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Applications of Mathematics

Exam Revision Booklet

SQA Questions by Topic

Contents

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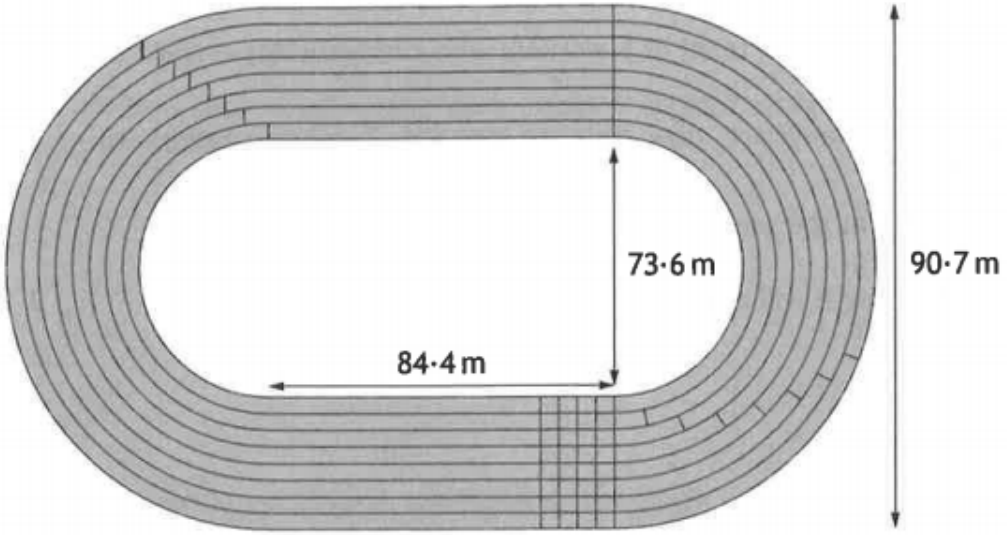
Area

Applications of Mathematics Exam Questions

(1)

A sports ground is in the shape of a rectangle and two semi-circles as shown.



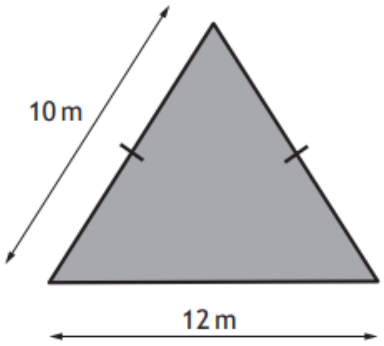
The running track is shaded in the diagram.

(a) Calculate the area of the running track.

Source: 2019 P2 Q10a N5 Applications of Mathematics

(2)

A lawn is to be created in the shape of an isosceles triangle with dimensions as shown below.



Calculate the area of the lawn.

Source: 2018 P1 Q13 N5 Applications of Mathematics

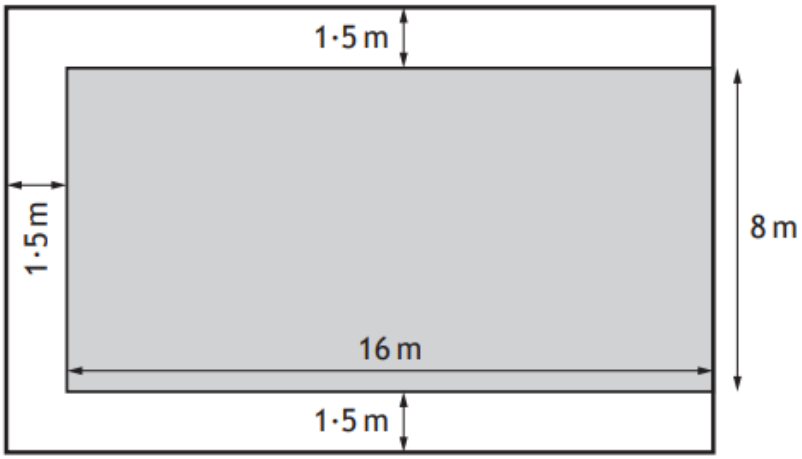
(3)

A new hotel is being planned in Benidorm.

The pool will have a walkway around three sides.

The walkway will be 1·5 m wide.

This is shown in the diagram.

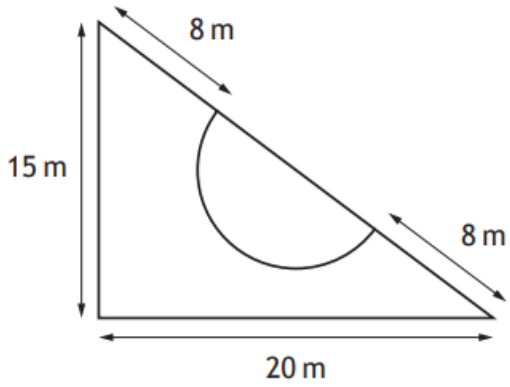


(a) Calculate the total area of the walkway.

Source: 2018 P2 Q11 N5 Applications of Mathematics

(4)

A garden in the shape of a **right-angled triangle** has a semi-circular pond on the hypotenuse as shown below.



(a) Calculate the diameter of the pond.

(b) The garden, excluding the pond, is to be covered with stone chips.
Calculate the area to be covered with stone chips.

(c) The stone chips come in 25 kg bags costing £2·59 each.
1000 kg of chips covers an area of 20 m^2.
Calculate the cost of the stone chips for the garden.

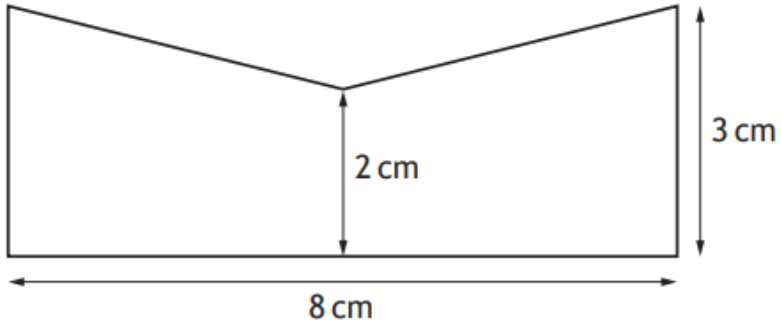
Source: Specimen P2 Q9 N5 Applications of Mathematics

(5)

Aneesa makes enamelled badges.

Each badge is made from metal.

The shape of the badge is shown below.



(a) Calculate the area of the front of each badge.

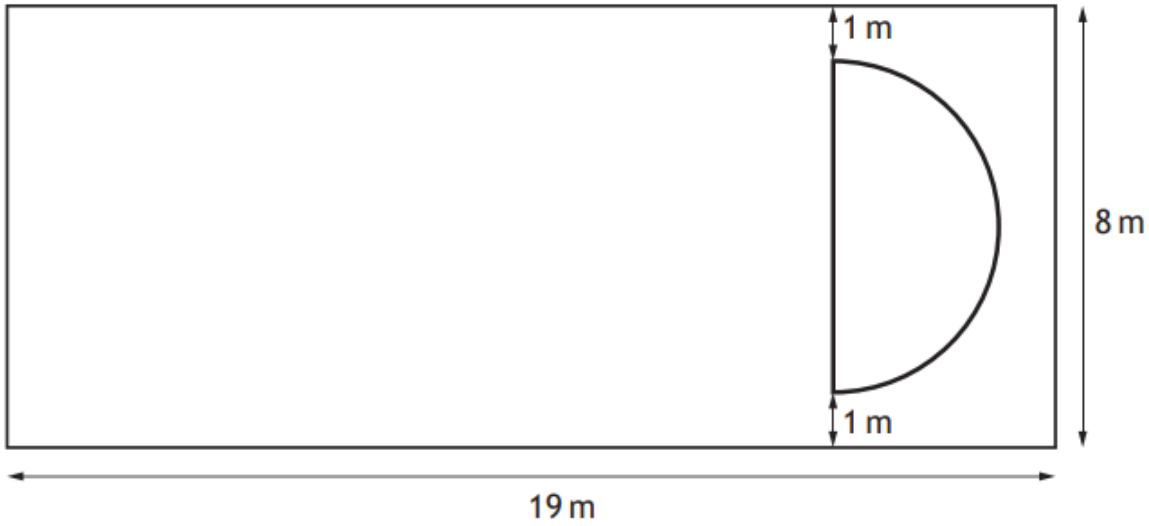
Source: 2017 P1 Q7a N5 Lifeskills

(6)

A new playground is planned for Aberbeath Primary School.

It will be a rectangle measuring 19 metres by 8 metres.

A semi-circular sandpit will be built within the playground as shown



The playground, excluding the sandpit, is to be covered in rubber tiles.

Calculate the area to be covered by the rubber tiles.

Take $\pi = 3{\cdot}14$.

Give your answer to **3 significant figures.**

Source: 2016 P1 Q8 N5 Lifeskills

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Compound Interest

Applications of Mathematics Exam Questions

(1)

Sam buys a rare stamp for his stamp collection at an auction. He buys the stamp for £920.

The stamp

- increased in value by 7% in each of the first 2 years
- decreased in value by 4% in the third year.

Calculate the value of the stamp after these 3 years.

Give your answer **to 3 significant figures.**

Source: 2019 P2 Q1 N5 Applications of Mathematics

(2)

Jack bought a car 3 years ago costing £1400.

The car has decreased in value by 13% each year.

(a) Calculate the current value of the car.

Give your answer to **2 significant figures.**

Jack sells his car for £950.

(b) Calculate his loss as a percentage of the **original price.**

Source: 2018 P2 Q1 N5 Applications of Mathematics

(3)	Erin bought a yacht costing £780 000 in February 2013. For the next three years the value of the yacht decreased by 4·1% per annum. Calculate the value of the yacht in February 2016. Give your answer to **3 significant figures.**

Source: Specimen P2 Q1 N5 Applications of Mathematics

(4)	Saraish bought her house in May 2009 for £130 000. In the first two years the value of the house increased by 5% per annum. For the next three years the value of the house decreased by 2% per annum. (a) What is the value of the house in May 2014? **Give your answer to the nearest thousand pounds.** (b) House prices have risen on average by 4·5% over this five year period. Has the value of Saraish's house risen in line with this average? **Give a reason for your answer.**

Source: 2014 P2 Q4 N5 Lifeskills

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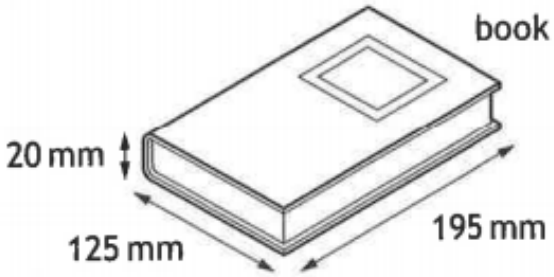
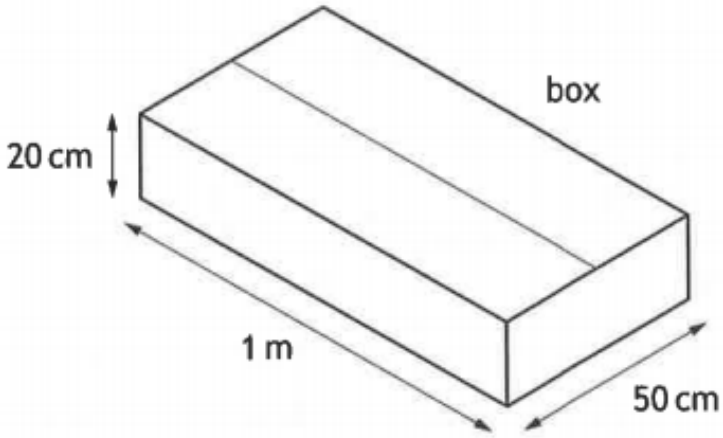
Container Packing

Applications of Mathematics Exam Questions

(1) The books are to be packed in boxes for transporting to the bookshops.

The dimensions of the book and the internal dimensions of the box are shown in the diagrams.





The books need to be laid with the front cover facing upwards in the boxes.

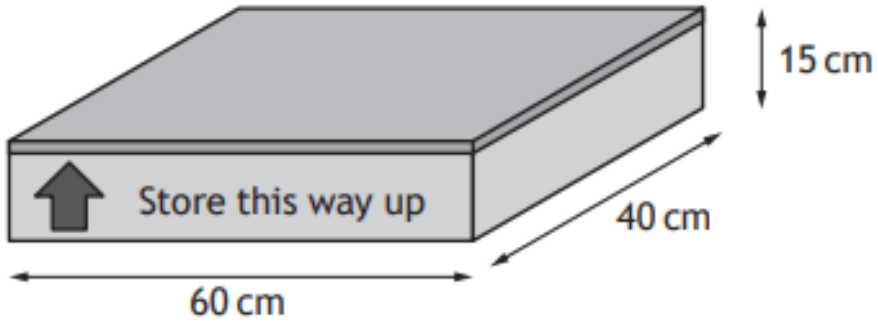
They must all be aligned in the same direction.

(c) Calculate the maximum number of books that can be packed into each box.

Source: 2019 P2 Q9c N5 Applications of Mathematics

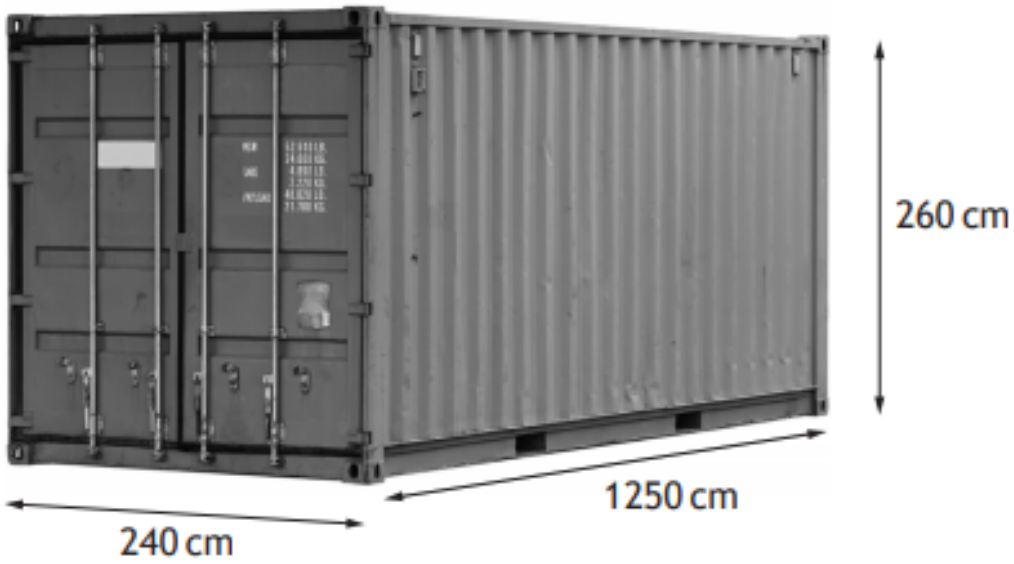
(2) The tins are packed in boxes.

Each box has dimensions 60 cm × 40 cm × 15 cm as shown below.



The boxes must be packed into containers for shipping to Canada.

The container has the internal dimensions shown below.

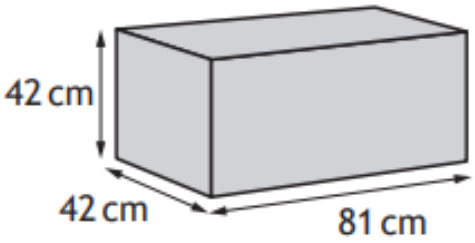


All the boxes must be aligned in the same direction.

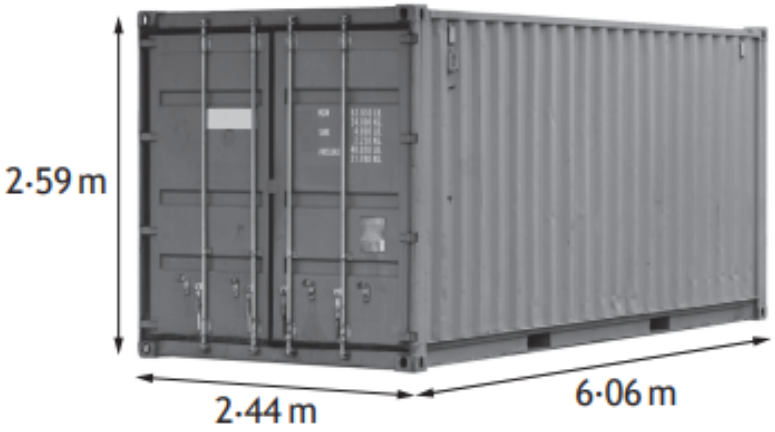
(c) Calculate the maximum number of boxes that will fit in the container.

Source: 2018 P2 Q9c N5 Applications of Mathematics

(3) She puts the bags into boxes. The boxes have the dimensions shown below.



Donna exports her handbags to the USA in a container. The container has the internal dimensions shown below.



All the boxes must be aligned in the same direction.

(a) Calculate the maximum number of boxes that can fit in the container.
Use your working to justify your answer.

Source: Specimen P2 Q5 N5 Applications of Mathematics

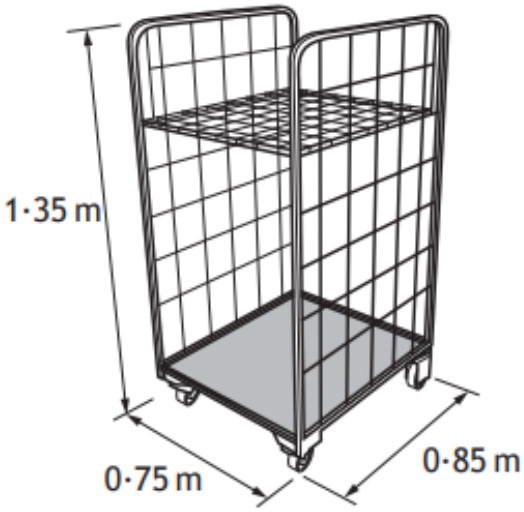
(4) 1. Russell is a lorry driver for a mail delivery company.

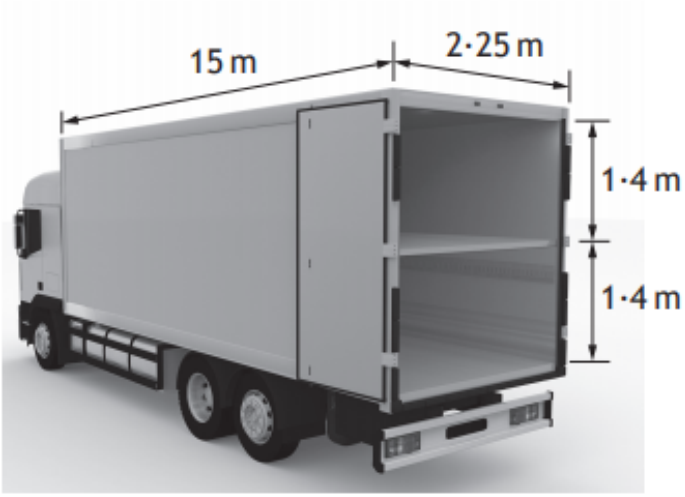
The mail is packed into cages which are then loaded on to the lorry.

His lorry has two levels for fitting cages.

Each cage has wheels on the bottom and must always be **loaded upright**.

The dimensions of the cage and the internal dimensions of the back of the lorry are shown in the diagrams.





(a) What is the maximum number of cages that can be loaded into the back of the lorry?

Source: 2017 P2 Q6 N5 Lifeskills

(5)

Freddie and Kamal work in a warehouse stacking shelves.

A section of the warehouse has 5 shelves; each shelf is 10 metres in length.

The shelves are currently stocked as shown below.

Shelf 1	Box A (7 m)
Shelf 2	Box B (5 m)
Shelf 3	Box C (6 m) Box D (3 m)
Shelf 4	Box E (4 m) Box F (3 m)
Shelf 5	Box G (2 m)

A new delivery of Box H (6 m), Box I (5 m), Box J (3 m), Box K (4 m), Box L (1 m) arrives to be stored in this section of the warehouse.

