Problem 1

Expand x(x+5)

Simplify
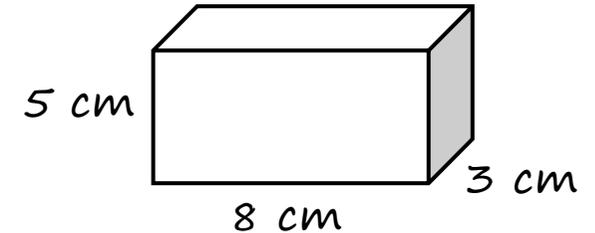
5x + x² + 8x + 3 + x²

Write an expression for:

6 less than x

half of x

Calculate the surface area of the cuboid

5 cm

3 cm

8 cm

A cuboid of length x, width 5 less than x and a height of half the length has a surface area of 250 cm².

Show that 4x² − 15x − 250 = 0

Problem 2

Find the Lowest Common Multiple of 16 and 22

Divide 72 in the ratio 3:5

The sweets in a bag are orange, lemon and strawberry in the ratio 1:3:5. Given that there are more than 20 sweets in the bag, what is the smallest possible number of lemon sweets?

At a film club the members can choose one of three types of film

Drama, Action or Horror

During the first week the members chose the films the in the ratio 2 : 5 : 8
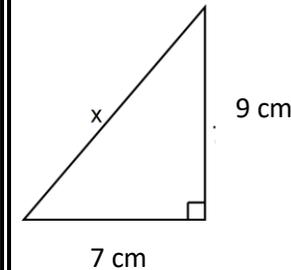During the second week the members chose the sports the in the ratio 5 : 7 : 6

If there are less than 100 members how many more chose Action in the second week than the first week?

Problem 3

Calculate the volume of a cylinder r = 6 cm and height = 10 cm	Make h the subject of the formula $V = \frac{1}{3}\pi r^2 h$	Calculate x (2 d.p.) 9 cm x 7 cm

A solid metal cylinder has a base radius of 6cm and a height of 12cm.

The cylinder was melted and recast into a solid cone with a circular base radius of 8cm. Find the total surface area of the cone.

Curved Surface area = πrl (l is the slant height)

Problem 4

| Decrease £50 by 10% | There are four times as many red counters than blue counters in a bag. Express this as a ratio | Fill in the blanks in the 2-way table |

	Voucher	No Voucher	Total
Adult	28		
Child			82
Total	68		120

30 adults and 60 children visit a theme park.

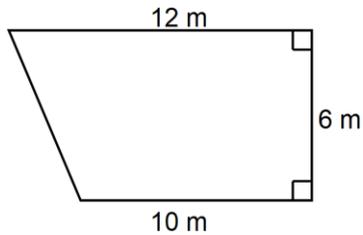The admission price is £40 for an adult and £30 for a child.

36 of the visitors have a voucher, which gives them 10% off the admission.

Twice as many children than adults do **not** have a voucher.

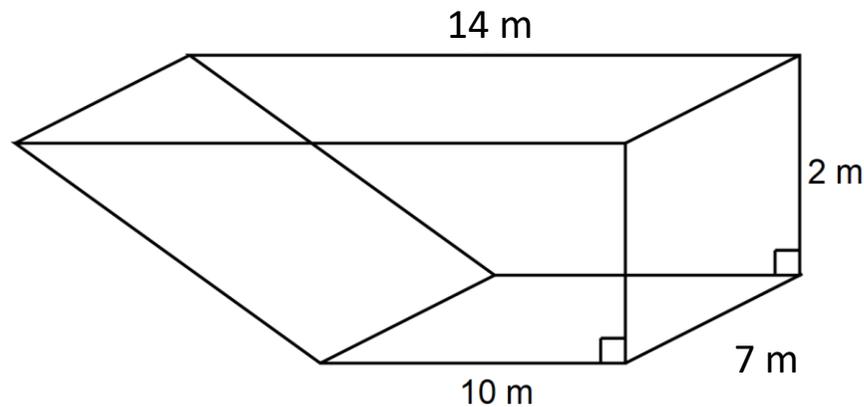Calculate the total paid for admission of the 32 adults and 60 children

Problem 5

Calculate the area of the trapezium

12 m

6 m

10 m

What is 2 m – 5 cm?

Convert 3.5 m³ to cm³

The pool is filled with water at a rate of 10 litres per second to a depth 10 cm less than the top of the pool. How long will it take to fill the pool?

14 m

2 m

7 m

10 m

PROBLEM 6

Calculate 1.5% of £400	Increase £2500 by 2.5%	Round £15260.98 correct to the nearest £

Bella invests £25000 in a savings account for three years. The account pays 2.5% compound interest per annum.

