N5

National
Qualifications
2022 MODIFIED

X844/75/01

Mark

**Applications of Mathematics
Paper 1 (Non-calculator)**

FRIDAY, 6 MAY

9:00 AM – 9:50 AM

X8447501

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day　　Month　　Year　　Scottish candidate number

Total marks — 35

Attempt ALL questions.

You may NOT use a calculator.

To earn full marks you must show your working in your answers.

State the units for your answer 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.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.
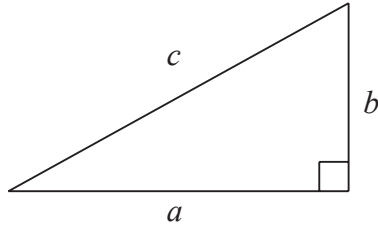
SQA

A/SA

FORMULAE LIST

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

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

Theorem of Pythagoras

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

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

Volume of a prism $\quad V = Ah$

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

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

Standard deviation $\quad s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}}$

$$\text{or} \quad s = \sqrt{\dfrac{\Sigma x^2 - \dfrac{(\Sigma x)^2}{n}}{n-1}} \text{ , where } n \text{ is the sample size.}$$
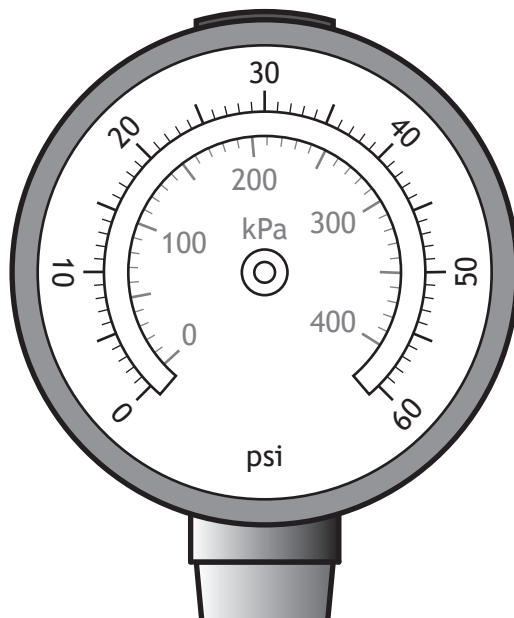
Gradient

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

Total marks — 35

Attempt ALL questions

1. Steven blew up the tyres on his bike.

In order to be safe, his tyres should be blown up to a pressure of between 35 and 45 psi.

Steven blew his tyres up to a pressure of 230 kPa

Determine whether his tyres are at a safe pressure.

Justify your answer.

2

2. Marie and John are both reading the same book.

Marie is using an e-book reader and John is reading a hardback book.

Marie's book

62% read

John's book

210 pages out of 350 pages read

John thinks he has read more of the book than Marie.

Is he correct?

Use your working to justify your answer. 2

3. The temperature, in degrees Celsius, of a restaurant fridge is recorded each day.

The temperatures over a 13 day period were:

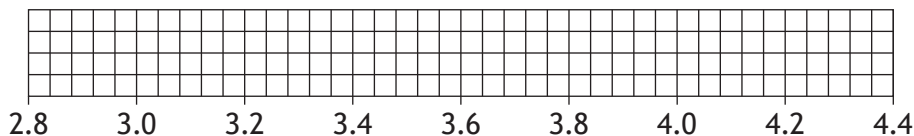|						
3.2	4.2	3.3	3.6	3.7	3.2	4.2
3.3	3.4	3.6	3.2	4.1	2.9	

(a) For this data, calculate:

- the median
- the lower quartile
- the upper quartile. **2**

(b) Construct a box plot for this set of data. **2**

(An additional grid, if required, can be found on *page 16*.)

restaurant fridge temperatures (°C)

(c) Calculate the interquartile range for this set of data. **1**

(d) The temperatures of a café fridge were also recorded for the same 13 day period.

The interquartile range of these temperatures was 0.9 degrees Celsius.

