**Design & Technology
A-Level**

Mathematics for D&T

Multiple Choice

Materials required for questions

- Pencil
- Rubber

- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- Use a cross in the box to mark you answer ☒

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don't spend too much time on one question

Good luck!

Q1. A designer needs to know the area of an A4 sheet of paper to know how much ink would be used when printing a design.

An A4 sheet of paper measures 210 x 297 mm. What is the area of the A4 sheet of paper? – aqa 2019
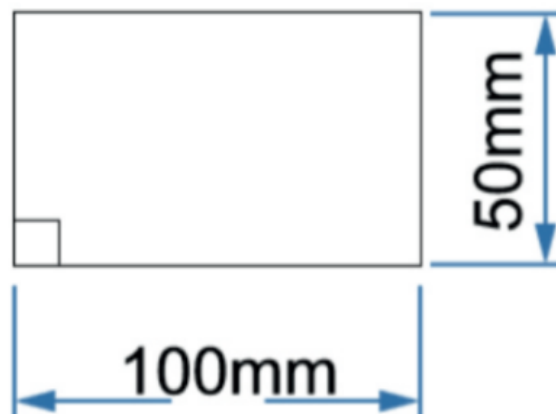
A   62 255 mm^2

B   62 470 mm^2

C   62 370 mm^2

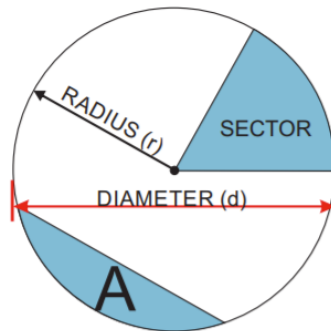**Q2.** What is the area of the rectangle shown below?

100mm

50mm

A   300mm^2
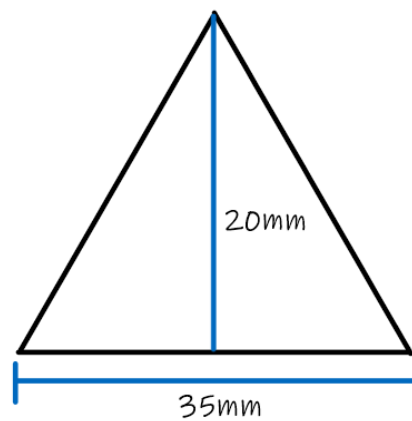
B   5000mm^2

C   500mm^2

Q3. What is the name of the area of the circle labelled 'A', seen below?

A   Aspect ☐

B   Tangent ☐

C   Segment ☐

Q4. What is the area of the triangle below?

A   350mm^2 ☐

B   700mm^2 ☐

C   105mm^2 ☐

Q5. A smoke alarm needs either four 1.5 volt alkaline batteries or five 1.2 volt re-chargeable batteries to work.

Complete Table 1 to show the total costs to the customer of five battery changes or five re-charges.

This information will be used to decide a suitable way to power the device **(2 marks)**

	Alkaline batteries	Re-chargeable batteries
Cost of batteries and charger if required	£2.45 for 4 batteries	£17.00 for 5 batteries and a charger
Cost per re-charge of 5 batteries	£0	£0.03 for 5 batteries to be re-charged
Cost to customer after 5 battery changes or 5 re-charges		

Q6a. The step ladder in Figure 4 has 12 steps. Each step is 275 mm long, 100 mm wide and 25 mm thick.

Each step should be 275 mm long.
The manufacturing tolerance is +/–0.5%
Calculate the maximum and minimum length of each step to two decimal places **(2 marks)**

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Q6b. 12 steps of exactly 275 mm will be cut from one piece of material 3.6 metres in length.
What is the percentage of waste material created after cutting the steps?

Calculate your answer to two decimal places. **(3 marks)**

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Q7. The component in Figure 5 is to be made by pouring a liquid material into a mould
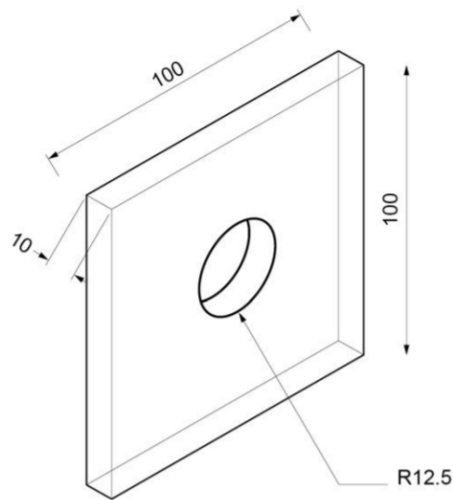

All dimensions are in millimetres.
Calculate the volume of material required to make one component.
Show your working and give your answer to the nearest mm3
(3 marks)

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Q8. A local wind farm produces 4 terawatt hours of electricity over a year. At the same time a solar farm produced 0.5 hours of electrical power. What is the ratio of Wind farm : Solar power? Show your working **(3 marks)**

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Q9. Calculate the volume of the engineered object. Tech student aqa paper 1 **(5 marks)**

