Mathematics Paper 3 (Calculator) Higher Tier

Edexcel GCSE

SET 2

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SET 2

Name

Total marks

Paper length: 1hr 30mins

Instructions

- Use black ink or ball-point pen.
- Fill in the boxes at the top of this page with your name,
  centre number and candidate number.
- Answer all questions.
- Answer the questions in the spaces provided
  – there may be more space than you need.
- You must show all your working.
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- Calculators may be used.

Information

- The total mark for this paper is 80
- The marks for each question are shown in brackets
  – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Please note, this practice paper is an example to help revision, these topics can be tested in other ways and other topics may be included in the actual papers

1   (a) Simplify $p^3 \times p^4$.

----

(1)

(b) Simplify $\dfrac{12q^7}{3q^2}$.

----

(2)

(Total for Question 1 is 3 marks)

2   A number, n, is rounded to 1 decimal place.

The result is 8.7.

Complete the error interval for n.

-------------- $\leq n <$ --------------

(Total for Question 2 is 2 marks)

3 Here is some information about the number of siblings that 32 children have.

Number of siblings	Frequency
0	8
1	13
2	7
3	3
4	1

(a) Work out the mean number of siblings.

- -

(3)
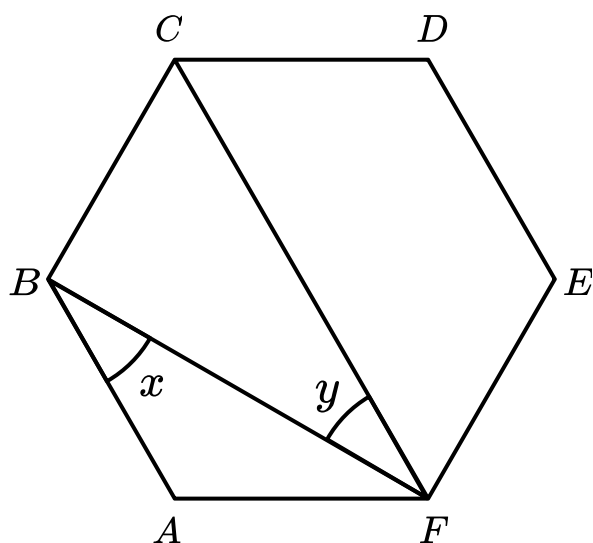
(b) One child is picked at random.

Stacy says 'the probability that the child has at least two siblings is $\frac{5}{16}$'.

Is Stacy correct? Show how you decide.

(1)

(Total for Question 3 is 4 marks)

4   Here is a regular hexagon.

(a) Work out the size of angle x.

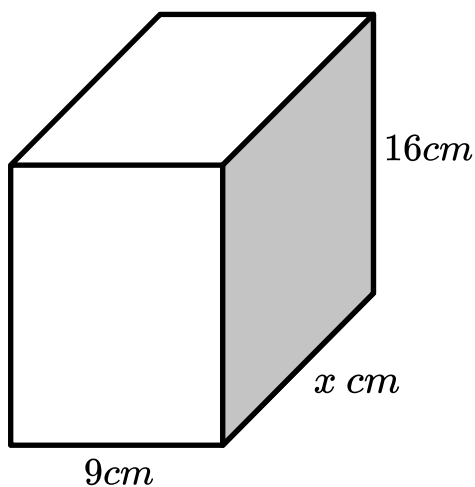Give reasons for each stage of your working.

- -

(4)

(b) Work out the size of angle y.

- -

(2)

(Total for Question 4 is 6 marks)

5 A company is designing some new packaging in the shape of a cuboid.

The packaging must have a height of $16cm$, a length of $9cm$ and a width of $x \, cm$, as shown below.

The company wants the surface area to be less than $900cm^2$.

(a) Show that $50x + 288 < 900$.

(4)

(b) Solve $50x + 288 < 900$.

- -

(2)

(c) x must be an integer. Write down the greatest possible value of x.

- -

(1)

(Total for Question 5 is 7 marks)

6 $x = 4 \times 10^5$

   $y = 6 \times 10^3$

Work out $x + 2y$.

Give your answer in standard form.