These new boxes need to be stored on different shelves from the existing stock.

The existing stock can be re-arranged to create space for the new delivery.

By writing the letters A to L in the diagram below, show how Freddie and Kamal can fit **all** the boxes onto the shelves.

(An additional diagram, if required can be found on *Page eleven)*

Shelf 1	
Shelf 2	
Shelf 3	
Shelf 4	
Shelf 5	

Source: 2015 P1 Q3 N5 Lifeskills

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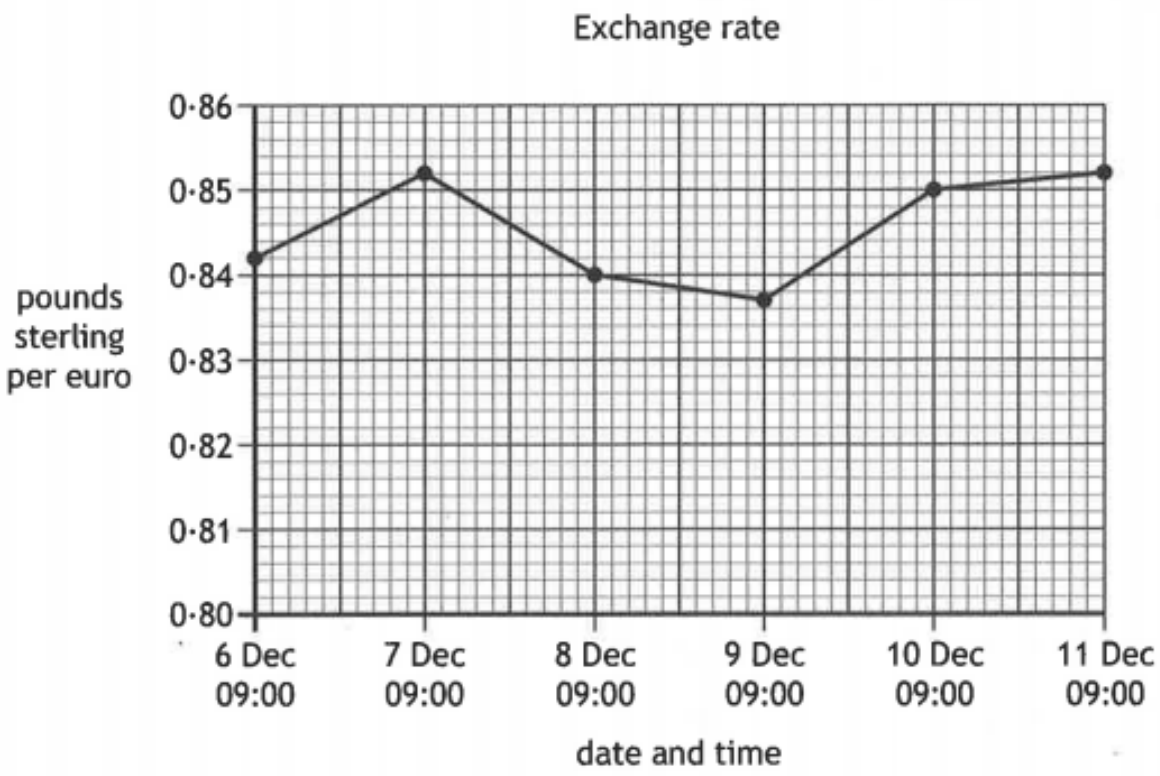
Foreign Exchange

Applications of Mathematics Exam Questions

(1) The graph shows how many pounds sterling could be bought for 1 euro during December 2017.



Daniel changed 250 euros to pounds sterling at 09:00 on 7 December.

(a) Calculate how many pounds he received.

Daniel was working in France.
He bought a laptop costing 400 euros.
He calculated this was equivalent to £334·80.

(b) Use the graph to find the date that Daniel bought the laptop.
Use your working to justify your answer.

Source: 2019 P2 Q3 N5 Applications of Mathematics

(2)

Gavin is going to South America to do charity work.

He changes £750 into Bolivian boliviano.

Currency exchange	
Pounds sterling (£)	**Other currencies**
1	20 Argentine peso
1	9 Bolivian boliviano
1	4 Brazilian real

(a) How many Bolivian boliviano will he receive?

He spends 2700 Bolivian boliviano.

He changes the remaining Bolivian boliviano into Argentine peso.

(b) How many Argentine peso will he receive?

Source: 2018 P1 Q7 N5 Applications of Mathematics

(3)

Jack is going to a festival in the Czech Republic from his home in Glasgow.

His mum orders the tickets costing 1500 Czech Koruna.

His mum lives in Poland so he must pay her back in Polish Zloty.

Rates of exchange	
Pounds Sterling (£)	**Other Currencies**
1	30·00 Czech Koruna
1	4·96 Polish Zloty

Calculate how many Polish Zloty he must give to his mum.

Source: Specimen P1 Q7 N5 Applications of Mathematics

(4)

Mr and Mrs Sibbald took £2400 spending money.

They exchanged 55% of their money into euro, to spend ashore.

The exchange rate was **£1 = 1·15 euro.**

By the end of the cruise they had spent 1379 euro.

(c) Calculate how many euro they had left at the end of the cruise.

Source: 2017 P2 Q5c N5 Lifeskills

(5)

Elaine goes on a 5 day long business trip to Oslo in Norway.

She changes £750 to Norwegian kroner for the trip.

Rates of exchange	
Pounds Sterling (£)	**Other Currencies**
1	NOK 8·00 (Norwegian kroner)
1	€1·20 (euros)

(a) How many Norwegian kroner will Elaine receive?

(b) Elaine spends NOK 520 each day she is in Norway.

Her company extends her trip by sending her to Munich in Germany for a further 3 days.

If she changes all her remaining kroner to euros, how many euros will she receive?

She spends €135 each day she is in Munich.

How much money does she have left at the end of her trip?

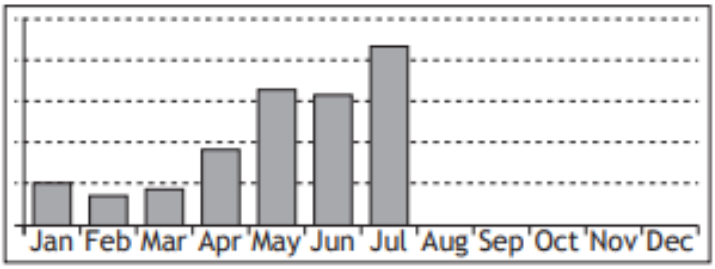
Give your answer in pounds sterling.

Source: 2014 P1 Q8 N5 Lifeskills

(6) The table below shows the average monthly exchange rates for British pounds (GBP) to euros (EUR) between January and July 2012.

Foreign Exchange Conversion Data

1 GBP to Euros



Average Monthly Rates

January	1·2018 EUR
February	1·1949 EUR
March	1·1984 EUR
April	1·2166 EUR
May	1·2435 EUR
June	1·2410 EUR
July	1·2637 EUR

Using the information above, how many more euros would I have received if I changed £500 when the exchange rate was at its highest in comparison to its lowest?

Show all your working.

Source: Specimen P1 Q6 N5 Lifeskills

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Hire Purchase

Applications of Mathematics Exam Questions

(1)

Paul is buying a new TV.

It is advertised at a price of £825.

He decides to use a payment plan to buy the TV.

The total cost of the TV using the payment plan is £845·80.

The payments are calculated as follows

- deposit of $\frac{1}{5}$ of **advertised** price
- 8 equal monthly instalments
- final payment of £100.

(b) Calculate the monthly instalment.

Source: 2019 P1 Q2b N5 Applications of Mathematics

(2)

Scott cannot afford to pay for the bike all at once.

The cash price of the complete bike from EP bikes is £2991·00.

He chooses to buy the complete bike from EP bikes, as they are the only retailer offering a finance package.

The finance package consists of:

- a deposit of 15% of the cash price
- 36 payments of £76·50.

(b) Calculate how much more this finance package will cost compared to the **minimum** total cost.

Source: 2018 P2 Q8b N5 Applications of Mathematics

(3)

Kyle is buying a new three piece suite.

It is advertised at a price of £1260.

Kyle can't afford to pay this all at once.

He decides to use a payment plan to buy the three piece suite.

The **total price** of the payment plan is **12% more** than the advertised price.

The payments are calculated as follows:

- deposit of $\frac{1}{3}$ of the total price
- 8 equal monthly instalments
- final payment of £200.

How much will each monthly instalment be?

Source: 2017 P2 Q3 N5 Lifeskills

(4) Novak is going to buy a new computer system. He researches online to find the prices from different retailers.

Retailer	Keyboard	Monitor	Computer Tower	Mouse	Printer
Easy Comp	50	130	130	15	95
ABC	45	135	140	20	75
Compact	30	125	180	25	120
Hardy's	70	130	165	15	125
Tonda	35	115	150	20	80
Disme	40	120	180	10	105

All prices are in £s

(a) Novak needs to buy one of each item. He is happy to buy these from different retailers.

What is the minimum total cost for his new computer system?

(b) Novak cannot afford to pay for his computer system all at once.

Disme can provide a finance package to buy the complete computer system.

The deposit is 10% of the cash price, followed by 12 payments of £40.

He chooses to buy the complete computer system from Disme using their finance package.

How much more than the minimum total will this cost him?

Source: 2015 P1 Q9 N5 Lifeskills

(5) Orla and Mark want a new kitchen.

They investigate various options to borrow the money they need and to pay it back **in one year**. The following information is what they found out.

The best rates for fixed amounts are from EasyBank as shown in the table below.

Loan Amount	£2500		£5000		£10 000	
Interest per year	17%		14·6%		12·26%	
Repayment terms over 1 year	Monthly	Total	Monthly	Total	Monthly	Total
	£243·75	**A**	£477·50	£5730	**B**	£11 226

(a) What is the total repayment **(A)** on a loan of £2500 from EasyBank?

(b) What is the monthly repayment **(B)** on a loan of £10 000 from EasyBank?

(c) Calculate the difference in total repayments between Orla and Mark taking out a loan of £5000 each, compared with a single loan of £10 000 from EasyBank.

(d) Orla and Mark also consider using a home improvement loan from a finance company to buy a kitchen. The finance company charges 27·5% simple interest on the loan amount. Calculate the total amount to be repaid for a loan of £5000.

Source: Specimen P2 Q4 N5 Lifeskills

(e) Calculate the difference between the total amount to be repaid on a £5000 loan from EasyBank, compared with the total amount to be repaid using the home improvement loan.

(f) Orla and Mark also consider using a store card to buy a kitchen. The kitchen costs £5000. The store card offers a 10% discount on the price of the kitchen. It then charges simple interest of 19·9% on the balance.

Compare the option of using the store card with the option of taking out a loan of £5000 from EasyBank for a year.

Would the store card be a good option? Use your calculations to justify your answer.

Source: Specimen P2 Q4 N5 Lifeskills

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National Insurance Calculations

Applications of Mathematics Exam Questions

(1) John works for the resurfacing company.

His annual salary is £17 108.

National Insurance is calculated on a person's salary **before** deductions such as pension contributions.

National Insurance rates	
Up to £8424	0%
From £8424 to £46 384	12%
Over £46 384	2%

(c) (i) Calculate John's annual National Insurance payment.

John pays 7% of his annual salary into his pension.

John's annual income tax is £1051·60.

(ii) Calculate John's annual net pay.

Source: 2019 P2 Q10 N5 Applications of Mathematics

(2)

Fiona is a vet.

She has started a new job.

Her new salary is £42 000.

National Insurance is calculated on a person's salary **before** deductions such as pension contributions.

National Insurance rates	
Up to £8164	0%
From £8164 to £45 032	12%
Over £45 032	2%

(a) (i) Calculate Fiona's annual National Insurance payment.

Fiona's annual income tax payment is £5427·96.

She pays an annual contribution of £3360 into her pension.

Fiona is paid in 12 equal monthly payments.

(ii) Calculate Fiona's monthly net pay.

Source: 2018 P2 Q10 N5 Applications of Mathematics

(3)

Graham earns £49 920 per annum.

National Insurance is calculated on a person's salary **before** deductions such as pension contributions.

National Insurance Rates	
Up to £8060	0%
From £8060 to £42 380	12%
Over £42 380	2%

(a) Calculate Graham's annual National Insurance payment.

(b) Graham pays 9% of his annual salary into his pension.

Graham's annual income tax is £6870·04.

Graham is paid in 12 monthly payments.

Calculate Graham's monthly net pay.

Source: Specimen P2 Q6 N5 Applications of Mathematics

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Shares

Applications of Mathematics Exam Questions

(1)	Denisa bought 375 shares for £4·50 per share. She later sold them all for £5·20 per share. She had to pay commission of 2·7% of the total selling price. Calculate her total profit.

Source: 2019 P2 Q6 N5 Applications of Mathematics

(2)	Mhairi bought 200 shares for £700. She decides to sell them, but the share price has dropped to £2·75 per share. She also has to pay a fee of 2½% of her selling price when she sells her shares. Calculate the loss that she has made.

Source: Specimen P1 Q11 N5 Applications of Mathematics

(3)

Asif bought 8000 shares in a local company in April 2013.

Each share cost him 73 pence.

The value of the shares

- decreased by 3% in the first year then,
- increased by 4·2% in each of the next **two years.**

(a) How much were Asif's shares worth in total in April 2016?

In April 2017 Asif's shares were worth £6560 in total.

He decided to sell 5000 of his shares.

He was charged £12·95 commission on his sale.

(b) How much did he receive from the sale of the shares?

Source: 2017 P2 Q2 N5 Lifeskills

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Wages & Overtime

Applications of Mathematics Exam Questions

(1) Paul usually works 30 hours each week.

He is paid time and a half for any **additional** hours that he works.

His basic rate of pay is £12·50.

Last week, he worked a total of 37 hours.

(a) Calculate his gross pay for last week.

Paul is buying a new TV.

It is advertised at a price of £825.

He decides to use a payment plan to buy the TV.

The total cost of the TV using the payment plan is £845·80.

The payments are calculated as follows

- deposit of $\frac{1}{5}$ of **advertised** price
- 8 equal monthly instalments
- final payment of £100.

(b) Calculate the monthly instalment.

Source: 2019 P1 Q2 N5 Applications of Mathematics

(2)

Mo is an electrician.

The table below shows the hours that Mo worked last week.

Monday	09:00 to 12:30	13:30 to 18:00	
Tuesday	09:00 to 12:30	13:30 to 18:00	
Wednesday	09:00 to 12:30	13:30 to 18:00	18:30 to 21:30
Thursday	09:00 to 12:30	13:30 to 18:00	18:30 to 21:30
Friday	09:00 to 12:30	13:30 to 18:00	

His basic hourly rate is £15·60.

Hours worked between 6 pm and 7 am are paid at time and a half.

Calculate his gross pay for last week.

Source: Specimen P1 Q6 N5 Applications of Mathematics

(3)

Anna works as a sales person for a computer company.

She is paid a basic monthly salary of £2450 plus commission of 2·5% on her monthly sales over £3000.

(a) Calculate Anna's gross salary for April when her sales totalled £9000.

In her April payslip, she has the following deductions:

- Income Tax £334·67
- National Insurance £230·20
- Pension £164·74

(b) Calculate her net salary for April.

Source: 2017 P1 Q2 N5 Lifeskills

(4)

Russell works night shift.

- He works from 2300 until 0900 the next day.
- His rate of pay is £14·40 per hour.
- He gets paid time and a half between 2200 and 0730.
- He works 5 shifts each week.

(b) Calculate his weekly gross pay.

Source: 2017 P2 Q6 N5 Lifeskills

(5)

Seonaid is saving up to buy a tablet computer costing £388.

She earns £7·30 per hour and works for 30 hours each week.

Seonaid is paid at the end of each week.

She pays £5·32 in Income Tax and £7·68 in National Insurance each week.

Her living expenses are £86 per week.

Seonaid saves **half** of the money that she has left each week towards the tablet computer.

How many weeks will it take her to save up enough money to buy the computer?

Source: 2016 P1 Q4 N5 Lifeskills

(6) Grace works for a company selling fitted kitchens.

She is paid a basic monthly salary of £500.

She also receives 5% commission on all her sales **above** £8000.

In January Grace sells £23 000 of goods.

Her monthly deductions are 12% of her gross income.

Grace writes down her budget for the month.

Rent	£245
Bills	£198
Food	£164
Entertaining	£75

Grace saves any surplus.

(a) Calculate Grace's **net** pay for January.

(b) (i) Calculate the surplus that Grace will have for January.

(ii) Grace's rent increases to £260 per month.
Calculate the percentage increase in her rent.

(c) To buy a car Grace needs to borrow £4500.
She wants to repay the loan **as soon as possible**.
She investigates the cost of the loan from five different lenders.
The table shows the repayments for a £4500 loan.

Source: 2016 P2 Q7 N5 Lifeskills

Lender	12 months	24 months	36 months
Tasko	£413·86	£215·07	£150·60
Bank of Shapes	£418·54	£219·31	£157·42
TMS	£458·83	£260·59	£197·74
Premier Bank	£422·46	£214·74	£159·21
Free Bank	£432·99	£234·15	£170·09

Grace assumes that she will earn the same commission each month.

Calculate her **new monthly surplus** and determine from which lender she should take her loan, and over how many months.

Source: 2016 P2 Q7 N5 Lifeskills

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Fractions

Applications of Mathematics Exam Questions

(1)	Write the following values in order from greatest to least. $0{\cdot}388,\ \frac{3}{8},\ 38{\cdot}38\%,\ 0{\cdot}39$ Justify your answer.
Source: 2019 P1 Q6 N5 Applications of Mathematics	

(2)	A basic cookie dough mix requires butter, sugar, flour and chocolate chips. • $\frac{1}{6}$ of the mix is butter • $\frac{1}{3}$ of the mix is sugar • $\frac{1}{4}$ of the mix is chocolate chips • The rest of the mix is flour Calculate the fraction of the mix that is flour.
Source: 2019 P1 Q10 N5 Applications of Mathematics	

(3)

Guests at a wedding were asked to choose their main course.

- $\frac{3}{7}$ of the guests chose chicken
- $\frac{1}{3}$ of the guests chose beef
- the remaining guests chose the vegetarian option.

Calculate the fraction of guests that chose the vegetarian option.

Source: 2018 P1 Q5 N5 Applications of Mathematics

(4)

A class of pupils were asked about how they travelled to school on a particular day.

- $\frac{1}{6}$ of the pupils were driven to school in a car.
- $\frac{2}{5}$ of the pupils took the bus.
- The rest of the pupils walked to school.

Calculate the fraction of pupils who walked to school.

Source: Specimen P1 Q8 N5 Applications of Mathematics

(5)

Carol knows that she can travel 280 miles on a full tank of fuel. She is making a trip of 110 miles.

The diagram below shows the car's fuel gauge

Does she have enough fuel to make the journey?

Show working to justify your answer.

Source: 2015 P1 Q1 N5 Lifeskills

(6)

Dave and Elaine each have the same monthly data allowance on their mobile phone contract.

Dave has used $\frac{4}{7}$ of his monthly data allowance.

Elaine has used $\frac{5}{8}$ of her monthly data allowance.

Who has used the most data?

Give a reason for your answer.

