R.U.L.E.R Exam Question Practice

Using your R.U.L.E.R and mastering all these

questions is all but guaranteed* to raise your grade.

Name: _____

Teacher: _____

HIGHER TIER

Answers (remember they may use a different method) @:

www.bit.ly/ruler   or   **www.tannermaths.co.uk/ruler**

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*obviously we can't actually guarantee it but completing the booklet is a tremendous way to increase the probability of you achieving a higher grade. You need to ensure you see your teacher when you get really stuck on a question.

Checklist and Contents

Ratio and Proportion	Done?	Money Calculations	Done?	Value for Money	Done?	Area Perimeter and Volume	Done?	Geometrical Reasoning	Done?	Forming Equations and Proof	Done?
Q1		Q1		Q1		Q1		Q1		Q1	
Q2		Q2		Q2		Q2		Q2		Q2	
Q3		Q3		Q3		Q3		Q3		Q3	
Q4		Q4		Q4		Q4		Q4		Q4	
Q5		Q5		Q5		Q5		Q5		Q5	
Q6		Q6		Q6		Q6		Q6		Q6	
Q7		Q7		Q7		Q7		Q7		Q7	
Q8		Q8		Q8		Q8		Q8		Q8	
Q9		Q9		Q9		Q9		Q9		Q9	
Q10		Q10		Q10		Q10		Q10		Q10	
Q11		Q11		Q11		Q11		Q11		Q11	
Q12		Q12		Q12		Q12		Q12		Q12	
Q13		Q13		Q13		Q13				Q13	
Q14		Q14		Q14		Q14				Q14	
Q15		Q15								Q15	
Q16		Q16								Q16	
Q17										Q17	
Q18										Q18	
Q19										Q19	
Q20											
Q21											

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Ratio and Proportion Questions

Q1. This is a list of ingredients for making chicken soup for 4 people.

Ingredients for 4 people

60 g	butter
300 g	chicken
150 ml	cream
1	onion
640 ml	chicken stock
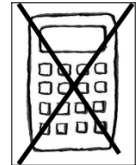
Bill is going to make chicken soup for 6 people.

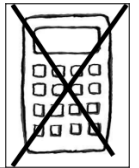Work out the amount of each ingredient he needs.

.... g butter

.... g chicken

.... ml cream

.... onion

.... ml chicken stock

(Total for Question is 3 marks)

Q2.

Here are the ingredients needed to make 16 gingerbread men.

Ingredients
to make **16** gingerbread men
180 g flour
40 g ginger
110 g butter
30 g sugar

Hamish wants to make 24 gingerbread men.

Work out how much of each of the ingredients he needs.

....g flour

....g ginger

....g butter

....g sugar

(Total for Question is 3 marks)

Q3.

* 225 grams of flour are needed to make 9 cakes.

Marian wants to make 20 of these cakes.
She has 475 grams of flour.

Does Marian have enough flour to make 20 cakes?
You must show all your working.
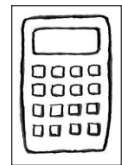
(Total for Question is 3 marks)

Q4. * Talil is going to make some concrete mix.
He needs to mix cement, sand and gravel in the ratio 1 : 3 : 5 by weight.

Talil wants to make 180 kg of concrete mix.

Talil has

  15 kg of cement
85 kg of sand
100 kg of gravel
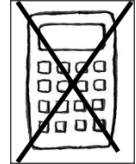
Does Talil have enough cement, sand and gravel to make the concrete mix?

(Total for Question is 4 marks)

Q5. Mr Mason asks 240 Year 11 students what they want to do next year.

  15% of the students want to go to college.

$\frac{3}{4}$ of the students want to stay at school.

  The rest of the students do not know.

Work out the number of students who do not know.
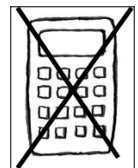
(Total for Question is 4 marks)

Q6.

5 schools sent some students to a conference.

One of the schools sent both boys and girls.
 This school sent 16 boys.
 The ratio of the number of boys it sent to the number of girls it sent was 1 : 2

The other 4 schools sent only girls.
 Each of the 5 schools sent the same number of students.

Work out the total number of students sent to the conference by these 5 schools.

....
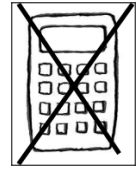
(Total for Question is 4 marks)

Q7. * Here is a list of ingredients for making 18 mince pies.

Ingredients for 18 mince pies

225 g of butter
350 g of flour
100 g of sugar
280 g of mincemeat
1 egg
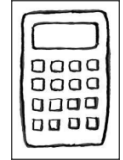
Elaine wants to make 45 mince pies.

Elaine has

1 kg of butter
1 kg of flour
500 g of sugar
600 g of mincemeat
6 eggs

Does Elaine have enough of each ingredient to make 45 mince pies?
You must show clearly how you got your answer.

(Total for Question is 4 marks)

Q8.

*140 children will be at a school sports day.
Lily is going to give a cup of orange drink to each of the 140 children.
She is going to put 200 millilitres of orange drink in each cup.

The orange drink is made from orange squash and water.
The orange squash and water are mixed in the ratio 1 : 9 by volume.

Orange squash is sold in bottles containing 750 millilitres.

Work out how many bottles of orange squash Lily needs to buy.
You must show all your working.
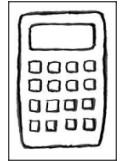
(Total for Question is 4 marks)

Q9. Here are the ingredients needed to make 16 chocolate biscuits.

Sabrina has 250 g of butter
          300 g of caster sugar
          600 g of flour
   and   60 g of cocoa

Work out the greatest number of chocolate biscuits Sabrina can make.
You must show your working.

Chocolate biscuits

Makes **16** chocolate biscuits

100 g of butter
50 g of caster sugar
120 g of flour
15 g of cocoa

....
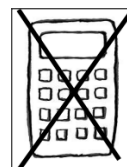
(Total for Question is 3 marks)

Q10. Here is a list of ingredients needed to make 12 scones.
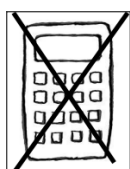
Viv is making scones for 15 people.
She is making 2 scones for each person.

Work out the amount of each ingredient she need

Ingredients for 12 scones

220 g self-raising flour
40 g butter
150 ml milk
2 tablespoons sugar

Self-raising flour . . . . g
Butter . . . . g
Milk . . . . ml
Tablespoons of sugar . . . .

(Total for Question is 3 marks)

Q11. Here is a list of ingredients for making 12 cheese scones.

Jason is going to make 30 cheese scones.

Work out the amount of each ingredient he needs.

Ingredients for 12 cheese scones

240 g flour
60 g butter
30 g cheese
150 ml milk
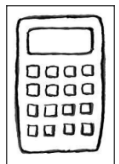
(Total for Question is 3 marks)

Q12. There are 200 counters in a bag.
The counters are blue or red or yellow.

35% of the counters are blue.

$\frac{1}{5}$ of the counters are red.

Work out the number of yellow counters in the bag.

....
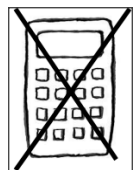
(Total for Question is 4 marks)

Q13. On Monday, a shop sells 120 loaves of bread.

20% of the loaves are wholemeal bread.

$\frac{1}{3}$ of the loaves are granary bread.

The rest of the loaves are white bread.

How many loaves of white bread does the shop sell on Monday?

....

(Total for Question is 3 marks)

Q14. Here is a list of ingredients for making a peach dessert for **6** people.

Bob is going to make a peach dessert for **15** people.

Work out the amount of each ingredient he needs.

Peach dessert for 6 people.

150 g	jelly
10	sponge fingers
500 ml	custard
200 g	peaches
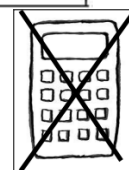
....g jelly

....sponge fingers

....ml custard

....g peaches

(Total for Question is 3 marks)

Q15. Pavel and Katie share some sweets in the ratio 3 : 8

Katie gets 32 sweets.
(a) How many sweets does Pavel get?
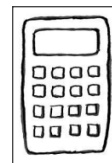
(2)

Katie also has a tin of chocolates.

There are 80 chocolates in the tin.

45% of the chocolates have toffee in the middle.
(b) Work out the number of chocolates that have toffee in the middle.

.... **(2)**

(Total for Question is 4 marks)

Q16.
Here are the ingredients needed to make 12 shortcakes.
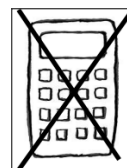
Shortcakes
Makes **12** shortcakes 50 g   of sugar
200 g   of butter
200 g   of flour
10 m*l*   of milk

Liz makes some shortcakes. She uses 25 m*l* of milk.

(a) How many shortcakes does Liz make?

(2)

Robert has   500 g of sugar

1000 g of butter
1000 g of flour
500 m*l* of milk

(b) Work out the greatest number of shortcakes Robert can make.

(2)

(Total for Question is 4 marks)

Q17.

A shop sells freezers and cookers.
The ratio of the number of freezers sold to the number of cookers sold is 5 : 2
The shop sells a total of 140 freezers and cookers in one week.

*(a) Work out the number of freezers and the number of cookers sold that week.
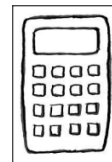
(3)

Jake buys this freezer in a sale.
The price of the freezer is reduced by 20%.

(b) Work out how much Jake saves.

Freezer
Original Price
£145

£ . . . .

(2)

(Total for Question is 5 marks)

Q18. Build-a-mix makes concrete.

1 cubic metre of concrete has a weight of 2400 kg.

15% of the concrete is water.
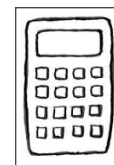
The rest of the ingredients of concrete are cement, sand and stone.
The weights of these ingredients are in the ratio 1 : 2 : 5

(a) Work out the weight of cement, of sand and of stone in 1 cubic metre of concrete.

cement = ... kg

sand = ... kg

stone = ... kg

(4)

Build-a-mix needs to make 30 cubic metres of concrete.
Build-a-mix has only got 6.5 tonnes of cement.

* (b) Will this be enough cement for Build-a-mix to make 30 cubic metres of concrete?
You must show all of your working.

(3)

(Total for Question is 7 marks)

Q19.
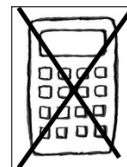
Here is a list of ingredients for making apple crumble for 2 people.

Anne is going to make apple crumble for 5 people.

(a) Work out how much flour she needs.
     Give your answer in grams.

**Apple Crumble
for 2 people**

10 ounces apples
4 ounces flour
2 ounces sugar
1 ounce butter
1 tablespoon water
1 teaspoon baking powder

1 ounce	=	28 grams
1 tablespoon	=	15 ml
1 teaspoon	=	5 ml

....
                                                                          (3)

David is making an apple crumble.
 He uses 140 grams of butter.

(b) Work out how many people he is making apple crumble for.

....**(2)**

(Total for Question is 5 marks)

Q20. Here is a list of ingredients for making cherry scones.
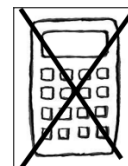
Makes 8 cherry scones
200 grams flour
60 grams margarine
40 grams sugar
60 grams cherries
160 m*l* milk

Chen wants to make 20 cherry scones.

(a) Work out how much milk he will need.

....m*l*

(2)

Sophie has 80 grams of sugar and 300 grams of flour.
She has plenty of the other ingredients.

*(b) What is the greatest number of cherry scones she can make?
You must show all your working.

(3)

(Total for Question is 5 marks)

Q21.

One day a supermarket has 8420 customers.

65% of the customers pay with a debit card.

$\frac{1}{5}$ of the customers pay with a credit card.

The rest of the customers pay with cash.

Work out how many customers pay with cash.
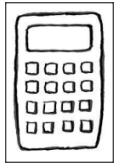
....

(Total for Question is 4 marks)

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Money Calculations

Q1. Greg sells car insurance and home insurance.

The table shows the cost of these insurances.
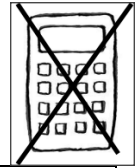
Insurance	car insurance	home insurance
Cost	£200	£350

Each month Greg earns

    £530 basic pay
      5% of the cost of all the car insurance he sells
  and 10% of the cost of all the home insurance he sells

In May Greg sold

    6 car insurances
  and 4 home insurances

Work out the total amount of money Greg earned in May.

