

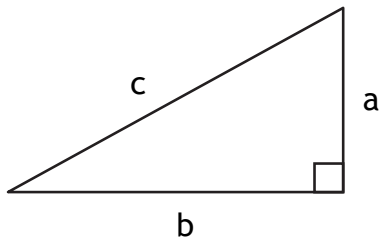
National 5 Applications Post Prelim Homework

FORMULAE LIST

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

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

Theorem of Pythagoras:



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

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

Volume of a prism: $V = Ah$

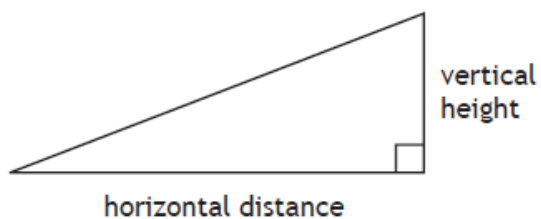
Volume of a cone: $V = \frac{1}{3} \pi r^2 h$

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

Standard deviation: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n - 1}}$,

where n is the sample size.

Gradient:



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

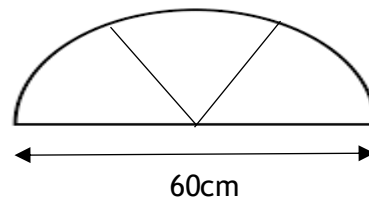
Homework 1

Non-calculator

- 720 people were asked which make of smart phone they owned.
 $\frac{3}{8}$ owned a Nokia, $\frac{2}{9}$ owned a Samsung and the rest owned an Apple.
Calculate the number of people who owned an Apple phone.
- A sculpture is to be made by stacking three blocks of stone.
Each block of stone is a cube of side (1.2 ± 0.05) metres.
Calculate the maximum and minimum height of the sculpture.
- Abby bought a mobile phone for £125.
She sold it a few months later for £80.
Calculate her loss as a percentage.

Calculator

- David's house was valued at £87450 in January 2015.
Its value appreciated by 3.5% annually.
Calculate the value of the house after 3 years.
- Joe is preparing to run the London Marathon.
He jogs round the perimeter of Strathclyde Park 5 days a week for 4 weeks.
His average speed is 9km/hr.
His total running time for the 4 weeks is 12 hours and 42 minutes.
Calculate the perimeter of the park.
- A semi-circular window is made from three identical pieces of glass.
One pane of glass was smashed by a ball.
Calculate the area of the damaged piece of glass.
- A ten pin bowling team recorded the following six scores in a match



- 134 102 127 98 104 131
- Calculate: (i) the mean
(ii) the standard deviation.

Another team had a mean score of 118 and a standard deviation of 14.8.
Make two valid comments comparing the scores of both teams.

- A plane flies on a bearing of 035° for 140km. It then turns and flies a further 215km on a bearing of 127° .
Using a scale of 1cm:20km make a scale drawing and use it to find the distance and bearing that the plane would need to fly to return to its base.

Homework 2

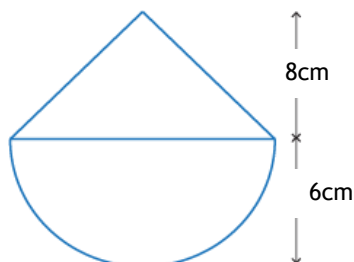
Non-calculator

- Sandy takes the bus to work each day.
Over a two week period she records the number of minutes the bus is late each day.
The results are 5 6 15 0 6 11 2 9 8 7
 - Use this information to find
 - The median
 - The lower and upper quartiles.
 - Construct a boxplot for the data
- Fred is a plumber. He is paid an hourly rate of £16.80. Overtime is paid at time and a half.
Last week Fred worked 40 hours at normal time and 6 hours overtime.
Calculate Fred's gross pay last week.
- Debbie is going to Egypt on holiday.
She exchanges £900 into Egyptian pounds.
The exchange rate is £1 = 25 Egyptian pounds.
 - Calculate how many Egyptian pounds she will receive.
She spends 21000 Egyptian pounds.
On her return the exchange rate is £1 = 20 Egyptian pounds.
 - Calculate how many British pounds she will receive.

Calculator

- A semi-circular prism has a diameter of 6m and a height of 9m.
Calculate the volume of the prism. Give your answer in litres.
- Paul conducts a survey to find the most popular school lunch.
30 pupils voted for Pasta
40 pupils voted for Baked Potato
2 pupils voted for Salad.
Construct a pie chart to show this information
- Mr Houston bought a new car for £18500 in July 2014.
Its value depreciated by 15% in the first year then by 18% in each of the following 2 years.
Calculate the value of the car after 3 years.

7.



A badge consists of a semi-circle and a triangle as shown.

- Calculate the area of the badge.
- It costs 34p per square centimetre to make a badge
Calculate the cost to make 25 badges.