Source: Specimen P1 Q1 N5 Lifeskills

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Gradients

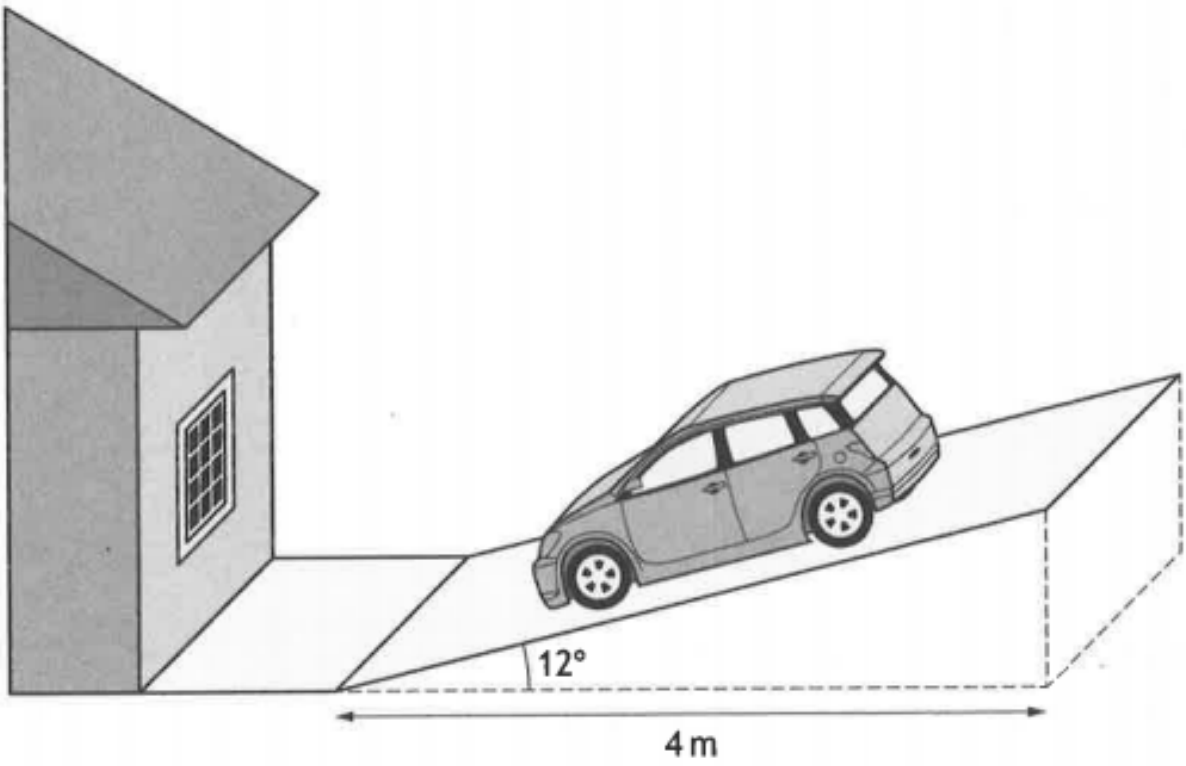
Applications of Mathematics Exam Questions

(1)

Sarah's driveway is sloped as shown in the diagram below.

The cross-section of the driveway is in the shape of a right-angled triangle.

The base is 4 metres long and makes an angle of 12° with the driveway as shown in the diagram below.



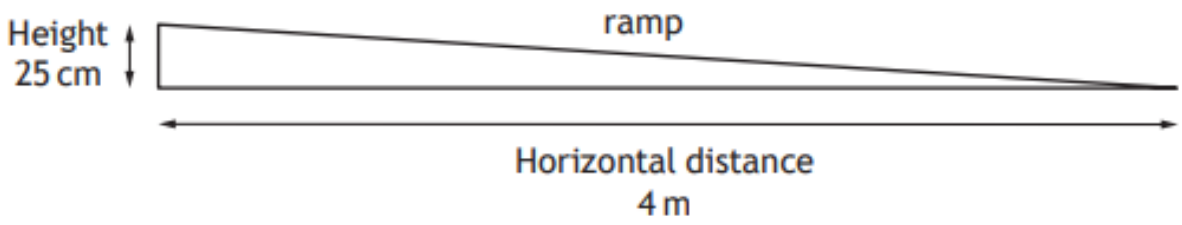
(a) Construct a scale drawing of the cross-section of the driveway.
Use a scale of 1 cm : 0·5 m.

(b) Use your scale drawing to calculate the gradient of the driveway.

Source: 2019 P1 Q8 N5 Applications of Mathematics

(2)

A ramp to allow wheelchair access to a school has the dimensions shown below.



The maximum gradient allowed for a ramp with a horizontal distance of 4 m is $\frac{1}{14}$.

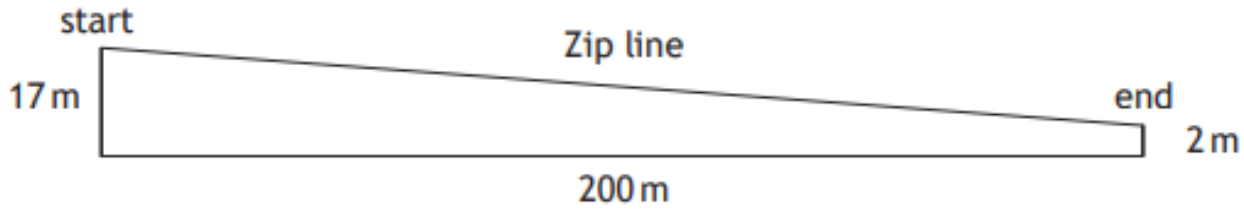
Does the gradient of this ramp meet the regulations?

Use your working to justify your answer.

Source: 2018 P1 Q15 N5 Applications of Mathematics

(3)

The diagram shows a planned zip line for a play park.



It is recommended that the average gradient of the zip line should be between 0·06 and 0·08 to be safe.

Does the planned zip line meet these safety recommendations?

Use your working to justify your answer.

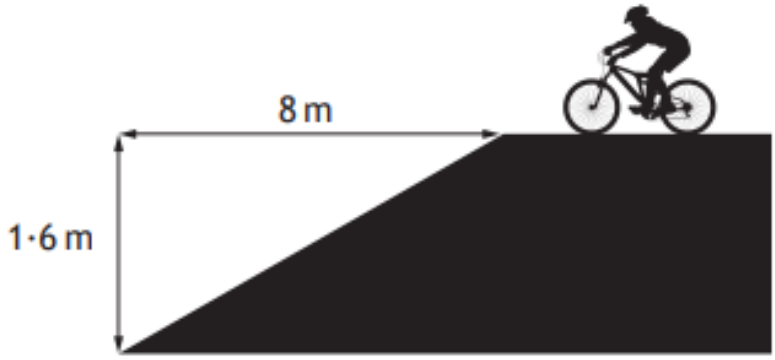
Source: Specimen P1 Q12 N5 Applications of Mathematics

(4) When classifying mountain bike trails, the gradient of the steepest section is taken into account.

Colour Grade (Difficulty)	Maximum Gradient
Green (Easy)	$\frac{1}{10}$
Blue (Intermediate)	$\frac{3}{20}$
Red (Advanced)	$\frac{1}{4}$
Black (Severe)	$\frac{1}{2}$

A new trail has been built at a mountain bike centre.

The steepest section of the new trail is shown below.



Can this be classified as a blue trail?

Use your working to justify your answer.

Source: 2017 P1 Q4 N5 Lifeskills

(5)

Bradley decides to cycle from Kilsyth to the highest point of Tak-Ma-Doon Road.

- The horizontal distance between these two places is 4·5 kilometres.
- Kilsyth is 70 metres above sea level.
- The highest point of Tak-Ma-Doon Road is 320 metres above sea level.

(a) Calculate the average gradient between Kilsyth and the highest point of Tak-Ma-Doon Road.

Give your answer as a fraction **in its simplest form**.

(b) One part of the road has gradient $\frac{2}{25}$.

Is this steeper than the average gradient?

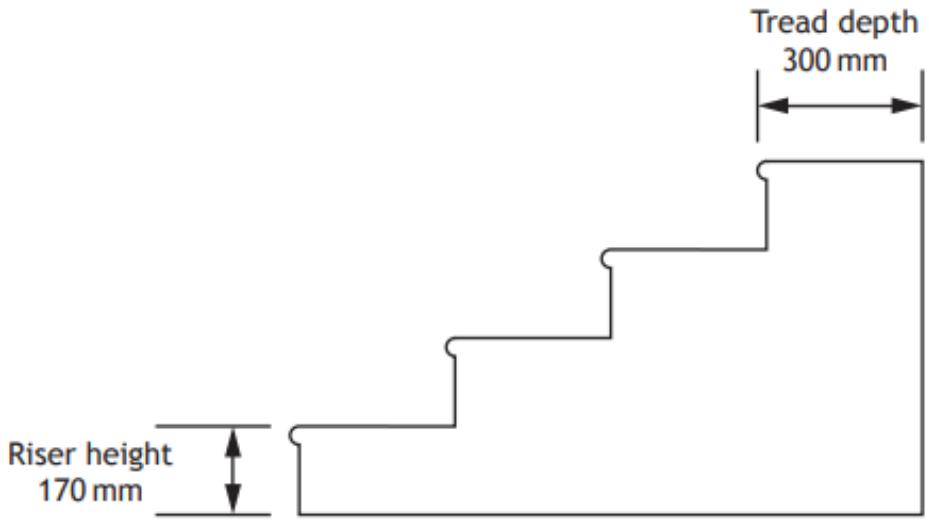
You must justify your answer.

Source: 2016 P1 Q10 N5 Lifeskills

(6)

The diagram below shows a staircase Mark intends to install in his home.

The dimensions of the riser and tread of each step are shown.



For safety reasons, these rules must be applied.

- Twice the riser height plus the tread depth should be 625 mm ±15 mm.
- The gradient of each step should be less than ½.

Mark thinks that this staircase will meet both of these rules.

Is Mark correct?

Source: 2015 P1 Q8 N5 Lifeskills

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Percentages

Applications of Mathematics Exam Questions

(1)	Allana takes out a loan of £4500. The interest plus the administration fee is 7·5% of the loan amount. The total amount will be paid back in 9 equal monthly payments. Calculate the monthly payment.

Source: 2019 P1 Q5 N5 Applications of Mathematics

(2)	Sam buys a rare stamp for his stamp collection at an auction. He buys the stamp for £920. The stamp • increased in value by 7% in each of the first 2 years • decreased in value by 4% in the third year. Calculate the value of the stamp after these 3 years. Give your answer **to 3 significant figures.**

Source: 2019 P2 Q1 N5 Applications of Mathematics

(3)	Denisa bought 375 shares for £4·50 per share. She later sold them all for £5·20 per share. She had to pay commission of 2·7% of the total selling price. Calculate her total profit.

Source: 2019 P2 Q6 N5 Applications of Mathematics

(4) Ian buys a new sofa.
The original price was £700.
The shop is having a sale with 25% off the price of all sofas.
When he goes to the shop he finds there is an additional 5% off the sale price.
Calculate the price Ian pays for his sofa.

Source: 2018 P1 Q8 N5 Applications of Mathematics

(5) David sat a class test.
His results are shown in the table below.

	Marks available	Percentage achieved
Paper 1	35	80%
Paper 2	65	60%

(a) Calculate the number of **marks** he achieved in paper 1.

(b) Calculate his overall percentage for this test

Source: 2018 P1 Q10 N5 Applications of Mathematics

(6) Mhairi bought 200 shares for £700.
She decides to sell them, but the share price has dropped to £2·75 per share.
She also has to pay a fee of 2½% of her selling price when she sells her shares.
Calculate the loss that she has made.

Source: Specimen P1 Q11 N5 Applications of Mathematics

Percentages – Compound Interest

(7)	Jack bought a car 3 years ago costing £1400. The car has decreased in value by 13% each year. (a) Calculate the current value of the car. Give your answer to **2 significant figures.** Jack sells his car for £950. (b) Calculate his loss as a percentage of the **original price.**
Source: 2018 P2 Q1 N5 Applications of Mathematics	

(8)	Erin bought a yacht costing £780 000 in February 2013. For the next three years the value of the yacht decreased by 4·1% per annum. Calculate the value of the yacht in February 2016. Give your answer to **3 significant figures.**
Source: Specimen P2 Q1 N5 Applications of Mathematics	

(9)	Saraish bought her house in May 2009 for £130 000. In the first two years the value of the house increased by 5% per annum. For the next three years the value of the house decreased by 2% per annum. (a) What is the value of the house in May 2014? **Give your answer to the nearest thousand pounds.** (b) House prices have risen on average by 4·5% over this five year period. Has the value of Saraish's house risen in line with this average? **Give a reason for your answer.**
Source: 2014 P2 Q4 N5 Lifeskills	

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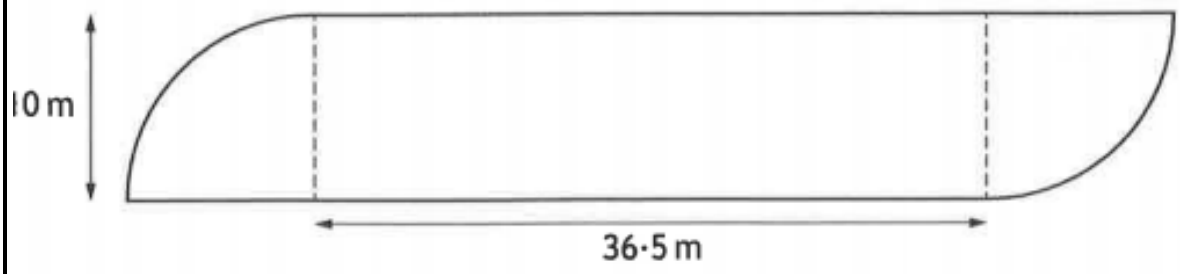
Perimeter

Applications of Mathematics Exam Questions

(1) A hotel is having a swimming pool built.

It is in the shape of a rectangle and two quarter circles as shown below.



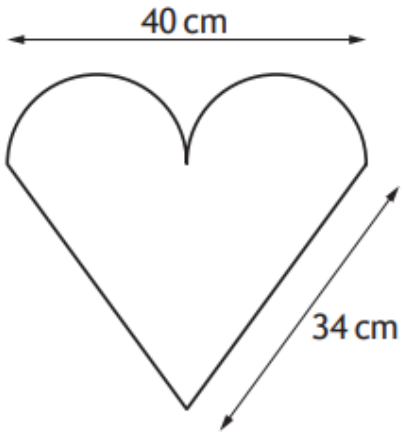
The swimming pool will have a safety rail fitted around its edge.

- There will be two 125 cm wide gaps to allow access to the pool
- Safety rail is sold in 3 metre lengths
- Each 3 metre length costs £11·49

Calculate the minimum cost of the safety rail for the pool.

Source: 2019 P2 Q5 N5 Applications of Mathematics

(2) Ribbon has to be placed around the outside of the love heart cake shown below.



The top of the cake is in the shape of an isosceles triangle with two identical semi-circles.

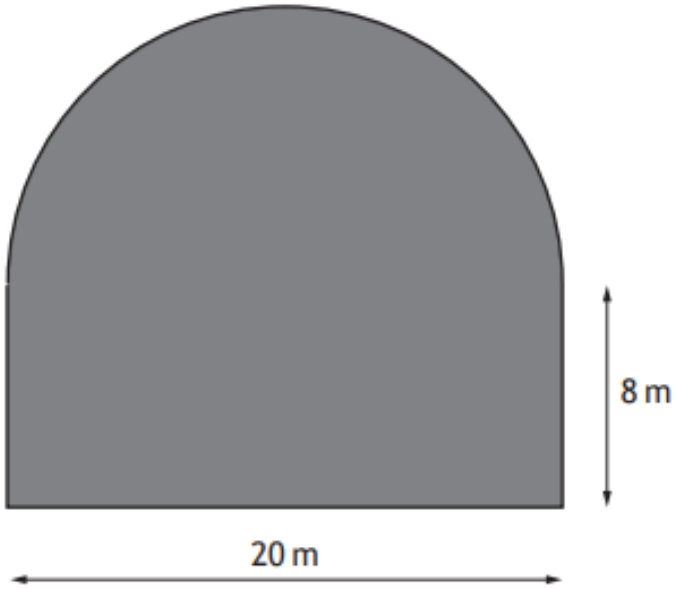
The ribbon needs to be the length of the perimeter of the top of the cake plus an extra 2·8 cm.

Calculate the length of ribbon needed for the cake.

Take $\pi = 3{\cdot}14$.

Source: 2018 P1 Q11 N5 Applications of Mathematics

(3) Joe buys a plot of land in the shape of a rectangle and a semi-circle, as shown below.



He plans to put a fence around the plot of land.

He employs Fence Direct to build the fence.

Fence Direct charges £15 per metre including all materials and labour.

(a) Calculate the cost of the fence.

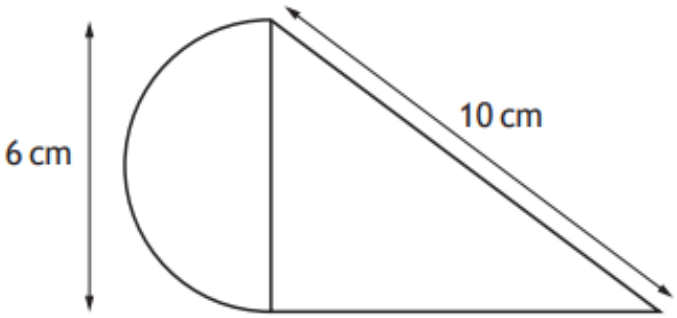
Take $\pi = 3{\cdot}14$.

Source: Specimen P1 Q13a N5 Applications of Mathematics

(4) A new design is discussed for a glue dispenser.

It is to be made from two plates of plastic.

Each plate is in the shape of a right angled triangle and a semi-circle as shown.

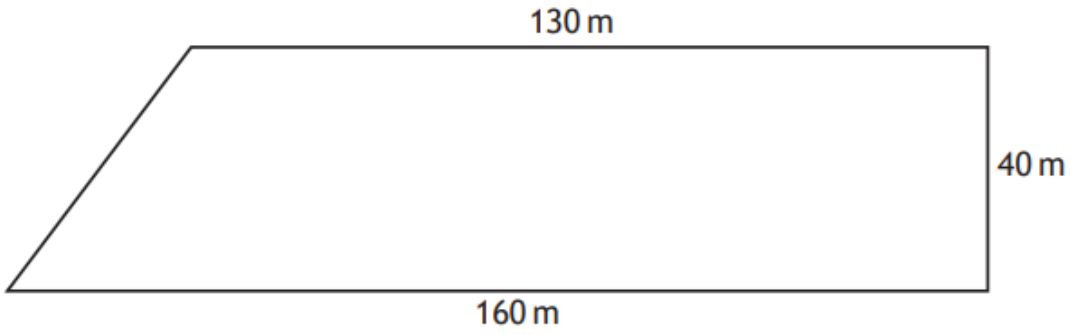


(a) Calculate the perimeter of each plate.

Use $\pi = 3{\cdot}14$.

Source: 2017 P1 Q9a N5 Lifeskills

(5) A farmer needs to **completely enclose** this field with a new fence.



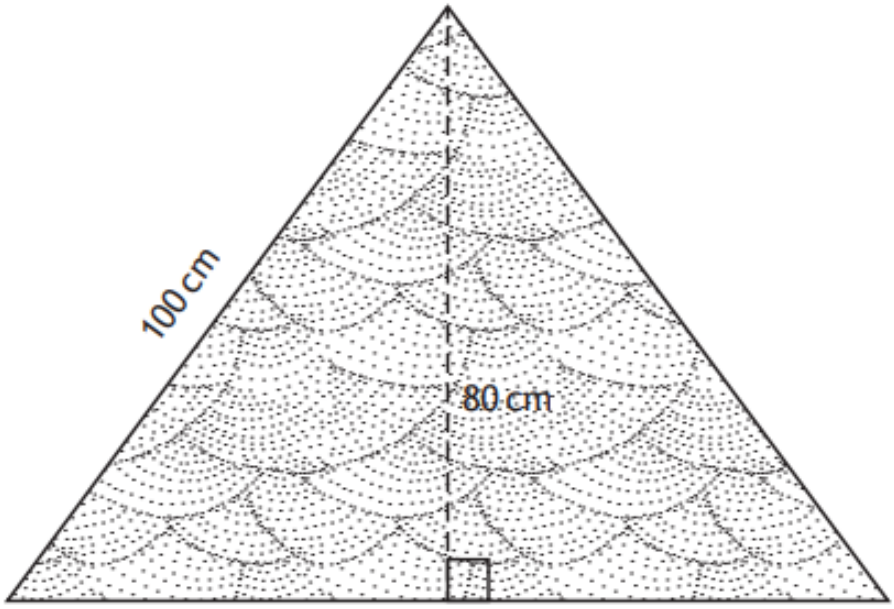
The fence is only sold in 80 metre rolls.

