Candidate surname

Other names

Centre Number

Candidate Number

**Pearson Edexcel**
**Level 1/Level 2 GCSE (9–1)**

## Mock Set 4 – Autumn 2018

Time: 1 hour 30 minutes

Paper Reference **1MA1/1H**

## Mathematics

**Paper 1 (Non-Calculator)**
**Higher Tier**

Solutions

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

Total Marks

## 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 not 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.

*Turn over* ▶

S 5 9 7 2 6 A 0 1 2 1

**Pearson**

**Answer ALL questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

**1**  Write 136 as a product of its prime factors.

$$2 \mid 136$$
$$2 \mid 68$$
$$2 \mid 34$$
$$17 \mid 17$$
$$1$$

$$136 = 2 \times 2 \times 2 \times 17$$

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

**(Total for Question 1 is 3 marks)**

**2** A biased spinner can land on red, on blue, on green or on yellow.

John is going to spin the spinner.

The table shows each of the probabilities that the spinner will land on red, on blue or on green.

| Colour | red | blue | green | yellow |
|---|---|---|---|---|
| **Probability** | 0.2 | 0.25 | 0.15 | 0.4 |

(a) Complete the table.

(2)

Hayley is going to spin the spinner 60 times.

(b) Work out an estimate for the number of times the spinner will land on red.

$60 \times 0.2$

..............12..............

(2)

**(Total for Question 2 is 4 marks)**

**3** An empty tank is a cylinder of height 5 metres.

Water is poured into the tank at a constant rate.
It takes 4 minutes to fill the tank completely with water.

Malcolm draws this graph to show the depth of water in the tank as water is poured into the tank.

5 metres

Depth of water (metres)

Time (minutes)
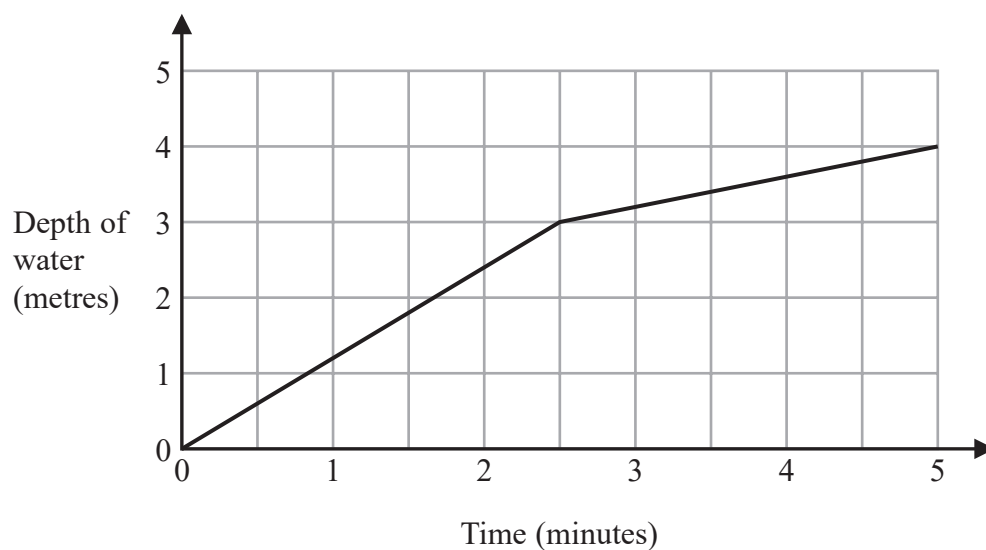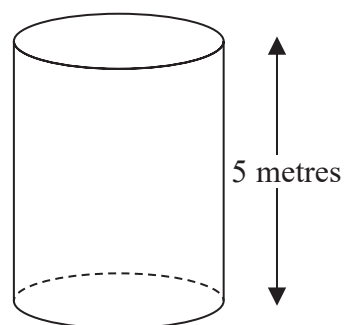
Write down two things wrong with this graph.

