Question 1. ***Marks***

a) Calculate, correct to 2 decimal places, $\dfrac{31.18-\sqrt{40.7}}{8.5}$ 1

b) Factorise fully, $a^2 - b^2 + 3a + 3b$ 2

c) If $g(x) = x^2 + 1$
i) Evaluate g (-3) 2
ii) For what values of x is g (x) = 2 ?

d) Graph on the number line the solution set of: $|3 - 2x| < 11$ 3

e) After a discount of 40% is allowed, the cost of insuring a car is $312. 2
Find the cost of insuring this car when no discount is allowed?

f) Express $\dfrac{3}{\sqrt{5}+2}$ in the form $\boldsymbol{a\sqrt{5}+b}$**.** 2

Question 2. (Start a new page)

a) Find the values of x for which $5x^2 - 2x - 3 = 0$ 1

b) Find the value of $\sqrt{20-tv}$ correct to 3 significant figures when $t = 5.3 \times 10^{-3}$ and $v = 7.8 \times 10^{-2}$ 2

c) i) Factorise $x^3 + 1$ 1
ii) Hence evaluate $\lim\limits_{x \to -1} \dfrac{x^3+1}{x+1}$ 1

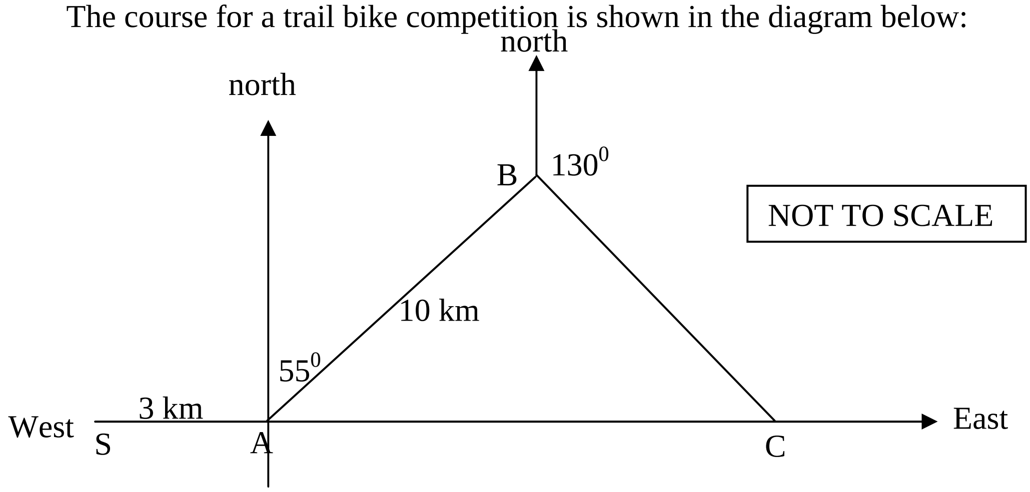
d) Solve $x + \dfrac{3-x}{5} = 12$ 2

e) Given that $\sin A = \dfrac{2}{5}$ and A is an obtuse angle, 3
find the EXACT values of tan A and cos A.

f) Find the values of ***tan x*** when $\boldsymbol{\tan^2 x + \sec^2 x = 7}$**.** 2

Question 3 (Start a new page)

a) The course for a trail bike competition is shown in the diagram below:



From the start S, Sharon rode 3 km due east to A. At A, she proceeded to a bearing of 055^0 for 10 km to B. At B she changed course to a bearing of 130^0 and continued in this direction until she reached the finish at C. (C is due east of start S and A.)

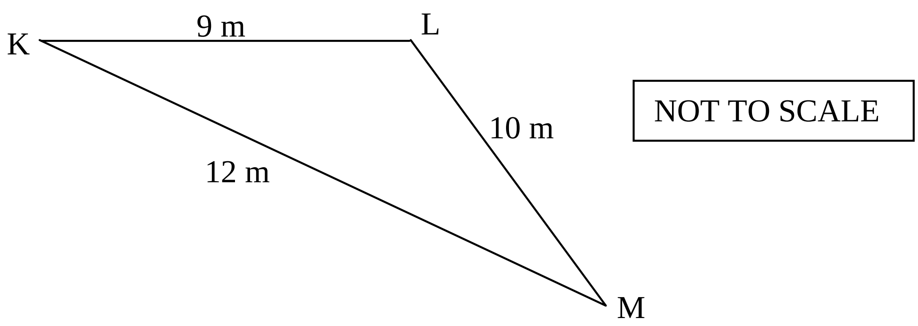
i) Copy this diagram onto your answer sheet. 5

ii) Show that $\angle ACB = 40^0$

iii) Use the SINE RULE to find the distance from B to C. Give your answer to the nearest km.

