"Mind Your Maths" Number 5
Year 10 Exam Revision

You may use a calculator
Marks Available : 60

Question 1

$$f(x) = \sqrt[3]{4x - 1}, \qquad x \in \mathbb{R}$$

(i) Find the value of $ff(86)$

[3 marks]

(ii) Find the value of x for which $f(x) = 11$

[3 marks]

Question 2

Expand the brackets and simplify,

(i) $(3m + 6)(m + 7)$

[2 marks]

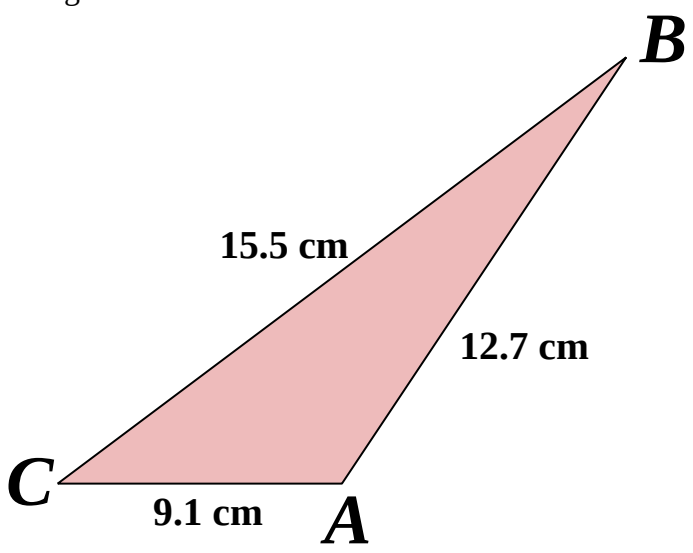
(ii) $(3w - 5)^2$

[3 marks]

Question 3

Consider the triangle *ABC* where;

- The length *AB* is 12.7 cm
- The length *BC* is 15.5 cm
- The length *CA* is 9.1 cm



In the GCSE examination you're told the cosine rule is $c^2 = a^2 + b^2 - 2ab\cos C$ but often what you really need is this formula rewritten with *cos C* as the subject.

(i) Either from memory, or by rearranging the above formula, write down the rewritten version of the cosine rule, often called “the cosine rule reversed”, with *cos C* as the subject.

[2 marks]

(ii) Hence, or otherwise, calculate the size of angle *C*.
Give your answer in degrees, accurate to one decimal place.

[3 marks]

(iii) The area of a triangle, in general, can be found using the formula.

$$Area\ \Delta\ =\ \frac{1}{2}\, b\, c\, sin\, A$$

Where A is the incuded angle, between sides b and c.

Write down the version of this formula that would be used when C (rather than A) is the included angle between sides a and b (rather than b and c).

[2 marks]

(iv) Hence, or otherwise, find the area of triange ABC.
Give your answer to three significant figures.

[3 marks]

Question 4

Factorise completely,

(i) $x^2 + 6x + 8$

[2 marks]

(ii) $2x^2 + 11x + 12$

[2 marks]

Question 5

Jack and Jill are having an argument about the formula, $Speed = \frac{Distance}{Time}$

Jack says, "Speed is **directly** proportional to time".
Jill says; "Speed is **inversely** proportional to time".

(i) Who is correct ?

[1 mark]

(ii) Give a reason for your part (i) answer.

[1 mark]

(iii) Every day Toni travels to Birmingham University from his home in Telford. If one day she travels twice as fast (on average) as the day before, what can be said about the time taken ?

[1 mark]

Question 6

A house was valued at £325 000 on 1st December 2008.
During the following year (in the financial crash) it fell in value by 21.8%.
Work out the value of the house on 1st December 2009.

[2 marks]

Question 7

This question is about rearranging formulae.

