REVISION PACK S3

CREDIT MATHS

S3 Credit Mathematics

Revision Pack

Expressions & Formulae

1. Given that $a = 8$, $b = 12$ and $c = 4$, calculate the value of:

(a) $a - 2c$ (b) $c(b - a)$ (c) $\dfrac{2a + b}{c}$

(d) $a + \dfrac{b}{c}$ (e) $a^2 + c^2$ (f) $(2c)^2$

2. A formula is defined as $E = 5p + q^2$.

(a) Calculate the value of E when $p = 2$ *and* $q = 3$.

(b) Calculate the value of E when $p = 4$ *and* $q = 2$.

(c) Calculate the value of E when $p = 5$ *and* $q = 8$.

3. (a) What is the value of $x^2 + 3x - 5$ when $x = 4$?

(b) What is the value of $x^2 - 2x + 7$ when $x = 3$?

(c) What is the value of $2x^2 + x - 1$ when $x = 2$?

4. Express each of the fractions below in their simplest form given that $a = 7$ *and* $b = 3$.

(a) $\dfrac{a-b}{a+b}$ (b) $\dfrac{a+b}{2a+2b}$ (c) $\dfrac{3b-a}{4b}$ (d) $\dfrac{4b-a}{4a-b}$

*** **You need a calculator for questions 5 and 6.***

5. A formula is defined as $P = d^2 - \dfrac{e}{17}$.

Calculate, giving your answers correct to 3 significant figures, the value of P when:

(a) $d = 13$ *and* $e = 130$ (b) $d = 11$ *and* $e = 64$ (c) $d = 21$ *and* $e = 200$

(d) $d = 4$ *and* $e = 60$ (e) $d = 3$ *and* $e = 32$ (f) $d = 21\cdot5$ *and* $e = 5950$

6. Given that $h = 15$ *and* $g = 23$, calculate, correct to 2 significant figures, the values of:

(a) $\dfrac{h + g}{h}$ (b) $\dfrac{h^2}{g}$ (c) $g(2h + g)$ (d) $\sqrt{\dfrac{h^2 + g^2}{30}}$

Scientific Notation (Standard Form)

1. Write each of the following numbers in scientific notation.

(a) 1200 (b) 4 125 000 (c) 225 (d) 67 000

(e) 9 (f) 41 000 000 (g) 92 (h) 240 000 000 000

2. For each of the following numbers i) write it out in figures ; ii) write it in scientific notation.

(a) 5 million (b) 32 thousand (c) $52 \cdot 1$ million (d) 243 thousand

3. Write each of the following numbers in scientific notation.

(a) $0 \cdot 057$ (b) $0 \cdot 0021$ (c) $0 \cdot 84$ (d) $0 \cdot 00000000915$

(e) $0 \cdot 0007$ (f) $0 \cdot 08004$ (g) $0 \cdot 0000012$ (h) $0 \cdot 6$

4. Write each of the following numbers out in full.

(a) $1 \cdot 6 \times 10^5$ (b) $2 \cdot 78 \times 10^3$ (c) $1 \cdot 22 \times 10^8$

(d) 4×10^4 (e) $2 \cdot 003 \times 10^2$ (f) $5 \cdot 7 \times 10^0$

(g) 6×10^{-3} (h) $4 \cdot 52 \times 10^{-6}$ (i) $1 \cdot 003 \times 10^{-4}$

(j) $7 \cdot 2 \times 10^{-5}$ (k) 23×10^{-2} (l) $6 \cdot 0004 \times 10^{-3}$

5. Calculate each of the following expressing your answer in standard form:

(a) $(2 \times 10^3) \times (3 \times 10^5)$ (b) $(4 \times 10^4) \times (2 \times 10^{-6})$

(c) $(5 \times 10^2) \times (3 \times 10^4)$ (d) $(9 \times 10^7) \div (1 \cdot 5 \times 10^2)$

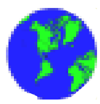
(e) $(3 \cdot 6 \times 10^2) \div (0 \cdot 2 \times 10^5)$ (f) $(24 \times 10^4) \div (48 \times 10^{-3})$

(g) $\dfrac{1 \cdot 28 \times 10^6}{0 \cdot 4 \times 10^2}$ (h) $\dfrac{4 \cdot 17 \times 10^2}{3 \times 10^{-3}}$ (i) $\dfrac{18 \times 10^{-2}}{0 \cdot 2 \times 10^5}$

6. Answer each of the following questions leaving your answers in standard form and correct to 3 **s.f.** where necessary.

(a) Light travels at $1 \cdot 85 \times 10^5$ miles per second. How far will it travel in an hour?

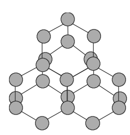
(b) The radius of the earth is $6 \cdot 45 \times 10^6$ metres. What is its circumference (in km)?



(c) If a heart beats 70 times a minute, how many times will it beat in a lifetime of 80 years?

(d) 100 grams of water contains 2000 drops. How many drops would there be in a tank containing 1 tonne of water?

(e) In 1 gram of carbon there are 6×10^{26} atoms. How many carbon atoms are there in 5kg of pure carbon?

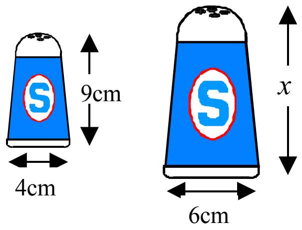


Similarity (1)

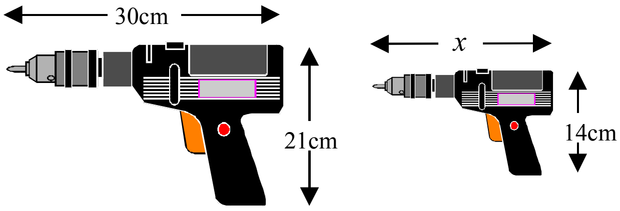
1. Each diagram below shows a pair of similar shapes or objects. For each pair ....

   i) state the scale factor (from left to right) ii) calculate the length marked x .

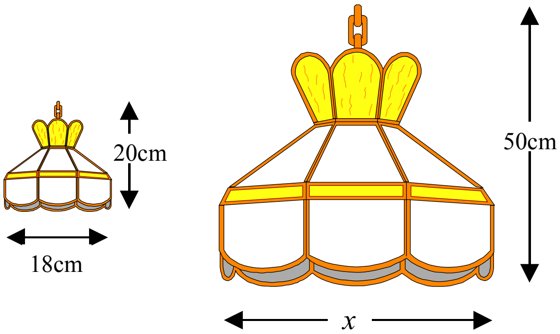
(a)



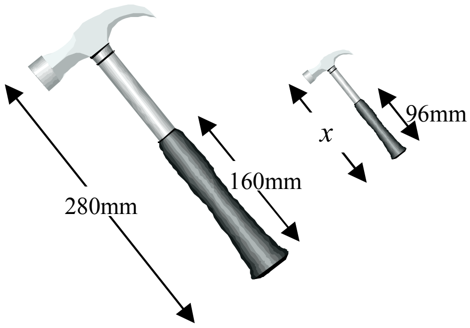
(b)



(c)



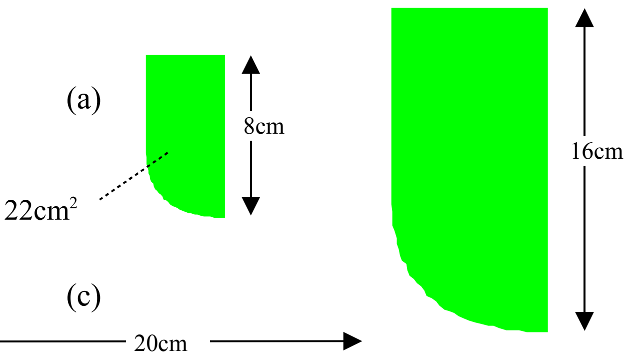
(d)



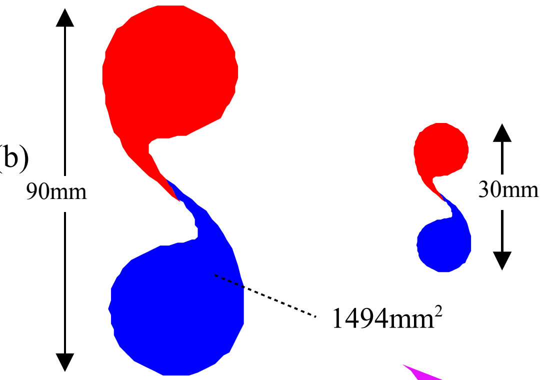
2. Each pair of shapes below is mathematically similar.

   Calculate the **area** of each right-hand shape.

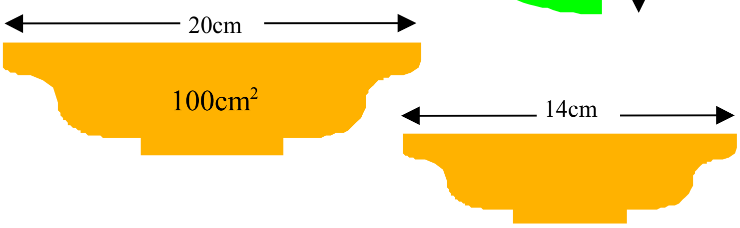
(a)



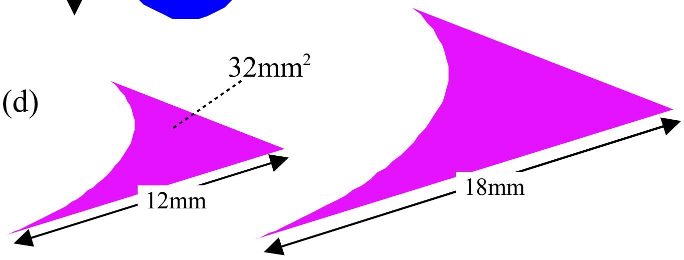
(b)



(c)



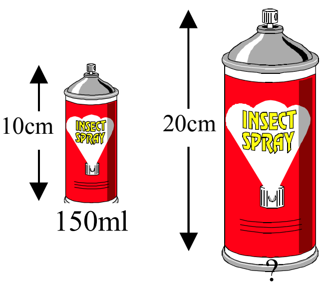
(d)



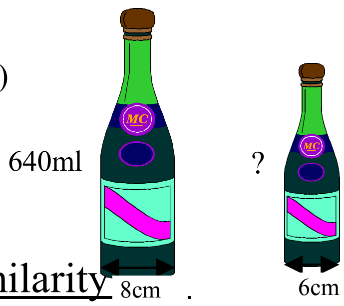
3. Each pair of containers below is mathematically similar.

   Calculate the **volume** of each right-hand container.

(a)

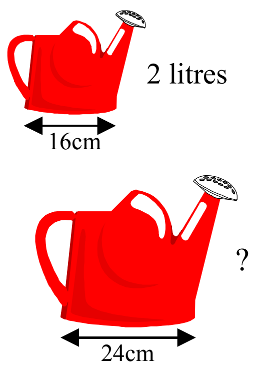


(b)



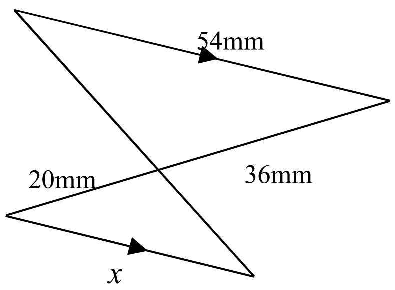
Similarity .

(c)

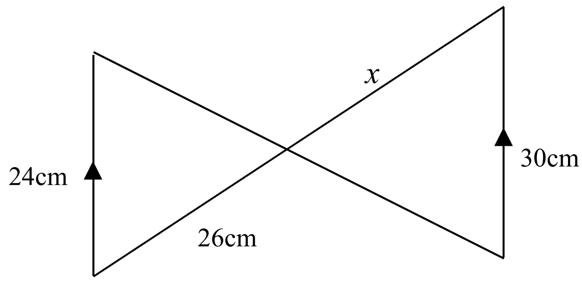


1. Calculate the length of the side marked x in each diagram below.

(a)



(b)

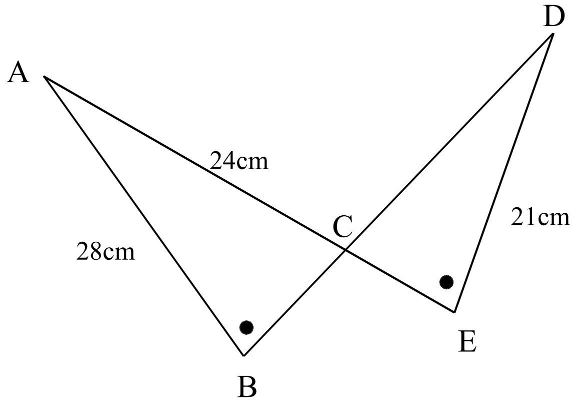


2. In the diagram $\angle ABC = \angle CED$, AB = 28cm, AC = 24cm and ED = 21cm.

(a) Explain why the triangles ABC and CDE are similar.

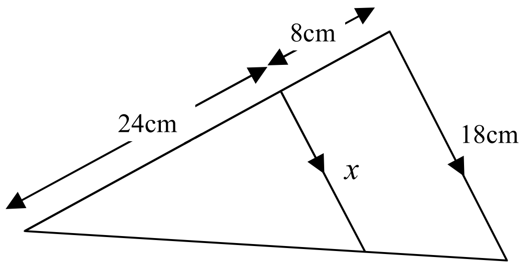
(b) Calculate the length of CD.

(c) Given that the area of triangle ABC is 144 square centimetres, calculate the area of triangle CDE.

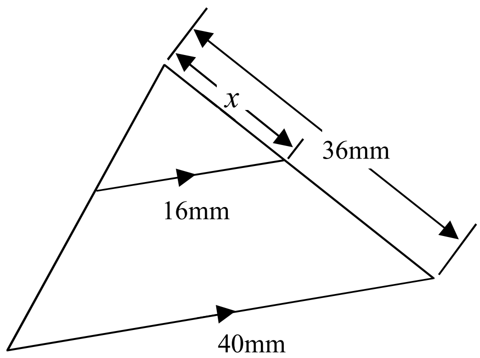


3. Calculate the length of the side marked x in each diagram below.

(a)



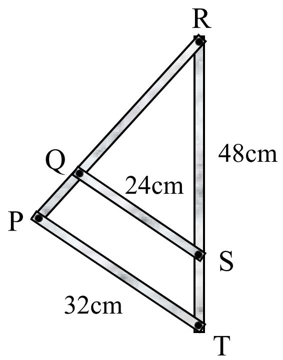
(b)



4. The digram opposite shows an aluminium pipe frame. The cross members QS and PT are parallel.

RS = 48cm, QS = 24cm and PT = 32cm as shown.

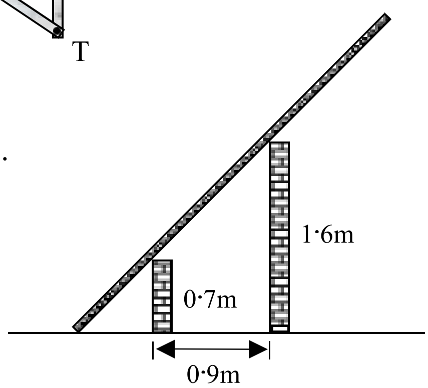
Calculate the length of ST



5. In the diagram a ladder is laid against two walls as shown.

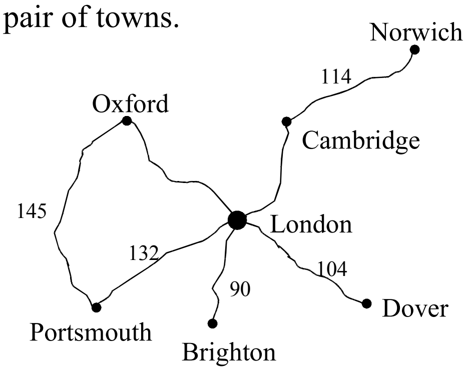
The higher wall is $1\cdot6$ metres high, and the lower wall is $0\cdot7$ metres. The distance between the two left hand faces of the walls is $0\cdot9$ metres.

Calculate the distance between the foot of the ladder and the lower wall.



Speed, Distance and Time

1. The map shows several towns with the main roads joining them.
The numbers indicate the **distances in kilometres** between each pair of towns.



(a) How far is it from London to Cambridge if the journey takes 2 hours at an average speed of 48 km/h?

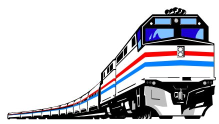
(b) A vintage car completed the London to Brighton run in 12 hours. What was its average speed?

(c) How long would it take a cyclist to travel from Oxford to Portsmouth if his average speed was 20km/h?

(d) A van driver left London at 0950 to travel to Norwich via Cambridge. He arrived in Norwich at 1335. Calculate his average speed for the journey.

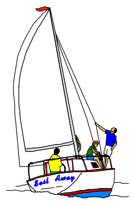
(e) A bus travelled from Oxford to Dover (via London) in 3hours 24 minutes. If its average speed for the journey was 60km/h, calculate the distance from Oxford to London.

2. The rail distance from Manchester to Glasgow is 357km.



If a high speed train averages 140 km/h, find the time taken in hours and minutes.

3. A yacht leaves Largs and sails a distance of 74km.



If the yacht averages a speed of 14km/h, calculate the time taken for the journey correct to the nearest minute.

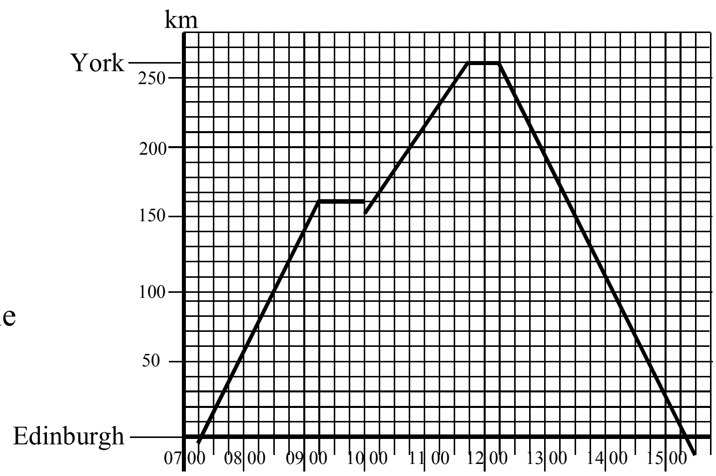
4. A car leaves Dumfries at 1.25pm and reaches Edinburgh at 2.53pm.