Each roll costs £73·99.

Calculate the cost of the new fence.

Source: 2016 P1 Q6 N5 Lifeskills

(6). Lucy has a scarf in the shape of an isosceles triangle with dimensions as shown below.



Lucy wants to sew ribbon along all three edges of the scarf.

She has 3·5 metres of ribbon.

Does Lucy have enough ribbon for the scarf?

Show all working and justify your answer.

Source: 2015 P1 Q7 N5 Lifeskills

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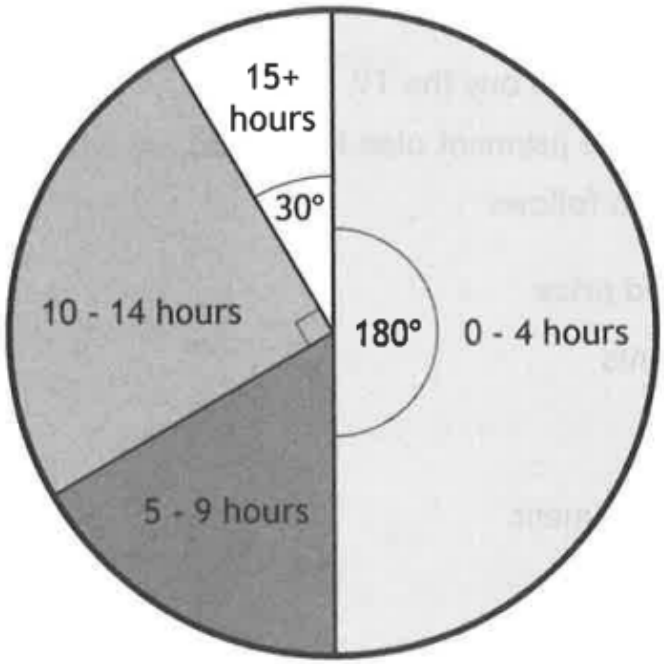
Pie Charts

Applications of Mathematics Exam Questions

(1) The pie chart shows the number of hours overtime that 72 employees of a supermarket worked during one month.



(a) Calculate how many employees worked 15+ hours overtime.

(b) Calculate the probability that an employee chosen at random worked 9 or less hours overtime.

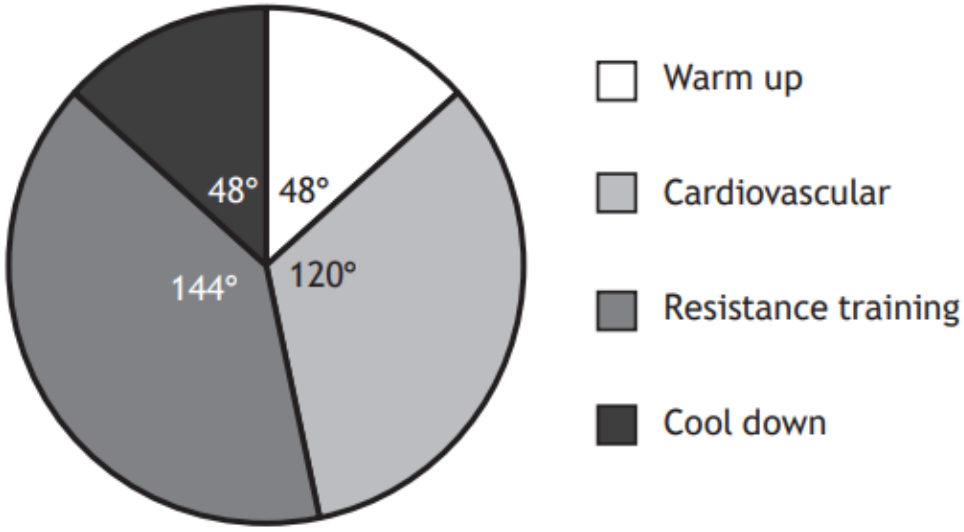
Source: 2019 P1 Q3 N5 Applications of Mathematics

(2)

Nicola has joined a gym.

The pie chart shows the proportion of time that Nicola will spend on each type of workout exercise.

Types of workout exercises



Nicola spent 1 hour and 45 minutes exercising in the gym.

(a) Calculate how long, **in minutes**, Nicola spent on resistance training.

Nicola spent 21 minutes exercising on a treadmill.

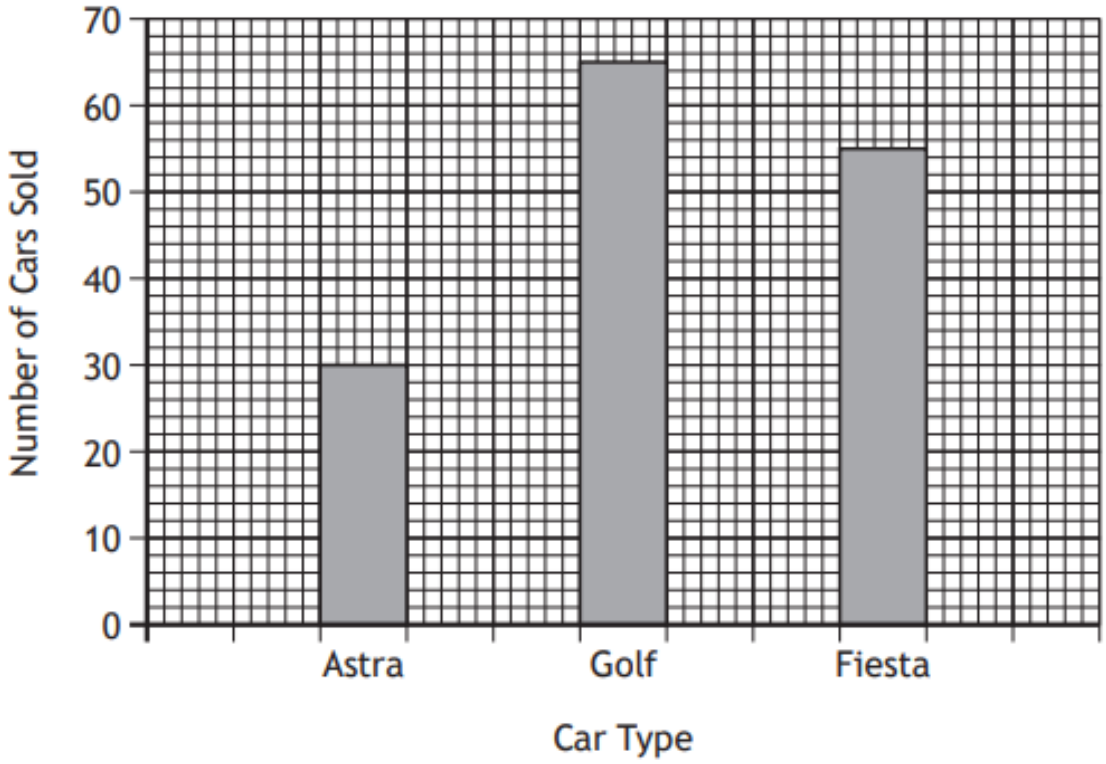
Her average speed was 6·6 km/h.

(b) Calculate the distance she ran on the treadmill.

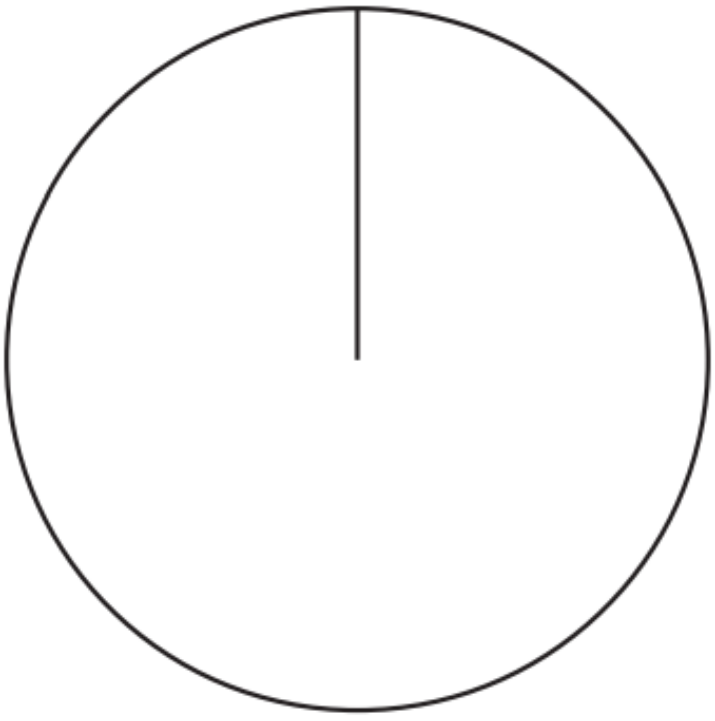
Source: 2018 P2 Q4 N5 Applications of Mathematics

(3) A garage sells 150 cars in a month.

The bar chart below shows how many cars of each type are sold.



Construct a pie chart to show this information.

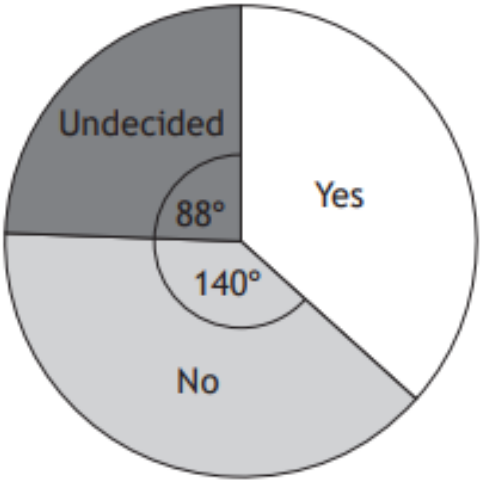


Source: Specimen P2 Q4 N5 Applications of Mathematics

(4) In September 2014 there was a referendum to determine the future of Scotland.

An opinion poll was taken in December 2013.
The question asked was "Should Scotland be an independent country?"

The results are shown in the pie chart below.



Another opinion poll was taken in April 2014.
1208 people were asked the same question as in December 2013.

The results of this poll are shown in the table below.

YES	NO	UNDECIDED
447	616	145

Compare the two opinion polls and make one relevant comment on the differences between them.

Source: 2016 P2 Q3 N5 Lifeskills

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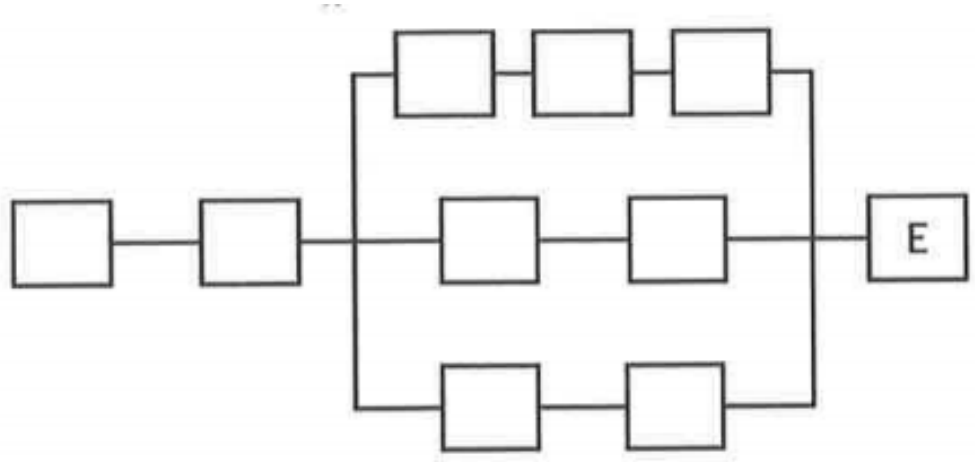
Precedence Tables

Applications of Mathematics Exam Questions

(1) The publishing company produced the following table to show all the tasks involved in publishing the book.

Activity	Description	Preceding task
A	Illustrate cover	H
B	Write 1st draft	C
C	Research ideas	None
D	Edit book	B
E	Publish book	A,J,G
F	Re-work	D
G	Proof read	F
H	Choose title	B
I	Copyright	B
J	ISBN	I

(b) Complete the diagram below to show the tasks.



Source: 2019 P2 Q9 N5 Applications of Mathematics

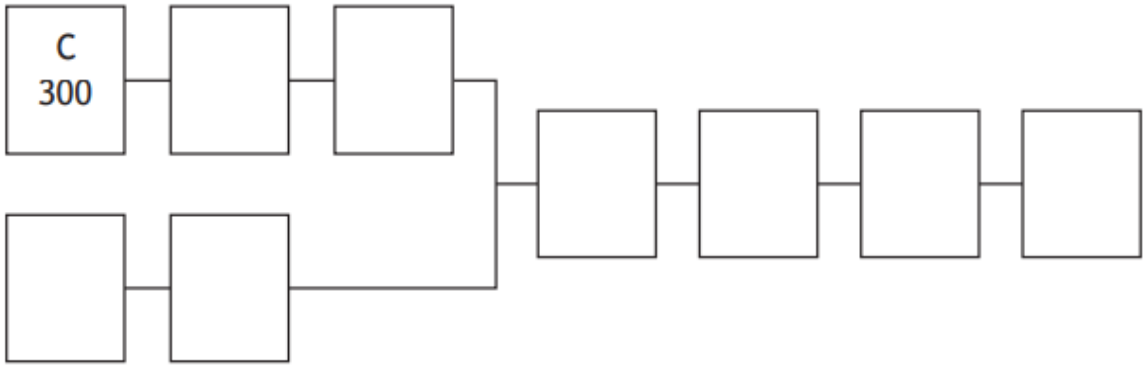
(2) A factory produces cans of tinned beans.

The table shows the list of tasks and the time taken to complete them.

Task	Detail	Preceding task	Time (seconds)
A	Boil beans to cook them	C	500
B	Put on lid	H,E	3
C	Blanch dried beans in water	None	300
D	Attach label	I	5
E	Put sauce in tin	F	2
F	Make the sauce	None	900
G	Put in box	D	5
H	Put beans in tin	A	2
I	Cook beans in sauce in tin	B	300

(a) Complete the diagram below to show the tasks and times in the boxes.

(An additional diagram, if required, can be found on *page 21*.)



The factory manager thinks that the whole process can be completed in less than 25 minutes.

(b) Based on the times given, is the factory manager correct?

Use your working to justify your answer.

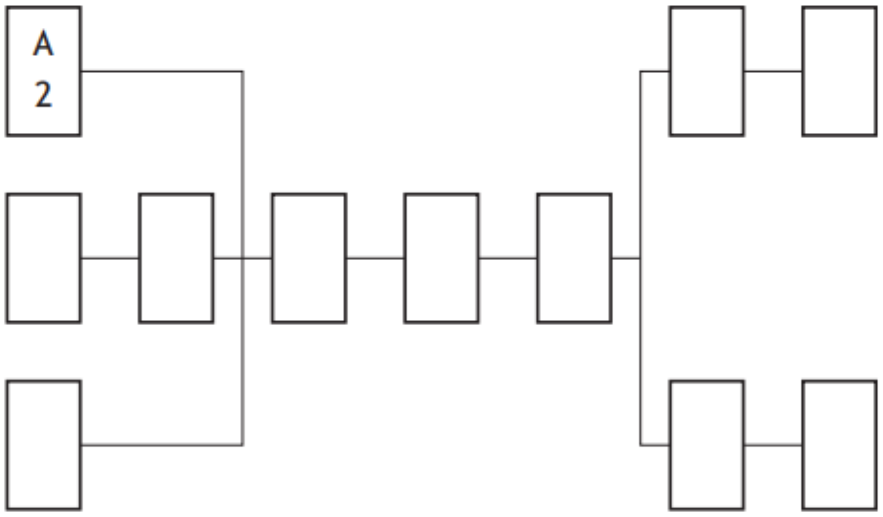
Source: 2018 P2 Q9 N5 Applications of Mathematics

(3) Fence Direct provides a team of workers to build the fence.

The table shows the list of tasks and the time taken to complete them.

Task	Detail	Preceding Task	Time (hours)
A	Take down old fence	None	2
B	Measure length of fence needed	None	0·5
C	Mark on the ground where new posts must go	None	0·5
D	Collect materials and tools from yard	B	1
E	Hammer posts into the ground	A, C, D	4
F	Attach metal fencing to posts	E	2
G	Attach barbed wire to top of posts	F	1
H	Gather up rubbish	G	2
I	Gather up tools	G	0·5
J	Take rubbish to recycling centre	H	1
K	Put tools back in yard	I	0·5

Complete the diagram below by writing these tasks and times in the boxes.



(c) Fence Direct claims that all of these tasks can be completed in 10 hours.

Is this a valid claim?

Use your working to justify your answer.

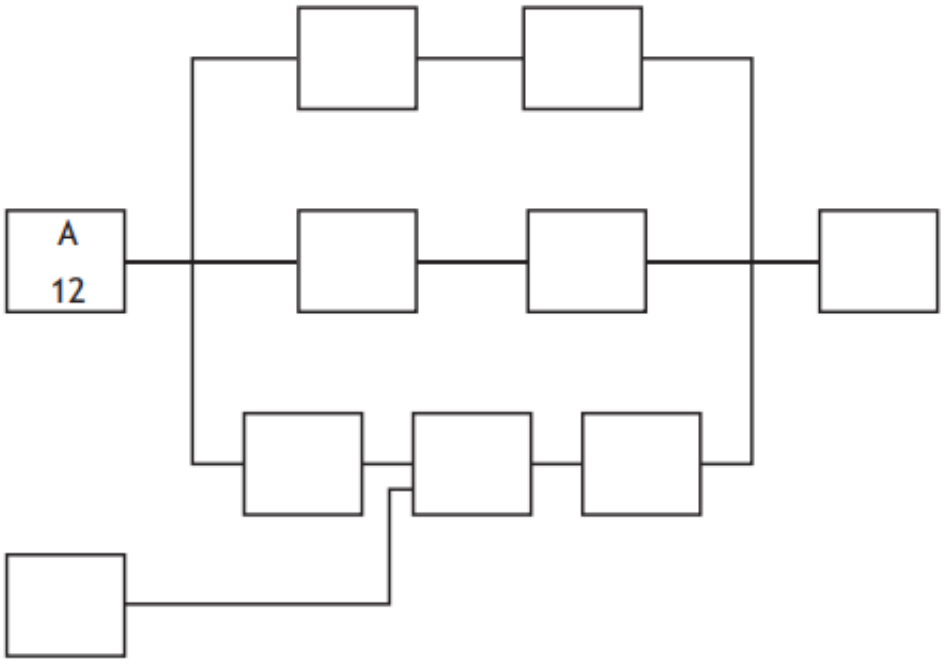
Source: Specimen P1 Q13b,c N5 Applications of Mathematics

(4) A computer company is researching how long it would take to develop a new games console and bring it to market.

The following table of necessary tasks was produced.

Activity	Description	Preceding Task	Time (months)
A	Product design	None	12
B	Market research	None	2
C	Production analysis	A	3
D	Product model	A	4
E	Sales brochure	A	1
F	Product testing	D	5
G	Cost analysis	C	3
H	Sales training	B,E	2
I	Pricing	H	1
J	Project report	F,G,I	1

(a) Complete the diagram below to show the tasks and times in the boxes.
(An additional diagram, if required, can be found on *Page 12*).



(b) The company want this entire process to be completed in 2 years.
Based on the times given, is this possible?
Show working to justify your answer.

Source: 2016 P1 Q5 N5 Lifeskills

(5)

The Clarks employ Kitease to install a new kitchen for them.