1. Should be a straight line graph

2. Should end at (4 min, 5m) not (5 min, 4m)

**(Total for Question 3 is 2 marks)**

**4**
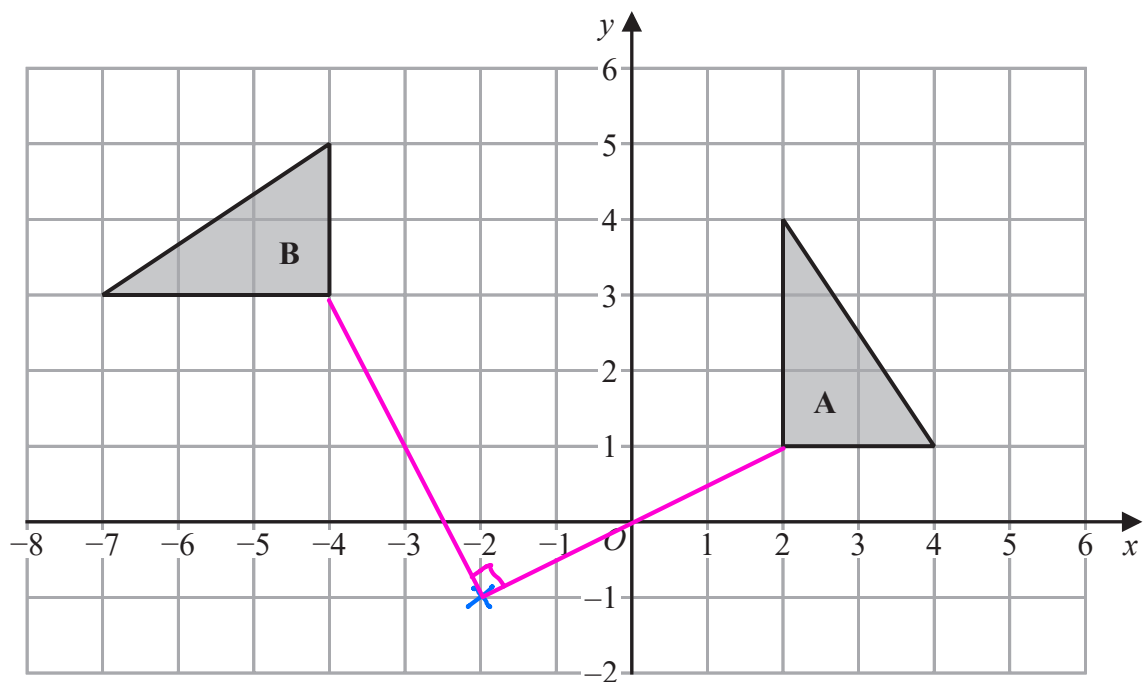


Describe fully the single transformation that maps triangle **A** onto triangle **B**.

Rotation by 90° anti-clockwise about (−2, −1)

**(Total for Question 4 is 2 marks)**

**5** This accurate diagram shows three points *A*, *B* and *C*.

$A$
×

×$B$

×
$C$

Region **R** contains all the points that are

less than 4 cm from each of the points *A* and *C*
and nearer to point *B* than to point *A*

Show, by shading, the region **R**.

**(Total for Question 5 is 3 marks)**

**6** Each student at a college is going to be given a notebook.

The colour of each notebook will be red or blue or green or orange.

Bill takes a sample of 50 of the students at the college.
He asks each of these students what colour of notebook they want.

The table gives Bill's results.

| Notebook colour | red | blue | green | orange |
|---|---|---|---|---|
| Number of students | 18 | 16 | 10 | 6 |

There are 3000 students at the college.

(a) Work out how many red notebooks Bill should buy.

$$Red = \frac{18}{50} = \frac{36}{100}$$

$$3000 \times \frac{36}{100} = 36 \times 30 = 1080$$

.................................................. 1080

**(2)**

(b) Write down one assumption that you made in answering part (a).
   Explain how your answer would be affected if this assumption were not true.