(a) How long did the journey take?

(b) If the distance travelled was 84 miles, calculate the average speed of the car correct to the nearest mile per hour.

5. Mr Munro drove his car from Edinburgh to York and back.

The record of his journey is shown in the graph.



(a) He rested on his way to York. For how long did he rest?

(b) Calculate his average speed from York back to Edinburgh.

(c) Calculate his average speed for the whole journey (do not include the stops).
Give your answer correct to 1 d.p.

Saving and Spending (1)

1. Susan Marshall is paid an hourly rate of £12.40.
She works a basic 36 hour week.
In addition any overtime she works is paid at time-and-a-half.

Calculate her total pay for a week in which she works 42 hours.

2. Mike has a part time job as a sales assistant working Friday and Saturday of each week.
He is paid £6.60 per hour between the hours of 9.00am and 4.00pm each day.
Any work he does outside these hours is paid at *'double-time'*.
In addition he is paid 3% commission on all the goods that he sells.

Below is his job sheet for a particular week ....

Employee : M. Smith	Start Time	Finish Time	Sales total (£)
Friday	9.00 am	3.00 pm	£860
Saturday	9.00 am	7.30 pm	£1850

Calculate his total pay for these two days.

3. (a) A man invests £4500 in a Building Society at an interest rate of 4% per annum.
How much will his investment be worth after 8 months?

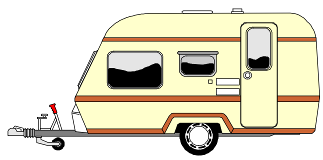
(b) In a sale, a shop offers a 12% discount on a table and four chairs normally priced at £1680.
How much would you pay for the table and chairs in the sale?

(c) V.A.T. is charged at a rate of $17\frac{1}{2}$% on the cost of an article before tax.
If a CD player is advertised at £74 + VAT, calculate the total cost of the player.

(d) A woman buys a car for £6700 and sells it for £4891 a year later. Calculate her percentage loss.

4. A caravan costing £8600 may be paid for in any of the following ways:

i) By cash.
ii) By hire purchase with terms ....
deposit - 15% of cash price + 36 monthly payments of £240.
iii) By a leasing agreement with terms ......
No deposit - 24 monthly instalments of £300 + final payment of £2250



(a) Calculate the total cost of each method and and find how much is saved between the least and most expensive.

(b) Express this saving as a percentage of the cash price, correct to the nearest percent.

5. In January a man bought American dollars to the value of £960 when the exchange rate was $1 \cdot 6$ dollars to the pound. Before he went on his holiday in April he noticed that the exchange rate had become $1 \cdot 65$ dollars to the pound.
How many more dollars would the man have received if he had waited until April to exchange his money?

6. After restoring a boat a man sold it for £2511 and made a 35% profit.
How much did he pay for the boat?

Saving and Spending (2)

1. The present reading on a householder's gas meter is 00976508 and the previous reading was 00930658 cubic feet.

   (a) How many cubic feet have been used?

   (b) If 1 therm = 100 cubic feet, how many therms have been used?

   (c) If gas is charged at 32p per therm, and the customer must pay a standing charge of £16.50, what is the total cost of the gas consumed?

2. An extract from Mr Lewis's electricity bill is shown below.

   (a) Copy and complete the last two columns.

	Meter Readings				
Meter	Previous	Present	Tariff	Units Used	Amount
81023C	20013	20740	Units used charged @ 3.86p each		
234098A	40236	40802	Units used charged @ 1.54p each		
			Standing Charge		£12.50
			TOTAL AMOUNT DUE FOR PAYMENT		

   (b) This bill worked out to be exactly 80% of his previous bill. How much did he pay in his previous bill?

3. A man insured his house, valued at £95 000, at the rate of 28p per £100, and its contents, valued at £24 000, at 38p per £100.
   Find the total annual premium he had to pay.

4. Gail Hendry has a annual income of £22 300. Her allowances free of tax amount to £5500.
   On her taxable income she has to pay tax at the rate of 22p in the pound.
   How much tax will she pay each **month**?

5. In a certain holiday brochure, advertisements were found for the following three campsites in France. The prices quoted are per person.

	JULY		AUGUST		SEPTEMBER	
	7 days	14 days	7 days	14 days	7 days	14 days
Bon Anse	£112	£178	£110	£154	£85	£140
La Oisier	£135	£205	£110	£160	£95	£155
Bon Ami	£115	£190	£100	£150	£90	£135

CAR FERRY – Portsmouth to Caen (return) £350 for a family of 4 : Portsmouth to St Malo (return) £428
A discount of 30% is given for all children under 12 years of age. A booking fee of 5% is added to each bill

Calculate the cost of a fourteen day holiday during August in the Le Oisier campsite for the Graham family, comprisng Mr and Mrs Graham, their daughter aged 16 years and their son aged 7 years, if they decide on the Portsmouth – St Malo crossing.

Positive and Negative Numbers

1. Calculate each of the following.

(a)	$4-7$	(b)	$-3+8$	(c)	$5+(-3)$	(d)	$2+(-7)$
(e)	$-3-6$	(f)	$-1-4$	(g)	$-9+5$	(h)	$-2+(-5)$
(i)	$2-(-4)$	(j)	$-6-(-3)$	(k)	$-2-(-4)$	(l)	$-7-(-7)$

2. Simplify:

(a)	$2x-5x$	(b)	$-3a+a$	(c)	$7x-4x$	(d)	$5p+(-8p)$
(e)	$-2e+7e$	(f)	$-d-3d$	(g)	$4h+(-2h)$	(h)	$-9a+(-a)$
(i)	$4k-(-2k)$	(j)	$-4p-(-2p)$	(k)	$-m-m$	(l)	$-5y-(-8y)$

3. Simplify:

(a)	-6×5	(b)	$-2\times(-7)$	(c)	$3\times(-4)$	(d)	-8×2
(e)	$-a\times 5$	(f)	$6\times(-4p)$	(g)	$-2y\times 7$	(h)	$-3d\times(-9d)$

4. Solve each of the following equations.

(a)	$3x+8=2$	(b)	$2t+3=-7$	(c)	$4m+1=-3$
(d)	$4y-7=-3$	(e)	$6a-1=-13$	(f)	$7d-2=-2$
(g)	$5y=3y-16$	(h)	$3a=20-2a$	(i)	$7d=-2d-18$
(j)	$7h+4=4h-5$	(k)	$12p-6=8p-2$	(l)	$8x+5=14-x$
(m)	$2p+3=p-4$	(n)	$7h-6=2h-21$	(o)	$5x+9=8x+33$
(p)	$4y-7=8y-23$	(q)	$7k+2=4k-25$	(r)	$16a-4=6a-34$

5. Evaluate each of the following expressions when $a=2$, $b=-4$ and $c=-3$.

(a)	$a+b$	(b)	$a-b$	(c)	$2a+c$	(d)	ab
(e)	bc	(f)	$b-c$	(g)	$a+2c$	(h)	$3b+6a$
(i)	$2c-2b$	(j)	b^2	(k)	$3c^2$	(l)	$(2b)^2$
(m)	a^2-c^2	(n)	$7a+3c$	(o)	$2c-3b$	(p)	$(2b-4c)^2$

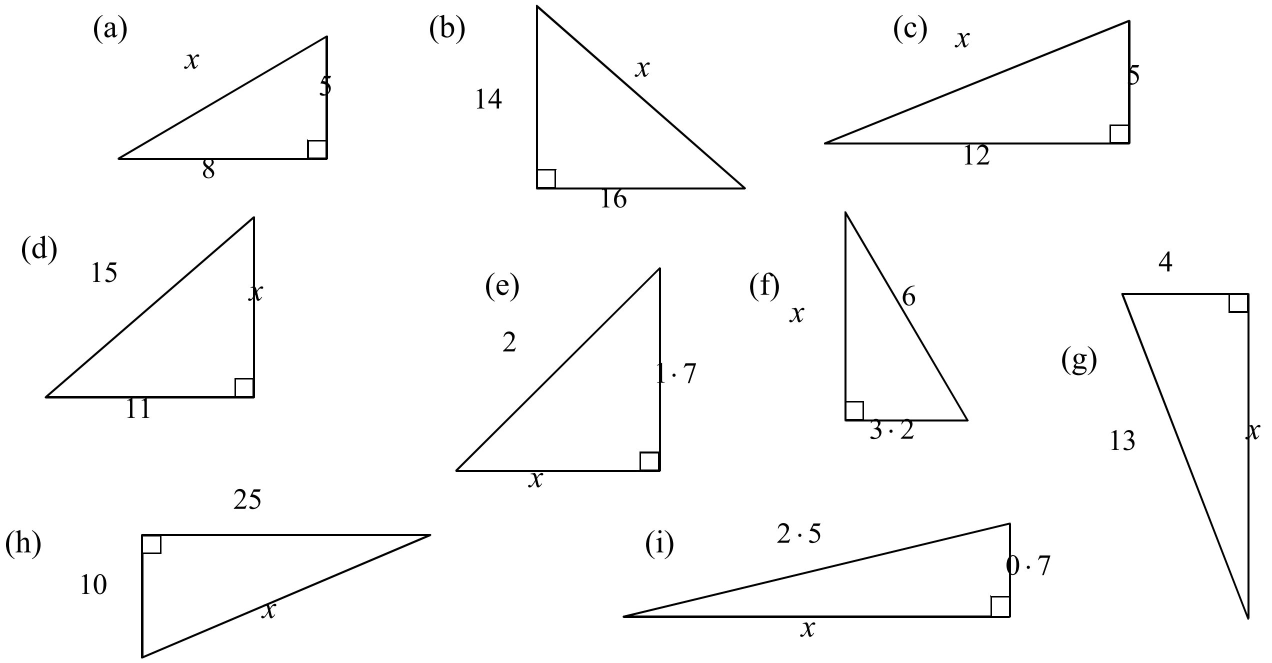
6. Evaluate each of the following expressions when $p=-2$, $q=4$ and $r=-6$.

(a)	$\dfrac{q}{p}$	(b)	$\dfrac{r}{p}$	(c)	$\dfrac{3q}{r}$	(d)	$\dfrac{2r}{q}$
(e)	$\dfrac{2q+r}{p}$	(f)	$\dfrac{q-p}{r}$	(g)	$\dfrac{2p+2r}{-q}$	(h)	$\dfrac{r^2+q}{2p}$

Pythagoras (1)

You need a calculator for this worksheet.
Round your answers to one decimal place where necessary.

1. Calculate the length of the side marked x in each triangle below

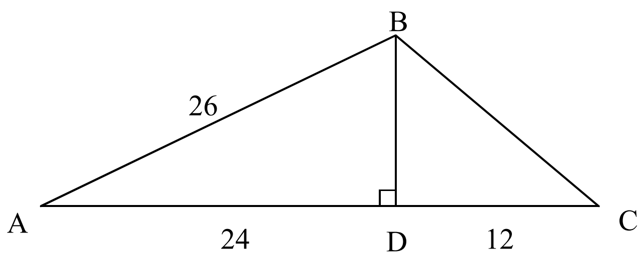


2. Consider the framework opposite.

   (a) Calculate the length of BD.

   (b) Hence calculate the length of BC.

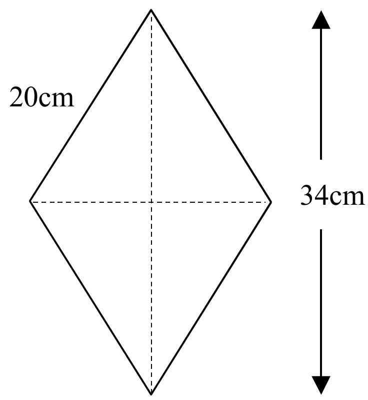
   (c) Calculate the area of triangle ABC.



3. A rhombus has sides of 20cm and its longest diagonal measuring 34cm.

   (a) Calculate the length of the shorter diagonal.

   (b) Calculate the area of the rhombus



4. Calculate the distance between each pair of points below.

(a)	A(2 , 5) , B(7 , 10)	(b)	P(1 ,8) , Q(12 ,2)
(c)	E(-2 , 3) , F(2 , -4)	(d)	R(-7 , -3) , F(3 , -1)

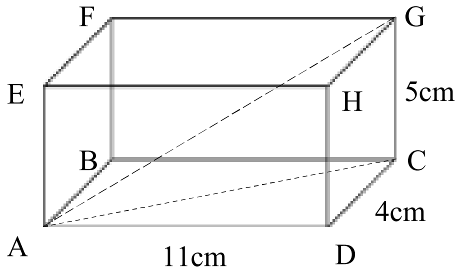
Pythagoras (2)

You need a calculator for this worksheet.
Round your answers to one decimal place where necessary.

1. Consider the cuboid opposite.

   (a) Calculate the length of the face diagonal AC.

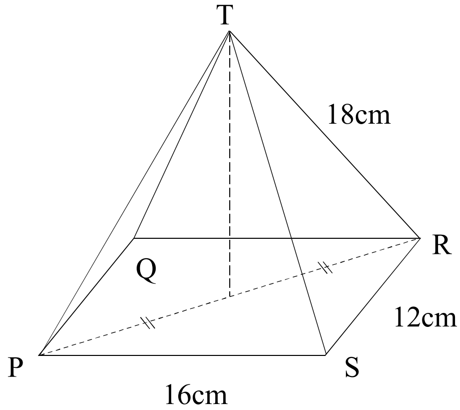
   (b) Hence calculate the length of the space diagonal AG.



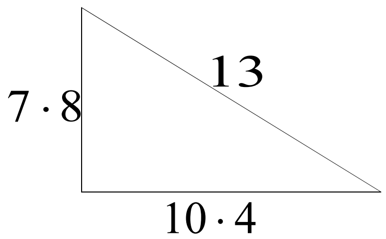
2. The pyramid opposite has a rectangular base.

   (a) Calculate the length of the base diagonal PR.

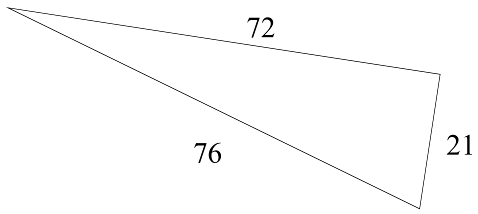
   (b) Given that edge TR = 18cm, calculate the vertical height of the pyramid.



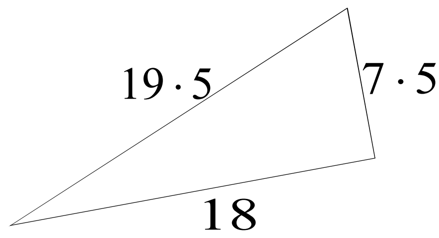
3. Which of the following triangles are right-angled?



(i)



(ii)



(iii)

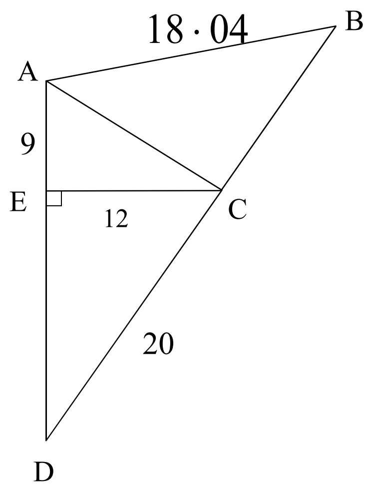
4. Consider the diagram opposite. All lengths are centimetres.

   (a) Calculate the length of AC.

   (b) Calculate the length of ED.

   (c) Prove that triangle ACD is right-angled at C.

   (d) Hence calculate the length of BC and the area of triangle ABC correct to the nearest whole number.

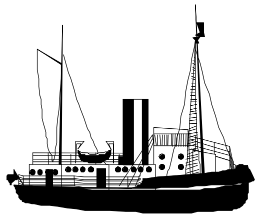


Pythagoras (3) - Problems

You need a calculator for this worksheet.
Round your answers to one decimal place where necessary.

Begin questions 1 to 8 by drawing a clear and well labelled diagram. Let x be the length to be found.

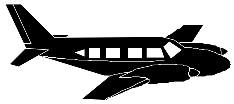
1. A ship sails 9km due North and then a further 17km due East.
   How far is the ship from its starting point?



2. An aircraft flies 400km due West and then a further 150km due South.
   How far is the aircraft from its starting point?

3. A ship sailed $8 \cdot 42$ km due East followed by $4 \cdot 7$ km due South.
   How far would it have sailed if it had followed a direct course?

4. A ship sails 9km due North and then a further distance x km due West.
   The ship is now 12km from its starting point. Calculate x.



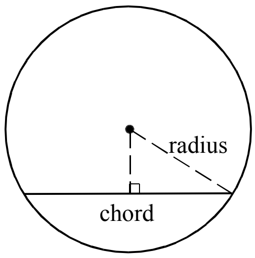
5. How long is the diagonal of a square of side 11mm?

6. A rectangle measures 14cm by 9cm. Calculate the length of its diagonals.

7. A ladder of length 5 metres leans against a vertical wall with the foot of the ladder 2 metres from the base of the wall. How high up the wall does the ladder reach?

8. A ladder is placed against a vertical wall. If the distance between the foot of the ladder and the wall is $1 \cdot 8$ metres, and the ladder reaches 4 metres up the wall, calculate the length of the ladder.

9. A circle has a diameter of 20cm.
   A chord is drawn which is 6cm from the centre of the circle.
   Calculate the length of the chord.

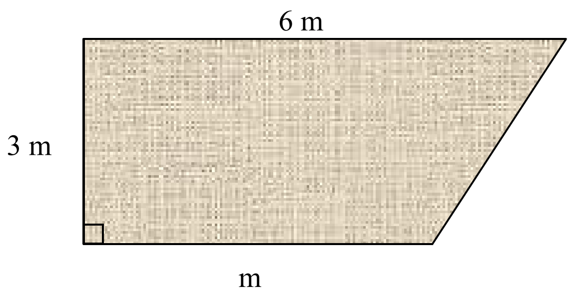


This diagram may help you with questions 9 and 10

10. A circle has a diameter of 12cm.
    A chord is drawn which is 5cm from the centre of the circle.
    Calculate the length of the chord.

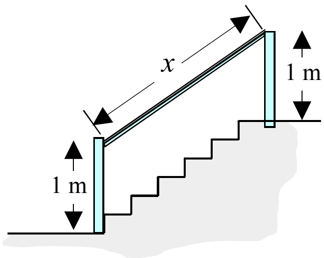
11. The room shown opposite has two parallel sides.