Bella has to pay 20% tax on the interest earned each year. This tax is taken from her account at the end of each year.

How much money will Bella have in her account at the end of the three years?

Give your answer to the nearest pound

PROBLEM 7

Calculate the circumference of a circle with radius 20 m	Convert 2120 mm to metres	Calculate the circumference of a circle with diameter 40 m

The race track above is made of a rectangle and two semi-circles. A standard bike wheel has a diameter of 620mm. Calculate how many complete revolutions a bike wheel will make when completing 5 laps of the track.
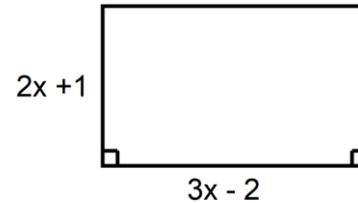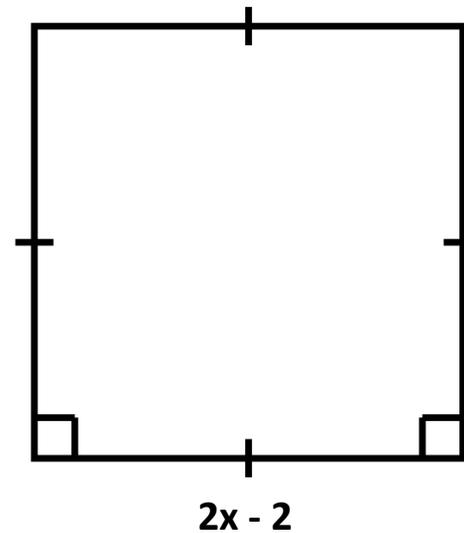
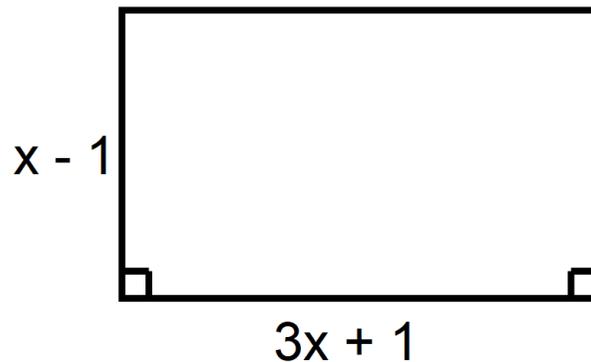80 m   25 m
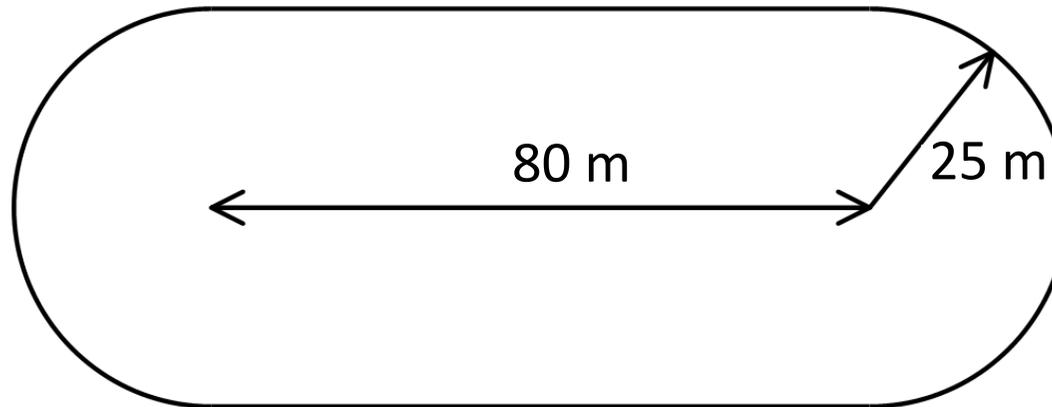
PROBLEM 8

Factorise $$x^2 - 7x + 12$$	Write an expression for the area of the rectangle 2x +1 3x - 2	Expand and simplify $(3x + 2)^2$

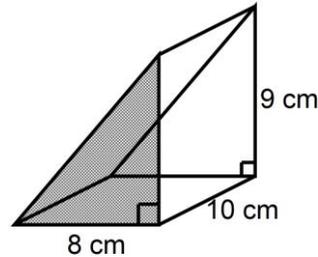The square has the same area as the rectangle.

