Elgin Academy Higher Maths - Summer Revision of N5 work

Task 1 – Non-calculator Multiple Choice

For each question, determine which of the four answers is correct.

1. The gradient of any line perpendicular to the line with equation $3x + 2y = 5$ is

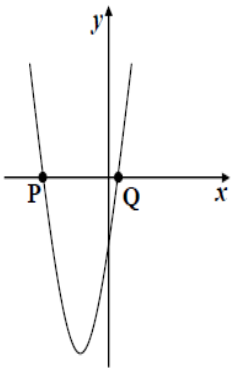
A -3

B $\frac{2}{3}$

C $-\frac{3}{2}$

D $\frac{1}{3}$

2. The graph in the diagram has equation $y = 2x^2 + 5x - 3$ and cuts the x-axis at P and Q. What are the x co-ordinates of P and Q?



A x = 3, x= 0.5

B x = -3, x = - 0.5

C x = 3, x = - 0.5

D x = -3, x = 0.5

3. Factorise $4k^2 - 25$

A (2k - 5)(2k – 5)

B (2k + 5)(2k + 5)

C (2k – 5)(2k + 5)

D (4k – 5)(k + 5)

4. Evaluate $3 - (\frac{1}{5} + \frac{2}{3})$

A $2\frac{2}{15}$

B $2\frac{13}{15}$

C $2\frac{8}{15}$

D $2\frac{10}{15}$

5. A function *f* is defined on the set of integers by the formula $f(x) = ax + b$ where *a* and *b* are integers.

Given that $f(1) = 2$ and $f(3) = 7$, what are the values of *a* and b?

A a = 2.5, b = 0.5

B a = 2.5, b = -0.5

C a = -2.5, b = -0.5

D a = -2.5, b = 0.5

6. In each of the following equations *x* and *y* are variables.

For which of the equations is $x = 0,\ y = 0$ the only possible solution?

A $xy = 0$

B $x - y = 0$

C $x^2 + y^2 = 0$

D $x^3 - y^3 = 0$

7. The maximum value of 4sin 2x is

A 4

B 2

C 0

D -4

8. Remove the brackets and simplify the following expression

$$(2x - 3)(3x + 2)$$

A $6x^2 + 5x - 6$

B $6x^2 + 5x + 6$

C $6x^2 - 5x + 6$

D $6x^2 - 5x - 6$

9. The function f such that $f(x) = (x-1)(x+5)$ has a minimum turning point at

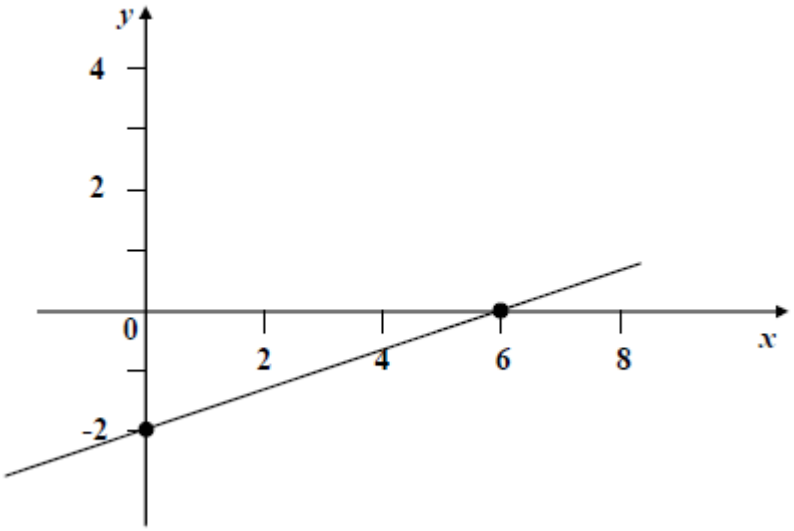
A **(**-9, -2)

B (2, 9)

C $(-2, -9)$

D **(**-2, 9)

