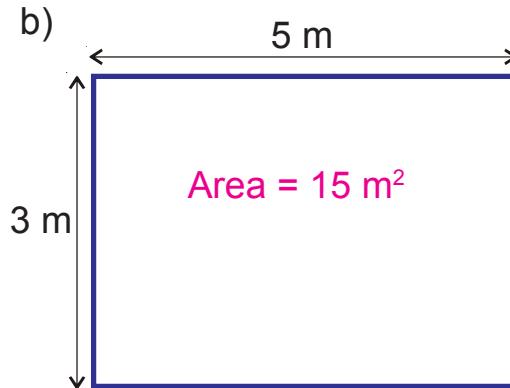
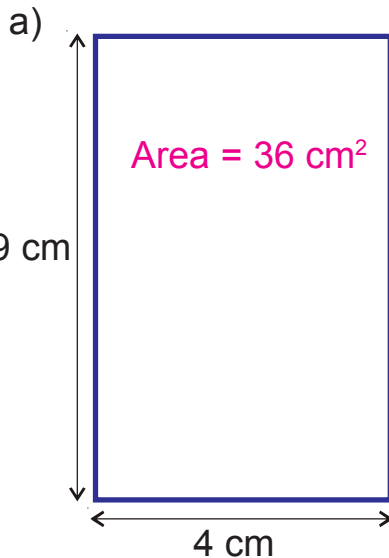
5) A regular polygon has interior angles of size  $135^\circ$ .  
a) How many sides does it have?  $8$   
b) What is its name?  $\text{Octagon}$

# G20a

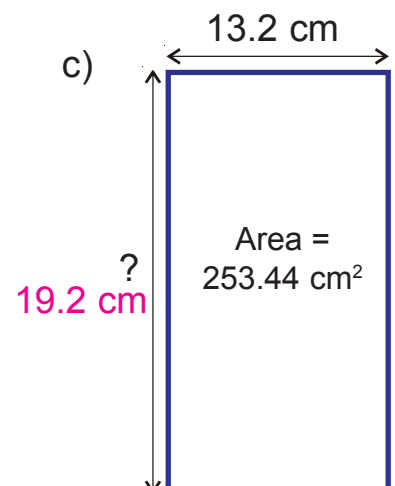
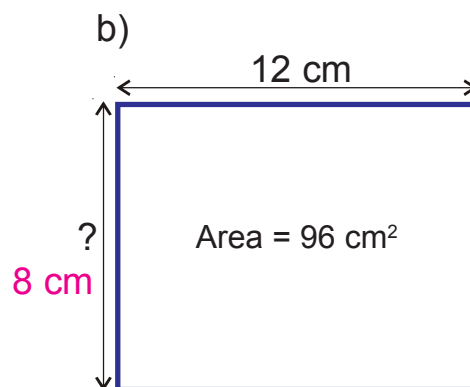
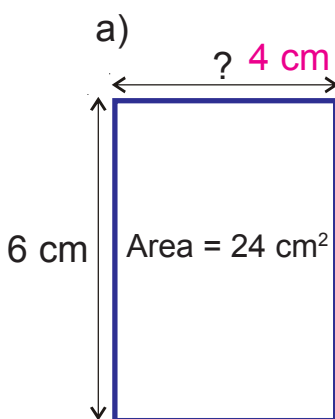
## Area - Rectangles

### Answers

1) Find the areas of the following four rectangles.



2) Find the lengths of the missing sides.

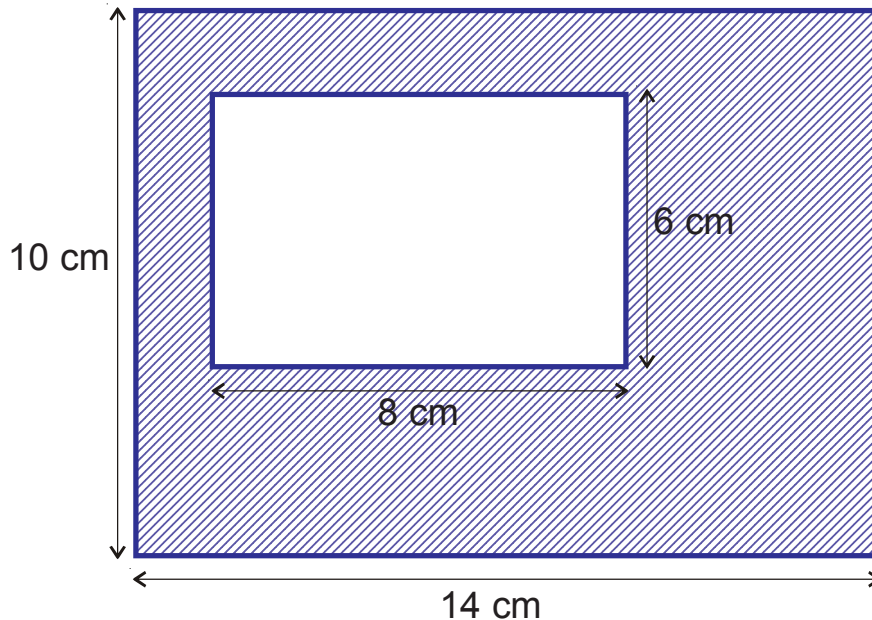


# G20a

## Area - Rectangles

### Answers

- 1) Find the area of the shaded section.

