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Question Index

Task 1 – non-calculator

Question 1

The table below shows the distances walked by Jay each day in a week.

Day of week	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Distance walked	$1\frac{1}{2}$ miles	$\frac{3}{4}$ mile	$\frac{1}{2}$ mile	$\frac{1}{3}$ mile	$\frac{1}{3}$ mile	$\frac{3}{4}$ mile	0 miles

What was the total distance Jay walked over the whole week?

(2 marks)

Workings:

$1.5 + 0.75 + 0.5 + 0.33 + 0.33 + 0.75 = 4.16$ miles (4.17 allowed)

Marks:

1 mark for conversion to decimals

1 mark for correct answer

Question 2

Put these fractions in order of size, smallest to largest:

$\frac{4}{3}$ $\frac{3}{4}$ $\frac{3}{8}$ $\frac{7}{6}$ $\frac{5}{8}$

(1 mark)

Workings:

$\frac{4}{3} = 1.333$, $\frac{3}{4} = 0.75$, $\frac{3}{8} = 0.375$, $\frac{7}{6} = 1.167$, $\frac{5}{8} = 0.625$

So order is:

$\frac{3}{8}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{6}$, $\frac{4}{3}$

Marks:

1 mark for correct order

Question 3

Calculate 273696 ÷ 24?

(1 mark)

Workings:

$$\begin{array}{r} 0\,1\,1\,4\,0\,4 \\ 24 \;\big|\; 2^{2}7^{3}3^{9}6^{0}9^{9}6 \end{array}$$

$273696 \div 24 = 11404$

Marks:

1 mark for correct answer

Question 4

Calculate the surface area of a cube when the length of a side a = 15cm.

Surface area = $6a^2$

(2 marks)

Workings:

$a^2 = (15\ cm)^2 = 225\ cm^2$
$6 \times 225\ cm^2 = 1350\ cm^2$

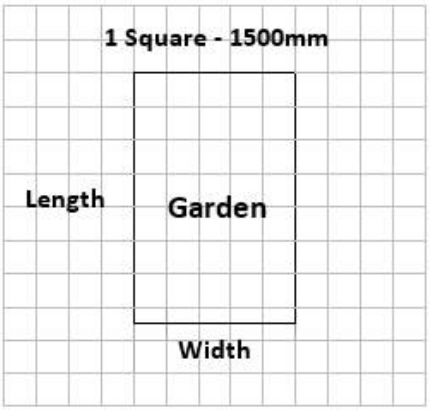
Marks:

1 mark for substitution of (a = 15 cm) into formula

1 mark for correct answer

Question 5

Simon is redesigning his garden. He has drawn his garden on the diagram below where 1 square = 1500mm.



Using the grid, calculate the actual length of the garden in metres?

(2 Marks)

Workings:

1 square = 1500 mm = 1.5 m

Length = 7.5 squares

$Length = 7.5 \times 1.5\ m = 11.25\ m$

Marks:

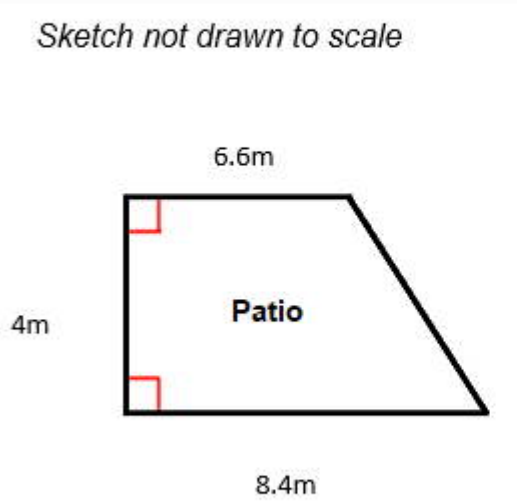
1 mark for conversion of mm to m

1 mark for correct calculation

Question 6

Simon is planning to build a patio in his garden. The patio will have four sides.