(i) Make *Distance* the subject of the formula,

$$Speed = \frac{Distance}{Time}$$

[2 marks]

(ii) Make t the subject of the formula,

$$v = u + a\,t$$

[2 marks]

(iii) Make $\sin Z$ the subject of the formula,

$$A = \frac{1}{2}\,x\,y\,\sin Z$$

[2 marks]

(iv) Make x the subject of the formula;

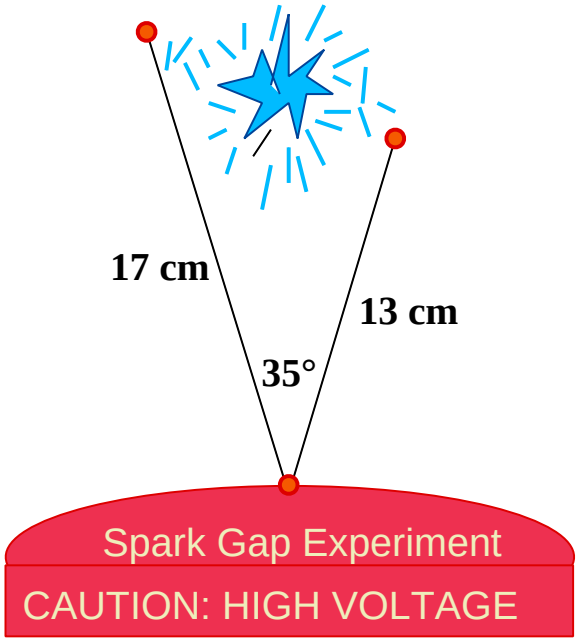
$$c = ax + bx$$

[2 marks]

Question 8

You may have noticed the lights flickering and going dim for short periods of time during the evenings recently.
This is due to Mr Patenden's "Spark Gap Experiment" ™ (© PP, 2022).
He is using a HIGH VOLTAGE device in an attempt to create a ball of electricity known as Saint Elmo's Fire.
Doing this requires vast amounts of electricity, hence the drain on Shrewsbury's electricity supply and the recent increases in school fees to pay for the energy used.

This question is to test if you would be of any use as Mr Patenden's assistant.



The device is shown above, and consists of two antennae, one 17cm, the other 13cm.
The angle between is currently (Ha, ha!) set at 35°.

Your job is to calculate the gap between the tips of the antennae, where the spark forms.

The cosine rule tells you that;

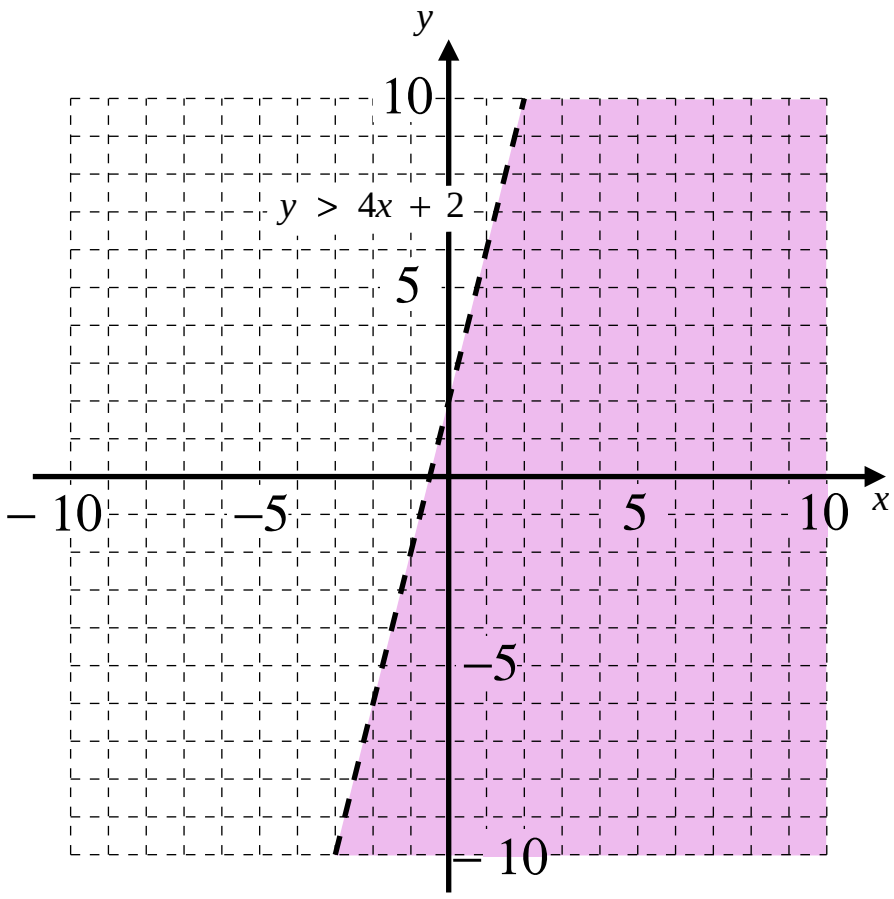
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Use this to calculate, in cm, the spark gap.
Give your answer to 3 significant figures.