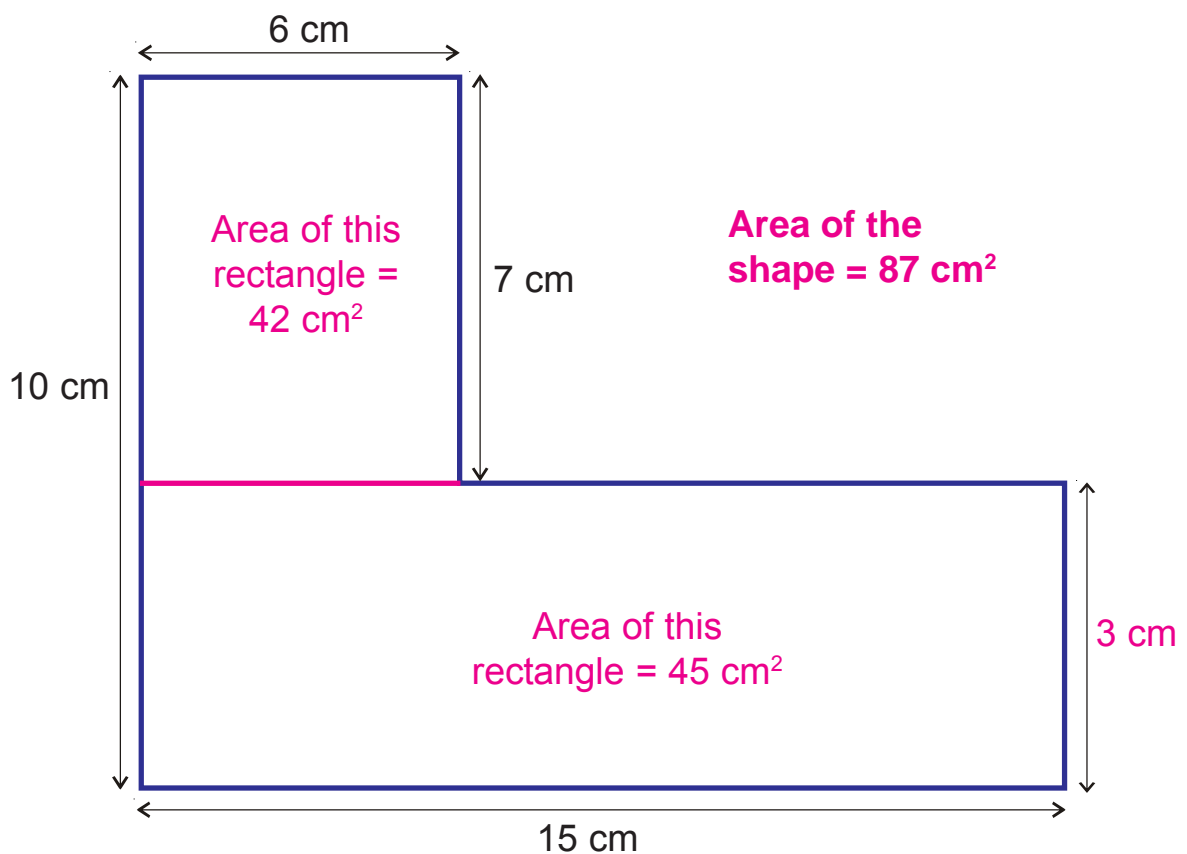


Area of large rectangle =  $140 \text{ cm}^2$

Area of small rectangle =  $48 \text{ cm}^2$

Area of shaded section =  $92 \text{ cm}^2$

- 2) Find the area of the shape below.