Assume sample is representative of choices
that would be made by all college students.
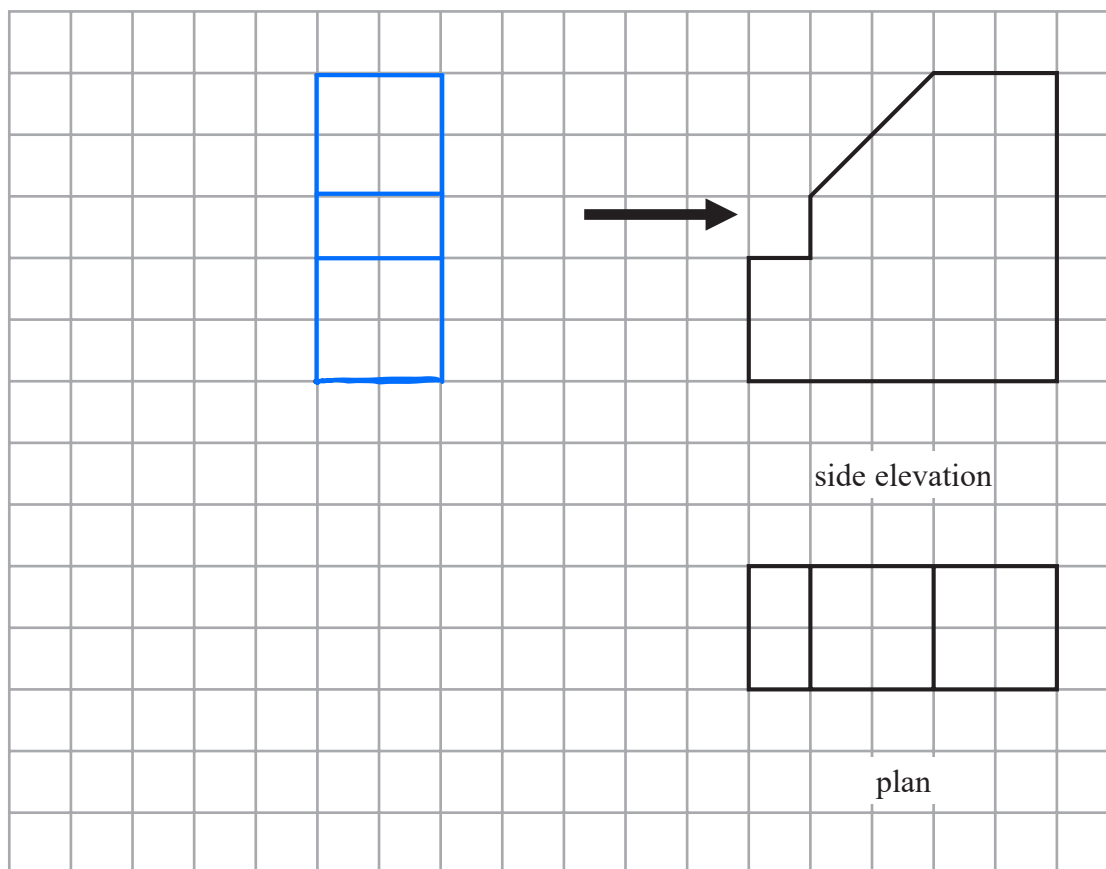Could need more or less red books if assumption
is not true.

**(1)**

**(Total for Question 6 is 3 marks)**

**7** The plan and side elevation of a solid prism are shown on the grid.

On the grid, draw the front elevation of the prism from the direction of the arrow.

side elevation

plan

**(Total for Question 7 is 2 marks)**

8  Cars are made in a factory for 24 hours every day.

In the factory a car is made every 209 seconds.

(a) Work out an estimate for the number of cars made in the factory in one year.
You must show how you get your answer.

$209s \approx 3$ min

so $\approx 20$ cars per hr

$24 \times 20 = 480$ cars per day

$480 \times 365$

$\approx 500 \times 365$

$$\begin{array}{r} 365 \\ 500 \times \\ \hline 172500 \end{array}$$

........172500........

(4)

(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

Have rounded time to make car down
Have rounded cars per day up
So unclear whether over or underestimate

(1)

**(Total for Question 8 is 5 marks)**

**9** Here is a stem and leaf diagram for the heights, in mm, of 25 seedlings.

```
3 | 2  4  4  6  9
4 | 2 (2) 4  5  7  7  8          Key:
5 | 0  2  3  5  6  6 (7) 7  9     3|2 represents 32 mm
6 | 1  2  2  4
```

Work out the interquartile range.      $IQR = 57 - 42 = 15$

15 ............................................................ mm

**(Total for Question 9 is 2 marks)**

**10** Adam buys a computer.

20% VAT is added to the price of the computer.
Adam has to pay a total of £900

Work out the price of the computer before VAT is added.

$£900 = 120\%$

$\dfrac{£900}{6} = £150 = 20\%$

$£150 \times 5 = £750 = 100\%$

£ 750 ............................................................