iv) It took Sharon 24 minutes to travel from the start to the finish. What was her average speed in km/hour.

b)

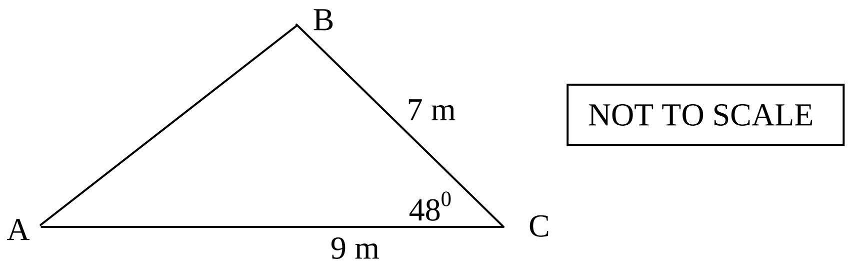


KLM is a triangle with KL = 9m, LM = 10m and MK = 12m as shown in the above figure.

i) Use the cosine rule to find the size of angle MKL to the nearest degree. 5

ii) Calculate the area of triangle KLM to the nearest square metre.

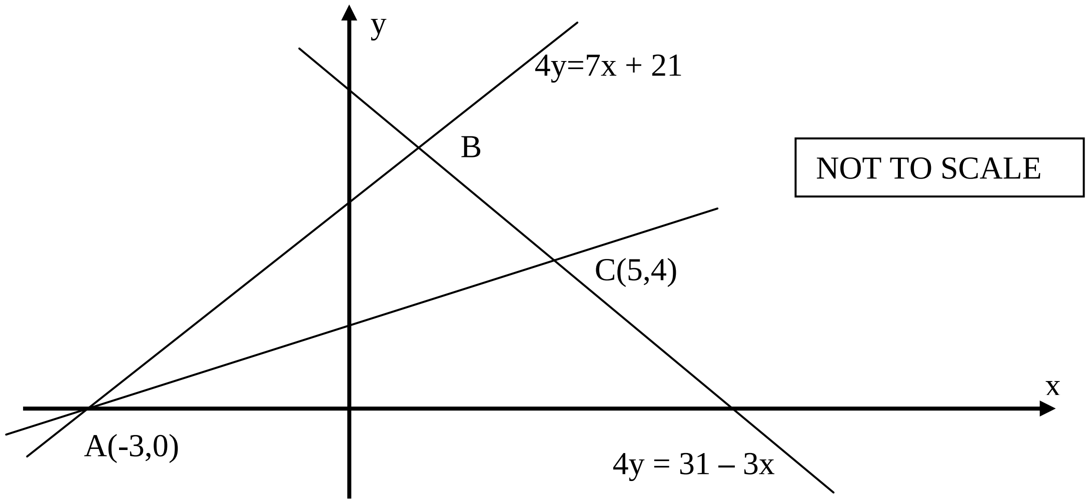
c)



Use the Cosine rule to find the length of AB to the nearest metre. 2

Question 4 (Start a new page)

In the diagram below, the lines $4y = 7x + 21$ and $4y = 31 - 3x$ intersect at the point B. Point A has coordinated (-3,0) and point C has coordinates (5,4)



a) Calculate the gradient of line AC 1

b) Show that the line AC has equation $2y = x + 3$ 1

c) Show that B has coordinates (1,7) 3

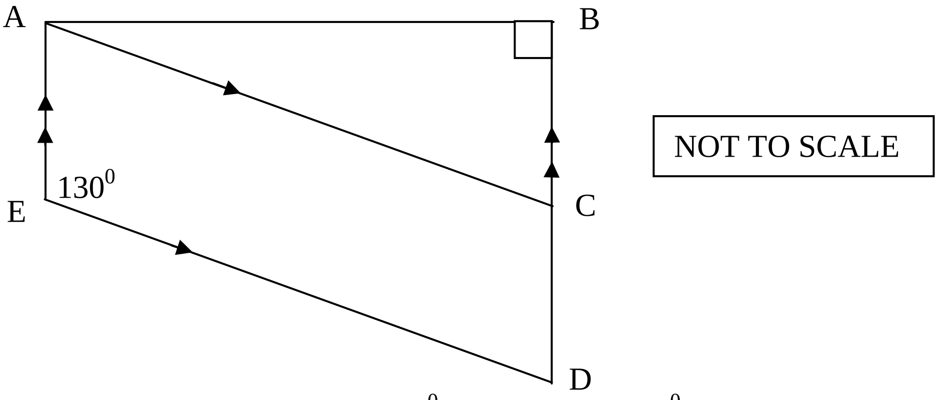
d) Show that the perpendicular distance from B to the line AC is $2\sqrt{5}$ units. 3

e) Find the exact length of the interval AC. 2
Express answer as a simplified surd.

