

| Grade C topics | Page |
|--|----------------------|
| Clip 92 Overview of Percentages | 92 A and B |
| Clip 93 Increase/Decrease by a Percentage | 93 |
| Clip 94 Ratio | 94 |
| Clip 95 Product of Prime Factors | 95 |
| Clip 96 HCF and LCM | 96 A |
| Clips 95/96 Product of Prime Factors. HCF and LCM..... | 96 B |
| Clip 97 Using Place Value | 97 A and B |
| Clip 98 Recurring Decimals into Fractions | 98 |
| Clip 99 Four Rules of Negatives | 99 |
| Clip 100 Division by Decimals | 100 |
| Clip 101 Estimation | 101 A, B and C |
| | |
| Clip 102 Algebraic Simplification | 102 A and B |
| Clip 103 Expanding and Simplifying Brackets | 103 A and B |
| Clip 104 Factorisation | 104 |
| Clip 105 Solving Equations..... | 105 |
| Clip 106 Forming Equations | 106 A, B and C |
| Clip 107 Changing the Subject of a Formula..... | 107 |
| Clip 108 Inequalities | 108 |
| Clip 109 Solving Inequalities | 109 A |
| Clips 105/109 Solving Equations and Inequalities | 109 B |
| Clip 110 Trial and Improvement | 110 |
| Clip 111 Index Notation for Multiplication and Division..... | 111 A and B |
| Clip 112 Finding the N th Term | 112 A |
| Clips 65/112 N th Term | 112 B and C |
| Clip 113 Drawing Straight Line Graphs | 113 A, B and C |
| Clip 114 Finding the Equation of a Straight Line | 114 |
| Clip 115 Solving Simultaneous Equations Graphically | 115 |
| Clip 116 Drawing Quadratic Graphs | 116 A, B, C, D and E |
| Clip 117 Real-Life Graphs | 117 |
| | |
| Clip 118 Pythagoras' Theorem | 118 A and B |
| Clip 119 Pythagoras - Line on a Graph | 119 |
| Clip 120 Surface Area of Cuboids | 120 |
| Clip 121 Surface Area of Triangular Prisms | 121 |
| Clip 122 Volume of a Prism | 122 A and B |
| Clip 123 Similar Shapes | 123 A, B and C |
| Clip 124 Converting Metric Units | 124 |
| Clip 125 Bounds | 125 |
| Clip 126 Compound Measures | 126 A and B |
| Clip 127 Bisecting a Line | 127 |
| Clip 128 Drawing a Perpendicular to a Line | 128 |
| Clip 129 Bisecting an Angle | 129 |
| Clip 130 Loci..... | 130 A, B and C |
| Clip 131 Bearings | 131 A and B |
| | |
| Clip 132 Experimental Probabilities | 132 |
| Clip 133 Averages from a Table | 133 A, B and C |
| Clip 134 Questionnaires | 134 |

Overview of Percentages



- 1) Find the following to the nearest penny:
- 23% of £670
 - 12% of £580
 - 48% of £64
 - 13% of £7.50
 - 87% of £44
 - 15.7% of £7000
 - 23.8% of £980
 - 34% of £16.34
 - 48.6% of £971.26
 - 78.24% of £12.82
 - 42.15% of £7876.42
 - 0.57% of £60000



- 2) Find the following:
- 10% of £700
 - 10% of £400
 - 10% of £350
 - 10% of £530
 - 10% of £68
 - 10% of £46
 - 10% of £6.50
 - 10% of £12.20
 - 20% of £600
 - 30% of £900
 - 60% of £800
 - 20% of £650
 - 40% of £320
 - 15% of £300
 - 15% of £360
 - 65% of £12000
 - 45% of £64
 - 85% of £96
 - 17.5% of £800
 - 17.5% of £40
 - 17.5% of £8.80



- 3) Change the following to percentages, giving all answers to 1 decimal place:
- 6 out of 28
 - 18 out of 37
 - 42 out of 83
 - 24 out of 96
 - 73 out of 403
 - 234 out of 659
 - 871 out of 903
 - 4.7 out of 23
 - 6.9 out of 79
 - 14.8 out of 23.6
 - 65.8 out of 203.7



- 4) Change the following to percentages:
- 46 out of 100
 - 18 out of 50
 - 7 out of 25
 - 23 out of 25
 - 9 out of 20
 - 16 out of 20
 - 7 out of 10
 - 9.5 out of 10
 - 10 out of 40
 - 16 out of 40
 - 30 out of 40
 - 12 out of 40
 - 28 out of 80
 - 32 out of 80
 - 60 out of 80
 - 3 out of 5
 - 4 out of 5
 - 15 out of 75
 - 24 out of 75
 - 30 out of 75



- 5) A shop gives a discount of 20% on a magazine that usually sells for £2.80. Work out the discount in pence.



- 6) A television costs £596 plus VAT at 17.5%.
Work out the cost of the television including VAT.



- 7) Peter has 128 trees in his garden. 16 of the trees are pear trees.
What percentage of the trees in his garden are pear trees?



- 8) Jane scored 27 out of 42 in a Maths test and 39 out of 61 in a Science test.
What were her percentages in both subjects to 1 decimal place?



- 9) In class 9A there are 7 girls and 18 boys.
What percentage of the class are girls?



- 10) A shop decides to reduce all the prices by 15%.
The original price of a pair of trainers was £70. How much are they after the reduction?



- 11) VAT at 17.5% is added to the price of a car. Before the VAT is added it cost £18000.
How much does it cost with the VAT?



- 1) The normal price of a dog basket is £20.
In a sale the price of the dog basket is reduced by 15%.
Work out the sale price of the dog basket.



- 2) Tony bought a car.
The total cost of the car was £6000 plus VAT at 17½%.
Tony paid £3000 when he got the car.
He paid the rest of the total cost of the car in 10 equal monthly payments.
Work out the cost of each monthly payment.



- 3) Jill bought a car.
The total cost of the car was £8000 plus VAT at 17½%.
Jill paid £3400 when she got the car.
She paid the rest of the total cost of the car in 12 equal monthly payments.
Work out the cost of each monthly payment.



- 4) The cost of a radio is the list price plus VAT at 17.5%.
The list price of the radio is £320.
Work out the cost of the radio.



- 5) A computer costs £460 plus 17.5% VAT.
Calculate the total cost of the computer.



- 6) Work out £168 as a percentage of £700.



- 7) A car tyre costs £90 plus VAT at 17.5%.
Work out the total cost of the tyre.



- 8) Kate got 9 out of 40 in a test.
Write 9 out of 40 as a percentage.



1) Increase:

a) 500 by 10%

c) 80 by 15%

b) 320 by 10%

d) 75 by 20%



2) Decrease:

a) 400 by 10%

c) 140 by 15%

b) 380 by 10%

d) 35 by 20%



3) The price of a laptop is increased by 15%.

The old price of the laptop was £300.

Work out the new price.



4) The price of a £6800 car is reduced by 10%.

What is the new price?



5) Increase:

a) 65 by 12%

c) 600 by 17.5%

b) 120 by 23%

d) 370 by 17.5%



6) Decrease:

a) 42 by 15%

c) 52 by 8.5%

b) 79 by 12%

d) 8900 by 18%



7) The price of a mobile phone is £78.40 plus VAT.

VAT is charged at a rate of 17.5%.

What is the total price of the mobile phone?



8) In a sale, normal prices are reduced by 7%.

The normal price of a camera is £89.

Work out the sale price of the camera.



9) A car dealer offers a discount of 20% off the normal price of a car, for cash.

Peter intends to buy a car which usually costs £6800.

He intends to pay by cash.

Work out how much he will pay.



10) A month ago, John weighed 97.5 kg.

He now weighs 4.5% more.

Work out how much John now weighs.

Give your answer to 1 decimal place.



- 1) Tom and Julie share £48 in the ratio 5 : 3
Work out how much more money Tom gets than Julie gets.



- 2) Ben and Sue share £60 in the ratio 2 : 3
Work out how much each person gets.



- 3) A box contains milk chocolates and plain chocolates only.
The number of milk chocolates to the number of plain chocolates is in the ratio 2 : 1
There are 24 milk chocolates.
Work out the total number of chocolates.



- 4) Andy, Ben and Claire share £54
Ben gets three times as much money as Andy.
Claire gets twice as much money as Ben.

How much money does Claire get?



- 5) There are some marbles in a bag.
18 of the marbles are blue.
12 of the marbles are red.
a) Write down the ratio of the number of blue marbles to the number of red marbles.
Give your ratio in its simplest form.

There are some apples and pears in a box.
The total number of apples and pears is 54.
The ratio of the number of apples to the number of pears is 1 : 5

- b) Work out the number of pears in the box.



- 6) A piece of string is 180 cm long.
Jim cuts it into three pieces in the ratio 2 : 3 : 4
Work out the length of the longest piece.



- 7) Sally is 13 years old.
Tammy is 12 years old.
Danny is 10 years old.
Sally, Tammy and Danny share £28 in the ratio of their ages.
Tammy gives a third of her share to her mother.
How much should Tammy now have?



1) List the first seven prime numbers.



2) Express the following numbers as the product of their prime factors:

a) 12

b) 20

c) 30

d) 24



3) Express the following numbers as the product of their prime factors:

a) 64

b) 100

c) 150



4) Express the following numbers as the product of their prime factors:

a) 175

b) 192

c) 315



5) The number 96 can be written as $2^m \times n$, where m and n are prime numbers.
Find the value of m and the value of n .



6) The number 75 can be written as $5^x \times y$, where x and y are prime numbers.
Find the value of x and the value of y .



1) Find the Highest Common Factor of 16 and 24.



2) Find the Highest Common Factor of 21 and 28.



3) Find the Highest Common Factor of 60 and 150.



4) Find the Highest Common Factor of 96 and 108.



5) Find the Lowest Common Multiple of 20 and 60.



6) Find the Lowest Common Multiple of 28 and 72.



7) Find the Lowest Common Multiple of 70 and 240.



8) Find the Lowest Common Multiple of 35 and 55.



- 9)
- (i) Write 42 and 63 as products of their prime factors.
 - (ii) Work out the Highest Common Factor of 42 and 63.
 - (iii) Work out the Lowest Common Multiple of 42 and 63.



- 1) a) Express 84 as a product of its prime factors.
b) Find the Highest Common Factor (HCF) of 84 and 35.



- 2) Express 72 as the product of its prime factors.



- 3) Express 180 as the product of its prime factors.



- 4) a) Express 66 as a product of its prime factors.
b) Express 132^2 as a product of its prime factors.



- 5) Express 252 as a product of its prime factors.



- 6) Find the Lowest Common Multiple (LCM) of 24 and 36.



- 7) a) Write 56 as a product of its prime factors.
b) Find the Highest Common Factor (HCF) of 56 and 42.



- 8) a) Express 45 as a product of its prime factors.
b) Find the Highest Common Factor (HCF) of 45 and 30.



- 9) a) Find the Highest Common Factor (HCF) of 24 and 30.
b) Find the Lowest Common Multiple (LCM) of 4, 5 and 6.

Using Place Value



1) Using the information that

$$4.7 \times 34 = 159.8$$

write down the value of

- a) 47×34
- b) 4.7×3.4
- c) $159.8 \div 47$



2) Using the information that

$$324 \times 48 = 15552$$

write down the value of

- a) 3.24×4.8
- b) 0.324×0.48
- c) $15552 \div 4.8$



3) Using the information that

$$73 \times 234 = 17082$$

write down the value of

- a) 730×234
- b) 73×2.34



4) Using the information that

$$27 \times 5.6 = 151.2$$

write down the value of

- a) 27×56
- b) 2.7×0.56
- c) $151.2 \div 56$



5) Using the information that

$$719 \times 35 = 25165$$

write down the value of

- a) 71.9×3.5
- b) 0.719×0.35
- c) $25165 \div 7.19$



- 1) Use the information that

$$13 \times 17 = 221$$

to write down the value of

- (i) 1.3×1.7
- (ii) $221 \div 1.7$



- 2) Use the information that

$$253 \times 48 = 12144$$

to write down the value of

- (i) 2.53×4.8
- (ii) 2530×480
- (iii) 0.253×4800
- (iv) $12144 \div 25.3$
- (v) $12144 \div 0.48$



- 3) Use the information that

$$27.3 \times 2.8 = 76.44$$

to write down the value of

- (i) 273×28
- (ii) 2.73×280
- (iii) 0.273×28
- (iv) $76.44 \div 28$
- (v) $7.644 \div 2.73$



- 4) Use the information that

$$97.6 \times 370 = 36112$$

to write down the value of

- (i) 9.76×37
- (ii) 9760×3700
- (iii) 0.0976×3.7
- (iv) $36.112 \div 3.7$
- (v) $361120 \div 9.76$



- 1) Write each recurring decimal as an exact fraction, in its lowest terms.

a) $0.\dot{5}$

b) $0.\dot{7}$

c) $0.\dot{4}$

d) $0.\dot{2}\dot{4}$

e) $0.\dot{7}\dot{5}$

f) $0.\dot{8}\dot{2}$

g) $0.\dot{6}\dot{1}\dot{7}$

h) $0.\dot{2}\dot{1}\dot{6}$

i) $0.\dot{7}\dot{1}\dot{4}$

j) $0.\dot{3}\dot{2}\dot{4}$

k) $0.\dot{7}\dot{2}\dot{3}\dot{5}\dot{7}$

l) $0.\dot{6}\dot{5}\dot{2}\dot{1}\dot{4}$



1) Work out the following:

- a) $2 - 7$
- b) $4 - 6$
- c) $1 - 8$
- d) $0 - 4$



2) Work out the following:

- a) $-3 + 2$
- b) $-7 + 5$
- c) $-3 + 8$
- d) $-9 + 11$



3) Work out the following:

- a) $-1 - 3$
- b) $-4 - 5$
- c) $-7 - 8$
- d) $-2 - 12$



4) Work out the following:

- a) $6 - -3$
- b) $-3 - -5$
- c) $-9 - -2$
- d) $1 - -13$



5) Work out the following:

- a) -3×4
- b) 5×-2
- c) -4×-5
- d) -6×-3



6) Work out the following:

- a) $12 \div -4$
- b) $-20 \div -2$
- c) $-15 \div 3$
- d) $-100 \div -5$



1) Work out the following:

- a) $1 \div 0.1$
- b) $1 \div 0.2$
- c) $1 \div 0.5$



2) Work out the following:

- a) $2 \div 0.2$
- b) $5 \div 0.1$
- c) $8 \div 0.5$



3) Work out the following:

- a) $6 \div 0.3$
- b) $24 \div 0.8$
- c) $7.2 \div 0.9$



4) Work out the following:

- a) $5 \div 0.25$
- b) $8 \div 0.25$
- c) $20 \div 0.25$



5) Work out the following:

- a) $4.08 \div 0.12$
- b) $7.13 \div 0.23$
- c) $44.94 \div 0.14$



6) Work out the following:

- a) $61.6 \div 0.55$
- b) $5.166 \div 0.42$
- c) $2.6202 \div 0.11$

Significant Figures



1) Round the following numbers to 1 significant figure:

- a) 428
- b) 783
- c) 5608
- d) 3521
- e) 21999
- f) 793041



2) Round the following numbers to 2 significant figures:

- a) 846
- b) 2647
- c) 3552
- d) 46817
- e) 89711
- f) 195084



3) Round the following numbers to 3 significant figures:

- a) 91249
- b) 64182
- c) 223058
- d) 389512
- e) 7761223
- f) 4997124



4) Work out the following and give your answer to 3 significant figures:

- a) 216×348
- b) 7721×609
- c) 8714×2198



5) Round the following numbers to 1 significant figure:

- a) 0.00618
- b) 0.00482
- c) 0.00006492
- d) 0.004981



6) Round the following numbers to 2 significant figures:

- a) 0.035812
- b) 0.00082477
- c) 0.0038611
- d) 0.000037211



7) Round the following numbers to 3 significant figures:

- a) 0.00143229
- b) 0.000721981
- c) 0.0000044251
- d) 0.000668821



8) Round the following numbers to 3 significant figures:

- a) 47.84122
- b) 9.778112
- c) 12.35913



9) Work out the following and give your answer to 3 significant figures:

- a) $15 \div 0.38$
- b) $0.31 \div 0.16$
- c) 208×366



1) Work out an estimate for

$$\frac{304 \times 9.96}{0.51}$$



2) Work out an estimate for

$$\frac{6.7 \times 192}{0.051}$$



3) Work out an estimate for

$$\frac{32 \times 4.92}{0.21}$$



4) Work out an estimate for

$$\frac{3880}{236 \times 4.85}$$



5) Work out an estimate for

$$\frac{7.18 \times 19.7}{0.47}$$



1) Work out an estimate for the value of

a)
$$\frac{547}{4.8 \times 9.7}$$

b)
$$\frac{69 \times 398}{207}$$

c)
$$\frac{7.5 \times 2.79}{2.71 + 3.19}$$

d)
$$\frac{409 \times 5.814}{0.19}$$



2) a) Work out an estimate for

$$\frac{19.6 \times 31.7}{7.9 \times 5.2}$$

b) Use your answer to part (a) to find an estimate for

$$\frac{196 \times 317}{79 \times 52}$$

3) a) Work out an estimate for

$$\frac{6.13 \times 9.68}{3.79 \times 2.56}$$

b) Use your answer to part (a) to find an estimate for

$$\frac{613 \times 968}{379 \times 256}$$



1) Simplify the following

- $x + x$
- $2x + 3x$
- $5t - 3t$
- $7y - 6y$
- $x + 2x + 3x$
- $3g - g + 6g$
- $2x - 7x + 8x$
- $y - 2y - 3y + 6y$



2) Simplify the following

- $xy + 3xy$
- $5xy - 2xy$
- $4x^2y + x^2y$
- $3xy^2 - 2xy^2$
- $2x^2y^3 + 4x^2y^3 - 3x^2y^3$
- $6a^2bc^4 + 5a^2bc^4 - 2a^2bc^4$



3) Simplify the following

- $x + y + x + y$
- $2x + 3y + x + 4y$
- $2a + 4b - a + 2b$
- $3x + 4y - x - 2y$
- $6x - 2y + 2x + 5y$
- $4x - 3y - 2x - 5y$
- $3t + 4u + 2t - 7u$
- $2xy + 3t - xy - 4t$