Make one valid comment comparing the temperatures of these two fridges. **1**
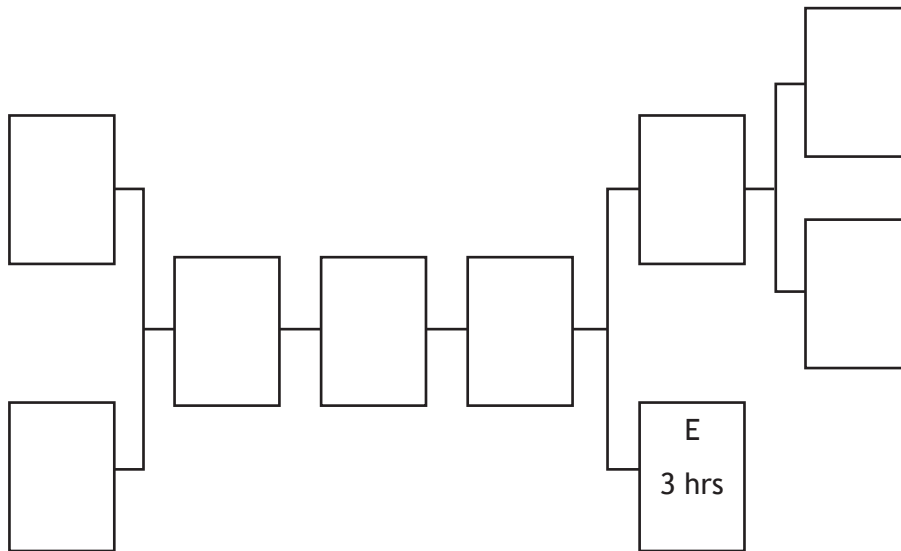
[Turn over

4. Kieran and Dylan decide to redesign their garden.

There are several tasks that need to be done in order to achieve this.

Activity	Description	Preceding task	Time taken
A	lay patio	I	5 hours
B	assemble furniture	A	1 hour 30 minutes
C	remove decking	none	6 hours
D	paint fence	G	3 hours
E	lay artificial grass	I	3 hours
F	remove grass	none	2 hours
G	buy all materials	C,F	45 minutes
H	plant patio tubs	A	2 hours 15 minutes
I	roughcast wall	D	1 hour 45 minutes

(a) Complete the diagram to show the tasks **and** times in the boxes. **2**

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

E

3 hrs

4. (continued)

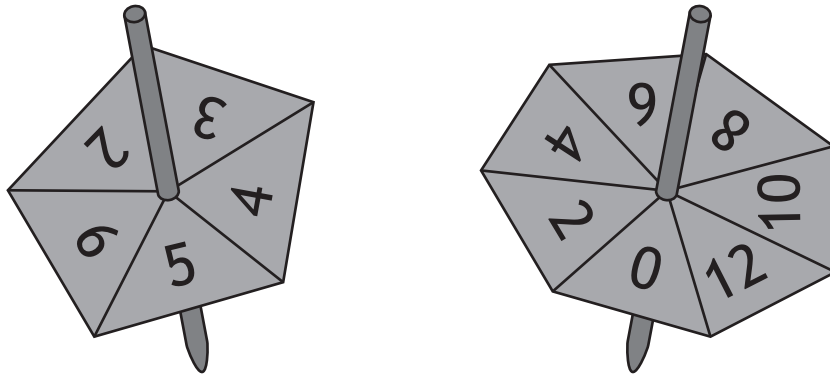(b) Based on the times given, calculate the minimum time to complete all of the work.

2

Give your answer in hours and minutes.

5. Jade runs a game stall at the Christmas coffee morning.

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

The spinners are fair and 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 **greater than 30**.

Calculate the probability of winning a prize.

3

6. Farah works in a shop.

She earns £8.40 per hour.

She gets paid overtime at time-and-a-half.

In January she worked 100 hours basic plus 30 hours overtime.

In January she paid £33.50 in income tax, £61.92 in National Insurance and £25.20 towards her pension.

Calculate Farah's net pay for January. **2**

[Turn over

7. Tracy decides to walk to the top of Dumyat Hill from Blairlogie car park.

- The horizontal distance between these two places is 3 kilometres.

- Blairlogie car park is 21 metres above sea level.

- The top of Dumyat Hill is 420 metres above sea level.

Calculate the average gradient between the Blairlogie car park and the top of Dumyat Hill.

3

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

8. Bryan, Jamie and Jessica bought **two** medium pizzas between them.

- Bryan ate $\frac{5}{7}$ of a pizza.

- Jamie ate $\frac{2}{3}$ of a pizza.

- Jessica ate the rest.