Calculate the perimeter of the square.

x - 1

3x + 1

2x - 2

PROBLEM 9

Write down the upper and lower bounds of a box of sweets weighing 350g correct to the nearest 10g

Calculate the volume

9 cm
10 cm
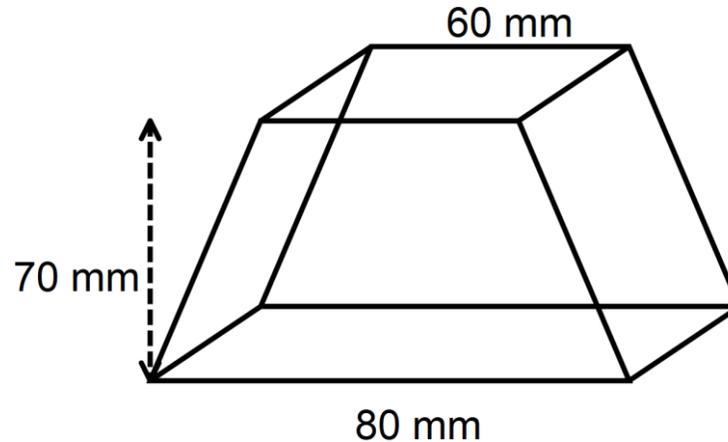8 cm

A block with volume of 18 cm³ is made from an alloy with density 2.5g/cm³. Calculate the mass of the block

The metal used to make the model shown below has a density of 4 g/cm³.

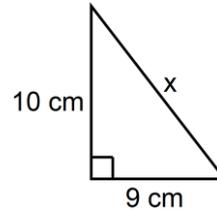The measurements are all given correct to the nearest 10mm.

60 mm

70 mm

80 mm

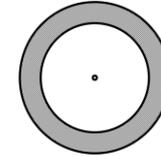Find the upper and lower bounds for the mass of the model.

PROBLEM 10

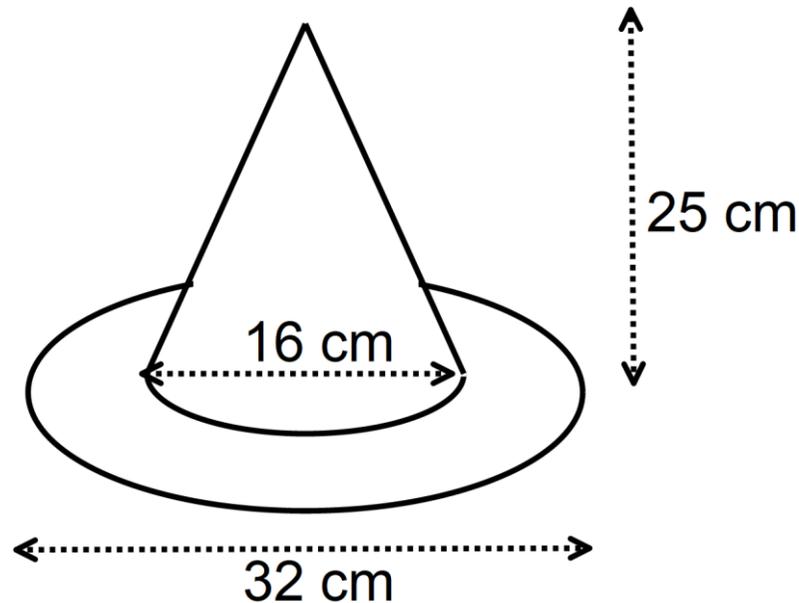| Calculate the area of a circle with a diameter of 12 cm	Calculate x	The circles have radii 10 cm and 8 cm. Calculate the shaded area.
	10 cm, 9 cm, x	

Calculate the area of material needed to fully cover the hat shown below inside and outside. (Curved surface area of a cone = πrl)

16 cm

25 cm

32 cm

PROBLEM 11

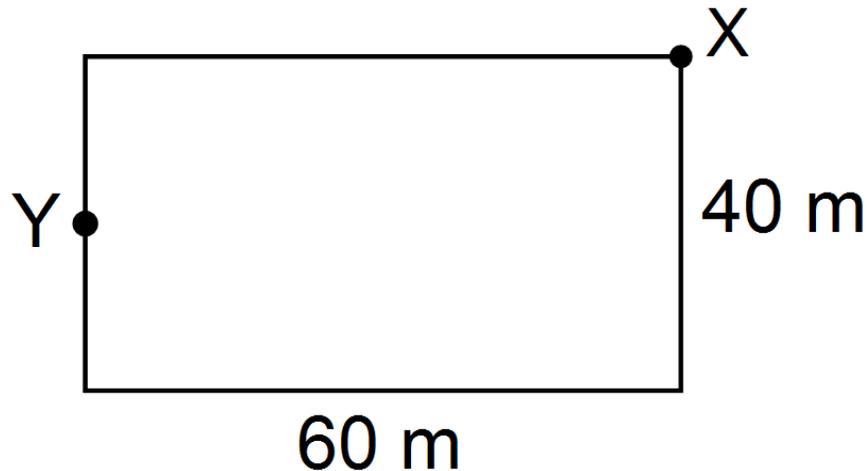| Calculate the area of a circle radius 5 cm	Express 25 out of 40 as a percentage	Calculate the area of a semi-circle of radius 10 cm