**(Total for Question 10 is 2 marks)**

**11** (a) Solve $3x^2 = 108$

$$x^2 = \frac{108}{3}$$
$$x^2 = 36$$
$$x = \pm\sqrt{36} = \pm 6$$

$x = \pm 6$

(2)

(b) Factorise $x^2 - 2x - 35$

$$(x+5)(x-7)$$

$(x+5)(x-7)$

(2)

$u = \dfrac{3t}{4} + 2$

(c) Make $t$ the subject of the formula.

$$u - 2 = \frac{3t}{4}$$
$$4(u-2) = 3t$$
$$\frac{4(u-2)}{3} = t$$

$t = \dfrac{4(u-2)}{3}$

(3)

**(Total for Question 11 is 7 marks)**

**12** (a) Write down the value of $25^0$

$1$

(1)

(b) Find the value of $49^{-\frac{1}{2}}$

$$= \frac{1}{49^{\frac{1}{2}}} = \frac{1}{\sqrt{49}} = \frac{1}{7}$$

$\frac{1}{7}$

(2)

(c) Find the value of $64^{\frac{2}{3}}$

$$= \left(\sqrt[3]{64}\right)^2 = 4^2 = 16$$

$16$

(2)

**(Total for Question 12 is 5 marks)**

**13** Ben fills a glass with orange juice and lemonade in the ratio 1 : 4 by volume.
He mixes the liquid that is in the glass.

Ben drinks $\frac{1}{4}$ of this liquid.

He then fills the glass using orange juice.

Work out the ratio of orange juice to lemonade, by volume, that is now in the glass.
Give your ratio in its simplest form.

Orange juice : lemonade

1 : 4

= 4 : 16    parts

Drinks ¼   so    3 : 12    parts left

Adds  5 parts orange    5
_____
8 : 12

= 2 : 3

orange : lemonade
2 : 3

**(Total for Question 13 is 3 marks)**

**14** Ayshab walked $x$ miles at 4 mph.
She then walked $2x$ miles at 3 mph.

(a) Find Ayshab's average speed for the whole journey.
Give your answer as a mixed number.

Distance     Speed     Time

$x$          4         $\dfrac{x}{4}$

$2x$        3         $\dfrac{2x}{3}$

Total    $3x$            $\dfrac{x}{4} + \dfrac{2x}{3} = \dfrac{3x + 8x}{12} = \dfrac{11x}{12}$

Average Speed $= \dfrac{3x}{\frac{11x}{12}} = \dfrac{3x \times 12}{11x} = \dfrac{36}{11} = 3\dfrac{3}{11}$

.................................................... mph

**(4)**

The second part of the journey took 25 minutes longer than the first part of the journey.

(b) Find the value of $x$.

$$\dfrac{2x}{3} - \dfrac{x}{4} = \dfrac{25}{60} = \dfrac{5}{12}$$

$$\dfrac{8x - 3x}{12} = \dfrac{5}{12}$$

$$\dfrac{5x}{12} = \dfrac{5}{12}$$

$$x = 1$$

$x =$ ............ 1 ............

**(4)**

**(Total for Question 14 is 8 marks)**

**15** $f(n) = (2n + 1)^2 - (2n - 1)^2 - 10$ where $n$ is an integer.

Prove that $f(n)$ is **never** a multiple of 8

$$f(n) = (4n^2 + 4n + 1) - (4n^2 - 4n + 1) - 10$$

$$= 4n^2 + 4n + 1 - 4n^2 + 4n - 1 - 10$$

$$= 8n - 10$$

$$= 8n - 8 - 2$$

$$= 8(n - 1) - 2$$

so always 2 less than a multiple of 8

and therefore never a multiple of 8

(Total for Question 15 is 4 marks)

**16** $y$ is inversely proportional to the square of $x$.

$y = 1$ when $x = 10$

Find the value of $y$ when $x = 5$

$$y = \frac{k}{x^2}$$

$y = 1$
$x = 10$

$$1 = \frac{k}{10^2}$$

$$100 = k$$

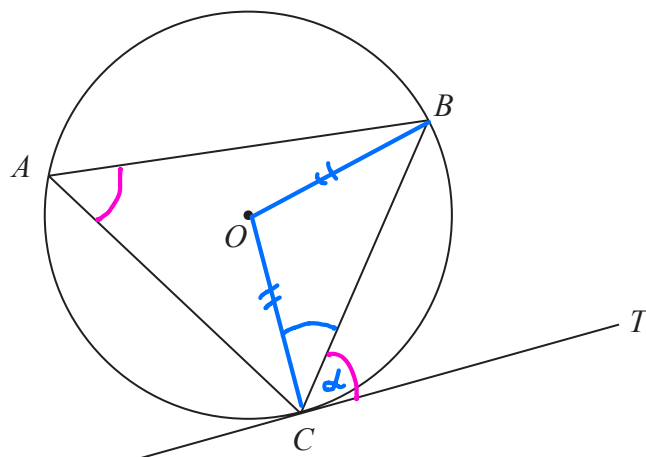$$y = \frac{100}{x^2}$$

When $x = 5$

$$y = \frac{100}{5^2}$$

$$y = \frac{100}{25}$$

$$y = 4$$

$y = $ ................ 4 ................