- -

(Total for Question 6 is 2 marks)

7   Write $48m^2$ in cm^2.

- cm^2

(Total for Question 7 is 2 marks)

8   Here is a plan of Harry's garden.

24*m*

10.5*m*
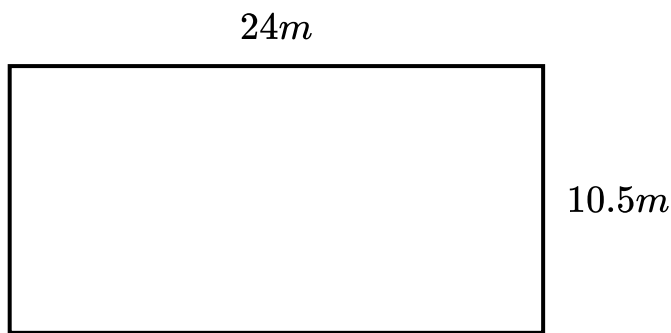
Harry wants to create a wildflower meadow.

To do this, Harry is going to mix a wildflower seed mix with a grass seed mix in the ratio 2:5.

Harry will then spread the seed mix on his garden.

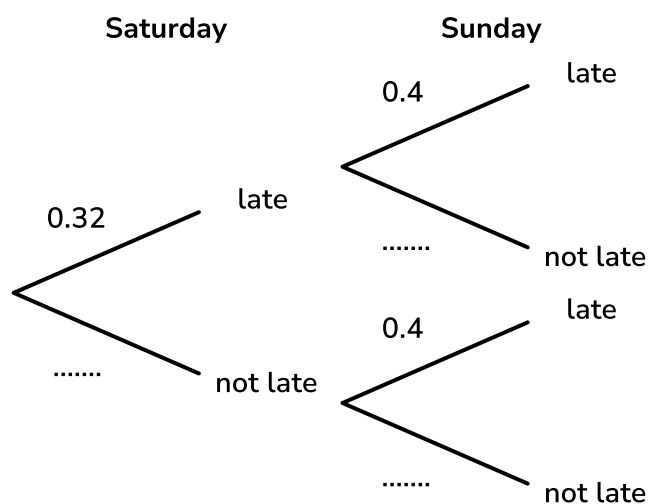1*kg* of his seed mix will cover 20m^2.

Grass seed comes in 5*kg* bags, which cost £32 each.

Wildflower seed comes in 1*kg* bags, which cost £21 each.

Work out the total cost of the seed for Harry's garden.

(Total for Question 8 is 4 marks)

9 The probability tree diagram shows the probability that Richard's bus will be late on the weekend.

(a) Complete the tree diagram.

(1)

(b) Calculate the probability that Richard's bus will be on time on at least one day.

(3)
(Total for Question 9 is 4 marks)

10 Expand and simplify $(2x + 1)(3x - 5)(x + 2)$.

(Total for Question 10 is 3 marks)

11 (a) Write 540 as a product of its prime factors.

....

(2)

(b) Hence write down the smallest number that 540 could be multiplied by to give a square number.

..............................

(1)

(Total for Question 11 is 3 marks)

12 An object exerts a force of $80N$ on an area of $16cm^2$. Brian increases the area of the base of the object, which decreases the pressure caused by the force by 20%.

By what percentage does Brian increase the area?

....

(Total for Question 12 is 4 marks)

13 This Venn diagram shows the number of year 11s who study French (*F*), German (*G*) and Spanish (*S*).

French   German

53   11   39
        3
    6   8
            12
        18
        Spanish
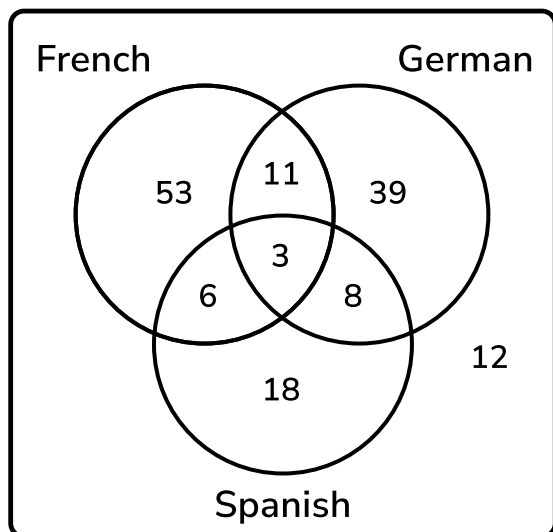
One student is chosen at random.

