OCR
Oxford Cambridge and RSA

GCSE (9–1) Mathematics

J560/05 Paper 5 (Higher Tier)

Practice Paper

H

Date – Morning/Afternoon

Time allowed: 1 hour 30 minutes

You may use:
- Geometrical instruments
- Tracing paper

Do not use:
- A calculator

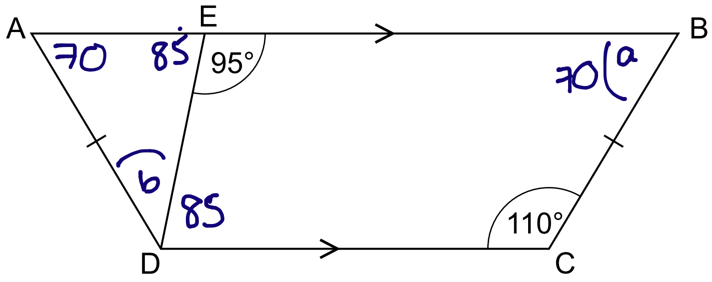
First name	Just Maths
Last name	Solutions
Centre number	
Candidate number	

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document consists of **20** pages.

Answer **all** the questions

1 ABCD is a trapezium.
AD = BC.



Work out

(a) angle EBC,

180-110

(a) ......70...... ° **[1]**

(b) angle ADE.

(b) ......25...... ° **[2]**

2 The angles in a triangle are in the ratio 1 : 2 : 3.
Neil says

This is a right-angled triangle.

Is Neil correct?
Show your reasoning.

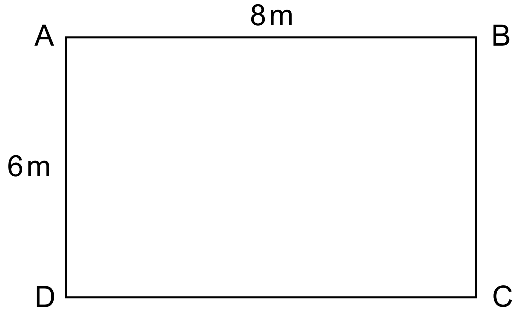
180 ÷ 6 = 30

$\underbrace{1 : 2 : 3}_{180 \div 6 = 30}$

30 : 60 : 90°

Yes the triangle is right angled. **[3]**

3 ABCD is a rectangle.



Not to scale

(a) Sunita calculates the length of AC, but gets it wrong.