10. Find the equation of the line in the diagram.



A $3y + x - 6 = 0$

B $3y + x + 6 = 0$

C $3y - x + 6 = 0$

D $3y - x - 6 = 0$

11. All the values of x which satisfy $(x-4)(x+3) \geq 0$ are

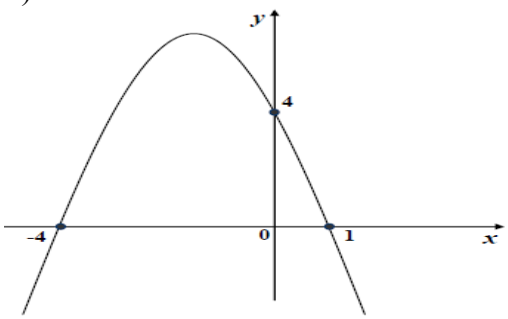
A $-4 \leq x \leq 3$

B $-3 \leq x \leq 4$

C $x < -3$ or $x > 4$

D $x \leq -3$ or $x \geq 4$

12. Determine the equation of the parabola in the diagram which passes through the points (-4, 0), (1, 0) and (0, 4).



A $y = 4 - 3x + x^2$

B $y = -4 + 3x - x^2$

C $y = -4 - 3x - x^2$

D $y = 4 - 3x - x^2$

13. Given that the points $(-2, 1)$, $(0, 7)$ and $(1, k)$ are collinear, then k equals

A 13

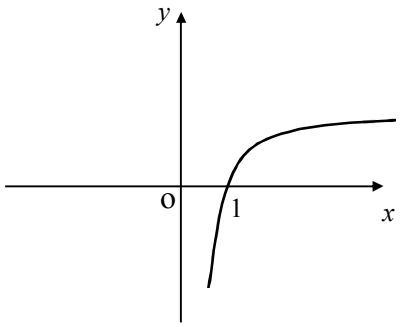
B 10

C 0

D -18

14. Which of the following could represent part of the graph of $y = 2^x$?

A



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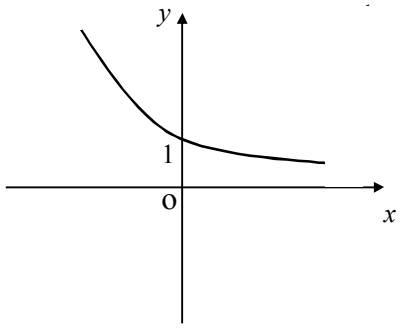

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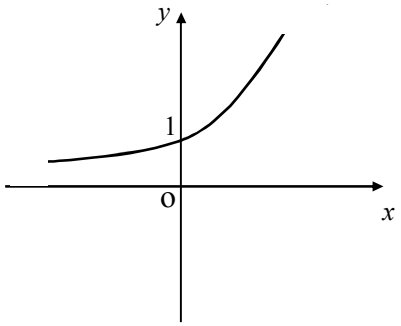

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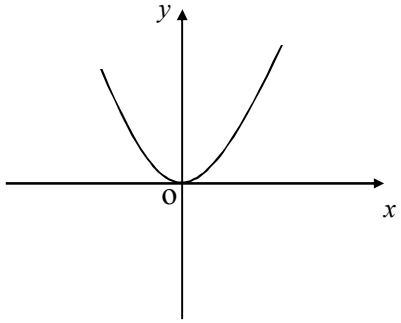