Homework 3

Non-calculator

1. A cake requires self raising flour and plain flour in a ratio of 3:1
 - (a) The cake needs 300g of self raising flour, how much plain flour is needed?
 - (b) Jenny wants to make as many cakes as possible. She has 730g of self raising flour and 200g of plain flour.
What is the maximum number of cakes she can make?
2. Evaluate $\frac{3}{4}$ of 480g.
3. A sweet manufacturer rejects packets of sweets whose weight does not lie within the acceptable tolerance level of $(120 \pm 2\%)$ grams.
Calculate the maximum and minimum acceptable weights.

Calculator

4. For safety reasons the speed limit outside Fairfield park is 20mph.
The distance between the speed limit signs is half a mile.
A van took 2 minutes to travel between the signs.
Was the van travelling at a safe speed?
5. Steph earns £47 560 per annum.
National Insurance is calculated before deductions.

| National Insurance Rates | |
|--------------------------|-----|
| Up to £8060 | 0% |
| From £8061 to £42380 | 12% |
| Over £42 381 | 2% |

- (a) Calculate Steph's annual National Insurance Contributions.
 - (b) Steph pays 9.3% of her annual salary into her pension.
Steph's annual income tax is £6843.48.
Steph is paid in 12 monthly instalments.
Calculate Steph's monthly net pay.
6. The Davidson family are planning to buy a new kitchen using hire purchase.
The cash price of the kitchen is £6300.
The hire purchase price is 22% more than the cash price.
The hire purchase agreement requires a deposit which is 15% of the cash price followed by 60 equal instalments.
Calculate the cost of each instalment.
 7. A sample of six boxes contains the following number of pins:

43 39 41 40 39 44

- Calculate: (i) the mean
(ii) the standard deviation.

A sample from a second machine has a mean of 40 and a standard deviation of 2.6. Make two valid comments comparing the two machines.

Homework 4

Non-calculator

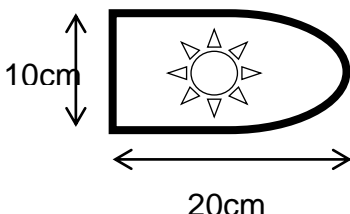
1. The table shows the results of a survey of First Year pupils

| | Wearing a blazer | Not wearing a blazer |
|-------|------------------|----------------------|
| Boys | 40 | 22 |
| Girls | 29 | 9 |

What is the probability that a pupil, chosen at random from this sample, will be a girl wearing a blazer?

2. A sphere has a diameter of 6 centimetres.
Calculate its volume.
Take $\pi = 3 \times 14$
3. At a ski resort the temperature was recorded each day at noon for the first fortnight in February.
- 0 -1 2 -5 4 2 -3 1 -4 8 -6 4 -2 1
- a) Calculate:
- (i) the median temperature
 - (ii) the lower quartile
 - (iii) the upper quartile
- b) Construct a box plot for this set a data.

Calculator

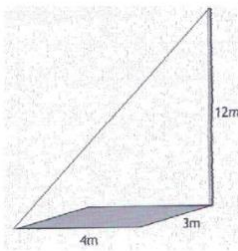
4. Ian's annual salary is £28 400. His boss tells him that his salary will increase by $2 \times 3\%$ per annum.
Calculate Ian's salary after 3 years.
5. Matthew's monthly salary is £1240. He also received 3% commission on all sales over £4500.
Last month he made sales of £9750.
Calculate his gross salary last month.
6. Gemma designs a brooch in the shape of a rectangle and semi-circle.
She plans to put gold leaf around the edge.
She has a piece of gold leaf 58cm long.
Is this long enough?
Use your working to justify your answer.
- 
7. The cost of painting is directly proportional to the area being painted.
A wall 10 metres by 2×5 metres costs £12 × 50 to paint.
Calculate how much will it cost to paint a wall 12 metres by 4 metres.
8. A plane is flying on a bearing of 37° for 130km. It then flies on a bearing of 245° for 225km.
Using a scale of 1cm represents 20km, make a scale drawing of the plane's journey.

Homework 5

Non-calculator


1. Janine is a cleaner.
She has an appointment with a new client at 1315.
She needs to two cleaning jobs to complete before the appointment.
One house takes 2hours and 20 minutes to clean and the other takes 1 hour and 55 minutes.
It takes her 10 minutes to get to the first job, 20 minutes to the second job and a further 15 minutes to get to the appointment.
If she leaves her house at 0745, will she make it to the appointment on time?
Use your working to justify your answer.
2. Jen arrives at Glasgow airport at 2140.
Her flight departs in 1 hour and 50 minutes.
The flight to Cancun is 11 hours.
Cancun is 6 hours behind British time.
 - a) Calculate the local time in Cancun when the flight arrives.
 - b) Glasgow to Cancun is 7680 km.
Calculate the average speed of the aircraft, give your answer correct to two significant figures.

3.



- A mast is fixed to the corner of a concrete base as shown in the diagram. A wire is fixed from the top of the mast to the opposite corner of the base. The base is 4m long and 3m wide. The mast is 12m high.
Calculate the length of the wire.