**(Total for Question 16 is 3 marks)**

**17**



*A*, *B* and *C* are points on a circle, centre *O*.
*CT* is the tangent to the circle at *C*.

Prove that angle *BAC* = angle *BCT*

Let $\angle BCT = \alpha$

$\angle OCB = 90 - \alpha$ (tgt - radius)

$\angle OBC = 90 - \alpha$ (Base $\angle$s of isos $\triangle$)

$\angle BOC = 180 - (90 - \alpha + 90 - \alpha)$ (angle sum of $\triangle$)

$\angle BOC = 2\alpha$

$\Rightarrow \angle BAC = \alpha$
($\angle$ at centre twice $\angle$ at circ)

(**Total for Question 17 is 4 marks**)

S 5 9 7 2 6 A 0 1 7 2 1

**18** The graph gives the speed, in km/h, of a ship $t$ hours after leaving a port.

Speed (km/h)

Time ($t$ hours)
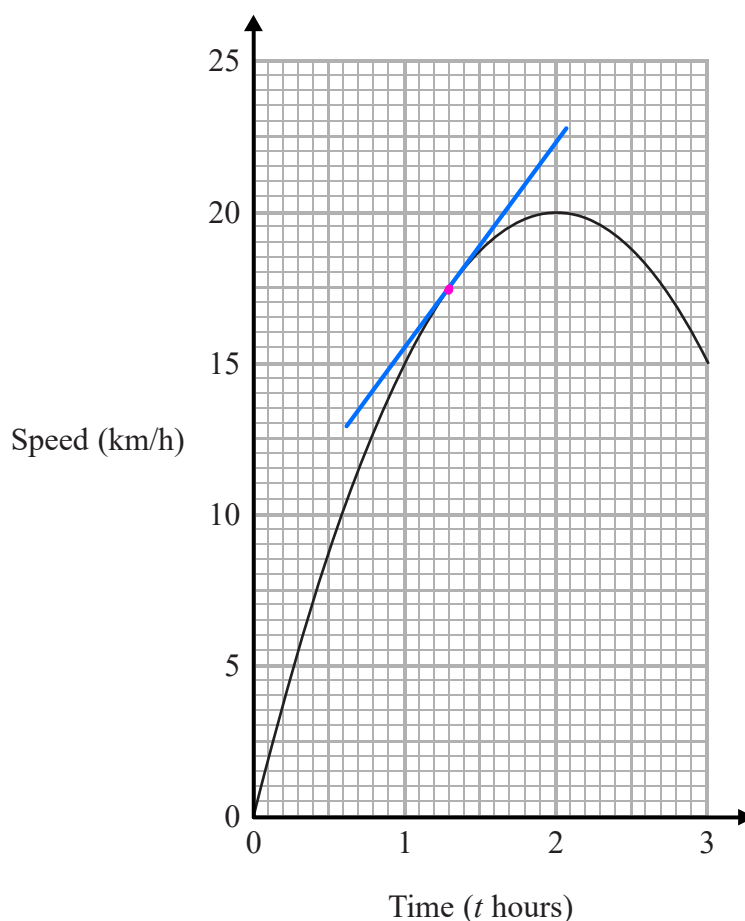
gradient

$$\frac{22.25 - 15.5}{2 - 1}$$

$\approx 6.75$

(a) Find an estimate of the gradient of the graph when $t = 1.3$
You must show how you get your answer.

6.75

(3)

(b) Interpret your answer to part (a) in the context of the question.
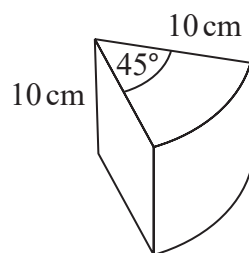You must give units with your interpretation.
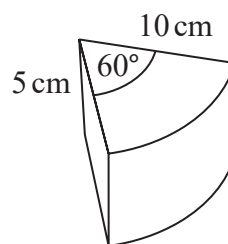
Acceleration   8.5 km per hr per hr

or   8.5 km h$^{-2}$

(2)

**(Total for Question 18 is 5 marks)**

**19** Here are two solid prisms, prism **A** and prism **B**.



prism **A**                    prism **B**

The cross section of prism **A** is a sector, with angle 45°, of a circle of radius 10 cm.
The prism has a depth of 10 cm and a mass of $40\pi$ grams.