He has drawn a sketch of the patio below.



Calculate the area of the patio.

(3 marks)

Workings:

Use the formula for area of trapezium:

$$area = \frac{1}{2}(a+b)h$$

$$area = \frac{1}{2}(6.6+8.4)4$$

$$area = \frac{1}{2}(15)4$$

$$area = \frac{1}{2}(60) = 30$$

Marks:

1 mark for correct use of trapezium rule or otherwise

1 mark for correct workings

1 mark for correct answer

Question 7

For the foundation of the patio, Simon will use a dry mixture of sand and cement.

He will need 20kg of mixture for each square metre of patio.

To make the mixture he needs to mix sand and cement in the ratio of 5:1.

Calculate how many 25kg bags of cement he will need.

Assume the area of the patio is 30 m^2

(4 marks)

Workings:

$Mass\ of\ mixture\ required = 20\ kg \times 30 = 600\ kg$

$Total\ parts = 5 + 1 = 6$

$1\ part = \frac{600\ kg}{6} = 100\ kg$

$Bags\ of\ cement\ required = 100\ kg \div 25\ kg = 4$

4 bags of cement are required

Marks:

1 mark for correct mass of mixture

2 marks for correct calculation using ratios

1 mark for identifying correct number of bags

Task 2 – calculator

Question 8

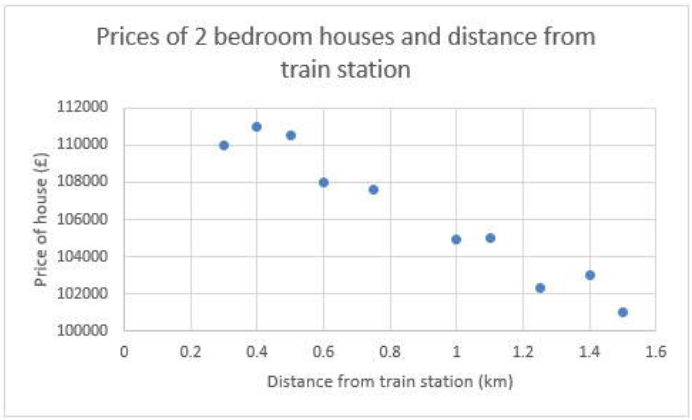
Khalid wants to buy a two-bedroom house no further than 0.6 miles from the station.

Khalid has saved a deposit of £4 875. He can afford a mortgage of 3.5 times his earnings which is £28 145 per annum.

The scatter graph shows information about the price and distance from the station of recent two-bedroom house sales in the area.

Can Khalid afford to buy a two-bedroom house within 0.6 miles of the station? Give a reason for your answer.

1 mile = 1.6 km



(5 marks)

Workings:

$Mortgage = £28{,}145 \times 3.5 = £98{,}507.50$
$Maximum\ affordable\ house\ price = £98{,}507.50 + £4{,}875 = £103{,}382.50$
$0.6\ miles = 0.96\ km$

Read from graph: price of house 0.96 km away from train station is in the range £104,000 - £106,000.

Therefore, Khalid can't afford to buy a house within 0.6 miles of the train station.

Marks:

2 mark for calculating maximum affordable price.

1 mark for conversion from miles to km

1 mark for interpreting data from graph

1 mark for correct graph.

Question 9

Find the mode in the following set of numbers.

8 8.5 8 7 11 23 9 11 7.5 11 7

(1 mark)

Workings:

Mode = most common number in the set = 11

Marks

1 mark for correct answer

Question 10

Calculate the median of the following set of numbers.

10 10.5 11 12 15 23 9 9.5

(2 marks)

Workings:

Rewrite in ascending order:

9 9.5 10 10.5 11 12 15 23

There are 8 numbers so median is between 4^{th} and 5^{th} numbers in sequence.

Median = 10.75

Marks

2 marks for correct answer

Question 11

Amy wants to catch the 10.12am train from Darlington to Chesterfield.