4) Simplify the following

- $x \times x$
- $x \times x \times x \times x \times x$
- $y \times y \times y$



5) Simplify the following

- $x^2 \times x^4$
- $x^3 \times x^5$
- $y \times y^3$
- $x^2 \times x \times x^4$
- $y^2 \times y^3 \times y^4$



6) Simplify the following

- $2x \times x$
- $4x \times 3x$
- $3t^2 \times 2t$
- $4y^2 \times 3y^3$
- $x \times 2x^2 \times 3x^3$



7) Simplify the following

- $x \times y$
- $2x \times 3y$
- $5r \times 2s \times 3t$
- $6x \times 2y \times z$



8) Simplify the following

- $3x \times y$
- $4x^2y \times 2x$
- $3xy^2 \times 2xy^3$
- $6xy \times x^2y^3 \times 2y$
- $2x^2y^3 \times 5x^4y^2$
- $tu^2 \times t^2u \times 4tu$

Algebraic Simplification



1) a) Simplify $4p \times 6q$

b) Simplify $d \times d \times d \times d$

c) Simplify $t \times t^2$



2) a) Simplify $4a + 3c - 2a + c$

b) Simplify $2x - 6c - x + 2c$



3) a) Simplify $5xt + 2xt - 4xt$

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

c) Simplify $m \times m \times m$

d) Simplify $3n \times 2t$



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



5) Simplify $4x + 3y - 2x + 6y$



6) a) Simplify $t^4 \times t^5$

b) Simplify $a \times a \times a$



7) a) Simplify $x^6 \times x^2$

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



8) a) Simplify $3a + 5c - a + 3c$

b) Simplify $x^3 \times x^4$

c) Simplify $4x^2y^4 \times 5xy^2$



9) Simplify $6x + 8y + 2x - 10y$



10) a) Simplify $x \times x \times x \times x$

b) Simplify $2x \times 3y$



11) a) Simplify $pq + 2pq$

b) Simplify $5x + 3y - x - 4y$



12) a) Simplify $6a + 5b - 3b + a$

b) Simplify $x^4 + x^4$



13) a) Simplify $x + y + x + y + x$

b) Simplify $t^2 + t^2 + t^2$



14) a) Simplify $a^3 \times a^3$

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



15) a) Simplify $3d + e - d + 4e$

b) Simplify $3x^2 - x^2$

c) Simplify $5t + 8d - 2t - 3d$

d) Simplify $4t \times 2q$



1) Expand these brackets

- a) $2(x + 3)$
- b) $3(2x + 4)$
- c) $5(3p - 2q)$
- d) $4(x^2 + 2y^2)$
- e) $6(r - r^2)$



2) Expand these brackets

- a) $x(x - 2)$
- b) $x(3x + 5)$
- c) $p(3p - 7q)$
- d) $y(y + 6y^2)$
- e) $x(r + r^2)$



3) Expand these brackets

- a) $2x(x - 5)$
- b) $4x(2x + 3)$
- c) $5p(4p - 2q)$
- d) $2y(3y + 4x^2)$
- e) $x(x + r^2)$



4) Expand these brackets

- a) $x(x^2 - 2)$
- b) $3x(2x^3 + 1)$
- c) $5p^2(4p - 2)$
- d) $2y^2(3y^3 + 4y)$
- e) $2xy(x + y^2)$



5) Expand and simplify

- a) $2(x + y) + 3(x + y)$
- b) $3(2x + y) + 2(5x + 3y)$
- c) $5(x + y) + 3(2x + y)$
- d) $3(2c + d) + 2(c + d)$
- e) $4(2p + q) + 3(2p + q)$



6) Expand and simplify

- a) $2(x + y) + 3(x - y)$
- b) $5(2x + y) + 2(3x - 2y)$
- c) $4(x - y) + 3(2x + y)$
- d) $6(2c - d) + 2(c - d)$
- e) $2(5p - q) + 3(p - 2q)$



7) Expand and simplify

- a) $3(x + 2y) - 3(x - y)$
- b) $5(2x - y) - 2(3x - 2y)$
- c) $7(x - 2y) - 3(2x + y)$
- d) $6(2x - y) - 2(x + 2y)$
- e) $2(5p - q) - (p - 3q)$

Expanding and Simplifying Brackets



1) Expand and simplify

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

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

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

d) $(x + 6)(x + 4)$

e) $(x + 5)(x + 7)$



2) Expand and simplify

a) $(x + 5)(x - 2)$

b) $(x - 7)(x + 2)$

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

d) $(x + 4)(x - 3)$

e) $(x - 5)(x + 5)$



3) Expand and simplify

a) $(x - 3)(x - 4)$

b) $(x - 2)(x - 6)$

c) $(x - 1)(x - 1)$

d) $(x - 7)(x - 2)$

e) $(x - 4)(x - 5)$



4) Expand and simplify

a) $(x - 7)(x + 1)$

b) $(p - 6)(p + 4)$

c) $(e - 3)(e - 7)$

d) $(x + 8)(x + 1)$

e) $(x - 5)(x - 5)$



5) Expand and simplify

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

b) $(3p - 4)(2p + 5)$

c) $(e - 3)(3e - 4)$

d) $(4x - 6)(2x + 1)$

e) $(2x - 3)(2x + 3)$



6) Expand and simplify

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

b) $(3p - 2q)(4p + 5q)$

c) $(4e - 3f)(2e - 2f)$

d) $(6x - y)(6x + y)$

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



1) Factorise

a) $2x + 4$

b) $2y + 10$

c) $3x + 12$

d) $3x - 6$

e) $5x - 15$



2) Factorise

a) $p^2 + 7p$

b) $x^2 + 4x$

c) $y^2 - 2y$

d) $p^2 - 5p$

e) $x^2 + x$



3) Factorise

a) $2x^2 + 6x$

b) $2y^2 - 8y$

c) $5p^2 + 10p$

d) $7c^2 - 21c$

e) $6x^2 + 9x$



4) Factorise

a) $2x^2 - 4xy$

b) $2t^2 + 10tu$

c) $6x^2 - 8xy$

d) $3x^2y^2 + 9xy$

Solving Equations



1) Solve $2x - 3 = 17$



2) Solve $3x + 2 = 14$



3) Solve $5x - 7 = 33$



4) Solve $4x + 7 = 19$



5) Solve $x + x + x + x = 20$



6) Solve $x + 3x = 24$



7) Solve $2(x + 3) = 8$



8) Solve $2(3x - 4) = 22$



9) Solve $5(t - 1) = 20$



10) Solve $3(2x + 5) = 36$



11) Solve $2x + 7 = x + 11$



12) Solve $5y - 2 = 3y + 10$



13) Solve $2x + 1 = 5x - 20$



14) Solve $p - 3 = 3p - 11$



15) Solve $2d + 5 = 20 - 3d$



16) Solve $4 - e = 2e - 8$



17) Solve $2(x + 3) = x + 9$



18) Solve $x - 7 = 3(2x - 4)$



19) Solve $5(x + 3) = 2(x + 6)$



20) Solve $4(2y + 1) = 2(12 - y)$



21) Solve $7 - 3x = 2(x + 1)$



22) Solve $\frac{x}{2} = 5$



23) Solve $\frac{x}{5} = 6$



24) Solve $\frac{2x}{3} = 4$



25) Solve $\frac{5x}{2} = 15$



26) Solve $\frac{x - 2}{3} = 1$



27) Solve $\frac{x + 5}{2} = 7$



28) Solve $\frac{2x + 1}{4} = 2$



29) Solve $\frac{5x - 3}{3} = 4$



30) Solve $\frac{x + 2}{3} = x + 4$



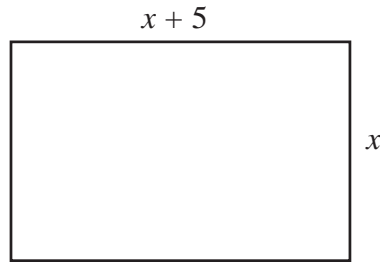
31) Solve $\frac{3x - 1}{4} = 2x - 3$



32) Solve $\frac{4x + 3}{5} = \frac{2x - 1}{2}$



- 1) The width of a rectangle is x centimetres.
The length of the rectangle is $(x + 5)$ centimetres.



- a) Find an expression, in terms of x , for the perimeter of the rectangle.
Give your answer in its simplest form.

The perimeter of the rectangle is 38 centimetres.

- b) Work out the length of the rectangle.



2)

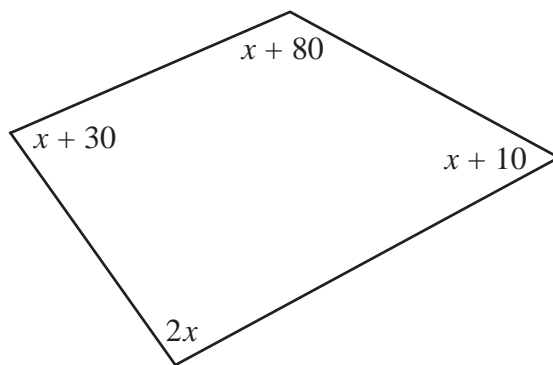


Diagram NOT accurately drawn

The sizes of the angles, in degrees, of the quadrilateral are

$x + 10$
 $2x$
 $x + 80$
 $x + 30$

- a) Use this information to write down an equation in terms of x .
b) Use your answer to part (a) to work out the size of the smallest angle of the quadrilateral.



- 3) Sarah buys 6 cups and 6 mugs

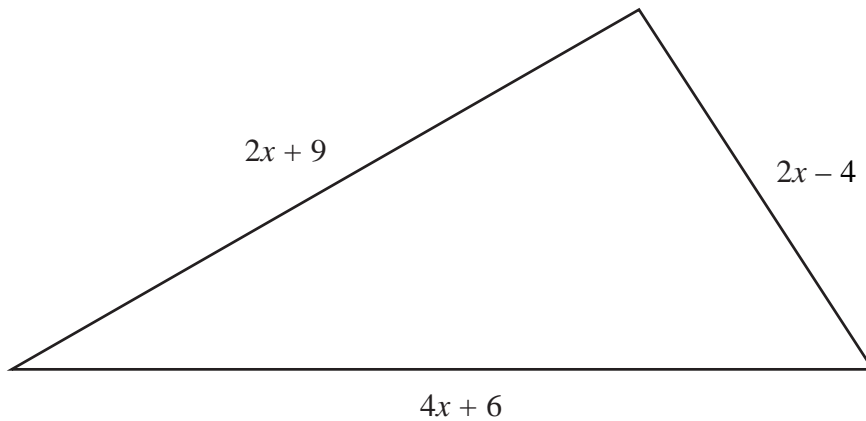
A cup costs $\pounds x$

A mug costs $\pounds(x + 3)$

- a) Write down an expression, in terms of x , for the total cost, in pounds, of 6 cups and 6 mugs.
b) If the total cost of 6 cups and 6 mugs is $\pounds 48$, write an equation in terms of x .
c) Solve your equation to find the cost of a cup and the cost of a mug.



1)



In the diagram, all measurements are in centimetres.

The lengths of the sides are

$$2x + 9$$

$$2x - 4$$

$$4x + 6$$

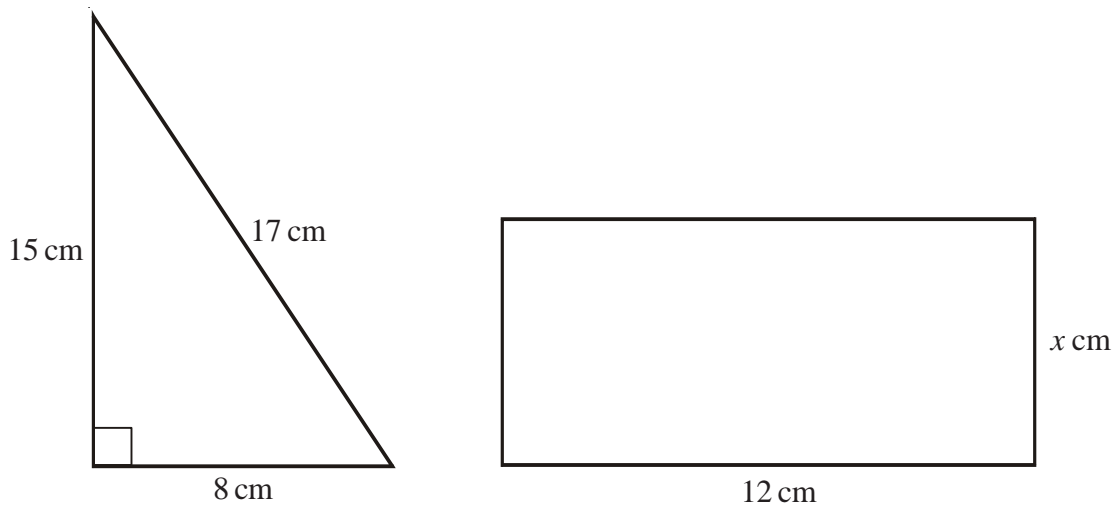
- a) Find an expression, in terms of x , for the perimeter of the triangle.
Give your expression in its simplest form.

The perimeter of the triangle is 39 cm.

- b) Find the value of x .



2) The diagram shows a right-angled triangle and a rectangle.



The area of the right-angled triangle is equal to the area of the rectangle.

Find the value of x .



- 1) A shop sells small boxes and large boxes for storing CDs.

A small box stores x CDs.

A large box stores y CDs.

Emma buys 8 small boxes and 5 large boxes.

Emma can store a total of T CDs in these boxes.

Write down a formula for T in terms of x and y .



- 2) Batteries are sold in packets and boxes.

Each packet contains 4 batteries.

Each box contains 20 batteries.

Tony buys p packets of batteries and b boxes of batteries.

Tony buys a total of N batteries.

Write down a formula for N in terms of p and b .



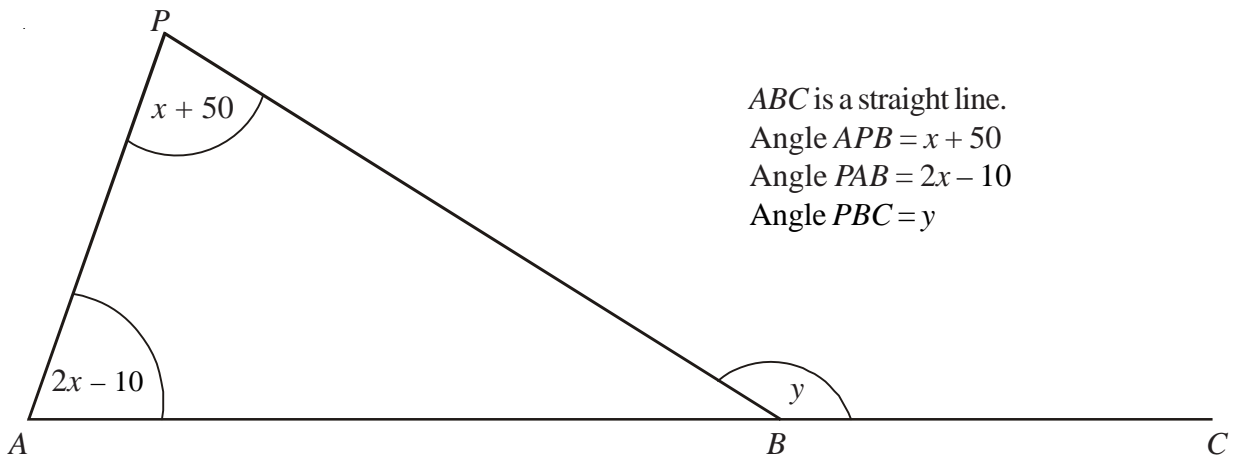
- 3) Compasses cost c pence each.

Rulers cost r pence each.

Write down an expression for the total cost, in pence, of 2 compasses and 4 rulers.



- 4)



- a) Show that $y = 3x + 40$
 Give reasons for each stage of your working.

- b) Given that y equals 145 degrees

- (i) Work out the value of x .
 (ii) Work out the size of the largest angle in triangle APB .



- 1) Make c the subject of the formula.

$$a = b + cd$$



- 2) Make t the subject of the formula.

$$u = v + 2t$$



- 3) Make n the subject of the formula.

$$M = 3n + 5$$



- 4) Make z the subject of the formula.

$$x = 3y + z$$



- 5) $r = 5s + 3t$

a) Make t the subject of the formula.

b) Make s the subject of the formula.



- 6) Rearrange $y = 3x + 1$ to make x the subject.



- 7) Rearrange $y = \frac{1}{2}x + 2$ to make x the subject.

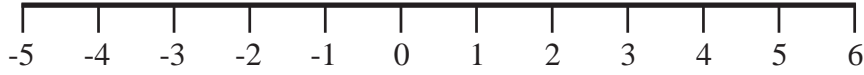


- 8) Rearrange $y = \frac{1}{3}x + 1$ to make x the subject.



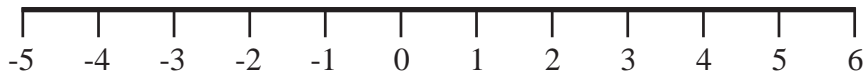
1) Represent this inequality on the number line

$$-3 < x \leq 2$$

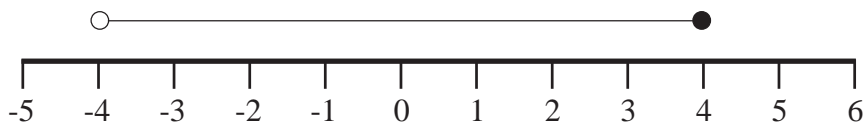


2) Represent this inequality on the number line

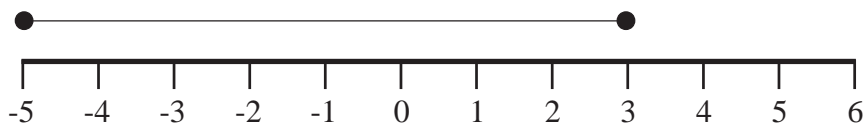
$$-1 < x < 5$$



3) Write down the inequality shown



4) Write down the inequality shown



5) If y is an integer, write down all the possible values of

$$-2 < y < 5$$



6) If x is an integer, write down all the possible values of

$$-9 < x < -5$$



1) Solve

a) $3x - 1 > 5$

b) $7y + 2 \leq 30$

c) $\frac{x}{2} - 3 \geq 2$

d) $5 + 2x > 7$

e) $8 < 5p - 2$

f) $\frac{y}{3} + 5 \geq 3$

g) $\frac{2x}{3} - 5 \geq -3$

h) $6x - 5 > 2x + 3$

i) $3p - 9 < 6 - 2p$

j) $5 - 3y < 2y - 10$



2) a) Solve the inequality

$$2z + 2 \geq 7$$

b) Write down the smallest **integer** value of z which satisfies the inequality

$$2z + 2 \geq 7$$



3) $5x + 2y < 10$

x and y are both integers.