$8^2 - 6^2 = AC^2$
$\sqrt{28} = AC$
$\sqrt{28} = 5.29$ or $^-5.29$
$AC = 5.29$

$AC^2 = 8^2 + 6^2$
$= 64 + 36 = 100$
$AC = \sqrt{100}$
$= 10$

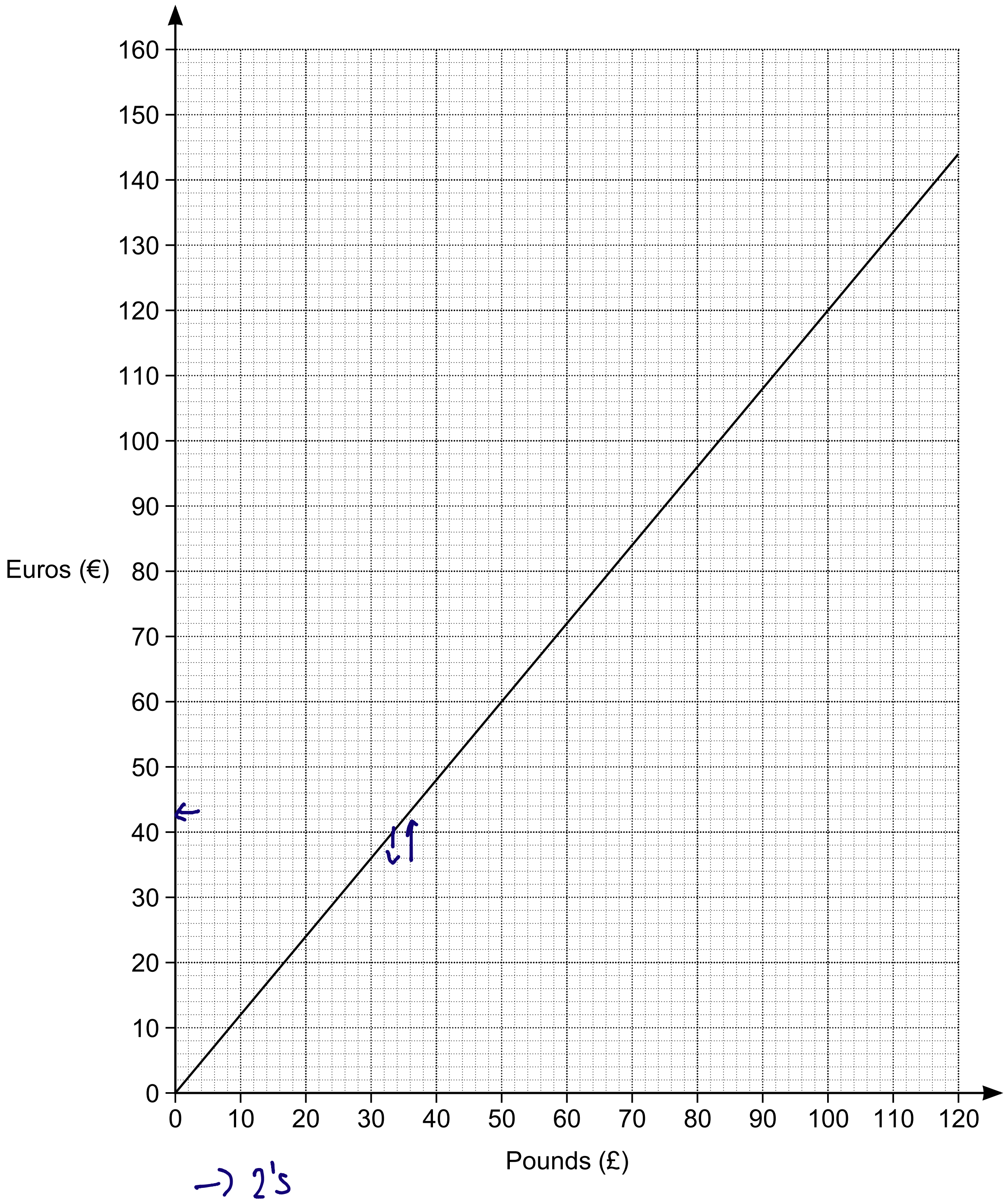
Explain what Sunita has done wrong.

She has subtracted $8^2 - 6^2$ instead of $8^2 + 6^2$ .... **[1]**

(b) Calculate the length of AC.

(b) ....10.... m **[2]**

4 This is a conversion graph between pounds and euros.



(a) Convert £36 into euros.

(a) € ....43.................................... **[1]**

(b) **(i)** Convert €400 into pounds.

$\times 10$ €40 = £33 $\times 10$
400

(b)(i) £ 330 **[3]**

(ii) State an assumption that you have made in working out your answer to part **(b)(i)**.

the conversion remains linear over £120 **[1]**

(c) Explain how the graph shows that the number of euros is directly proportional to the number of pounds.

its a straight line

[2]

5 Kamile sells sandwiches.

In May, she sold 400 sandwiches.
In June, Kamile sold 20% more sandwiches than in May.
In July, Kamile sold 15% fewer sandwiches than in June.

Calculate the percentage change in her sales from May to July.

may 400 June 480 +20% July 408 −15%

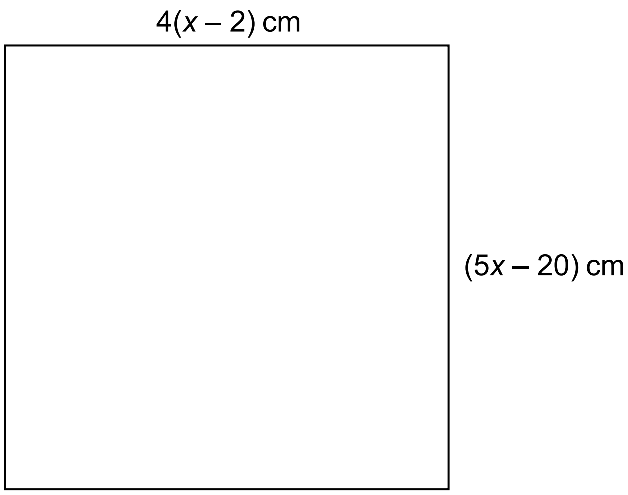
10% = 48
5% = 24
72

480 − 72 = 408

$\frac{8}{4\cancel{00}} \times 1\cancel{00} = \frac{8}{4} = 2$

2 % **[5]**

6 This is a square.



Not to scale

Work out the length of the side of the square.