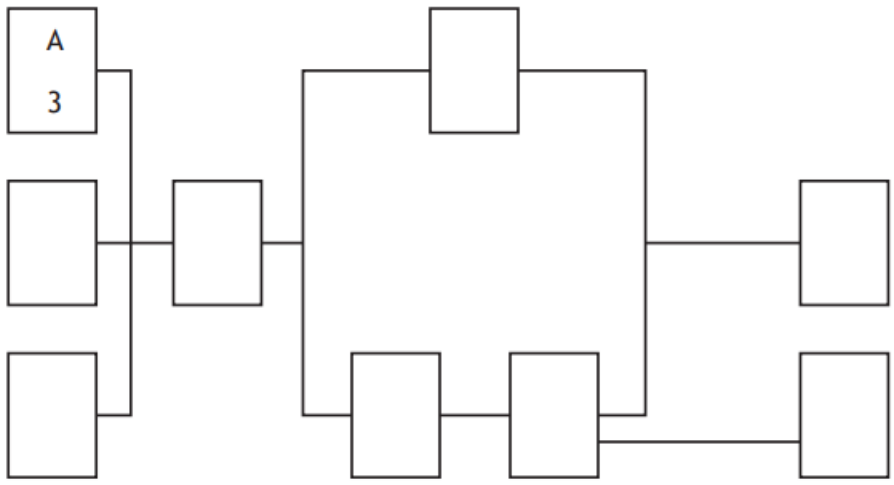
Kitease provide a team of workers to install the kitchen.

The table shows the list of tasks and the time required for each.

Task	Detail	Preceding task	Time(hours)
A	Begin electrics	None	3
B	Build cupboards	None	5
C	Begin plumbing	None	2
D	Plaster walls	A,B,C	8
E	Fit wall cupboards	D	6
F	Fit floor cupboards	D	5
G	Fit worktops	F	3
H	Finish plumbing	G	3
I	Finish electrics	E,G	4

(a) Complete the diagram below by writing these tasks and times in the boxes.

(An additional diagram, if required, can be found on *Page fifteen*.)



(b) Kitease claim they can install this kitchen in 22 hours.

Is this a valid claim?

Give a reason for your answer.

Source: 2014 P1 Q6 N5 Lifeskills

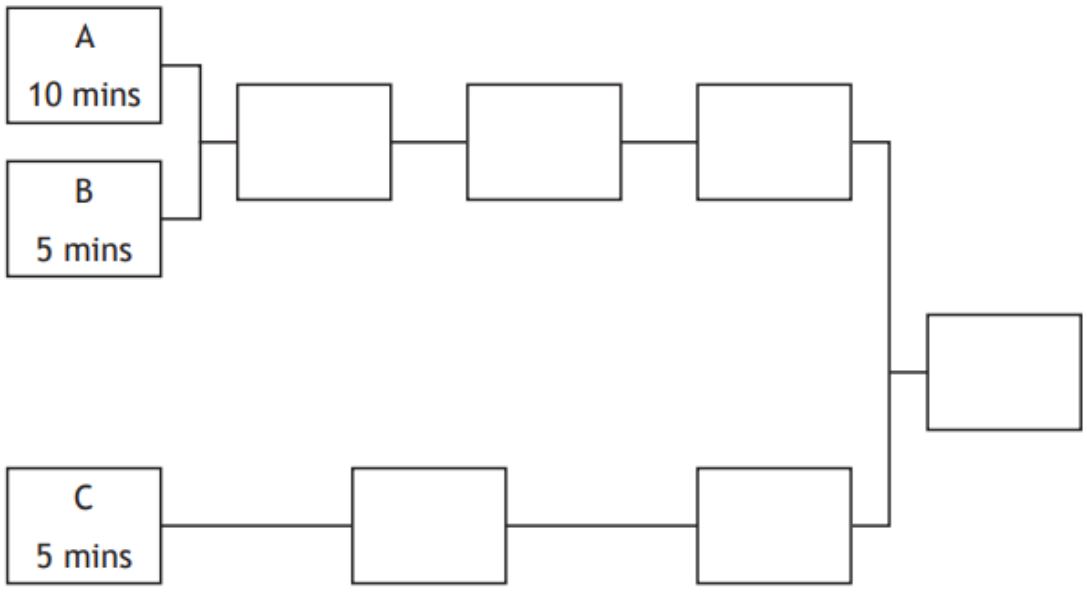
(6)

Three friends decide to tidy up their garden.

The tasks which need to be done are shown in the table below:

Tasks	Detail	Preceding task	Time (minutes)
A	Clear rubbish from the garden	None	10
B	Get lawnmower and edge shears out of the shed	None	5
C	Get hedge trimmer out of the shed	None	5
D	Cut grass in the garden	A, B	30
E	Trim edges of the lawn with shears	B, D	10
F	Cut the hedge	C	20
G	Put grass clippings in bag	D, E	5
H	Put hedge clippings in bag	F	5
I	Take bags to recycling centre	G, H	45

(a) Complete the chart below by writing the letter of the tasks and time (in minutes) in the boxes.



(b) Calculate how much time **in total** the three friends should allow for the garden to be completed?

Source: Specimen P1 Q4 N5 Lifeskills

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Probability

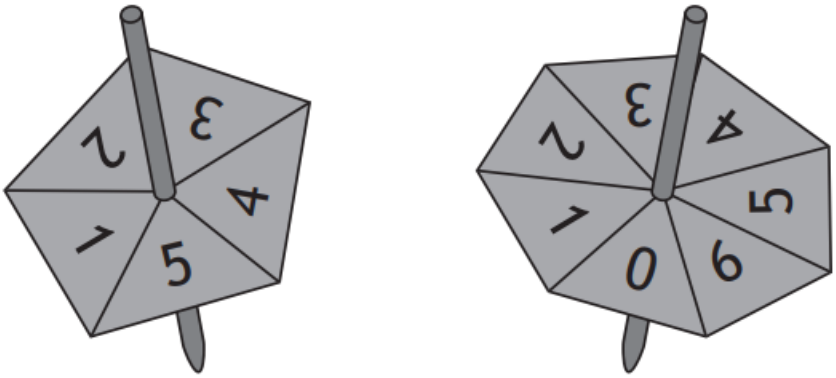
Applications of Mathematics Exam Questions

(1)

Michael runs a stall at the school fayre.

His game requires two spinners to be spun and allowed to come to rest.

The spinners are shown below.



The numbers on which the spinners come to rest are multiplied together.

To win a prize the answer to this multiplication must be **less than 5**.

Calculate the probability of winning a prize.

Source: 2018 P1 Q14 N5 Applications of Mathematics

(2)

S6 pupils were asked to choose their favourite subject.

The results are shown in the table below.

Subject	Boys	Girls
Geography	11	7
French	9	14
Maths	18	13
Spanish	10	12
Modern Studies	18	8
Total	66	54

Calculate the probability that a boy from this group chose French as his favourite subject.

Give your answer as a fraction in its simplest form.

Source: Specimen P1 Q2 N5 Applications of Mathematics

(3)

Mr and Mrs Sibbald take part in an on board lottery which consists of a draw from a set of 32 balls numbered from 1 to 32.

(d) (i) What is the probability that the first ball drawn has a number greater than 25?

In the draw four numbered balls are drawn and not replaced.

A further bonus ball is also drawn.

(ii) What is the probability of the number 9 being drawn as the bonus ball if it was not drawn in the first four?

Source: 2017 P2 Q5d N5 Applications of Mathematics

(4)

Aneesha and Brian are playing a board game. Each move is determined by rolling two dice.

Aneesha requires a total of **10 or more** on her next roll to win the game.

What is the probability of Aneesha winning the game on the next roll?

Give your answer as a fraction.

Source: 2016 P1 Q2 N5 Lifeskills

(5) Mrs Abid took a survey in her mathematics class of how pupils travelled to school.

The results are shown in the table.

	Walk	Cycle	Bus
Boys	6	4	3
Girls	2	3	12

What is the probability that a pupil chosen at random is a girl who cycles to school?

Give your answer in its simplest form.

Source: 2014 P1 Q1 N5 Lifeskills

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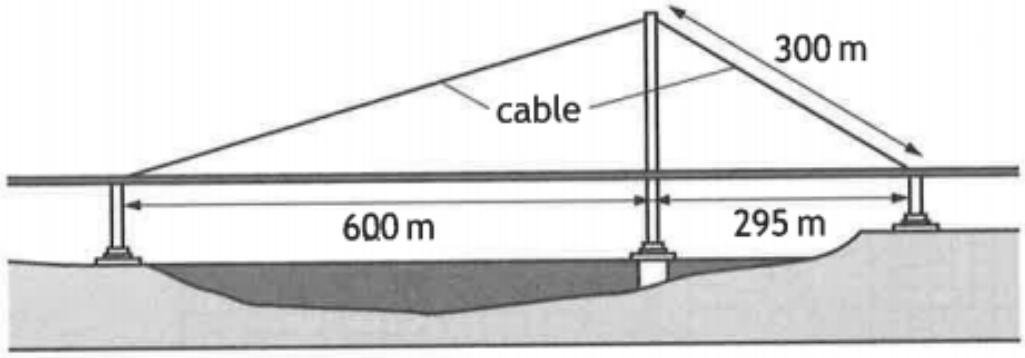
Pythagoras

Applications of Mathematics Exam Questions

(1)

Two cables support a section of the bridge.

This section forms two right-angled triangles, as shown in the diagram.



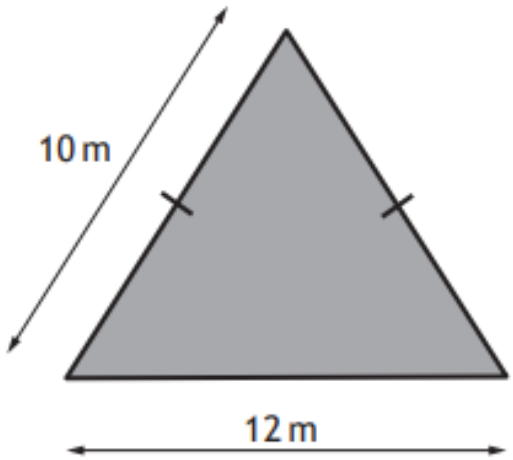
(b) Calculate the total length of cable needed for this section of bridge.

Do not use a scale drawing.

Source: 2019 P2 Q8b N5 Applications of Mathematics

(2)

A lawn is to be created in the shape of an isosceles triangle with dimensions as shown below.

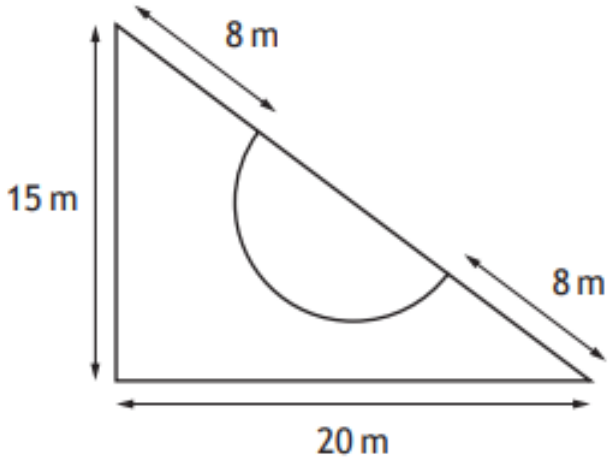


Calculate the area of the lawn.

Source: 2018 P1 Q13 N5 Applications of Mathematics – Note: P1 No Calculator

(3)

A garden in the shape of a **right-angled triangle** has a semi-circular pond on the hypotenuse as shown below.



(a) Calculate the diameter of the pond.

(b) The garden, excluding the pond, is to be covered with stone chips.
Calculate the area to be covered with stone chips.

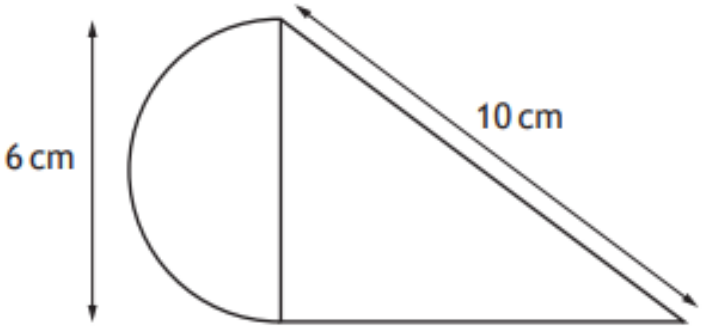
Source: Specimen P2 Q9 N5 Applications of Mathematics

(4)

A new design is discussed for a glue dispenser.

It is to be made from two plates of plastic.

Each plate is in the shape of a right angled triangle and a semi-circle as shown.

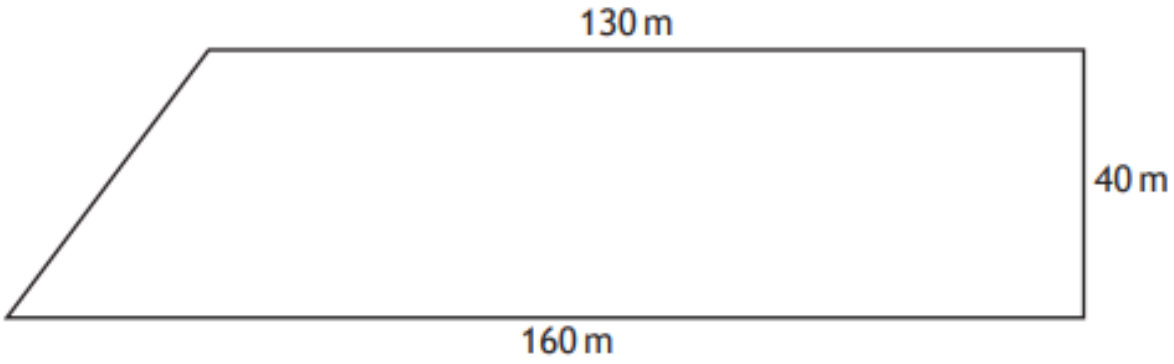


(a) Calculate the perimeter of each plate.
Use $\pi = 3{\cdot}14$.

Source: 2017 P1 Q9 N5 Lifeskills – Note: PAPER 1 No Calculator

(5)

A farmer needs to **completely enclose** this field with a new fence.



The fence is only sold in 80 metre rolls.

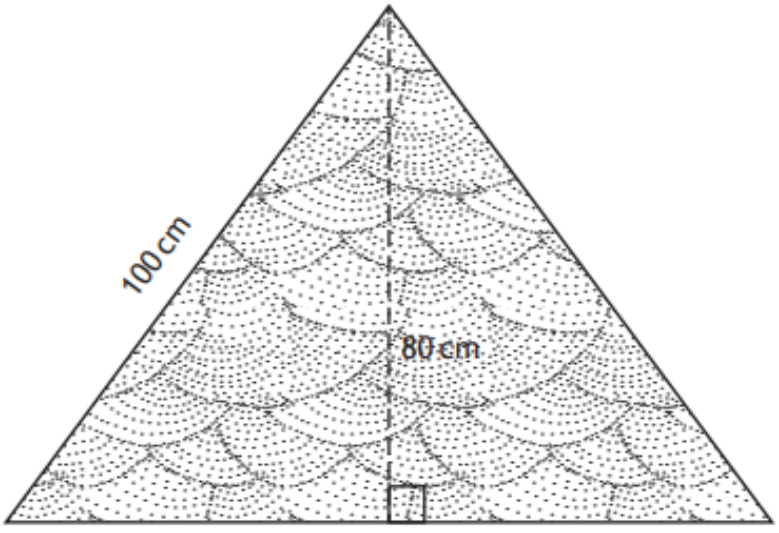
Each roll costs £73·99.

Calculate the cost of the new fence.

Source: 2016 P1 Q6 N5 Lifeskills – Note: PAPER 1 No Calculator

(6)

Lucy has a scarf in the shape of an isosceles triangle with dimensions as shown below.



Lucy wants to sew ribbon along all three edges of the scarf.

She has 3·5 metres of ribbon.

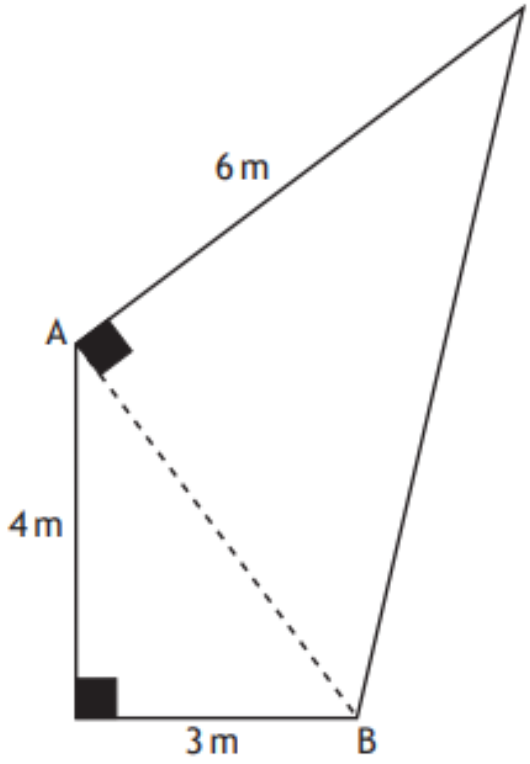
Does Lucy have enough ribbon for the scarf?

Show all working and justify your answer.

Source: 2015 P1 Q7 N5 Lifeskills – Note: PAPER 1 No Calculator

(7) A new sail is being designed for a yacht as shown below.

It consists of two right angled triangles.



(a) Calculate the length of AB.

(b) Calculate the total area of the sail.

Source: 2014 P1 Q3 N5 Lifeskills – Note: PAPER 1 No Calculator

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Ratio

Applications of Mathematics Exam Questions

(1)

Mary gave some money to four of her nieces.

It was shared **in proportion to** their ages.

Name	Age
Jane	4
Heather	11
Laura	9
Kate	6

Kate's share is £1950.

Calculate the total amount Mary gifted her nieces.

Source: 2019 P1 Q11 N5 Applications of Mathematics

(2)

Ali, Kate and Jim are paid to deliver leaflets advertising a new restaurant.

They shared the money they were paid in a ratio of 3 : 5 : 7.

Jim received £154.

Calculate how much the restaurant paid, **in total**, to deliver the leaflets.

Source: 2018 P2 Q6 N5 Applications of Mathematics

(3)

It takes 5 bakers 3 hours to decorate a tray of cupcakes.

All the bakers work at the same rate.

Calculate the time taken for 4 bakers working at this rate to decorate the same number of cupcakes.

Give your answer in **hours and minutes**.

Source: Specimen P1 Q9 N5 Applications of Mathematics

(4)

The mathematics teachers in a school win a lottery.

They decide to share their winnings **in proportion to** the amount they each pay per week.

They each pay the following amounts per week:

Mr Jones	£0·50
Miss Smith	£2·00
Mr Ross	£2·50
Mr Young	£4·00

Mr Young's share is £2 794 000.

Calculate how much the teachers win in total.

Source: 2017 P1 Q6 N5 Lifeskills

(5)

A restaurant can buy long grain rice in two sizes of bags.

- A 9 kg bag costs £25·65
- A 20 kg bag costs £57·20

Which size of bag is better value for the restaurant?

Use your working to justify your answer.

Source: 2016 P1 Q1 N5 Lifeskills

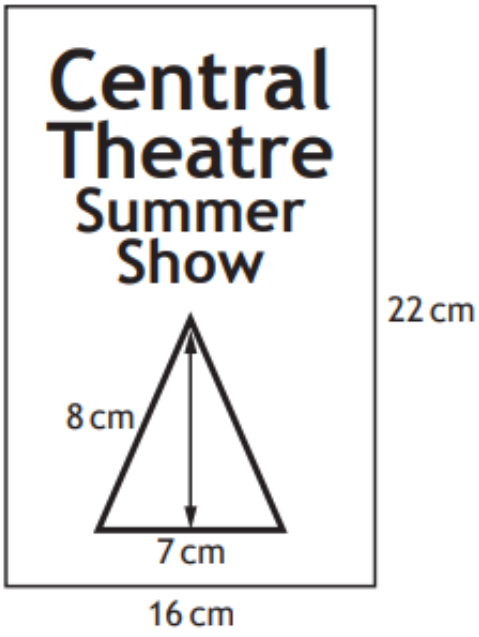
(6) Publicity material is to be designed for a theatre show that is being sponsored by a local company.