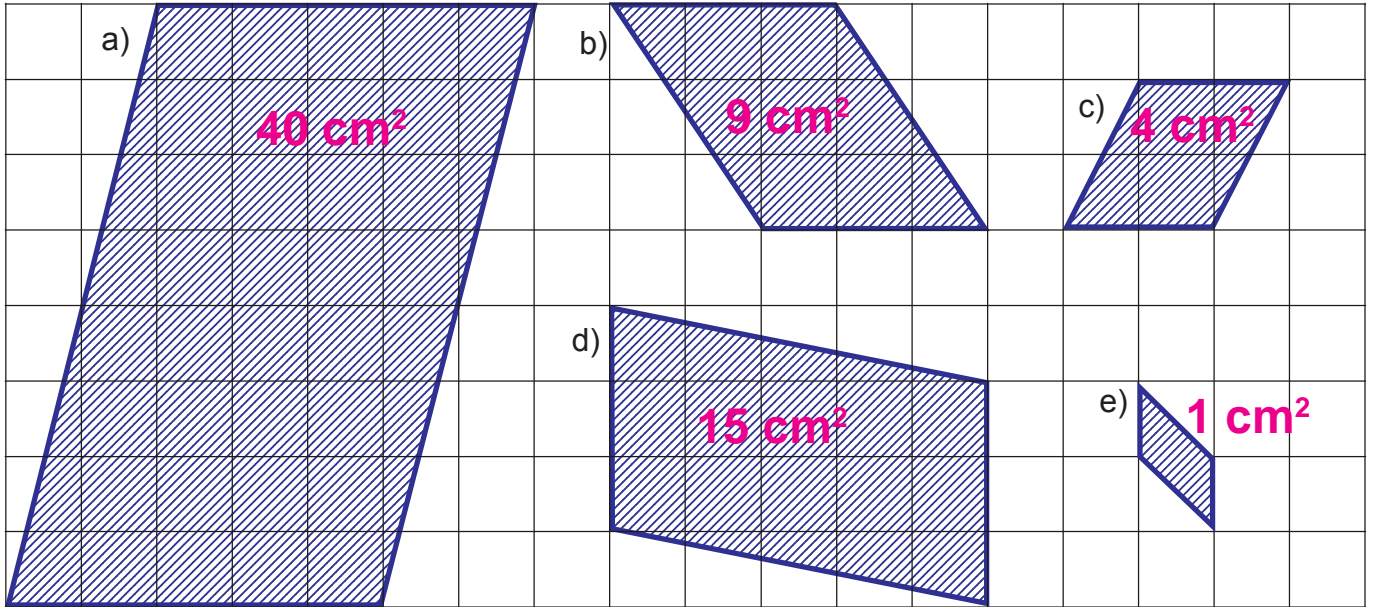


# Area - Parallelograms

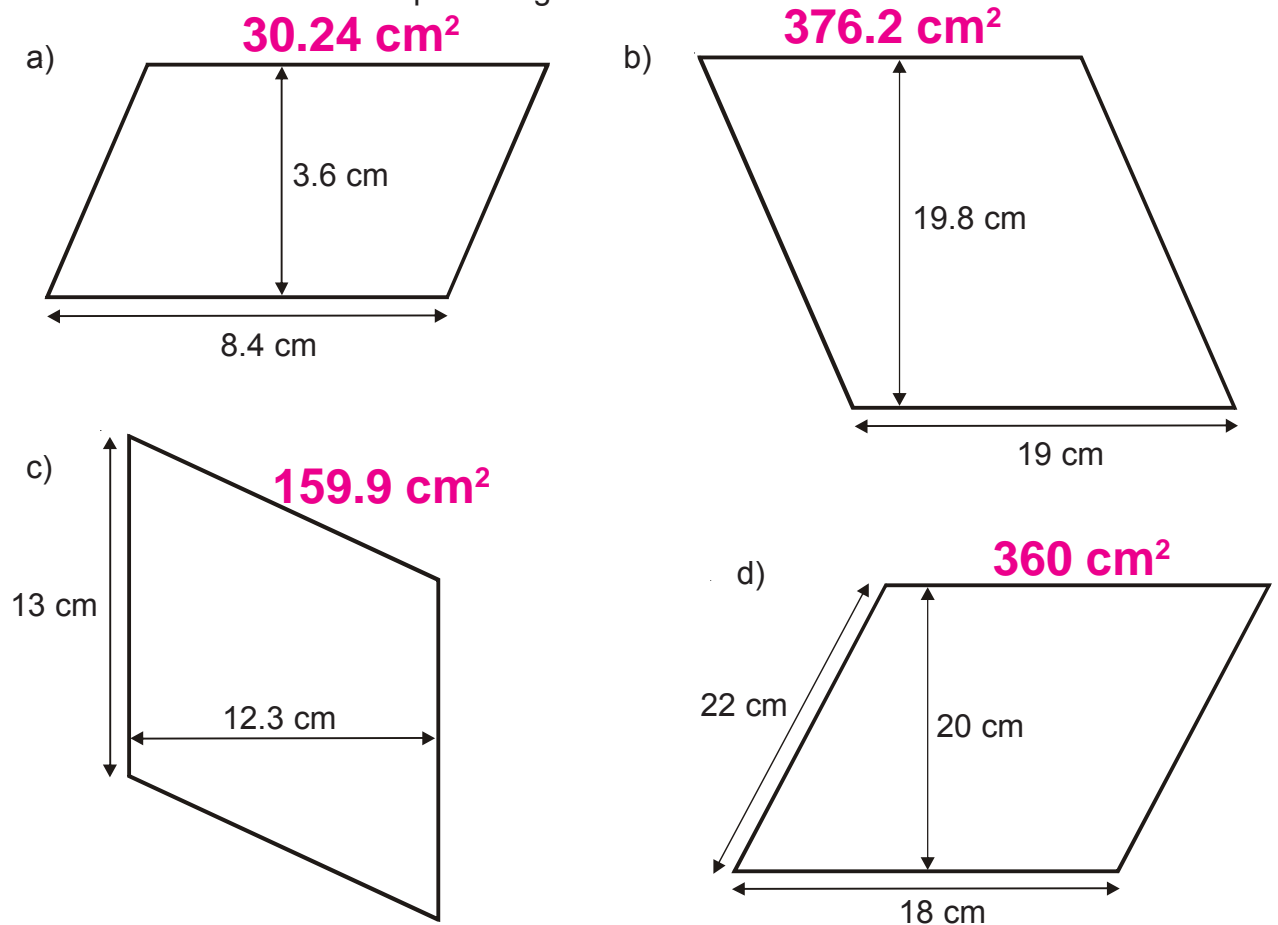
## G20b

### Answers

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



2) Find the areas of these four parallelograms

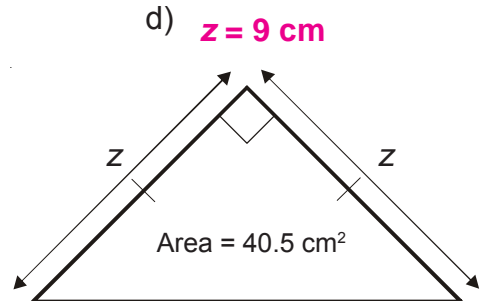
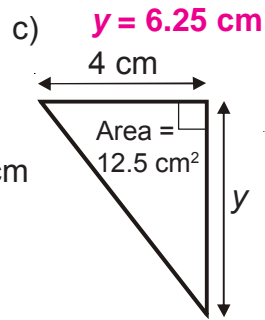
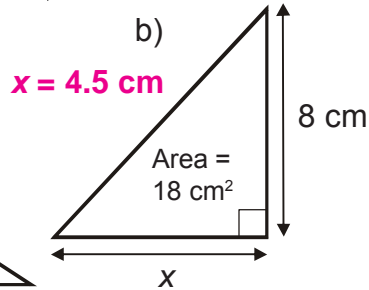
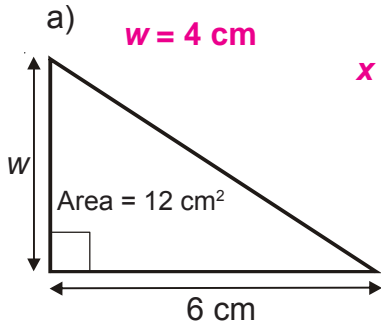


# Area - Triangles

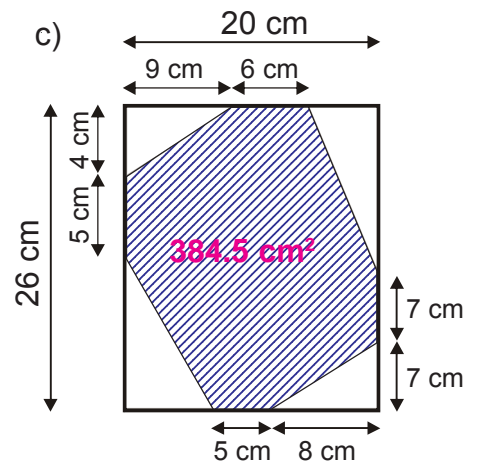
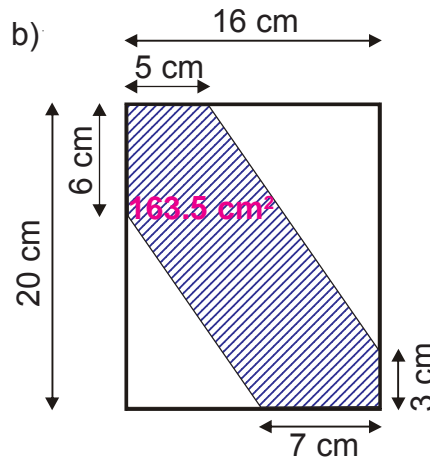
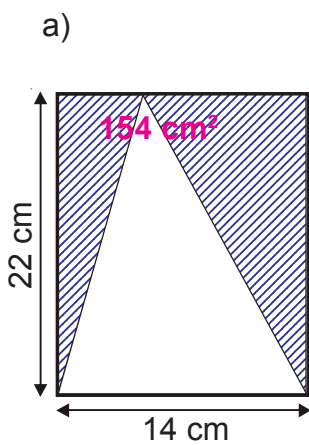
## G20c

### Answers

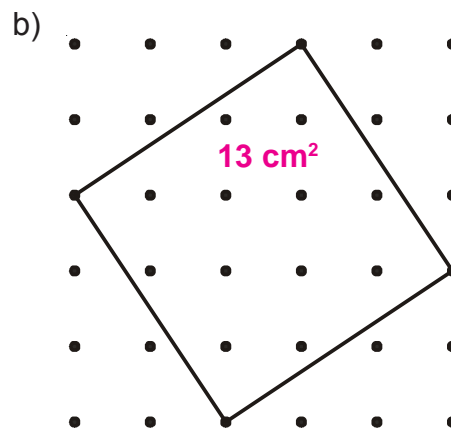
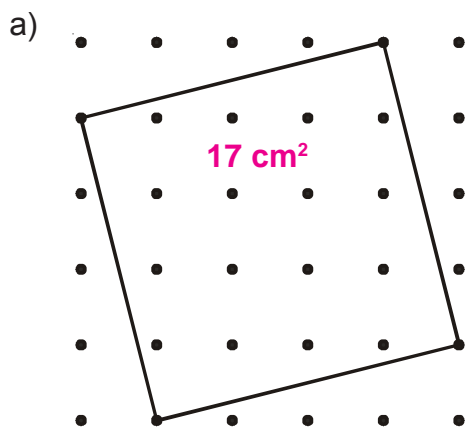
1) Find the lengths  $w$ ,  $x$ ,  $y$  and  $z$



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



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

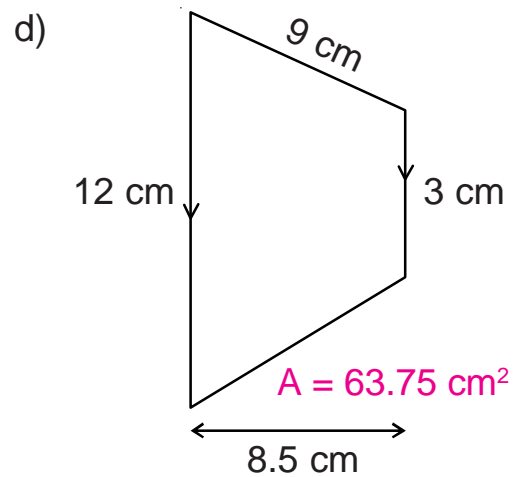
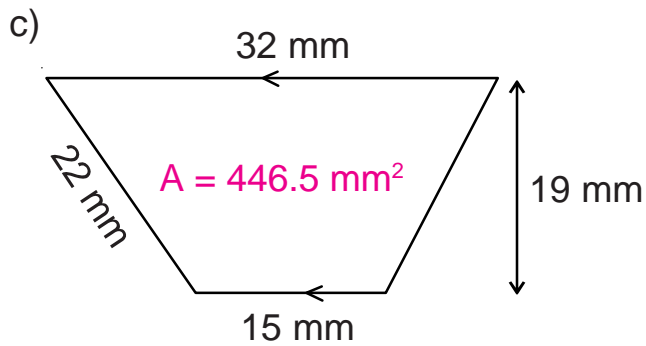
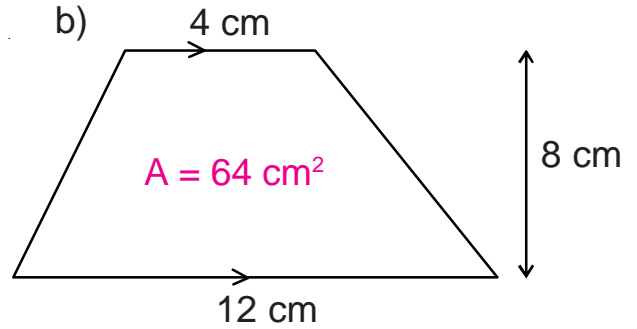
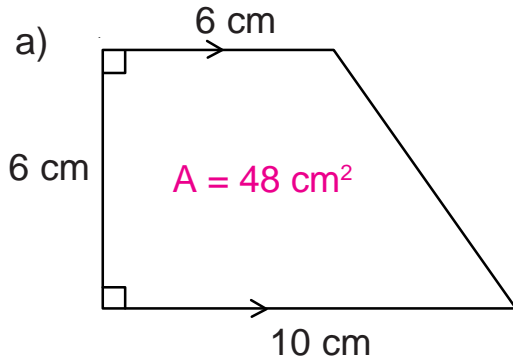