Write down two possible pairs of values that satisfy this inequality.

$x = \dots\dots\dots, y = \dots\dots\dots$

and

$x = \dots\dots\dots, y = \dots\dots\dots$

Solving Equations & Inequalities



1) Solve the inequality $6x - 3 < 9$



2) Solve $4x + 1 = 2x + 12$



3) a) Solve the inequality $3t + 1 < t + 13$

b) If $2t^2 = 72$ find a value of t



4) Solve $3(x + 2) = 8$



5) Solve the inequality $6y > y + 10$



6) Solve $4(2x - 3) = 5x + 7$



7) $h = 5t^2 + 3$

Work out the value of t when $h = 48$



8) Solve $3(2p - 4) = 2p + 12$



9) Solve the equation $4x + 1 = 19$



10) Solve $\frac{29 - x}{3} = x + 5$



11) Solve $3x - 10 = x + 30$



12) Solve the inequality $3x - 2 > x + 7$



13) Solve the inequality $\frac{2x}{3} < 10$



1) The equation

$$x^3 - x = 29$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.



2) The equation

$$x^3 - 4x = 25$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.



3) The equation

$$x^3 - 2x = 68$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.



4) The equation

$$x^3 + 4x = 101$$

has one solution which is a positive number.

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.



1) Write as a power of 8

a) $8^4 \times 8^3$

b) $8^{12} \div 8^7$



2) Write as a power of 3

a) $3^2 \times 3^9$

b) $3^{10} \div 3^3$



3) Simplify

a) $k^5 \times k^2$

b) $x^4 \div x^2$

c) $\frac{k^{11}}{k^6}$

d) $(k^8)^2$



4) Simplify

eg. $(2xy^3)^4 = 2xy^3 \times 2xy^3 \times 2xy^3 \times 2xy^3 = 16x^4y^{12}$

a) $(2xy^5)^3$

b) $(2x^2y^2)^3$

c) $(4xy^4)^2$

d) $(3xy^2)^4$



5) $2^x \times 2^y = 2^{10}$

and

$2^x \div 2^y = 2^2$

Work out the value of x and the value of y .



6) $5^x \times 5^y = 5^{12}$

and

$5^x \div 5^y = 5^6$

Work out the value of x and the value of y .



7) $a = 2^x$, $b = 2^y$

Express in terms of a and b

a) 2^{x+y}

b) 2^{2x}

c) 2^{3y}

d) 2^{x+2y}



- 1) a) Simplify $d \times d \times d \times d$
b) Simplify $t \times t^2$
c) Simplify $m^5 \div m^3$



- 2) a) Simplify $(2x^2)^3$
b) Simplify $3x^2 \times 4x^5y^4$



- 3) a) Simplify $t^4 \times t^5$
b) Simplify $x^8 \div x^5$
c) Simplify $(c^4)^3$



- 4) a) Simplify $x^6 \times x^2$
b) Simplify $\frac{x^8}{x^3}$
c) Simplify $(2t)^3$
d) Simplify $3x^2y \times 4x^5y^4$



- 5) a) Simplify $x^3 \times x^4$
b) Simplify $t^7 \div t^3$
c) Simplify $4x^2y^4 \times 3xy^2$



- 6) a) Simplify $x \times x \times x \times x$
b) Simplify $2x \times 3y$



- 1) Here are the first five terms of an arithmetic sequence.

1 3 5 7 9

Find, in terms of n , an expression for the n th term of this sequence.



- 2) Here are the first five terms of an arithmetic sequence.

6 10 14 18 22

Find, in terms of n , an expression for the n th term of this sequence.



- 3) Here are the first five terms of an arithmetic sequence.

1 4 7 10 13

Find, in terms of n , an expression for the n th term of this sequence.



- 4) Here are the first five terms of an arithmetic sequence.

7 12 17 22 27

Find, in terms of n , an expression for the n th term of this sequence.



- 5) Here are the first five terms of an arithmetic sequence.

8 6 4 2 0

Find, in terms of n , an expression for the n th term of this sequence.



- 1) Here are the first four terms of an arithmetic sequence.

4 7 10 13

Find an expression, in terms of n , for the n th term of the sequence.



- 2) The n th term of a number sequence is $n^2 + 3$
Write down the first three terms of the sequence.



- 3) Here are the first five terms of an arithmetic sequence.

2 7 12 17 22

- a) Find, in terms of n , an expression for the n th term of this sequence.
- b) An expression for the n th term of another sequence is $11 - n^2$
- (i) Find the third term of this sequence.
- (ii) Find the fifth term of this sequence.



- 4) The n th term of a sequence is $2n^2$
- (i) Find the 4th term of the sequence.
- (ii) Is the number 400 a term of the sequence?

Give reasons for your answer.



- 1) The n th term of a number sequence is given by $4n + 1$
- a) Work out the first **two** terms of the number sequence.

Here are the first four terms of another number sequence.

1 4 7 10

- b) Find, in terms of n , an expression for the n th term of this number sequence.



- 2) Here is a number pattern.

| Line Number | | | |
|-------------|-------------|--------------------|----|
| 1 | $1^2 + 3^2$ | $2 \times 2^2 + 2$ | 10 |
| 2 | $2^2 + 4^2$ | $2 \times 3^2 + 2$ | 20 |
| 3 | $3^2 + 5^2$ | $2 \times 4^2 + 2$ | 34 |
| 4 | | | |
| ⋮ | | | |
| 10 | | | |

- a) Complete Line Number 4 of the pattern.
- b) Complete Line Number 10 of the pattern.
- c) Use the number pattern to find the answer to $999^2 + 1001^2$

Drawing Straight Line Graphs



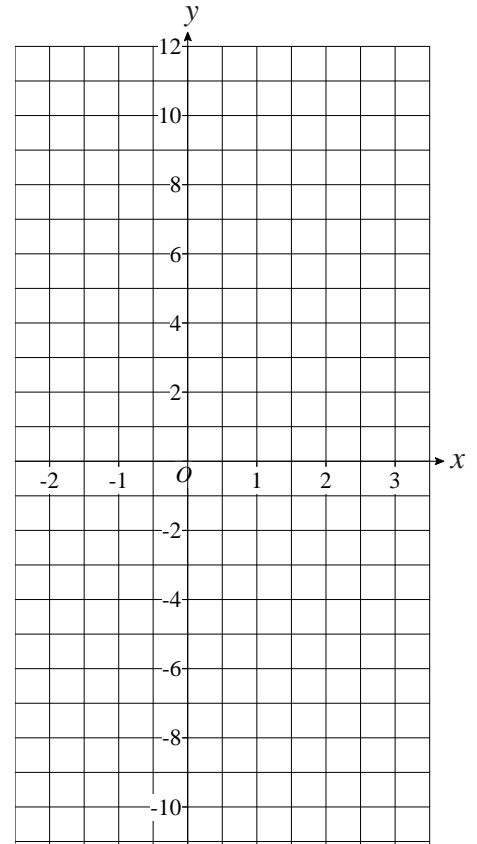
1) a) Complete the table of values for $y = 4x - 2$

| | | | | | | |
|-----|-----|----|----|---|---|----|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | -10 | | -2 | | | 10 |

b) On the grid, draw the graph of $y = 4x - 2$, for values of x from -2 to 3.

c) Use the graph to find the value of y when $x = 2.5$

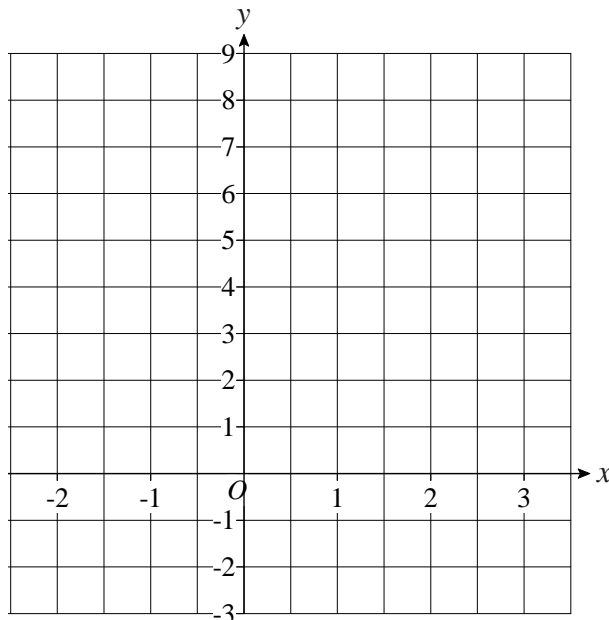
d) Use the graph to find the value of x when $y = -8$



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

| | | | | | | |
|-----|----|----|---|---|---|---|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | | 0 | 2 | | | |

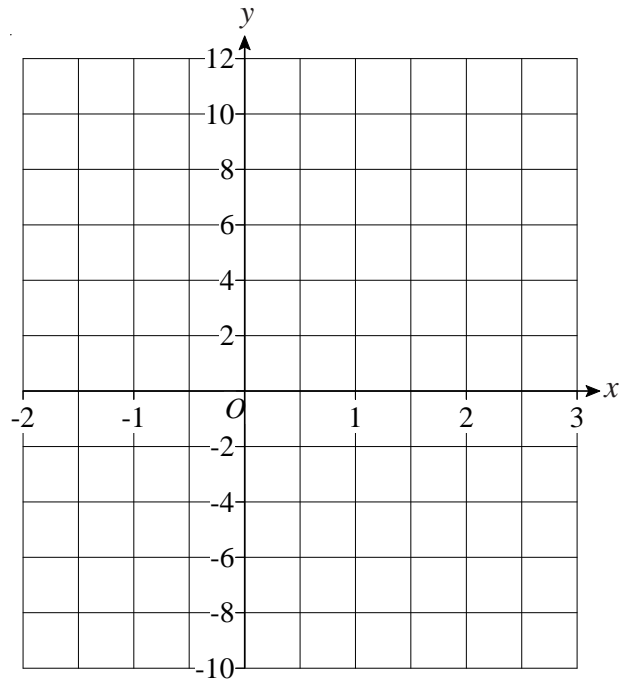
b) On the grid, draw the graph of $y = 2x + 2$.



Drawing Straight Line Graphs



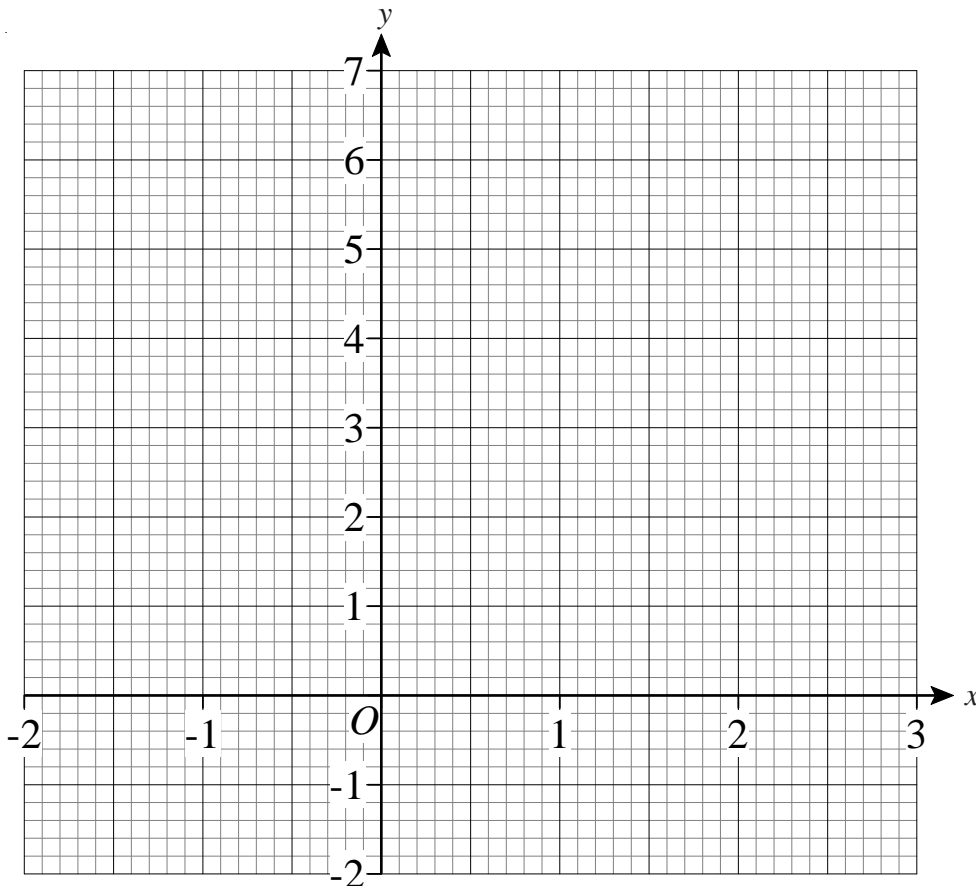
1) On the grid, draw the graph of $y = 2x - 4$



2) a) Complete the table of values for $3x + 2y = 6$

| | | | | | | |
|-----|----|-----|---|---|---|------|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | | 4.5 | 3 | | | -1.5 |

b) On the grid, draw the graph of $3x + 2y = 6$



c) Find the gradient of the graph of $3x + 2y = 6$.

Drawing Straight Line Graphs



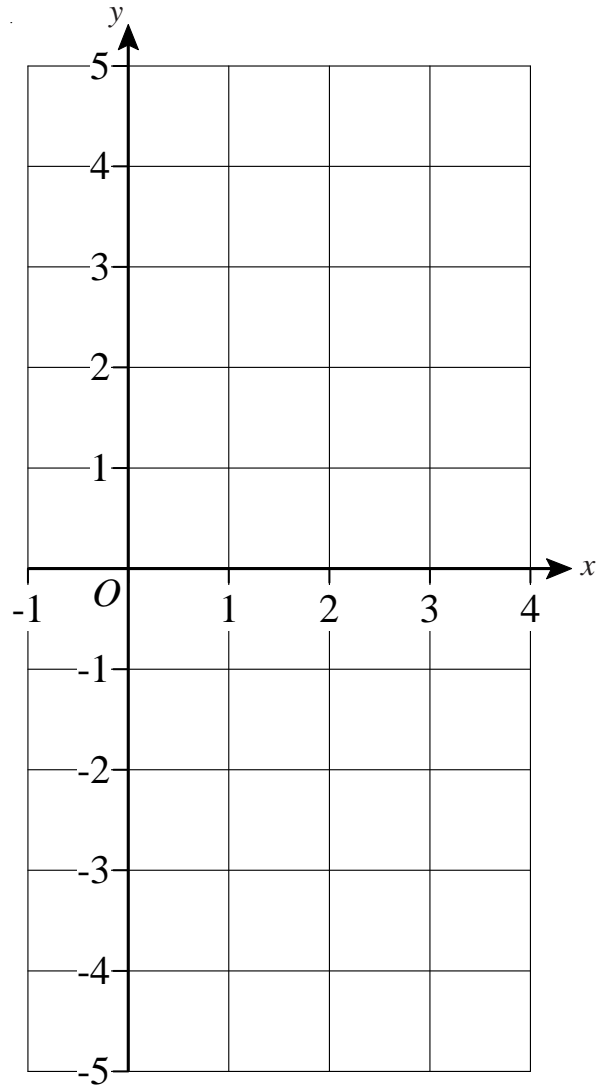
1) a) Complete the table of values for $y = 2x - 3$

| | | | | | | |
|-----|----|---|---|---|---|---|
| x | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | | | 1 | | |

b) Using the axes on the right draw the graph of $y = 2x - 3$

c) Use your graph to work out the value of y when $x = 2.5$

d) Use your graph to work out the value of x when $y = 4.5$



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

| | | | | | | |
|-----|----|---|---|---|----|---|
| x | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | | | | -1 | |

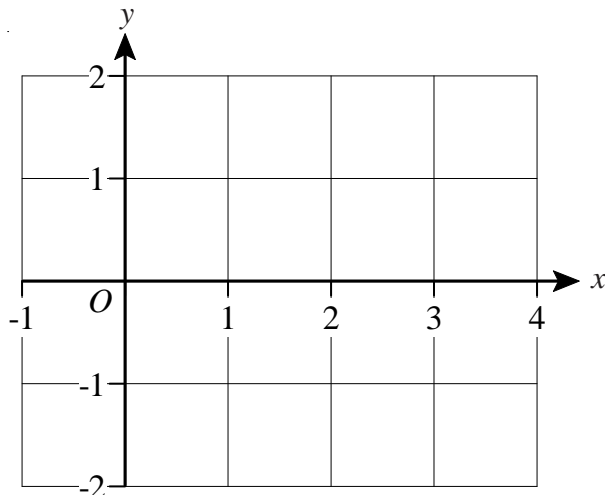
b) Using the axes on the right, again, draw the graph of $y = 2 - x$



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

b) Draw the graph of $y = \frac{1}{2}x - 1$

| | | | | | | |
|-----|----|---|---|---|---|---|
| x | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | | | 0 | | |