All the publicity material must feature the company logo.

The company logo is in the shape of a triangle.

The designer is to produce a small "flyer" and a large poster.

The designer produces a sketch for the flyer as shown.



(a) The ratio of the dimensions in the poster to those in the flyer is 7:2.

Calculate the dimensions of the logo as it will appear on the poster.

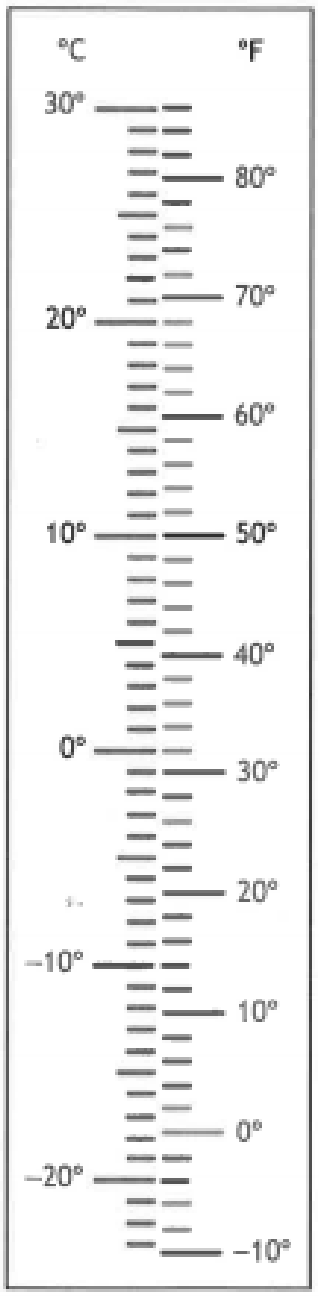
Source: 2015 P2 Q1a N5 Lifeskills

Reading Scale

Applications of Mathematics Exam Questions

(1) Gillian thinks that 24 °F is colder than −3 °C.

A thermometer is shown.



Determine if she is correct.

Justify your answer.

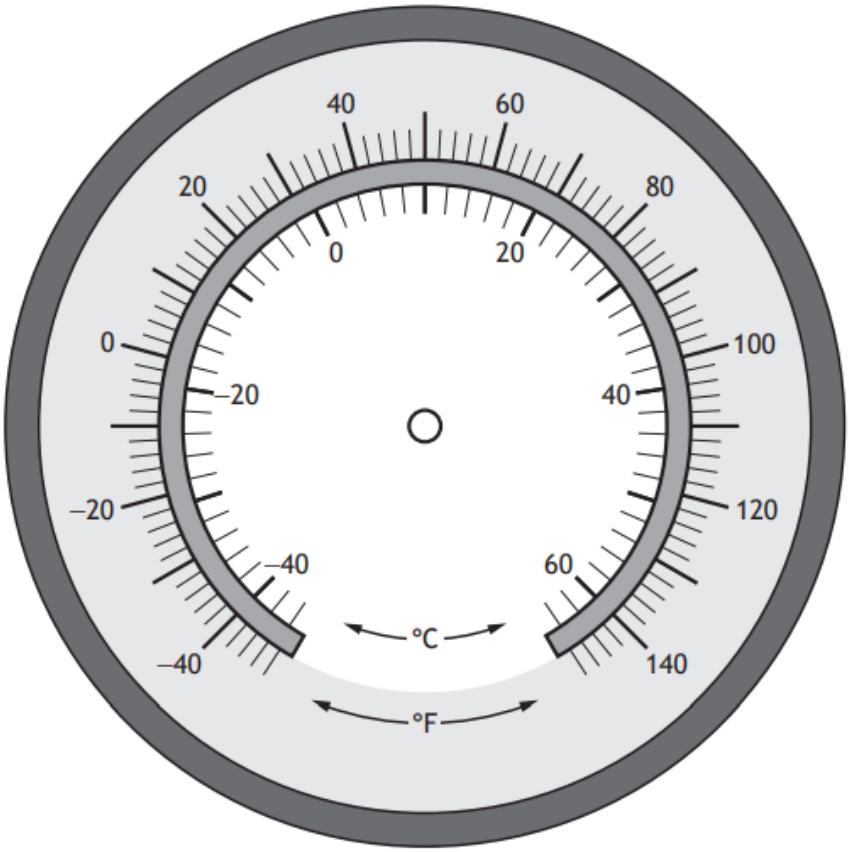
Source: 2019 P1 Q4 N5 Applications of Mathematics

(2)

Lynn is flying an aircraft and has been told that the outside temperature is 34 °C lower than the ground temperature.

The ground temperature is 6 °C.

Calculate the outside temperature and mark it on the gauge below.



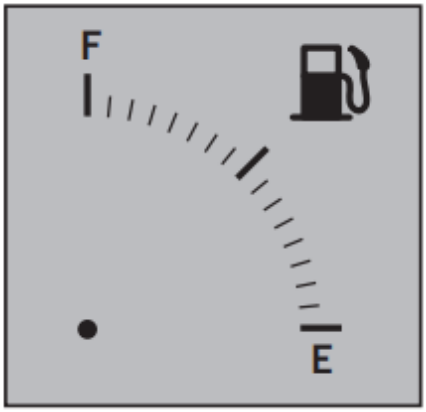
Source: 2018 P1 Q4 N5 Applications of Mathematics

(3)

The fuel tank in Colin's car holds 64 litres of fuel.

Colin started with a full tank and used 40 litres of fuel.

Mark the amount of fuel **remaining** in the tank on the gauge shown below.



Source: Specimen P2 Q2 N5 Applications of Mathematics

(4) Carol knows that she can travel 280 miles on a full tank of fuel. She is making a trip of 110 miles.

The diagram below shows the car's fuel gauge

Does she have enough fuel to make the journey?

Show working to justify your answer.

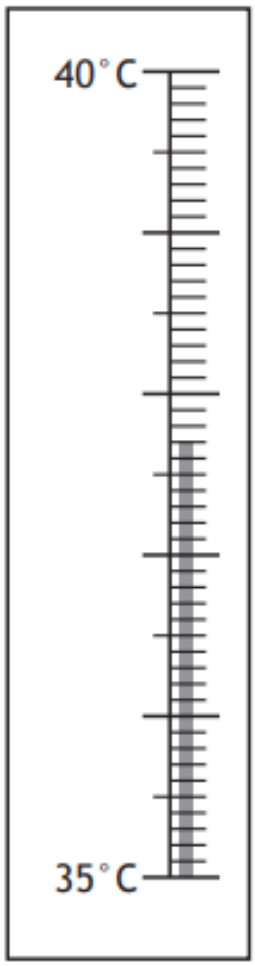
Source: 2015 P1 Q1 N5 Lifeskills

(5) Frances is not feeling well.

She takes her temperature using a thermometer.

Her temperature is shown below.

The temperature of a person in good health is 36·8°C ± 0·4°C.



Is Frances in good health?

Give a reason for your answer.

Source: 2014 P1 Q2 N5 Lifeskills

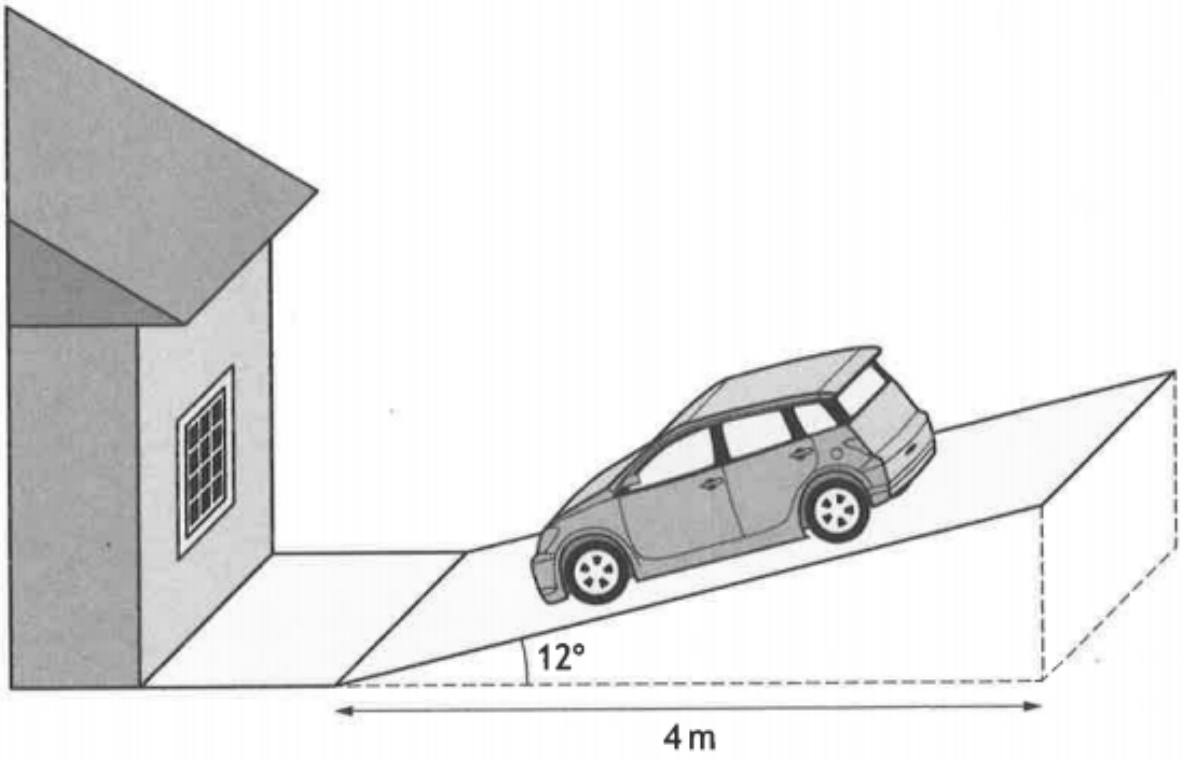
Scale Drawing & Bearings

Applications of Mathematics Exam Questions

(1) Sarah's driveway is sloped as shown in the diagram below.

The cross-section of the driveway is in the shape of a right-angled triangle.

The base is 4 metres long and makes an angle of 12° with the driveway as shown in the diagram below.



(a) Construct a scale drawing of the cross-section of the driveway.
Use a scale of 1 cm : 0·5 m.

(b) Use your scale drawing to calculate the gradient of the driveway.

Source: 2019 P1 Q8 N5 Applications of Mathematics

(2)

A helicopter flew from Aberdeen airport to transport workers to oil rig 1 and then continued on to oil rig 2.

It flew 82 km on a bearing of 042° to oil rig 1.

It then flew 46 km on a bearing of 194° to oil rig 2.

(a) Construct a scale drawing to illustrate this journey.

Use a scale of 1 cm : 10 km.

The helicopter then returns to Aberdeen airport from oil rig 2.

(b) Use the scale drawing to determine the distance and bearing of the airport from oil rig 2.

Source: 2018 P1 Q12 N5 Applications of Mathematics

(3) The boat leaves from the harbour on a bearing of 045° for a distance of 22 miles to Puffin Island.

The boat leaves Puffin Island on a bearing of 170° and travels for a further 37 miles to Gull Isle.

(a) Construct a scale drawing to illustrate this journey.

Use a scale of 1 cm : 5 miles.

The boat continues back to the harbour.

(b) Use the scale drawing to determine the bearing and distance of the harbour from the boat.

(c) The boat leaves the harbour at 0930.

It stops for 1 hour 15 minutes at Puffin Island and 2 hours 50 minutes at Gull Isle.

The boat arrives back at the harbour at 1800 the same day.

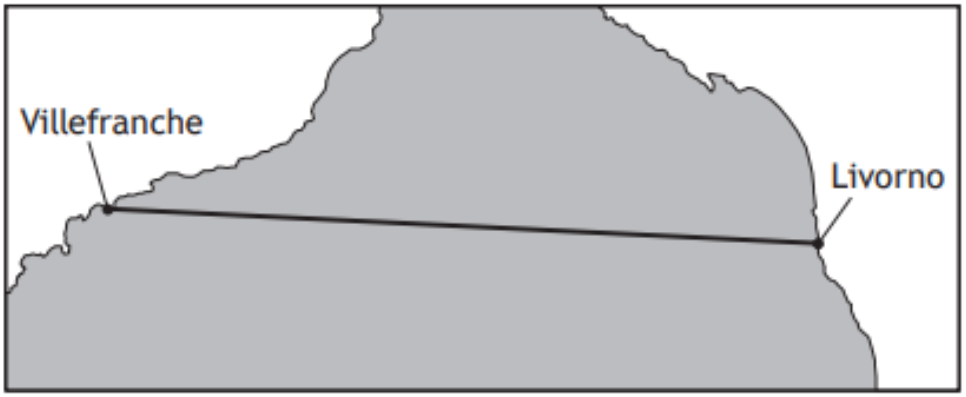
Calculate the average speed of the boat whilst it is moving.

Source: Specimen P2 Q7 N5 Applications of Mathematics

(4) Mr and Mrs Sibbald went on a cruise.

Part of the cruise involved sailing from Villefranche to Livorno.

The map below shows the route the ship takes.



The scale of the map is 1 : 3 000 000

(a) Calculate the distance from Villefranche to Livorno.

Give your answer in kilometres.

It took 7 hours and 30 minutes to sail from Villefranche to Livorno.

(b) Calculate the average speed of the ship's journey.

Give your answer in knots.

1 kilometre per hour = 0·54 knots

Round your answer to 2 significant figures.

Source: 2017 P2 Q5 N5 Lifeskills

(5) . Alison and Michael are travelling to Inverie on Knoydart for a holiday. They must take a ferry from Mallaig to Inverie

(a) The direct distance from Mallaig to Inverie is 9·8 kilometres.

(i) Calculate the scale used in the diagram above.

(ii)

The ferry leaves Mallaig and travels North for 0·6 km .

The ferry then changes direction to sail directly to Inverie.

Use the second diagram to find the bearing and distance, in kilometres, that the ferry must travel on the **second part** of its journey.

(b) The average speed of the ferry from Mallaig to Inverie is 24 ± 3 kilometres per hour depending on tide and weather.

What is the shortest time that the **complete** ferry journey might take?

Give your answer to the **nearest minute**.

Source: 2016 P2 Q4 N5 Lifeskills

(6) A seaplane flies from an airport on a bearing of 050° at a speed of 170 mph for 36 minutes.

It then turns onto a new bearing of 190° and flies at the same speed for a further 1 hour 12 minutes.

(a) Construct a scale drawing to illustrate this journey.

Use a scale of 1 cm:20 miles

Source: 2015 P2 Q4 N5 Lifeskills

The seaplane continues at the same speed back to the airport.

(b) Use the scale drawing to determine the distance and bearing of the airport from the seaplane.

The seaplane burns fuel at 32 litres per hour.

Aviation fuel costs £2·04 per litre.

(c) Calculate the cost of the fuel for the complete journey.

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Scatter Graphs

Applications of Mathematics Exam Questions

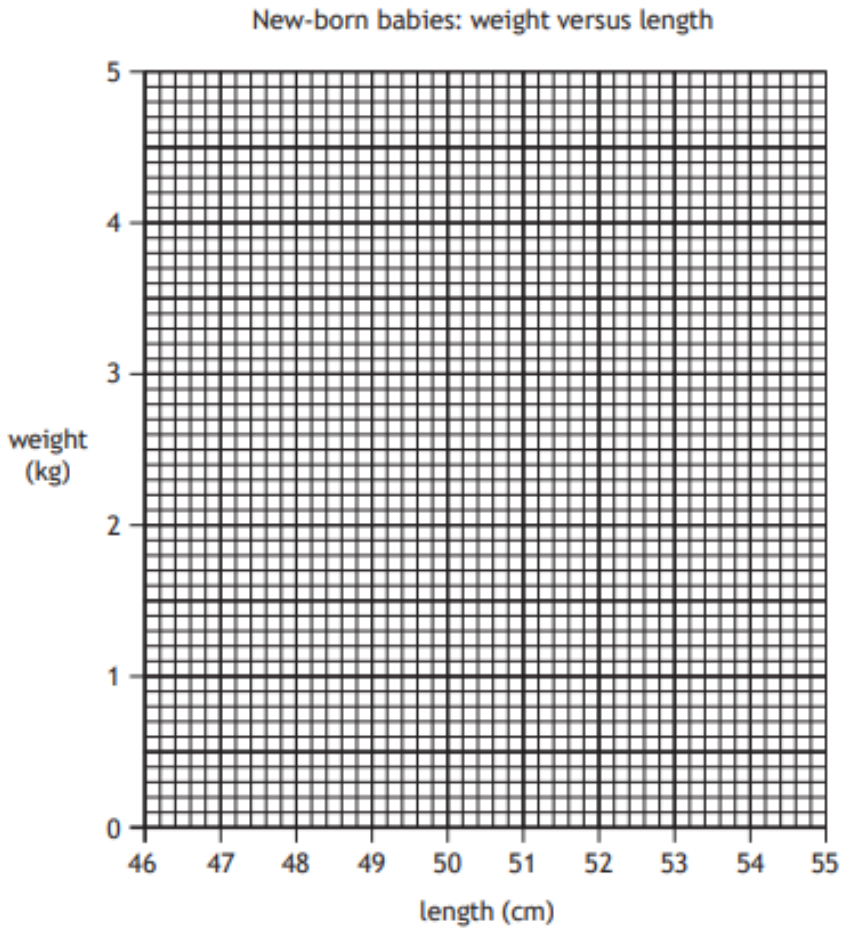
(1)

The lengths and weights of 8 new-born babies are recorded in the table as shown.

Length (cm)	46	47	49	51	52	52	54	55
Weight (kg)	2·7	2·8	3·5	3·7	3·4	3·7	4·0	4·4

(c) (i) On the grid draw a scatter graph to show this data.

(An additional grid, if required, can be found on *page 20*.)



(ii) Draw a line of best fit on your scatter graph.

(iii) Use your line of best fit to estimate the weight of a baby who was 50 cm when born.