# Area - Trapeziums

## G20d

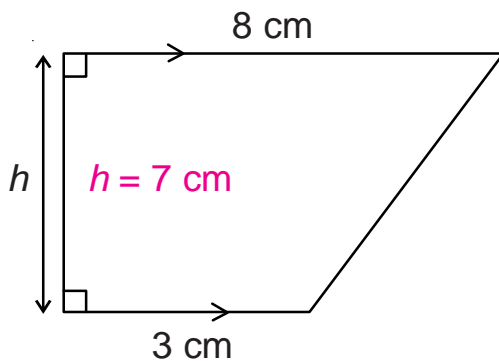
### Answers

1) Find the area of the following trapeziums:

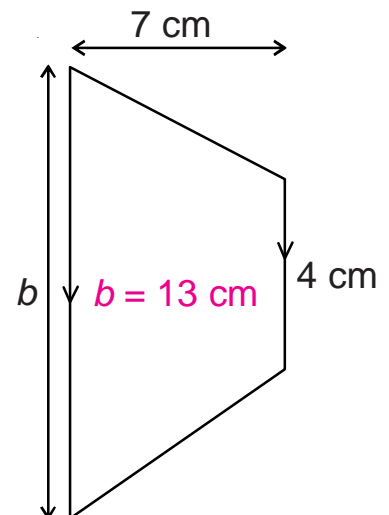


2) Find the missing lengths.

a) area =  $38.5 \text{ cm}^2$



b) area =  $59.5 \text{ cm}^2$

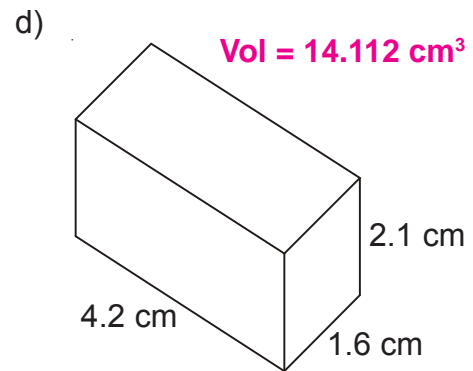
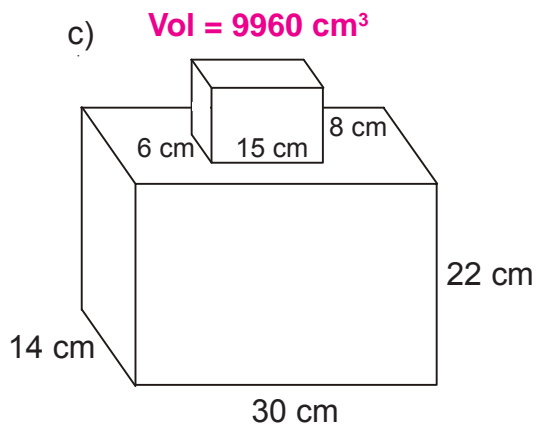
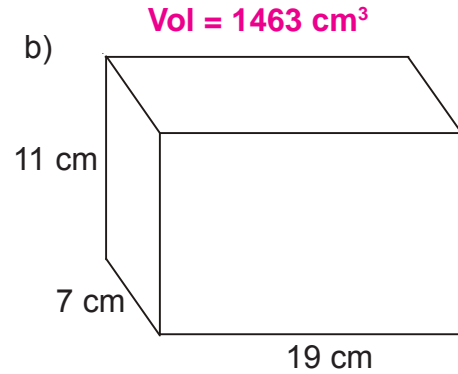
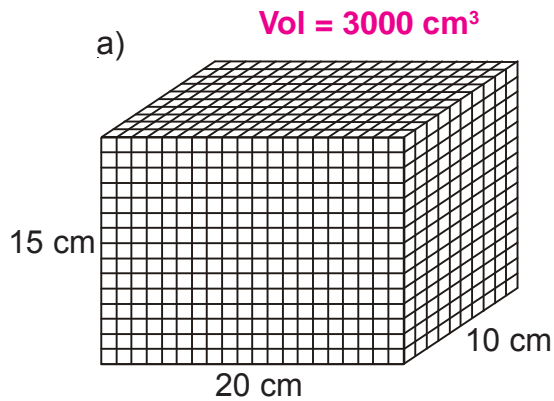


# G21a

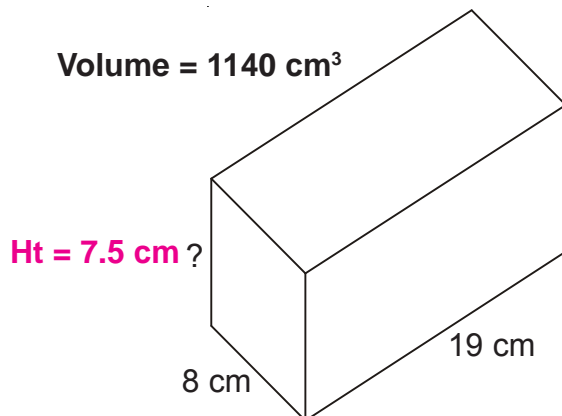
## Cuboids - Volume

### Answers

1) Find the volume of the following:

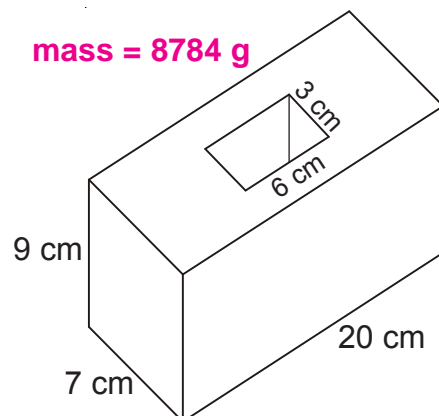


2) Find the height of this cuboid



3) The cuboid below is made out of steel and has a rectangular hole all the way through it.

If 1 cm<sup>3</sup> of steel has a mass of 8 g, what is the mass of the cuboid?