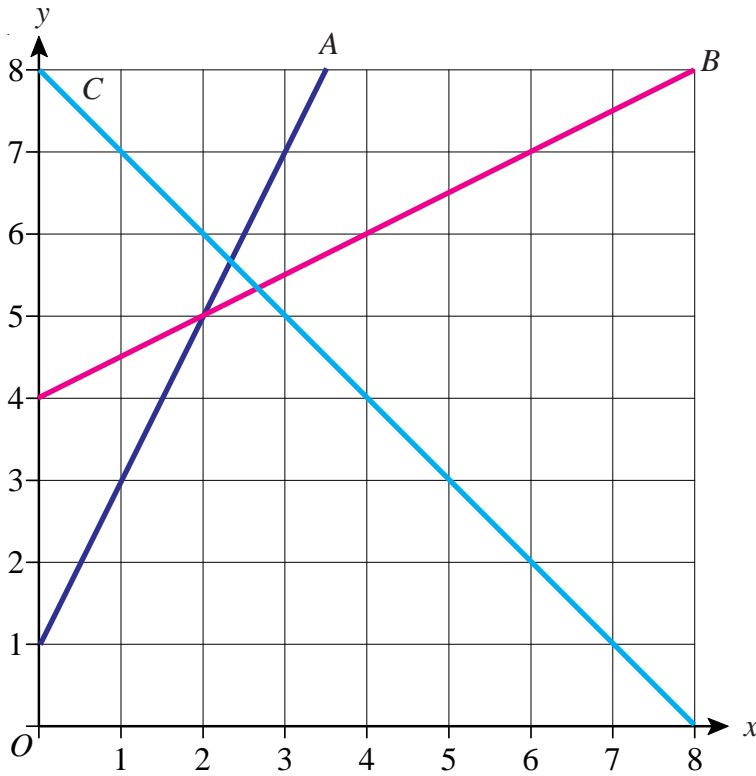


c) Use your graph to find the value of y when $x = 3.5$

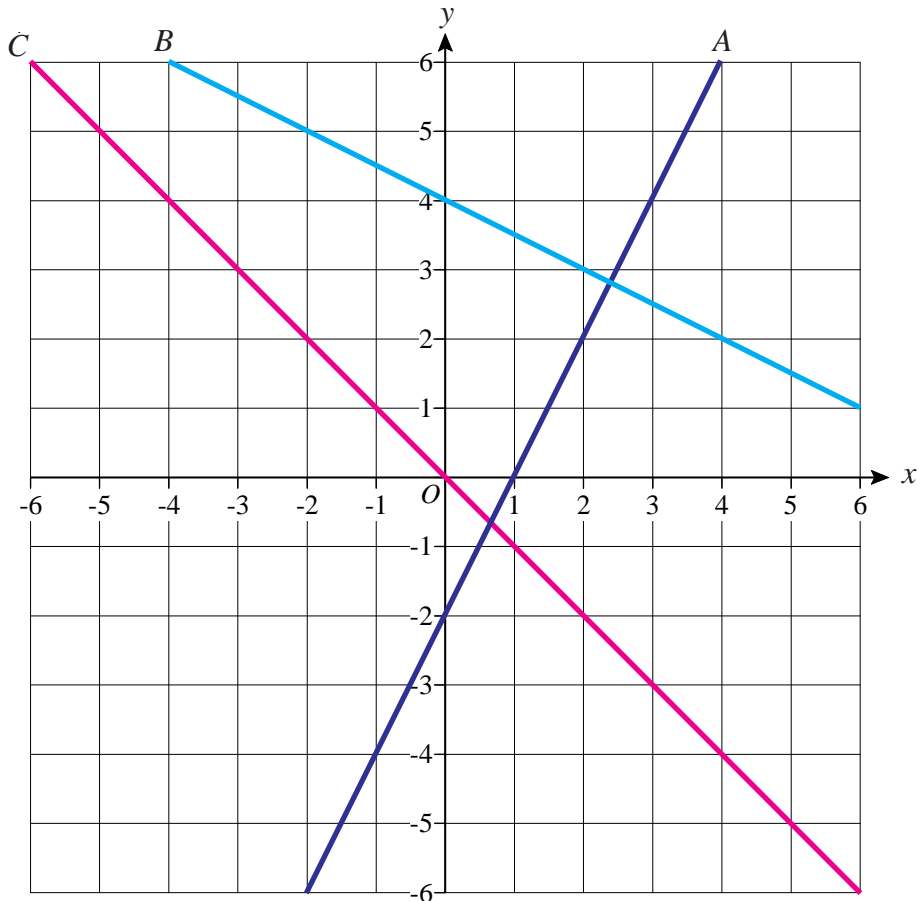
Finding the Equation of a Straight Line



1) Find the equations of lines A , B and C on the axes below



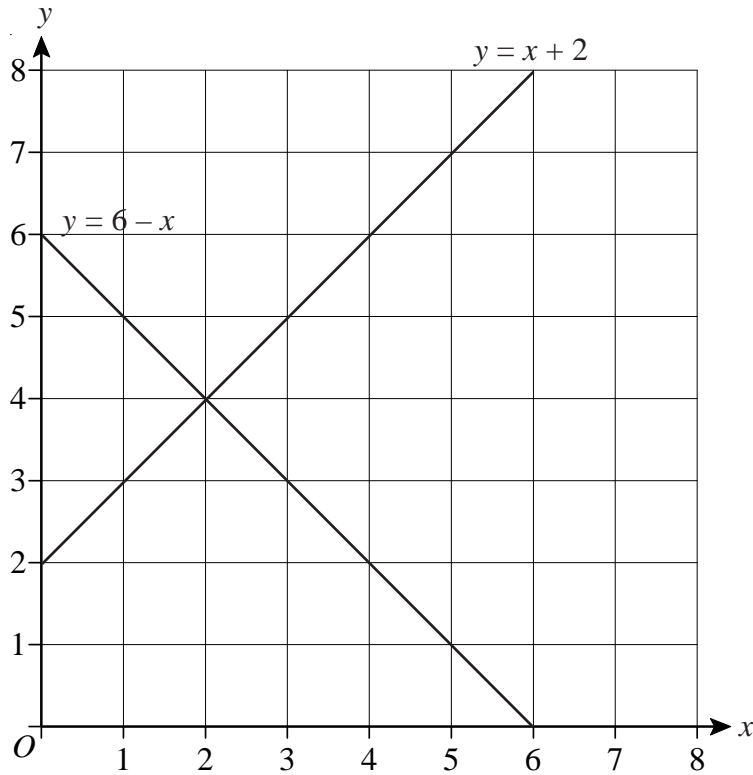
2) Find the equations of lines A , B and C on the axes below



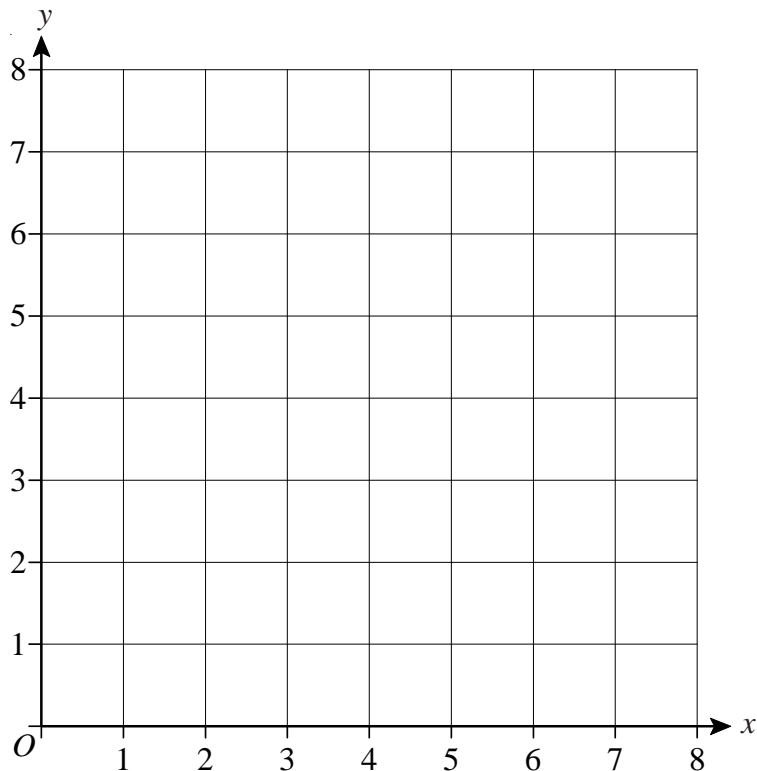
Solving Simultaneous Equations Graphically



- 1) On the axes below, the graphs of $y = x + 2$ and $y = 6 - x$ have been drawn.
Use the graphs to solve the simultaneous equations $y = x + 2$ and $y = 6 - x$



- 2) On the axes below draw the graphs of $y = 2x + 1$ and $y = 7 - x$
Use your graphs to solve the simultaneous equations $y = 2x + 1$ and $y = 7 - x$



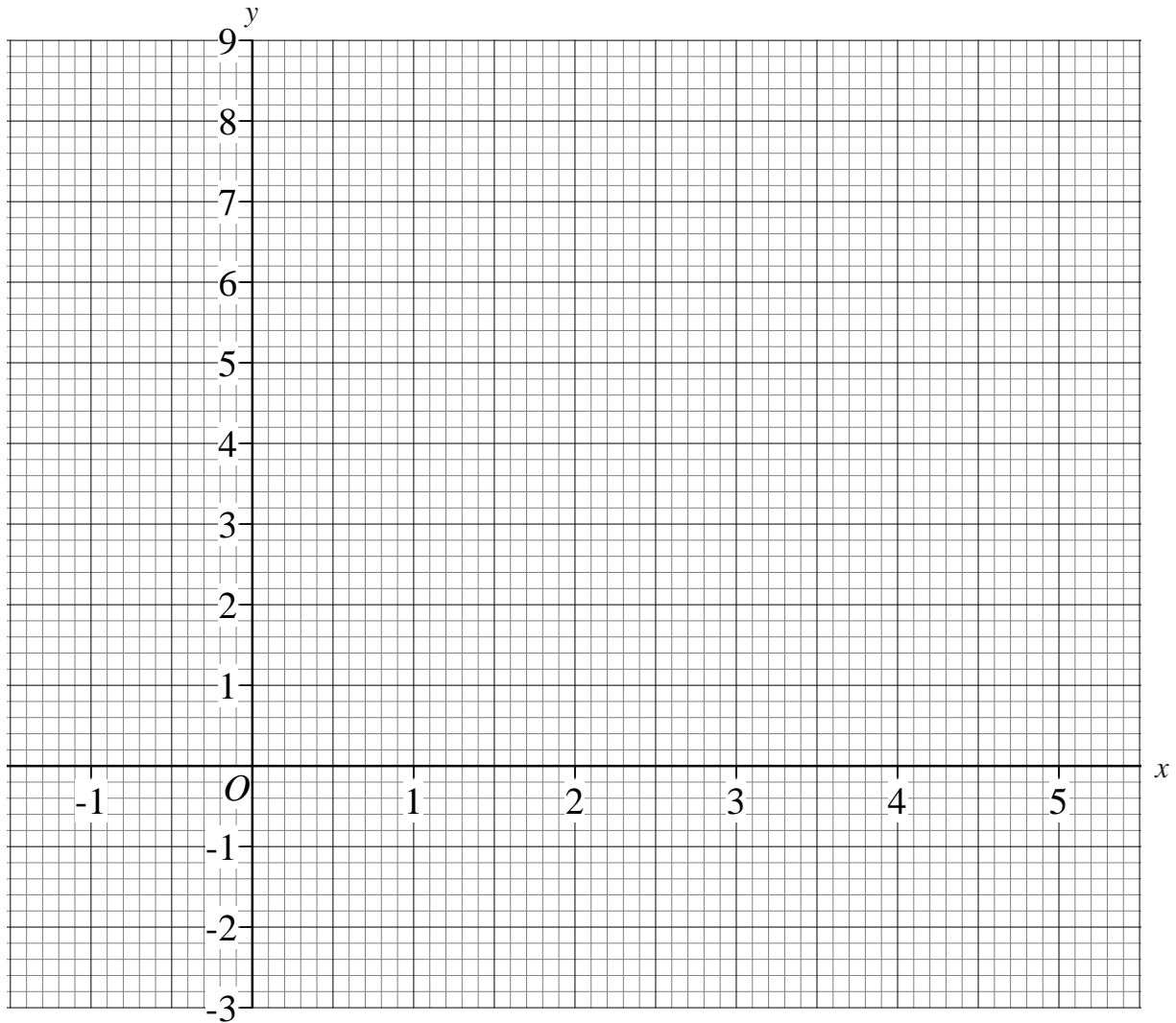
Drawing Quadratic Graphs



1) Complete the table of values for $y = x^2 - 4x + 3$

| | | | | | | | |
|-----|----|---|---|---|---|---|---|
| x | -1 | 0 | 1 | 2 | 3 | 4 | 5 |
| y | | 3 | 0 | | 0 | | 8 |

On the grid, draw the graph of $y = x^2 - 4x + 3$



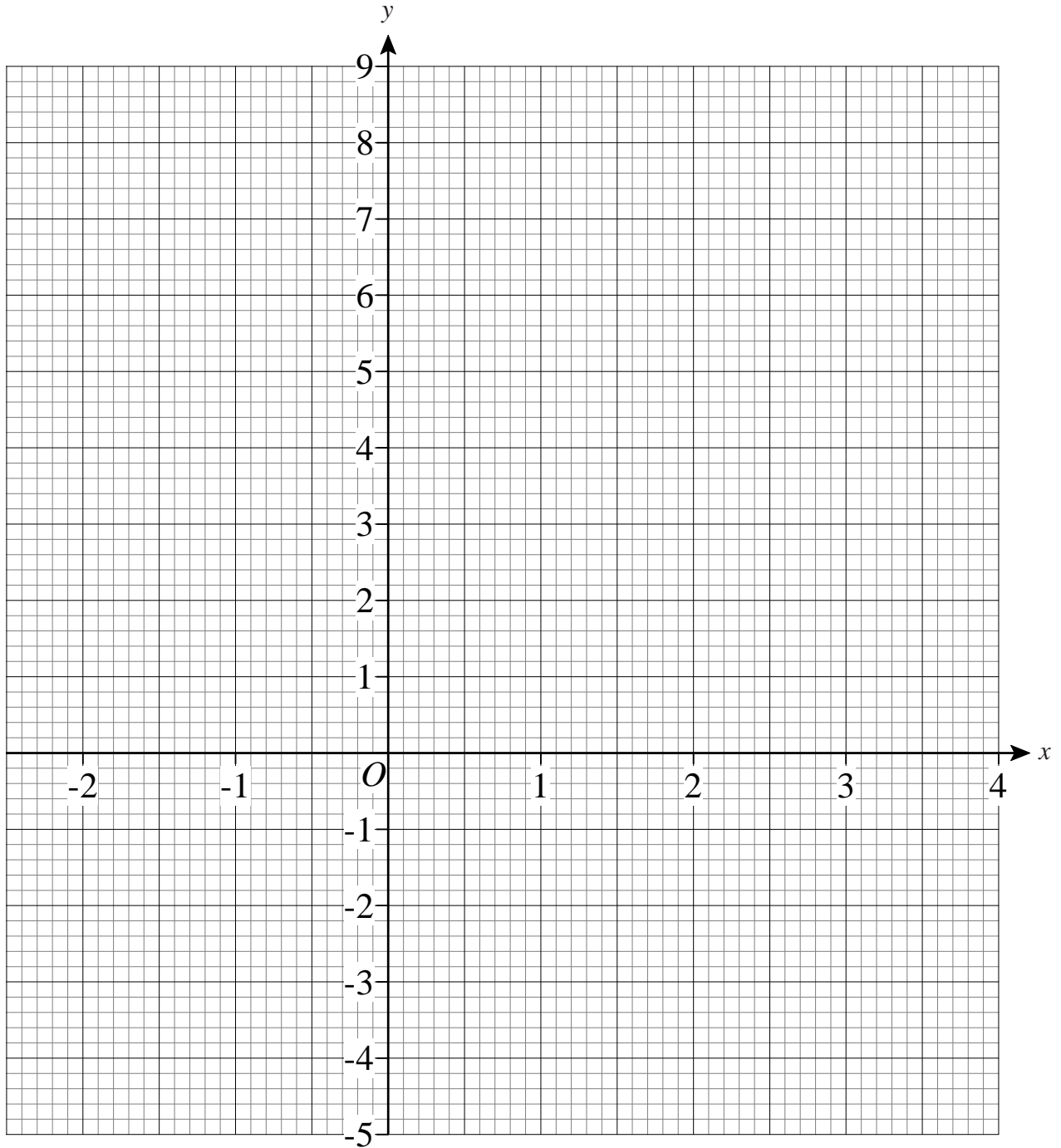
Drawing Quadratic Graphs



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

| | | | | | | | |
|---|----|----|----|----|---|----|---|
| x | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | 2 | -2 | -4 | | -2 | |