2 goats are tethered in a rectangular field measuring 40m by 60 m. One goat is on a rope measuring 40 m attached at point X, the second goat is on a rope 15 m attached at the midpoint Y. What percentage of the field will be not be touched by the goats?

PROBLEM 12

Divide 48 in the ratio 5 : 3	After an increase of 20% the price of a bike is £180. What was the price before the increase?	There are 8 red counters in a bag. If one third of the counters are red and the rest are blue, how many counters are in the bag?

A sports club has 60 members.

One quarter of the male members are junior members.

There are 40% more junior female members than junior male members.

If there are 7 junior female members, how many adult female members are there?

PROBLEM 13

What is the difference between £456 and 324?

Divide 3400 in the ratio 5 : 12

Work out 345 × 15

28775 tickets are sold for a football match.
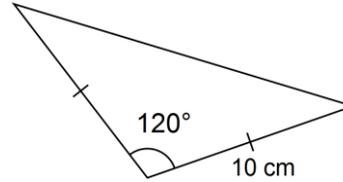
A child's ticket costs £15

The ratio of children to adults is 9 : 16

If the total ticket sales are £615785, what is the difference between the price of an adult and the price of a child's ticket?
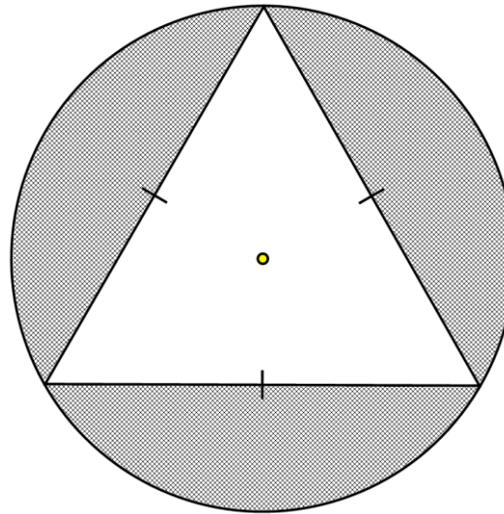
PROBLEM 14

If the circumference of a circle is 200 cm what is the radius?

Calculate the area of the triangle

120°

10 cm

Express 68 out of 120 as percentage, correct to 1 decimal place

The circumference of the circle is 314.2 cm. Calculate the percentage of the circle that is shaded.

PROBLEM 15

Solve 5x + 3 = 35	An unbiased coin is tossed twice. Calculate the probability of getting 2 heads?	A and B are independent events with P(A) = 0.4 and P(B)=0.3. Calculate the probability that both A and B occur (either order)

A spinner can land on 0, 5, 10 or 20

The table shows the probability that it lands on each value

Value	0	5	10	20
Probability	x	x – 0.1	2x + 0.05	x – 0.15

The spinner is spun twice and the scores added.

Calculate the probability that the total score is exactly 20

PROBLEM 16

Calculate the volume of the cone with radius 4 cm and height 9 cm.

1 litre of water is poured into hemispheres with radius 3 cm. How many hemispheres can be filled?

60 pens bought for 95p each. 50 of them are sold for £1.20 each and the rest for £1.05 each. Calculate the percentage profit.

215 Ice creams are sold for £1.50 each at a charity event.
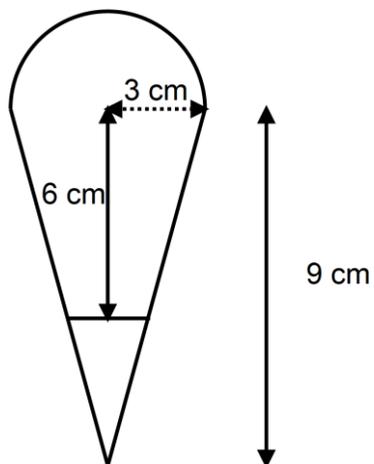
A hemisphere of ice cream is placed on top of each cone and the cone if filled to a depth of 6 cm.

The cones cost 12p each and the ice cream is bought in 1 litre tubs costing of £1.75 each.