$4(x-2) = 5x - 20$

$4x - 8 = 5x - 20$

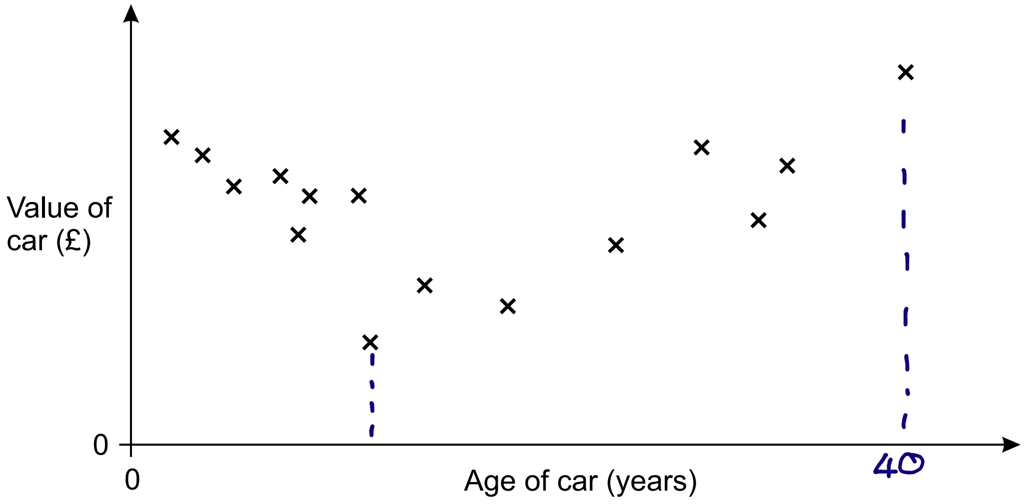
$-8 + 20 = 5x - 4x$

$x = 12\text{cm}$

$4(12-2) = 4 \times 10$

.......................40....................... cm **[5]**

7 This scatter graph shows the values of 15 sports cars plotted against their ages.



(a) **(i)** Lewis thinks that there is **no correlation** between the ages and values of these cars.

Is Lewis correct?
Give a reason for your answer.

it is diffrcult to tell as the points do not follow a linear pattern .... **[2]**

(ii) Sebastian thinks that there is a **relationship** between the ages and values of these cars.

Is Sebastian correct?
Give a reason for your answer.

Yes They initially decrease in value then increase in value as they get older .... **[2]**

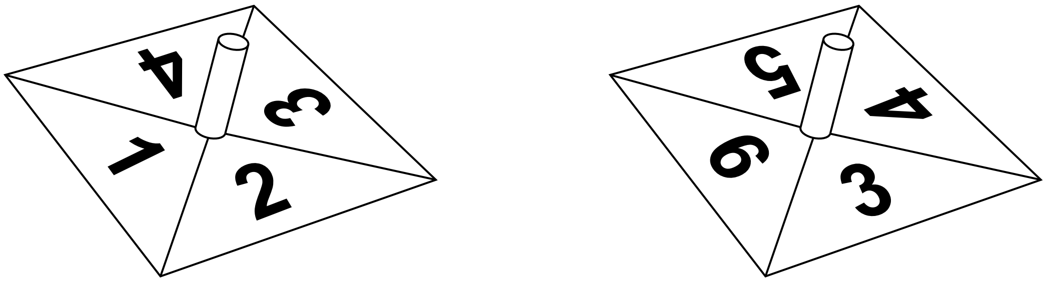
(b) The car with the highest value is 40 years old.

Estimate the age of the car with the lowest value.

(range accepted 11-14)

(b) ....12.... years **[2]**

8 Andrea has these two fair spinners.



Spinner A Spinner B

(a) Andrea spins **spinner A**.

Calculate the probability that Andrea gets 2 with one spin.

(a) ......$\frac{1}{4}$...... **[1]**

(b) Andrea now spins **both** spinners once.
She adds the number she gets on spinner A to the number she gets on spinner B.

(i) Andrea works out the probability that the two numbers she gets add to 4.
Here is her working.

> 1 + 3 = 4 3 + 1 = 4
>
> There are 4 outcomes on each spinner making 8 outcomes in total.
>
> The probability of the two numbers adding to 4 is $\frac{2}{8} = \frac{1}{4}$.

Andrea has made some errors.
Describe these errors.

She can only get a 1 and 3 not 3 and 1 as there isnt a 1 on spinner B

There are 4 x 4 = 16 outcomes so its $\frac{1}{16}$

....