15. Change the subject of the formula $x = \frac{3(y+2)}{5}$ to y.

A $y = \frac{1}{3}(5x + 6)$

B $y = \frac{1}{3}(5x - 6)$

C $y = 5x - 6$

D $y = \frac{1}{3}(5x - 2)$

16. Re-express this expression in index form

$$\frac{2}{\sqrt[3]{x}}$$

A $2x^3$

B $\frac{1}{2}x^{-3}$

C $2x^{1/3}$

D $2x^{-1/3}$

17. Factorise fully $4x^2 - 10x - 6$

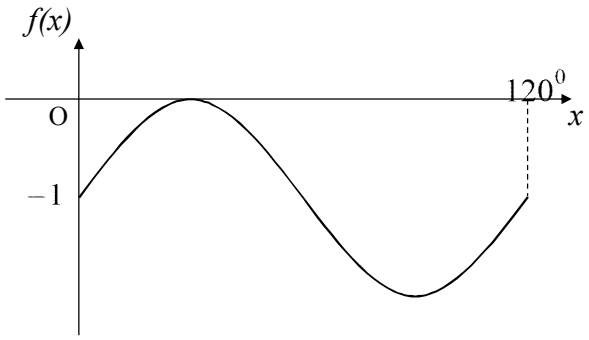
A $2(2x - 1)(x + 3)$

B $2(2x + 1)(x + 3)$

C $2(2x - 1)(x - 3)$

D $2(2x + 1)(x - 3)$

18. The diagram below shows part of the graph of a trigonometrical function.



The most likely function could be $f(x) = ...$

A $-\sin x$

B $-\cos 3x$

C $\sin 3x - 1$

D $1 - \sin 3x$

19. Evaluate $2\frac{1}{3}+\frac{4}{5}\,of\,1\frac{3}{7}$

A $\mathbf{3}\frac{20}{21}$

B $3\frac{1}{3}$

C $3\frac{10}{21}$

D $3\frac{11}{21}$

20. Evaluate $64^{-2/3}$

A $-42\frac{2}{3}$

B $42\frac{2}{3}$

C $\frac{1}{16}$

D 16

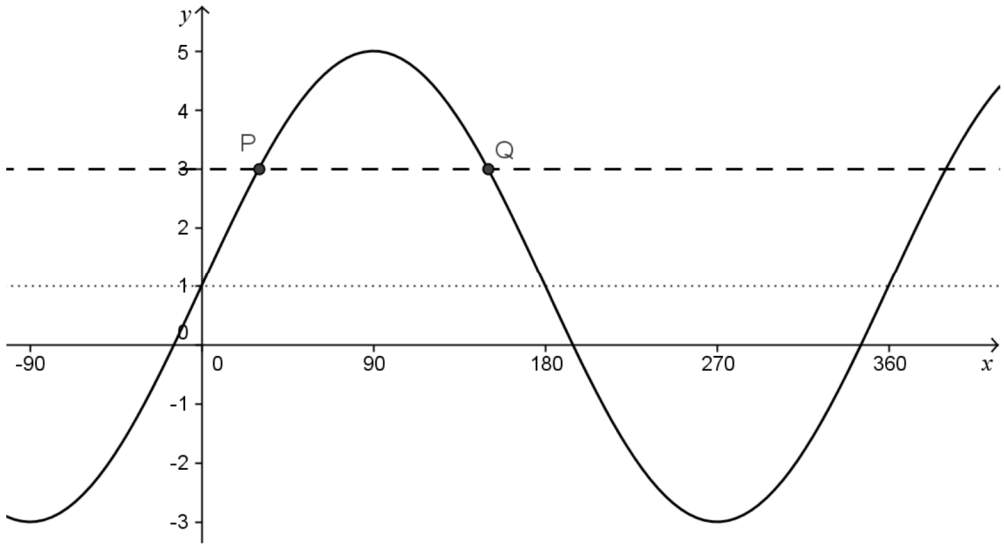
Task 2 – Non-calculator general revision

1. Express as a single fraction (a) $\frac{x}{6} + \frac{2x}{3}$ **2**

2. Simplify $\left(3a^{-2}\right)^3$ **2**

3. A triangle ABC has vertices A(3, -4), B(11,-4) and C(11,0)
Find the exact length of AC, giving your answer as a surd in simplest form. **3**

4. The diagram below shows part of the graph $y = a \sin x^\circ + b$ and the line $y = 3$.



(a) State the values of a and b. **2**

(b) The line $y = 3$ cuts the graph at P and Q. Find the coordinates of P and Q. **3**