[3 marks]

Question 9

On the graph below the **unshaded** region is the inequality $y > 4x + 2$



To the graph add, using shading, the following inequalities.
(You are recommended to shade **out** the regions not wanted)

(i) $y \leqslant 2$ **(ii)** $x \geqslant -5$ **(iii)** $y > -0.5x - 6$

Identify the region satisfying all four inequalities with the letter *R*.

[7 marks]

Question 10

Use your calculator to work out each of the following;

(i) $\left(\dfrac{9^2 - 5^2}{1^2 - 3^2} \right)^2$

[2 marks]

(ii) $\left(\dfrac{\tan 30° \times \tan 60°}{\sin 30° + \tan 45° + \cos 60°} \right)^2$

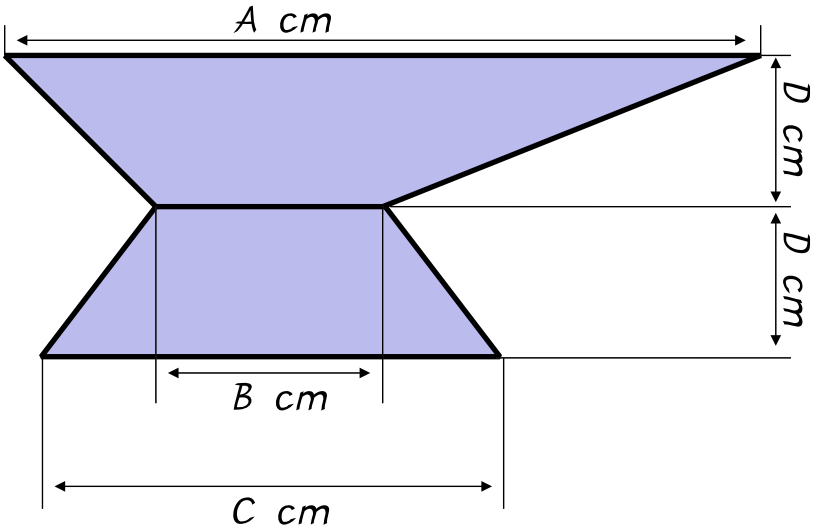
[2 mark]

Question 11

(i) Prove that the "blacksmiths anvil", shown in cross section below, has a cross sectional area formula given by;

$$\text{Area} = \frac{D}{2}\,(A + 2B + C)$$

In your proof you may use, without justification, any of the standard area formulae for a triangle, a rectangle or a trapezium.



[4 marks]

(ii) Hence, or otherwise, find the cross sectional area of an anvil in which A = 48 cm, B = 20 cm, C = 32 cm and D = 18 cm.

[4 marks]