b) On the grid, draw the graph of $y = x^2 - 3x - 2$



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

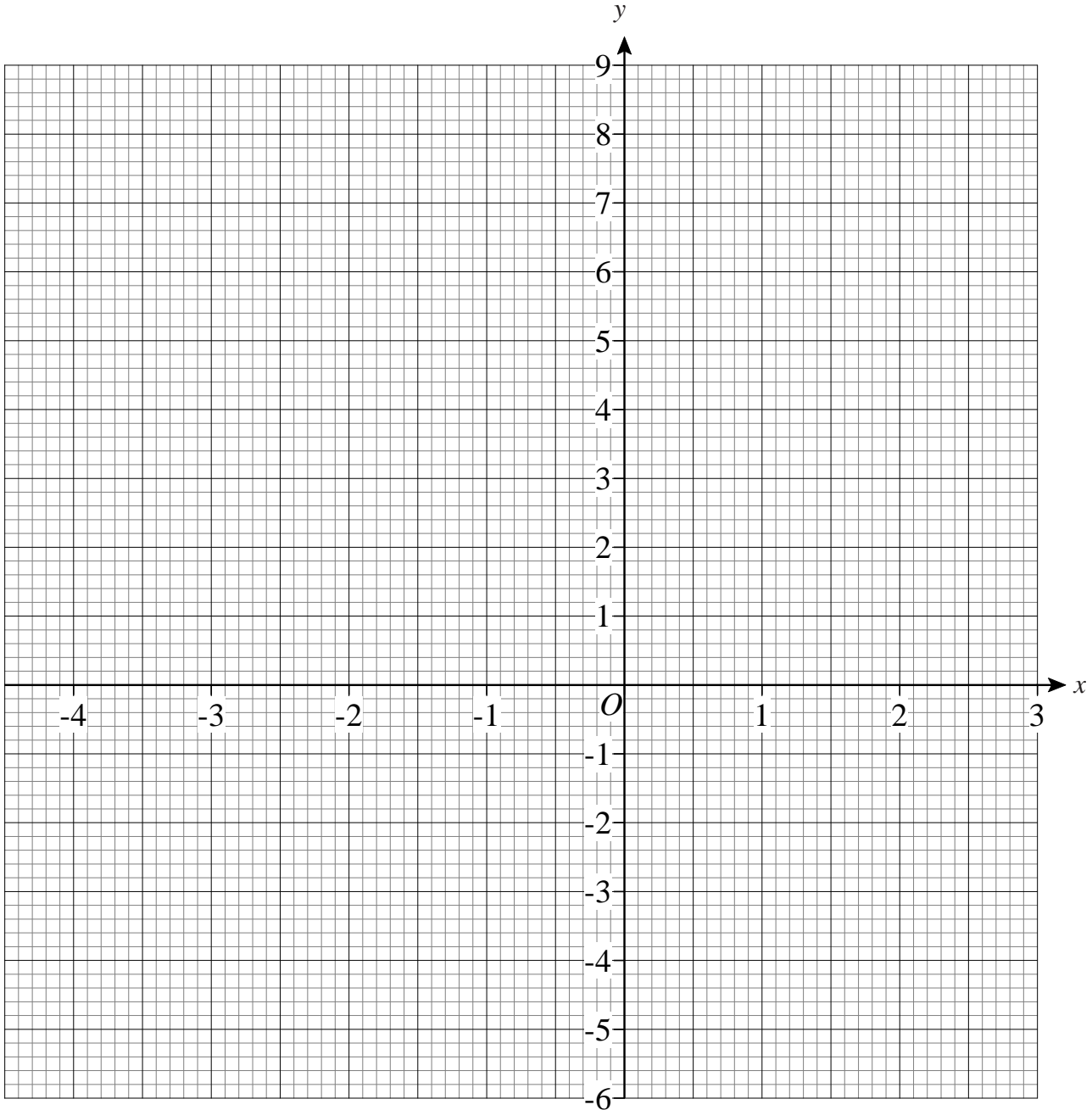
Drawing Quadratic Graphs



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

| | | | | | | | | |
|---|----|----|----|----|---|---|---|---|
| x | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| y | 8 | | -2 | -4 | | | | 8 |

b) On the grid, draw the graph of $y = x^2 + x - 4$



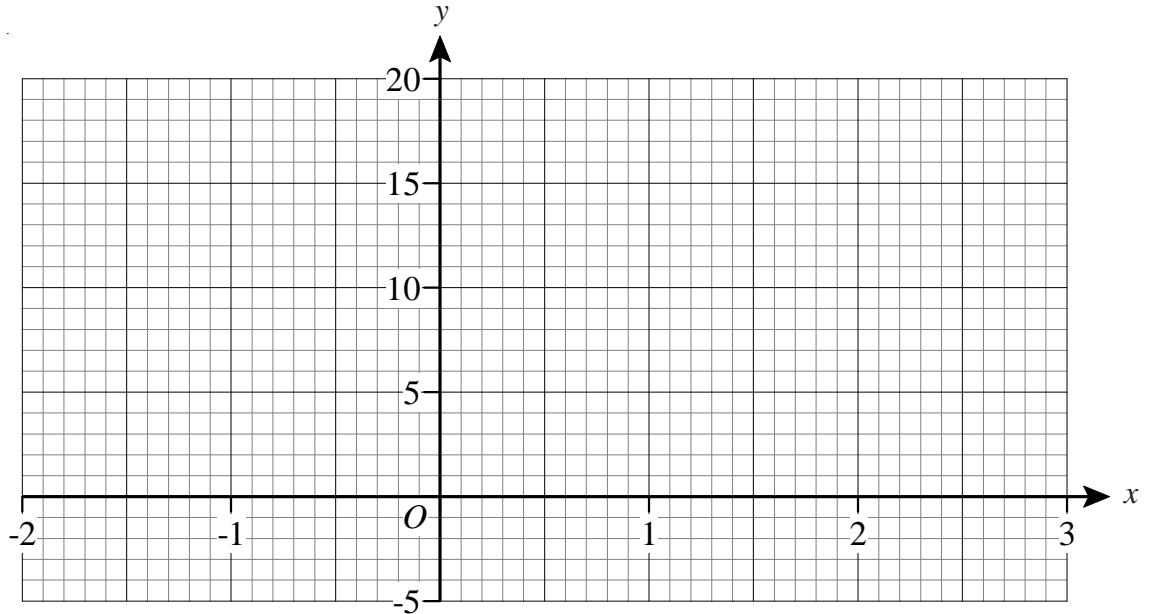
Drawing Quadratic Graphs



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

| | | | | | | |
|-----|----|----|---|---|---|---|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | 14 | | 0 | | | 9 |

- b) On the grid, draw the graph of $y = 2x^2 - 3x$ for values of x from -2 to 3



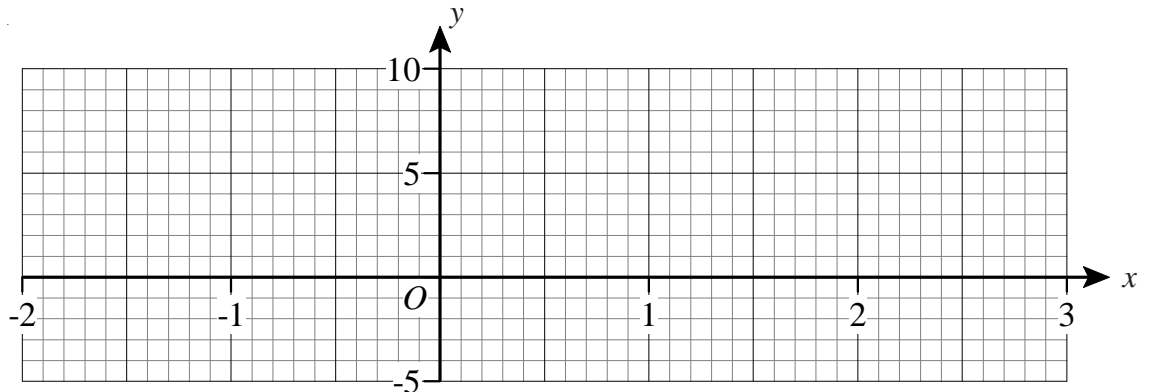
- c) Use the graph to find the value of y when $x = -1.5$
d) Use the graph to find the values of x when $y = 4$



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

| | | | | | | |
|-----|----|----|---|---|---|---|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | 8 | | 0 | | | |

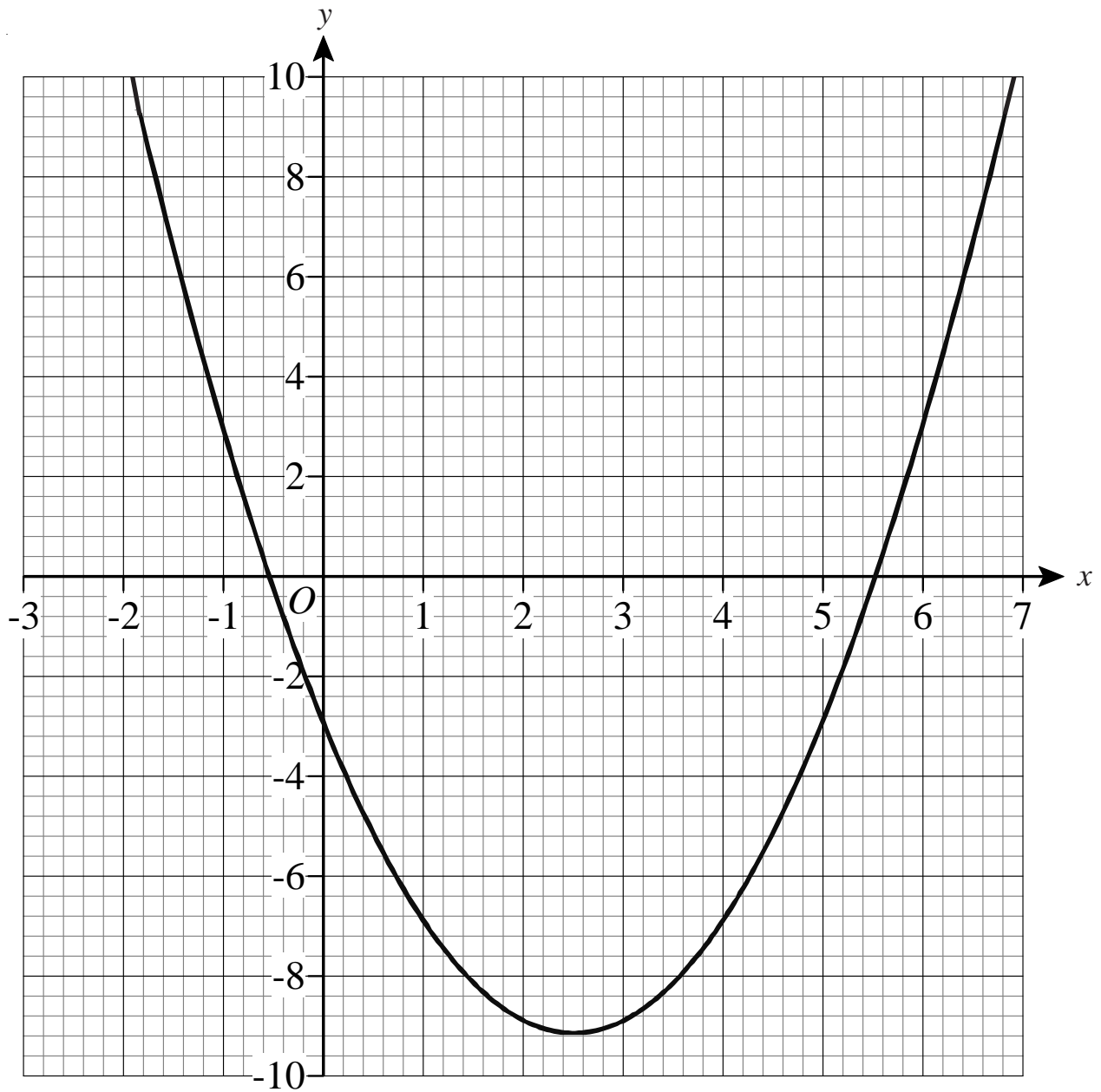
- b) On the grid, draw the graph of $y = x^2 - 2x$ for values of x from -2 to 3



- c) (i) On the same axes draw the straight line $y = 2.5$
(ii) Write down the values of x for which $x^2 - 2x = 2.5$



- 1) The diagram shows the graph of $y = x^2 - 5x - 3$

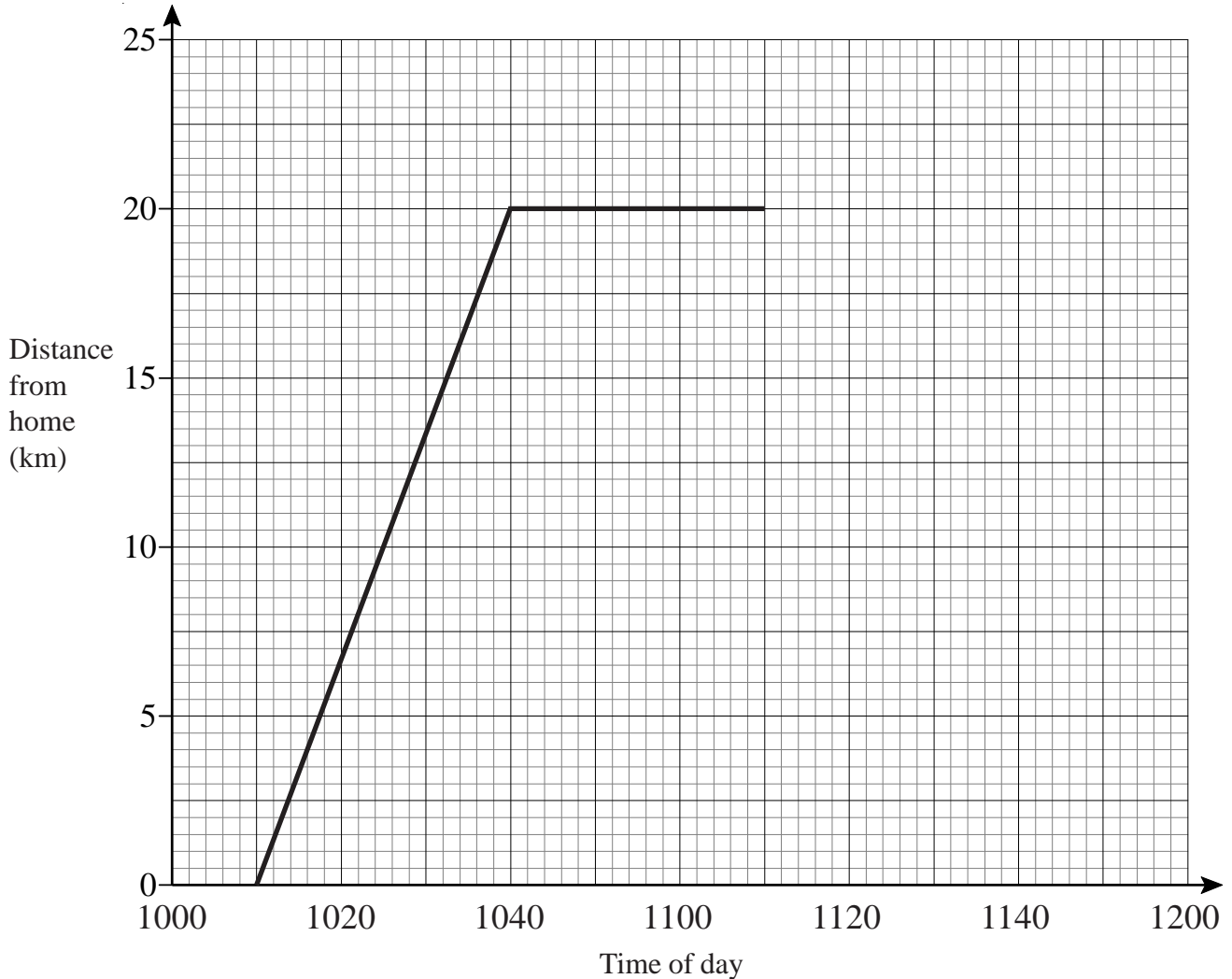


- a) Use the graph to find estimates for the solutions of
- $x^2 - 5x - 3 = 0$
 - $x^2 - 5x - 3 = 6$
- b) Use the graph to find estimates for the solutions of the simultaneous equations
- $$y = x^2 - 5x - 3$$
- $$y = x - 4$$

Real-Life Graphs



- 1) Sarah travelled 20 km from home to her friend's house. She stayed at her friend's house for some time before returning home. Here is the travel graph for part of Sarah's journey.



- a) At what time did Sarah leave home?
 b) How far was Sarah from home at 10 30?

Sarah left her friend's house at 11 10 to return home.

- c) Work out the time in minutes Sarah spent at her friend's house.

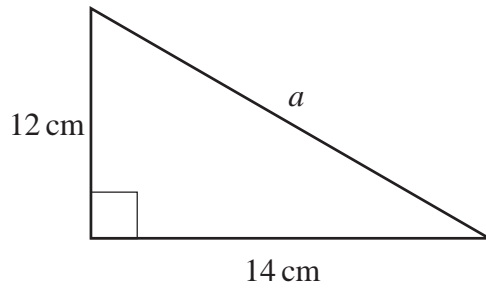
Sarah returned home at a steady speed.
 She arrived home at 11 50

- d) Complete the travel graph.
 e) Work out Sarah's average speed on her journey from her home to her friend's house. Give your answer in kilometres per hour.
 f) Work out Sarah's average speed on her journey home from her friend's house. Give your answer in kilometres per hour.

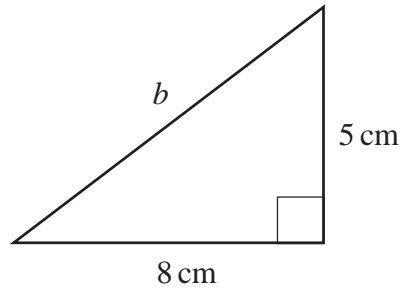
Pythagoras' Theorem



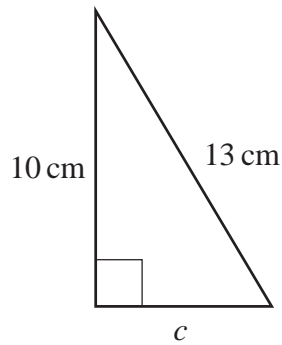
- 1) Find the length of side a .
Give your answer to 1 decimal place.



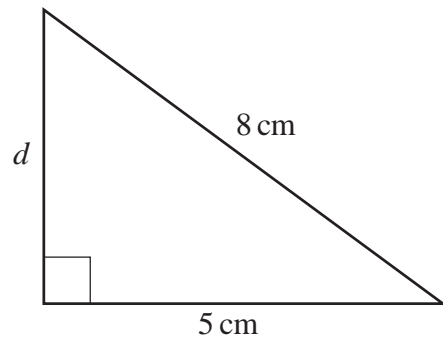
- 2) Find the length of side b .
Give your answer to 1 decimal place.



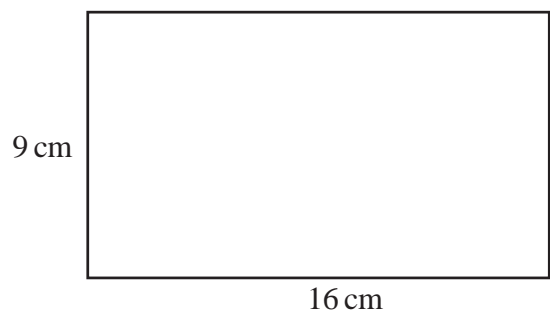
- 3) Find the length of side c .
Give your answer to 1 decimal place.