The cross section of prism **B** is a sector, with angle 60°, of a circle of radius 10 cm.
The prism has a depth of 5 cm and a mass of $50\pi$ grams.

Express the difference in the densities of the two prisms as a percentage of the density of prism **A**.

$$\text{Vol } A = \frac{1}{8} \times \pi \times 10^2 \times 10 = 125\pi$$

$$\text{Vol } B = \frac{1}{6} \times \pi \times 10^2 \times 5 = \frac{500\pi}{6}$$

$$\text{Density } A = \frac{40\pi}{125\pi} = \frac{8}{25}$$

$$\text{Density } B = \frac{50\pi}{\frac{500\pi}{6}} = \frac{6}{10}$$

$$\text{Difference} = \frac{6}{10} - \frac{8}{25} = \frac{30-16}{50} = \frac{14}{50} = \frac{7}{25}$$

Difference as a percentage of Density A

$$\frac{\frac{7}{25}}{\frac{8}{25}} \times 100 = \frac{7}{8} \times 100 = \underline{\hspace{3cm}}$$

**87.5**

.................................................... %

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

S 5 9 7 2 6 A 0 1 9 2 1

**20** Show that $\dfrac{12 + \sqrt{128}}{1 - \sqrt{2}}$ can be written in the form $a + b\sqrt{2}$ where $a$ and $b$ are integers.

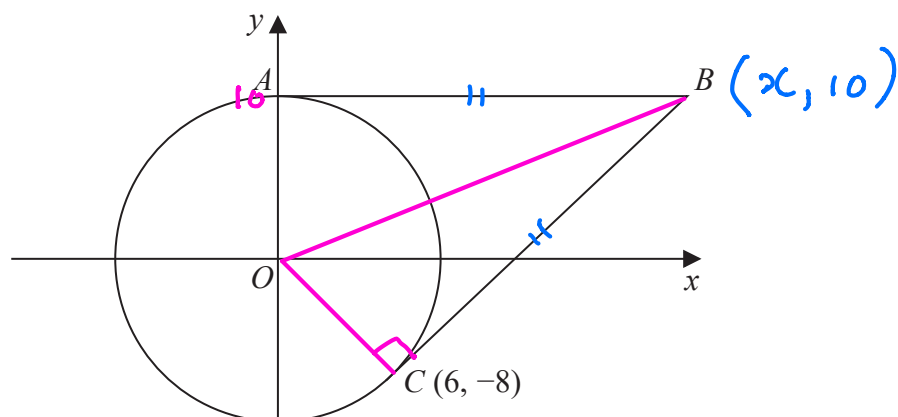$$= \frac{\left(12 + \sqrt{64 \times 2}\right)}{\left(1 - \sqrt{2}\right)} \times \frac{\left(1 + \sqrt{2}\right)}{\left(1 + \sqrt{2}\right)}$$

$$= \frac{\left(12 + 8\sqrt{2}\right) \times \left(1 + \sqrt{2}\right)}{1^2 - \sqrt{2}^2} = \frac{12 + 8\sqrt{2} + 12\sqrt{2} + 16}{-1}$$

$$= -28 - 20\sqrt{2}$$

**(Total for Question 20 is 4 marks)**

**21**



The diagram shows the circle with equation $x^2 + y^2 = 100$    *radius = 10*
The unit of length on both axes is one centimetre.

The circle intersects the positive $y$-axis at the point $A$.
The point $C$ on the circle has coordinates $(6, -8)$
The straight lines $AB$ and $CB$ are tangents to the circle.

Find the area of quadrilateral $ABCO$.

$$AB^2 = BC^2$$

$$x^2 = (x-6)^2 + (10--8)^2$$

$$x^2 = x^2 - 12x + 36 + 324$$

$$12x = 360$$

$$x = \frac{360}{12} = 30$$

Area of $\triangle OAB = \frac{1}{2}$ base $\times$ height

$$= \frac{1}{2} \times 10 \times 30 = 150 \, cm^2$$

Area of quadrilateral $ABCO = 2 \times \triangle OAB$

$$= 2 \times 150$$

$$= 300 \, cm^2$$

................................... **300** ................................... cm²

**(Total for Question 21 is 4 marks)**

**TOTAL FOR PAPER IS 80 MARKS**