(Total for Question is 5 marks)

Q2. Mr Brown and his 2 children are going to London by train.

An adult ticket costs £24
A child ticket costs £12

Mr Brown has a Family Railcard.
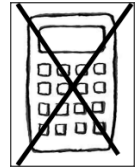
Family Railcard gives

$\frac{1}{3}$ off adult tickets

60% off child tickets

Work out the total cost of the tickets when Mr Brown uses his Family Railcard.

£...

(Total for Question is 4 marks)

Q3.*   A company sells boxes to factories.
Fred buys boxes.
The boxes are sold in packs of 1000
Each pack costs £193.86
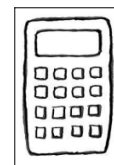
Fred orders 3 packs of boxes. He gets a discount on his total order.

The table shows the discount he will get.

Total Order	Discount
£100 - £300	5%
£301 - £400	10%
£401 and above	15%

Work out the total cost of the order after the discount.
You must show your working.

(Total for Question is 5 marks)

Q4. Petra booked a family holiday.
The total cost of the holiday was £3500 **plus** VAT at 20%.

Petra paid £900 of the total cost when she booked the holiday.
She paid the rest of the total cost in 6 equal monthly payments.

Work out the amount of each monthly payment.

....
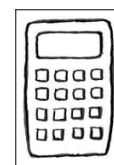
(Total for Question is 5 marks)

Q5. Mrs Evans is planning a trip to the zoo.

She finds out this information.
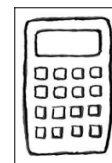
July

M	T	W	T	F	S	S
	1	2	3	4	5	
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

☐ Off peak   ▨ Peak

Ticket Prices

	Peak	Off peak
Adult	£20.50	£19.50
Child	£15.50	£15.00
Senior citizen	£19	£18

Family Offer

10% Discount	2 adults and 2 children or 1 adult and 3 children

Mrs Evans will go to the zoo on Friday 17th July.

She will need to buy tickets for 1 adult and 3 children.

Mrs Evans wants to buy the tickets as cheaply as possible.

Work out the total cost of the tickets.

£ ....

(Total for Question is 4 marks)

Q6

Ali is planning a party.

He wants to buy some cakes and some sausage rolls.

The cakes are sold in boxes.
There are 12 cakes in each box.
Each box of cakes costs £2.50

The sausage rolls are sold in packs.
There are 8 sausage rolls in each pack.
Each pack of sausage rolls costs £1.20

Ali wants to buy more than 60 cakes and more than 60 sausage rolls.
He wants to buy exactly the same number of cakes as sausage rolls.

What is the least amount of money Ali will have to pay?

£...
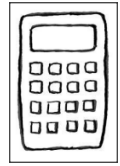
(Total for Question is 5 marks)

Q7. Glen buys four tickets for a concert.
Each ticket costs £54

Glen also has to pay a booking fee.
The booking fee is 5% of the total price of the tickets.

Work out the total amount Glen has to pay.

£..
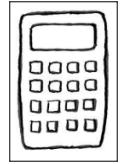
(Total for Question is 3 marks)

Q8. Linda is going on holiday to the Czech Republic.
She needs to change some money into koruna.

She can only change her money into 100 koruna notes.

Linda only wants to change up to £200 into koruna.
She wants as many 100 koruna notes as possible.

The exchange rate is £1 = 25.82 koruna.

How many 100 koruna notes should she get?
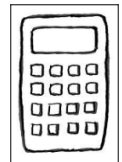
(Total for Question is 3 marks)
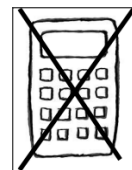
Q9. Each day a company posts some small letters and some large letters.

The company posts all the letters by first class post.
The tables show information about the cost of sending a small letter by first class post and the cost of sending a large letter by first class post.

Small Letter

Weight	First Class Post
0–100 g	60p

Large Letter

Weight	First Class Post
0–100 g	£1.00
101–250 g	£1.50
251–500 g	£1.70
501–750 g	£2.50

One day the company wants to post 200 letters.
The ratio of the number of small letters to the number of large letters is 3:2
70% of the large letters weigh 0-100 g.
The rest of the large letters weigh 101-250 g.
Work out the total cost of posting the 200 letters by first class post.

£ ....
(Total for Question is 5 marks)

Q10. You can use this conversion graph to change between pounds (£) and dollars ($).
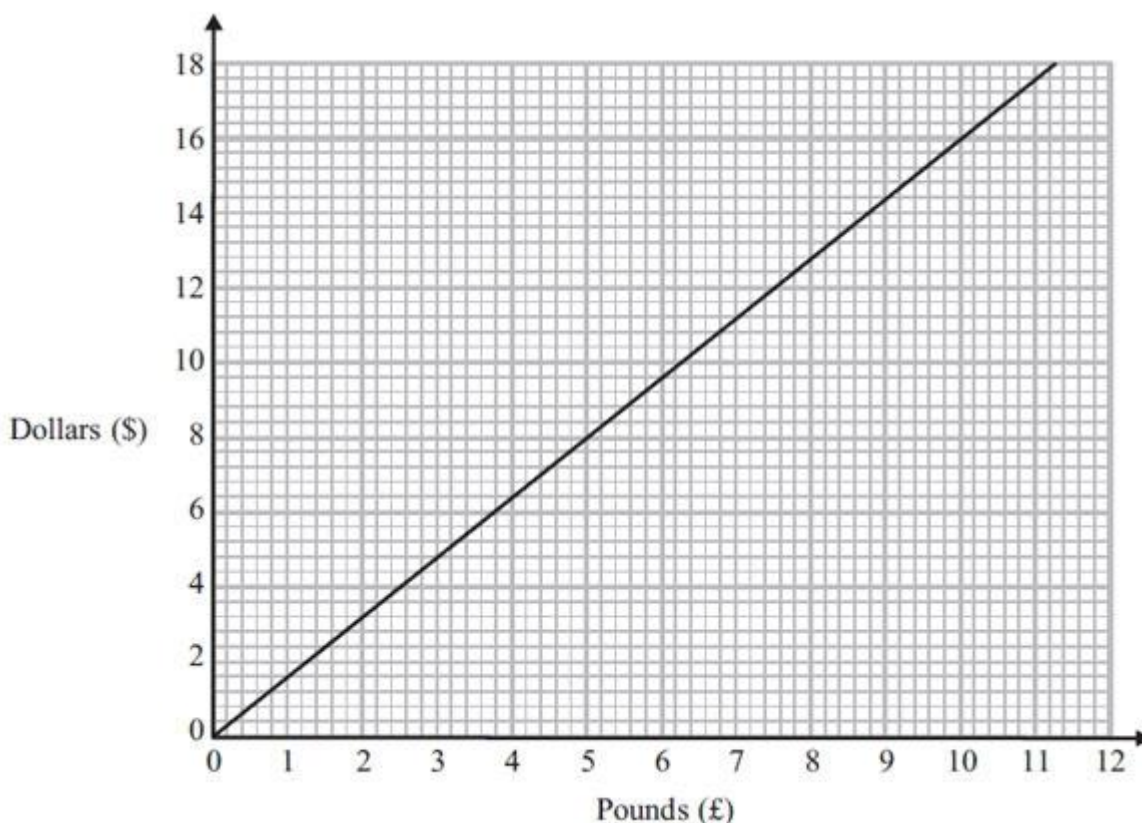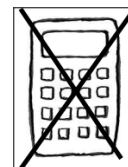
(a) Use the conversion graph to change £5 to dollars.

.... (1)

Ella has $200 and £800
 Her hotel bill is $600

Ella pays the bill with the $200 and some of the pounds.

(b) Use the conversion graph to work out how many pounds she has left.

....(4)

(Total for Question is 5 marks)

Q11. A company sends every item of mail by second class post.
Each item of mail is either a letter or a packet.

The tables show information about the cost of sending a letter by second class post and the cost of sending a packet by second class post.
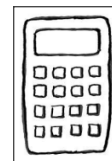
Letter

Weight range	Second Class
0–100g	32p

Packet

Weight range	Second Class
0–100g	£1.17
101–250g	£1.51
251–500g	£1.95
501–750g	£2.36
751–1000g	£2.84

The company sent 420 items by second class post.
The ratio of the number of letters sent to the number of packets sent was 5 : 2

$\frac{2}{3}$ of the packets sent were in the weight range 0 – 100 g.

The other packets sent were in the weight range 101 – 250 g.

Work out the total cost of sending the 420 items by second class post.

£ . . . .

(Total for Question is 5 marks)

Q12. *   In the UK, petrol cost £1.24 per litre.

In the USA, petrol cost 3.15 dollars per US gallon.

1 US gallon = 3.79 litres
£1 = 1.47 dollars

Was petrol cheaper in the UK or in the USA?
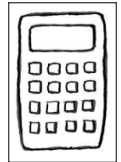
(Total for Question is 4 marks)

Q13.

Mr Watkins needs to buy some oil for his central heating.

Mr Watkins can put up to 1500 litres of oil in his oil tank.
There are already 850 litres of oil in the tank.
Mr Watkins is going to fill the tank with oil.

The price of oil is 67.2p per litre.
Mr Watkins gets 5% off the price of the oil.

How much does Mr Watkins pay for the oil he needs to buy?

....
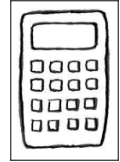
(Total for Question is 5 marks)

Q14.

* Zara is the manager of a shop.

The table gives information about the expenses the shop had last year.
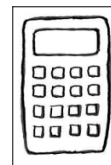
Expense	Wages	Rent	Goods	Other expenses
Amount	£92 000	£10 800	£72 000	£7000

This year

the wages will increase by 7.5%,

the rent will be $^7/_9$ of the rent last year,

the other expenses will halve.

Zara wants to increase the amount of money she spends on goods.

She also wants the total expenses the shop has this year to be the same as last year.

Can Zara increase the amount of money she spends on goods?

(Total for Question is 4 marks)

Q15. Grant drives a lorry to deliver some equipment from a factory to a hospital.
The distance from the factory to the hospital is 200 miles.

The lorry uses one litre of fuel to go 5 miles.
A litre of fuel for the lorry costs £1.50

Work out the total cost of the fuel the lorry used.
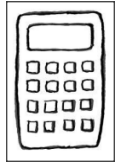
....

(Total for Question is 3 marks)

Q16. Ben goes on holiday to Hong Kong.
In Hong Kong, Ben sees a camera costing HK$3179.55

In London, an identical camera costs £285
The exchange rate is £1 = HK$12.30
Ben buys the camera in Hong Kong.
How much cheaper is the camera in Hong Kong than in London?
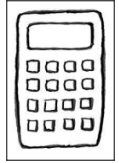
....

(Total for Question is 3 marks)

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Value for Money

Q1.* Railtickets and Cheaptrains are two websites selling train tickets.

Each of the websites adds a credit card charge and a booking fee to the ticket price.
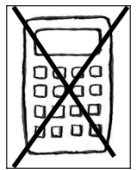
Railtickets

Credit card charge: 2.25% of ticket price

Booking fee: 80 pence

Cheaptrains

Credit card charge: 1.5% of ticket price

Booking fee: £1.90

Nadia wants to buy a train ticket.
The ticket price is £60 on each website.
Nadia will pay by credit card.

Will it be cheaper for Nadia to buy the train ticket from Railtickets or from Cheaptrains?

(Total for Question is 4 marks)

Q2. * Viv wants to invest £2000 for 2 years in the same bank.

The International Bank	The Friendly Bank
Compound Interest	Compound Interest
4% for the first year 1% for each extra year	5% for the first year 0.5% for each extra year
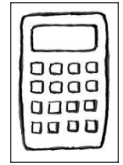
At the end of 2 years, Viv wants to have as much money as possible.

Which bank should she invest her £2000 in?

(Total for Question is 4 marks)

Q3. * Sam is going to paint his garden shed.

The paint is sold in two different shops.

Paint For You

2.5 litres

£8.35 plus VAT at 20%

Paul's Paints

0.75 litres

£3.15
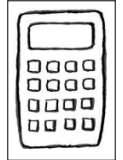
Sam needs **7.5 litres** of paint.