Task 3 – Non-calculator exam-style
Recommended time limit: 1 hour

1. Evaluate $17 - 3.2 \div 4$ 2

2. (a) Evaluate $3xy$ where $x = -3$ and $y = 6$ 2

   (b) Evaluate $m^2 - \frac{m}{n}$ where $m = -4$ and $n = 2$. 2

3. Calculate $3\frac{2}{3} \div 2\frac{3}{4}$. 2

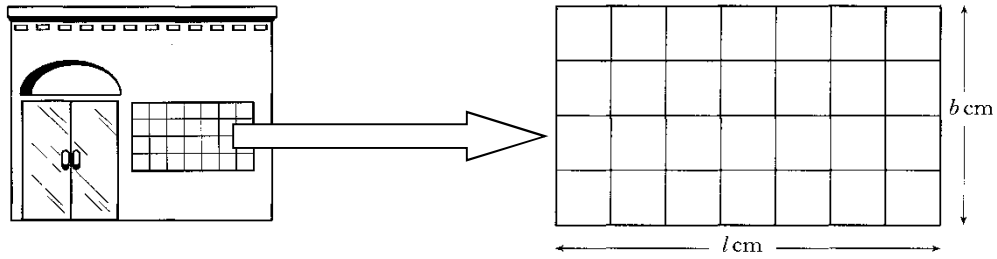
4. (a) Solve $2 - 5(3x - 2) \geq 4(1 - 3x)$ 4

   (b) Hence state the **lowest positive integer** value of x that satisfies the above inequality. 1

5. (a) Factorise $4a^2 - 9b^2$. 2

   (b) Express $\frac{3(x+4)}{x^2-16}$ in its simplest form. 2

6.



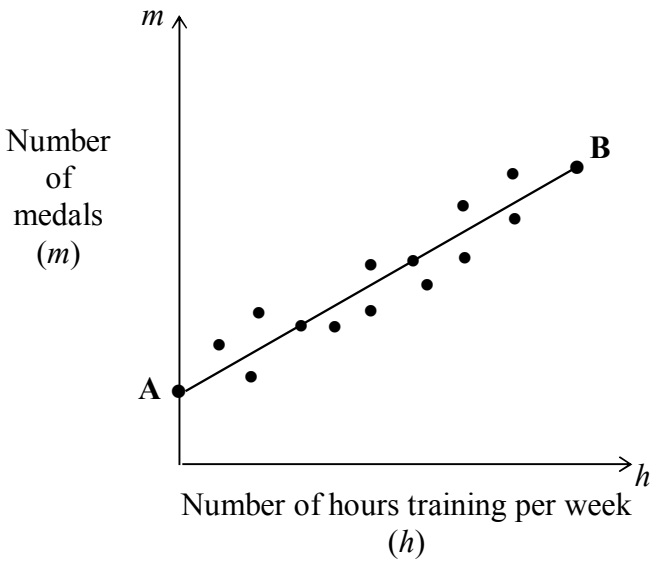
A rectangular window has length, l centimetres and breadth, b centimetres.
A security grid is made to fit this window. The grid has 5 horizontal wires and 8 vertical wires.

(a) The perimeter of the window is 260 centimetres.
Use this information to write down an equation involving l and b. 1

(b) In total, 770 centimetres of wire are used.
Write down another equation involving l and b. 2

(c) Find the length and breadth of the window. 3

7. The graph below shows the relationship between the number of hours (h) a swimmer trains per week and the number of Championship medals (m) they have won.

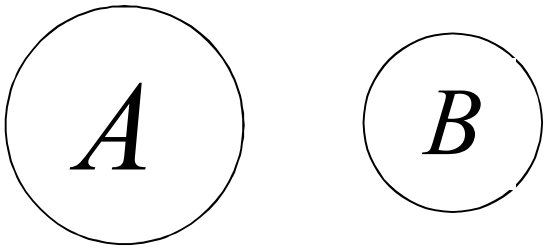


A best fitting straight line AB has been drawn.
Swimmer A does not train but has won 3 medals this year.
Swimmer B who trains for 14 hours per week has won 31 medals this year.