    Using the given dimensions calculate the perimeter of the room.



12. Calculate the length of the banister rail shown in the diagram if there are 6 stairs, and if each tread measures 25cm and each riser 20cm.

    Give your answer in metres.



Brackets And Equations (1)

1. Expand each of the following:

a)	$3(c+5)$	*b*)	$2(w-4)$	*c*)	$2(3f+1)$	*d*)	$3(t+8)$
e)	$5(g-3)$	*f*)	$7(w+x)$	*g*)	$6(y-3)$	*h*)	$7(p+2q)$
i)	$4(1+2y)$	*j*)	$8(p+9k)$	*k*)	$5(1+2a)$	*l*)	$4(7f+2g)$
m)	$8(1+3e)$	*n*)	$5(2+3w)$	*o*)	$h(h+2)$	*p*)	$a(a+5)$
q)	$c(c-5)$	*r*)	$e(e-2)$	*s*)	$f(1+4f)$	*t*)	$2t(t+4)$
u)	$p(p+q)$	*v*)	$p(3p+1)$	*w*)	$5a(h+a)$	*x*)	$3r(p-2r)$

2. Expand:

a)	$-4(d+3)$	*b*)	$-2(x-3)$	*c*)	$-5(d+2)$	*d*)	$-3(a-4)$
e)	$-7e(e+5)$	*f*)	$-9(x+9)$	*g*)	$-6p(p-7)$	*h*)	$-8(k+7)$
i)	$-3y(1-2y)$	*j*)	$-7(1+6h)$	*k*)	$-5v(5-2v)$	*l*)	$-4p(1-8p)$

3. Solve each of the following equations:

a)	$3(x+2)=24$	*b*)	$5(2p-3)=15$	*c*)	$4(2+x)=40$
d)	$7(2p-1)=21$	*e*)	$2(3m-1)=16$	*f*)	$8(2v-1)=24$
g)	$-3(x+5)=-27$	*h*)	$-4(y-1)=-16$	*i*)	$-3(p+4)=6$
j)	$-(a+2)=-9$	*k*)	$-5(2a-3)=5$	*l*)	$-4(3x-2)=-16$
m)	$3(m+4)=11$	*n*)	$2(7+y)=17$	*o*)	$6(2x-1)=-3$
p)	$-2(x+5)=3$	*q*)	$-3(2p-1)=-4$	*r*)	$-12(d-3)=-12$

4. Expand each of the following:

a)	$3(a+b+2c)$	*b*)	$5(x^2-2x+3)$	*c*)	$a(a+b-c)$
d)	$2p(3p-q+1)$	*e*)	$-3(y^2-2y+5)$	*f*)	$-x(x^2+3x-1)$

1. Expand and simplify :

a)	$3(2a - 1) + a$	b)	$2(3x + 1) - 2x$	c)	$5(b + 1) - 11$
d)	$5(2g - 1) + 3$	e)	$3(3 - 4y) + 7y$	f)	$3(4c + 1) - 6$
g)	$4(3h + 1) - 10h$	h)	$a(b + 2) + 2ab$	i)	$7(2 - 3m) - 8$
j)	$6 + 2(4y - 3)$	k)	$5a + 2(2a - 3)$	l)	$7 - 2(2p - 3)$
m)	$6 + 5(3y - 2)$	n)	$7b - 3(2b - 3)$	o)	$8 - 2(5y - 3)$
p)	$2x - 3(2x - 5)$	q)	$3c + 2(1 - 3c)$	r)	$9 - 2(6g - 1)$

2. Expand each of the following :

a)	$(x + 1)(x + 3)$	b)	$(y + 3)(y + 1)$	c)	$(a + 2)(a + 5)$
d)	$(b + 2)(b + 4)$	e)	$(x + 2)(x + 6)$	f)	$(s + 1)(s + 6)$
g)	$(y + 5)(y + 4)$	h)	$(b + 6)(b + 4)$	i)	$(c + 9)(c + 8)$
j)	$(x - 3)(x - 5)$	k)	$(b - 2)(b - 3)$	l)	$(c - 15)(c - 3)$
m)	$(a - 4)(a - 9)$	n)	$(y - 7)(y - 8)$	o)	$(x - 1)(x - 1)$
p)	$(s - 7)(s - 7)$	q)	$(d - 2)(d - 12)$	r)	$(b - 11)(b - 2)$

3. Expand each of the following :

a)	$(x - 2)(x + 5)$	b)	$(a + 3)(a - 4)$	c)	$(t - 6)(t + 3)$
d)	$(y + 7)(y - 4)$	e)	$(c + 2)(c - 5)$	f)	$(x - 5)(x + 1)$
g)	$(b - 3)(b + 9)$	h)	$(p - 10)(p + 1)$	i)	$(y - 7)(y + 6)$
j)	$(z + 2)(z - 6)$	k)	$(x + 1)(x - 2)$	l)	$(a + 1)(a - 1)$
m)	$(c - 5)(c + 3)$	n).	$(p - 7)(p + 2)$	o)	$(b + 12)(b - 6)$
p)	$(x - 2)(x + 5)$	q)	$(a + 3)(a - 6)$	r)	$(t - 8)(t + 3)$
s)	$(y + 1)(y - 4)$	t)	$(c + 2)(c - 8)$	u)	$(x - 4)(x + 7)$
v)	$(b - 1)(b + 9)$	w)	$(p - 10)(p + 3)$	x)	$(y - 1)(y + 4)$

4. Expand each of the following :

a)	$(3x - 3)(x - 5)$	b)	$(a + 1)(2a + 4)$	c)	$(t - 5)(5t - 3)$
d)	$(y - 7)(2y - 2)$	e)	$(3c + 2)(c + 7)$	f)	$(2x + 5)(x + 2)$
g)	$(b - 1)(3b - 8)$	h)	$(5p + 11)(p + 1)$	i)	$(3y - 6)(3y - 6)$
j)	$(4z + 2)(z - 3)$	k)	$(2x + 1)(2x - 3)$	l)	$(4a + 1)(3a - 1)$
m)	$(c - 4)(2c + 3)$	n).	$(5p - 7)(p + 4)$	o)	$(b + 2)(7b - 6)$
p)	$(3x - 2)(2x + 1)$	q)	$(a + 1)(7a + 6)$	r)	$(2t - 8)(3t + 1)$
s)	$(y - 1)(3y - 1)$	t)	$(3c + 2)(3c - 2)$	u)	$(3x - 1)(3x - 7)$
v)	$(2b + 1)(4b + 2)$	w)	$(2p - 3)(p + 3)$	x)	$(2y - 1)(7y + 3)$

5. Expand :

a)	$(x + 1)^2$b)	$(w - 3)^2$		c)	$(a - 4)^2$	d)	$(c + 6)^2$
e)	$(y - 8)^2$	f)	$(a + 7)^2$	g)	$(b + 2)^2$	h)	$(k + 9)^2$
i)	$(b - 9)^2$	j)	$(x - 10)^2$	k)	$(c - 1)^2$	l)	$(y - 5)^2$
m)	$(p - 10)^2$	n)	$(c - 12)^2$	o)	$(p - 6)^2$	p)	$(x + 4)^2$
q)	$(2g - 1)^2$	r)	$(5y + 3)^2$	s)	$(3q + 2)^2$	t)	$(4a - 1)^2$
u)	$(3y - 6)^2$	v)	$(4h + 1)^2$	w)	$(3x + 4)^2$	x)	$(4b - 5)^2$
y)	$(2d - 8)^2$	z)	$(5a + 4)^2$				

Brackets And Equations (3) - Extension

1. Expand, simplify and solve each of the following equations :

a)	$5-3(x-2)=-1$	*b*)	$2(3x-1)+3=31$
c)	$4(x+2)+3(x+4)=-1$	*d*)	$5(x+5)-(2x+1)=6$
e)	$2(x+1)+3(x+4)+1=0$	*f*)	$3(x+6)-2(x+9)=31$
g)	$2-x-(3x-2)=4$	*h*)	$7(1-x)-2(4-3x)=4$
i)	$2(3-2x)-5(3x-4)=45$	*j*)	$2(3-x)-3(5-2x)=-17$
k)	$2(4x+1)-3(3x-7)=23$	*l*)	$3(5-x)-2(7-3x)+8=0$
m)	$4(2x+1)-(x+2)=16$	*n*)	$3(4-x)+5=19-x$

2. Expand and simplify each of the following expressions :

a)	$3(x-4)+(x+2)^2$	*b*)	$(2x-1)(x+3)+2x(x-3)$
c)	$(2x+3)^2-4(x+1)$	*d*)	$-(x+2)^2+4x$
e)	$-3(2x-1)^2+12x^2$	*f*)	$(x-3)(x+1)-(x+4)^2$
g)	$3x(x-4)-(x+2)(x-4)$	*h*)	$(x+2)^2+(2x-1)^2-(x+3)$
i)	$(2x-3)^2-4(x-3)(2x+1)$	*j*)	$3x(x+3)^2+2x(x-3)$
k)	$2x(x^2-x+2)+(x-3)^2$	*l*)	$(x-1)^2-x(x+1)^2$

3. Solve each of the following equations :

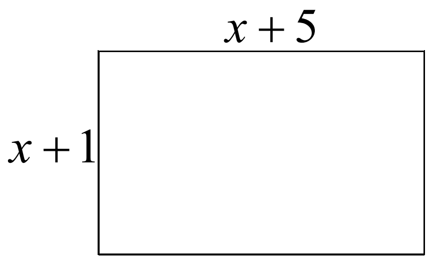
a)	$x^2+7x-2 = x^2+5x+8$	*b*)	$10x+x^2+9 = x^2+7x+30$
c)	$(x+4)(x+2) = x^2+x+28$	*d*)	$(x+1)^2 = x(x-7)+19$
e)	$(2x-1)^2-1 = 4(x+3)(x-1)$	*f*)	$(x-7)(x-3) = (x+2)^2+3$
g)	$3(x+5)(x-1) = 3(x+6)^2-27$	*h*)	$(2x+1)(x+1) = 2(x-4)^2+7$
i)	$(3x-1)(x+1) = 3x(x+1)+4$	*j*)	$(2x+1)^2-3x(x+5) = (x+3)(x+6)+3$

1. (a) For the rectangle opposite write down, in its simplest, an expression for:

   i) its perimeter (P);

   ii) its area (A).

   (b) Calculate P when $x = 4$ cm.

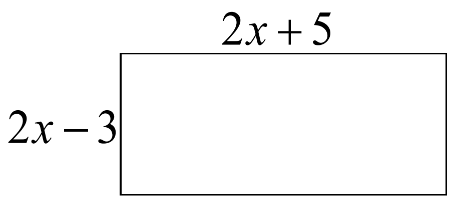


2. (a) For the rectangle opposite write down, in its simplest, an expression for:

   i) its perimeter (P);

   ii) its area (A).

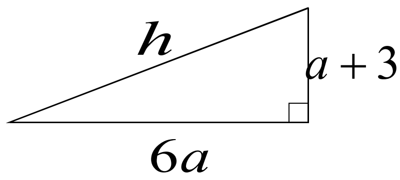
   (b) Calculate A when $x = 6$ cm.



3. Consider the triangle opposite.

   (a) Write down an expression for h^2 in its simplest form.

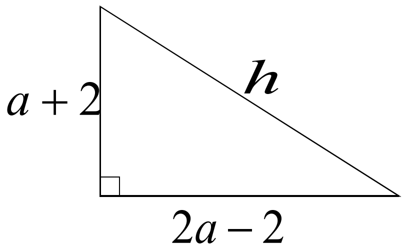
   (b) Hence calculate h when $a = 2$.



4. Consider the triangle opposite.

   (a) Write down an expression for h^2 in its simplest form.

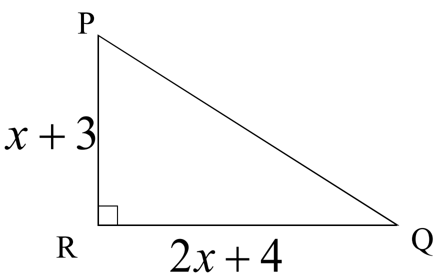
   (b) Hence calculate h when $a = 7$.



5. For the triangle opposite, write down simplified expressions for:

   (a) its area (A);

   (b) the length of PQ.

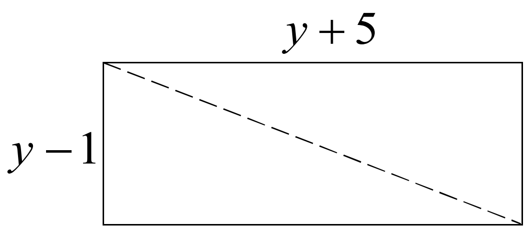


6. For the rectangle opposite, write down simplified expressions for:

   (a) P, its perimeter.

   (b) A, its area.

   (c) The length, d, of its diagonal.



7. Repeat question 6. for rectangles measuring:

   (a) $(x+5)\ cm \ \ by \ \ (2x+2)\ cm$

   (b) $(x+3)\ mm \ \ by \ \ (3x-1)\ mm$

Statistics (1) - Measures of the Centre (Mean, Median & Mode)

1. For each set of numbers below, calculate : i) the **range**; ii) the **mean**.

   (a) 5 7 3 8 8 5 3 9

   (b) 23 53 21 34 87 64

   (c) $1\cdot4$ $4\cdot7$ $7\cdot1$ $12\cdot2$ $4\cdot6$ $13\cdot1$ $20\cdot2$ $11\cdot8$ $5\cdot0$

2. For each set of numbers below, establish the **median** and state the **mode**:

   (a) 2 3 3 3 4 4 5 7 7 8 8

   (b) 32 45 33 17 22 54 45

   (c) $6\cdot3$ $1\cdot7$ $8\cdot8$ $1\cdot2$ $8\cdot6$ $4\cdot1$ $10\cdot7$ $6\cdot3$ $6\cdot3$

   (d) 8 12 56 24 36 12 24 24

   (e) 11 11 7 12 16 17

   (f) 23 26 38 65 43 75 75 62 86 22

3. For each set of numbers in Q2, calculate the **mean** value, rounding your answers to 1d.p.

4. (a) Calculate the mean of the numbers 5 12 7 3 2 5 1

   (b) Calculate the new mean when a 9 is added.

5. Seven women have weights of 44kg , 51kg , 57kg , 63kg , 48kg , 49kg and 45kg.

   (a) Find the mean weight of the seven women.

   (b) Find the mean weight of the remaining five women after the lightest and the heaviest women leave.

6. The average weight of 12 boxes is $2\cdot4$kg.

   (a) What is the total weight of all 12 boxes?

   (b) If an extra box is added weighing $1\cdot1$kg , what is the average weight of the thirteen boxes?

7. The mean of six numbers is $4\cdot7$. The mean of a different four numbers is $6\cdot5$.
   Calculate the mean of all ten numbers together.

8. The mean height of eight tomato plants is 42cm. A ninth plant is added to the group and the mean height of all nine plants is 43cm. Establish the height of the ninth plant.

9. The following are the heights (in metres) of a group of people:

   $1\cdot6$, $1\cdot7$, $1\cdot9$, $1\cdot8$, $1\cdot6$, $1\cdot7$, $1\cdot5$, $1\cdot9$, $1\cdot6$, $1\cdot8$

   (a) Find the mean, median and modal height of the group.

   (b) When a new member joined the group the mean height became $1\cdot7$ m exactly.
   What height was the new member?

Statistics (2) - Mean, Median & Mode (Frequency Tables)

1. Calculate the **mean** and determine the **median** and **mode** for each frequency table below.

Apple Weight (g)	*f*
70	2
71	6
72	9
73	11
74	8
75	3
76	1

Eggs in Nest	*f*
1	5
2	15
3	25
4	30
5	15
6	10

Test Marks /10	*f*
3	1
4	0
5	2
6	8
7	9
8	13
9	9
10	8

2. Twenty-five children were measured and their heights are shown in the frequency table below.

height (metres)	1.4	1.44	1.48	1.52	1.56
frequency	3	5	6	8	3

Calculate the mean height of the 25 children correct to 1 decimal place.

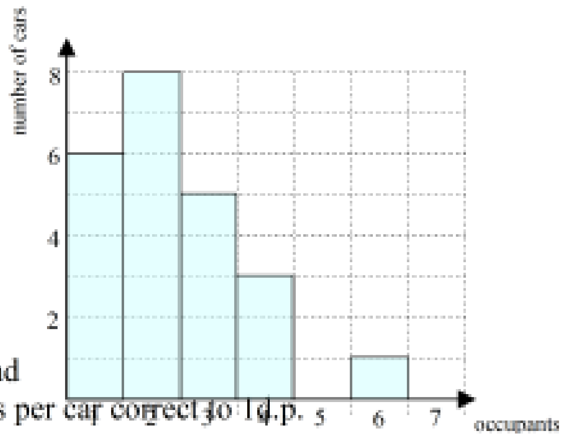
3. In a survey the number of occupants in the cars passing a school was recorded.

The results have been shown in the histogram opposite.

(a) How many cars were in the survey?

(b) What is the modal number of occupants?

(c) Construct a frequency table from the diagram and use it to calculate the mean number of occupants per car correct to 1d.p.



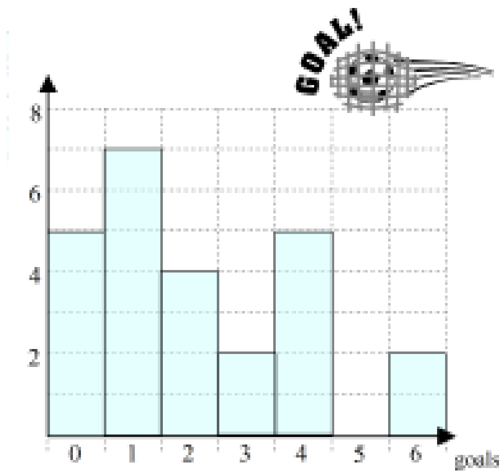
4. The graph opposite shows the number of goals scored by 25 football teams on a particular Saturday.

(a) What is the range of goals scored?

(b) State the median and modal number of goals.

(c) What percentage of the teams scored 2 goals?

(d) Construct a frequency table from the graph and use it to calculate the mean number of goals scored.



5. (**Extension**) Construct your own frequency table to fit the following criteria:

Range = 5 , $\sum f = 15$, mode = 7 , median = 6 , mean = 6

Statistics (3) - Quartiles,Semi-interquartile Range & Cumulative Frequency

1. For each data set below establish the value of the median (Q_2) and the quartiles Q_1 and Q_3. Hence calculate the semi-interquartile range for each set.