Sam wants to buy the cheapest paint.
He is going to buy the paint from one of these shops.

Which shop should he buy the paint from?
You must show your working.

(Total for Question is 4 marks)

Q4. * Ella wants to invest £6000 in a savings account for 2 years.

She finds information about savings accounts at two different banks.

Northway Bank

Compound interest

of

3.8% per annum

Portland Bank

Compound interest

of

5% per annum in year 1
3.2% per annum in year 2
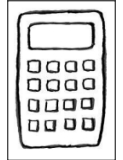
Ella wants to choose the bank that pays the greater total amount of interest for the 2 years.

Which bank should she choose?
You must show all your working.

(Total for Question is 4 marks)

Q5. *Milk is sold in two sizes of bottle.

4 pints
£1.18
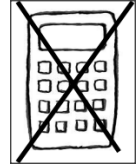
6 pints
£1.74

A 4 pint bottle of milk costs £1.18
A 6 pint bottle of milk costs £1.74

Which bottle of milk is the best value for money?
You must show all your working.

(Total for Question is 3 marks)

Q6.*   Potatoes cost £9 for a 12.5 kg bag at a farm shop.
The same type of potatoes cost £1.83 for a 2.5 kg bag at a supermarket.

Where are the potatoes the better value, at the farm shop or at the
supermarket?
You must show your working.
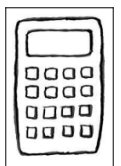
(Total for Question is 4 marks)

Q7. *   Henry is thinking about having a water meter.

These are the two ways he can pay for the water he uses.

Water Meter

A charge of £28.20 per year

plus

91.22p for every cubic metre of water used

1 cubic metre = 1000 litres

No Water Meter

A charge of £107 per year
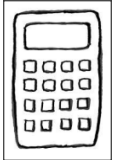
Henry uses an average of 180 litres of water each day.

Henry wants to pay as little as possible for the water he uses.
Should Henry have a water meter?

(Total for Question is 5 marks)

Q9.

*   Pete and Sue are going to take their children to France.
They will travel together on the same ferry.
They will travel with one of two ferry companies, Easy Ferry or Seawagon.

The tables give information about the costs for each adult and each child to travel with these ferry companies.

Easy Ferry	July			August		
Date	1 - 10	11 - 21	22 - 31	1 - 10	11 - 21	22 - 31
Adult	£32.00	£36.50	£39.50	£42.25	£42.25	£37.75
Child	£18.00	£20.25	£23.75	£25.85	£25.85	£21.00

Seawagon	July			August		
Date	1 - 10	11 - 21	22 - 31	1 - 10	11 - 21	22 - 31
Adult	£33.50	£37.50	£40.25	£43.85	£44.95	£38.50
Child	£17.25	£19.75	£21.85	£24.65	£23.95	£19.95

The table below gives information about the discount they will get from each ferry company if they book early.

Early booking discount	
Easy Ferry	⅓ off
Seawagon	25% off

Pete and Sue have three children.
They will travel on 25 July.
They will book early.

Pete and Sue will travel with the cheaper ferry company.

Which ferry company?
You must show all your working.

(Total for Question is 5 marks)

Q8. *   Plants are sold in three different sizes of tray.

A small tray of 30 plants costs £6.50

A medium tray of 40 plants costs £8.95

A large tray of 50 plants costs £10.99
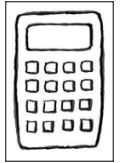
Kaz wants to buy the tray of plants that is the best value for money.

Which size tray of plants should she buy?

You must show all your working.

(Total for Question is 4 marks)

Q11.

* Mr and Mrs Jones are planning a holiday to the Majestic Hotel in the Cape Verde Islands.

The table gives information about the prices of holidays to the Majestic Hotel.
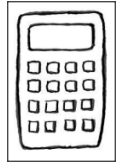
MAJESTIC HOTEL, Cape Verde Islands		
Departures	**Price per adult**	
	7 nights	**14 nights**
1 Jan – 8 Jan	£ 694	£ 825
9 Jan – 28 Jan	£ 679	£ 804
29 Jan – 5 Feb	£ 687	£ 815
6 Feb – 18 Feb	£ 769	£ 835
19 Feb – 8 Mar	£ 714	£ 817
9 Mar – 31 Mar	£ 685	£ 805
1 April – 9 April	£ 788	£ 862
10 April – 30 April	£ 748	£ 802
Price per child: 95% of adult price for 7 nights or 85% of adult price for 14 nights.		

Mr and Mrs Jones are thinking about going on holiday

   on 20 February for 7 nights
   on 10 April for 14 nights.

Mr and Mrs Jones have 2 children.

Compare the costs of these two holidays for the Jones family.

(Total for Question is 5 marks)
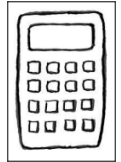
Q10. *   Debra and Mark are planning to go on a cruise.
They can travel with one of two companies, Caribbean Calypso or Royal European.

The table shows the cost per person to travel with each company.

		Type of cabin			
		Inside	Outside	Balcony	Suite
Cost per person	Caribbean Calypso	£1136	£1319	£1529	£2329
	Royal European	£1043	£1263	£1484	£2147

Caribbean Calypso has a discount of 10% if you book online.
Royal European has a discount of 5% if you book online.

Debra and Mark are going to book a suite for their cruise.
They are going to book online.

Debra and Mark want to pay the lowest possible cost.
Which company should they choose?
You must show all your working.

(Total for Question is 5 marks)

Q12.

* Gordon owns a shop.

Here are the prices of three items in Gordon's shop and in a Supermarket.
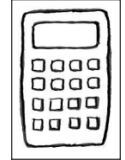
Gordon's Shop	
400 g loaf of bread	£1.22
1 litre of milk	£0.96
40 tea bags	£2.42

Supermarket	
400 g loaf of bread	£1.15
1 litre of milk	£0.86
40 tea bags	£2.28

Gordon reduces his prices by 5%.
Will the total cost of these three items be cheaper in Gordon's shop than in the Supermarket?

(Total for Question is 3 marks)

Q13.
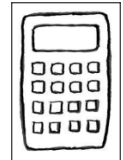
* The Kumar family are going to go to New York.

They will go with Highway Airlines or Jetstream Airlines.

The tables show how much it costs for each adult and each child to go with these airlines.

Highway Airlines

Date	Adult	Child
4 – 10 July	£475	£280
11 – 17 July	£488	£282
18 – 24 July	£516	£304
25 – 31 July	£506	£297
1 – 7 August	£462	£251
8 – 14 August	£430	£238
15 – 21 August	£421	£235
22 – 28 August	£399	£221

Jetstream Airlines

Date	Adult	Child
4 – 10 July	£483	£286
11 – 17 July	£493	£296
18 – 24 July	£526	£315
25 – 31 July	£519	£303
1 – 7 August	£485	£218
8 – 14 August	£429	£245
15 – 21 August	£409	£232
22 – 28 August	£401	£222

Highway Airlines give a discount of 5% of the total cost for booking online.

Jetstream Airlines give a discount of £25 per person for booking online.

The Kumar family are going to New York on 3 August.

They will buy 2 adult tickets and 1 child ticket.

They will book online.

The Kumar family want to pay the lower total cost.

Which airline should they choose?

(Total for Question is 5 marks)

Q14. Dishwasher tablets are sold in two sizes of box.

Dishwasher
tablets

15

£3.95

Small box

Dishwasher
tablets

22

£6.15
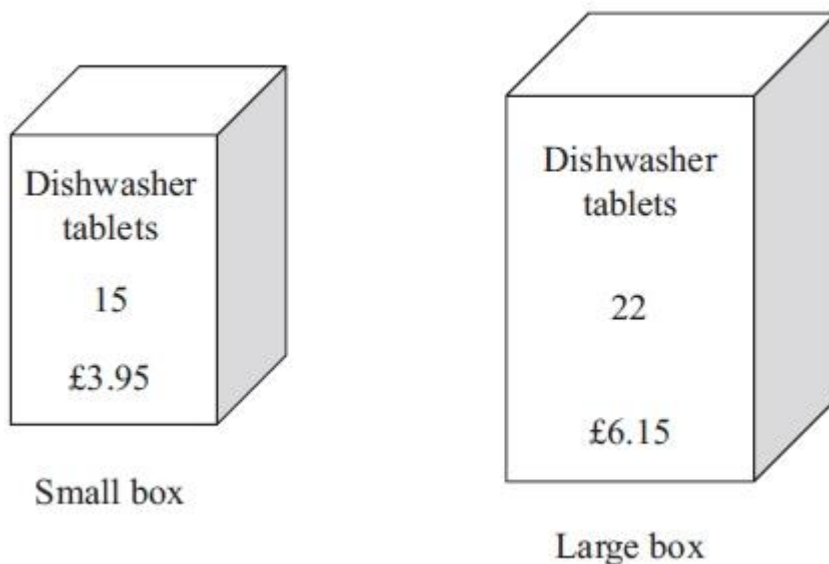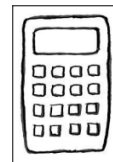
Large box

A small box contains 15 tablets and costs £3.95
A large box contains 22 tablets and costs £6.15

* (a) Which size of box gives the better value for money?
You must show all your working.

(4)

The weight of the large box is 357 grams, to the nearest gram.
(b) (i) What is the minimum possible weight of the box?

. . . . grams

(ii) What is the maximum possible weight of the box?

. . . . grams

(2)

(Total for Question is 6 marks)

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Area, Perimeter and Volume

Q1. * The diagram shows the floor of a village hall.

Diagram **NOT** accurately drawn

9 m

8 m

6 m

16 m
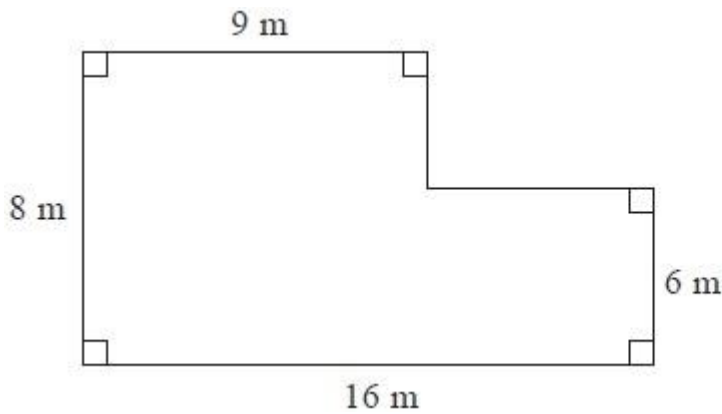
The caretaker needs to polish the floor.
One tin of polish normally costs £19

One tin of polish covers 12 m^2 of floor.

There is a discount of 30% off the cost of the polish.

The caretaker has £130
Has the caretaker got enough money to buy the polish for the floor?

You must show all your working.

(Total for Question is 5 marks)

Q2. Here is a plan of Martin's driveway.
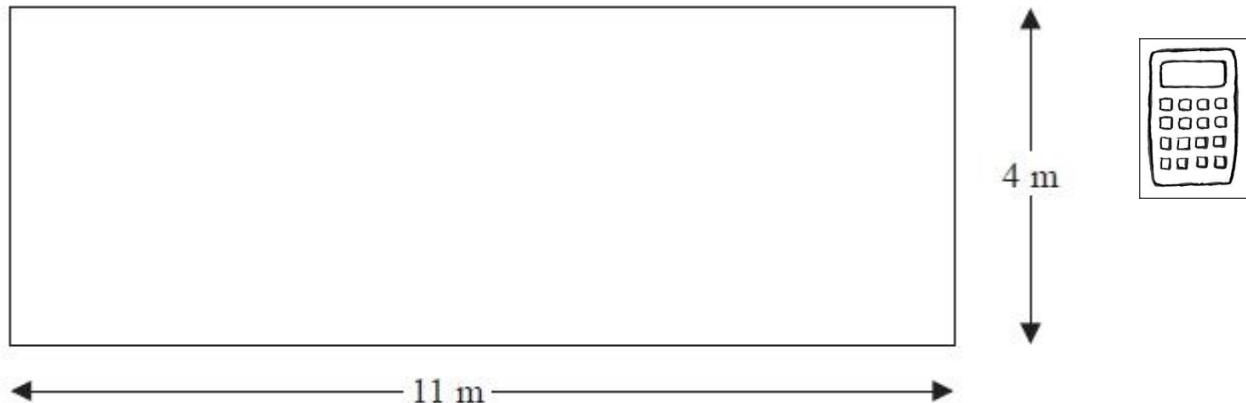
Diagram **NOT** accurately drawn

Martin is going to cover his driveway with gravel.
The gravel will be 6 cm deep.

