Question 1

A car will travel 19 km per litre of fuel in the country and 13 km per litre in town. If 32% of fuel is used in town, how many km will the car go on 88 L of fuel? Give your answer to the nearest kilometre.

The car will travel 32% of 88 L at 13 km/L
The car will travel 68% of 88 L at 19 km/L
32% of 88 = 28.16
68% of 88 = 59.84
Therefore car will travel
28.16 x 13 = 366.08 plus 59.84 x 19 = 1,136.96
Total 366.08 + 1,136.96 = 1,503.04
Final answer rounded to nearest kilometre = 1,503

Question 2

A football stadium has eight turnstiles: 3 are fast and each admit 9,000 persons per hour; the others are slower and admit only 5,000 persons per hour each. If the stadium holds 40,000 people, how many minutes will it take to fill the stadium? Round your answer to the nearest minute.

Fast turnstiles will admit 3 x 9,000 = 27,000 per hour
Number of slow turnstiles 8 – 3 = 5
Slow turnstiles will admit 5 x 5,000 = 25,000 per hour
Total number admitted per hour = 25,000 + 27,000 = 52,000
Total admitted per minute = 52,000/60 = 866.67
Time taken to admit 40,000 = 40,000/866.67 = 46.15
Round to nearest minute = 46

Question 3

A lorry weighs 4 tonnes and is carrying a load of 12 tonnes. If a bridge has a weight restriction of 12 tonnes, what percentage of the load has to be removed to enable the lorry to cross safely? Give your answer to the nearest whole number.

Total weight of laden lorry is 4 + 12 = 16 tonnes
Excess weight to be removed is 16 – 12 = 4 tonnes
4 tonnes as a percentage of 12 tonnes = 4*100/12 = 33.33%
Answer rounded to nearest percent = 33
Question 4

Three friends go drinking regularly at the local pub. They agree to split the bill in proportion to their annual net salary. If friend A earns £90,000 per year, B earns £15,000 per year and C earns £35,000 per year, and the bill is £60.32, how much will A pay to the nearest penny? Give your answer in pounds and pence without a currency symbol (e.g. 99.99).

Total salary of friends is £90,000 + £15,000 + £35,000 = £140,000
Friend A earns as percentage of total salary £90,000*100/£140,000 = 64.28%
A will pay 64.28% of £60.32
(60.32/100) x 64.28 = 38.777
Answer rounded to nearest penny 38.78

Question 5

How many grams of calcium hypochlorite granules do you need to add to a swimming pool of length 6 m, width 18 m and depth 1.5 m to raise the chlorine level by 2 parts per million (ppm) if 0.000165 g of chlorine per litre will raise the level by 1 ppm? 1 m³ of water is equal to 1,000 L. Give your answer to nearest whole number of grams.

Pool volume = 6 x 18 x 1.5 = 162 m³.
Pool volume in litres = 162 x 1,000 = 162,000
To raise chlorine by 2 ppm requires 0.000165 x 162,000 x 2 = 53.46
Answer rounded to nearest whole number of grams = 53

Question 6

An item costs £150 inclusive of VAT. If the VAT level is changed in the budget from 15% to 12%, how much would you save on this purchase? Give your answer in pounds and pence without a currency symbol (e.g. 99.99).

Calculate value of article before VAT at 15% added.
150/1.15 = 130.43
Add VAT at 12%
130.43 x 1.12 = 146.08
The difference is 150 – 146.08 = 3.91
**Question 7**

Compound Interest is calculated using the formula \( M = P(1+i)^n \) where \( M \) is the final sum, \( P \) is the principal sum invested, \( i \) is the annual % interest rate divided by 100 (to convert to a decimal) and \( n \) is the number of years invested. How much interest will you receive if you invest £100 for 10 years at an interest rate of 5%? Round your answer to the nearest penny and give it in pounds and pence without a currency symbol (e.g. 99.99).

Calculate \((1+i)^n = 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 = 1.6289\)

Substitute into formula \(1.6289 \times 100 = 162.89\)

Deduct principle sum £100

Final answer = **62.89**

**Question 8**

A pond containing 100,000 L of water is leaking at a rate of 500 L/day. If 5% of the pond has emptied already, how many litres of water per hour will be needed over 24 h to counteract the leak and fill the pond to the pre-leak level? Give your answer to one decimal place.