(a)	4	4	5	6	8	10	10	10	12	13	18	
(b)	23	32	32	34	35	40	41	47	50			
(c)	4	4	5	7	8	9	9	9	12	14		
(d)	23	34	38	46	58	71						
(e)	10	12	12	13	15	20	21	21	26	32	38	41
(f)	43	28	27	32	50	19	24	47				

2. For each frequency table below : i) Copy the table and complete the cumulative frequency column.
ii) Work out the two quartiles, Q_1 and Q_3 and the median (Q_2).
iii) Calculate the semi-interquartile range.

(a)

Cats in litter	*f*	Cum. *f*
6	2	
7	3	
8	4	
9	6	
10	3	
11	1	

(b)

Hours of Sunshine (day)	*f*	Cum. *f*
8	4	
9	5	
10	8	
11	5	
12	6	
13	1	
14	1	

(c)

Matches in Box	*f*	Cum. *f*
48	3	
49	3	
50	6	
51	7	
52	10	
53	7	
54	9	
55	5	

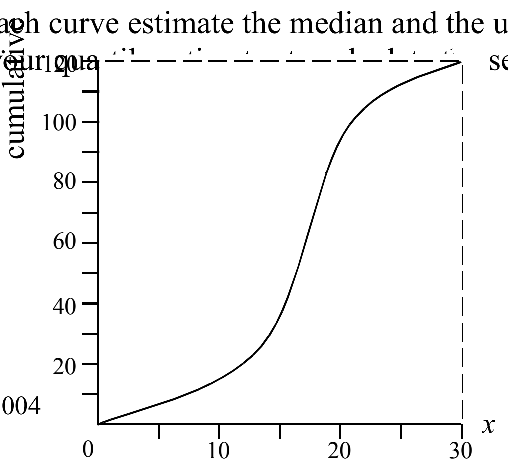
(d)

Plant Height (cm)	*f*	Cum. *f*
120	5	
121	17	
122	18	
123	14	
124	24	
125	14	
126	8	

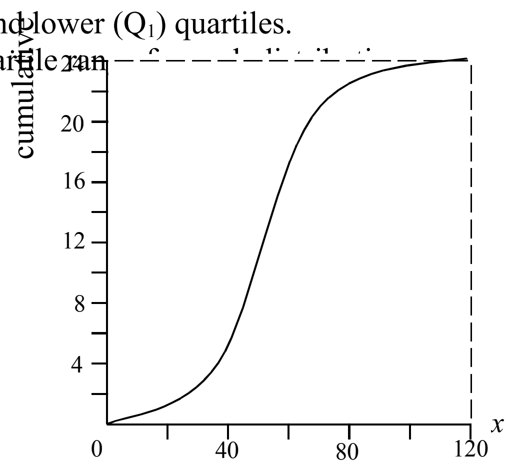
3. Draw a cumulative frequency curve (an ogive) for each distribution in question 2. Mark the median and the upper and lower quartiles, as accurately as you can, on each curve.

4. Two cumulative frequency curves are shown below. For each curve estimate the median and the upper (Q_3) and lower (Q_1) quartiles. Use your qua ... semi-interquartile ran ...

(a)



(b)

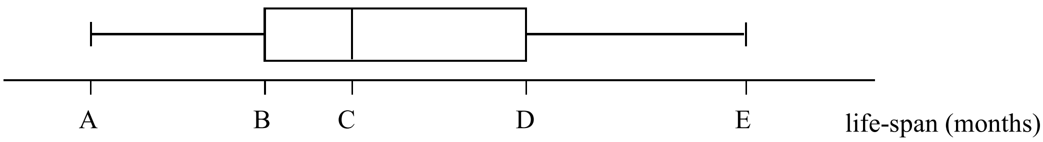


Statistics (4) - Boxplots (the five-figure summary)

1. The life-span (in months) of a sample of eleven lightbulbs is shown below.

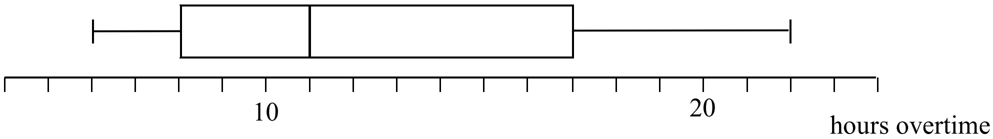
2 3 6 7 8 8 9 11 12 14 17

These results are now illustrated using a boxplot.



Make a five-figure summary to find the values of A, B, C, D and E.

2. The boxplot below shows the number of hours overtime worked in a small factory in a particular month.



(a) What is the greatest and least number of overtime hours worked?

(b) What is the median of this distribution?

(c) What percentage of the workforce completed between 8 and 17 hours overtime?

(d) Calculate the range <u>and</u> the semi-interquartile range for this data.

3. For each data set below ..... i) make a five-figure summary;
ii) draw a boxplot;
iii) calculate the semi-interquartile range.

(a) 5 6 7 7 8 8 12 12 12 13 15 20 21

(b) 16 18 18 20 26 27 39 40

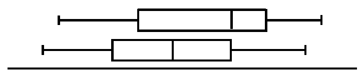
(c) 1 1 5 6 6 8 9 9 9 9 12 20 24 40 40

4. In a particular French holiday resort the number of hours sunhine over a twelve day period in June and over a similar period in July were recorded. The results are shown below.

June -	8	6	9	7	4	2	12	13	1	7	9	6
July -	10	12	9	9	15	14	2	3	9	8	16	4

(a) Make a five-figure summary for both June and July's data.

(b) Draw a composite boxplot.
(i.e. draw a boxplot for each set on the same diagram)

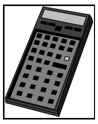


(c) State the median and calculate the range and semi-interquartile range for each set.

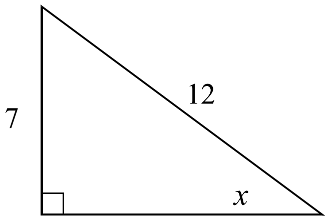
(d) Compare and **comment** on the two sets of data.

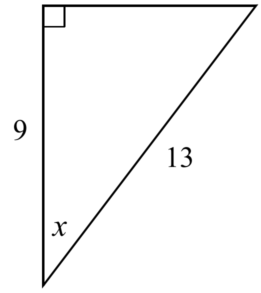
Trigonometry (1)

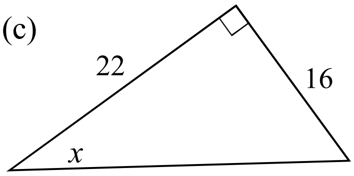
You need a scientific calculator for this worksheet.
Round all answers to 1 d.p. where necessary.

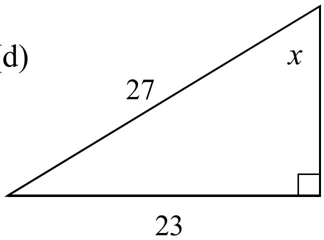


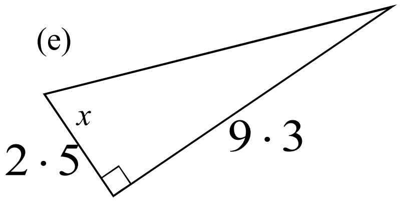
1. Find the size of angle x in each diagram.

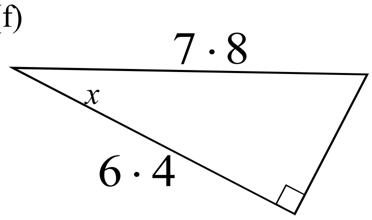
(a)


(b)


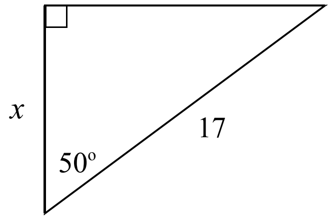
(c)


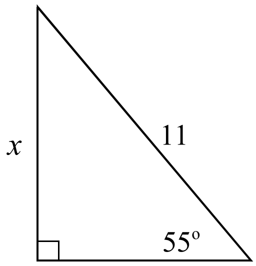
(d)


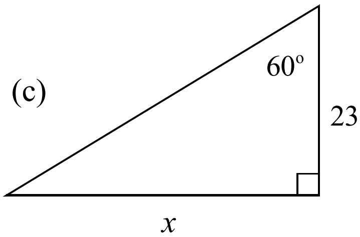
(e)


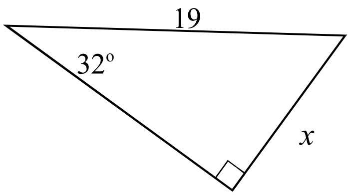
(f)


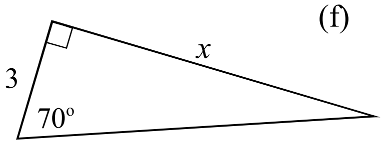
2. Calculate the length of the side marked x in each triangle below.

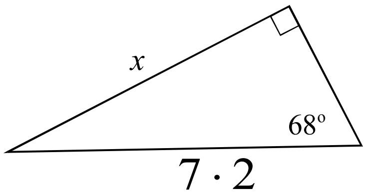
(a)


(b)


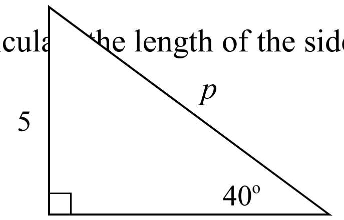
(c)


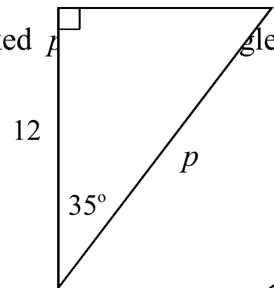
(d)


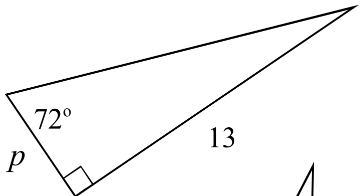
(e)


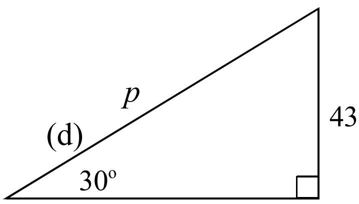
(f)


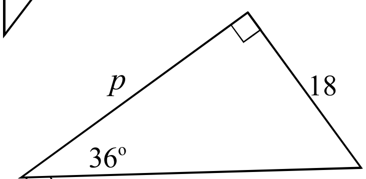
3. Calculate the length of the side marked p in each triangle below.

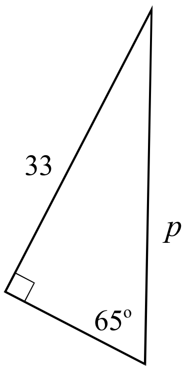
(a)


(b)


(c)


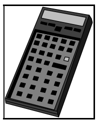
(d)


(e)


(f)


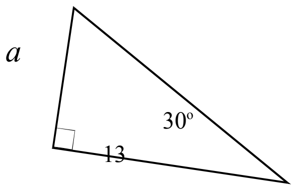
Trigonometry (2) – More Practice

You need a scientific calculator for this worksheet.

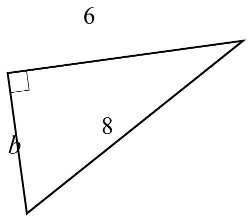


Find the angles and sides marked with letters.

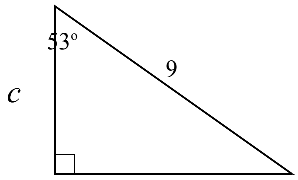
1.



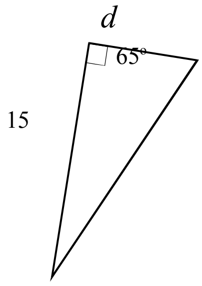
2.



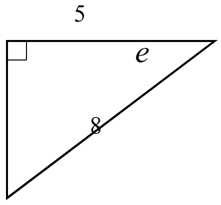
3.



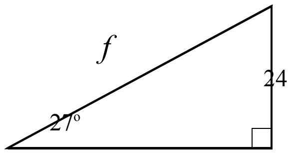
4.



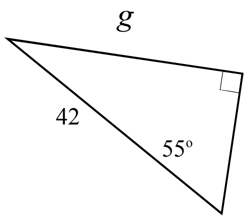
5.



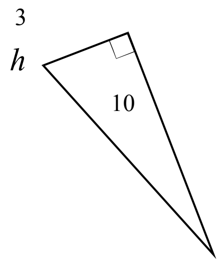
6.



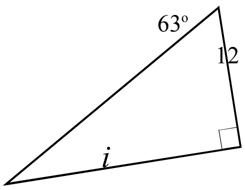
7.



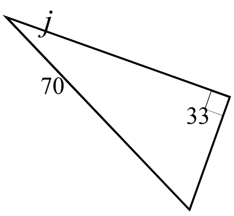
8.



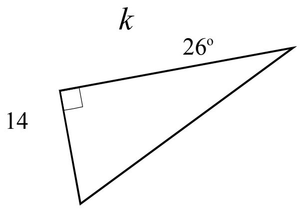
9.



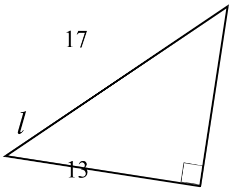
10.



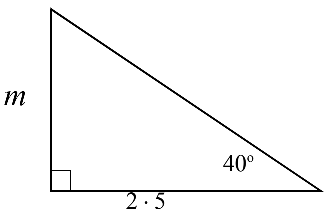
11.



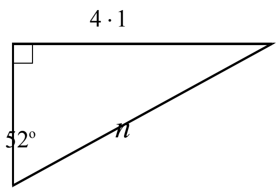
12.



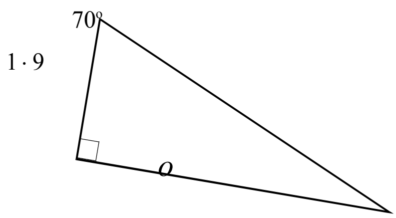
13.



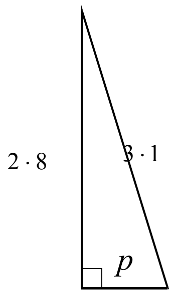
14.



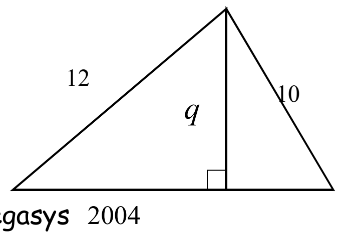
15.



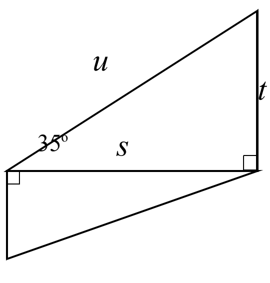
16.



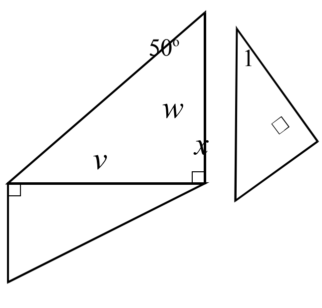
17.



18.



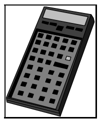
19.



43° r 72° 7 0 · 8 65°

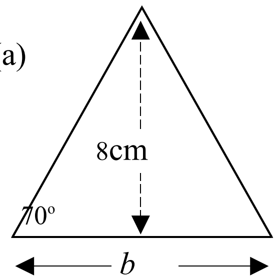
Trigonometry (3) - Isosceles Triangles & Frameworks

You need a scientific calculator for this worksheet.

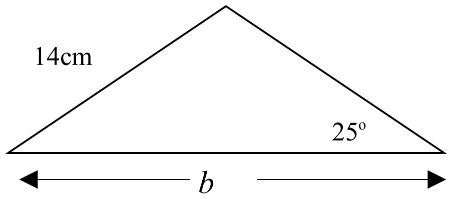


1. Calculate the length of the base, *b* , of each isosceles triangle below.

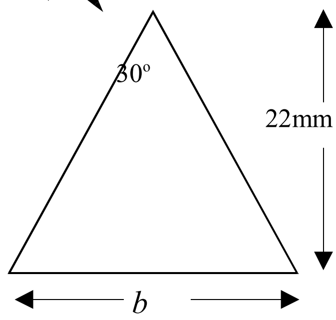
(a)



(b)

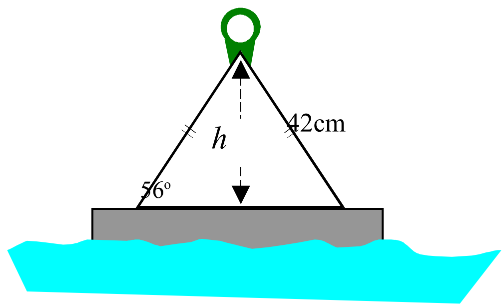


(c)



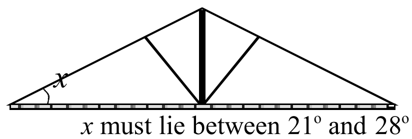
2. The diagram opposite represents a buoy used for tying-up small boats.

   Calculate the vertical height (*h*) of its triangular frame.

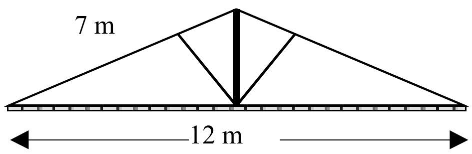


3. To comply with building regulations a roof must have an angle of between 21° and 28° to the horizontal (see diagram).

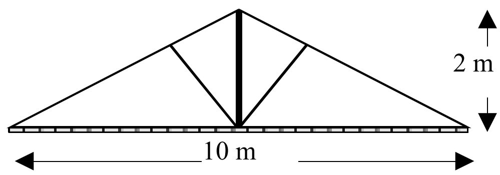
   Which, if any, of the two roofs below comply with the building regulations?