Find the equation of the straight line AB in terms of m and h. 4

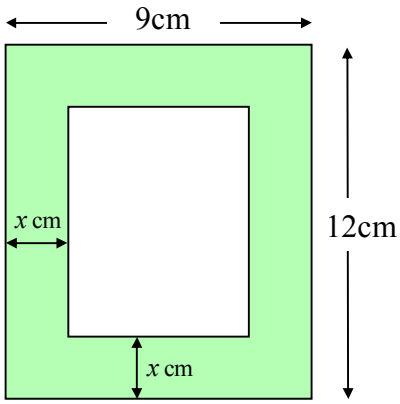
8. Given that $R = \frac{4S}{T}$, change the subject of the formula to S. 2

9. Circle A has a circumference of 14π centimetres and circle B has a circumference of 10π centimetres.



Calculate the difference in size between the radius of circle A and the radius of circle B. 3

10. Sandy found a small photo-frame and decided to put one of her favourite photographs in it. The diagram below shows the dimensions of the frame.



The width of the wooden surround is x cm.

Unfortunately the glass in the centre of the frame was cracked and had to be replaced.

(a) Show that the area of glass needed for the centre of the frame can be given by the formula

$$A = \left(4x^2 - 42x + 108\right) \text{ cm}^2$$

4

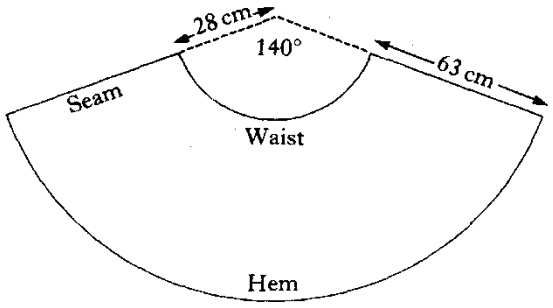
(b) If the area of glass needed was 54cm2, find a possible value for x. 3

Task 4 – Calculator exam-style
Recommended time limit: 1.5 hours

1. By accident, 5 tonnes of a chemical are released into a sea loch. If the tides remove 40% of the chemical in the loch each week, how many tonnes of chemical will be expected to remain after 3 weeks?
   Give your answer correct to **one** decimal place. 4

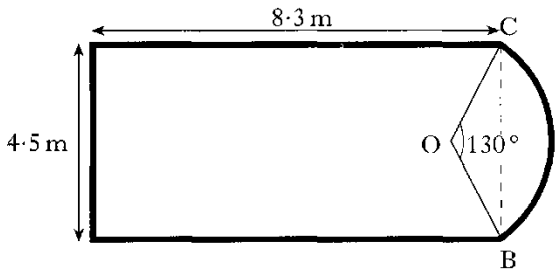
2. The annual profit of a company was £3.2×10^9 for the year 1997.
   What profit did the company make per second?
   Give your answer to **three significant figures**. 2

3. The pattern for a skirt consists of part of the sector of a circle.



   Calculate the length of the waist shown on the pattern opposite. 3

4. The diagram below shows a ceiling in the shape of a rectangle and a segment of a circle.



The rectangle measures 8.3m by 4.5m. OB and OC are radii of the circle and angle BOC is 130°.

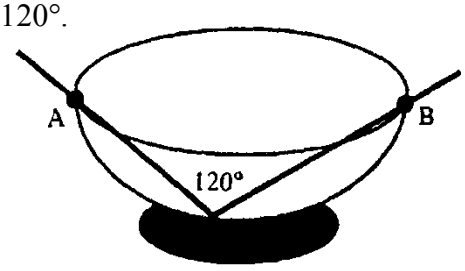
(a) Find the length of OB. 3

A border has to be fitted round the perimeter of the ceiling.