.... **[2]**

(ii) Find the probability that the two numbers she gets add to 6.

1, 2, 3, 4   3, 4, 5 6

1, 5
2, 4
3, 3

(b)(ii) $\frac{3}{16}$ **[3]**

9 **(a)** Calculate.

$$2\frac{3}{8} \div 1\frac{1}{18}$$

Give your answer as a mixed number in its lowest terms.

$\frac{19}{8} \div \frac{19}{18}$ $\frac{\cancel{19}}{\cancel{8}4} \times \frac{\cancel{18}9}{\cancel{19}}$ $= \frac{9}{4}$

(a) $2\frac{1}{4}$ **[3]**

(b) Write $\frac{5}{11}$ as a recurring decimal.

$5 \div 11$

$11 \overline{)5.{}^50{}^60{}^50{}^60}$ = 0.4545

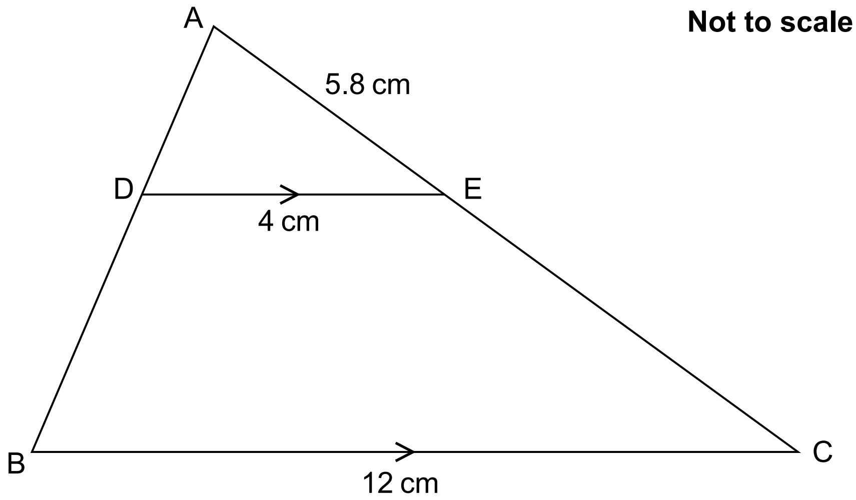
(b) $0.\dot{4}\dot{5}$ **[2]**

(c) Write $0.\dot{3}\dot{6}$ as a fraction in its lowest terms.

$x = 0.363636\ldots$
$100x = 36.3636\ldots$
$99x = 36$
$x = \frac{36}{99} = \frac{4}{11}$

(c) $\frac{4}{11}$ **[3]**

10 In the diagram BC is parallel to DE.



Not to scale

(a) Prove that triangle ABC is similar to triangle ADE. **[3]**

in $\triangle ABC$ $\quad\quad$ $\triangle ADE$

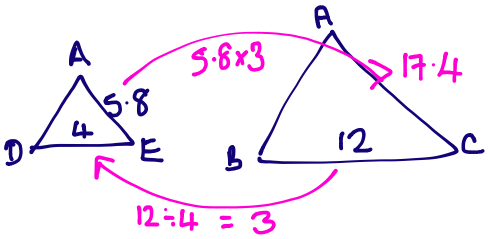
$B\hat{A}C = D\hat{A}E$

$A\hat{B}C = A\hat{D}E$ corresponding angles are equal

$A\hat{C}B = A\hat{E}D$ corresponding angles are equal

$\therefore$ Triangles are similar as they have equal angles

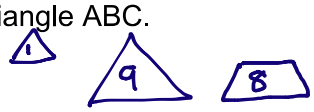
(b) Calculate the length of AC.



(b) ....17.4........ cm **[2]**

(c) Find the ratio

area of quadrilateral DBCE : area of triangle ABC.



length scale factor = 3

area scale factor = $3^2 = 9$

(c) ....8........ : ....9........ **[3]**

11 Evaluate.

$$16^{-\frac{3}{2}}$$

$= \frac{1}{16^{3/2}} = \frac{1}{(\sqrt{16})^3} = \frac{1}{4^3} = \frac{1}{4 \times 4 \times 4}$

$\frac{1}{64}$ **[3]**

12 **(a)** Expand and simplify.

$$(x+7)(x+2)$$

(a) $x^2 + 9x + 14$ **[2]**

(b) Factorise completely.

$$2x^2 - 6xy$$

(b) $2x(x - 3y)$ **[2]**

(c) Solve.