HEIGHT= 40mm
RADIUS= 30mm

A

←B

HEIGHT= 130mm

RADIUS= 60mm

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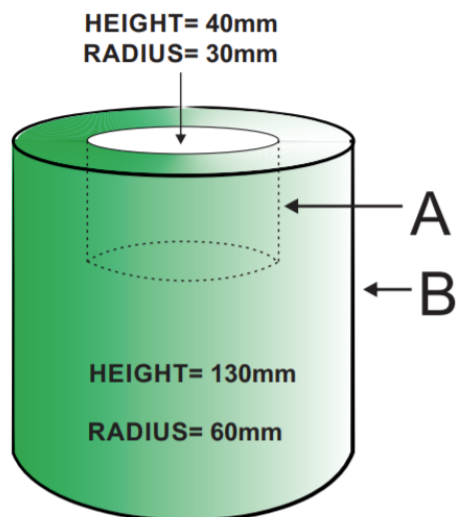
Q10. What is the circumference of the circle below. **(2 marks)**

RADIUS
100mm

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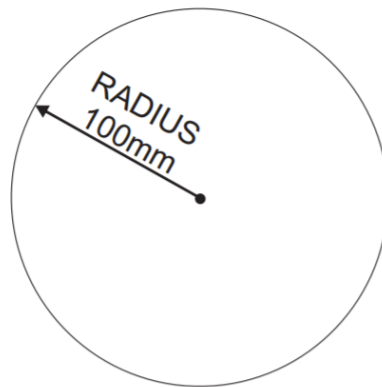
Answers

Q1. C
Q2. B
Q3. C
Q4. A

Q5.

	Alkaline batteries	Re-chargeable batteries
Cost of batteries and charger if required	£2.45 for 4 batteries	£17.00 for 5 batteries and a charger
Cost per re-charge of 5 batteries	£0	£0.03 for 5 batteries to be re-charged
Cost to customer after 5 battery changes or 5 re-charges	£ 2.45 x 5 = £12.25	£17.00 plus £0.03 x 5 = £17.15

Award 1 mark for £12.25
Award 1 mark for correct answer £17.15

Q6a.
1 mark each for maximum and minimum lengths
Maximum length will be (275 + 1.375) = 276.375 mm
Rounded to 276.38/ 276.38mm for mark
Minimum length will be (275 – 1.375) = 273.625mm
Rounded to 273.63/273.63mm for mark

6b.
1 mark for each step below up to a maximum of 3
1. Material used for 12 steps is 12 x 0.275 = 3.3 m or 3300mm
2. Waste is 3.6m – 3.3m = 0.3m or 300mm
Or
3300/3600 = 0.9167 (amount used for steps)
3. Percentage waste is (0.3/3.6) x 100 = 8.33%

If correct answer is arrived at then award all 3 marks even if steps 1 and/or 2 are not evident.

Q7.
1 mark for overall total volume
1 mark for material not required by 12.5 radius hole in shape
1 mark for total material required in mm3
Top tip: check answer first and work back to check working
Add:
100 x 100 x 10 = 100,000 or 100,000mm^3
Subtract:
V = 3.142 x 12.5^2 x 10 = 4909.375 or 4909.375mm^3
or
V = 3.14 x 12.5^2 x 10 = 4906.25 or 4906.25mm^3
or
V =156.25 π x 10 = 4908.74 or 4908.74mm^3
or
V= 312.5/2 π x 10 = 4908.74 or 4908.74mm^3
or
V = 625/4 π x10 = 4908.74 or 4908.74mm^3
Total material required/ total volume:
100,000 – 4909.375 = 95,090.625
or
100,000- 4906.25 = 95,093.75
Accept 4909 or 4906 for hole volume as the answer still works out despite rounding too early.
Possible answers:
95,091 or 95,091 mm^3 (using 3.142 or π)
or
95094 or 95,094 mm^3 (using 3.14)

Q8.

1 mark:
    Wind farm : Solar power
            4 : 0.5
1 mark:
    To make final ratio whole number:
    Wind farm/solar power = 4/0.5 = 8

1 mark:

Wind farm : Solar power

8 : 1

Q9.

Part A (2 marks)

$$V = \pi r^2 h$$
$$volume = 3.14 * 30mm * 30mm * 40mm$$
$$volume = 113040mm^3$$
$$or$$
$$volume = 113.040cm^3$$

Part B (2 marks)

$$V = \pi r^2 h$$
$$volume = 3.14 * 60mm * 60mm * 130mm$$
$$volume = 1469520mm^3$$
$$or$$
$$volume = 1469.520cm^3$$

Subtraction (1 mark)

$$Final\ volume = B - A$$
$$= 1469520mm^3 - 113040mm^3$$
$$= 1356480mm^3\ or\ 1356.48cm^3$$

Q10.

$$Circumerference: C = 2 * \pi * r$$
$$C = 2 * 3.14 * 100\ \ (1\ mark)$$
$$C = 628mm\ (1\ mark)$$