(a)



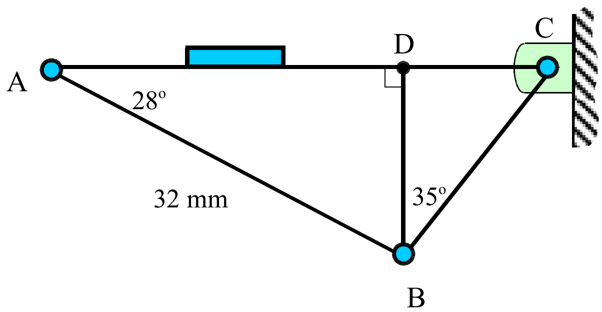
(b)



4. The diagram opposite shows part of the framework for a small hinged bracket.

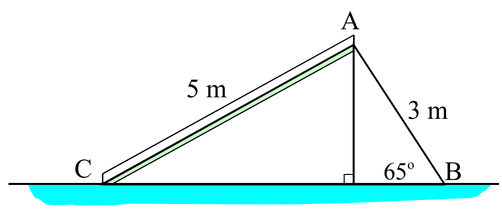
   (a) Calculate the length of DB.

   (b) Hence calculate the length of BC.



5. The diagram opposite represents a playground chute. AC represents the slide and AB the stairs.

   A local council ruling states " *for a slide to be safe the* ***maximum*** *permissible angle between the slide and*



the ground is 35° ".

Does this diagram represent a "safe" slide?

Trigonometry (4) - Problems

You need a scientific calculator for this worksheet.

Most of the problems below will require you to draw a neat sketch before attempting to answer the question.

1. A ladder of length 4m rests against a vertical wall so that the base of the ladder is $1 \cdot 5$ m from the wall.

   Calculate the angle between the ladder and the ground.

2. A ladder of length 5m leans against a vertical wall so that the base of the ladder is 2m from the wall.

   Calculate the angle between the ladder and the wall.

3. A vertical telegraph pole has a wire support of length 9m stretching from the top of the pole to the ground so that the angle between the wire support and the ground is 65°.

   How far is the end of the wire support from the base of the pole?

4. A vertical aerial mast has a wire support of length 12m stretching from the top of the mast to the ground so that the angle between the wire support and the ground is 78°.

   Calculate the height of the mast.

5. A ladder of length $4 \cdot 8$ m rests against a vertical wall so that it reaches up the wall to a height of $4 \cdot 3$ m.

   Calculate the angle between the ladder and the ground.

6. A tall thin tree has a height of 15m. A rope support stretches from the top of the tree to a point on the ground out from the base of the tree.

   If the angle between the rope and the ground is 62°, calculate the length of the rope support.

7. From a distance of 20m from the base of a tower the angle of elevation to the top of the tower is 38°. How high is the tower?

8. P is a point 30m from the base of a building. The building has a height of 18m.

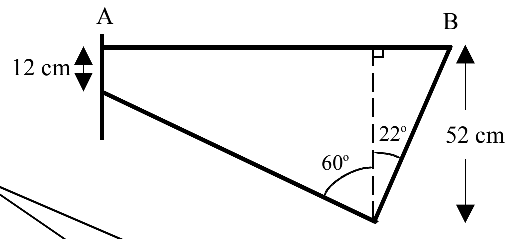
   Calculate the angle of elevation to the top of the building from P.

9. A girl is flying a kite from a string of length 46m.
   The string is taut, and is being held 1m above the ground.

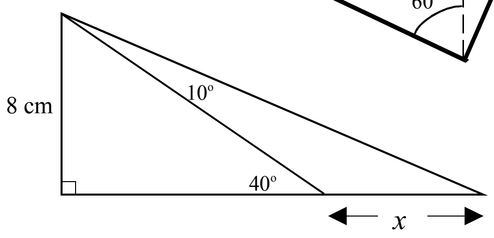
   Calculate the height of the kite above the ground if the angle of elevation is 36° between the string and the horizontal.

10. The frame of a bicycle is shown in the diagram opposite.

    Find the length of the cross bar, AB.



11. Consider the diagram opposite.



Calculate the length marked x.

Simultaneous Equations (1)

1. Solve the following systems of equations by "**elimination**".

(a) $2x + 4y = 24$, $7x - 2y = 4$ (b) $4a - 3b = 18$, $2a + 6b = -6$ (c) $2e + 7f = 26$, $8e - 5f = 38$

(d) $5x + y = -2$, $3x + 2y = 3$ (e) $2x - 3y = 10$, $3x - 6y = 18$ (f) $4p + 3q = 1$, $8p + 5q = -1$

(g) $2g + 3h = 1$, $5g - 2h = -26$ (h) $-2x + 3y = 6$, $9x - 7y = -1$ (i) $2u + 4v = -16$, $11u - 7v = -1$

(j) $2x - 8y = 0$, $5x - 5y = 15$ (k) $3p + 2q = -11$, $4p + 3q = -14$ (l) $10a - 3b = 46$, $6a - 8b = 40$

2. Solve the following systems of equations by "**substitution**".

(a) $x + 3y = 17$, $3x - 2y = -4$ (b) $a - 3b = 6$, $3a + b = 8$ (c) $2e + f = 1$, $5e - 2f = -20$

(d) $5x + 3y = 7$, $4x + y = 0$ (e) $2x - 5y = -14$, $x - 2y = -5$ (f) $2p + 3q = 6$, $4p + q = -8$

(g) $2g + h = 11$, $7g - 8h = 96$ (h) $3x - 2y = 25$, $x + 5y = -3$ (i) $u - 4v = 10$, $9u - 2v = 22$

(j) $2x = 3y + 5$, $x + 5y = 9$ (k) $3p - 2q + 7 = 0$, $4p + q = -2$ (l) $4a + b - 30 = 0$, $6a + 5b - 38 = 0$

3. Solve the following simultaneous equations "**graphically**".

(a) $x + y = 6$, $2x + y = 8$
Draw axes with x and y from 0 to 8

(b) $x + 2y = 8$, $3x + y = 9$
Draw axes with x and y from 0 to 9

(c) $x + 3y = 6$, $x - y = 2$
Draw axes with x from 0 to 8 and y from –2 to 4

(d) $\begin{aligned} 2x + 3y &= 12 \\ x + y &= 5 \end{aligned}$

Draw axes with x and y from 0 to 7

(e) $\begin{aligned} 3x + 4y &= 24 \\ 3x + 2y &= 18 \end{aligned}$

Draw axes with x and y from 0 to 9

(f) $\begin{aligned} 5x + y &= 10 \\ x - y &= -4 \end{aligned}$

Draw axes with x from -4 to 4 and y from 0 to 10

Simultaneous Equations (2)

Problems Leading to Simultaneous Equations

Note: each question must begin with the construction of two separate equations each with two stated unknowns.

1. Find two numbers whose sum is 56 and whose difference is 16.

2. Find two numbers whose sum is 22 and where twice the big one minus three times the small one is 24.

3. Two numbers are such that twice the smaller plus the larger is equal to 18 and the difference between twice the larger and the smaller is 11.
Find the two numbers.

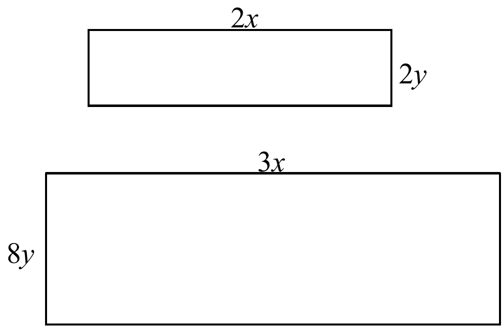
4. Two numbers are such that three times the larger plus twice the smaller is equal to 31 and the sum of twice the smaller plus the larger is 13.
Find the two numbers.

5. Consider the two rectangles opposite.

The smaller one has a perimeter of 60cm.
The larger one has a perimeter of twice the smaller.

(a) Form two equations and solve them simultaneously to find the values of x and y.

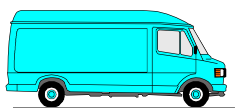
(b) Hence calculate the area of the smaller rectangle.



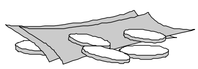
6. A van is carrying eight identical boxes and five identical parcels.

(a) If 3 boxes and 2 parcels weigh a total of 22kg and 4 boxes and 3 parcels weigh 30kg, find the weight of an individual box and a single parcel.

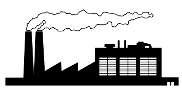
(b) What is the total weight carried by the van?



7. 3 pounds of butter and 4 pints of milk costs £3.84.
5 pounds of butter and 7 pints of milk costs £6.48.
Find the cost of a pound of butter and a single pint of milk.



8. In a certain factory, the basic rate of pay is £4.50 per hour, with overtime at £6.40.
His total wage for a certain week was £215.80.
If he worked a total of 45 hours in all, how many hours did he work at the basis rate?

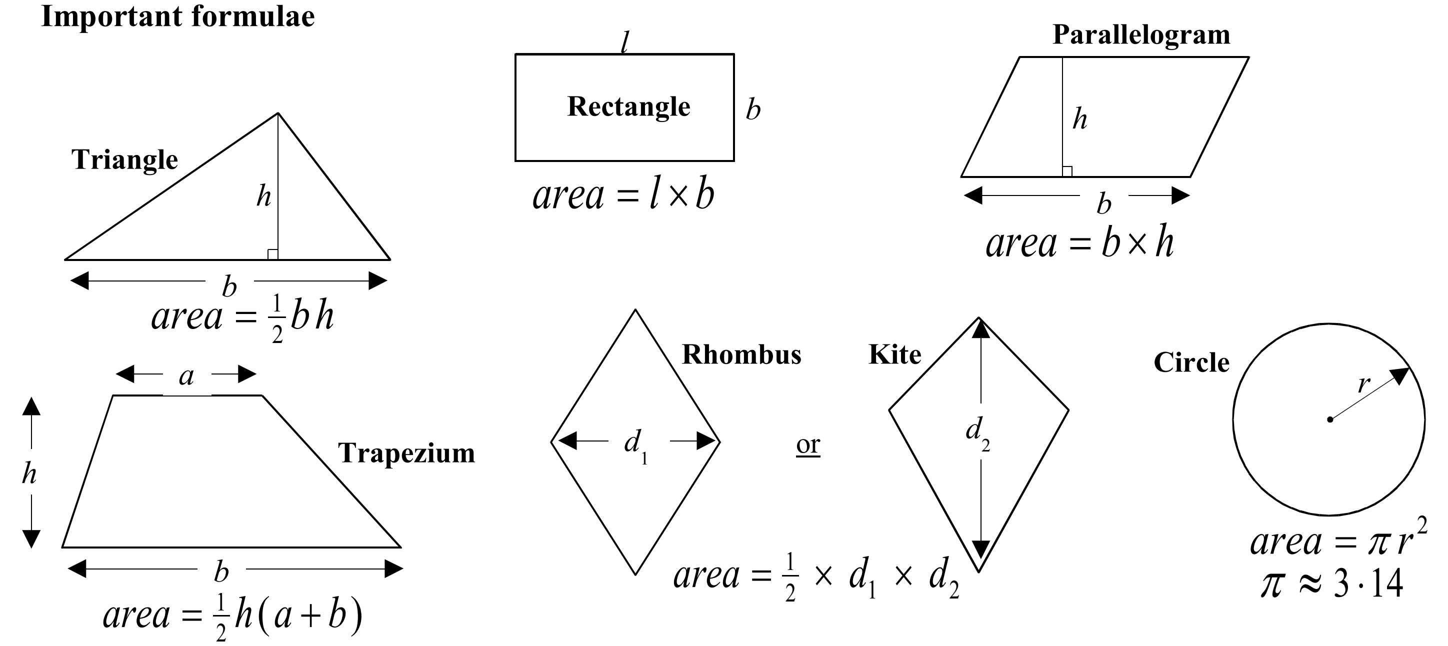


9. At a concert 500 tickets were sold. Cheap tickets cost £5 whereas more expensive ones cost £9.
If the total receipts were £3 220, how many cheap tickets were sold?

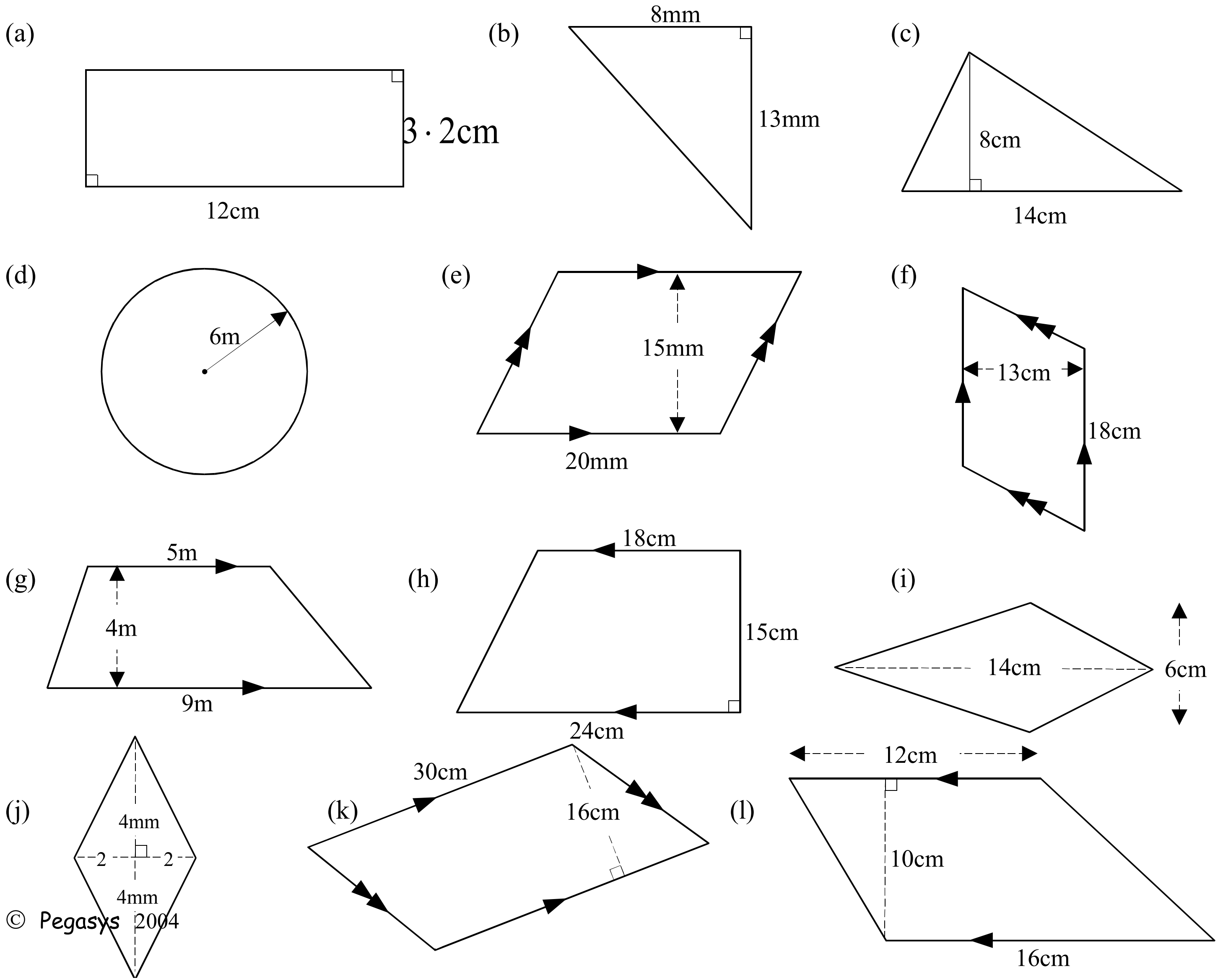
10. John saves money by putting every 50p and every 20p coin he recieves in a box. After a while he discover's that he has 54 coins amounting to £17.10. How many 50p coins does he have?

Area (1)

Important formulae



Calculate the area of each shape below:

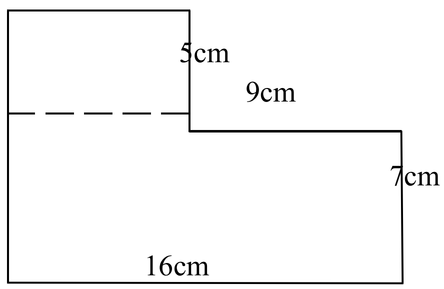


Area (2)

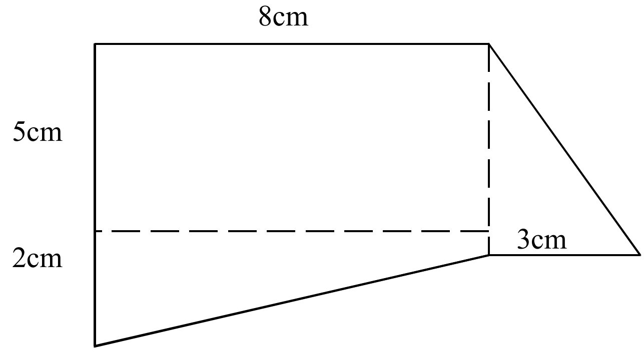
Calculate the area of each composite shape below:
(*note.... assume right-angles where obvious*)

Round your answers to 1 decimal place where necessary.