- 4) Find the length of side d .
Give your answer to 1 decimal place.



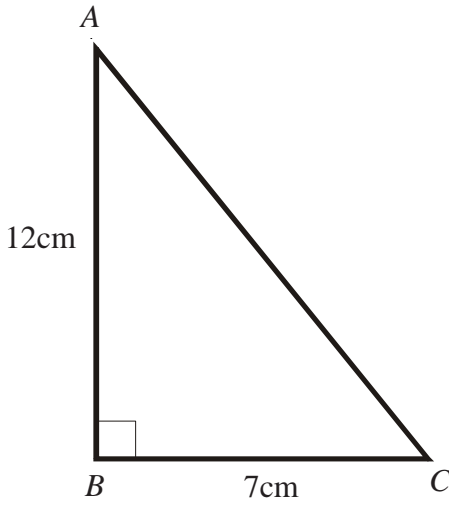
- 5) Find the length of the diagonal of this rectangle.
Give your answer to 1 decimal place.



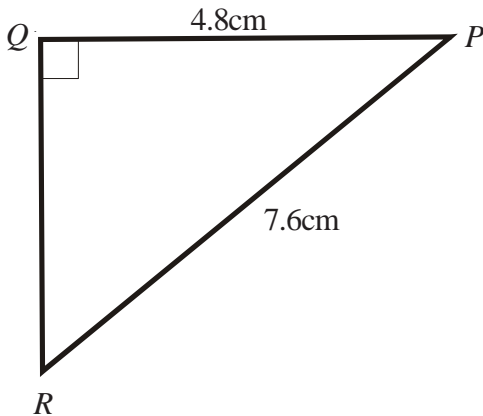
Pythagoras' Theorem



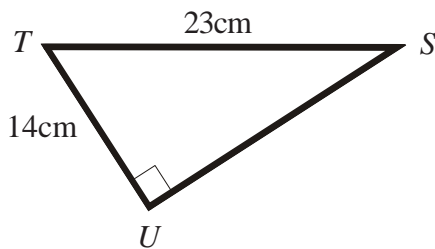
- 1) Find the length of side AC .
Give your answer to 1 decimal place.



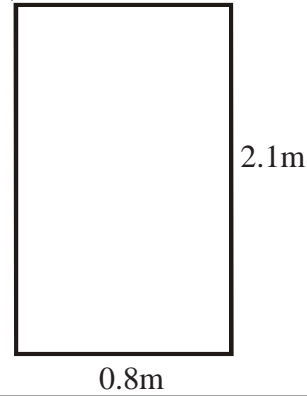
- 2) Find the length of side QR .
Give your answer to 1 decimal place.



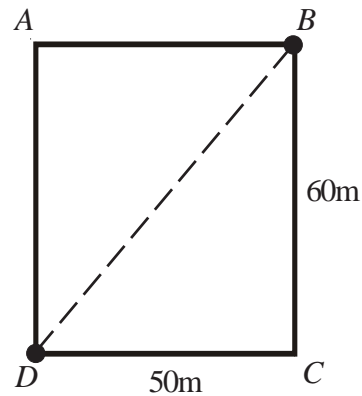
- 3) Find the length of side SU .
Give your answer to 1 decimal place.



- 4) Below is a picture of a doorway.
Find the size of the diagonal of the doorway.
Give your answer to 1 decimal place.



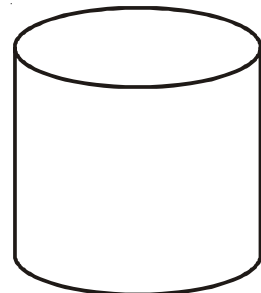
- 5) In the sketch of the rectangular field, below, James wants to walk from B to D .



Which of the following routes is shorter and by how much?
From B to C to D or straight across the field from B to D .
Give your answer to the nearest metre.

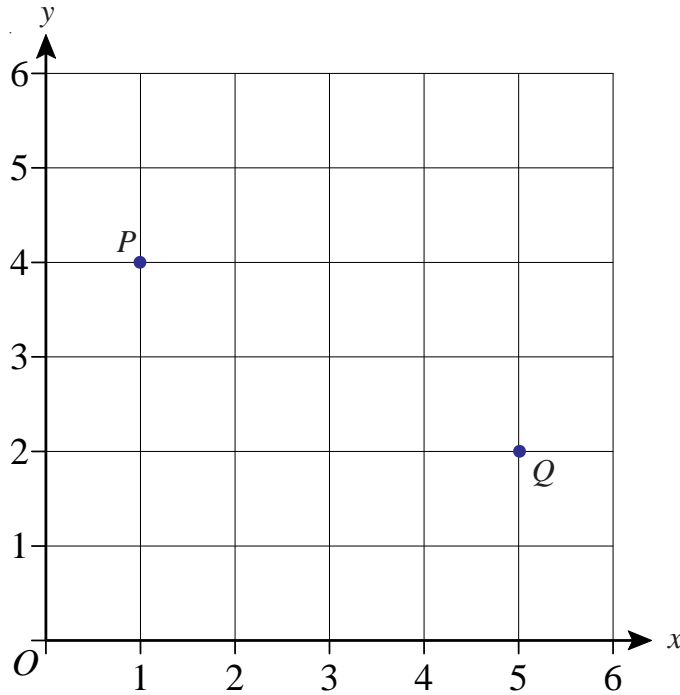


- 6) Fiona keeps her pencils in a cylindrical beaker as shown below.
The beaker has a diameter of 8cm and a height of 17cm .
Will a pencil of length 19cm fit in the beaker without poking out of the top?
All workings must be shown.

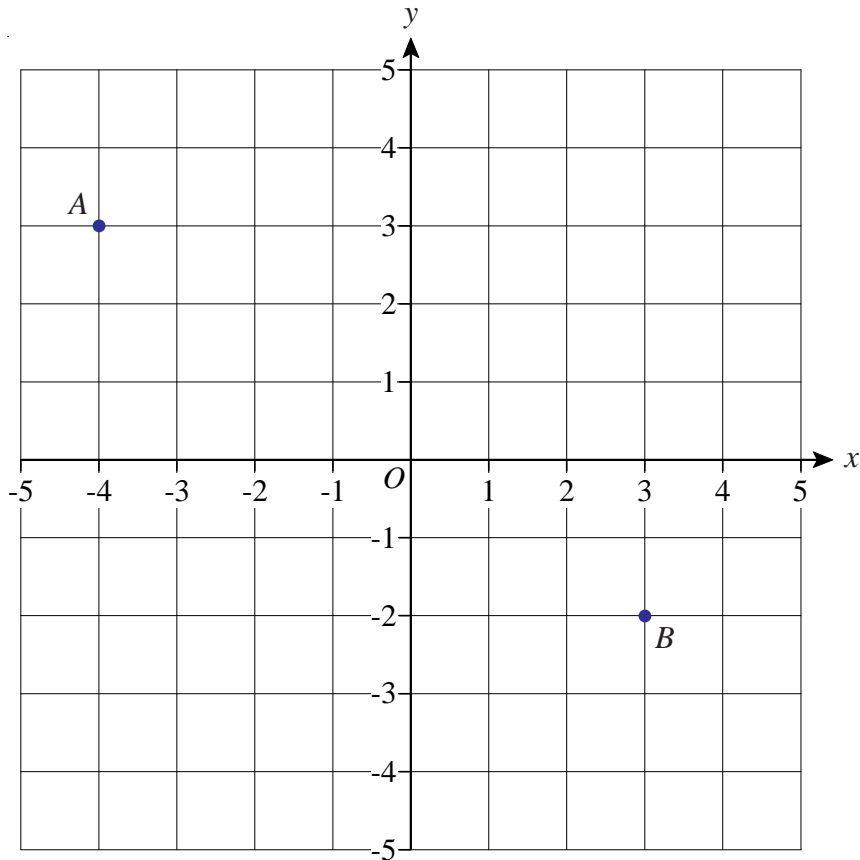




- 1) Points P and Q have coordinates $(1, 4)$ and $(5, 2)$.
 Calculate the shortest distance between P and Q .
 Give your answer correct to 1 decimal place.

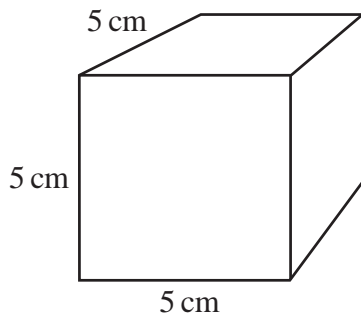


- 2) Points A and B have coordinates $(-4, 3)$ and $(3, -2)$.
 Calculate the shortest distance between A and B .
 Give your answer correct to 1 decimal place.

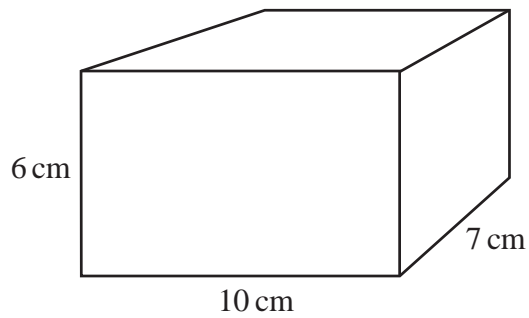




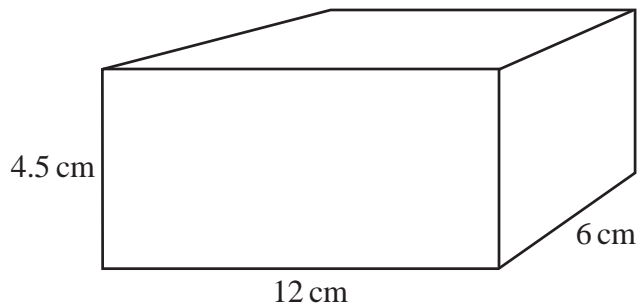
- 1) A cube has sides of length 5 cm.
Find the total surface area of the cube.



- 2) A cuboid has sides of length 10 cm, 6cm and 7 cm.
Find the total surface area of the cuboid.



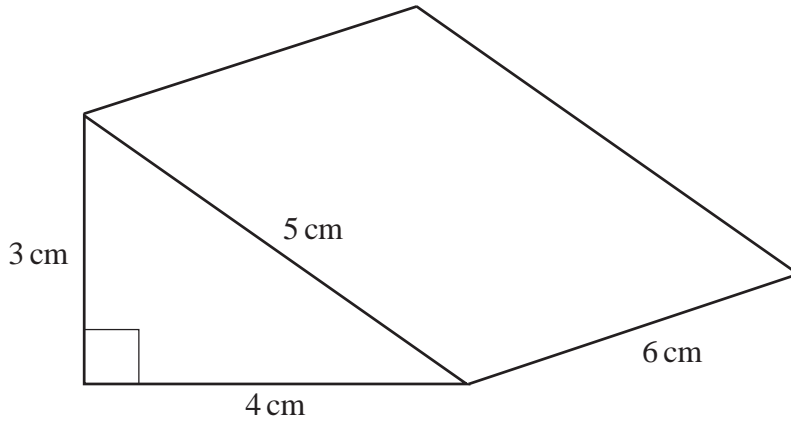
- 3) A cuboid has sides of length 12 cm, 4.5cm and 6 cm.
Find the total surface area of the cuboid.



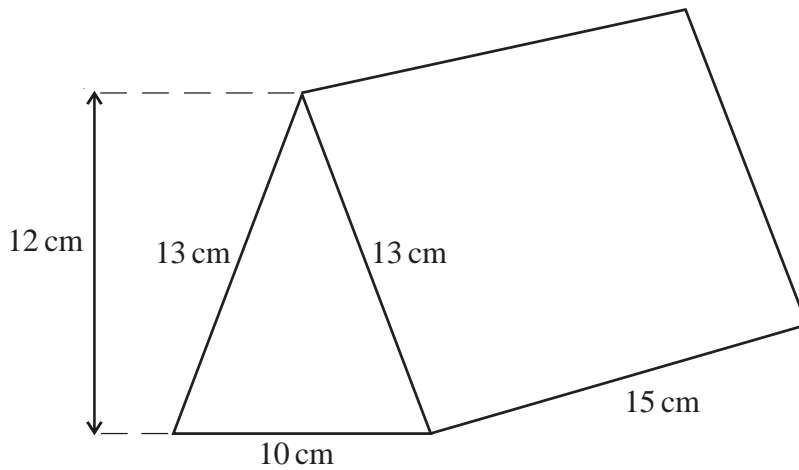
Surface Area of Triangular Prisms



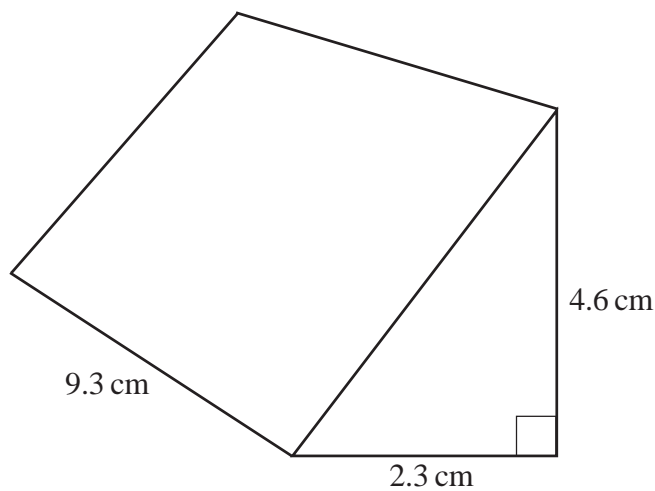
- 1) Find the surface area of this triangular prism.



- 2) Find the surface area of this triangular prism.



- 3) With the aid of Pythagoras' Theorem, find the surface area of this triangular prism.
Give your answer correct to 2 significant figures.

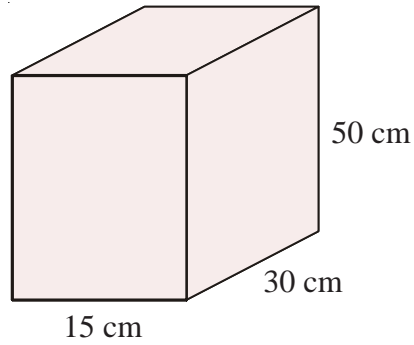


Volume of a Prism

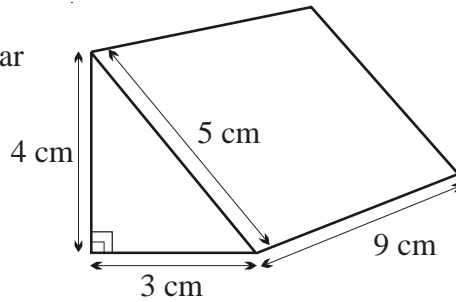


- 1) The diagram shows a cuboid.

Work out the volume of the cuboid.



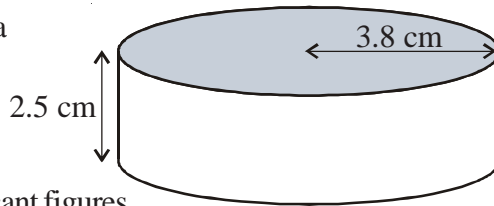
- 2) Calculate the volume of this triangular prism.



- 3) An ice hockey puck is in the shape of a cylinder with a radius of 3.8 cm and a thickness of 2.5 cm.

Take π to be 3.142

Work out the volume of the puck.
Give your answer correct to 3 significant figures.

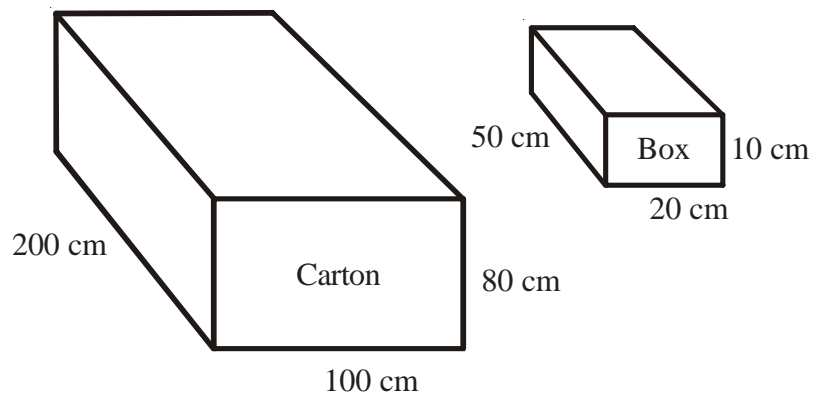


- 4) A cuboid has:
a volume of 80cm^3
a length of 5 cm
a width of 2 cm

Work out the height of the cuboid.



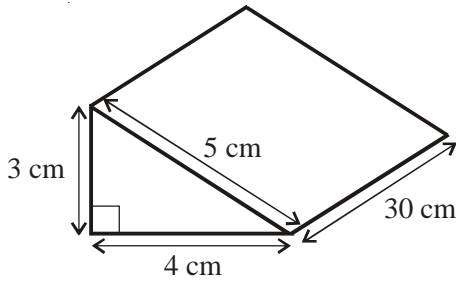
- 5) Work out the maximum number of boxes which can fit in the carton.



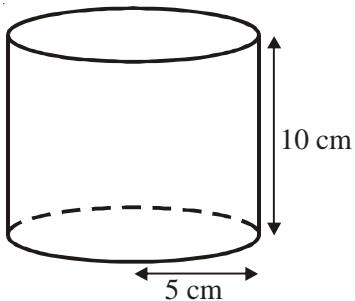
Volume of a Prism



1) Work out the volume of the prism.



2)



A solid cylinder has a radius of 5 cm and a height of 10 cm.

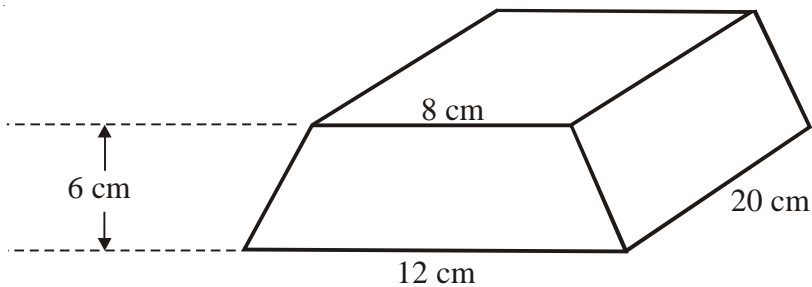
Work out the volume of the cylinder.