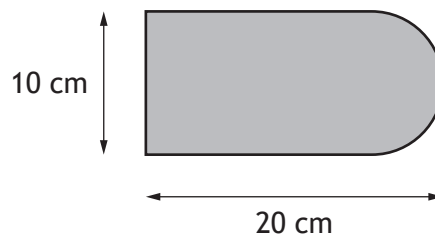Calculate the total amount of pizza that Jessica ate.   **3**

Give your answer as a fraction of a pizza.

[Turn over

9. Zainab designs a new badge.

The design is based on a rectangle and a semi-circle as shown in the diagram.

10 cm

20 cm

She decides to put gold edging around the badge.

Calculate the length of gold edging she needs.   **2**

Take $\pi = 3.14$

10. A youth group is planning a fundraising night to help pay for a trip.

The expenses for the night are shown.

DJ and disco	£340
Hall hire	£50
Hog roast	£770
Ticket production	£40

They will sell 200 tickets.

They need to make a profit of £2000.

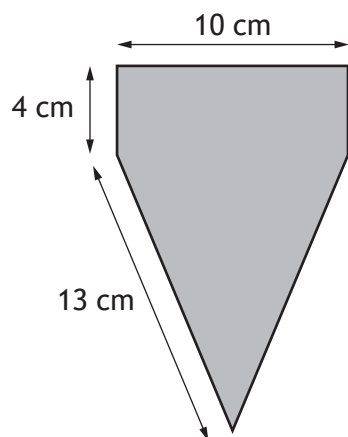Calculate the minimum ticket price to achieve this profit. **2**

[Turn over

11. A flag is in the shape of an isosceles triangle with a rectangle on the top.

Calculate the area of the flag.

4

12. A company delivers parcels to people's homes.

The probability of a parcel arriving damaged is 0.023.

In one month, the company delivered 700 parcels, of which 15 were damaged.

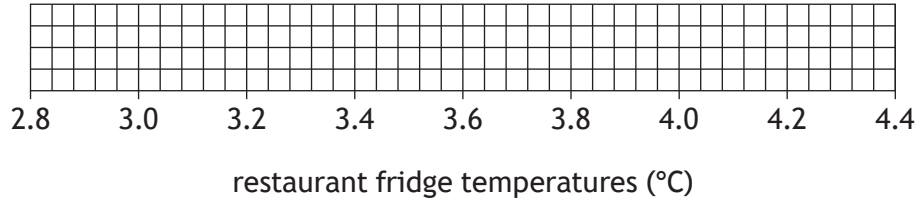Determine if this is more or less than expected. **2**

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

Additional grid for question 3 (b)

2.8   3.0   3.2   3.4   3.6   3.8   4.0   4.2   4.4

restaurant fridge temperatures (°C)

Additional diagram for question 4 (a)
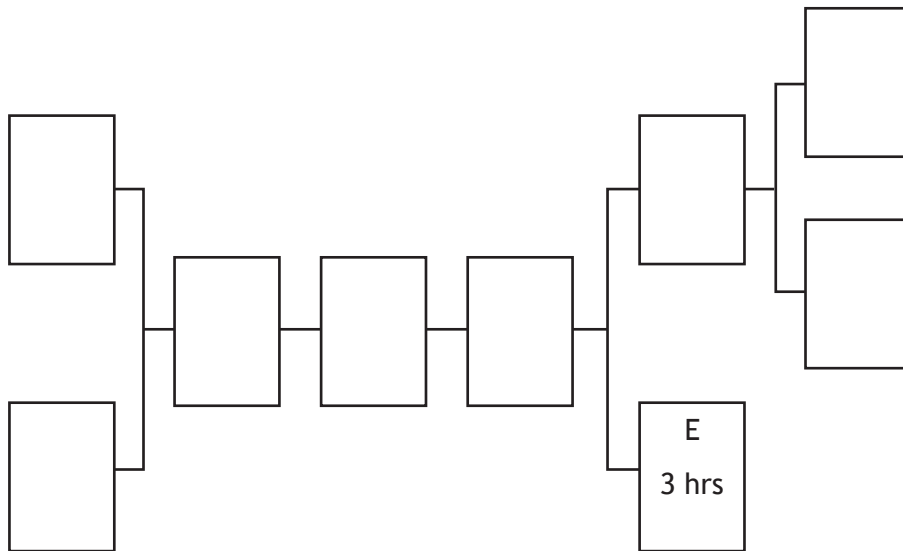
E

3 hrs

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL SPACE FOR ANSWERS

page 18

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N5

National Qualifications 2022 MODIFIED

Mark

X844/75/02

Applications of Mathematics
Paper 2

FRIDAY, 6 MAY

10:20 AM – 12:00 NOON

X8447502

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Full name of centre

Town

Forename(s)