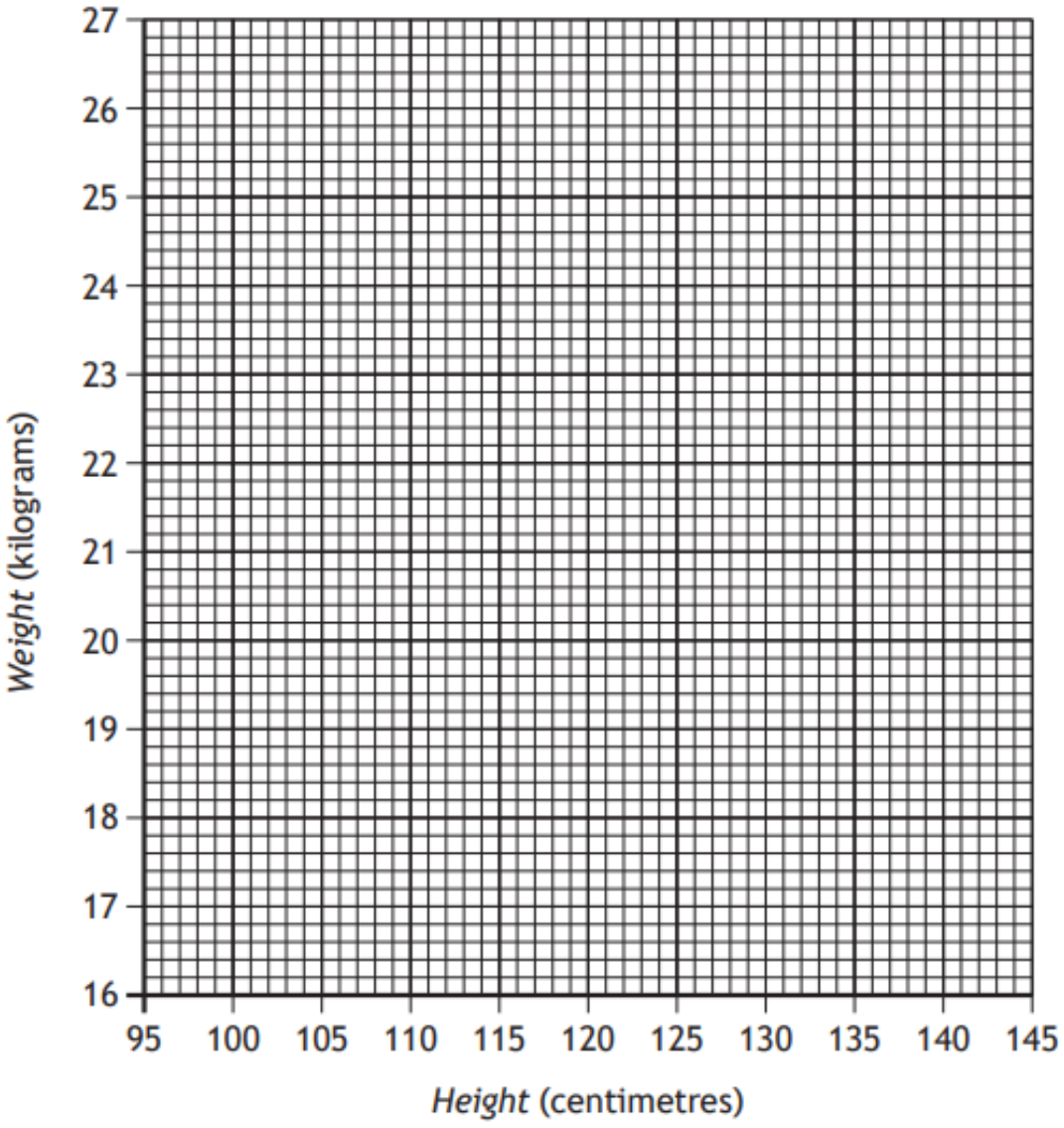
Source: 2019 P2 Q7 N5 Applications of Mathematics

(2)

3. The heights and weights of 8 children aged six are recorded in the table below.

Height in centimetres	104	107	120	124	99	127	104	130
Weight in kilograms	18	19	24	22	17	25	19	24

(a) On the grid below draw a scattergraph to show this data.



(b) Draw a line of best fit on the scattergraph.

(c) Use your line of best fit to estimate the height of a child who weighs 20 kilograms.

Source: 2018 P1 Q3 N5 Applications of Mathematics

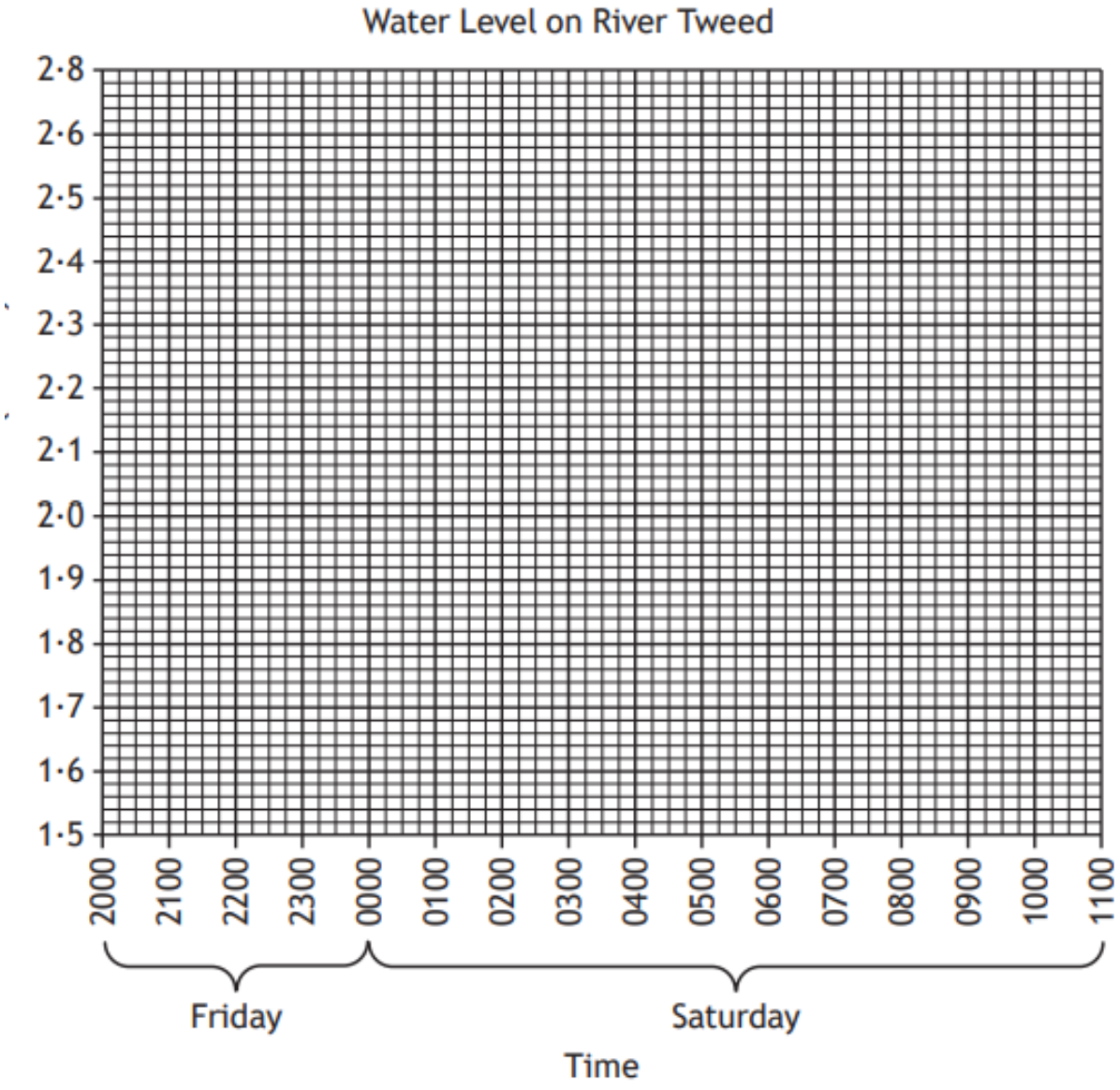
(3)

Canoeists in Scotland use water level data to decide if there is enough water in a river to canoe down it.

The data for the River Tweed is shown below.

Table 1

Time	Water Level (metres)
Friday 2015	1·55
Friday 2200	1·58
Friday 2315	1·67
Saturday 0015	1·70
Saturday 0100	1·88
Saturday 0300	1·97
Saturday 0415	2·05



Source: Specimen P1 Q10 N5 Applications of Mathematics

(a) (i) Plot the water levels on the scattergraph.

(ii) Draw a line of best fit on the scattergraph.

(b) The water level is predicted to rise at the same rate until 1100 on Saturday.

The canoeists use their line of best fit to predict the water level of the River Tweed at 0830 on Saturday.

They hope that it will be "Very High".

Table 2

River Tweed	
Water level:	
Huge	> 3·5
Very High	2·5 - 3·5
High	2·0 - 2·5
Medium	1·7 - 2·0
Low	1·2 - 1·7
Scrapeable	0·0 - 1·2
Empty	never

Will the Tweed be "Very High" at 0830?

Justify your answer.

Source: Specimen P1 Q10 N5 Applications of Mathematics

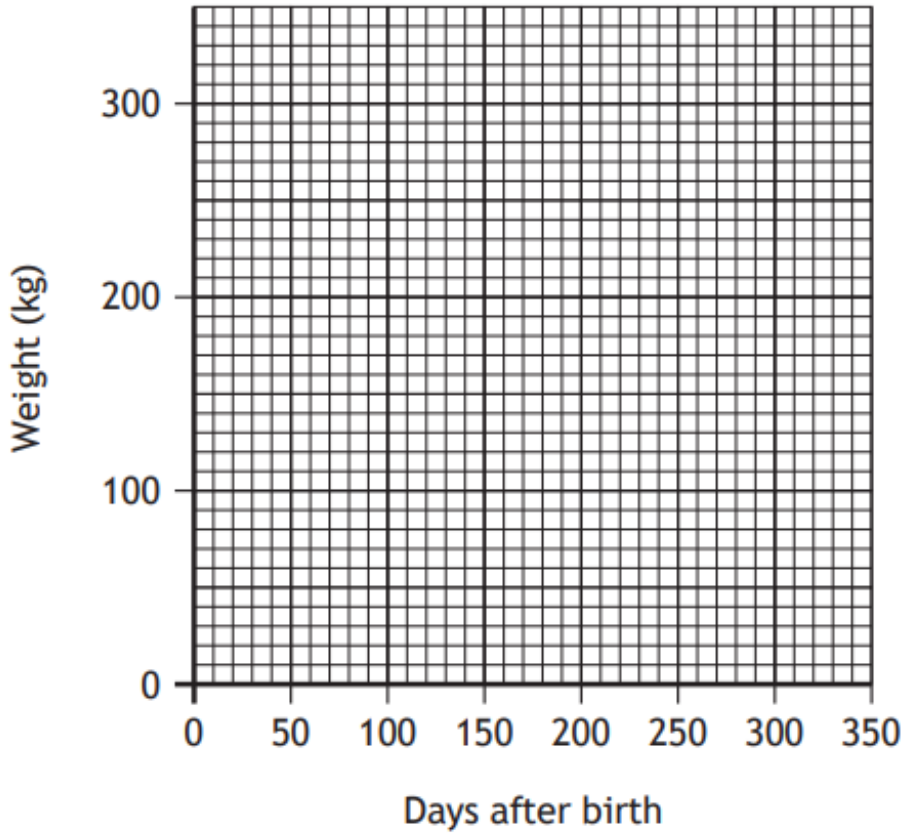
(4) Scott is a farmer.

He records the weight of a calf from birth.

The weight of his calf is shown in the table below.

Days after birth	0	60	120	160	200	260
Weight (kg)	40	110	130	175	220	275

(a) On the grid below draw a scatter graph to show this data.



(b) Draw a line of best fit on the diagram above.

(c) Use your line of best fit to estimate the **age** of this calf in days when it weighed 240 kilograms.

Source: 2017 P1 Q3 N5 Lifeskills

(5) Callum, a fitness instructor, is working with ten adults.

He records their resting pulse rates in beats per minute (bpm).

He then takes them on a "Step" exercise session and records their pulse rates immediately after this exercise.

Callum allows the adults to return to their resting pulse rates.

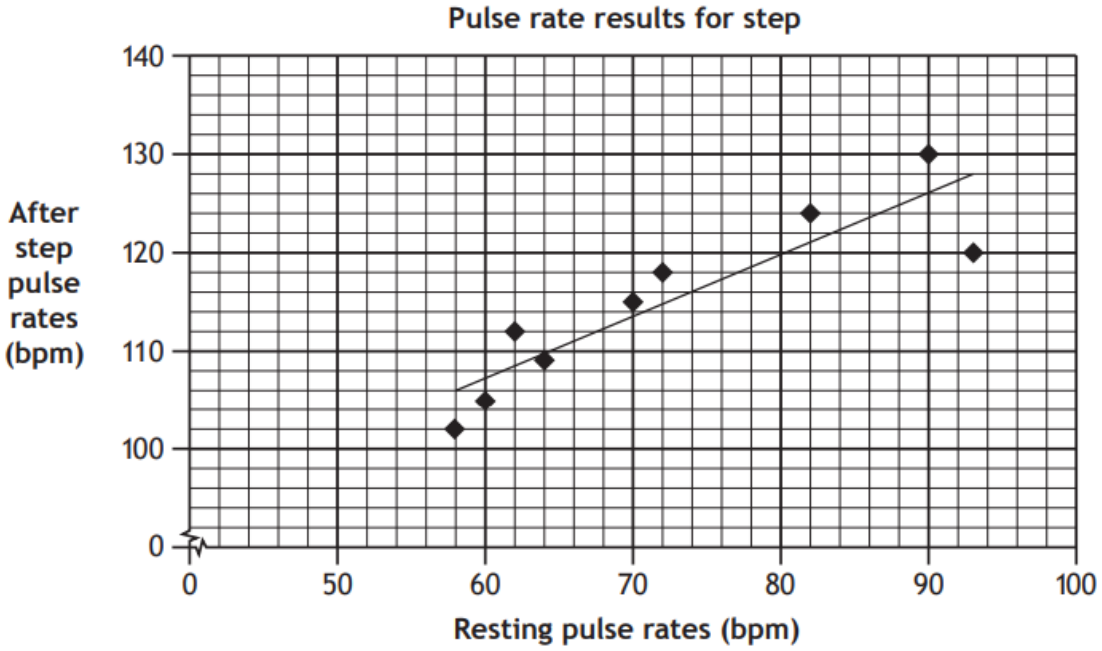
He then takes them on a "Rowing" exercise session and records their pulse rates immediately after this exercise.

The results are displayed in the table below:

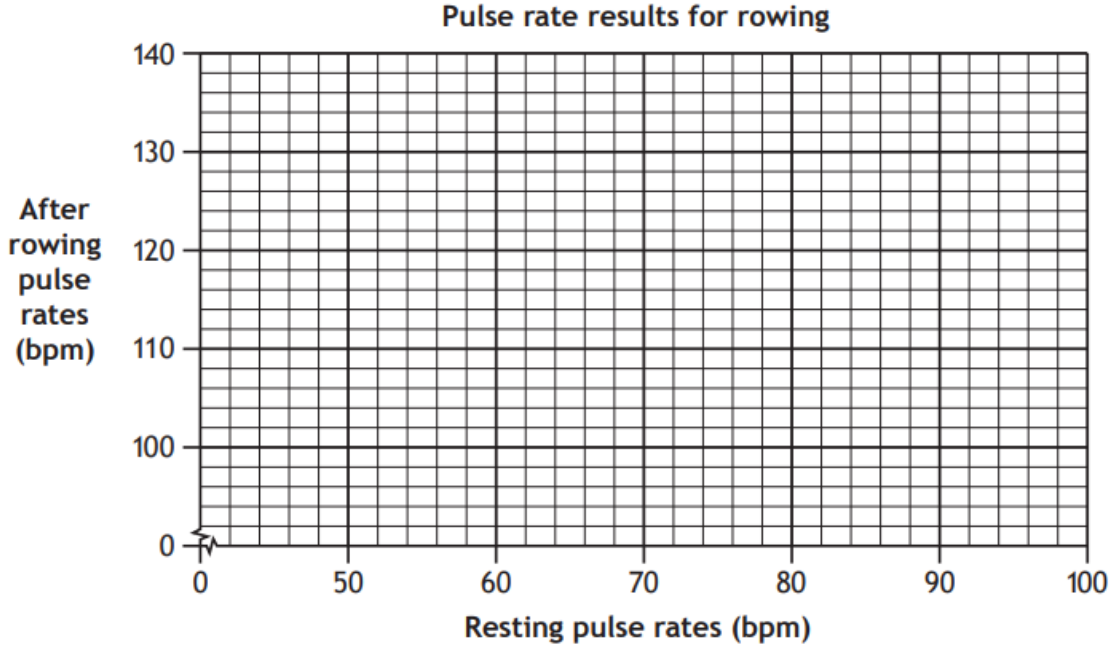
Adult		A	B	C	D	E	F	G	H	I	J
Resting pulse rate (bpm)		60	70	64	78	58	93	62	72	82	90
After Step pulse rate (bpm)		105	115	109	120	102	120	112	118	124	130
After Rowing pulse rate (bpm)		102	117	100	110	100	120	105	107	112	120

Source: Specimen P1 Q5 N5 Lifeskills

Callum has drawn the following scattergraph of the pulse rate results for the **step** exercise, and marked in a line of best fit.



(a) Mark in the pulse rate results for **rowing** on the grid below.



(b) Draw a line of best fit on the diagram above.

(c) A new member of the group had a resting pulse rate of 87. After exercise his pulse rate was 112.

Which exercise do you think he is likely to have done?

Give a reason for your answer.

Source: Specimen P1 Q5 N5 Lifeskills

Standard Deviation

Applications of Mathematics Exam Questions

(1)

The birth weight of babies in a hospital in 2017 was recorded.

A sample of the weights, in kilograms, is shown.

2·5 4·5 3·7 3·1 3·8 3·4

(a) For these weights, calculate

(i) the mean

(ii) the standard deviation.

The birth weight of babies born in hospital in 1987 was also recorded. The mean weight in 1987 was 3·4 kg and the standard deviation was 0·95 kg.

(b) Make two valid comparisons about the weight of babies in 1987 and 2017.

Source: 2019 P2 Q7 N5 Applications of Mathematics

(2) Scott trains at the velodrome on his new bike.

He records his top speed, in kilometres per hour, for each lap.

Six of these speeds are shown below.

61·2 58·3 59·1 58·8 60·4 59·8

(c) For these speeds, calculate:

(i) the mean;

(ii) the standard deviation.

Scott had a mean top speed on his old bike of 57·3 km/h and a standard deviation of 1·21 km/h.

(d) Make two valid comments comparing his top speed on the two different bikes.

Source: 2018 P2 Q8c(i)(ii) N5 Applications of Mathematics

(3) Mr Mackenzie has decided to move to South Africa with his family. He has been offered jobs in both Durban and Cape Town.

The typical monthly temperatures from March to August in Durban are recorded in the table below.

Month	**Temperature** (°C)
March	24
April	22
May	19
June	18
July	17
August	17

(a) For the typical monthly temperatures in Durban, calculate:

(i) the mean;

(ii) the standard deviation.

In Cape Town the mean monthly temperature for the same period is 15·5 °C and the standard deviation is 1·87 °C.

(b) Make two valid comments comparing the temperatures in both cities.

Source: 2017 P2 Q7 Lifeskills

(4) Fraser tests motorcycle tyres on racing circuits.

On Monday he tested Goodhold tyres.

His lap times, in seconds, are given below.

81·8 81·7 81·6 81·0 80·3 80·2

(a) For Fraser's times on Goodhold tyres, calculate:

(i) the mean;

(ii) the standard deviation.

(b) Fraser then changed to Megagrip tyres and recorded his times for another six laps.

These times produced a mean of 81·6 seconds and standard deviation of 0·65 seconds.

Make two valid comments comparing the two types of tyres.

Source: 2016 P2 Q6 N5 Lifeskills

(5) The monthly profits, in pounds, for the second 6 months of this year, are recorded below.

22 16 25 19 18 20

Calculate:

(i) the mean monthly profit.

(ii) the standard deviation.

Round your answer to the nearest penny.

(c) The mean profit and standard deviation, for the same period, the previous year was £16·25 and £2·40 respectively.

Make two valid comparisons between these.

Source: 2015 P2 Q5b,c N5 Lifeskills

(6) . Over an eight month period, Goran records how much he spends on his pay-as-you-go mobile phone.

£32, £23, £43, £40, £27, £35, £15, £25.

Calculate the mean and standard deviation for this data.

Source: 2014 P2 Q1 N5 Lifeskills

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Stem and Leaf Diagrams

Applications of Mathematics Exam Questions

(1) This back-to-back stem and leaf diagram represents the number of hours a class spends on social networking websites in a week.