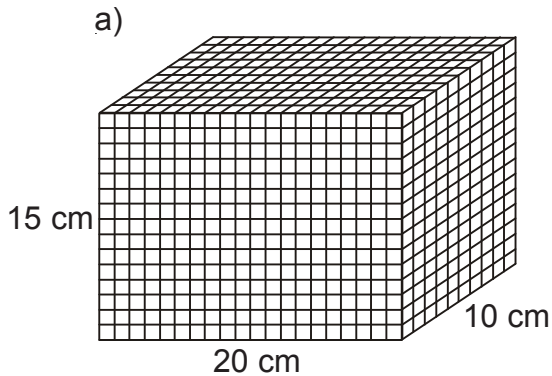
# Cuboids - Surface Area

## G21b

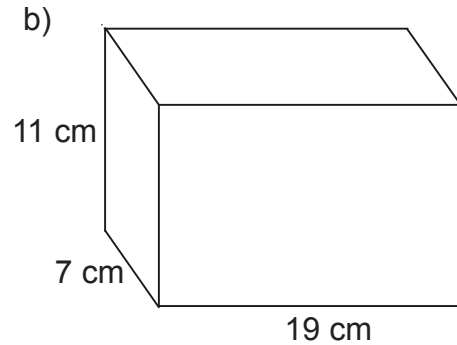
### Answers

1) Find the surface area of the following:

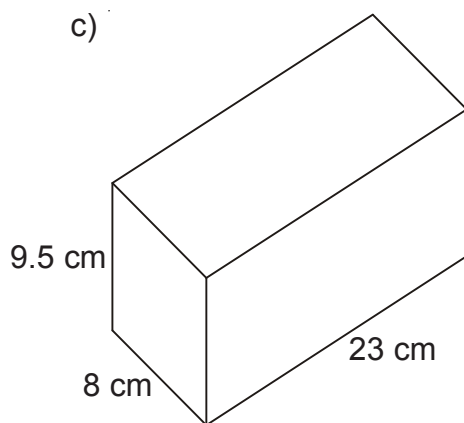
**Surface area = 1300 cm<sup>2</sup>**



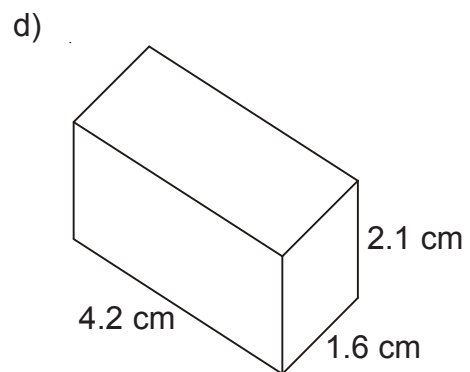
**Surface area = 838 cm<sup>2</sup>**



**Surface area = 957 cm<sup>2</sup>**



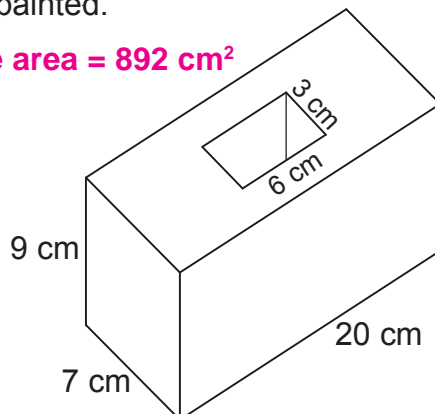
**Surface area = 37.8 cm<sup>2</sup>**



2) The cuboid below is made out of steel and has a rectangular hole all the way through it.

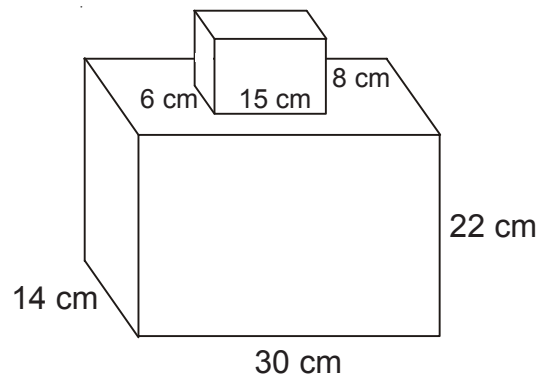
All the surfaces are painted including the base and the sides of the rectangular hole.  
Work out the area which will be painted.

**Surface area = 892 cm<sup>2</sup>**



3) The shape below consists of a cuboid glued onto another cuboid. If the whole shape - including the base - is painted, work out the area which will be painted.

**Surface area = 3112 cm<sup>2</sup>**



# Circles - Circumference

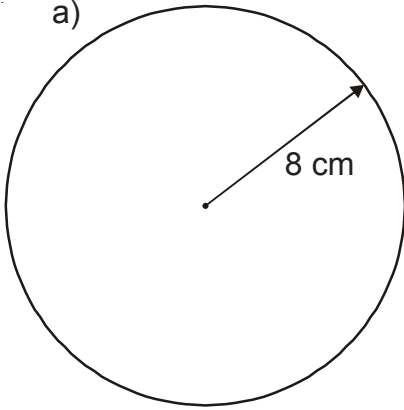
## G22a

### Answers

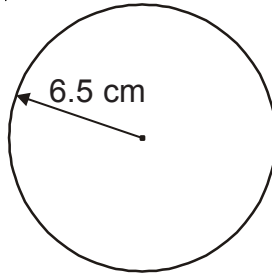
In all questions, take  $\pi$  to be 3.142

1) Find the circumference of the following circles

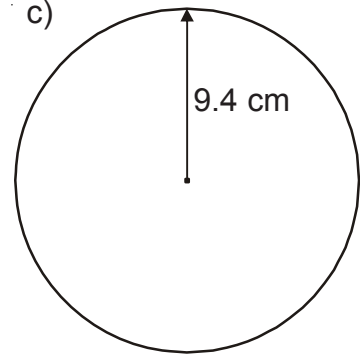
a)  **$C = 50.272 \text{ cm}$**



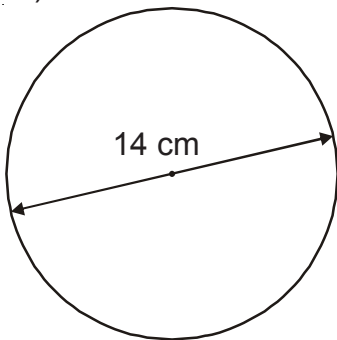
b)  **$C = 40.846 \text{ cm}$**



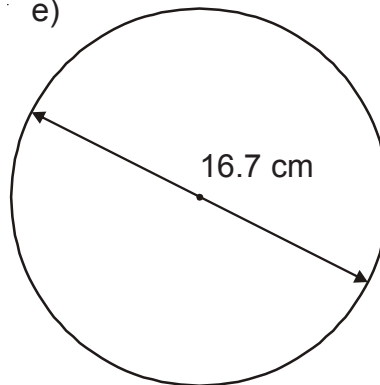
c)  **$C = 59.0696 \text{ cm}$**



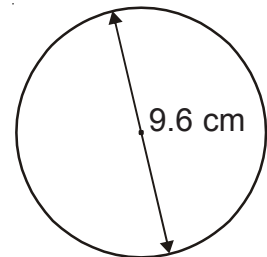
d)  **$C = 43.988 \text{ cm}$**



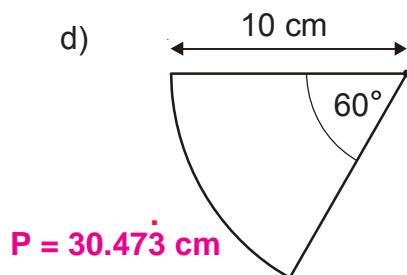
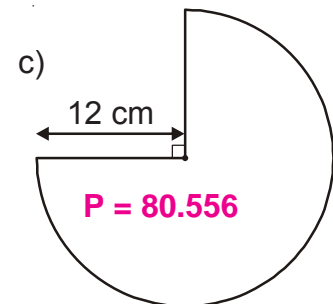
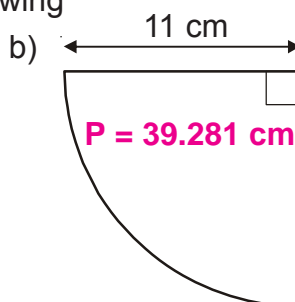
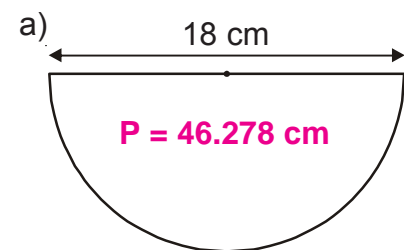
e)  **$C = 52.4714 \text{ cm}$**



f)  **$C = 30.1632 \text{ cm}$**



2) Find the perimeter of the following



3) The circumference of the earth is approximately 40000 km.