Gravel is sold in bags.
There are 0.4 m^3 of gravel in each bag.
Each bag of gravel costs £38

Martin gets a discount of 30% off the cost of the gravel.

Work out the total amount of money Martin pays for the gravel.

£..

(Total for Question is 5 marks)

Q3. ∗The diagram shows the plan of a small field.

16 m

Diagram **NOT**
accurately drawn

6 m

10 m

7 m
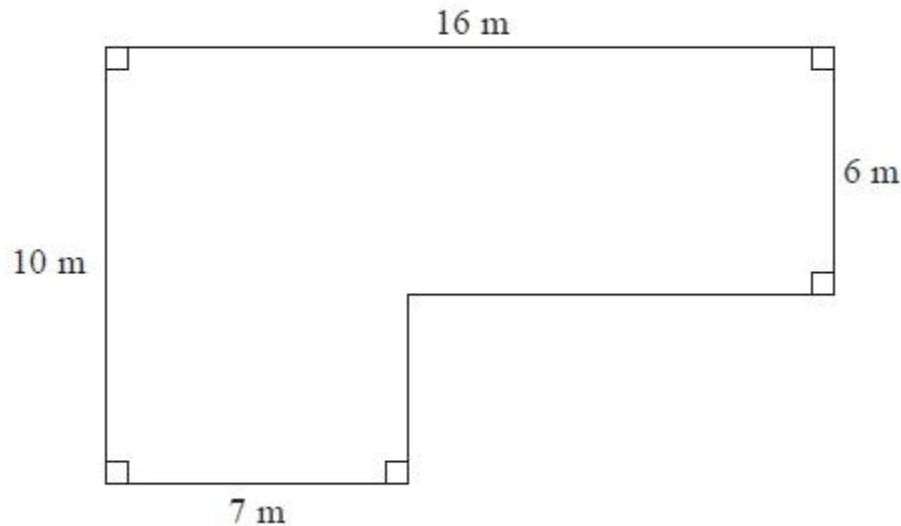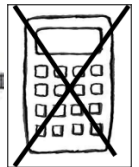
Kevin is going to keep some pigs in the field.
Each pig needs an area of 36 square metres.

Work out the greatest number of pigs Kevin can keep in the field.

(Total for Question is 4 marks)

Q4. The diagram shows a patio in the shape of a rectangle.

3 m

3.6 m
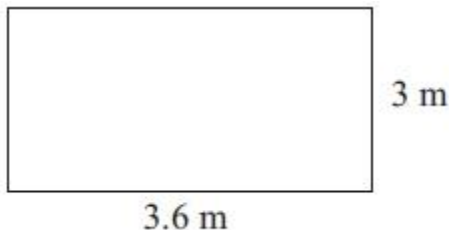
Diagram **NOT** accurately drawn
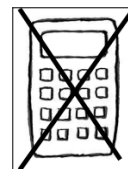
The patio is 3.6 m long and 3 m wide.

Matthew is going to cover the patio with paving slabs.
Each paving slab is a square of side 60 cm.

Matthew buys 32 of the paving slabs.

(a) Does Matthew buy enough paving slabs to cover the patio?
You must show all your working.

....
....

(3)

The paving slabs cost £8.63 each.

(b) Work out the total cost of the 32 paving slabs.

£. . . . .

(3)

(Total for Question is 6 marks)

Q5.

Mrs Kunal's garden is in the shape of a rectangle.
Part of the garden is a patio in the shape of a triangle.
The rest of the garden is grass.

Diagram **NOT** accurately drawn

12 m

grass

7 m

3 m

patio

6 m
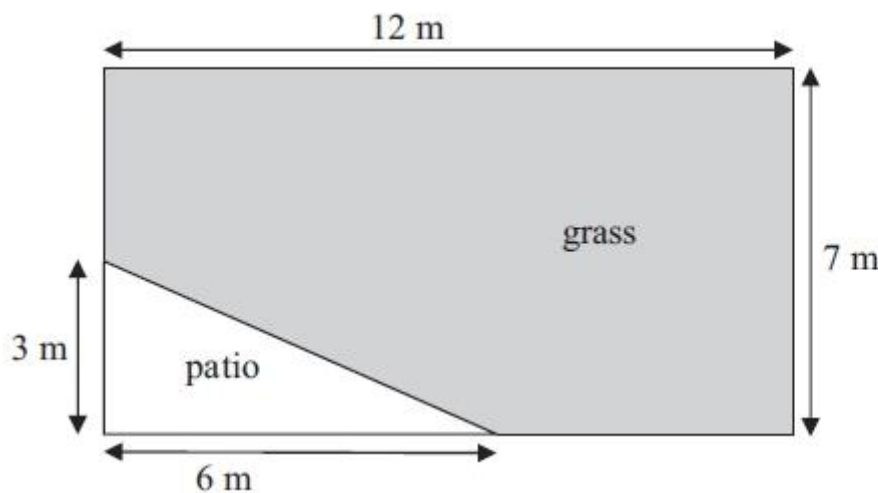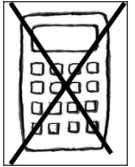
Mrs Kunal wants to spread fertiliser over all her grass.

One box of fertiliser is enough for 32 m^2 of grass.

How many boxes of fertiliser will she need?
You must show your working.

....

(Total for Question is 4 marks)

Q6.
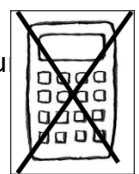
* Marc drives a truck.
The truck pulls a container.
The container is a cuboid 10 m by 4 m by 5 m.

Diagram **NOT** accurately drawn

container

5 m

4 m

10 m

box
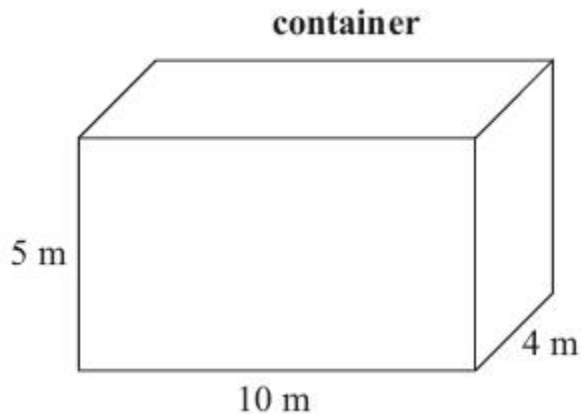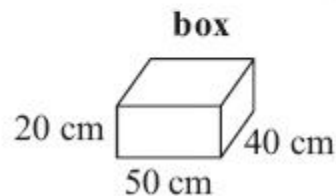
20 cm

40 cm

50 cm

Marc fills the container with boxes.
Each box is a cuboid 50 cm by 40 cm by 20 cm.

Show that Marc can put no more than 5000 boxes into the container.

(Total for Question is 4 marks)

Q7.

Here is a diagram of Jim's garden.

12 m

Diagram **NOT**
accurately drawn

9 m

18 m
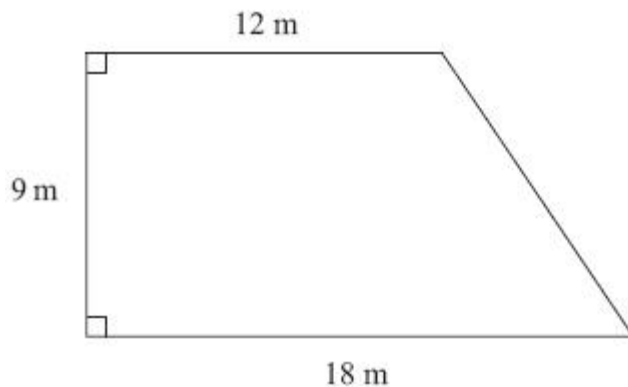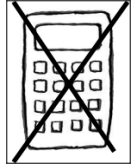
Jim wants to cover his garden with grass seed to make a lawn.

Grass seed is sold in bags.
There is enough grass seed in each bag to cover 20 m^2 of garden.

Each bag of grass seed costs £4.99

Work out the least cost of putting grass seed on Jim's garden.

£...

(Total for Question is 4 marks)

Q8.

A water trough is in the shape of a prism.
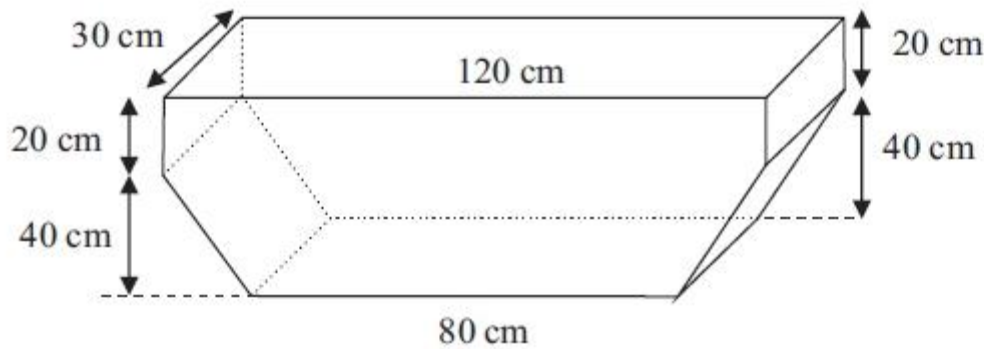
Diagram **NOT** accurately drawn

Hamish fills the trough completely.

Water leaks from the bottom of the trough at a constant rate.
2 hours later, the level of the water has fallen by 20 cm.

Water continues to leak from the trough at the same rate.

How many more minutes will it take for the trough to empty completely?
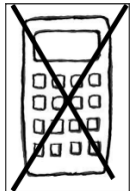
. . . . minutes

(Total for Question is 6 marks)

Q9.
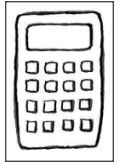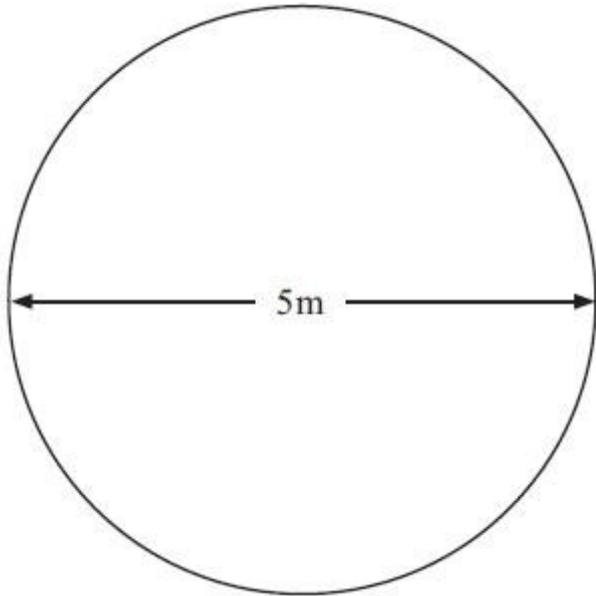
Diagram **NOT**
accurately drawn

Jon has a flower garden in the shape of a circle.
The diameter of the garden is 5 metres.

Jon wants to put fencing around the edge of the garden.
The fencing costs £1.80 per metre.

Work out the total cost of the fencing.

....

(Total for Question is 3 marks)

Q10.

* The diagram shows the floor plan of Jill's dining room.

4.5 m

2 m

4m

1.5 m

2m

3 m
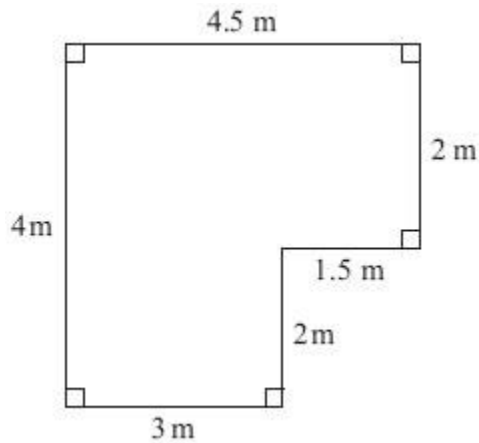
Diagram **NOT** accurately drawn
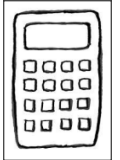
Jill is going to cover the floor with wooden floorboards.