Write down:

(a) $P(F)$

----
(1)

(b) $P(G \cup S)$

----
(1)

(c) $P(F \cap G' \cap S')$

----
(1)

(d) One of the students is chosen. The student studies German.

Elliot says the probability that the student also studies Spanish is $\frac{11}{150}$.
Elliot is not correct. Explain why.

----
(1)

(Total for Question 13 is 4 marks)

14 At the start of year t, the mass of a radioactive substance is M_t.

At the start of the following year, the mass of the radioactive substance is M_{t+1} where

$$M_{t+1} = 0.8M_t$$

(a) At the start of 2021 the mass of a radioactive substance is $4500g$.

Find the mass of the substance at the start of 2022.

(1)

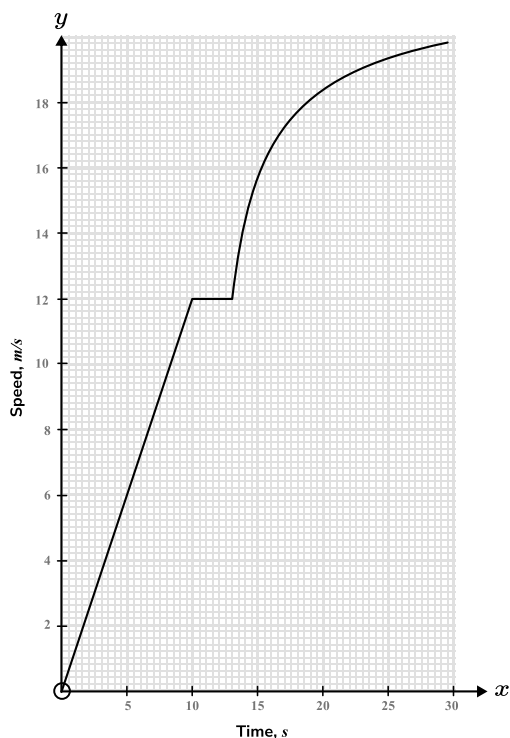The half life of a radioactive substance is the amount of time taken for the amount of the radioactive substance to halve.

(b) Nigel says that the half life of this substance is approximately 3 years.

Is Nigel correct? Explain how you decide.

(2)

(Total for Question 14 is 3 marks)

15 Here is a speed-time graph for a train.

(a) Describe what is happening between 10 and 13 seconds.

----

(1)

(b) Work out the distance travelled by the train in the first 13 seconds of the journey.

----

(2)

(c) Work out an estimate for the acceleration of the train at $t = 20$.

----

(2)

(Total for Question 15 is 5 marks)

16 *m* is inversely proportional to the cube root of *n*.

m = 46 when *n* = 125.

Find the value of *m* when *n* = 8

(Total for Question 16 is 3 marks)

17
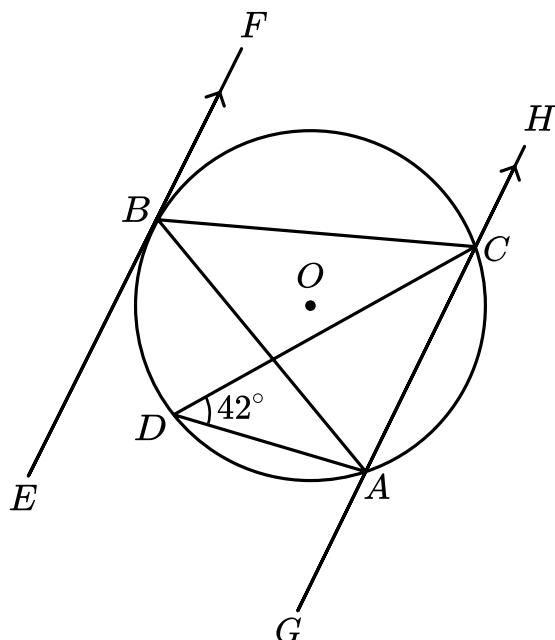
O is the centre of the circle.