Take π to be 3.142

Give your answer correct to 3 significant figures.



3)



The diagram shows a solid prism made from metal.

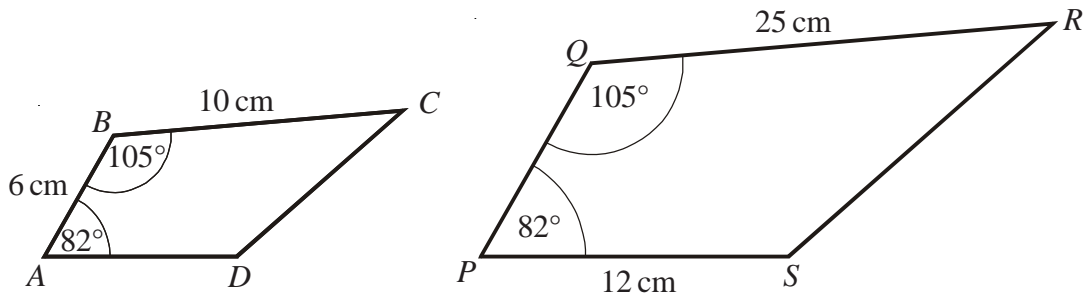
The cross-section of the prism is a trapezium.

Find the volume of the prism.

You must state your units.



1)

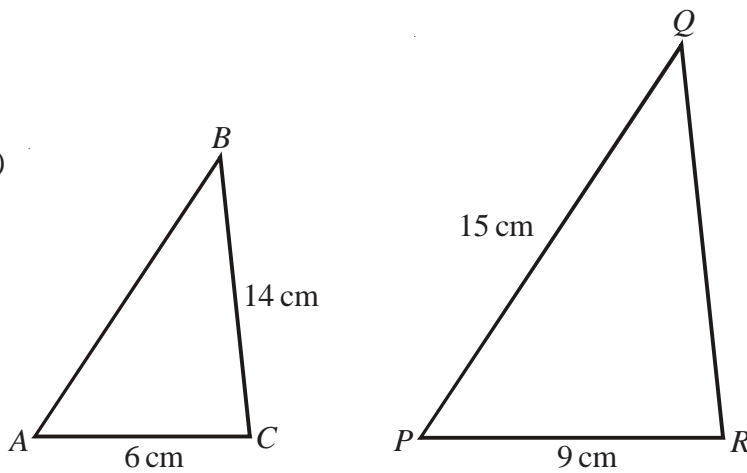


$ABCD$ and $PQRS$ are mathematically similar.

- Find the length of PQ .
- Find the length of AD .



2)



Triangles ABC and PQR are mathematically similar.

Angle A = angle P .

Angle B = angle Q .

Angle C = angle R .

AC = 6 cm.

BC = 14 cm.

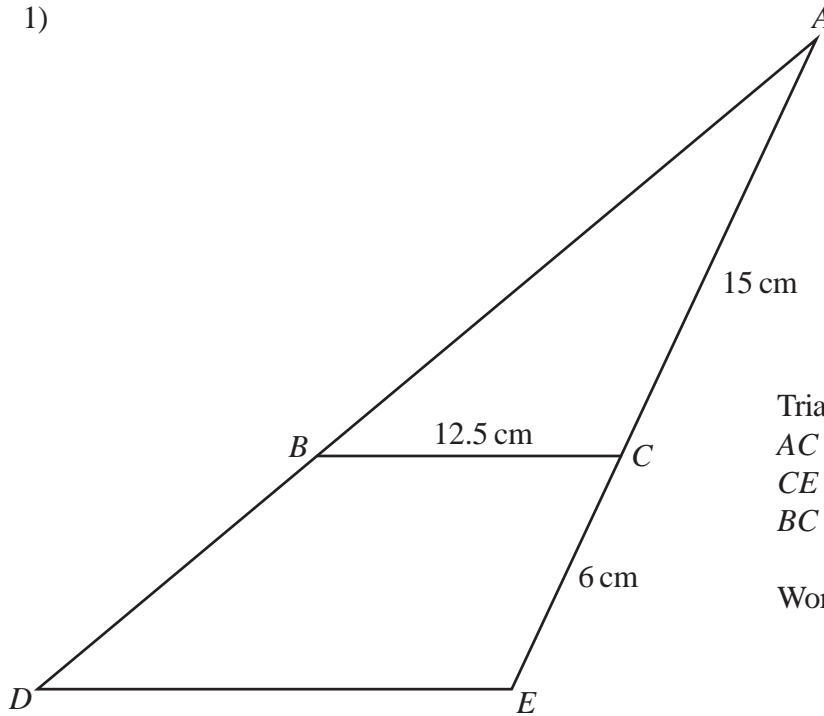
PR = 9 cm.

PQ = 15 cm

- Work out the length of QR .
- Work out the length of AB .



1)



Triangle ABC is similar to triangle ADE .

$AC = 15$ cm.

$CE = 6$ cm.

$BC = 12.5$ cm.

Work out the length of DE .



2) ABC and AED are straight lines.

EB is parallel to DC .

Angle $ACD = 90^\circ$

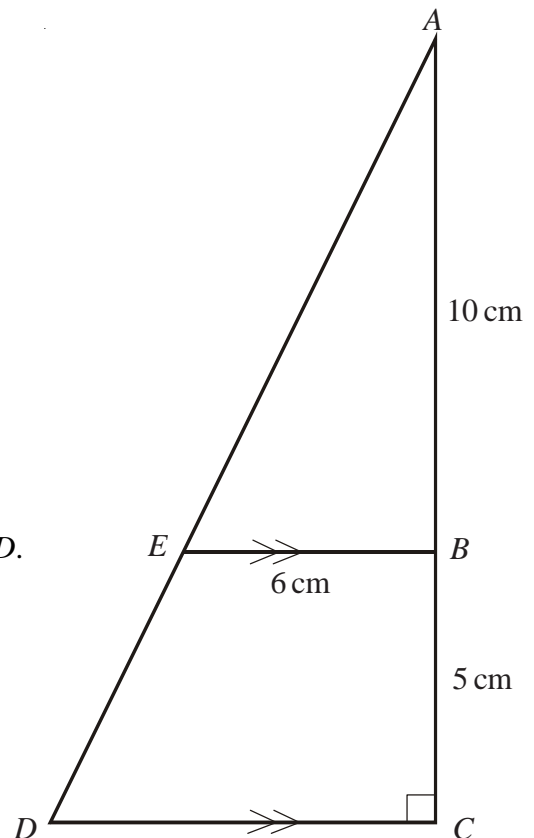
$AB = 10$ cm

$BC = 5$ cm

$EB = 6$ cm

a) Work out the length of DC .

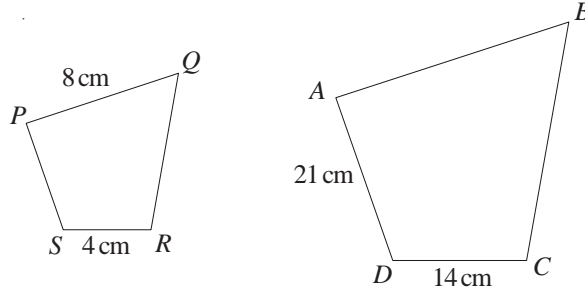
b) Work out the area of the trapezium $EBCD$.



Similar Shapes



- 1) The diagram shows two quadrilaterals that are mathematically **similar**.

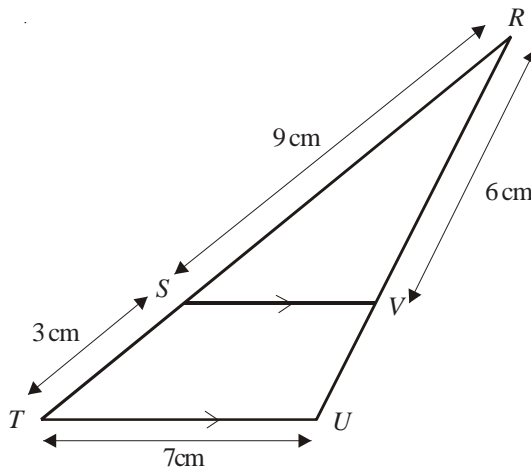


- Calculate the length of AB
- Calculate the length of PS



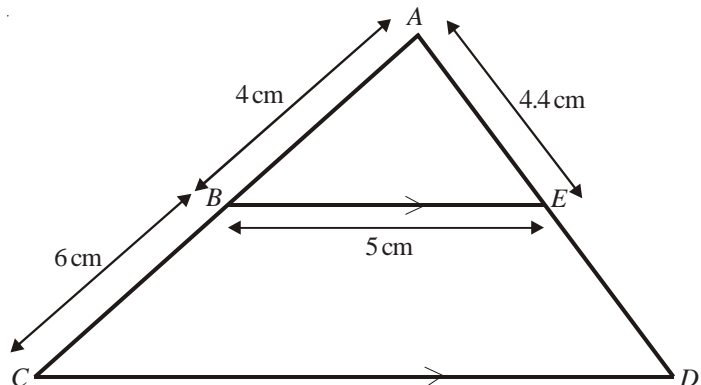
- 2) SV is parallel to TU .
 RST and RVU are straight lines.
 $RS = 9$ cm, $ST = 3$ cm, $TU = 7$ cm, $RV = 6$ cm

Calculate the length of VU .



- 3) BE is parallel to CD .
 ABC and AED are straight lines.
 $AB = 4$ cm, $BC = 6$ cm, $BE = 5$ cm, $AE = 4.4$ cm

- Calculate the length of CD .
- Calculate the length of ED .



Converting Metric Units



1) Change 9 m^2 into cm^2



2) How many square metres are there in 5 square kilometres?



3) Change 4 cm^2 into mm^2



4) Convert 6.5 m^2 into mm^2



5) Change 2 m^3 into cm^3



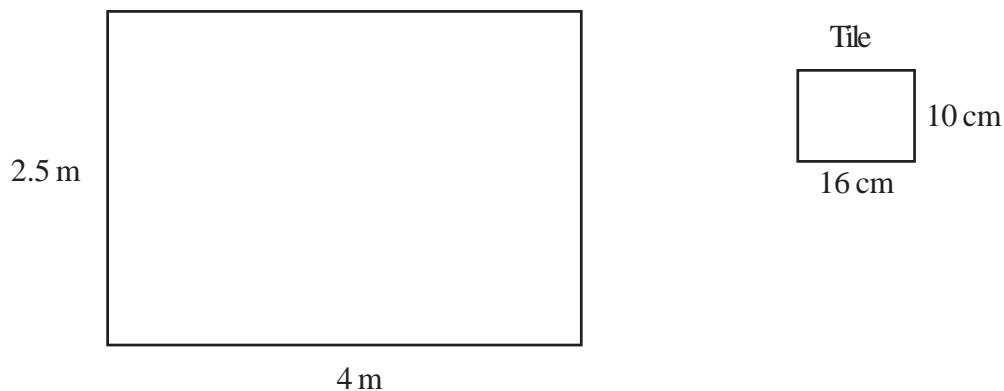
6) How many cubic millimetres are there in 3 cubic centimetres?



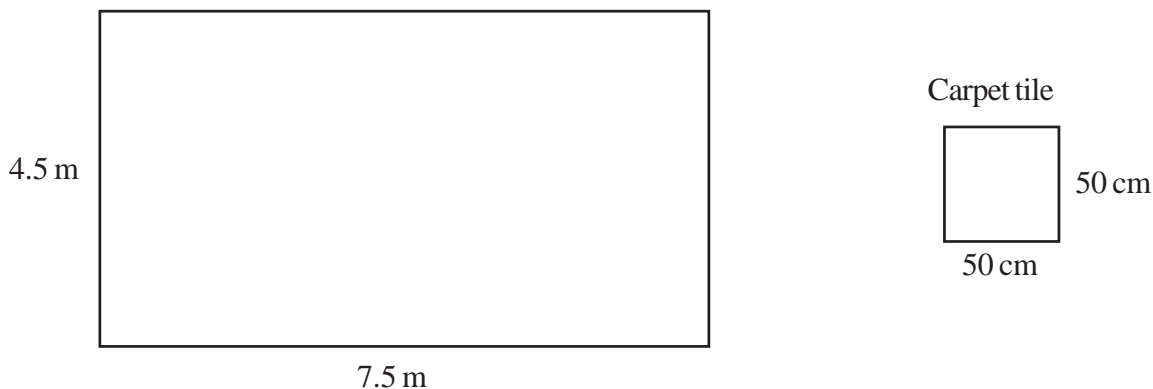
7) Change 7 m^3 into mm^3



8) A tiler wants to tile a rectangular wall which measures 4 m by 2.5 m.
Each tile measures 16 cm by 10 cm.
How many tiles will he need for the wall?



9) A carpet-fitter is laying carpet tiles on a rectangular floor which measures 7.5 m by 4.5 m.
Each carpet tile measures 50 cm by 50 cm.
How many carpet tiles will he need for the floor?





- 1) A silver necklace has a mass of 123 grams, correct to the nearest gram.
- Write down the least possible mass of the necklace.
 - Write down the greatest possible mass of the necklace.



- 2) Each of these measurements was made correct to one decimal place.
Write the maximum and minimum possible measurement in each case.
- a) 4.6 cm b) 0.8 kg c) 12.5 litres d) 25.0 km/h
- e) 10.3 s f) 36.1 m g) 136.7 m/s h) 0.1 g



- 3) Each side of a regular octagon has a length of 20.6 cm, correct to the nearest millimetre.
- Write down the least possible length of each side.
 - Write down the greatest possible length of each side.
 - Write down the greatest possible perimeter of the octagon.



- 4) A girl has a pen that is of length 12 cm, measured to the nearest centimetre.
Her pencil case has a diagonal of length 12.5 cm, measured to the nearest millimetre.
Explain why it might not be possible for her to fit the pen in the pencil case.



- 5) A square has sides of length 7 cm, correct to the nearest centimetre.
- Calculate the lower bound for the perimeter of the square.
 - Calculate the upper bound for the area of the square.



- 1) Jane runs 200 metres in 21.4 seconds.

Work out Jane's average speed in metres per second.
Give your answer correct to 1 decimal place.



- 2) A car travels at a steady speed and takes five hours to travel 310 miles.

Work out the average speed of the car in miles per hour.



- 3) A plane flies 1440 miles at a speed of 240 mph.

How long does it take?



- 4) A marathon runner runs at 7.6 mph for three and a half hours.

How many miles has he run?



- 5) A car takes 15 minutes to travel 24 miles.

Find its speed in **mph**.



- 6) A cyclist takes 10 minutes to travel 2.4 miles.

Calculate the average speed in mph.



-
- 7) An ice hockey puck has a volume of 113 cm^3 .

It is made out of rubber with a density of 1.5 grams per cm^3 .

Work out the mass of the ice hockey puck.



- 8) An apple has a mass of 160 g and a volume of 100 cm^3 .

Find its density in g/cm^3 .



- 9) A steel ball has a volume of 1500 cm^3 .

The density of the ball is 95 g/cm^3 .

Find the mass of the ball **in kg**.



- 10) The mass of a bar of chocolate is 1800 g.

The density of the chocolate is 9 g/cm^3 .

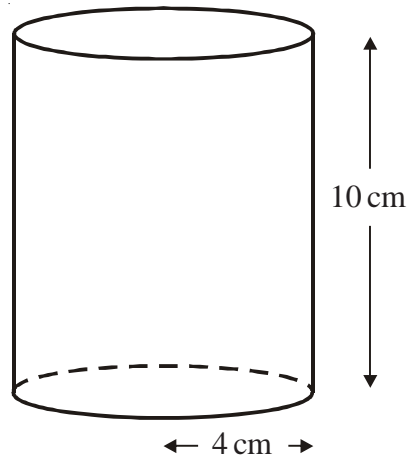
What is the volume of the bar of chocolate?



- 1) Tony went on holiday to Miami.
He travelled from London by plane.
- The distance from London to Miami is 7120 km.
The plane journey took 8 hours.
- Calculate the average speed of the plane.



- 2) A solid cylinder has a radius of 4 cm and a height of 10 cm.



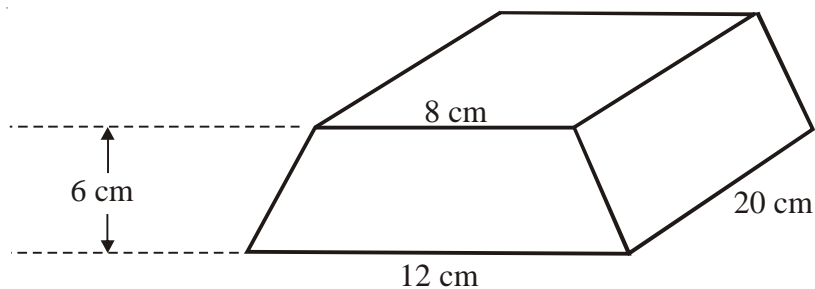
- a) Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

The cylinder is made of wood.
The density of the wood is 0.7 grams per cm^3

- b) Work out the mass of the cylinder.
Give your answer correct to 3 significant figures.



- 3)



The diagram shows a solid prism made from metal.
The cross-section of the prism is a trapezium.

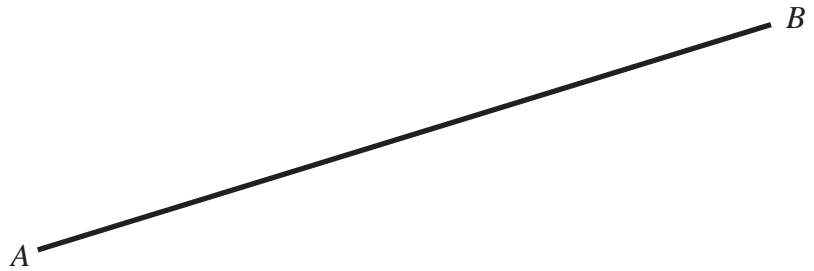
The parallel sides of the trapezium are 8 cm and 12 cm.
The height of the trapezium is 6 cm.
The length of the prism is 20 cm.