She needs to allow 10 minutes to buy a ticket and get to the platform.

She lives 2 miles from the station and knows that she can walk at 3mph.

At what time should she leave home?

(2 marks)

Workings:

$speed = \frac{distance}{time}, \qquad time = \frac{distance}{speed}$

$time = \frac{2\ miles}{3\ mph} = \frac{2}{3} hours = 40\ mins$

$total\ time\ required = 40\ mins + 10\ mins = 50\ mins$

$10{:}12\ am - 50\ mins = 09{:}22\ am$

She should leave at 09:22 am at the latest

Marks:

1 mark for correct calculation

1 mark for correct time

Question 12

Tom is given £8 500 to go towards a deposit to buy his first house.

Tom sees these two savings accounts.

Money saver account	Bonus saver account
1.75% per year. To be added at the end of each year	Save for 3 years and receive a single bonus of 5.25%

Tom puts his money in the Money saver account.

How much more money will Tom have after 3 years compared to the Bonus saver account?

(5 marks)

Workings:

Money saver account:

$Value\ (after\ 3\ years) = £8{,}500 \times 1.0175^3 = £8{,}954.10$

Bonus saver account:

$Value\ (after\ 3\ years) = £8{,}500 \times 1.0525 = £8{,}946.25$

Difference:

$£8{,}954.10 - £8946.25 = £7.85$

Marks:

2 marks for correct value after 3 years in Money saver account

2 marks for correct value after 3 years in Bonus saver account

1 mark for final answer

Task 3 – calculator

Question 13

The formula below is used to calculate the percentage fuel saving when driving at a reduced speed compared to a higher speed.

$$F = 100 \times \left(\frac{a-b}{b}\right)^2$$

F = % fuel savings
a = original average speed
b = reduced average speed

Calculate F when the speed is reduced from 60 mph to 50mph.

(3 marks)

Workings:

Using a = 60 mph b = 50 mph

$$F = 100 \times \left(\frac{60-50}{50}\right)^2$$

$$F = 100 \times 0.2^2 = 4\ \%$$

Marks:

2 marks for correct calculation

1 mark for correct answer

Question 14

Raheema is concerned about the environment and is looking for ways to be more eco-friendly.

Raheema is researching the use of solar panels for her house. She has found some information on the total number of sun hours per month where she lives for 2016 and 2017.

Total sun hours per month		
	2016	2017
January	21	47
February	75	61
March	112	119
April	147	128
May	206	214
June	143	108
July	112	144
August	146	126
September	105	94
October	97	56
November	64	6
December	21	

Average sun hours per month 2017	
Mean	94.5

Raheema thinks the total number of sun hours was higher in December 2017 than in December 2016. Is she correct?

(3 marks)

Workings:

$$mean = \frac{total\ hours\ per\ year}{number\ of\ months}$$

$$94.5 = \frac{47 + 61 + 119 + 128 + 214 + 108 + 144 + 126 + 94 + 56 + 6 + x}{12} = \frac{1103 + x}{12}$$

Where 'x' is the sun hours in Dec 2017

$$94.5 \times 12 = 1103 + x$$

$$1134 = 1103 + x$$

$$x = 31\ hours$$

Raheema is correct.

Marks:

1 mark for correct equation

1 mark for correct calculation of sun hours in Dec 2017 ('x')

1 mark for correct statement.

Question 15

Which year had the greatest range of sun hours?

(1 mark)

Workings:

2016:

$range = 206 - 21 = 185$

2017:

$range = 214 - 6 = 208$

2017 had the greatest range of sun hours.

Marks:

1 mark for correct answer

Question 16

To generate the maximum amount of electricity, a solar panel needs to face south and have a tilt angle of 30o. This will generate a maximum of 1.225kWh of electricity for each hour of sunshine. In June there were 108 hours of sunshine.

Raheema's roof faces south-west and has a tilt angle of 50o. To find out how much electricity her solar panel will produce, she needs to divide the maximum electricity that could be generated by a factor given in the table below.