The floorboards are sold in packs.
One pack of floorboards will cover 2.25 m^2.

Work out how many packs Jill needs.
You must show all your working.

(Total for Question is 4 marks)

Q11.

The diagram shows the plan of a playground.

80 m

30 m

Diagram **NOT** accurately drawn

60 m

50 m

40 m
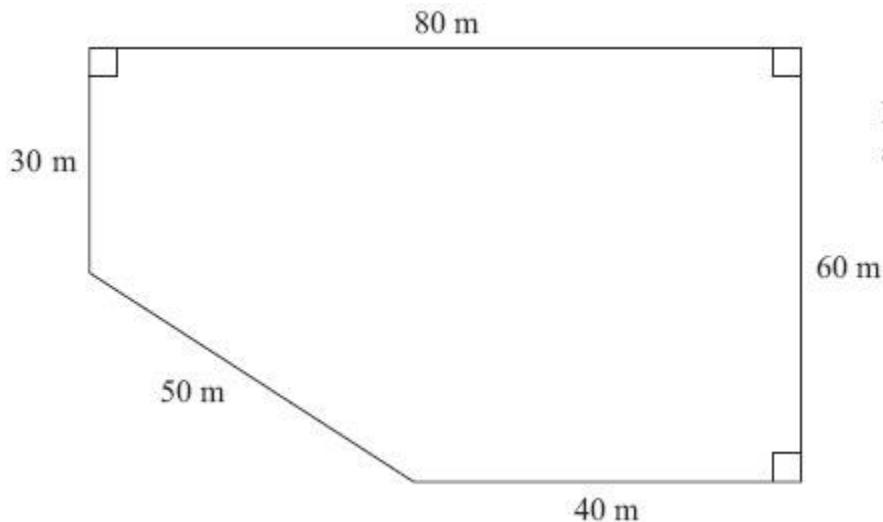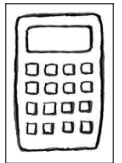
Bill is going to cover the playground with tarmac.
It costs £2.56 to cover each square metre with tarmac.

Work out the total cost of the tarmac Bill needs.

....

(Total for Question is 4 marks)

Q12.

Sumeet has a pond in the shape of a prism.

2 m

1 m

0.5 m

1.3 m
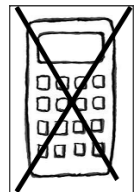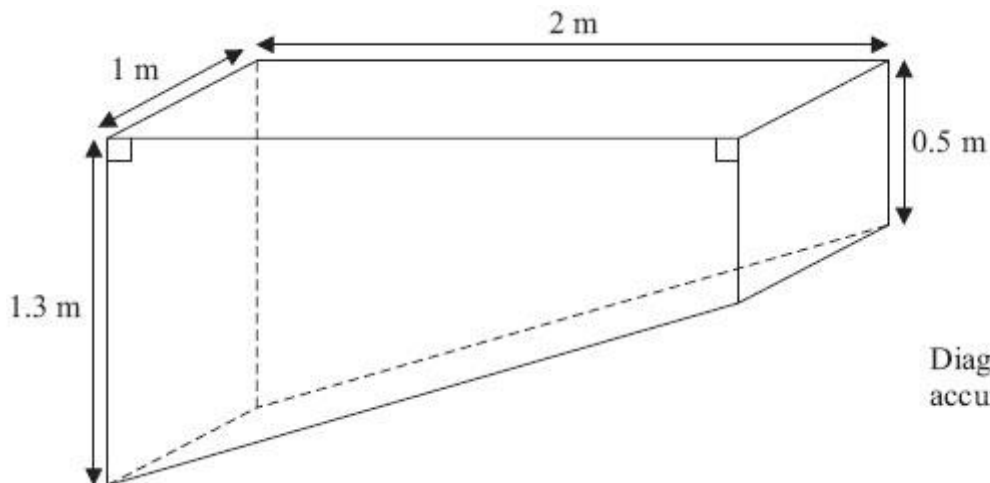
Diagram **NOT**
accurately drawn

The pond is completely full of water.
 Sumeet wants to empty the pond so he can clean it.
 Sumeet uses a pump to empty the pond.

 The volume of water in the pond decreases at a constant rate.
 The level of the water in the pond goes down by 20 cm in the first 30 minutes.

Work out how much more time Sumeet has to wait for the pump to empty the pond completely.

....

(Total for Question is 6 marks)

Q13. Ali has some packets.

Diagram **NOT** accurately draw:
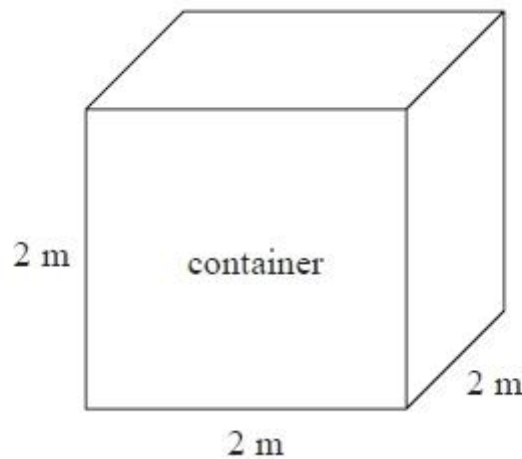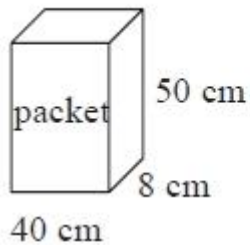
packet
50 cm
8 cm
40 cm
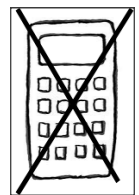
2 m container 2 m
2 m

Each packet has dimensions 40 cm by 8 cm by 50 cm.

Ali fills a container with these packets.
The container is a cube of side 2 m.

Ali fills the container completely with these packets.

Work out the number of packets.

(Total for Question is 4 marks)

Q14. The diagram shows a container used to store oil.
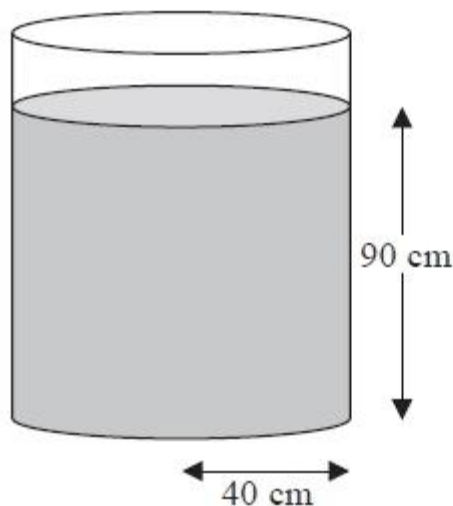
Diagram **NOT** accurately drawn
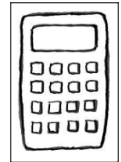
90 cm

40 cm

The container is in the shape of a cylinder of radius 40 cm.

The height of the oil in the container is 90 cm.

65 litres of oil are taken from the container.
1 litre = 1000 cm^3.

Work out the new height of the oil in the container.
Give your answer correct to one decimal placce.

..........................cm

(Total for Question is 4 marks)

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Geometrical Reasoning

Q1.
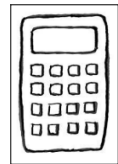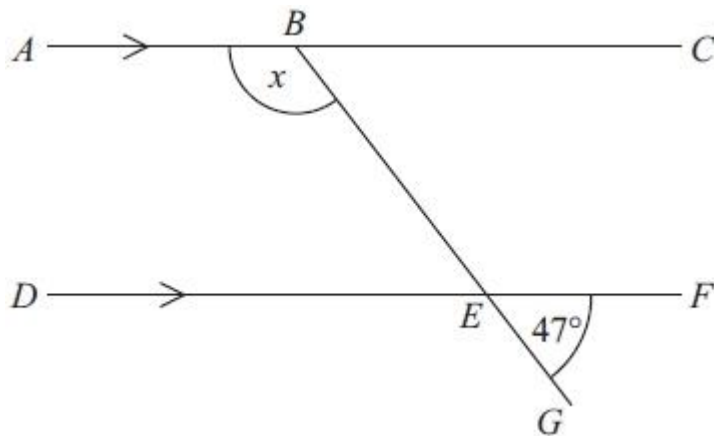
Diagram **NOT**
accurately drawn

ABC and *DEF* are parallel lines.
BEG is a straight line.
Angle *GEF* = 47°.

Work out the size of the angle marked *x*.
Give reasons for your answer.

. . . .°

(Total for Question is 3 marks)

Q2.

The diagram shows a pattern using four identical rhombuses.

Diagram **NOT**
accurately drawn

25°   25°

a

25°   25°
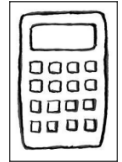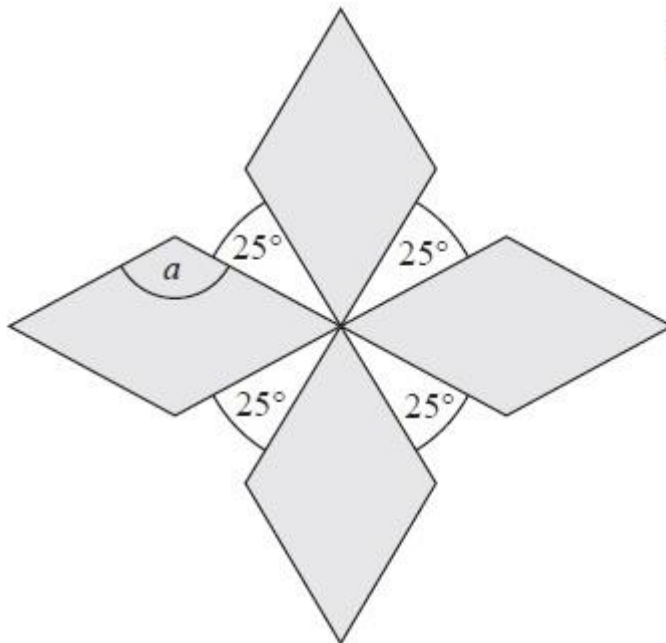
Work out the size of the angle marked *a*.

You must show your working.

.... °

(Total for Question is 4 marks)

Q3.

*
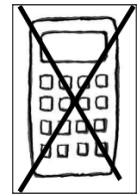
Diagram
accurately
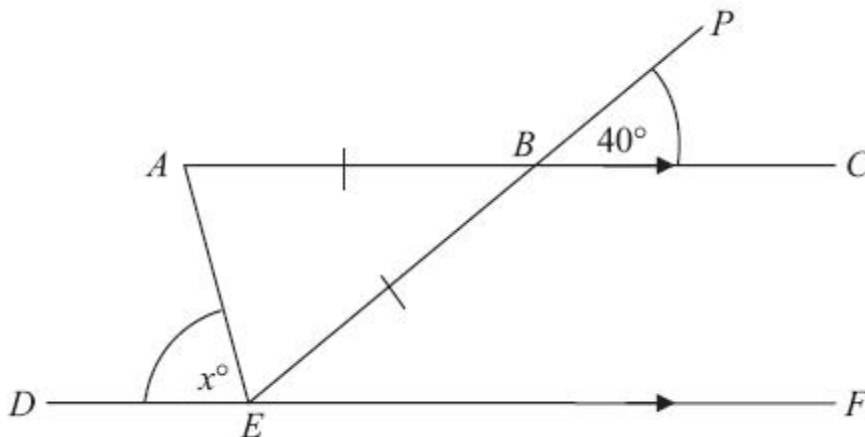
ABC is parallel to *DEF*.
EBP is a straight line.
AB = *EB*.
Angle *PBC* = 40°.
Angle *AED* = $x°$.

Work out the value of x.
Give a reason for each stage of your working.

(Total for Question is 5 marks)

Q4.