Surname

Number of seat

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Day

Month

Year

Scottish candidate number

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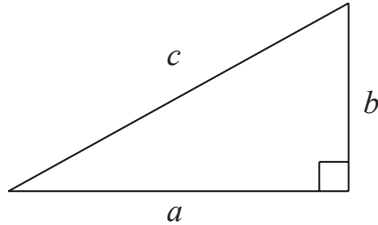
X84475020 1

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Gradient

horizontal distance

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

Total marks — 55

Attempt ALL questions

1. A soft drinks company currently have sales of 240 000 bottles per year.

   It is predicted that sales will

   • Decrease by 4.2% in the next year.

   • Increase by 5.3% in each of the following 2 years.

   Calculate the predicted sales after 3 years.

   Give your answer **to 3 significant figures**. **4**

[Turn over

2. The prices of lambs sold in September was recorded.

A sample of the prices, in pounds, is shown.

72   75   73   68   65   70

(a) For these prices, calculate:

(i) the mean **1**

(ii) the standard deviation. **3**

The price of lambs sold in August was also recorded.

The mean price was £70.20 and the standard deviation was £3.85.

(b) Make two valid comparisons about the prices of lambs in August and September. **2**

3. Laura earns £40,560 per annum.

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

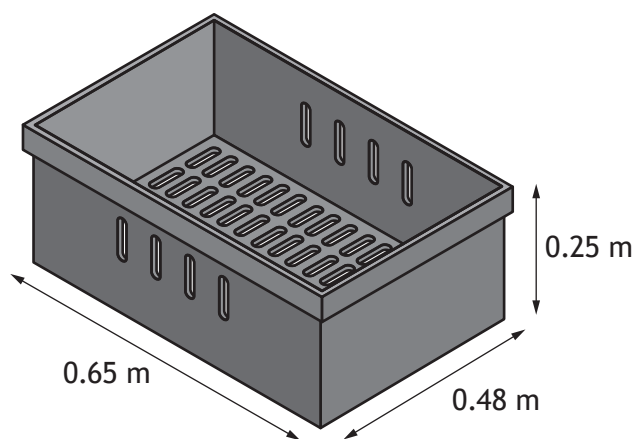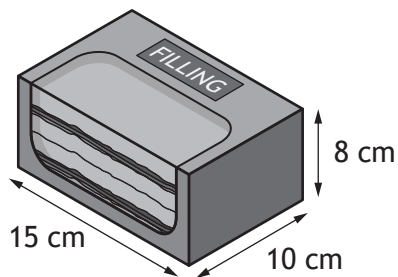| National Insurance rates	
Up to £9568	0%
From £9568 to £50,270	12%
Over £50,270	2%

Calculate her annual National Insurance payment. **2**

4. A company produces sandwiches and packs them in crates for transporting to shops.

The dimensions of each sandwich box and the internal dimensions of a crate are shown in the diagrams. The filling label is placed on the top.

The sandwich boxes need to be laid with the filling label facing upwards.

They must all be aligned in the same direction.

(a) Calculate the maximum number of sandwich boxes that can be fitted into each crate.

3

4. (continued)

The company receives an order for 100 sandwiches.

It takes 7 employees 44 minutes to make 100 sandwiches.

All the employees work at the same rate.

(b) Calculate the time it would take 11 employees to make 100 sandwiches.　　**3**

4. (continued)

Isaac sells sandwiches in his shop.

He spent a total of £92.65 on sandwiches, including delivery.

He then sold:

- 10 chicken salad sandwiches at £2.50 each
- 15 prawn mayo sandwiches at £3.20 each
- 9 egg mayo sandwiches at £1.95 each.

(c) Calculate the percentage loss Isaac made for this order.

3

4. **(continued)**

The table shows the cost of one box of sandwiches, in pounds.