The density of the metal is 4 g/cm^3 .

Calculate the mass of the prism.
Give your answer in kilograms.



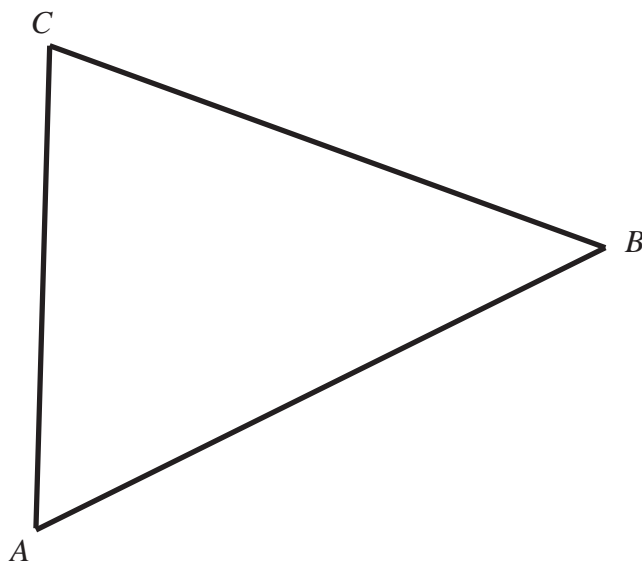
- 1) Using ruler and compasses, bisect line AB .



- 2) Using ruler and compasses

- Bisect line AB
- Bisect line BC
- Bisect line AC
- Place your compass point where your three lines cross*

Now open them out until your pencil is touching vertex A .
Draw a circle using this radius.

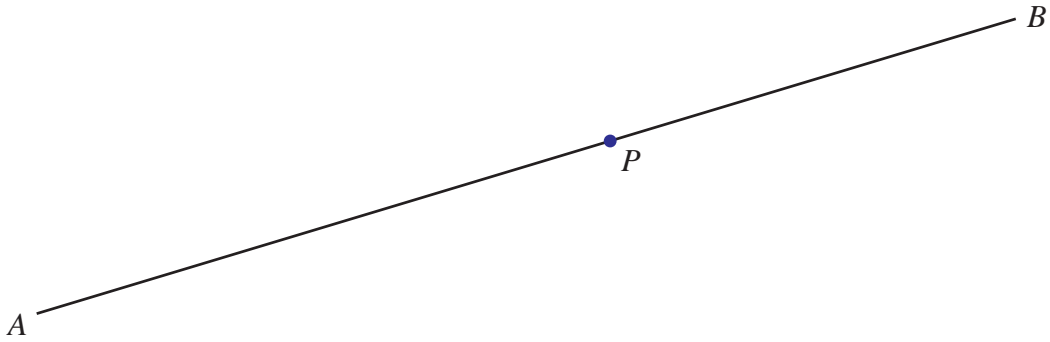


* If your three lines don't cross at a point then you have a mistake somewhere or just haven't been accurate enough.

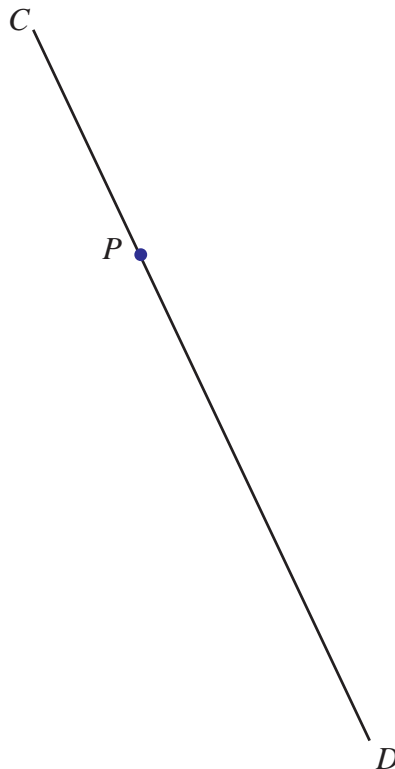
Drawing a Perpendicular to a Line



- 1) Use ruler and compasses to **construct** the perpendicular to the line segment AB that passes through the point P .
You must show all construction lines.



- 2) Use ruler and compasses to **construct** the perpendicular to the line segment CD that passes through the point P .
You must show all construction lines.



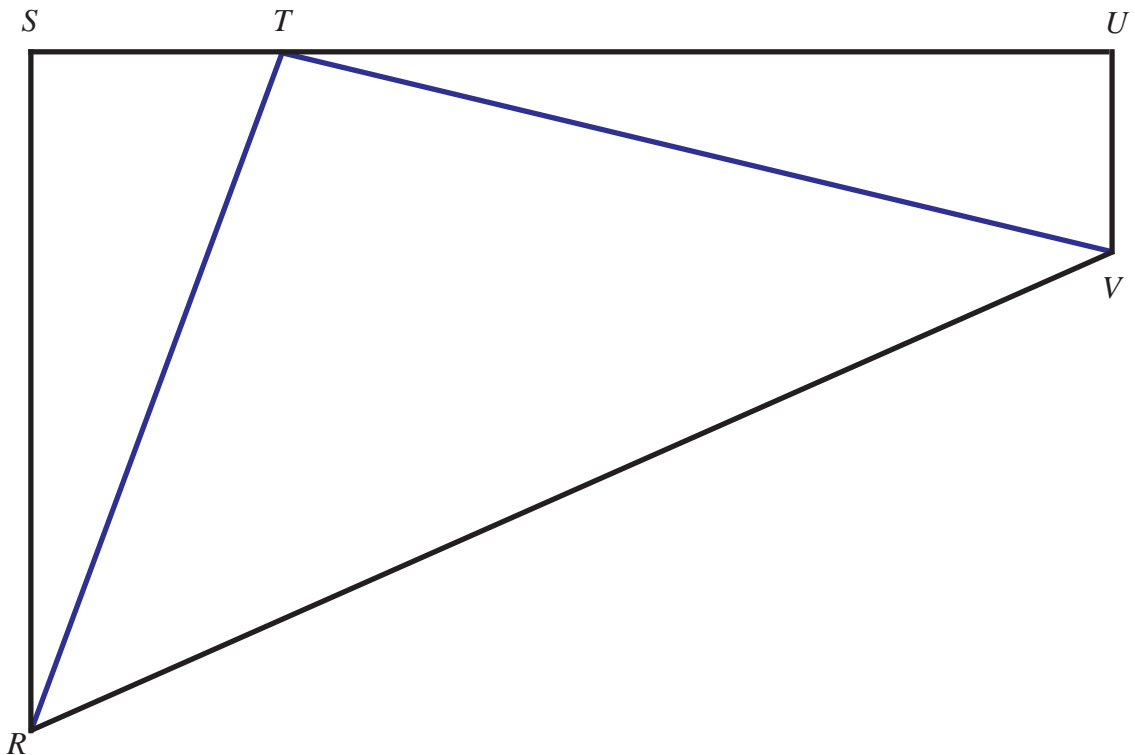
Bisecting an Angle



- 1) Using ruler and compasses, bisect angle ABC .



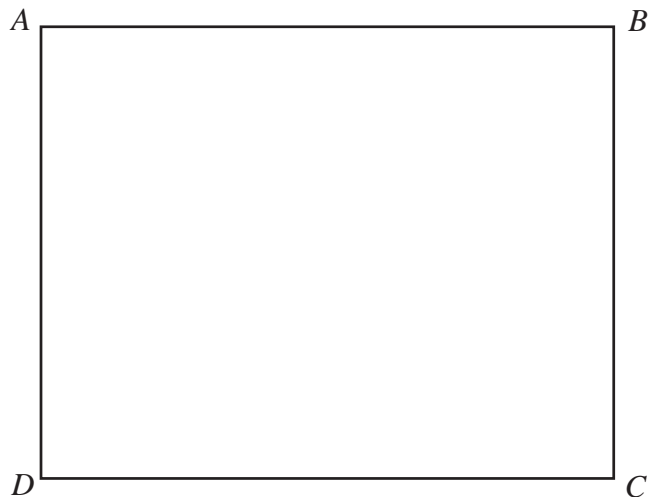
- 2) The diagram below shows the plan of a park.
The border of the park is shown by the quadrilateral $RSTUV$



There are two paths in the park. One is labelled TR and the other TV
A man walks in the park so that he is always the same distance from both paths.
Using ruler and compasses show exactly where the man can walk.



1)



$ABCD$ is a rectangle.

Shade the set of points inside the rectangle which are **both**
 more than 4 centimetres from the point D
and more than 1 centimetre from the line AB .



2) Two radio transmitters, A and B , are situated as below.

A ●

B ●

Transmitter A broadcasts signals which can be heard up to 3 km from A .

Transmitter B broadcasts signals which can be heard up to 6 km from B .

Shade in the area in which radio signals can be heard from both transmitters.

Use a scale of 1 cm = 1 km.



- 1) Draw the locus of all points which are equidistant from the lines AB and AC .



- 2) Draw the locus of all points which are equidistant from the points A and B .

$A \times$

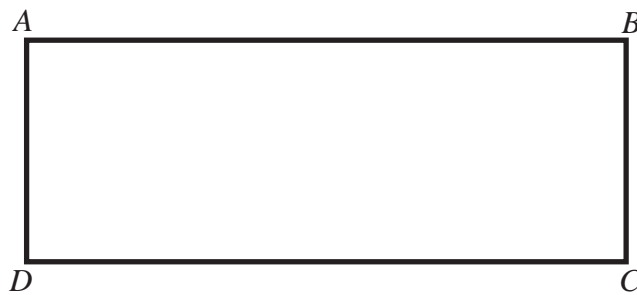
$\times B$



- 1) Draw the locus of all points that are exactly 3 cm from the line PQ .



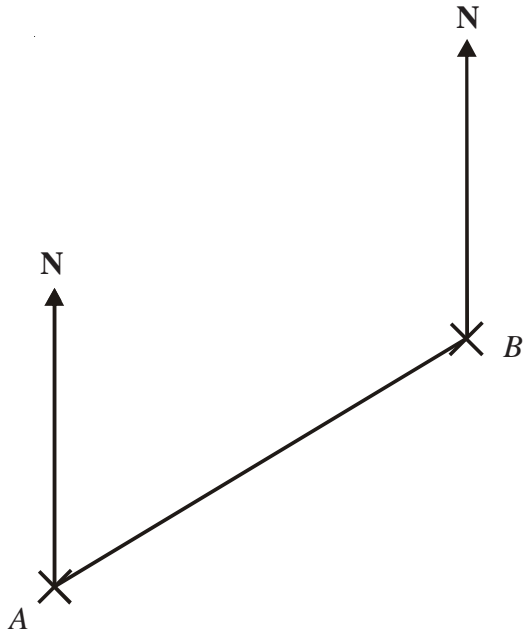
- 2) Draw the locus of all points that are exactly 4 cm from the rectangle $ABCD$



Bearings



1) The diagram shows the position of two telephone masts, A and B , on a map.



a) Measure the bearing of B from A .

Another mast C is on a bearing of 160° from B .
On the map, C is 4 cm from B .

b) Mark the position of C with a cross and label it C .



2) The diagram shows the positions of two boats, P and Q .



The bearing of a boat R from boat P is 050°

The bearing of boat R from boat Q is 320°

In the space above, draw an accurate diagram to show the position of boat R .
Mark the position of boat R with a cross (\times). Label it R .

Bearings



- 1) School B is due east of school A .
 C is another school.
 The bearing of C from A is 065° .
 The bearing of C from B is 313° .

Complete the scale drawing below.
 Mark with a cross the position of C .



- 2) In the diagram, point A marks the position of Middlewich.
 The position of Middlemarch is to be marked on the diagram as point B .
 On the diagram, mark with a cross the position of B given that:
 B is on a bearing of 320° from A and
 B is 5 cm from A .



- 3) **Work out** the bearing of
 a) B from P
 b) P from A

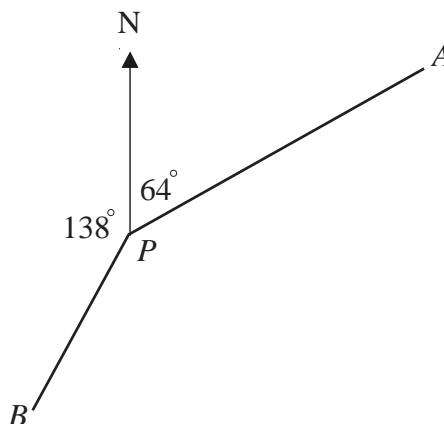


Diagram NOT accurately drawn.

Experimental Probabilities



- 1) Ahmad does a statistical experiment.
He throws a dice 600 times.
He scores one, 200 times.
Is the dice fair? Explain your answer



- 2) Chris has a biased coin.
The probability that the biased coin will land on a tail is 0.3
Chris is going to flip the coin 150 times.
Work out an estimate for the number of times the coin will land on a tail.



- 3) On a biased dice, the probability of getting a six is $\frac{2}{3}$.
The dice is rolled 300 times.
Work out an estimate for the number of times the dice will land on a six.



- 4) On a biased dice, the probability of getting a three is 0.5
The dice is rolled 350 times.
Work out an estimate for the number of times the dice will land on a three.



- 5) Jenny throws a biased dice 100 times.
The table shows her results.

| Score | Frequency |
|-------|-----------|
| 1 | 15 |
| 2 | 17 |
| 3 | 10 |
| 4 | 24 |
| 5 | 18 |
| 6 | 16 |

- a) She throws the dice once more.
Find an estimate for the probability that she will get a four.
- b) If the dice is rolled 250 times, how many times would you expect to get a five?

Averages from a Table



- 1) Tom carried out a survey of the number of school dinners 34 students had in one week.

The table shows this information.

| Number of school dinners | Frequency | |
|--------------------------|-----------|--|
| 0 | 0 | |
| 1 | 7 | |
| 2 | 14 | |
| 3 | 7 | |
| 4 | 4 | |
| 5 | 2 | |

Calculate the mean number of school dinners.

Give your answer to 1 decimal place.



- 2) Sindy recorded the time, in minutes, that her train was late over 100 days.

Information about these times is shown in the table.

| Time (t minutes) | Frequency | | |
|---------------------|-----------|--|--|
| $0 < t < 6$ | 15 | | |
| $6 < t < 12$ | 23 | | |
| $12 < t < 18$ | 28 | | |
| $18 < t < 24$ | 19 | | |
| $24 < t < 30$ | 15 | | |

Calculate an estimate for the mean time that her train was late.

Give your answer to 1 decimal place.



- 3) Tony asked 32 men about the number of children they had.

The table shows information about his results.

| Number of children | Frequency | |
|--------------------|-----------|--|
| 0 | 10 | |
| 1 | 5 | |
| 2 | 7 | |
| 3 | 8 | |
| 4 | 2 | |
| more than 4 | 0 | |

- a) Find the mode.
b) Calculate the mean to 1 decimal place.



1) The table shows some information about the heights (h cm) of 100 plants.

| Height (h cm) | Frequency | | |
|------------------|-----------|--|--|
| $120 < h < 130$ | 9 | | |
| $130 < h < 140$ | 18 | | |
| $140 < h < 150$ | 27 | | |
| $150 < h < 160$ | 31 | | |
| $160 < h < 170$ | 15 | | |

- a) Find the class interval in which the median lies.
- b) Work out an estimate for the mean height of the plants.



2) The table gives information about the number of books sold in a shop during each of the last 30 weeks.

| Number of books (n) | Frequency | | |
|-------------------------|-----------|--|--|
| $0 < n < 40$ | 2 | | |
| $40 < n < 80$ | 6 | | |
| $80 < n < 120$ | 13 | | |
| $120 < n < 160$ | 6 | | |
| $160 < n < 200$ | 3 | | |

Calculate an estimate for the mean number of books sold each week.
Give your answer correct to 1 decimal place.



- 1) The number of pens in each pupil's pencil case in a classroom has been counted. The results are displayed in a table.

| Number of pens | Number of pupils |
|----------------|------------------|
| 0 | 4 |
| 1 | 6 |
| 2 | 7 |
| 3 | 5 |
| 4 | 3 |
| 5 | 1 |

- Work out the total number of pens in the classroom.
- Write down the modal number of pens in a pencil case.
- Work out the mean number of pens in a pencil case.
- Work out the range of the number of pens in a pencil case.



- 2) Thomas is analysing the local football team. He records the number of goals scored in each football match in the past twelve months.

Thomas said that the mode is 7
Thomas is wrong.

- Explain why.
- Calculate the mean number of goals scored.

| Goals scored | Frequency |
|--------------|-----------|
| 0 | 7 |
| 1 | 5 |
| 2 | 3 |
| 3 | 6 |
| 4 | 2 |
| 5 | 1 |
| 6 | 1 |



- 3) Tina recorded how long, in minutes, she watched TV for each day during a month.

- Find the class interval in which the median lies.
- Work out an estimate for the mean amount of time Tina watched TV each day of this month. Give your answer to the nearest minute.

| Time (t in minutes) | Frequency |
|------------------------|-----------|
| $10 < t < 20$ | 5 |
| $20 < t < 30$ | 9 |
| $30 < t < 45$ | 8 |
| $45 < t < 60$ | 6 |
| $60 < t < 90$ | 3 |



- 1) A survey into how people communicate with each other is carried out. A questionnaire is designed and two of the questions used are shown below. The questions are **not** suitable. For each question, write down a reason why.

- a) Do you prefer to communicate with your friend by phone (voice call) or by text message?

Yes No

Reason

.....

- b) How many text messages do you send?

1 2 3 4

Reason

.....



- 2) A restaurant owner has made some changes. He wants to find out what customers think of these changes. He uses this question on a questionnaire.

“What do you think of the changes in the restaurant?”

 Excellent Very good Good

- a) Write down what is wrong with this question.

This is another question on the questionnaire.

“How often do you come to the restaurant?”

 Very often Not often

- b) i) Write down one thing that is wrong with this question.

- ii) Design a better question to use. You should include some response boxes.