*
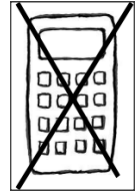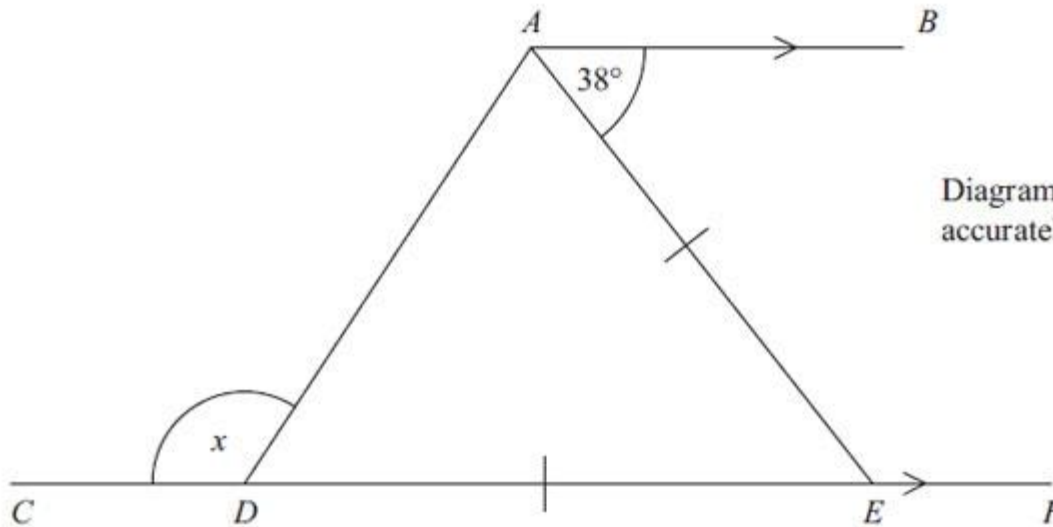
Diagram **NOT**
accurately drav

CDEF is a straight line.
AB is parallel to *CF*.
DE = AE.

Work out the size of the angle marked *x*.
  You must give reasons for your answer.

(Total for Question is 4 marks)

Q5.
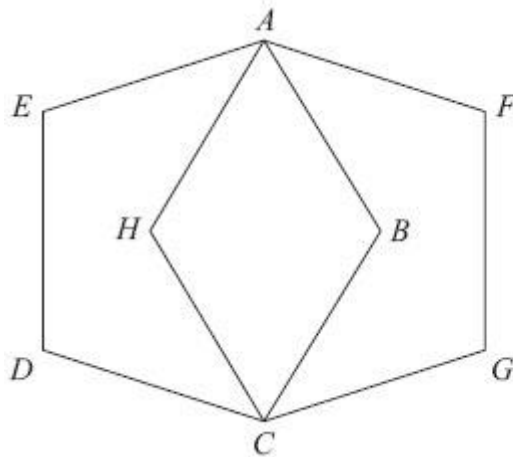
Diagram **NOT**
accurately drawn
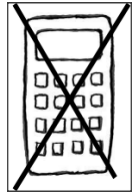
ABCDE and *AFGCH* are regular pentagons.
The two pentagons are the same size.

Work out the size of angle *EAH*.
You must show how you got your answer.

....

(Total for Question is 4 marks)

Q6.

*
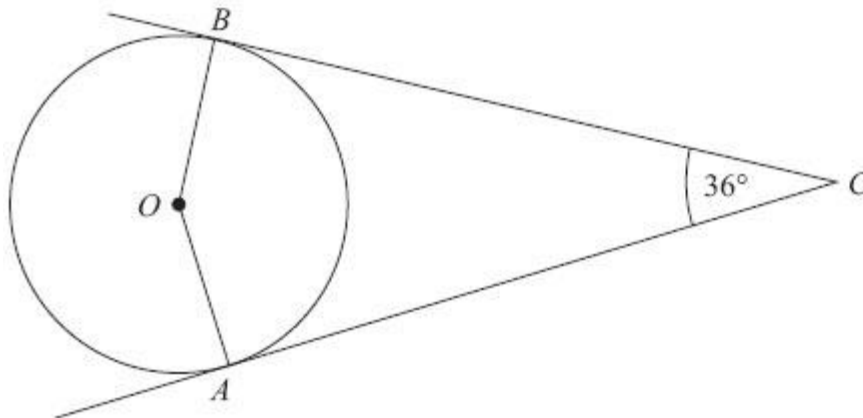
Diagram **NOT** accurately drawn
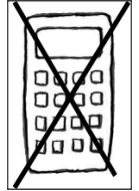
A and *B* are points on the circumference of a circle, centre *O*.
AC and *BC* are tangents to the circle.

Angle *ACB* = 36°.

Find the size of angle *OBA*.
Give reasons for your answer.

(Total for Question is 4 marks)

Q7.*
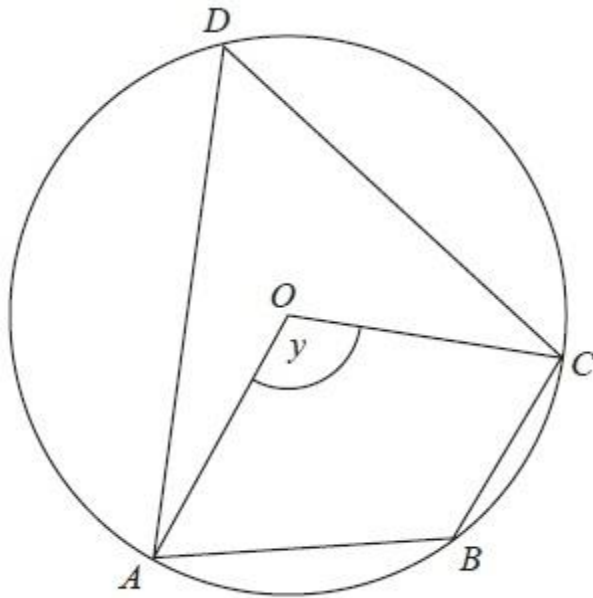
Diagram **NOT**
accurately drawn
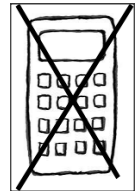
A, B, C and D are points on the circumference of a circle, centre O.

Angle $AOC = y$.

Find the size of angle ABC in terms of y.
Give a reason for each stage of your working.

(Total for Question is 4 marks)

Q8.*
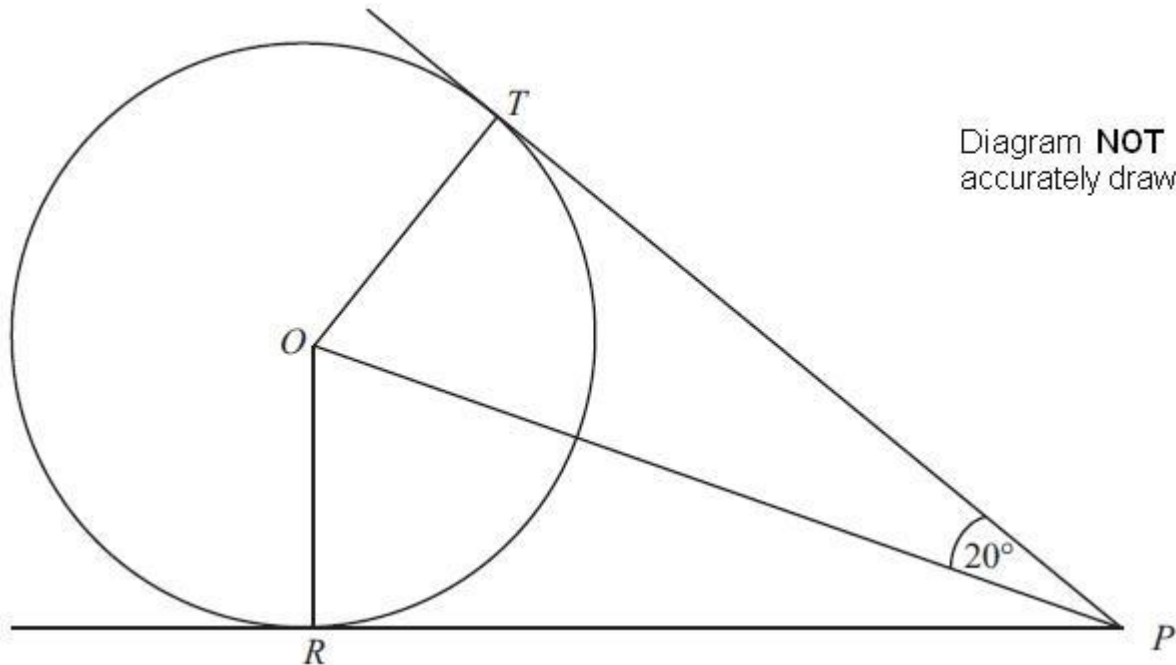
Diagram **NOT** accurately drawn
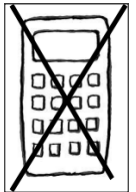
T and R are two points on a circle centre O.

PT and PR are the tangents to the circle from P.

Angle $TPO = 20°$.

Work out the size of angle TOR.
You must give reasons for each stage of your working.

(Total for Question is 4 marks)

Q9.
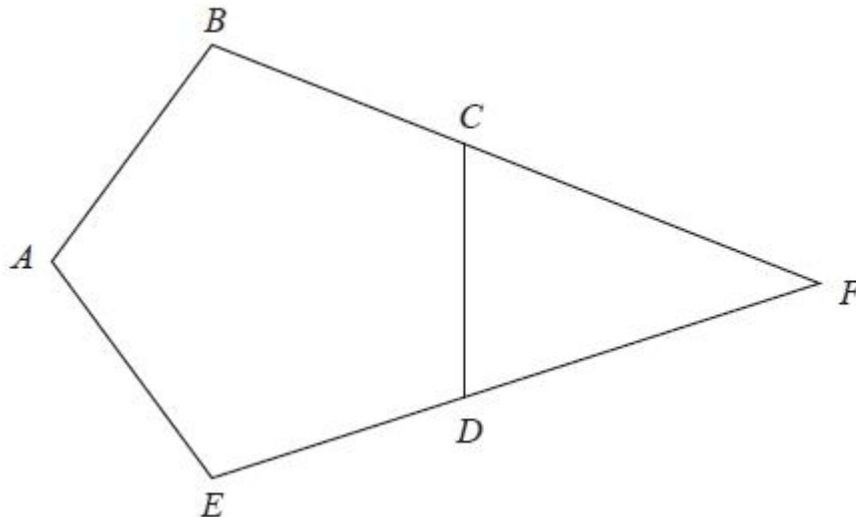
Diagram **NOT**
accurately drawn
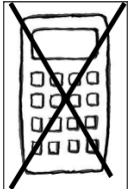
ABCDE is a regular pentagon.
BCF and *EDF* are straight lines.

Work out the size of angle *CFD*.
You must show how you got your answer.

.... °

(Total for Question is 3 marks)

Q10.
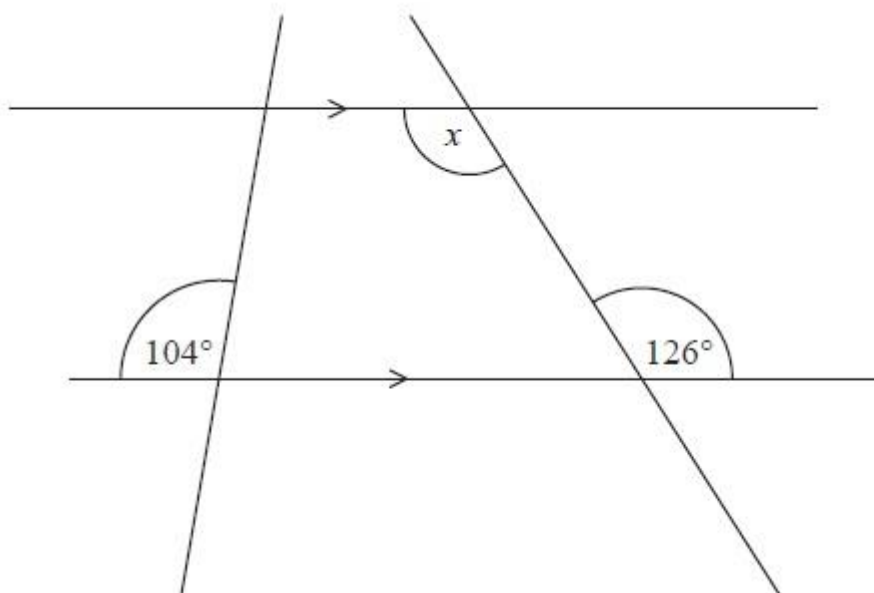
Diagram **NOT** accurately drawn
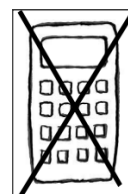
(i) Find the size of the angle marked *x*.