Filling	Number of boxes of sandwiches ordered			
	0 to 9	10 to 19	20 to 29	30 or more
Tuna mayo	1.80	1.70	1.60	1.55
Chicken salad	1.95	1.85	1.75	1.65
Prawn mayo	2.30	2.20	2.10	2.05
Egg mayo	1.50	1.45	1.35	1.30
Ham and cheese	2.35	2.25	2.15	2.00

For each order, the company charges £2.75 per mile for delivery.

Yolanda's Sandwich Shop places an order for:

- 20 chicken salad
- 30 prawn mayo
- 15 egg mayo.

The distance travelled for the delivery is 6 miles.

(d) Calculate the total cost of this order.   **3**

[Turn over

5. An international athletics event was held in Doha, Qatar.

In athletics, competitors in the heptathlon must compete in seven different events.

The competitor is awarded points depending on how well they perform in each event.

The table shows the number of points awarded for different levels of performance in each of the events.

Points scored	Event						
	100 m Hurdles (sec)	High jump (m)	Shot put (m)	200 m run (sec)	Long jump (m)	Javelin throw (m)	800 m run (min sec)
980	13.99	1.81	16.77	24.01	6.42	56.15	2 min 9 sec
1000	13.85	1.82	17.07	23.80	6.48	57.18	2 min 8 sec
1020	13.71	1.83	17.37	23.59	6.54	58.25	2 min 6 sec
1040	13.57	1.85	17.66	23.39	6.60	59.25	2 min 5 sec
1060	13.43	1.86	17.95	23.19	6.66	60.30	2 min 4 sec
1080	13.30	1.88	18.25	22.99	6.72	61.30	2 min 2 sec
1100	13.16	1.89	18.54	22.79	6.78	62.30	2 min 1 sec
1120	13.03	1.91	18.84	22.59	6.84	63.35	2 min 0 sec
1140	12.90	1.92	19.14	22.40	6.90	64.39	1 min 59 sec
1160	12.76	1.95	19.43	22.20	6.96	65.40	1 min 57 sec
1180	12.63	1.96	19.72	22.01	7.02	66.40	1 min 56 sec
1200	12.51	1.97	20.02	21.82	7.08	67.45	1 min 55 sec

One of the competitors achieved a height of 1.95 metres in the high jump.

(a) Use the table to state how many points they scored for the high jump.   **1**

5. (continued)

The final event of the heptathlon is the 800 m run.

In this event, another of the competitors scored 1000 points.

(b) By referring to the table, calculate this competitor's average speed over the 800 m run.

Give your answer in **metres per second**.   **3**

Lucy is a sports journalist.

She travelled to Doha to report on the international athletics event.

She flew from Manchester to Doha.

- Her flight landed in Doha at 19:18 local time.
- The flying time was 7 hours 23 minutes.
- Doha is 2 hours ahead of Manchester time.

(c) Calculate the local time the flight left Manchester.   **2**

[Turn over

5. **(continued)**

When she was in Qatar, Lucy stayed in a hotel.

She changed £1500 into Qatari riyals.

- She stayed for 8 nights.

- The room rate was 418 Qatari riyals per night.

- She spent 1836 Qatari riyals on other expenses.

- She then changed all her remaining Qatari riyals into **euros**.

The rates of exchange were:

Currency exchange	
Pounds sterling (£)	**Other currencies**
1	4.67 Qatari riyals
1	1.16 euros

(d) Calculate how many euros Lucy received.   **4**

6. Pepe inspects and sells fire extinguishers.

His monthly gross pay consists of a basic wage plus commission on the sale of any fire extinguishers.

The rate of commission he earns depends on the mean price he sells each fire extinguisher for, as shown.

Mean price of fire extinguisher	Rate of commission
£40–£49.99	14%
£50–£59.99	14.5%
£60–£69.99	15%
£70–£79.99	15.5%
£80–£89.99	16%
£90–£99.99	16.5%

In January, Pepe's basic wage was £1200.

He sold 107 fire extinguishers for a total of £8185.50.

(a) Calculate Pepe's gross pay for the month of January.   **3**

Pepe sells three different types of fire extinguishers.

In February he sold water, foam and powder fire extinguishers in the ratio 6:2:7 respectively.

He sold 56 powder fire extinguishers in February.

(b) Calculate the **total** number of fire extinguishers he sold in February.   **2**

[Turn over

6. **(continued)**

A customer wants to buy 12 powder fire extinguishers and 12 stands.