Raheema usually pays £0.143 per kWh of electricity.

Tilt Angle	Facing South-west	Facing South	Facing South-east
60°	1.15	1.07	1.15
50°	1.09	1.03	1.08
40°	1.05	1.01	1.05
30°	1.04	1	1.04

How much would the electricity generated in June cost if she had to pay for it?

(3 marks)

Workings:

Tilt angle of 50° facing South-West corresponds to a factor of 1.09

$$Energy\ produced\ (per\ hour) = \frac{1.225\ kWh}{1.09}\ per\ hour = 1.1239\ kWh\ per\ hour$$

$$Energy\ produced\ (per\ month) = 1.1239\ \times 108 = 121.38\ kWh\ per\ month$$

$$Usual\ cost = 121.38\ kWh \times £0.143 = £17.36$$

Marks

1 mark for correct calculation of energy produced per hour

1 mark for correct calculation of energy produced per month

1 mark for correct final answer

Question 17

Raheema finds that she can be more environmentally friendly by collecting rain water from her drain pipe, so she can use it to water her garden.

Raheema buys a cylindrical container that is 80cm in diameter and 1 metre high.

Raheema thinks the container will hold at least 100 gallons of water. Is she correct?

ϖ = 3.14
$1m^3$ = 219.97 gallons

(5 marks)

Workings:

$$radius\ of\ cylinder = \frac{80}{2} cm = 40\ cm = 0.4\ m$$

$$volume\ of\ cylinder = \pi r^2 \times h$$
$$volume\ of\ cylinder = 3.14\ \times (0.4\ m)^2 \times 1\ m = 0.5024\ m^3$$ (Using π = 3.14 as given)

$$0.5024\ m^3 \times 219.97 = 110.51\ gallons$$

Raheema is correct

Marks:

1 mark for calculating radius in m

1 mark for correct formula for volume

1 mark for correct calculation of volume

1 mark for conversion from m^3 to gallons

1 mark for correct final answer

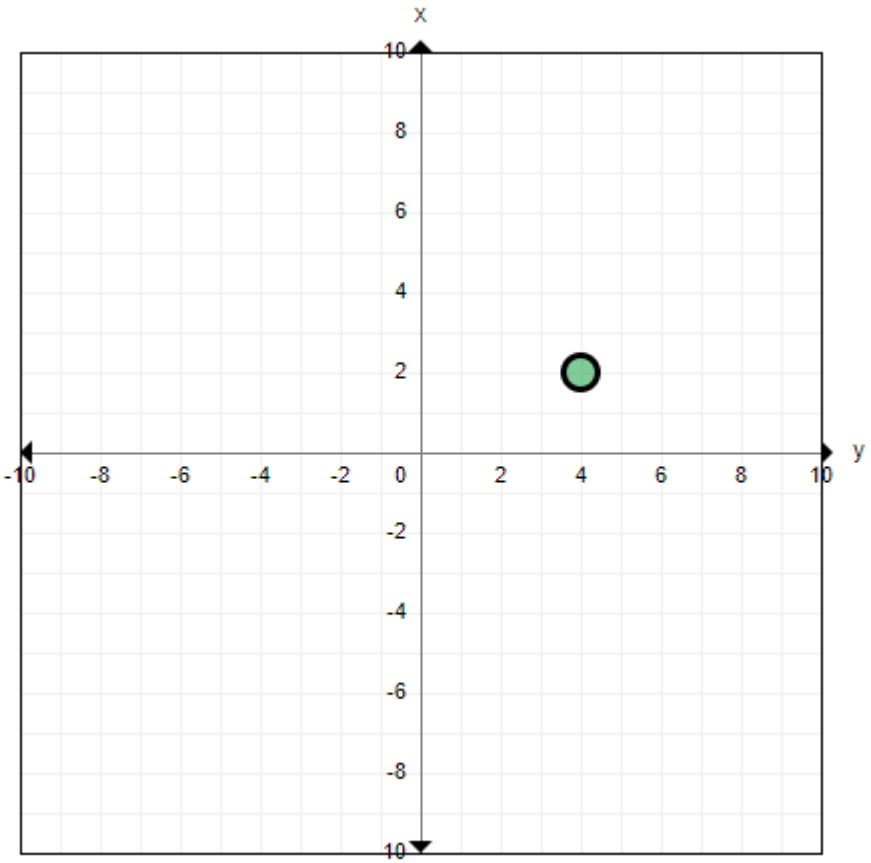
Task 4 – calculator

Question 18

On the grid mark the point (4, 2).

(1 mark)

Answer:



Question 19

Give 144 as a fraction of 240 in its simplest form.

(2 marks)

Workings:

$$\frac{144}{240} = \frac{12}{20} = \frac{6}{10} = \frac{3}{5}$$

Marks:

1 mark for correct method (simplifying or otherwise)

1 mark for correct final answer

Question 20

Sarah helps to organise a family fun day charity event each year.

Last year, 120 people attended the event each paying a £2.50 entry fee.

	Money taken during the event (£)	**Percentage of money taken (%)**
Entry fees		
Cake stall		19%
Bouncy castle		32%
Tombola		9%
Wheel of fortune		15%

It cost £175 to hire the Village Hall for the event and a further £85 for prizes.

How much profit did Sarah make for charity?

(4 marks)

Workings:

Money taken from entry fees:

$entry\ fees\ total = £2.50 \times 120 = £300.00$

Percentage of money from entry fees:

$entry\ fees\ percentage = 100 - (19 + 32 + 9 + 15) = 100 - 75 = 25\ \%$

Total money taken during event (revenue):

$$total\ revenue = £300 \times \frac{100}{25} = £300 \times 4 = £1{,}200$$

Profit:

$profit = total\ revenue - total\ costs$

$profit = £1{,}200 - £175 - £85 = £940$

Marks:

1 mark for correct entry fee total

1 mark for calculating total revenue

1 mark for correct calculation for profit

1 mark for correct final answer

Question 21

Sarah bakes 15 identical cakes for the charity event. Each cake is circular with a radius of 80mm.

She plans to decorate each cake with a piece of ribbon around its edge.

She wants to buy an extra 12.5% to allow for overlap.

She can only buy ribbon in full metres, costing £4.95 per metre.

How much will she spend on ribbon?

Use π = 3.14

(5 marks)

Workings:

Radius = 80 mm = 0.08 m

$circumference = 2\pi r$

$circumference = 2 \times 3.14 \times 0.08\ m = 0.5024\ m\ (per\ cake)$

$ribbon\ required = 0.5024 \times 1.125 = 0.5652\ m\ (per\ cake)$

$total\ ribbon\ required = 15 \times 0.5652\ m = 8.478\ m$

Sarah can only buy full metres of ribbon, so she needs 9 m in total.

$total\ cost = 9 \times £4.95 = £44.55$

Marks:

1 mark for calculating circumference

1 mark for calculating amount of ribbon required

1 mark for multiplying to convert amount per cake to total amount

1 mark for identifying correct amount of ribbon required (i.e. 9 m)

1 mark for correct final answer

Question 22

At the charity event there is a Wheel of Fortune game for the boys and girls.

To win you need to spin the dial and land on a 'win' segment.

15 girls and 15 boys are each having a turn on the game today.

What is the probability today that a child who plays is a girl, **and** that she wins a prize?

(3 marks)

Workings:

$Probability\ of\ girl = 0.5$

$Probability\ of\ win = \frac{4}{12} = 0.\dot{3}$

$Probability\ of\ girl\ and\ win = 0.\dot{3} \times 0.5 = \frac{1}{6} = 0.167\ (3\ sf)$

Marks:

1 mark for identifying correct probability that a child is a girl

1 mark for identifying correct probability of a win

1 mark for calculating correct probability that a child is a girl and wins a prize.