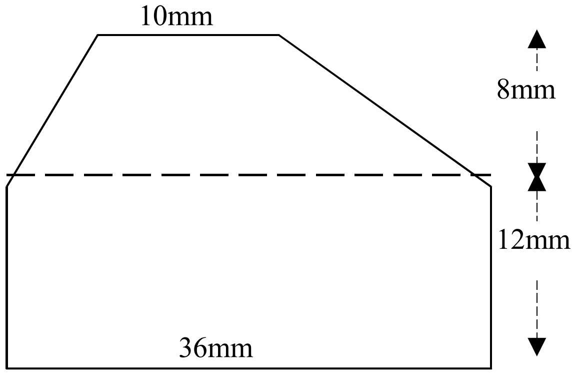
(a)



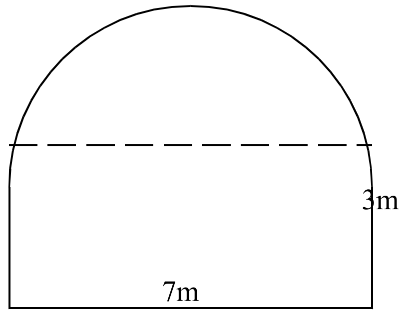
(b)



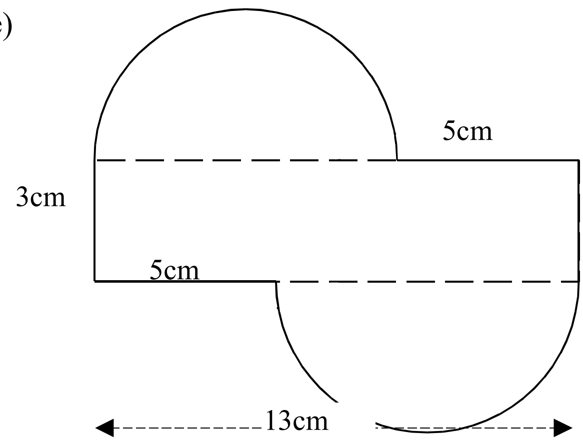
(c)



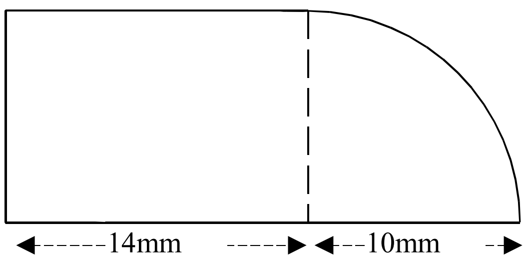
(d)



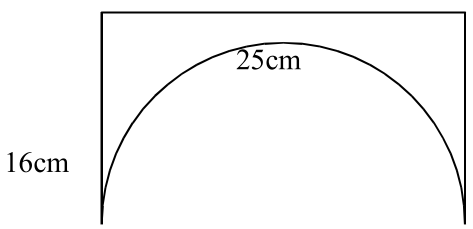
(e)



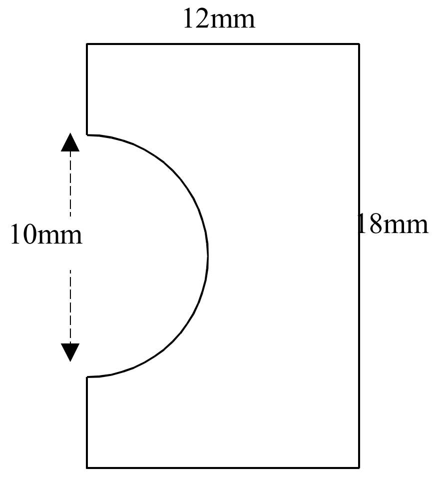
(f)



(g)



(h)

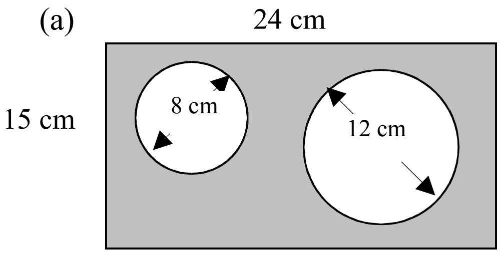


Area (3) - Problems

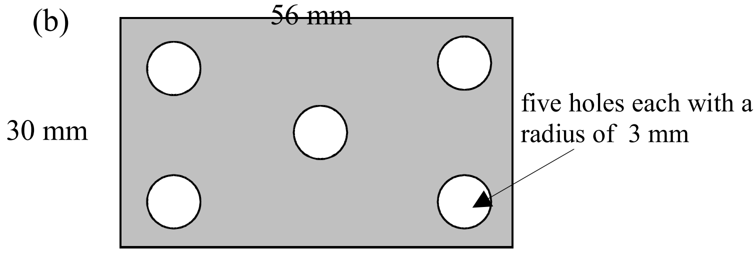
Round your answers to 1 decimal place where necessary.

1. Calculate the shaded area in each diagram below.

(a)



(b)



2. A rectangular steel plate measures 40cm by 25cm.
Four holes, each with a diameter of 10cm, have been drilled through the plate.

(a) Calculate the area of metal remaining, after the holes have been drilled.

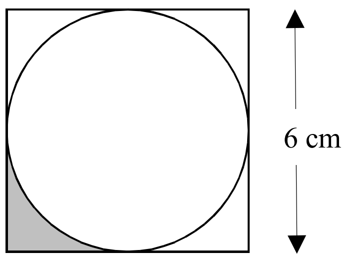
(b) What percentage of metal has been wasted?

3. A piece of thin plastic is in the shape of a square of side 18cm.

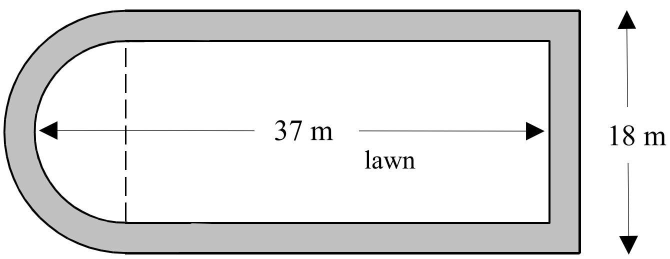
(a) Calculate the area of the largest circular hole which can be drilled through the plastic.

(b) What percentage of the plastic has been lost to create this circular disc?

4. Calculate the shaded area in the diagram opposite.



5. The diagram below shows a lawn (unshaded) surrounded by a path of uniform width (shaded).
The curved end of the lawn is a semi-circle of diameter 14 metres.



(a) Calculate the area of the lawn.

(b) Calculate the area of the path.

6. A rectangular sheet of metal measures 60cm by 20cm. It is melted down and recast into circular discs of the same thickness as the original sheet and with radius 5cm.
How many complete discs can be cast?

Volume (1)

Important formulae:

Cuboid : $V = l \times b \times h = lbh$

Prism : $V = \text{face area} \times 3^{rd} \text{ dimension} = A \times l$

Cylider: $V = \pi r^2 h$

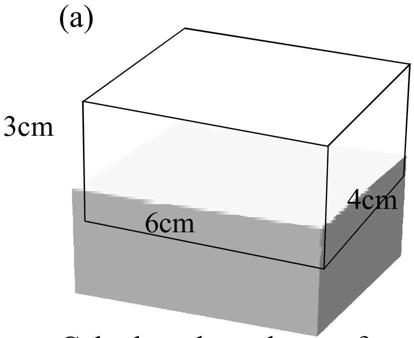
Sphere: $V = \frac{4}{3}\pi r^3$

Cone: $V = \frac{1}{3}\pi r^2 h$

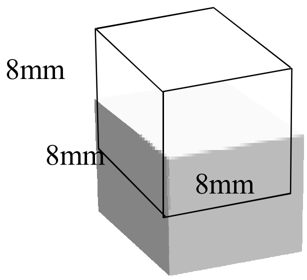
Pyramid $V = \frac{1}{3}(\text{base area}) \times \text{height} = \frac{1}{3}Ah$

1. Calculate the volume of each cuboid below:

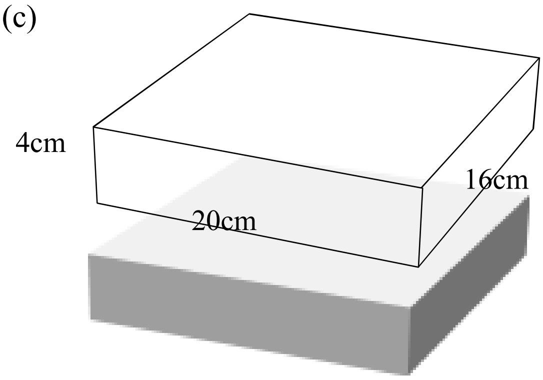
(a)



(b)

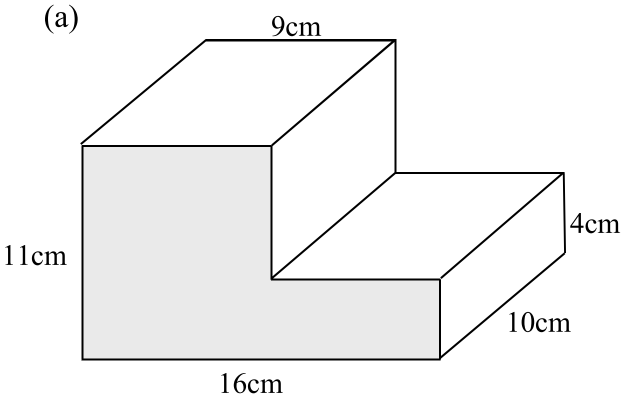


(c)

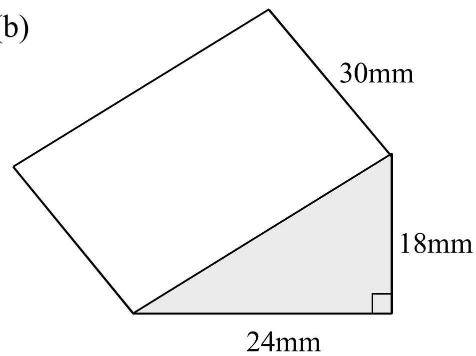


2. Calculate the volume of each prism below:

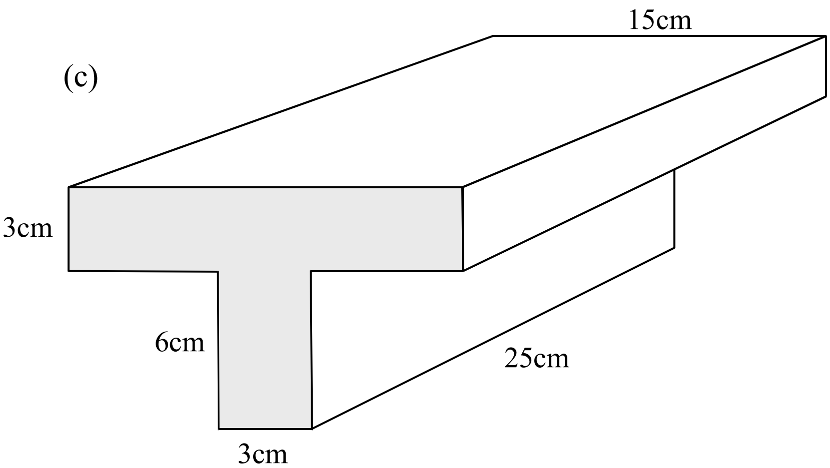
(a)



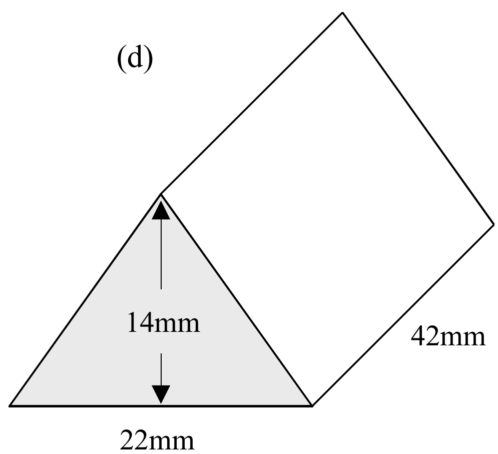
(b)



(c)

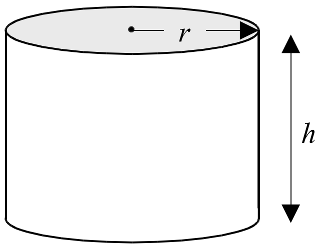


(d)



Volume (2)

1. Calculate the volume of each cylinder with given radius and height.



(a) $r = 2\text{cm}$, $h = 6\text{cm}$

(b) $r = 8\text{cm}$, $h = 3\text{cm}$

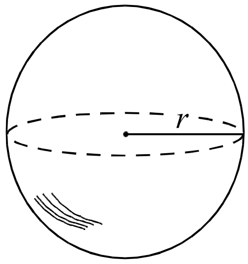
(c) $r = 4\text{mm}$, $h = 10\text{mm}$

(d) $r = 3\text{m}$, $h = 2\text{m}$

2. A cylinder has a diameter of 20cm and a height of 16cm. Calculate its volume.

3. A cylinder has a diameter of $2 \cdot 6\,\text{m}$ and a height of 80cm.
Calculate its volume to the nearest cubic metre.

4. Calculate the volume of each sphere described below, rounding your answer to 1 decimal place.



(a) $r = 6\text{cm}$

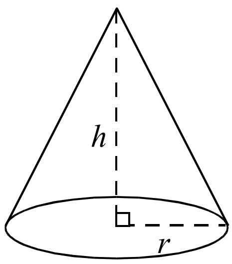
(b) $r = 2\text{m}$

(c) $r = 9\text{mm}$

(d) $r = 3\text{cm}$

5. A sphere has a diameter of 8cm.
Calculate its volume giving your answer correct to 3 significant figures.

6. Calculate the volume of each cone described below, rounding your answers to 1 decimal place.



(a) $r = 3\text{cm}$, $h = 6\text{cm}$

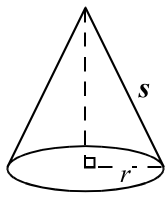
(b) $r = 8\text{mm}$, $h = 12\text{mm}$

(c) $r = 3\text{cm}$, $h = 5\text{cm}$

(d) $r = 2\text{m}$, $h = 6\text{m}$

7. A cone has a base diameter of 8cm and a height of 5cm. Calculate the volume of this cone.

8. A cone has a base diameter of 10cm and a **slant height** of 13cm.
Calculate the volume of the cone.



9. A cone has a base radius of 9cm and a **slant height** of 15cm.
Calculate the volume of the cone.

10. A pyramid has a square base of side 4cm and a vertical height of 7cm.
Calculate the volume of the pyramid correct to 2 significant figures.

11. A pyramid has a rectangular base measuring 16mm by 12mm and a vertical height of 10mm.
Calculate the volume of the pyramid .

Factorisation

1. Factorise each of the following by first removing a common factor.

(a)	$3x-15$	(b)	$5y+35$	(c)	$8a+48$	(d)	$18+6t$
(e)	x^2+9x	(f)	$3y-y^2$	(g)	b^2-4b	(h)	$5p+p^2$
(i)	$ab+ac$	(j)	x^2-xy	(k)	$pq-pr$	(l)	a^2+ax
(m)	$8a+20$	(n)	$21y-28$	(o)	$24x+22$	(p)	$36c-63$

2. Factorise each of the following by first removing the highest common factor.

(a)	$2a^2+6a$	(b)	$5x^2-40x$	(c)	$30y-y^2$	(d)	$3t^2+18t$
(e)	$6x^2-27x$	(f)	$14y-10y^2$	(g)	$12b^2-32b$	(h)	$25x^2+20x$

3. Factorise (each expression contains a difference of squares):

(a)	a^2-3^2	(b)	x^2-2^2	(c)	p^2-9^2	(d)	c^2-5^2
(e)	b^2-1	(f)	y^2-16	(g)	m^2-25	(h)	a^2-9
(i)	$36-d^2$	(j)	$4-q^2$	(k)	$49-w^2$	(l)	x^2-64
(m)	$81-4g^2$	(n)	$36w^2-y^2$	(o)	$4a^2-1$	(p)	g^2-81h^2
(q)	$49x^2-y^2$	(r)	$9c^2-16d^2$	(s)	$4p^2-9q^2$	(t)	b^2-100c^2

4. Factorise each of the following quadratic expressions:

(a)	$b^2+7b+12$	(b)	$x^2+14x+45$	(c)	$s^2+11s+24$	(d)	$y^2+11y+28$
(e)	b^2+6b+9	(f)	$c^2+13c+42$	(g)	$a^2+12a+32$	(h)	y^2+6y+8
(i)	x^2-6x+5	(j)	c^2-6c+8	(k)	$y^2-10y+21$	(l)	$b^2-14b+48$
(m)	$x^2-7x+10$	(n)	$s^2-13s+40$	(o)	$y^2-11y+18$	(p)	$a^2-8a+16$

5. Factorise:

(a)	x^2+4x-5	(b)	$a^2-4a-21$	(c)	t^2-t-20	(d)	$y^2+4y-32$
(e)	$c^2-5c-14$	(f)	x^2-5x-6	(g)	$b^2+7b-18$	(h)	$p^2-8p-20$
(i)	y^2-y-56	(j)	$z^2-2z-24$	(k)	$x^2-3x-28$	(l)	$a^2-13a-30$
(m)	c^2+c-20	(n)	p^2-6p-7	(o)	$b^2+5b-50$	(p)	$x^2+3x-18$

Formula (1)

1. Evaluate the following formulae for the values given:

(a) $T = 3s + 2$, find T when $s = 18$ (b) $P = 5q - 7$, find P when $q = 3$

(c) $R = 40 - 8x$, find R when $x = 2\cdot5$ (d) $z = 3 + 5y$, find z when $y = 1\cdot8$

(e) $k = 2a + 3b$, find k when $a = 7, b = 2$ (f) $R = C + Pt$, find R when $C = 0\cdot6$, $P = 2\cdot4$, $t = 7$

(g) $P = kT - 0\cdot8$, find P when $k = 4$, $T = 1\cdot7$ (h) $Y = 1\cdot9 + sZ$, find Y when $s = 2\cdot8$, $Z = 0\cdot5$

2. The following formulae are used in mathematics and science.

Evaluate each formula for the numbers given:

(a) $V = \dfrac{\pi r^2 h}{3}$ Find V when $\pi = 3\cdot14$, $r = 9$, $h = 35$.

(b) $R = \dfrac{V}{I}$ Find R when $I = 5$ and $V = 0\cdot1$.

(c) $v = f\lambda$ Find v when $f = 18$ and $\lambda = 2\cdot5$.

(d) $E = mgh$ Find E when $m = 70$, $g = 10$ and $h = 2$.

(e) $A = \pi rs$ Find A when $\pi = 3\cdot14$, $r = 2\cdot5$ and $s = 12$.

(f) $v = u + at$ Find v when $u = 18$, $a = 6$ and $t = 9$.

(g) $s = ut + ½ at^2$ Find s when $a = 0\cdot2$, $t = 90$ and $u = 0$.

(h) $A = 2\pi rh$ Find A when $\pi = 3\cdot14$, $r = 24$ and $h = 50$.

(i) $P = I^2 r$ Find P when $I = 5$, $r = 15$.

(j) $A = \pi(R^2 - r^2)$ Find A when $\pi = 3\cdot14$, $R = 20$ and $r = 8$.

(k) $e = ½ mv^2$ Find e when $m = 2$ and $v = 16$.

(l) $h = \dfrac{AVt}{mT}$ Find h when $A = 6$, $m = 0.8$, $V = 12$, $t = 60$, $T = 20$.

(m) $F = \dfrac{mv - mu}{t}$ Find F when $m = 2$, $u = 4$, $v = 7$ and $t = 3$.

(n) $s = \dfrac{v^2 - u^2}{2a}$ Find s when $a = ½$, $u = 3$ and $v = 5$.

(o) $a = \sqrt{b^2 - c^2}$ Find a when $b = 31\cdot2$ and $c = 12$.