.... °

(ii) Give a reason for your answer.

....

(Total for Question is 2 marks)

Q11.
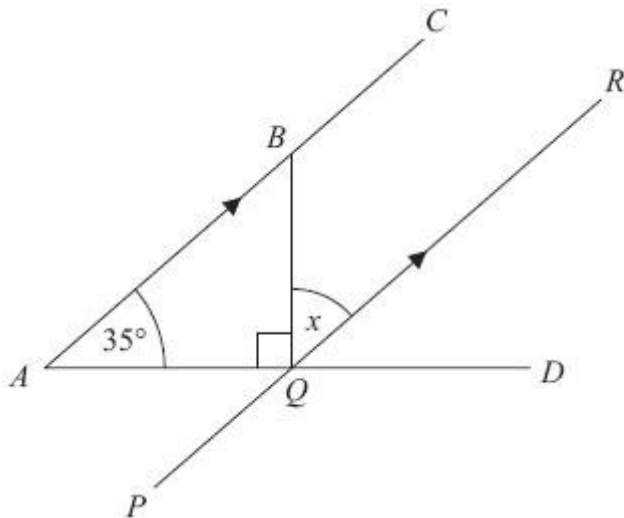
Diagram **NOT**
accurately drawn
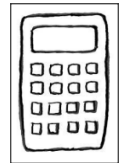
ABC, *PQR* and *AQD* are straight lines.
ABC is parallel to *PQR*.

Angle *BAQ* = 35°
Angle *BQA* = 90°

Work out the size of the angle marked *x*.
Give reasons for each stage of your working.

$x = \dots\dots\dots\dots\dots\dots\dots$ °

(Total for Question is 4 marks)

Q12.

*
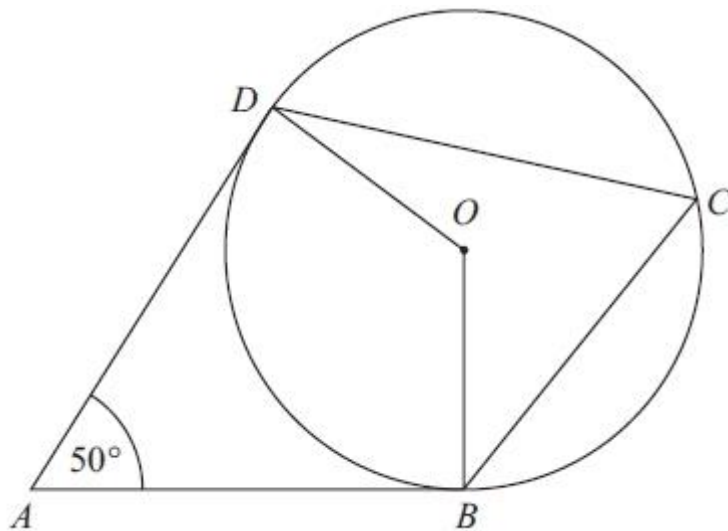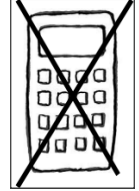
Diagram **NOT** accurately drawn

B, C and D are points on the circumference of a circle, centre O.
AB and AD are tangents to the circle.

Angle $DAB = 50°$

Work out the size of angle BCD.
Give a reason for each stage in your working.

(Total for Question is 4 marks)

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Forming Equations and Proof

Q1.

ABC is a triangle.

Diagram **NOT**
accurately drawn

Angle *ABC* = angle *BCA*.
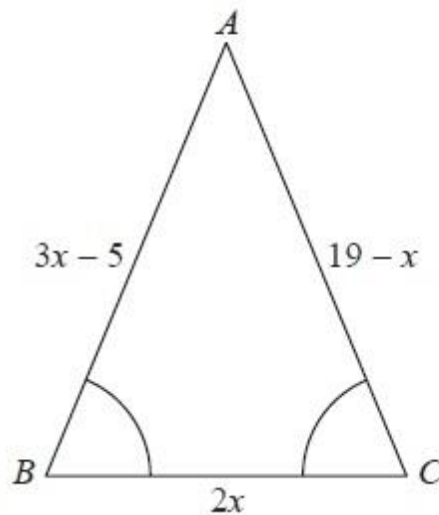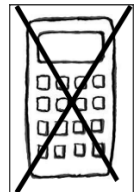
The length of side *AB* is $(3x - 5)$ cm.

The length of side *AC* is $(19 - x)$ cm.

The length of side *BC* is $2x$ cm.

Work out the perimeter of the triangle.

Give your answer as a number of centimetres.

.... cm

(Total for Question is 5 marks)

Q2. Julie is x years old.
Kevin is $x + 3$ years old.
Omar is $2x$ years old.
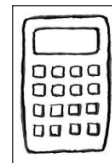
Write an expression, in terms of x, for the mean of their ages.

....

(Total for Question is 2 marks)

Q3. The diagram shows a triangle.

Diagram **NOT** accurately drawn

$3x + 1$

$x - 1$

$3x$
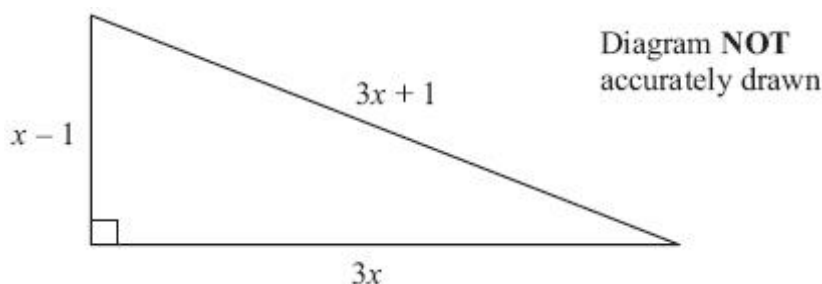
In the diagram, all the measurements are in metres.
The perimeter of the triangle is 56 m.
The area of the triangle is A m^2.
Work out the value of A.

....
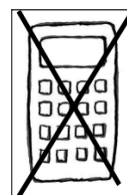
(Total for Question is 4 marks)

Q4.
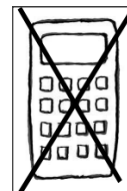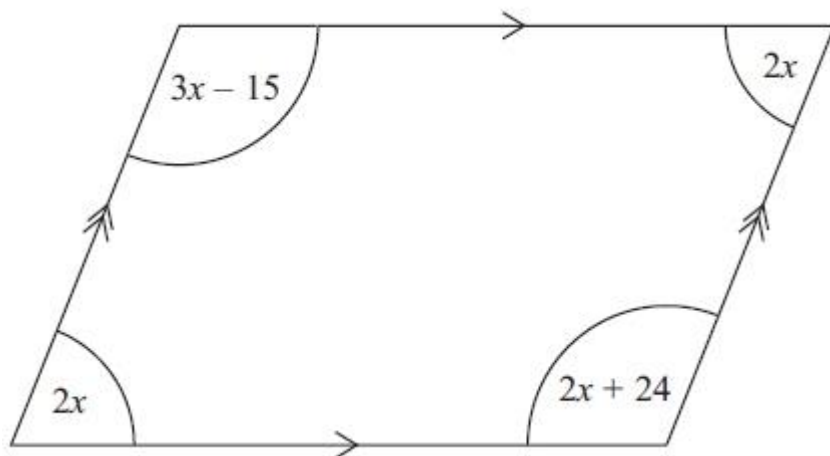
Diagram **NOT** accurately drawn

The diagram shows a parallelogram.
The sizes of the angles, in degrees, are

$2x$
$3x - 15$
$2x$
$2x + 24$

Work out the value of x.

$x = $ . . . .

(Total for Question is 3 marks)

Q5.
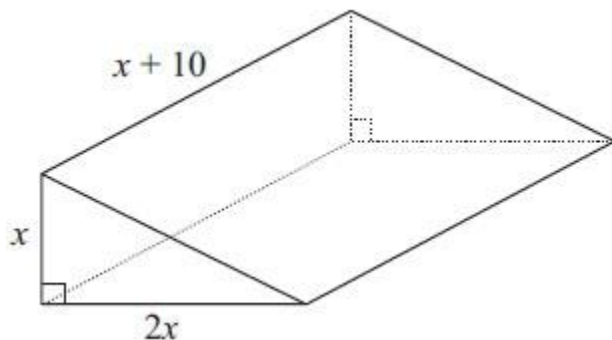
Diagram **NOT**
accurately drawn
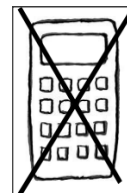
The diagram shows a solid triangular prism.
All the measurements are in centimetres.

The volume of the prism is $V\,\text{cm}^3$.

Find a formula for V in terms of x.
Give your answer in simplified form.

....

(Total for Question is 3 marks)

Q6. Dan has some marbles.
 Ellie has twice as many marbles as Dan.
 Frank has 15 marbles.

Dan, Ellie and Frank have a total of 63 marbles.

How many marbles does Dan have?

....
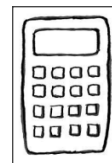
(Total for Question is 3 marks)

Q7. Stephanie is x years old.
Tobi is twice as old as Stephanie.
Ulrika is 3 years younger than Tobi.

The sum of all their ages is 52 years.

(a) Show that $5x - 3 = 52$

(3)

(b) Work out the value of x.

$x =$ ....**(2)**

(Total for Question is 5 marks)

Q8.
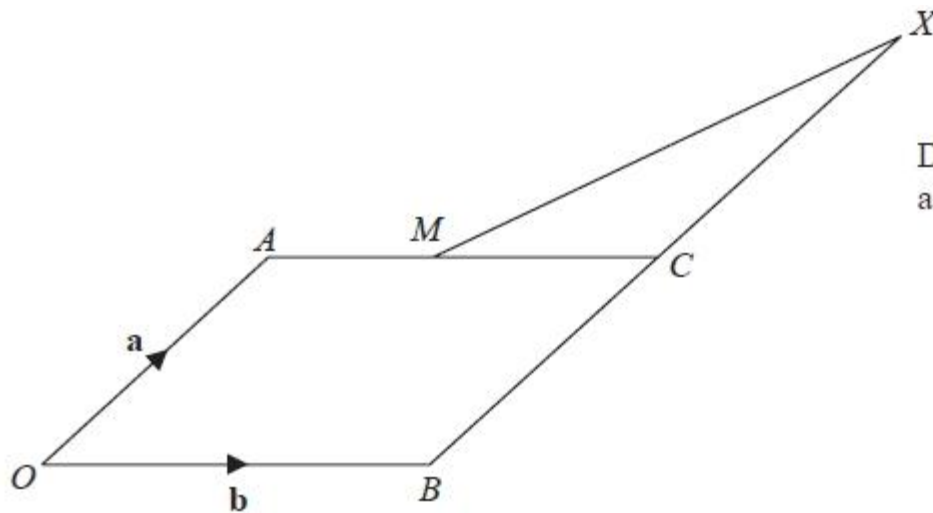
Diagram **NOT** accurately drawn
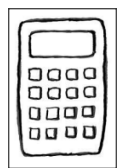
OACB is a parallelogram.

M is the midpoint of *AC*.
C is the midpoint of the straight line *BCX*.

$$\overrightarrow{OA} = \mathbf{a} \qquad \overrightarrow{OB} = \mathbf{b}$$

Prove that *OMX* is a straight line.

(Total for Question is 4 marks)

Q9.