Girls		Boys
	0	3 6 8 9
8 4 3 0	1	1 2 4 7 7 8 9
9 8 7 6 2 2 1	2	2 6 7 8 8
7 2 0	3	
2	4	

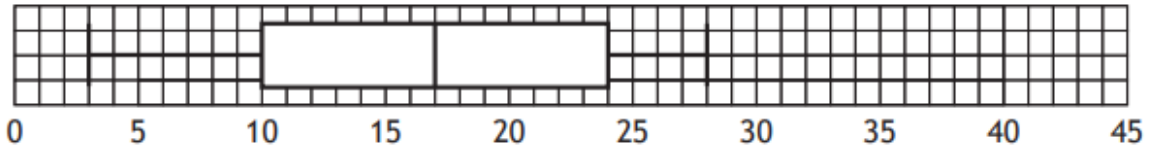
n = 15 n = 16

KEY

3 | 1 | represents 13 hours

2 | 5 represents 25 hours

(a) A boxplot is drawn to represent one set of data.



Which set of data does this represent?

Give a reason for your answer.

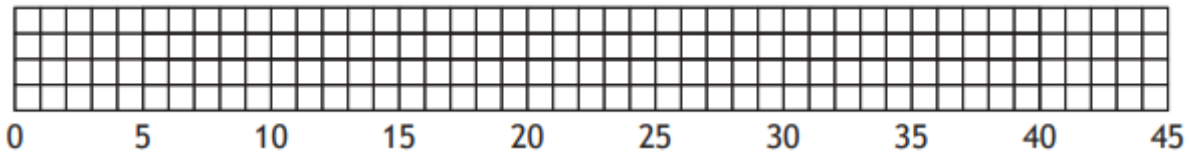
(b) For the other set of data, state:

the median

the lower quartile

the upper quartile.

(c) Construct a box plot for the second set of data.



Source: Specimen P1 Q5 N5 Applications of Mathematics

(2) The back to back stem and leaf diagram shows data gathered at a gymnasium before and after walking on a treadmill.

Heart rate data (beats per minute (bpm))

Before						After					
		9	8	3	2	0 | 5	9					
6	6	6	1	1	0	0 | 6	2	4	7	8	8
				9	6	2 | 7	1	1	1	8	
						8 | 2	4	9			
						9 | 2	5				

7 | 8 = 78

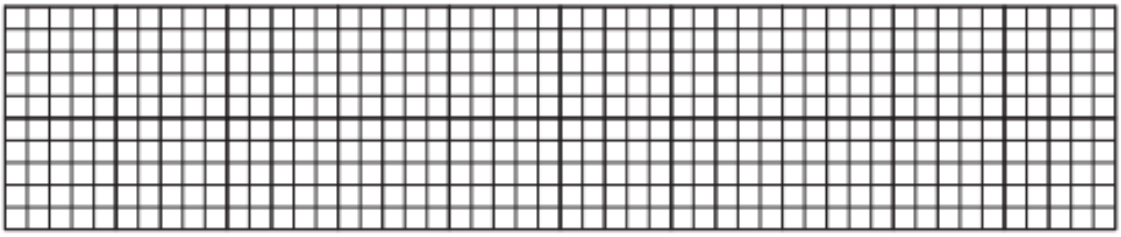
n = 15 **n = 15**

(a) State the most common heart rate (bpm) **after** walking on the treadmill.

(b) What is the difference in the median heart rates (bpm) before and after walking on the treadmill?

(c) Construct a boxplot to show the heart rate data **after** exercise.

(An additional diagram, if required, can be found on *Page 16*.)



Source: 2017 P2 Q4 N5 Lifeskills

(3)

The local youth club runs a weekly tuck shop. Any profit that is made is donated to a local charity.

The stem and leaf diagram shows their weekly takings for the first 6 months of this year.

0	5	7	7	8	9	9				
1	0	2	5	6	6	7	8	8	8	9
2	0	1	1	2	3	5				
3	0	4								

n = 24 3 | 4 represents £34

(a) (i) State:

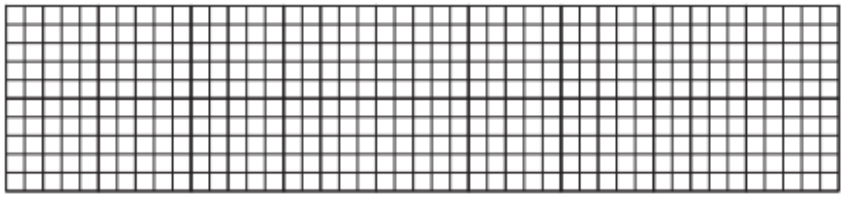
the median

the lower quartile

the upper quartile.

(ii) Using the above data construct a boxplot in the space provided.

(An additional diagram, if required, can be found on *Page fourteen*)



(b) The monthly profits, in pounds, for the second 6 months of this year, are recorded below.

22 16 25 19 18 20

Calculate:

(i) the mean monthly profit.

(ii) the standard deviation.

Round your answer to the nearest penny.

(c) The mean profit and standard deviation, for the same period, the previous year was £16·25 and £2·40 respectively.

Make two valid comparisons between these.

(d) The local youth club thinks that the mean donations have increased by 25%.

Are they correct?

Source: 2015 P2 Q5 N5 Lifeskills

Speed, Distance & Time

Applications of Mathematics Exam Questions

(1)	Joe had a business meeting in London. He travelled from home to his meeting by car. • He arrived at his meeting at 11:45 • He travelled 220 miles to his meeting at an average speed of 50 mph • During his journey he stopped for half an hour for breakfast Calculate the time he left home.
Source: 2019 P1 Q13 N5 Applications of Mathematics	

(2)	Nicola spent 21 minutes exercising on a treadmill. Her average speed was 6·6 km/h. (b) Calculate the distance she ran on the treadmill.
Source: 2018 P2 Q4b N5 Applications of Mathematics	

(3)	(c) Another rider completed one lap of the circuit in 81·0 seconds. The track is 3·6 kilometres long. Calculate his average speed in **kilometres per hour**.

Source: 2016 P2 Q6c N5 Lifeskills

(4)	Reece is given a lift to school. She leaves the house at 8:30 am and arrives at school at 8:50 am. She uses an app on her phone to calculate her average speed for the journey. Her phone displays 6·8m/s. What distance did she travel? **Give your answer to 2 significant figures.**

Source: 2014 P1 Q5 N5 Lifeskills

(5)	Alzena drove from Glasgow to Manchester Airport, 252 miles away. Alzena left Glasgow at 11.25 pm. She arrived at Manchester Airport at 3.25 am. (a) How long did Alzena's journey take ? (b) Calculate her average speed in miles per hour for the journey.

Source: Specimen P1 Q2 N5 Lifeskills

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Time Zones

Applications of Mathematics Exam Questions

(1) After a meeting in Beijing, Jennifer flies home to London via Amsterdam.

The plane leaves Beijing on 3 February at 12:15 local time.

The plane lands in Amsterdam on 3 February at 18:00 local time.

Beijing is 7 hours ahead of Amsterdam.

(a) Calculate the time taken for Jennifer's flight from Beijing to Amsterdam.

Give your answer in hours and minutes.

On landing in Amsterdam, Jennifer's phone tells her the time and date in the following cities.

Amsterdam, Netherlands	18:00	3 Feb
London, United Kingdom	17:00	3 Feb
Miami, United States of America	12:00	3 Feb

- Jennifer plans to telephone her brother as soon as she gets home.
- She will arrive at her home, in London, at 23:15 local time.
- Her brother lives in Miami, and arrives home from work at 17:00 local time.

(b) Determine whether her brother will be home from work when Jennifer makes the phone call.

Use your working to justify your answer.

Source: 2019 P1 Q9 N5 Applications of Mathematics

(2)

Steven flew to Hong Kong to start a new job.

The flight included a stop in Doha.

He flew from Edinburgh to Doha then from Doha to Hong Kong.

- The flight from Edinburgh to Doha took 6 hours 35 minutes.
- The flight from Doha to Hong Kong took 7 hours 20 minutes.
- Hong Kong is 8 hours ahead of Edinburgh.

Steven's plane took off from Edinburgh at 9:15 am local time.

It landed in Hong Kong at 8:50 am local time.

How long was the stop in Doha?

Source: 2018 P1 Q9 N5 Applications of Mathematics

(3)

Liam is on holiday in New York.

He looks at the world time app on his phone.

The display shows the times below:

His flight to Glasgow departs New York at 8:00 am local time.

The flight time is 6 hours 30 minutes.

Calculate the local time when the plane lands in Glasgow.

Source: Specimen P1 Q1 N5 Applications of Mathematics

(4)	Chris flew from Perth, Australia, to London, United Kingdom, on Saturday 9th January 2016. • The plane left Perth, Australia, at 13:05. • The total journey time, including a stopover in Dubai, is 20 hours and 25 minutes. • Perth time is 8 hours ahead of London. At what time did the plane land in London?
Source: 2016 P2 Q2 N5 Lifeskills	

(5)	Usain flies from London to Moscow for a business meeting. The plane leaves London at 1845. The flight takes 3 hours and 40 minutes. Moscow time is 4 hours ahead of London. It should take 45 minutes to collect his luggage and clear security. His company arranges for a driver to collect him from Moscow Airport. At what time should the driver expect to collect Usain?
Source: 2015 P1 Q2 N5 Lifeskills	

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Tolerance

Applications of Mathematics Exam Questions

(1)	Helen makes and sells candles. These candles should be 22·5 cm tall. She rejects any candle that is outwith the range of ±2 mm of this height. Below are the heights, in centimetres, of 10 candles chosen at random. 22·2, 22·6, 22·5, 22·9, 22·3, 21·6, 22·6, 22·4, 22·7, 22·8 Calculate the percentage of candles that she rejects.
Source: 2019 P1 Q1 N5 Applications of Mathematics	

(2)	A baking company will reject cakes if they do not weigh 400 g ± 3%. The weights of a sample of 13 cakes are shown below. 385, 391, 409, 403, 386, 412, 413, 407, 400, 390, 387, 405, 388 Calculate the fraction of cakes that will be rejected. Use your working to justify your answer.
Source: 2018 P1 Q1 N5 Applications of Mathematics	

(3)

A company orders a bag of washers with a thickness of $2{\cdot}4 \pm 0{\cdot}05$ mm.

An inspector takes a sample from the bag of washers.

The thicknesses, in mm, of the washers in this sample are shown below.

2·44, 2·37, 2·36, 2·45, 2·35

2·35, 2·44, 2·43, 2·34, 2·40

2·40, 2·41, 2·39, 2·38, 2·46

2·41, 2·39, 2·53, 2·36, 2·37

For the bag to be accepted, at least 88% of the washers in this sample must be within tolerance.

Will the bag be accepted?

Source: Specimen P1 Q3 N5 Applications of Mathematics

(4)

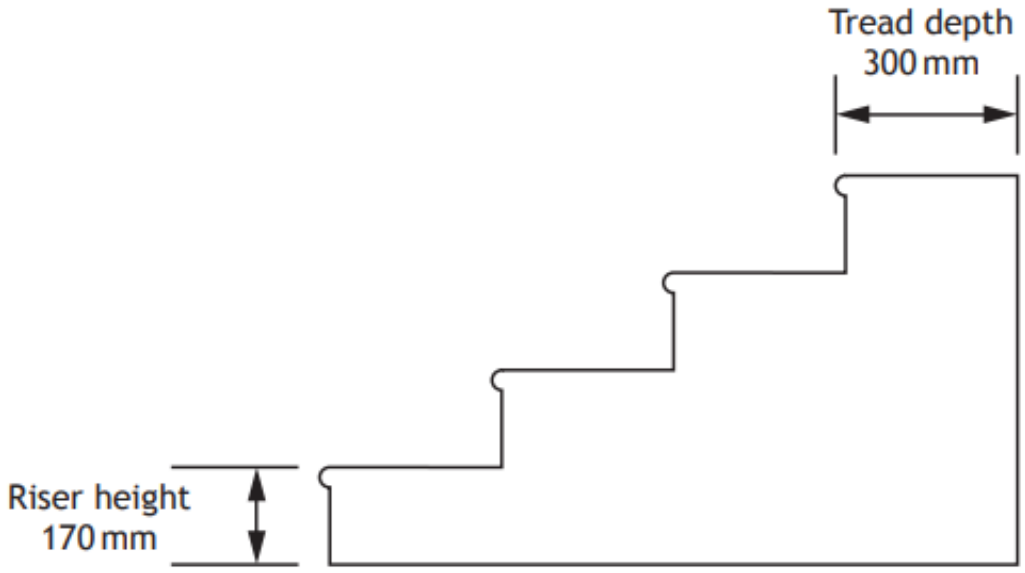
A wall is built using foam bricks which are 194 ± 2 mm long.

The wall is 50 bricks long.

What is the minimum length of the wall?

Source: 2017 P1 Q1 N5 Lifeskills

(5) . The diagram below shows a staircase Mark intends to install in his home.
The dimensions of the riser and tread of each step are shown.



For safety reasons, these rules must be applied.

- Twice the riser height plus the tread depth should be 625 mm ±15 mm.
- The gradient of each step should be less than ½.

Mark thinks that this staircase will meet both of these rules.

Is Mark correct?

Use your working to justify your answer.

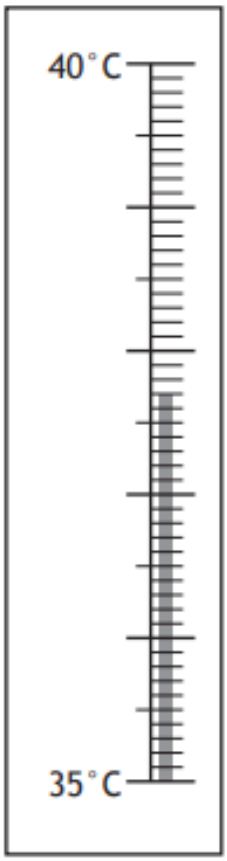
Source: 2015 P1 Q8 N5 Lifeskills

(6) Frances is not feeling well.

She takes her temperature using a thermometer.

Her temperature is shown below.

The temperature of a person in good health is 36·8°C ± 0·4°C.



Is Frances in good health?

Give a reason for your answer.

Source: 2014 P1 Q2 N5 Lifeskills

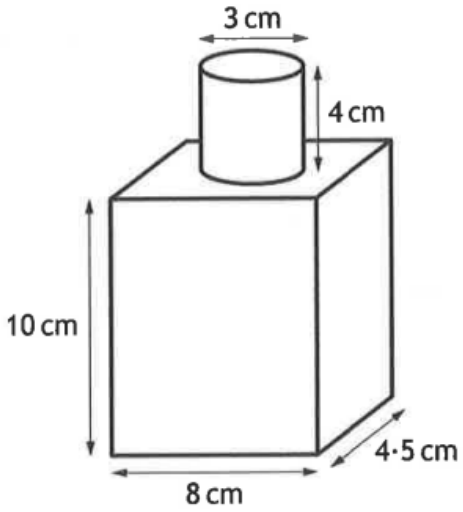
Volume

Applications of Mathematics Exam Questions

(1)

A bottle consists of a cuboid and a cylinder.

The dimensions are shown in the diagram.

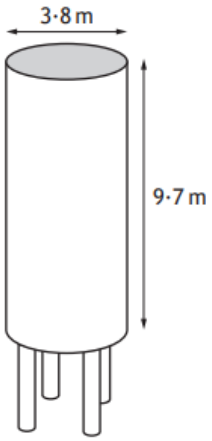


Calculate the volume of the bottle.

Source: 2019 P2 Q2 N5 Applications of Mathematics

(2)

The storage container for the sheep food is in the shape of a cylinder, with dimensions as shown below.

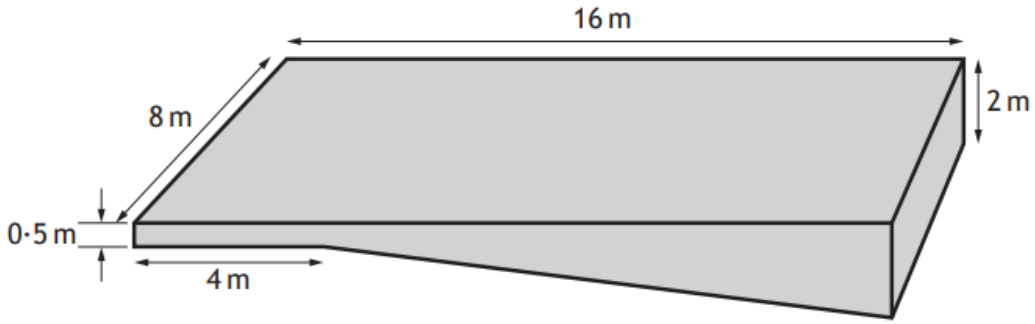


(b) Calculate the volume of the storage container.

Source: 2018 P2 Q5b N5 Applications of Mathematics

(3)

The swimming pool is a prism, with dimensions as shown in the diagram below.



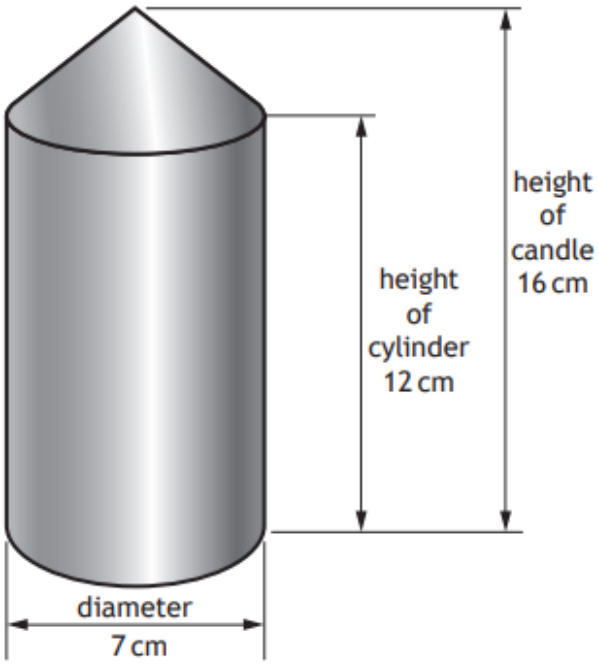
(c) Calculate the volume of the swimming pool.

Give your answer **in litres**.

Source: 2018 P2 Q11c N5 Applications of Mathematics

(4)

Brendan also makes blue candles in the shape of a cylinder with a cone on top as shown.



(c) He buys blue wax in blocks with volume 12 000 cm^3.

Brendan thinks that he can make 25 of these candles from one block of wax.

Is he correct?

Use your working to justify your answer.

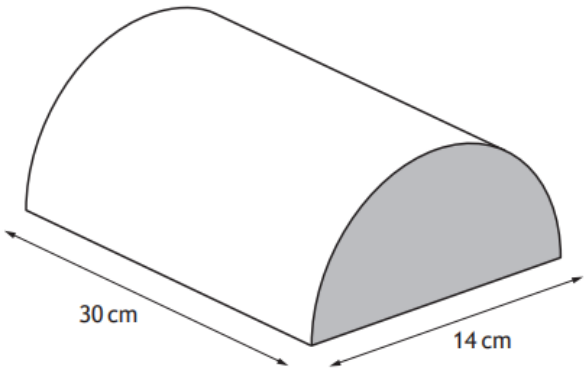
Source: Specimen P2 Q10c N5 Applications of Mathematics

(5)

The Victorians used stoneware hot water bottles.

They were semi-circular prisms as shown.

The diameter of the bottle is 14 cm and the length is 30 cm.



Calculate the volume of the hot water bottle.

Source: 2017 P2 Q1 N5 Lifeskills

(6)

For an end-of-term party, the teacher brought in a 2 litre bottle of **undiluted** orange juice.

The 2 litre bottle of undiluted orange juice has to be mixed with 4 times the amount of water.

The teacher **diluted** the orange juice and then poured it into cylindrical glasses with a radius of 4 cm and a height of 10 cm.

(a) If a space of 1 cm is left at the top of each glass, how many pupils will be able to get a glass of orange juice?

(b) If all of the diluted orange juice is poured into 25 of these cylindrical glasses so that each contains the same amount, what depth of orange juice will be in glass?

Write your answer to the nearest centimetre.

Source: Specimen P2 Q5 Lifeskills