(b) Find the length of border required. 4

5. The diagram shows a glass bowl with two chop-sticks resting on the rim at points A and B.

The lengths of the parts of the chop-sticks inside the bowl are 10cm and 12cm respectively and the angle between them is 120°.



Find the length of AB to **two significant figures**. 5

6. Figure 1 shows the circular cross-section of a tunnel with a horizontal floor.

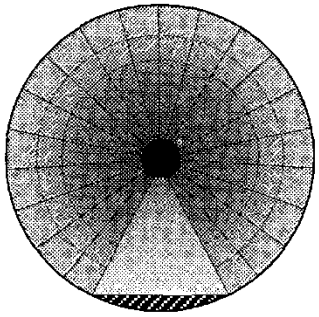


Figure 1

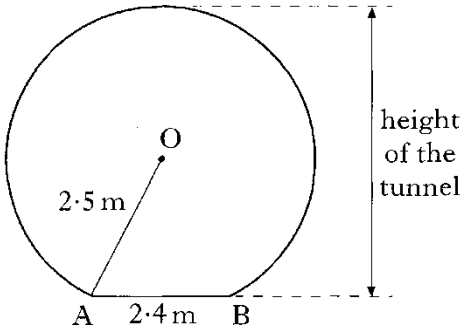
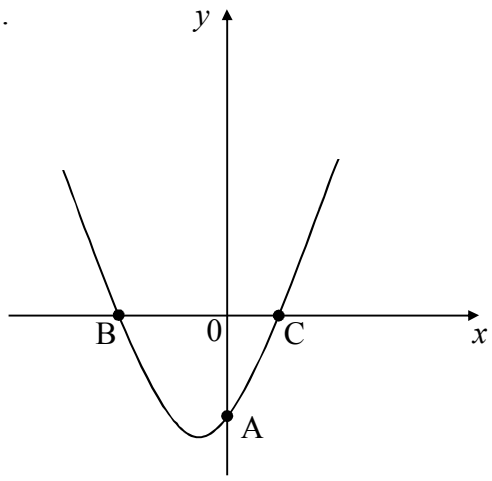


Figure 2

In figure 2, AB represents the floor. AB is 2.4 metres.
The radius, OA, of the cross-section is 2.5 metres.

Find the height of the tunnel. 4

7. The graph shown has equation $y = x^2 + 3x - 10$.

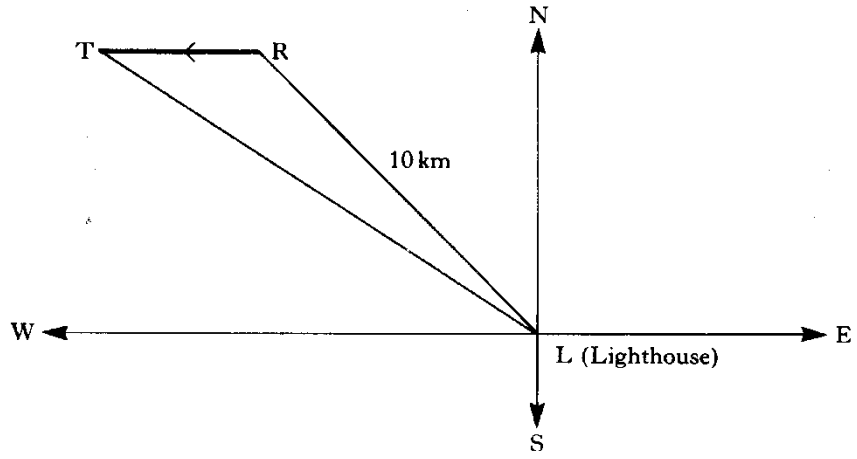


(a) Find the coordinates of A, the point where the curve cuts the y – axis. 1

(b) Find the coordinates of B and C, the points where the curve cuts the x – axis. 3

(c) Find the coordinates of the minimum turning point. 2

8.