Calculate pond water deficit at 5% of the volume of the pond \( 100,000 \div 100 \times 5 = 5,000 \)

Add ongoing leak to deficit to determine litres required in 24 hours \( 5,000 + 500 = 5,500 \)

Divide by 24 to determine hourly filling rate required = \( 5,500 \div 24 = 229.166 \)

Answer to one decimal place **229.2**

**Question 9**

A keeper of tropical marine fish has a tank and aims to keep the salt concentration at 3.5 g/L. The salt concentration has risen to 3.6 g/L owing to evaporation. If at the time of testing the tank contains 340 L, how many litres of water must be added to correct the salt concentration? Give your answer in litres to one decimal place.

Calculate the total amount of salt in grams in the tank: \( 340 \times 3.6 = 1,224 \)g

Calculate how much water is required to give a concentration of 3.5 g/L

\( 1,224 \div 3.5 = 349.71 \)

Subtract the existing volume from the volume required to dilute the salt to required concentration

\( 349.71 - 340 = 9.71 \)

Round to 1 decimal place = **9.7**
**Question 10**

_A chef in a hospital canteen is creating a meal of 300 kcal for a patient. He uses 70 g of chicken at 1.25 kcal/g, 80 g of peas at 0.75 kcal/g and 100 g of gravy at 0.25 kcal/g. If potato is 0.7 kcal/g, how many grams of potato would be needed to provide the required number of calories? Give your answer to the nearest whole number._

Calculate kcal already included in meal

\[(70 \times 1.25) + (80 \times 0.75) + (100 \times 0.25) = 172.5\]

Calculate deficit 300 – 172.5 = 127.50

Divide by kcal content of potato \(127.5/0.7 = 182.14\)

Final answer **182**

**Question 11**

_A farmer has 109 cows, of which 10 produce 50 L of milk each per day, 50 produce 20 L each per day and the rest produce 7 L each per day. If he is able to get rid of 30 of his lowest producing cows, by how many litres per day will his average milk yield per cow increase? Give your answer to 2 decimal places._

How many cows produce 7 L per day = 109 – 10 – 50 = 49

Calculate total milk yield

\[10 \times 50 + 50 \times 20 + 49 \times 7 = 1843\]

Average yield per cow \[1843/109 = 16.908\]

Remove 30 cows from herd 109 – 30 = 79

How many cows produce 7 litres per day = 79 – 10 – 50 = 19

Calculate total milk yield

\[10 \times 50 + 50 \times 20 + 19 \times 7 = 1633\]

Average yield per cow \[1633/79 = 20.671\]

Subtract initial yield from final yield \[20.671 – 16.908 + 3.762\]

Answer rounded to 2 decimal places = **3.76**
Question 12

Shop A advertises an article of clothing for £249.99 with a discount of 45%, whereas shop B advertises the same article at the same starting price with a discount of 30% plus an extra reduction of 15% of the discounted price that day. How much cheaper is the article in shop A? Give your answer to the nearest penny and enter it as pounds and pence without a currency symbol (e.g. 99.99).

Calculate the price in shop A

Note that a discount of 45% means the price is 55% of the original amount.

\[
\frac{249.99}{100} \times 55 = £137.49
\]

Calculate the price in shop B

Apply first discount

Note that a discount of 30% means the price is 70% of the original amount.

\[
\frac{249.99}{100} \times 70 = £174.99
\]

Apply second discount

Note that a discount of 15% means the price is 85% of the previous amount.

\[
\frac{174.99}{100} \times 85 = 148.74
\]

Deduct final price in shop A from final price in shop B

\[
148.74 - 137.49 = 11.25
\]

Question 13

In a house the lights are on for an average of 8 hours per day. There are 20 bulbs of 60 W and electricity costs 18 p per kW hour. If after an economy drive the bulbs are swapped for LED bulbs of 5 W which are used for 7 hours per day, how much money will be saved in a year? Give your answer in pounds and pence (without a currency symbol) to the nearest penny.

Calculate current usage for 1 day in watts = 8 x 20 x 60 = 9,600

Calculate new usage for 1 day in watts = 7 x 20 x 5 = 700

For amount of saving subtract new usage from current usage = 8,900

Convert to kW = 8,900/1,000 = 8.9

Multiply by 365 for annual saving = 3,248.5

Multiply by 18 for saving in pence = 5,8473

Divide by 100 to convert to pounds and pence = 584.73
Question 14

A decorator papers a wall 2.3 m high by 5 m wide. A roll of wallpaper is 10 m long and 52 cm wide. Allowance of 70 cm must be made for each piece cut in order to match the pattern. How many whole rolls of paper are required to complete the job?