Formula (2) - Changing the Subject of a Formula

1. Change the subject of each formula to x.

a.	$y = x + 3$	**b.**	$y = x - 5$	**c.**	$y = x + a$
d.	$y = x - b$	**e.**	$y = 3x$	**f.**	$y = 10x$
g.	$y = kx$	**h.**	$y = ax$	**i.**	$y = 3p + x$
j.	$y = x - 5t$	**k.**	$y = 2x + 1$	**l.**	$y = 3x - 7$
m.	$y = 7x + 4a$	**n.**	$y = 3b + 4x$	**o.**	$y = 8 + 10x$

2. Make x the subject of each formula below.

a.	$y = ax + b$	**b.**	$y = mx + c$	**c.**	$t = sx - r$
d.	$p = qx + 2r$	**e.**	$m = fx - 3n$	**f.**	$a = b + cx$
g.	$k = h - mx$	**h.**	$d = 3b + cx$	**i.**	$g = kc - hx$

3. Change the subject of each formula to the letter shown in brackets.

a.	$P = 4l$	(l)	**b.**	$V = IR$	(I)	**c.**	$S = DT$	(T)
d.	$A = lb$	(b)	**e.**	$C = \pi d$	(d)	**f.**	$G = UT$	(U)
g.	$v = u + at$	(t)	**h.**	$P = 2l + 2b$	(l)	**i.**	$H = xy + 5m$	(y)

4. Make x the subject of each formula.

a.	$y = \frac{3}{x}$	**b.**	$d = \frac{c}{x}$	**c.**	$m = \frac{y}{x}$
d.	$s = \frac{a+2}{x}$	**e.**	$w = \frac{z-1}{x}$	**f.**	$a = \frac{b+c}{x}$
g.	$a = \frac{x+8}{9}$	**h.**	$k = \frac{x-5}{2}$	**i.**	$p = \frac{3-x}{4}$
j.	$y = \frac{2}{x} + 1$	**k.**	$z = \frac{6}{x} - 7$	**l.**	$h = \frac{m}{x} + k$

5. Change the subject of each formula to the letter shown in brackets.

a.	$v^2 = u^2 + 2as$	(s)	**b.**	$v^2 = u^2 + 2as$	(u)
c.	$V = \pi r^2 h$	(h)	**d.**	$V = \pi r^2 h$	(r)
e.	$r = \sqrt{\frac{A}{\pi}}$	(A)	**f.**	$L = 3 + \sqrt{6a}$	(a)
g.	$2k = \sqrt{(p+4)}$	(p)	**h.**	$x^2 = \frac{4yz}{t}$	(y)
i.	$ar = \frac{1}{2}\sqrt{\frac{x}{b}}$	(b)	**j.**	$st = A^2(x - 3y)$	(A)
k.	$R = A^2(x - 3y)$	(x)	**l.**	$na = \sqrt{(1 - n^2)}$	(n)
m.	$d = \frac{t(n-1)}{n}$	(n)	**n.**	$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$	(R)

Answers to S3 Credit Revision Pack

Expressions & Formulae

1. (a) 0 (b) 16 (c) 7
 (d) 11 (e) 80 (f) 64

2. (a) $E = 19$ (b) $E = 24$ (c) $E = 89$

3. (a) 23 (b) 10 (c) 9

4. (a) $\frac{2}{5}$ (b) $\frac{1}{2}$ (c) $\frac{1}{6}$ (d) $\frac{1}{5}$

5. (a) $P = 161$ (b) $P = 117$ (c) $P = 429$
 (d) $P = 12\cdot5$ (e) $P = 7\cdot12$ (f) $P = 112$

6. (a) $2\cdot5$ (b) $9\cdot8$ (c) 1200 (d) $5\cdot0$

Scientific Notation

1. (a) $1\cdot2 \times 10^3$ (b) $4\cdot125 \times 10^6$ (c) $2\cdot25 \times 10^2$ (d) $6\cdot7 \times 10^4$
 (e) 9×10^0 (f) $4\cdot1 \times 10^7$ (g) $9\cdot2 \times 10^1$ (h) $2\cdot4 \times 10^{11}$

2. (a) 5000000 , 5×10^6 (b) 32000 , $3\cdot2 \times 10^4$
 (c) 52100000 , $5\cdot21 \times 10^7$ (d) 243000 , $2\cdot43 \times 10^5$

3. (a) $5\cdot7 \times 10^{-2}$ (b) $2\cdot1 \times 10^{-3}$ (c) $8\cdot4 \times 10^{-1}$ (d) $9\cdot15 \times 10^{-9}$
 (e) 7×10^{-4} (f) $8\cdot004 \times 10^{-2}$ (g) $1\cdot2 \times 10^{-6}$ (h) 6×10^{-1}

4. (a) 160000 (b) 2780 (c) 122000000 (d) 40000
 (e) $200\cdot3$ (f) $5\cdot7$ (g) $0\cdot006$ (h) $0\cdot00000452$
 (i) $0\cdot0001003$ (j) $0\cdot000072$ (k) $0\cdot23$ (l) $0\cdot006\,0004$

5. (a) 6×10^8 (b) 8×10^{-2} (c) $1\cdot5 \times 10^7$ (d) 6×10^5
 (e) $1\cdot8 \times 10^{-2}$ (f) 5×10^6 (g) $3\cdot2 \times 10^4$ (h) $1\cdot39 \times 10^5$
 (i) 9×10^{-6}

6. (a) $6\cdot66 \times 10^8$ miles (b) $4\cdot05 \times 10^4$ km (c) $2\cdot94 \times 10^9$ times
 (d) 2×10^7 drops (e) 3×10^{30} atoms

Similarity (1)

1. (a) i) $k = \frac{3}{2}$ *or* $1\cdot5$ ii) $13\cdot5\ cm$ (b) i) $k = \frac{2}{3}$ *or* $0\cdot666..$ ii) $20\ cm$

(c) i) $k = \frac{5}{2}$ *or* $2 \cdot 5$ ii) 45 *cm* (d) i) $k = \frac{3}{5}$ *or* $0 \cdot 6$ ii) 168 *mm*

2. (a) 88 cm^2 (b) 166 mm^2 (c) 49cm^2 (d) 72 mm^2

3. (a) 1200 ml (b) 270 ml (c) $6 \cdot 75$ litres

Similarity (2)

1. (a) $x = 30$mm (b) $x = 32 \cdot 5$cm

2. (a) Because they are equiangular (b) CD = 18cm (c) 81 cm^2

3. (a) $x = 13 \cdot 5$ cm (b) $x = 14 \cdot 4$ mm

4. ST = 16cm

5. distance = $0 \cdot 7$ m

Speed, Distance & Time

1. (a) 96 km (b) $7 \cdot 5$ km/h (c) 7hrs 15mins (d) 56 km/h (e) 100 km

2. 2 hrs 33 mins

3. 5 hrs 17 mins

4. (a) 2 hrs 28 mins (b) 57 mph

5. (a) 45 mins (b) 80 km/h (c) $520 \div 7 = 74 \cdot 3$ km/h

Saving & Spending (1)

1. £558

2. £213.30

3. (a) £4620 (b) £1478.40 (c) £86.95 (d) 27%

4. (a) Cash = £8600 , H.P. = £9930 , Lease = £9450 ; Total saved = 9930 – 8600 = £1330
   (b) 15%

5. 48 dollars

6. £1860

Saving & Spending (2)

1. (a) 45850 (b) $458 \cdot 5$ therms (c) £163.22

2. (a)

Units Used	Amount
727	£ 28.06
566	£ 8.72
	£ 12.50
	£ 49.28

(b) £61.60

3. £ 357.20

4. £ 308 per month

5. £ 1071

Positive & Negative Numbers

1. (a) -3 (b) 5 (c) 2 (d) -5
(e) -9 (f) -5 (g) -4 (h) -7
(i) 6 (j) -3 (k) 2 (l) 0

2. (a) $-3x$ (b) $-2a$ (c) $3x$ (d) $-3p$
(e) $5e$ (f) $-4d$ (g) $2h$ (h) $-10a$
(i) $6k$ (j) $-2p$ (k) $-2m$ (l) $3y$

3. (a) -30 (b) 14 (c) -12 (d) -16
(e) $-5a$ (f) $-24p$ (g) $-14y$ (h) $27d^2$

4. (a) $x = -2$ (b) $t = -5$ (c) $m = -1$
(d) $y = 1$ (e) $a = -2$ (f) $d = 0$
(g) $y = -8$ (h) $a = 4$ (i) $d = -2$
(j) $h = -3$ (k) $p = 1$ (l) $x = 1$
(m) $p = -7$ (n) $h = -3$ (o) $x = -8$
(p) $y = 4$ (q) $k = -9$ (r) $a = -3$

5. (a) -2 (b) 6 (c) 1 (d) -8
(e) 12 (f) -1 (g) -4 (h) 0
(i) 2 (j) 16 (k) 27 (l) 64
(m) -5 (n) 5 (o) 6 (p) 16

6. (a) -2 (b) 3 (c) -2 (d) -3
(e) -1 (f) -1 (g) 4 (h) -10

Pythagoras (1)

1. (a) $x = 9 \cdot 4$ (b) $x = 21 \cdot 3$ (c) $x = 13$

(d) $x = 10 \cdot 2$ (e) $x = 1 \cdot 1$ (f) $x = 5 \cdot 1$

(g) $x = 12 \cdot 4$ (h) $x = 26 \cdot 9$ (i) $x = 2 \cdot 4$

2. (a) BD = 10

   (b) BC = $15 \cdot 6$

   (c) Area = 180 cm^2

3. (a) 21 or $21 \cdot 1$cm

   (b) Area $\approx$ 357 cm^2

4. (a) $7 \cdot 1$ (b) $12 \cdot 5$

   (c) $8 \cdot 1$ (d) $10 \cdot 2$

Pythagoras (2)

1. (a) $11 \cdot 7$ cm (b) $12 \cdot 7$
2. (a) 20 cm (b) 15 cm
3. (i) Yes (ii) No (iii) Yes
4. (a) 15 cm (b) 16 cm (c) Proof (d) BC = 10 cm , Area = 225 cm^2

Pythagoras (3) - Problems

1. $19 \cdot 2$ km
2. $427 \cdot 2$ km
3. $9 \cdot 6$ km
4. $7 \cdot 9$ km
5. $15 \cdot 6$ mm
6. $16 \cdot 6$ cm
7. $4 \cdot 6$ m
8. $4 \cdot 4$ m
9. 16 cm
10. $6 \cdot 6$ cm
11. P = $16 \cdot 9$ m
12. $1 \cdot 9\,(2)$ m

Brackets & Equations (1)

1.

$a)$	$3c+15$	$b)$	$2w-8$	$c)$	$6f+2$	$d)$	$3t+24$
$e)$	$5g-15$	$f)$	$7w+7x$	$g)$	$6y-18$	$h)$	$7p+14q$
$i)$	$4+8y$	$j)$	$8p+72k$	$k)$	$5+10a$	$l)$	$28f+8g$
$m)$	$8+24e$	$n)$	$10+15w$	$o)$	h^2+2h	$p)$	a^2+5a
$q)$	c^2-5c	$r)$	e^2-2e	$s)$	$f+4f^2$	$t)$	$2t^2+8t$
$u)$	p^2+pq	$v)$	$3p^2+p$	$w)$	$5ah+5a^2$	$x)$	$3rp-6r^2$

2.

$a)$	$-4d-12$	$b)$	$-2x+6$	$c)$	$-5d-10$	$d)$	$-3a+12$
$e)$	$-7e^2-35e$	$f)$	$-9x-81$	$g)$	$-6p^2+42p$	$h)$	$-8k-56$
$i)$	$-3y+6y^2$	$j)$	$-7-42h$	$k)$	$-25v+10v^2$	$l)$	$-4p+32p^2$

3.

$a)$	$x=6$	$b)$	$p=3$	$c)$	$x=8$
$d)$	$p=2$	$e)$	$m=3$	$f)$	$v=2$
$g)$	$x=4$	$h)$	$y=5$	$i)$	$p=-6$
$j)$	$a=7$	$k)$	$a=1$	$l)$	$x=2$
$m)$	$m=-\frac{1}{3}$	$n)$	$y=\frac{3}{2}$	$o)$	$x=\frac{3}{12}=\frac{1}{4}$
$p)$	$x=-\frac{13}{2}$	$q)$	$p=\frac{7}{6}$	$r)$	$d=4$

4.

$a)$	$3a+3b+6c$	$b)$	$5x^2-10x+15$	$c)$	$a^2+ab-ac$
$d)$	$6p^2-2pq+2p$	$e)$	$-3y^2+6y-15$	$f)$	$-x^3-3x^2+x$

Brackets & Equations (2)

1.

a)	$7a-3$	b)	$4x+2$	c)	$5b-6$
d)	$10g-2$	e)	$9-5y$	f)	$12c-3$
g)	$2h+4$	h)	$3ab+2a$	i)	$6-21m$
j)	$8y$	k)	$9a-6$	l)	$13-4p$
m)	$15y-4$	n)	$b+9$	o)	$14-10y$
p)	$-4x+15$	q)	$-3c+2$	r)	$11-12g$

2.

a)	x^2+4x+3	b)	y^2+4y+3	c)	$a^2+7a+10$
d)	b^2+6b+8	e)	$x^2+8x+12$	f)	s^2+7s+6
g)	$y^2+9y+20$	h)	$b^2+10b+24$	i)	$c^2+17c+72$
j)	$x^2-8x+15$	k)	x^2-5b+6	l)	$c^2-18c+45$
m)	$a^2-13a+36$	n)	$y^2-15y+56$	o)	x^2-2x+1
p)	$s^2-14s+49$	q)	$d^2-14d+24$	r)	$b^2-13b+22$

3.

a)	$x^2+3x-10$	b)	a^2-a-12	c)	$t^2-3t-18$
d)	$y^2+3y-28$	e)	$c^2-3c-10$	f)	x^2-4x-5
g)	$b^2+6b-27$	h)	$p^2-9p-10$	i)	y^2-y-42
j)	$z^2-4z-12$	k)	x^2-x-2	l)	a^2-1
m)	$c^2-2c-15$	n)	$p^2-5p-14$	o)	$b^2+6b-72$
p)	$x^2+3x-10$	q)	$a^2-3a-18$	r)	$t^2-5t-24$
s)	y^2-3y-4	t)	$c^2-6c-16$	u)	$x^2+3x-28$
v)	b^2+8b-9	w)	$p^2-7p-30$	x)	y^2+3y-4

4.

a)	$3x^2-18x+15$	b)	$2a^2+6a+4$	c)	$5t^2-28t+15$
d)	$2y^2-16y+14$	e)	$3c^2+23c+14$	f)	$2x^2+9x+10$
g)	$3b^2-11b+8$	h)	$5p^2+16p+11$	i)	$9y^2-36y+36$
j)	$4z^2-10z-6$	k)	$4x^2-4x-3$	l)	$12a^2-a-1$
m)	$2c^2-5c-12$	n)	$5p^2+13p-28$	o)	$7b^2+8b-12$
p)	$6x^2-x-2$	q)	$7a^2+13a+6$	r)	$6t^2-22t-8$
s)	$3y^2-4y+1$	t)	$9c^2-4$	u)	$9x^2-24x+7$
v)	$8b^2+8b+2$	w)	$2p^2+3p-9$	x)	$14y^2-y-3$

5.

a)	x^2+2x+1	b)	w^2-6w+9	c)	$a^2-8a+16$	d)	$c^2+12c+36$
e)	$y^2-16y+64$	f)	$a^2+14a+49$	g)	b^2+4b+4	h)	$k^2+18k+81$
i)	$b^2-18b+81$	j)	$x^2-20x+100$	k)	c^2-2c+1	l)	$y^2-10y+25$
m)	$p^2-20p+100$	n)	$c^2-24c+144$	o)	$p^2-12p+36$	p)	$x^2+8x+16$
q)	$4g^2-4g+1$	r)	$25y^2+30y+9$	s)	$9q^2+12q+4$	t)	$16a^2-8a+1$
u)	$9y^2-36y+36$	v)	$16h^2+8h+1$	w)	$9x^2+24x+16$	x)	$16b^2-40b+25$
y)	$4d^2-32d+64$	z)	$25a^2+40a+16$				

Brackets & Equations (3) - Extension

1.

$a)$	$x=4$	$b)$	$x=5$	$c)$	$x=-3$	$d)$	$x=-6$
$e)$	$x=-3$	$f)$	$x=31$	$g)$	$x=0$	$h)$	$x=-5$
$i)$	$x=-1$	$j)$	$x=-2$	$k)$	$x=0$	$l)$	$x=-3$
$m)$	$x=2$	$n)$	$x=-1$				

2.

$a)$	x^2+7x-8	$b)$	$4x^2-x-3$	$c)$	$4x^2+8x+5$
$d)$	$-x^2-4$	$e)$	$12x-3$	$f)$	$-10x-19$
$g)$	$2x^2-10x+8$	$h)$	$5x^2-x+2$	$i)$	$-4x^2+8x+21$
$j)$	$3x^3+20x^2+21x$	$k)$	$2x^3-x^2-2x+9$	$l)$	$-x^3-x^2-3x+1$

3.