Calculator

4. A tin of beans has a diameter of 7×3 cm and a height of 22cm.
The tins are packed into boxes measuring 50cm by 40cm by 90cm.
 - a) Calculate the largest number of tins that can be packed into one box.
 - b) The company have 65 000 tins of beans to be sent out to supermarkets. One lorry can hold 75 boxes of beans.
Calculate how many lorries are needed to transport all the boxes of beans.
5. A football is in the shape of a sphere with a diameter of $11\text{cm} \pm 3\text{mm}$.
Calculate the difference between the maximum and minimum volumes of the football.
6. 

A road drops from a height of 1423 metres to a height of 1376m. The road has a gradient of $\frac{1}{3}$.
Calculate the length of the road.
7. Harry records his golf scores. The scores for some of the games are
84 78 87 80 81
 - a) For this sample calculate the mean and standard deviation.
His friend has a mean score of 84 and a standard deviation of 3×32 .
Make two valid comments comparing the scores.

Homework 6

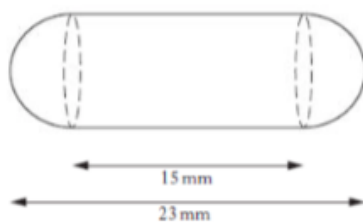
Non-calculator

- Dave and Eva each have the same monthly data allowance.
Dave used $\frac{4}{7}$ of his monthly allowance.
Eva used $\frac{5}{8}$ of her monthly allowance.
Eva thinks she used more data than Dave. Is she correct?
- It took 10 men 20 hours to dig a 12 metre long ditch.
Working at the same rate, calculate how long it will take 8 men to dig the same 12 metre ditch.
- Henri exchanged £800 into euros at a rate of £1 to 1×20euro.
He spends 90euro each day on his 7 day trip.
Before returning he spends half of his remaining money on presents.
Does he have enough money left to pay for his 120euro flight home?

Calculator

- Robert invests £50 000. The interest rate is 4×5% per annum.
Calculate the value of the investment after 4 years.
- Irene works in the local pharmacy.
One week she worked 40 hours at her basic rate of pay and 3 hours overtime at double time.
Her gross pay for that week was £239×20.
Calculate Irene's basic hourly rate of pay.
- A sculpture is to be made by stacking three blocks of stone. Each block of stone is a cube of side 1×2 metres ±5cm.
 - Calculate the maximum height of the sculpture.
 - Calculate the minimum volume of stone needed to make the sculpture.

7.



A health food shop produces cod liver oil

- A ship sails north east for 250km from Port A to oilrig B. It then changes course and sails a further 150km on a bearing of 153° to oilrig C.
 - Use a scale of 1cm:50km to construct a scale diagram.
 - Using your diagram calculate the distance and bearing that the ship sails to return to port.
 - If the ship sails at 20km/hr, calculate the time taken to complete the whole journey.

Homework 7

Non-calculator

1. James is a builder. He is paid an hourly rate of £19.40. Overtime is paid at time and a half.
Last week Fred worked 40 hours at normal time and 8 hours overtime.
Calculate James' gross pay last week.
2. A wall is to be made by placing 50 foam blocks together.
Each foam block is a cuboid of side (0.6 ± 0.05) metres.
Calculate the maximum and minimum length of the wall.
3. Steph bought a guitar for £250 and sold it for £375.
Calculate his percentage profit or loss.

Calculator

4. A water trough is in the shape of half a cylinder has a diameter of 70cm and a length of 1.6m.
Calculate the volume of the water trough.
5. The number of people per hour, for the first eight hours, who voted at a remote polling station are shown,

38, 47, 46, 82, 75, 74, 76, 66

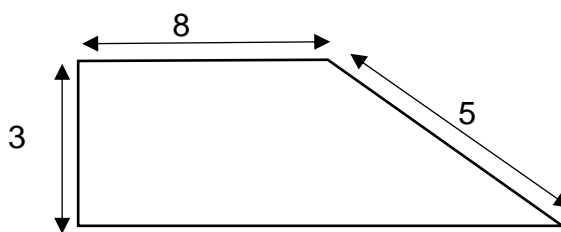
- (a) Calculate the mean and standard deviation for this data.
 - (b) At another election at the same polling station the mean number of people voting was 58 and the standard deviation was 14.2.
Make two valid comments between the data recorded over the two elections.
6. Richard invested £14000.
The value of the investment appreciated by 7.3% over the first 3 years.
It then depreciated in value by 4.6% in the fourth year.
Calculate the value of the investment at the end of the fourth year.

7. Fred is going to replace the grass in his garden.

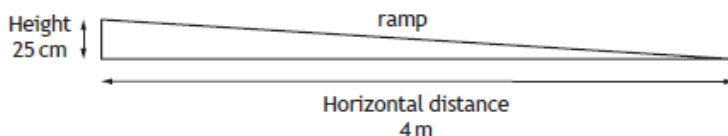
- (a) Calculate the area of grass to be replaced.

- (b) It costs £4.50 per square metre for new grass.

Calculate how much it will cost Fred to replace his grass.



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



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

Does the gradient of this ramp meet the regulations?
Use your working to justify your answer.