3 cm

6 cm

9 cm

Calculate the percentage profit from selling 215 ice creams

(Assume only whole tubs of ice cream can be purchased but cones can be bought individually)

PROBLEM 17

Divide 280 in the ratio 11 : 3	Calculate 40% of 900	Calculate the total profit from the following sales

Calculate the total profit from the following sales

Item	Bought for	Sold for
Boots	£15.50	£24.00
Bag	£12.99	£15.99
Socks	£3.50	£3.45
Coat	£45.00	£54.50

Boxes of chocolates are bought in 3 sizes small, medium and large for £1.50, £2.00 and £3.50 respectively.

They are sold to raise funds for charity for £2.20, £3.00 and £4.50.

Over one weekend exactly 200 boxes of chocolates were sold. The ratio of the number of boxes sold on Saturday to the number sold on Sunday is 3:2. The 34 medium sized boxes were sold on Saturday. 30% of the boxes sold on Sunday were small. 44 of the boxes sold during the weekend were large. One quarter of the boxes sold on Sunday were large. How much profit was made from the weekend sales?

PROBLEM 18

| Calculate the mean of £12.50, £9.00, £18.00, £15.50	Divide 300 in the ratio 7 : 8	120 tickets are sold for an mean price of £12.40. Calculate the total income from sales

200 tickets are sold for a show for an average price (mean) of £13.80.

Band A tickets cost £18.00 and make up 15% of the tickets sold. The rest of the tickets are from Bands B and C and are sold in the ratio 11 : 6 respectively.
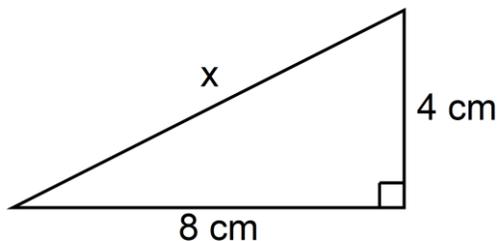
If a Band C ticket is priced at £9.50, how much is a Band B ticket for the show?
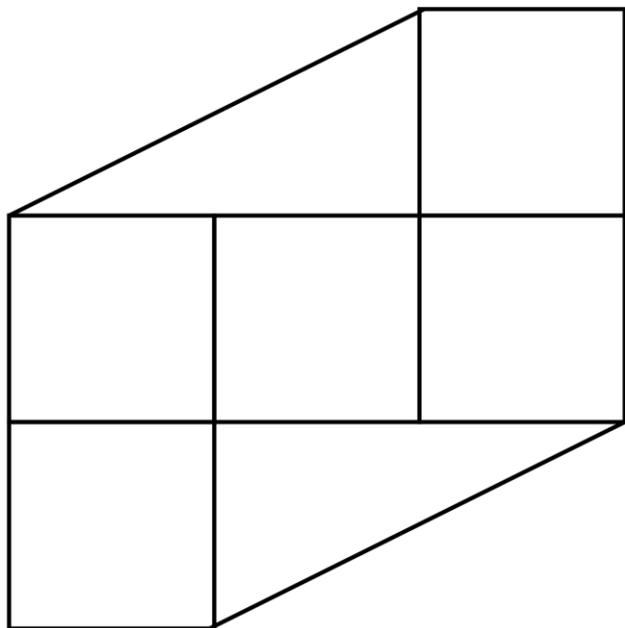
PROBLEM 19
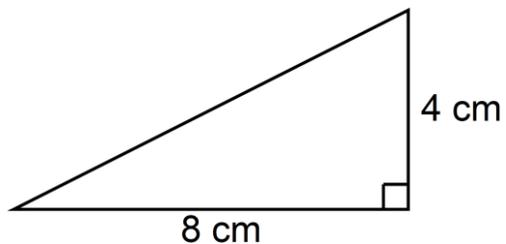
Calculate the area of the triangle	Calculate x (in exact form)	Simplify
4 cm / 8 cm	x / 4 cm / 8 cm	$4\sqrt{3} + 5 + 4\sqrt{3} + 10$

The design shown, consisting of 5 squares and 2 triangles, has an area of 175 cm²

Calculate in exact form the perimeter of the design

PROBLEM 20

Write down an expression for

5 more than x

2 lots of x − 4

Expand and simplify

3x − 2(x + 3)

Solve $\frac{1}{x+3} + \frac{1}{2} = \frac{1}{10}$

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x is a fraction such that the denominator is 2 more than the numerator.

When 2 is added to the numerator and the denominator is doubled the difference between

the new fraction (y) and x is equivalent to 0.1 (x > y). Find x