f) Find the area of Δ ABC 2

Question 5 (Start a new page)

a)

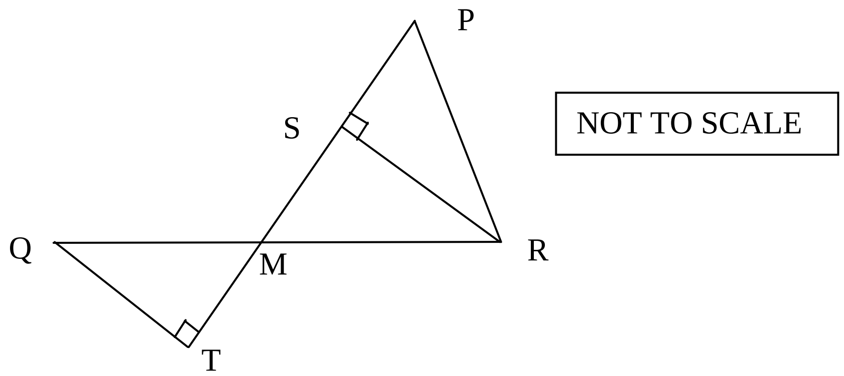


In the diagram AE || BD, AC || ED, $\angle AED = 130^0$ and $\angle ABC = 90^0$

i) Copy diagram onto your answer sheet.

ii) Find the size of $\angle$ BAC, giving reasons. 3

b) In the diagram below, QT and RS are perpendicular to the line PT.
M is the midpoint of the interval QR.

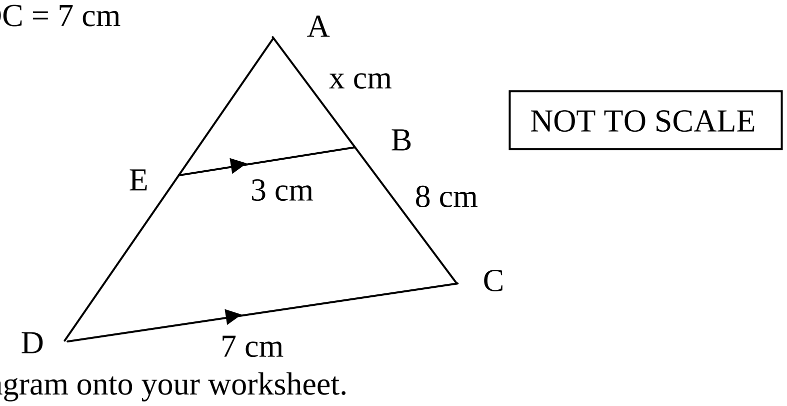


i) Copy diagram onto your answer sheet.

ii) Prove, giving reasons, that triangles QMT and RMS are congruent.

iii) If PT = 21 cm and SP = 12 cm, what is the length of TM? 5
Give reasons for your answer.

c) In the diagram below it is known that AB = x cm, and BC = 8 cm,
EB = 3 cm and DC = 7 cm



i) Copy diagram onto your worksheet.

ii) Prove triangles ABE and ACD are similar. 4

iii) Find the value of x.

Question 6 (Start a new page)

a) Differentiate the following

i) $y = 4x^3 - 7x^2 + 3$ 1

ii) $y = \dfrac{5}{x^2}$ 1

iii) $y = \sqrt{2x-7}$ 1

iv) $y = \dfrac{5x}{1-x}$ 2

v) $y = 7x(2x^2+1)^4$ 2

b) Find the equation of the normal to the curve $y = x^2 + 4x + 3$ at the point where $x = 3$. 3

c) Given $f(t) = 3t^4 - 2t^3 + 5t - 4$, find $f''(-2)$ 2

Question 7 (Start a new page)

a) Sketch the curve $f(x) = 2x^3 + 3x^2 - 36x + 5$ for $-3 \le x \le 3$, showing any turning points and point of inflexion. 5
Find the maximum and minimum values for the function $-3 \le x \le 3$.

b) A farmer wants to make a rectangular paddock with an area of 4000 m^2. However fencing costs are high and she wants the paddock to have a minimum perimeter.

i) Show that the perimeter is given by the equation $P = 2x + \dfrac{8000}{x}$ 4

ii) Find the dimensions of the rectangle that will give the minimum perimeter, correct to 1 decimal place

iii) Calculate the cost of fencing the paddock at $22.45 per metre.

c) Find the primitive function of:

i) $x^4 - 3x^2$

ii) $\dfrac{1}{x^8}$ 3

iii) $\sqrt{x}$