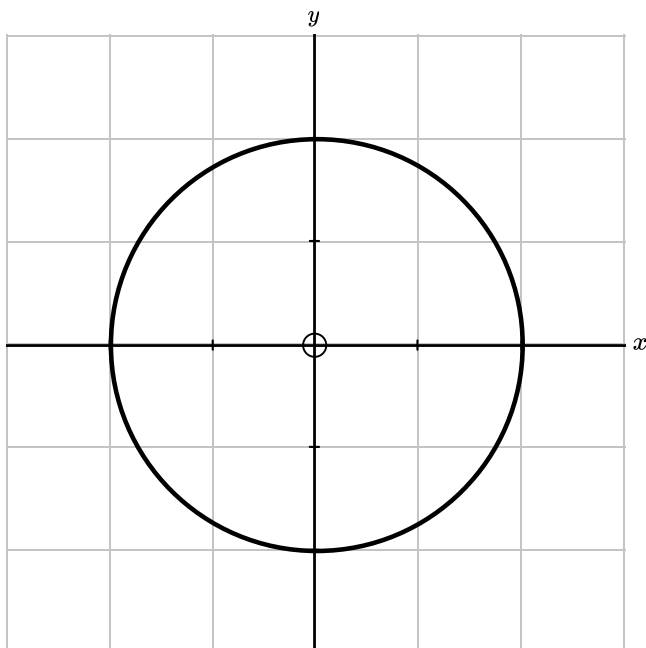The line EF is a tangent to the circle at the point B.

The lines EF and GH are parallel.

Angle ADC = 42°.

Work out the size of angle CBF.

°

(Total for Question 17 is 3 marks)

18 Here is the graph of a circle.

(a) The circumference of the circle is 20π.
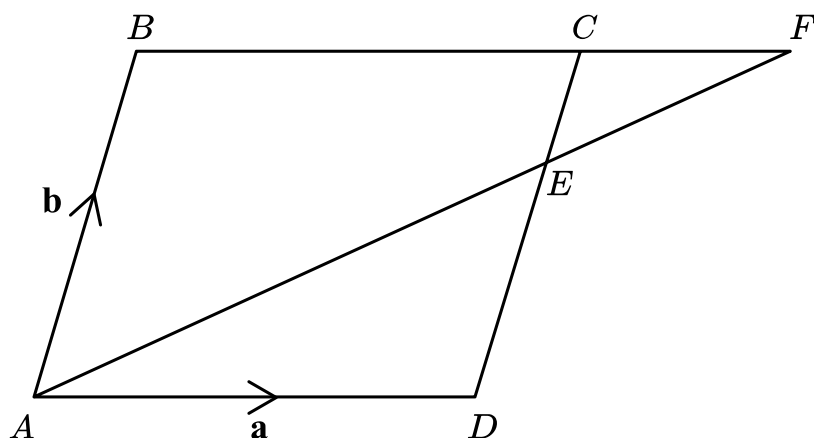
Work out the equation of the circle.

- -

(3)

(b) Decide whether the point (7, 8) lies inside or outside the circle.

You must show how you decide.

- -

(3)

(Total for Question 18 is 6 marks)

19 ABCD is a parallelogram.

$\overrightarrow{AD} = \mathbf{a}$

$\overrightarrow{AB} = \mathbf{b}$

E is the point such that DE:EC = 2:1

BCF is a straight line such that BF = $\dfrac{3}{2}$ BC.

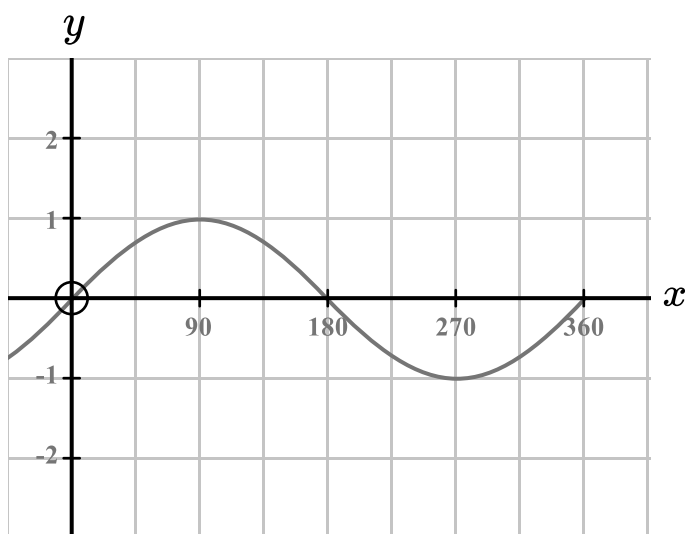(a) Work out the vector $\overrightarrow{BD}$ in terms of **a** and **b**.

- -

(1)

(b) Prove that AEF is a straight line.