If you had a piece of string which was 6.3 m longer than 40000 km and put it around the earth, how far away from the earth, all the way round, would the extra 6.3 m allow it to be?

a) 0.1 mm   b) 1 mm   c) 1 cm   **d) 1 m**

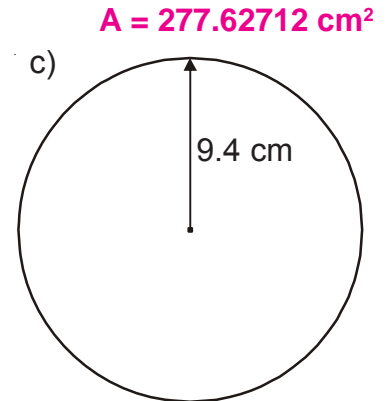
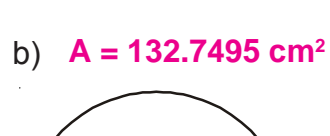
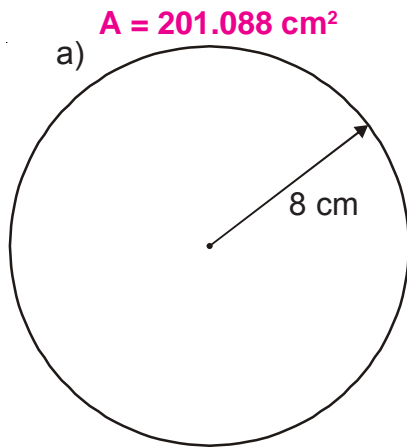
# G22b

## Circles - Area

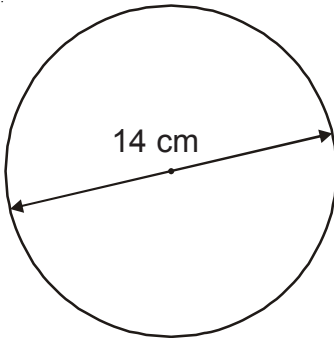
### Answers

In all questions, take  $\pi$  to be 3.142

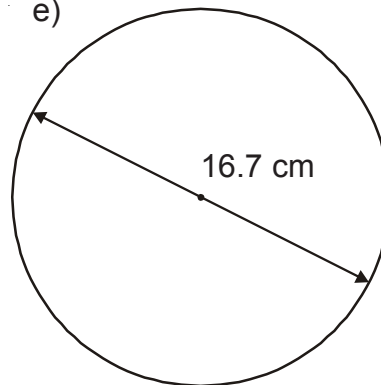
1) Find the areas of the following circles



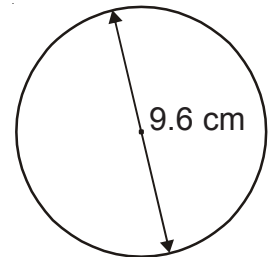
d)  $A = 153.958 \text{ cm}^2$



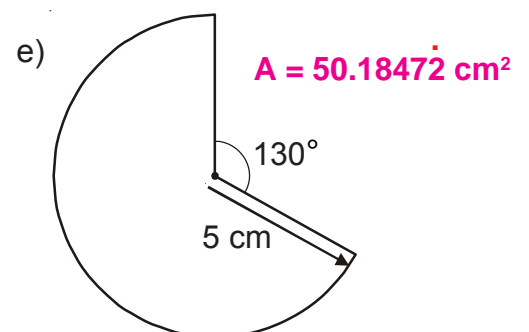
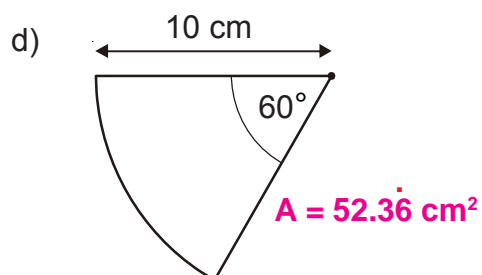
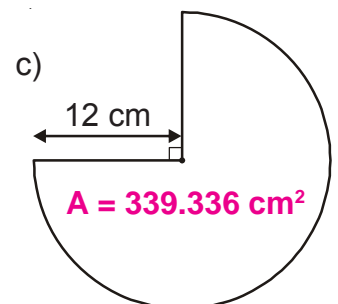
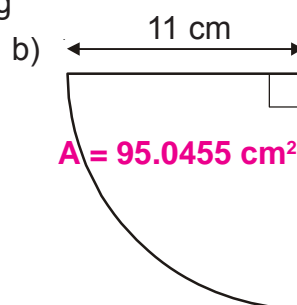
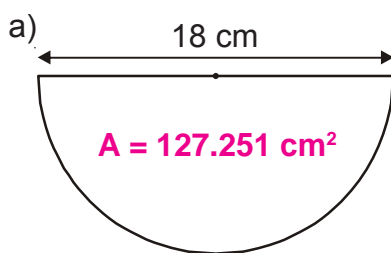
e)  $A = 218.068095 \text{ cm}^2$



f)  $A = 72.39168 \text{ cm}^2$



2) Find the areas of the following



## P2a Outcomes - Basics

### Answers

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

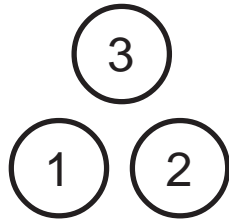
- a) If you flip a coin you will get a 'head'.  $\frac{1}{2}$
- b) If you flip two coins you will get two 'heads'.  $\frac{1}{4}$
- c) If you roll a dice you will get a 6.  $\frac{1}{6}$
- d) If you roll two dice you will get two 6's.  $\frac{1}{36}$
- e) If you flip a coin and roll a dice you will get a 'head' and a 6.  $\frac{1}{12}$
- f) If you flip three coins you will get three 'heads'.  $\frac{1}{8}$
- g) If you flip three coins you will get two 'heads' and a tail in any order.  $\frac{3}{8}$
- h) If you flip three coins you will get at least one 'head'.  $\frac{7}{8}$
- i) If you roll two dice and add the scores together you will get a total of 4.  $\frac{3}{36}$



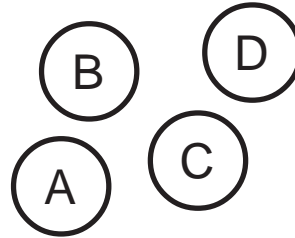
# P2b

## Outcomes Harder Questions Answers

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



Set 1



Set 2

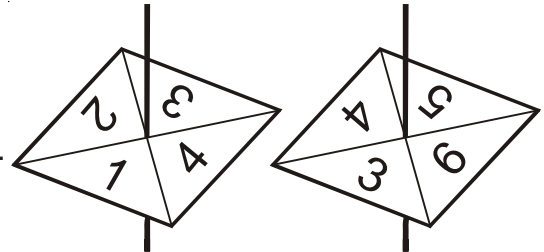
- a) Write down all the possible pairs of counters that may be chosen.  
b) What is the probability that 3B will be picked?  $\frac{1}{12}$   
c) What is the probability that any pair of counters will be chosen **except** 3B?  $\frac{11}{12}$   
d) What is the probability that the pair of counters chosen will include an odd number?  $\frac{8}{12}$

1A 1B 1C 1D  
2A 2B 2C 2D  
3A 3B 3C 3D

- 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.