A ship is first spotted at a position R, which is on a bearing of 315° from a lighthouse L. The distance between R and L is 10 kilometres. After the ship has travelled due West to position T, its bearing from the lighthouse is 300°.

How far has the ship travelled from R to T? 5

9. Thermogreen Ltd are developing a new greenhouse which claims to maintain an average interior temperature of 18^0 C.
Over a period of time the following temperatures (in degrees Celsius) were recorded:

16·8 20·3 17·4 18·2 19·5 17·6 19·1 17·8 16·5 18·8

(a) Calculate the mean temperature. 1

(b) Calculate the standard deviation correct to 1 decimal place. 3

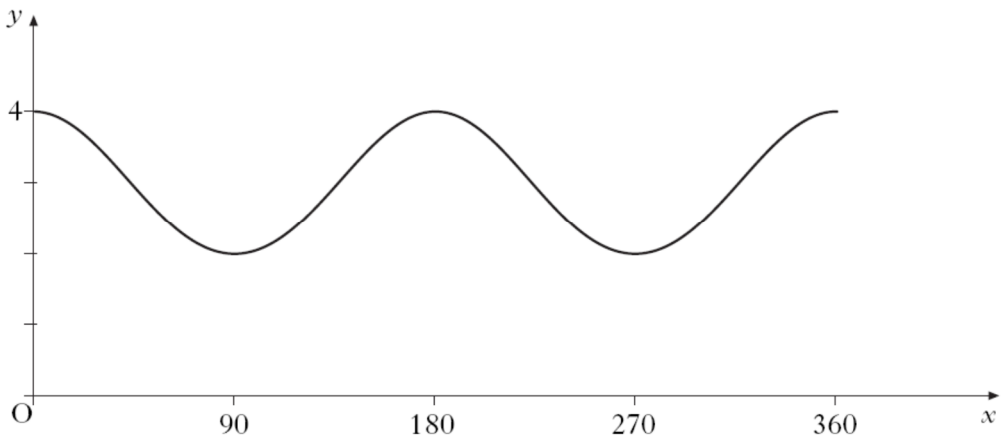
(c) Trading Standards expect the mean temperature to be within $0 \cdot 4^{\circ}$ C of the stated temperature and the standard deviation to be less than $1 \cdot 5^{\circ}$ C.
Will Thermogreen be able to market their new greenhouse? 1

10. A survey was carried out amongst 400 adults who booked a holiday on-line to find out what type of holiday they had chosen.
The results of the survey are shown in the table below.

Age	Package	Activity	Fly drive	Cruise
40 and under	92	86	18	14
Over 40	45	38	21	86

What is the probability that any adult, chosen at random, would have booked a cruise? Give your answer in its simplest terms. 2

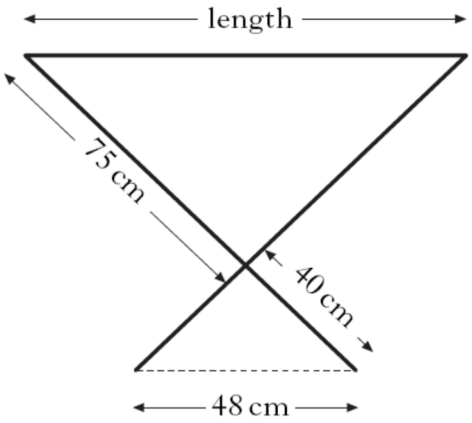
11. Part of the graph of $y = \cos bx^\circ + c$ is shown below.

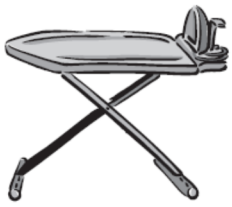


Write down the values of b and c. 2

12. Mick needs an ironing board.

He sees one in a catalogue with measurements as shown in the diagram below.





When the ironing board is set up, two similar triangles are formed.

Mick wants an ironing board which is at least 80 centimetres in length.

Does this ironing board meet Mick's requirements?

Show all your working. 3