The diagram shows a trapezium.
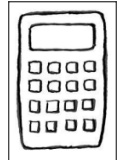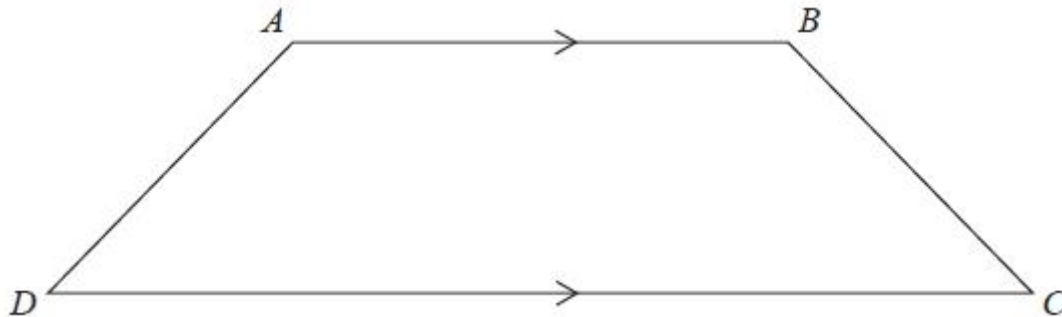
Diagram **NOT** accurately drawn

$AD = x$ cm.
BC is the same length as AD.
AB is twice the length of AD.
DC is 4 cm longer than AB.

The perimeter of the trapezium is 38 cm.

Work out the length of AD.

....cm

(Total for Question is 4 marks)

Q10.

The diagram shows shape **A**.
All the measurements are in centimetres.
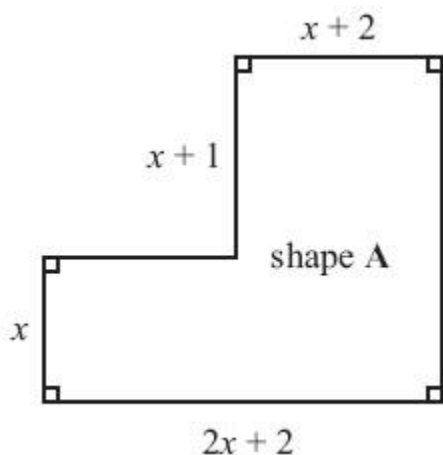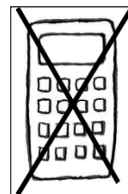
Diagram **NOT** accurately drawn

(a) Find an expression in terms of x for the area, in cm^2, of shape **A**.
You must simplify your answer.

. . . .

(4)

Shape **B** is a rectangle.
Shape **B** has the same area as shape **A**.
Shape **B** has a length of $(3x + 2)$ centimetres.

(b) Find an expression in terms of x for the width, in centimetres, of shape **B.**

. . . .

(1)

(Total for Question is 5 marks)

Q11.

* This shape is a solid prism. The cross section of the prism is a trapezium.
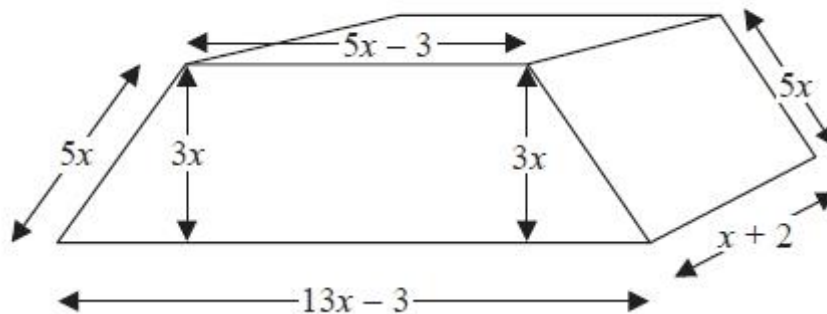
Diagram **NOT**
accurately drawn
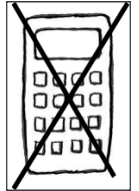
Show that the total surface area of the prism is $82x^2 + 32x - 12$

(Total for Question is 4 marks)
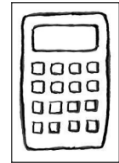
Q12. The diagram shows a trapezium.
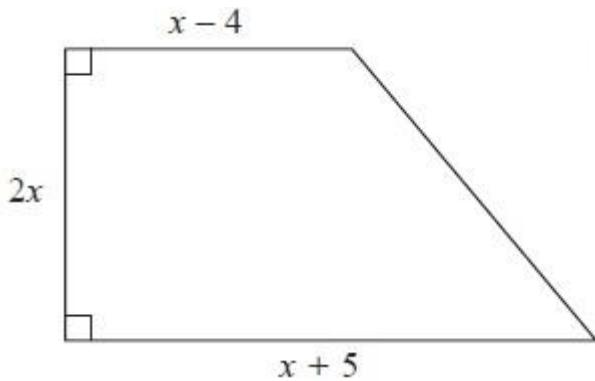
Diagram **NOT** accurately drawn

All the measurements are in centimetres.

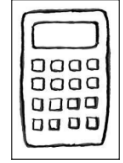The area of the trapezium is 351 cm^2.

(a) Show that $2x^2 + x - 351 = 0$

(2)

(b) Work out the value of x

....(3)

(Total for Question is 5 marks)

Q13.

Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of 8}$$

for all positive integer values of n.

(Total for Question is 3 marks)

Q14.

*
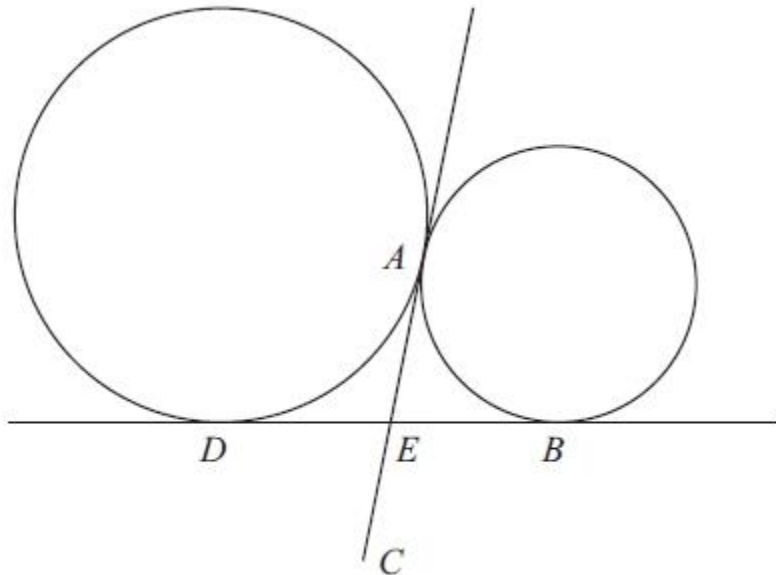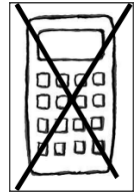
Diagram **NOT** accurately drawn

A and *D* are two points on the circumference of a circle.
A and *B* are two points on the circumference of a smaller circle.
DB and *AC* are tangents to both circles.
E is the intersection of *DB* and *AC*.
E is the midpoint of *AC*.

Prove that *ABCD* is a rectangle.

....

(Total for Question is 4 marks)

Q15.

In the diagram,

ADE is a right-angled triangle, *ABCD* and *AEFG* are squares.

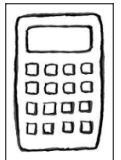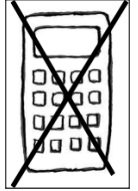Prove that triangle *ABE* is congruent to triangle *ADG*.
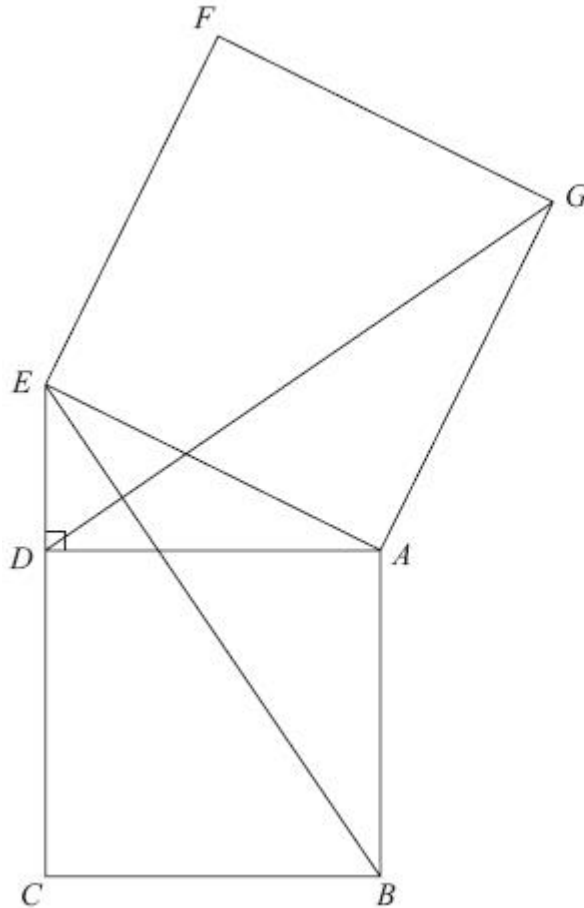
Diagram **NOT** accurately drawn

(Total for Question is 3 marks)

Q16. * Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

(Total for Question is 4 marks)

Q17.*

AOC and *BOD* are diameters of a circle, centre *O*.

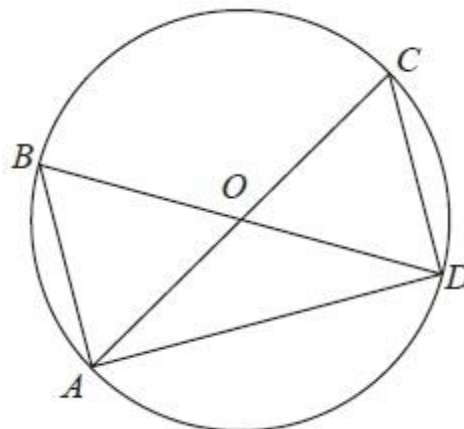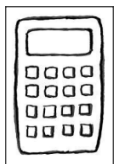Prove that triangle *ABD* and triangle *DCA* are congruent.
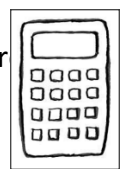

Diagram **NOT** accurately drawn

(Total for Question is 3 marks)

Q18.

(a)   Expand and simplify $(y - 2)(y - 5)$

....
(2)

*(b) Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \text{ is an even number}$$

for all positive integer values of n.
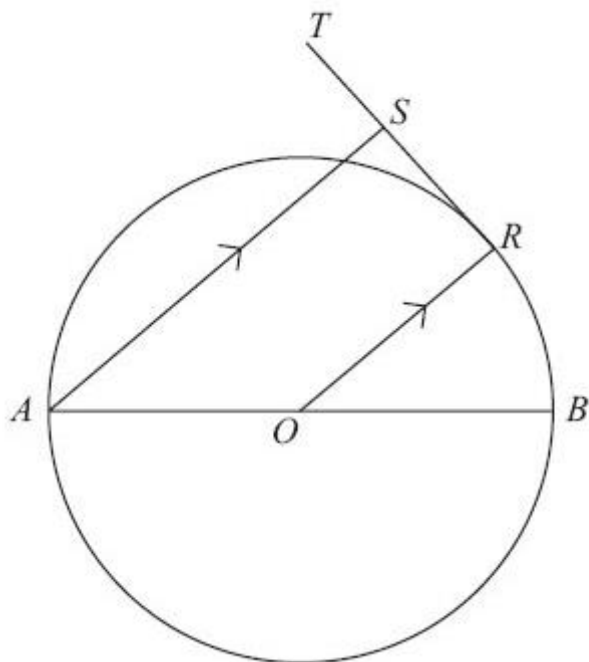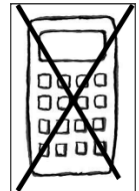
(3)

(Total for Question is 5 marks)

Q19.

*

Diagram **NOT**
accurately drawn

AB is a diameter of a circle centre *O*.
The point *R* is on the circumference of the circle.
RST is the tangent to the circle at *R*.
AS is parallel to *OR*.

Prove that the size of angle *AST* is 90°.

(Total for Question is 3 marks)