$a)$	$x=5$	$b)$	$x=7$	$c)$	$x=4$	$d)$	$x=2$
$e)$	$x=1$	$f)$	$x=1$	$g)$	$x=-4$	$h)$	$x=2$
$i)$	$x=-5$	$j)$	$x=-1$				

Brackets & Equations (4) - Applications

1. (a) i) $P=4x+12$ ii) $A=x^2+6x+5$

   (b) 28 cm

2. (a) i) $P=8x+4$ ii) $A=4x^2+4x-15$

   (b) 153 cm^2

3. (a) $h^2=37a^2+6a+9$

   (b) $h=13$

4. (a) $h^2=5a^2-4a+8$

   (b) $h=15$

5. (a) $A=x^2+5x+6$

   (b) $PQ=\sqrt{(5x^2+22x+25)}$

6. (a) $P=4y+8$ (b) $A=y^2+4y-5$ (c) $d=\sqrt{(2y^2+8y+26)}$

7. (a) $P=6x+14$, $A=2x^2+12x+10$, $d=\sqrt{(5x^2+18x+29)}$

   (a) $P=8x+4$, $A=3x^2+8x-3$, $d=\sqrt{(10x^2+10)}$

Statistics (1) - Measures of the Centre (Mean, Median & Mode)

1. (a) i) range = 6 ii) mean = 6
   (b) i) range = 66 ii) mean = 47
   (c) i) range = $18 \cdot 8$ ii) mean = $8 \cdot 9$
2. (a) median = 4 mode = 3 (b) median = 33 mode = 45
   (c) median = $6 \cdot 3$ mode = $6 \cdot 3$ (d) median = 24 mode = 24
   (e) median = $11 \cdot 5$ mode = 11 (f) median = $52 \cdot 5$ mode = 75
3. (a) $4 \cdot 9$ (b) $35 \cdot 4$ (c) $6 \cdot 0$ (d) $24 \cdot 5$ (e) $12 \cdot 3$ (f) $51 \cdot 5$
4. (a) 5 (b) $5 \cdot 5$
5. (a) 51kg (b) 50kg
6. (a) $28 \cdot 8$ kg (b) $2 \cdot 3$ kg
7. $5 \cdot 42$
8. 51 cm
9. (a) mean = $1 \cdot 71$ m , median = $1 \cdot 7$ m , mode = $1 \cdot 6$ m
   (b) $1 \cdot 6$ m

Statistics (2) - Mean, Median & Mode (Frequency Tables)

1. Table 1 : mean = $72 \cdot 25$, median = 73 , mode = 73
   Table 2 : mean = $3 \cdot 65$, median = 4 , mode = 4
   Table 3 : mean = $7 \cdot 78$, median = 8 , mode = 8
2. mean = $1 \cdot 5$ m
3. (a) 23 cars (b) 2 (c) frequency table , mean = $2 \cdot 4$ occupants/car
4. (a) range = 6 goals (b) median = 2 goals , mode = 1 goal
   (c) 16% (d) frequency table , mean = $2 \cdot 12$ goals
5. A possible answer ....

x	3	4	5	6	7	8
frequency	1	2	2	3	5	2

Statistics (3) - Quartiles,Semi-interquartile Range & Cumulative Frequency

1. (a) median (Q_2) = 10 , $Q_1 = 5$, $Q_3 = 12$, S.I.R. = $3 \cdot 5$

   (b) median (Q_2) = 35 , $Q_1 = 32$, $Q_3 = 44$, S.I.R. = 6

   (c) median (Q_2) = $8 \cdot 5$, $Q_1 = 5$, $Q_3 = 9$, S.I.R. = 2

   (d) median (Q_2) = 42 , $Q_1 = 34$, $Q_3 = 58$, S.I.R. = 12

   (e) median (Q_2) = $20 \cdot 5$, $Q_1 = 12 \cdot 5$, $Q_3 = 29$, S.I.R. = $8 \cdot 25$

   (f) median (Q_2) = 30 , $Q_1 = 25 \cdot 5$, $Q_3 = 45$, S.I.R. = $9 \cdot 75$

2. (a) i) column completed ii) median (Q_2) = 8 , $Q_1 = 7$, $Q_3 = 15$ iii) S.I.R. = 4

   (b) i) column completed ii) median (Q_2) = 10 , $Q_1 = 9$, $Q_3 = 12$ iii) S.I.R. = $10 \cdot 5$

   (c) i) column completed ii) median (Q_2) = 52 , $Q_1 = 51$, $Q_3 = 54$ iii) S.I.R. = $1 \cdot 5$

   (d) i) column completed ii) median (Q_2) = 123 , $Q_1 = 122$, $Q_3 = 124$ iii) S.I.R. = 1

3. Pupils own drawings

4. All these answers are approximate: (a) median (Q_2) = 17 , $Q_1 = 14$, $Q_3 = 19 \cdot 5$, S.I.R. = $2 \cdot 75$

   (b) median (Q_2) = 52 , $Q_1 = 41$, $Q_3 = 62$, S.I.R. = $10 \cdot 5$

Statistics (4) - Boxplots (the five-figure summary)

1. A = 2 B = 6 C = 8 D = 12 E = 17

2. (a) 6 hours and 22 hours

   (b) 11 hours

   (c) 50%

   (d) range = 16 hours , S.I.R. = $4 \cdot 5$ hours

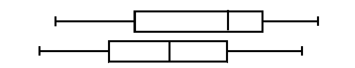
3. (a) i) L = 5 , $Q_1 = 7$, $Q_2 = 12$, $Q_3 = 14$, H = 21 ii) boxplot iii) S.I.R. = $3 \cdot 5$

   (b) i) L = 16 , $Q_1 = 18$, $Q_2 = 23$, $Q_3 = 33$, H = 40 ii) boxplot iii) S.I.R. = $7 \cdot 5$

   (c) i) L = 1 , $Q_1 = 6$, $Q_2 = 9$, $Q_3 = 20$, H = 40 ii) boxplot iii) S.I.R. = 7

4. (a) June : L = 1 , $Q_1 = 5$, $Q_2 = 7$, $Q_3 = 9$, H = 13
   July : L = 2 , $Q_1 = 6$, $Q_2 = 9$, $Q_3 = 11$, H = 15

   (b) boxplot



   (c) June : range = 12 , S.I.R. = 2 July : range = 13 , S.I.R. = $3 \cdot 5$

   (d) comments .... (July's median higher also a bigger spread, etc.)

Trigonometry (1)

1. (a) $x = 35 \cdot 7^\circ$ (b) $x = 46 \cdot 2^\circ$ (c) $x = 36 \cdot 0^\circ$

   (d) $x = 58 \cdot 4^\circ$ (e) $x = 75 \cdot 0^\circ$ (f) $x = 34 \cdot 9^\circ$

2. (a) $x = 10 \cdot 9$ (b) $x = 9 \cdot 0$ (c) $x = 39 \cdot 8$

   (d) $x = 10 \cdot 1$ (e) $x = 8 \cdot 2$ (f) $x = 6 \cdot 7$

3. (a) $p = 7 \cdot 8$ (b) $p = 14 \cdot 6$ (c) $p = 4 \cdot 2$

   (d) $p = 86 \cdot 0$ (e) $p = 24 \cdot 8$ (f) $p = 36 \cdot 4$

Trigonometry (2) – More Practice

1. $a = 7 \cdot 5$ 2. $b = 48 \cdot 6^\circ$ 3. $c = 5 \cdot 4$ 4. $d = 7 \cdot 0$ 5. $e = 51 \cdot 3^\circ$

6. $f = 52 \cdot 9$ 7. $g = 34 \cdot 4$ 8. $h = 73 \cdot 3^\circ$ 9. $i = 23 \cdot 6$ 10. $j = 28 \cdot 1^\circ$

11. $k = 28 \cdot 7$ 12. $l = 40 \cdot 1^\circ$ 13. $m = 2 \cdot 1$ 14. $n = 5 \cdot 2$ 15. $o = 5 \cdot 2$

16. $p = 64 \cdot 6^\circ$ 17. $q = 8 \cdot 2$ $r = 55 \cdot 1^\circ$ 18. $s = 6 \cdot 7$ $t = 4 \cdot 7$ $u = 8 \cdot 2$

19 $v = 1 \cdot 7$ $w = 1 \cdot 4$ $x = 45 \cdot 6^\circ$

Trigonometry (3) – Isosceles Triangles & Frameworks

1. (a) $5 \cdot 8\,\text{cm}$ (b) $25 \cdot 4\,\text{cm}$ (c) $11 \cdot 8\,\text{mm}$

2. $34 \cdot 8\,\text{cm}$

3. (a) 31^o - No (b) $21 \cdot 8^o$ - Yes

4. (a) DB = $15 \cdot 0$ mm (b) BC = $18 \cdot 3$ mm

5. AB = $2 \cdot 7\,\text{m}$ $\therefore \angle ACB = 32 \cdot 7^\circ$ $(32 \cdot 9^\circ)$ - It is a safe chute.

Trigonometry (4) – Problems

1. 68.0º 2. 41.8º 3. 3.8 m 4. 11.7 m

5. 63.6º 6. 17.0 m 7. 15.6 m 8. 40.0º

9. 28.0 m 10. 88.8 cm 11. 4.4 cm

Simultaneous Equations (1)

1.	(a)	$x = 2$ $y = 5$	(b)	$a = 3$ $b = -2$	(c)	$e = 6$ $f = 2$	(d)	$x = -1$ $y = 3$
	(e)	$x = 2$ $y = -2$	(f)	$p = -2$ $q = 3$	(g)	$g = -4$ $h = 3$	(h)	$x = 3$ $y = 4$
	(i)	$u = -2$ $v = -3$	(j)	$x = 4$ $y = 1$	(k)	$p = -5$ $q = 2$	(l)	$a = 4$ $b = -2$
2.	(a)	$x = 2$ $y = 5$	(b)	$a = 3$ $b = -1$	(c)	$e = -2$ $f = 5$	(d)	$x = -1$ $y = 4$
	(e)	$x = 3$ $y = 4$	(f)	$p = -3$ $q = 4$	(g)	$g = 8$ $h = -5$	(h)	$x = 7$ $y = -2$
	(i)	$u = 2$ $v = -2$	(j)	$x = 4$ $y = 1$	(k)	$p = -1$ $q = 2$	(l)	$a = 8$ $b = -2$
3.	(a)	(2,4)	(b)	(2,3)	(c)	(3,1)	(d)	(3,2)
	(e)	(4,3)	(f)	(1,5)				

Simultaneous Equations (2)

1. 36 and 20   2. 18 and 4   3. 8 and 5

4. 9 and 2   5. (a) $x = 12$, $y = 3$ (b) 144 cm^2

6. (a) box = 6 kg , parcel = 2 kg   (b) 58 kg   7. butter = 96p , milk = 24p

8. 38 hours   9. 320 cheaper tickets   10. 21 fifty pence coins

Area 1

(a)	$38 \cdot 4\,cm^2$	(b)	$52mm^2$	(c)	$56cm^2$	(d)	$113 \cdot 04\,m^2$
(e)	$300mm^2$	(f)	$234cm^2$	(g)	$28m^2$	(h)	$315cm^2$
(i)	42cm*2*	(j)	$16mm^2$	(k)	$480cm^2$	(l)	$140cm^2$

Area 2

1.	$147\,cm^2$	2.	$55\cdot5\,cm^2$	3.	$616\,mm^2$
4.	$40\cdot2\,m^2$	5.	$89\cdot2\,cm^2$	6.	$218\cdot5\,mm^2$
7.	$154\cdot7\,cm^2$	8.	$176\cdot8\,mm^2$		

Area 3 - Problems

1.	(a)	$196\cdot8\,cm^2$	(b)	$1538\cdot7\,mm^2$
2.	(a)	$686\,cm^2$	(b)	$31\cdot4\,\%$
3.	(a)	$254\cdot3\,cm^2$	(b)	$21\cdot5\,\%$
4.	$1\cdot9\,cm^2$			
5.	(a)	$496\cdot9\,m^2$	(b)	$206\cdot3\,m^2$
6.	15			

Volume (1)

1.	(a)	$72cm^3$	(b)	$512mm^3$	(c)	$1280cm^3$		
2.	(a)	$1270cm^3$	(b)	$6480mm^3$	(c)	$1575cm^3$	(d)	$6468mm^3$

Volume (2)

1.	(a)	$75\cdot36\,cm^3$	(b)	$602\cdot88\,cm^3$	(c)	$502\cdot4\,mm^3$	(d)	$56\cdot52\,m^3$
2.	$5024\,cm^3$		3.	$4\,m^3$				
4.	(a)	$904\cdot3\,cm^3$	(b)	$33\cdot5\,m^3$	(c)	$3052\cdot1\,mm^3$	(d)	$113\cdot0\,cm^3$
5.	$268\,cm^3$							
6.	(a)	$56\cdot5\,cm^3$	(b)	$803\cdot8\,mm^3$	(c)	$47\cdot1\,cm^3$	(d)	$25\cdot1\,cm^3$
7.	$83\cdot7\,cm^3$		8.	$314\,cm^3$		9.	$1017\cdot36\,cm^3$	
10.	$37\,cm^3$		11.	$640\,mm^3$				

Factorisation

1.	(a)	$3(x-5)$	(b)	$5(y+7)$	(c)	$8(a+6)$	(d)	$6(3+t)$
	(e)	$x(x+9)$	(f)	$y(3-y)$	(g)	$b(b-4)$	(h)	$p(5+p)$
	(i)	$a(b+c)$	(j)	$x(x-y)$	(k)	$p(q-r)$	(l)	$a(a+x)$
	(m)	$4(2a+5)$	(n)	$7(3y-4)$	(o)	$2(12x+11)$	(p)	$9(4c-7)$
2.	(a)	$2a(a+3)$	(b)	$5x(x-8)$	(c)	$10y(3-y)$	(d)	$3t(t+6)$
	(e)	$3x(2x-9)$	(f)	$2y(7-5y)$	(g)	$4b(3b-8)$	(h)	$5x(5x+4)$
3.	(a)	$(a-3)(a+3)$	(b)	$(x-2)(x+2)$	(c)	$(p-9)(p+9)$	(d)	$(c-5)(c+5)$
	(e)	$(b-1)(b+1)$	(f)	$(y-4)(y+4)$	(g)	$(m-5)(m+5)$	(h)	$(a-3)(a+3)$
	(i)	$(6-d)(6+d)$	(j)	$(2-q)(2+q)$	(k)	$(7-w)(7+w)$	(l)	$(x-8)(x+8)$
	(m)	$(9-2g)(9+2g)$	(n)	$(6w-y)(6w+y)$	(o)	$(2a-1)(2a+1)$	(p)	$(g-9h)(g+9h)$
	(q)	$(7x-y)(7x+y)$	(r)	$(3c-4d)(3c+4d)$	(s)	$(2p-3q)(2p+3q)$	(t)	$(b-10c)(b+10c)$
4.	(a)	$(b+3)(b+4)$	(b)	$(x+9)(x+5)$	(c)	$(s+3)(s+8)$	(d)	$(y+7)(y+4)$
	(e)	$(b+3)(b+3)$	(f)	$(c+6)(c+7)$	(g)	$(a+8)(a+4)$	(h)	$(y+4)(y+2)$
	(i)	$(x-1)(x-5)$	(j)	$(c-4)(c-2)$	(k)	$(y-3)(y-7)$	(l)	$(b-6)(b-8)$
	(m)	$(x-5)(x-2)$	(n)	$(s-8)(s-5)$	(o)	$(y-2)(y-9)$	(p)	$(a-4)(a-4)$
5.	(a)	$(x-1)(x+5)$	(b)	$(a+3)(a-7)$	(c)	$(t-5)(t+4)$	(d)	$(y+8)(y-4)$
	(e)	$(c+2)(c-7)$	(f)	$(x-6)(x+1)$	(g)	$(b-2)(b+9)$	(h)	$(p-10)(p+2)$
	(i)	$(y-8)(y+7)$	(j)	$(z+4)(z-6)$	(k)	$(x+4)(x-7)$	(l)	$(a+2)(a-15)$
	(m)	$(c+5)(c-4)$	(n)	$(p-7)(p+1)$	(o)	$(b+10)(b-5)$	(p)	$(x-3)(x+6)$

Formula (1)

1.	(a)	$T=56$	(b)	$P=8$	(c)	$R=20$	(d)	$z=12$
	(e)	$k=20$	(f)	$R=17\cdot4$	(g)	$P=6$	(h)	$y=3\cdot3$
2.	(a)	$V=2967\cdot3$	(b)	$R=0\cdot02$	(c)	$v=45$	(d)	$E=1400$
	(e)	$A=94\cdot2$	(f)	$v=72$	(g)	$s=810$	(h)	$A=7536$
	(i)	$P=375$	(j)	$A=1055\cdot04$	(k)	$e=256$	(l)	$h=270$
	(m)	$F=2$	(n)	$s=16$	(o)	$a=28\cdot8$		

Formula (2)

1. **a.** $x = y - 3$ **b.** $x = y + 5$ **c.** $x = y - a$ **d.** $x = y + b$
e. $x = \frac{y}{3}$ **f.** $x = \frac{y}{10}$ **g.** $x = \frac{y}{k}$ **h.** $x = \frac{y}{a}$
i. $x = y - 3p$ **j.** $x = y + 5t$ **k.** $x = \frac{y-1}{2}$ **l.** $x = \frac{y+7}{3}$
m. $x = \frac{y-4a}{7}$ **n.** $x = \frac{y-3b}{4}$ **o.** $x = \frac{y-8}{10}$

2. **a.** $x = \frac{y-b}{a}$ **b.** $x = \frac{y-c}{m}$ **c.** $x = \frac{t+r}{s}$ **d.** $x = \frac{p-2r}{q}$
e. $x = \frac{m+3n}{f}$ **f.** $x = \frac{a-b}{c}$ **g.** $x = \frac{h-k}{m}$ **h.** $x = \frac{d-3b}{c}$ **i.** $x = \frac{kc-g}{h}$

3. **a.** $l = \frac{P}{4}$ **b.** $I = \frac{V}{R}$ **c.** $T = \frac{S}{D}$ **d.** $b = \frac{A}{l}$ **e.** $d = \frac{C}{\pi}$
f. $U = \frac{G}{T}$ **g.** $t = \frac{v-u}{a}$ **h.** $l = \frac{P-2b}{2}$ **i.** $y = \frac{H-5m}{x}$

4. **a.** $x = \frac{3}{y}$ **b.** $x = \frac{c}{d}$ **c.** $x = \frac{y}{m}$ **d.** $x = \frac{a+2}{s}$
e. $x = \frac{z-1}{w}$ **f.** $x = \frac{b+c}{a}$ **g.** $x = 9a - 8$ **h.** $x = 2k + 5$
i. $x = 3 - 4p$ **j.** $x = \frac{2}{y-1}$ **k.** $x = \frac{6}{z+7}$ **l.** $x = \frac{m}{h-k}$

5. **a.** $s = \frac{v^2 - u^2}{2a}$ **b.** $u = \sqrt{v^2 - 2as}$ **c.** $h = \frac{V}{\pi r^2}$
d. $r = \sqrt{\frac{V}{\pi h}}$ **e.** $A = \pi r^2$ **f.** $a = \frac{(L-3)^2}{6}$
g. $p = 4k^2 - 4$ **h.** $y = \frac{x^2 t}{4z}$ **i.** $b = \frac{x}{(2ar)^2}$
j. $A = \sqrt{\frac{st}{(x-3y}}$ **k.** $x = \frac{R + 3A^2 y}{A^2}$ **l.** $n = \sqrt{1-(na)^2}$
m. $n = \frac{t}{t-d}$ **n.** $R = \frac{r_1 r_2}{r_1 + r_2}$