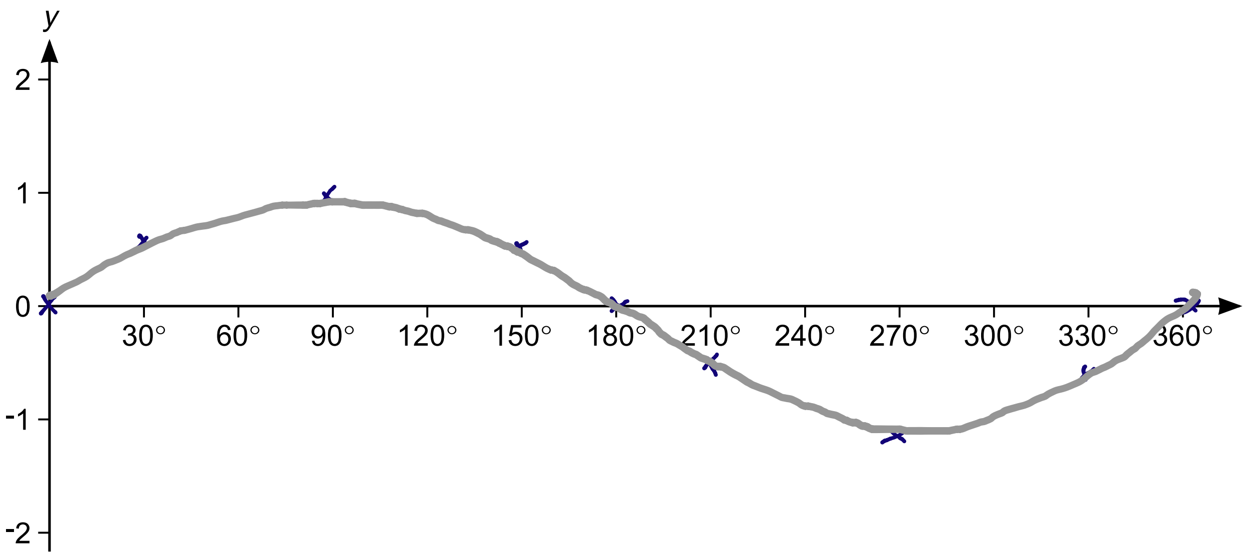
$$x^2 + 5x = 24$$

$x^2 + 5x - 24 = 0$

$(x + 8)(x - 3) = 0$

(c) $x = 3$ or $x = -8$ **[3]**

13 (a) Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

(b) (i) Write down the coordinates of the maximum point of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

(b)(i) (90 , 1) **[1]**

(ii) Write down the coordinates of the maximum point of $y = 3 + \sin x$ for $0° \leqslant x \leqslant 360°$.

(ii) (90 , 4) **[1]**

(c) One solution to the equation $4 \sin x = k$ is $x = 60°$.

(i) Find the value of k.

$4 \times \frac{\sqrt{3}}{2} = K$

(c)(i) $k =$ $2\sqrt{3}$ **[2]**

(ii) Find another solution for x in the range $0° \leqslant x \leqslant 360°$.

(ii) $x =$ 120 ° **[1]**

14 Here is a sequence.

$2 \times \sqrt{7}\sqrt{7}$ $\quad$ $14\sqrt{7}\sqrt{7}$

$$2 \qquad 2\sqrt{7} \qquad 14 \qquad 14\sqrt{7}$$

$\times\sqrt{7}$ $\quad \times\sqrt{7}$ $\quad \times\sqrt{7}$

(a) Work out the next term.

14×7

(a) ....98............ **[1]**

(b) Find the *n*th term.

$2 \times \sqrt{7}^{(n-1)}$

(b) ....$2\sqrt{7}^{(n-1)}$............ **[3]**

(c) Find the value of the 21st term divided by the 17th term.

$$\frac{21st = \cancel{2} \times \sqrt{7}^{20}}{17th = \cancel{2} \times \sqrt{7}^{(16)}}$$

$$7^{\frac{20}{2}} \div 7^{\frac{16}{2}} = 7^{10} \div 7^{8} = 7^{2}$$

(c) ....49............ **[2]**

15 Tony and Ian are each buying a new car.

There are three upgrades that they can select:

- metallic paint (10 different choices)
- alloy wheels (5 different choices)
- music system (3 different choices).

(a) Tony selects all 3 upgrades.