6	7	8	9	10
5	6	7	8	9
4	5	6	7	8
3	4	5	6	7
	1	2	3	4



- b) What is the probability of scoring a total which is bigger than 5?  $\frac{13}{16}$

# P3

## Mutually Exclusive Events

### Answers

- 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.

0.24

0.18

0.47

0.89

$$1 - 0.89 = 0.11$$

School dinner	Sausages	Chicken	Pizza	Tuna
Probability	0.24	0.18	? 0.11	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 probability x.

School dinner	Sausages	Chicken	Pizza	Tuna
Probability	x	0.41	0.35	x

0.12

0.12

0.41

0.35

0.76

$$1 - 0.76 = 0.24$$

$$0.24 \div 2 = 0.12$$

# P4

## Two-Way Tables

### Answers

- 1) 160 pupils in a school are asked to choose a new colour for the school tie. They can only choose from Blue, Green or Red.

Some of the results are shown in this two-way table.

	Blue	Green	Red	Total
Male	30	27	28	85
Female	35	26	14	75
Total	65	53	42	160

Complete the two-way table.

- 2) A survey was done by a school to find out how people travel to the school. Altogether, 100 people were asked and the results can be seen below.

	Walk	Car	Cycle	Taxi	Bus	Total
Male pupils	12	3	6	1	3	25
Female pupils	2	1	5	6	6	20
Male teachers	7	12	6	6	1	32
Female teachers	4	8	2	7	2	23
Total	25	24	19	20	12	100

- a) Complete the two-way table.
- b) How many people cycle to school? 19
- c) How many female pupils go to school by taxi? 6

# S4

## Frequency Tables Grouped Data Answers

- 1) Here are the Maths test marks for two mixed ability Year 7 classes.

43 16 68 49 31 24 83 61 55 40 72 44 45 23 48 33 20  
81 63 58 41 50 59 46 35 24 13 66 99 53 47 66 48 51  
33 35 40 64 50 31 37 42 35 54 97 24 33 48 53 42

Complete the frequency table to show all the results.

Mark	Tally	Frequency
20 and under		3
21 - 30		4
31 - 40		11
41 - 50		14
51 - 60		7
61 - 70		6
over 70		5

- 2) A group of students measured their hand span (s) in centimetres. Here are their results:

14.7 20.0 16.7 21.6 18.2 17.9 18.1  
19.0 19.9 16.0 14.4 19.1 21.8 16.4  
17.9 15.9 18.0 19.1 16.5 21.1 18.9

Complete the frequency table to show all the results.

Class interval	Tally	Frequency
$14 < s < 16$		3
$16 < s < 18$		6
$18 < s < 20$		8
$20 < s < 22$		4

# S4

## Frequency Tables Grouped Data Answers

Sally, the organiser of a slimming club, keeps data on how much weight ( $w$ ), in kg, her 60 members have lost over the previous twelve months.

She organises the data in a two-way table.

	Men	Women	Total
$0 < w < 5$	2	4	6
$5 < w < 10$	4	10	14
$10 < w < 15$	7	9	16
$15 < w < 20$	2	8	10
$20 < w < 25$	3	11	14
Total	18	42	60

- a) Complete the two-way table.
- b) How many members of the club were women? 42
- c) How many women lost between 5 and 10 kg? 10
- d) How many men lost less than 20 kg? 15
- e) How many men lost 5 kg or more? 16
- f) How many men and women lost 15 kg or more? 24

# S5

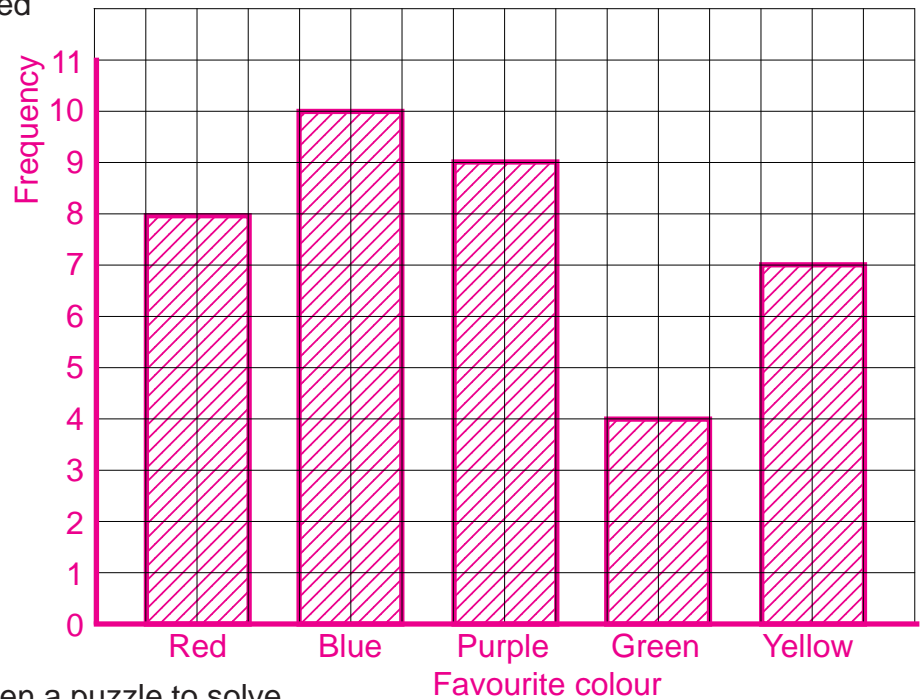
## Frequency Diagrams

### Answers

Favourite Colours

- 1) A group of pupils were asked for their favourite colour. Here are the results.  
Draw a suitable chart to show this information.

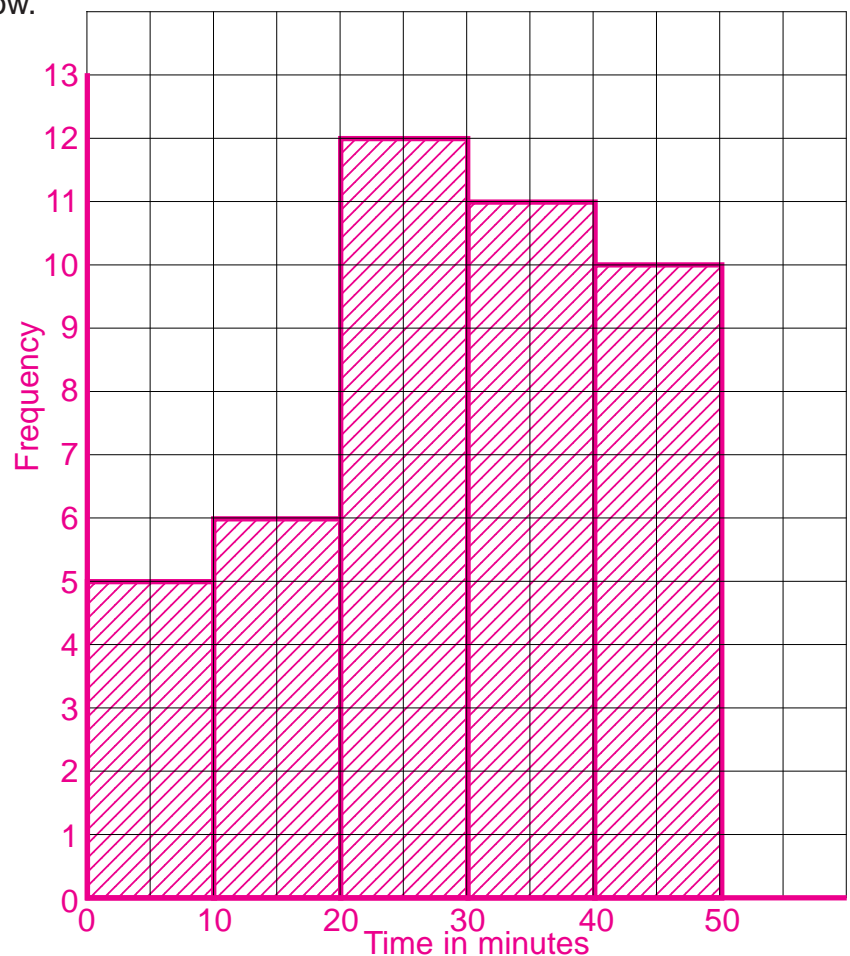
Colour	Frequency
Red	8
Blue	10
Purple	9
Green	4
Yellow	7