- The recommended price of one powder fire extinguishers is £78.
- The recommended price of one stand is £15.

The customer saw the following deals available.

Company A	Company B	Company C
Buy 2 powder fire extinguishers, get one free. All stands reduced by £2.50.	$\frac{1}{6}$ off the recommended price of all fire extinguishers. Each fire extinguisher comes with a free stand.	12 powder fire extinguishers and 12 stands for £900.

To encourage the customer to buy from him instead, Pepe offers a 5% discount on the cheapest of these deals.

(c) Calculate how much Pepe will charge the customer. **3**

6. (continued)

Pepe inspected the fire extinguishers of a local business.

The fire extinguishers were considered safe if they weighed 10.4 kg $\pm$ 10%.

The weights, in kilograms, of the fire extinguishers inspected are shown.

9.80, 11.67, 9.12, 10.94, 11.10, 9.27, 10.55

(d) Calculate the maximum and minimum safe weights and determine the fraction that were considered safe.

3

7. Jamel keeps fish.

To make tap water safe for fish, a conditioner is added.

The volume of conditioner required is directly proportional to the volume of tap water.

5 ml of conditioner must be used for every 20 000 ml of tap water.

(a) Calculate the volume of conditioner required for 14 litres of tap water. **2**
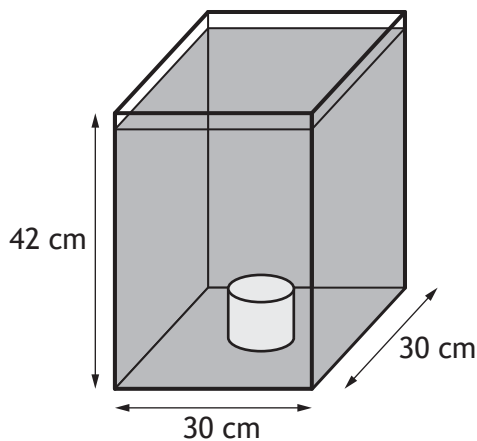
7. (continued)

Jamel has a fish tank.

The fish tank is a cuboid with dimensions 30 cm by 30 cm by 42 cm.

The tank has a cylindrical light box at the bottom as shown.

The cylindrical light box has a diameter of 10 cm and a height of 8 cm.

There is a **2 cm gap** between the top of the tank and the water level.

The light box **does not** hold any water.

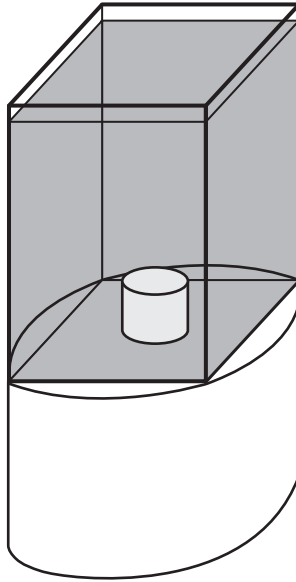(b) Calculate the volume of water in the tank.   **4**
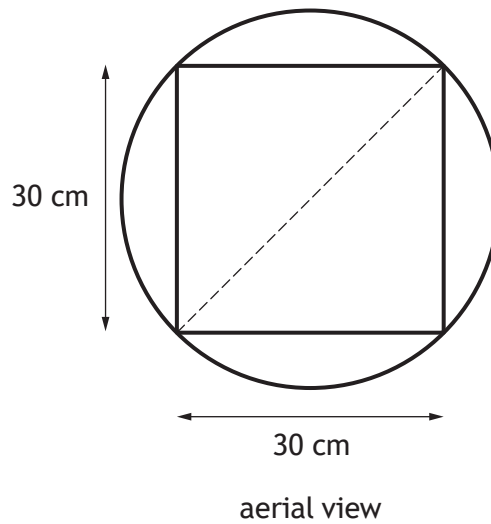
7. (continued)

Jamel bought a stand for this fish tank.

The top of the stand is circular.

The corners of the square base of the tank touch the edge of the circle as shown.

The diameter of the circle is shown by the dotted line in the aerial view.

30 cm

30 cm

aerial view

7. (continued)

(c) Calculate the area of the top of the stand.

Give your answer in **square metres**.   **4**

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

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