Show that there are 150 different possible combinations. **[1]**

$10 \times 5 \times 3 = 150$

(b) Ian selects 2 of these upgrades.

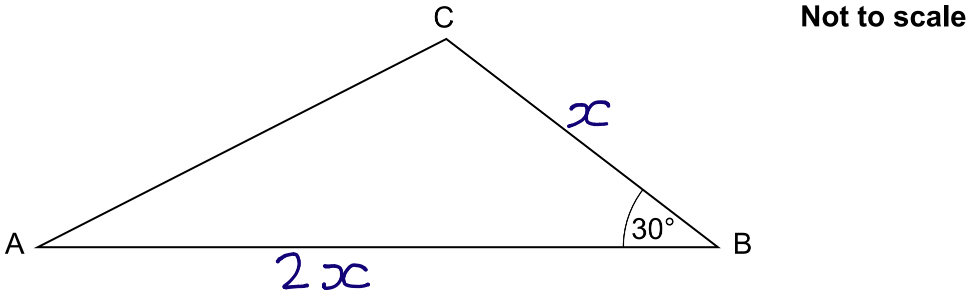
Show that there are 95 different possible combinations. **[3]**

$10 \times 5 + 10 \times 3 + 3 \times 5$

$50 + 30 + 15$

$= 95$

16 Triangle ABC has area 40 cm^2.
AB = 2BC.



Work out the length of BC.
Give your answer as a surd in its simplest form.

area $= \frac{1}{2}ab\sin C$

$\frac{1}{2} \times x \times 2x \times \sin 30 = 40$

$\frac{1}{2} \times 2x^2 \times \frac{1}{2} = 40$

$2x^2 = 40 \times 4 = 160$

$x^2 = 80$

$x = \sqrt{80}$

$\sqrt{16} \times \sqrt{5}$ = $4\sqrt{5}$ .... cm **[6]**

17 A solid metal sphere has radius 9.8 cm.
The metal has a density of 5.023 g/cm^3.

Lynne estimates the mass of this sphere to be 20 kg. = 20,000g

Show that this is a reasonable estimate for the mass of the sphere. **[5]**

[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$D = \frac{m}{V}$

$V = \frac{4}{3} \times \pi \times 9.8^3$

$= 3942.45583$

using $M = D \times V$

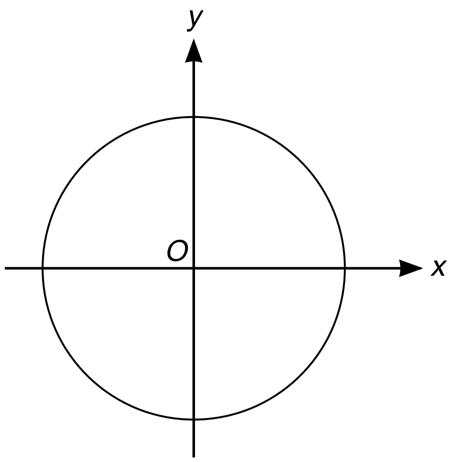
$= 3942.46\ldots \times 5.023$

$= 19{,}802.95564$

$\Rightarrow 19{,}803$

which is close to 20,000

18 **(a)** The diagram shows a circle, centre O.



The circumference of the circle is 20π cm.

Find the equation of the circle.

$C = \pi \times D = 20\pi$
$D = 20$
$r = 10$

$x^2 + y^2 = 10^2$

(a) $x^2 + y^2 = 10^2$ **[4]**

(b) The line $10x + py = q$ is a tangent at the point $(5, 4)$ in another circle with centre $(0, 0)$.

Find the value of p and the value of q.

gradient between $(0,0)$ and $(5,4)$

$\frac{4}{5}$

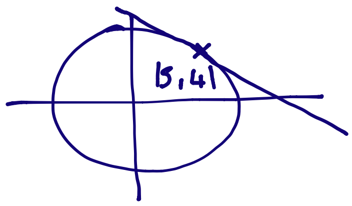
gradient of tangent $= -\frac{5}{4}$

using $y = mx + c$
when $x = 5$ $y = 4$

$4 = -\frac{5}{4} \times 5 + c$

$c = 4 + \frac{25}{4} = \frac{41}{4}$

$y = -\frac{5}{4}x + \frac{41}{4}$ $\quad \frac{5}{4}x + y = \frac{41}{4}$



$(\times 4)$ $5x + 4y = 41$

$(\times 2)$ $10x + 8y = 82$

(b) $p =$ 8

$q =$ 82 **[4]**