- 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
$0 < t < 10$	5
$10 < t < 20$	6
$20 < t < 30$	12
$30 < t < 40$	11
$40 < t < 50$	10

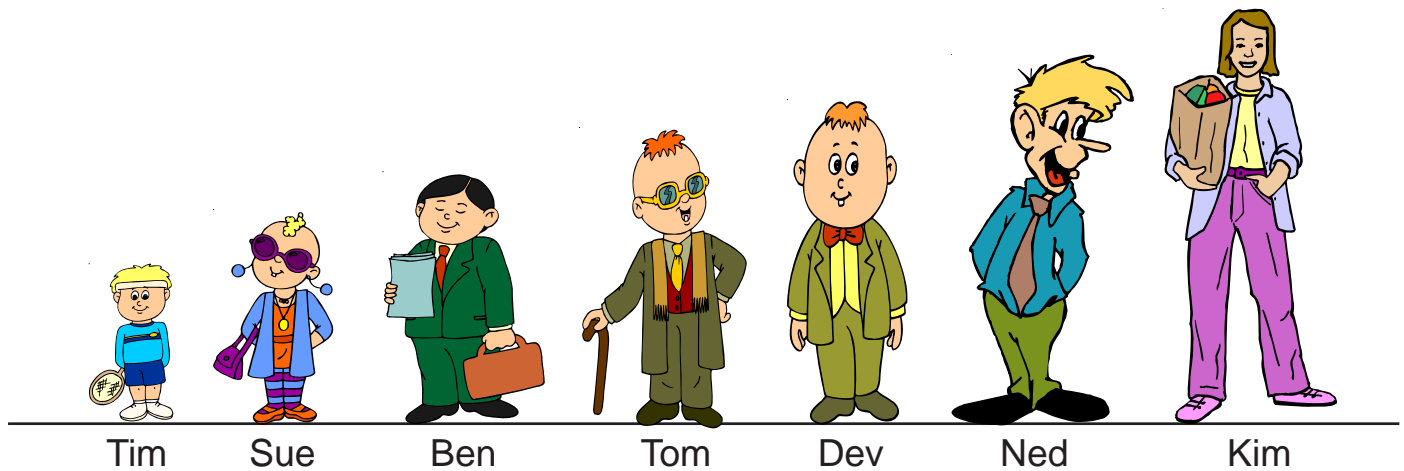
Time to Solve a Puzzle



# S6

## Median, Mode and Range

### Answers



- 1) a) In this group of seven people, which one has the median average height? **Tom**
- b) What are the names of the people who are below the median average height? **Tim, Sue and Ben**
- c) To find the range of the heights you would need to measure the height of two people. Which two? **Kim and Tim**

- 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. **2**
- b) Which number of pets is the mode? **1**
- c) What is the range of the answers? **5 (5 – 0)**

- 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? **Red**
- b) Why can't we find the median colour? **The median can only be used with numerical values.**

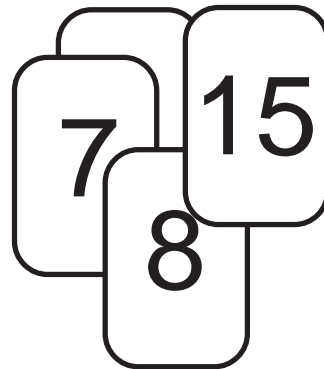
# S6

## Median, Mode and Range

### Answers

- 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
- Find the modal height of the plants. **15 cm**
  - Find the median height of the plants. **15.5 cm**
  - Find the range of the heights. **8 cm**

- 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. **11**



- 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.

- What is Sue's modal score? **6**
- What is Sue's median score? **4**
- What is the range of Sue's scores? **5**

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

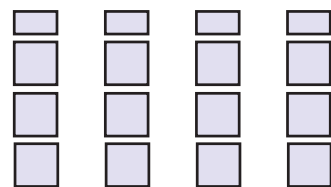
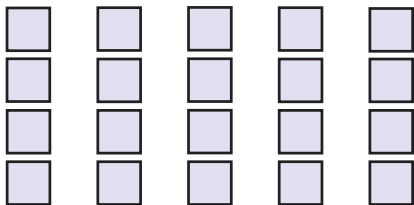


# S7

## The Mean Average

### Answers

- 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? **4**
- 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? **3.5**



- 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. **4.5**  
b) How many children had a score below the mean average? **10**

- 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.

**Mean average for David's class: 14.1875**

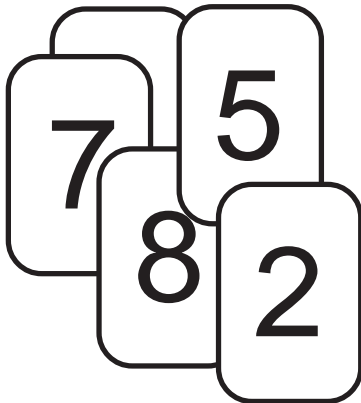
**Mean average for Harry's class: 14.28571**

**Harry's class did best.**

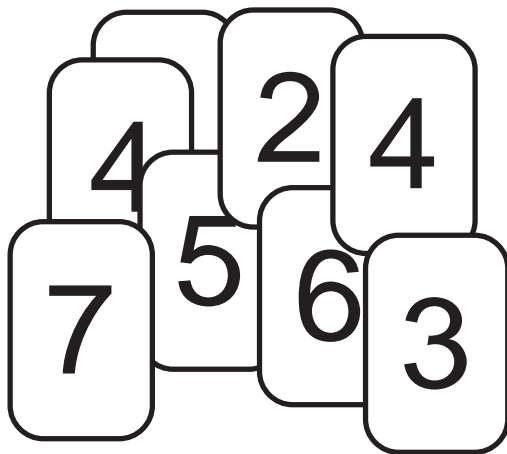
# S7

## The Mean Average

### Answers



- 1) If the mean average number on these five cards is 6, what is the number on the bottom card? **8**



- 2) If the mean average number on these eight cards is 4.25, what is the number on the bottom card? **3**

- 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.  
**3.9**

- 4) What is the mean average number of arms per person in Britain? **1.999....**  
**Very close to 2 but definitely not quite 2**
- 5) Can you find out the mean number of children per family in the UK?  
**Widely reported as 1.8**