National 5 Applications of Mathematics

Larbert High School

Practice Paper

Mark

Mathematics Paper 2 (Calculator)

1 hour 50 minutes

Fill in these boxes and read all that is written below.

Forename(s)

Surname

Class

Teacher

Total marks – 60

Attempt all question.

You may **not** use a calculator.

Full credit will be given only to solutions which contain appropriate working.
State units for answers where appropriate.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space, you must clearly identify the question number you are attempting.
Use blue or black ink.

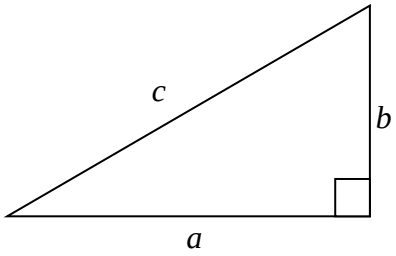
STEM Science, Technology, Engineering, Mathematics

FORMULAE LIST

Circumference of a circle: $C = \pi d$

Area of a circle: $A = \pi r^2$

Theorem of Pythagoras:



$a^2 + b^2 = c^2$

Volume of a cylinder: $V = \pi r^2 h$

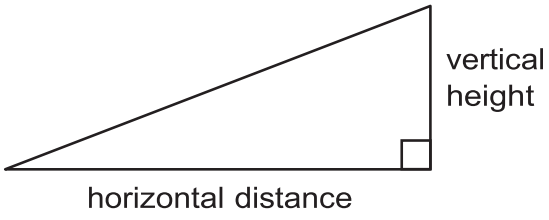
Volume of a prism: $V = Ah$

Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Standard deviation: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1}}$, where n is the sample size.

Gradient:



$$\text{gradient} = \frac{\text{vertical height}}{\text{horizontal distance}}$$

1. The following information is taken from a toy shop for the prices of Teddy Bears. The prices in the shop are shown below.

£19 £25 £17 £32 £20 £22

(a) Calculate the mean and the standard deviation

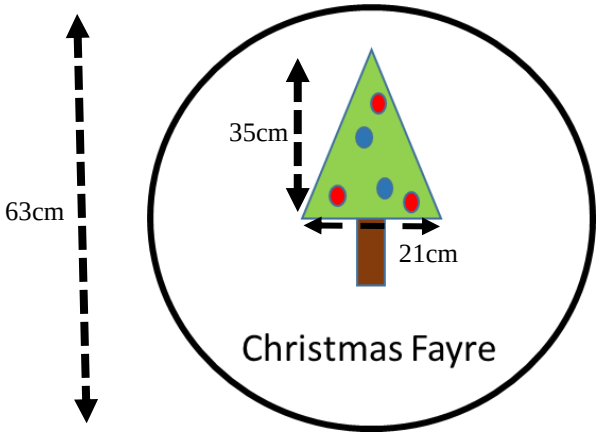
4

In a different shop the mean price was £22.50 and the standard deviation was 2.3.

(b) Make two valid comparisons about the two sets of data.

2

2. The circular logo below is being used for a Christmas Fayre. The logo is used on a banner as shown in the dimensions.



The logo is shrunk down for a leaflet on the event. The ratio between the logo on the banner to the logo on the leaflet is 7:3.

(a)What are the new dimensions of the tree on the leaflet? **2**

The tree is only supposed to occupy between 7% and 12% of the circular logo.

(b) Does the shrunk down version of the banner meet these specifications?

5

3. Henry buys a new house for £250 000.
The first two years the price of the house falls by 3%.
The following 3 years the price of the house falls by 2.5%.

(a) Calculate the new value for the house.

5

(b) Henry managed to sell his house for £230 000, calculate his loss as a percentage of the original amount.

2

4. Sarah earns £51 800

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 Sarah's annual National Insurance Payment

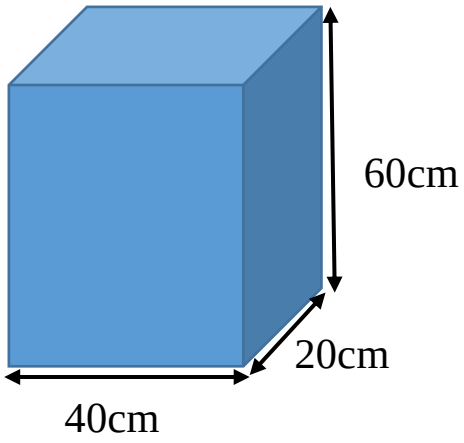
3

Sarah pays 12% of her annual salary into her pension.
Sarah's annual income tax id £7570.50
Sarah is paid in monthly payments

(b) Calculate Sarah's monthly net pay.

3

5. A company are making plastic parts. The plastic arrived at the factory in cuboid blocks before it is melted down into cylinders. The dimensions of the cuboid are shown below.

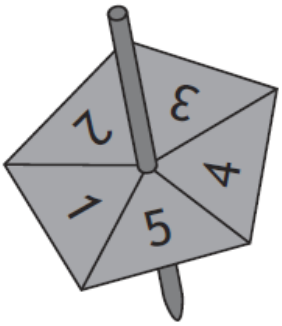


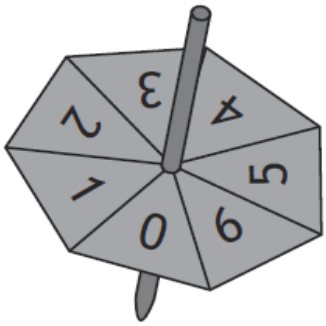
(a) Calculate the volume of the cube. **2**

This cuboid is used to make 120 plastic cylinder pieces. The radius of each plastic piece is 4cm.