Calculate how many whole pieces can be taken from a roll of wallpaper:

Need to convert centimetres to metres by dividing by 100
Add wall drop to allowance for pattern = 2.3 + 0.7 = 3 m
10 m divided by 3 = 3.33 which is 3 whole pieces per roll.
Calculate how many pieces are required to complete the job?
5 m divided by 0.52 m = 9.61
This requires 10 pieces to complete the job
There are 3 whole pieces per roll so rolls required is 10/3 = 3.33
Therefore 4 rolls are required to complete the job

Question 15

A gardener needs to treat his lawn with weed & feed granules. His lawn is 11.7 m wide and 22.8 m long. The lawn product is in a pack of 1 kg which is sufficient to treat 250 m\(^2\) of lawn. If his applicator applies 15% more product than required, how many grams will he need? Answer to the nearest whole number of grams.

Calculate area of the lawn 11.7 x 22.8 = 266.76 m\(^2\)
Calculate grams needed to treat 1 m\(^2\) 1,000/250 = 4 g
Calculate the quantity required if applicator working correctly 266.76 x 4 = 1,067.04
Add an additional 15% for overtreatment 1,067.04 x 1.15 = 1,227.096
Final answer 1227

Question 16

An environmental agency needs to spray Japanese knotweed with a solution that contains 10.5 g/L of glycophosphate. If a litre of the concentrated product contains 460 g of glycophosphate, how many litres of water have to be added to a litre of concentrate to provide a solution of the correct concentration? Give your answer in litres rounded to 1 decimal place.

How many times stronger than required is the concentrated product.
460/10.5 = 43.8
Therefore the required diluted volume is 43.8 x 1 = 43.8 L
To calculate how much fluid to add to obtain this dilution, subtract volume in which the concentrate is contained
43.8 – 1 = 42.8
Final answer 42.8
Question 17

A mother cuts a freshly baked cake into 2 pieces. She then cuts one of these pieces into 2 pieces. Finally she cuts one of these pieces into 2 pieces. What percentage of the whole cake does one of these final pieces represent? Give your answer to the nearest whole percentage.

Calculate the fraction of the cake the final piece represents.

\[
\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}
\]

Convert into percentage \(\frac{1}{8} \times 100 = 12.5\%

Final answer = 13

Question 18

Shop A sells a pack of 12 sausages for £3.50. Shop B has a pack of 10 sausages for £4.25 with a buy one get one half-price offer. Shop C has packs of 15 for £3.80 with a buy one get one free offer. If you buy two packs of sausages from each shop, what is the difference in price per sausage between the most expensive and the cheapest sausages? Give your answer in pence to the nearest penny.

Calculate prices of individual sausages from shops A, B & C:

Shop A

\[
3.50/12 = \£0.2916
\]

Shop B

\[
4.25 \times 1.5 = 6.375/20 = \£0.318
\]

Shop C

\[
3.80/30 = \£0.1267
\]

Subtract shop C price (cheapest) from shop B price (most expensive)

\[
\£0.318 - \£0.1267 = \£0.1913
\]

Final answer in pence 19

Question 19

How many calories (kcal) are there in a glass containing 150 mL of wine with an abv of 11% (abv = mL of alcohol per 100 mL of wine)? One mL of alcohol weighs 0.8 g and 1 g of alcohol contains 7 kcal. Give your answer to the nearest whole kcal.

Calculate mL of alcohol in glass of wine \(150/100 \times 11 = 16.5\)

Convert mL to grams of alcohol \(16.5 \times 0.8 = 13.2\ g\)

Calculate calories in \(13.2\ g\) wine \(13.2 \times 7 = 92.4\ kcal\)

Final answer = 92
Question 20

Jo is going fishing. For his planned session he needs half a litre of maggots and 2 kg of ground-bait. Maggots cost 60p per 100 mL; ground-bait costs 25p per 100 g. The shop offers a 15% discount on purchases over £5. How much will Jo pay for his purchase? Give your answer in pounds and pence without a currency symbol (e.g. 99.99).

How much will Jo’s bait cost without the discount?

Half a litre of maggots = 5 x 100 mL @ 60p = 5 x £0.60 = £3.00
Two kilograms of ground-bait = 20 x 100 g @ 25p = 20 x £0.25 = £5.00
Total cost = £8.00
Applying 15% discount gives (1 – 0.15 = 0.85) x £8.00 = £6.80
Final answer = 6.80