(4)

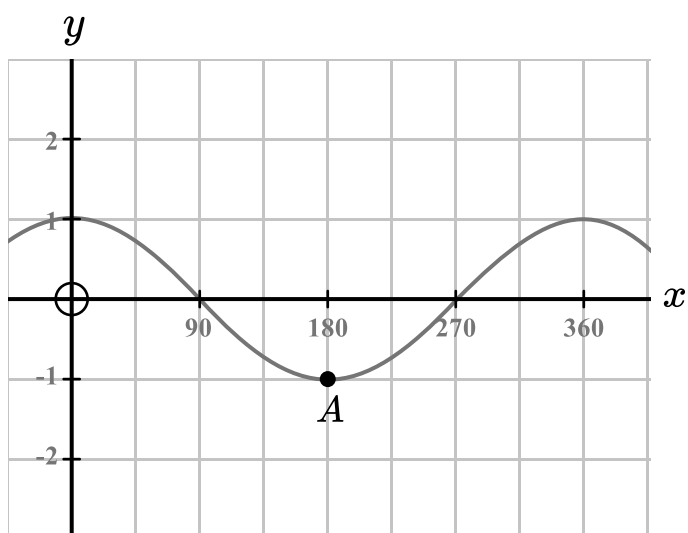**(Total for Question 19 is 5 marks)**

20 Here is the graph of $y = \sin(x)$.

(a) On this grid, sketch the graph of $y = \sin(x) - 1$.

(1)

(b) Here is the graph of $y = \cos(x)$.

A transformation is applied to $y = \cos(x)$.

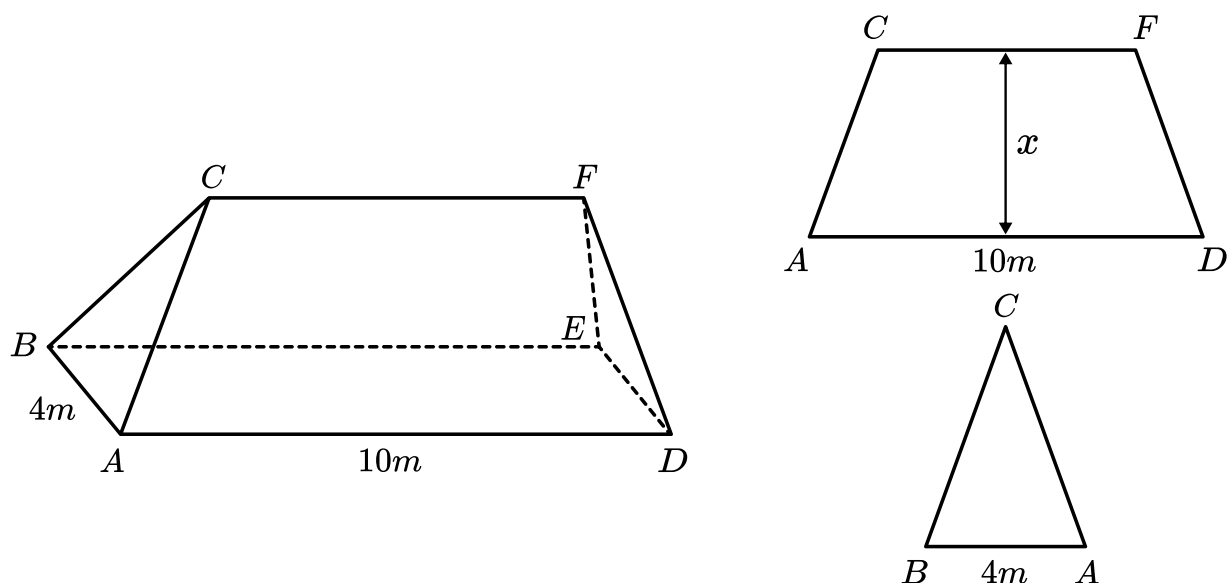The new coordinates of point A after the transformation are (180, 1).

Write down two possible equations for the new graph.

(2)

(Total for Question 20 is 3 marks)

21 Here is a diagram of a roof.

The roof is made from two isosceles trapeziums and two isosceles triangles.

The perpendicular height of the triangle ABC 10% longer than the perpendicular height x of the trapezium ACFD.

Show that the length CF is given by $CF = 10 - 2\sqrt{0.21x^2 + 4}$.

(Total for Question 21 is 4 marks)

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