(b) Calculate the height of each piece of plastic. **3**

6. A game requires two spinners as shown below. One has the numbers 1 to 5, the other has the numbers 0 to 7.

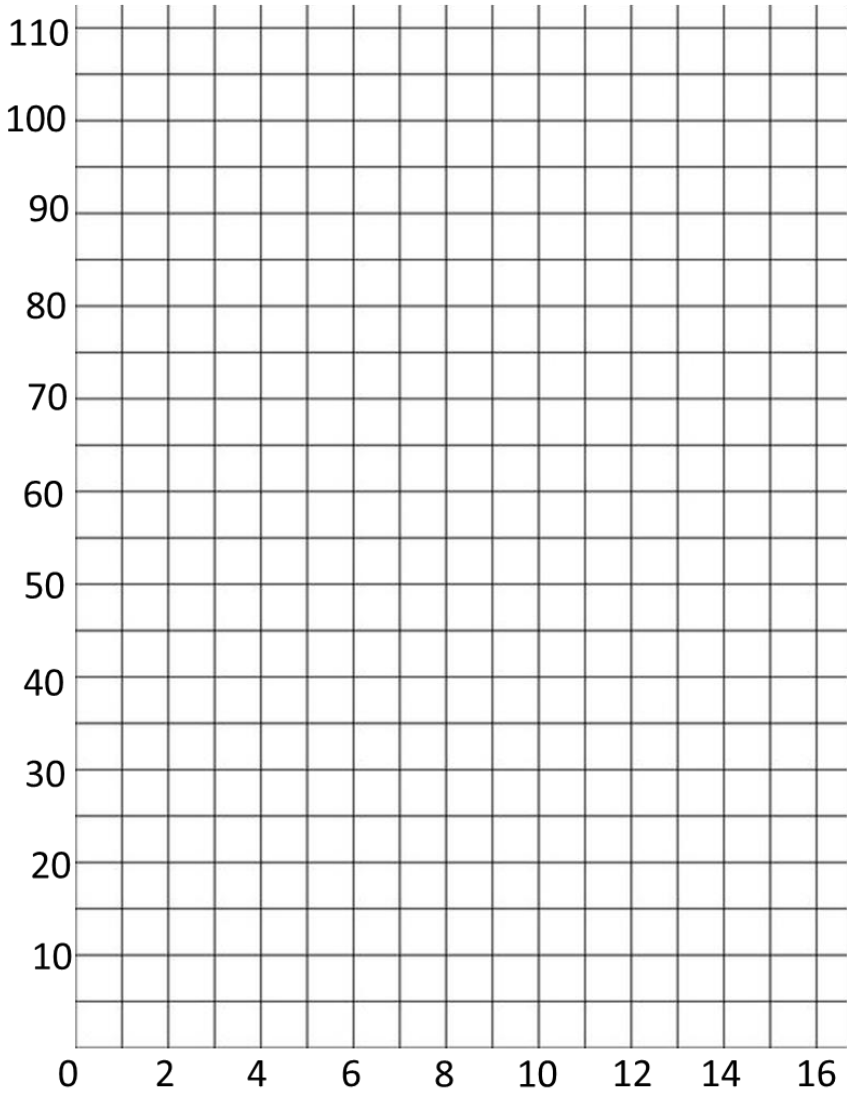




To win a prize you need to score between 0 and 3.
Calculate the probability that you do not win a prize? **3**

7. The following table shows the speed of a car accelerating from rest.

Time (secs)	0	2	6	8	12	14
Speed (mph)	0	14	44	56	82	98



(a) Plot the points on the graphs about **2**

(b) Draw an appropriate line of best fit. **1**

(c) Approximate the speed of the car after 4 seconds **1**

The car reaches its full speed at 16 seconds. The car travels for this speed for 1 hour and 20 minutes.

(d) How far does it travel in this time?

4

8. Gary works as an electrician for a company.
He is paid a basic monthly salary of £1200
Gary receives an extra 12% on his wage (before deductions) due to the high number of hours he has worked this month.

(a) Calculate Gary's pay for the month. **2**

He loses 18% of this in his pension, tax and national insurance

(b) Calculate his take home pay **2**

He writes down his expenses as follows. Everything else is called his surplus.

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

(c) Calculate Gary's surplus for the month. **2**

Gary needs to save up for a new kitchen. He doesn't want to use more than 50% of his surplus for each monthly instalment of his kitchen.

The table below shows a company's four options that he can choose, each involving monthly instalments.

Duration	12 months	24 months	36 months	48 months
Cost	£3175	£3400	£3690	£3800

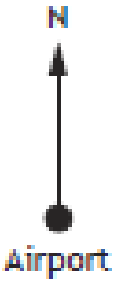
Gary would also like to have it paid as soon as he is able to.

(d) Which option should Gary take and why?

4

9. A plane flies from an airport on a bearing of 070 at a speed of 100mph for 2 hours. It then turns on a bearing of 230 and flies a further 30 minutes.

(a) Construct a scale drawing to show this journey.
Use a scale of 1cm: 20 miles **4**



(b) Calculate the distance of the plane from the airport at this point. **2**

(c) Calculate the current bearing of the airport from the plane. **2**

[Blank Page for working]