UNITS 1 – 3

Miscellaneous Exercises

1.

Continent	Population	Area $\left(\text{m}^2\right)$
Europe	6.82×10^8	1.05×10^{10}
Asia	2.96×10^9	4.35×10^{10}

$$\text{Population density} = \frac{\text{Population}}{\text{Area}}$$

Which of these two continents has the larger population density?

You must show all your working.

(SEG)

2. The cost of hiring a car can be calculated by using the formula

$$\text{Cost} = 25d + \frac{12\left(m - 50d\right)}{100}$$

where d is the number of days the car is hired and m is the number of miles the car is driven.

A car is hired for 7 days and driven 476 miles.

Calculate the total cost of the car hire.

(SEG)

3. The temperature inside a fridge is $3°\text{C}$.
The temperature inside a freezer is $-18°\text{C}$.

(a) How much colder is it inside the freezer than inside the fridge?

(b) The formula $F = \frac{9\text{C}}{5} + 32$ is used to convert $°\text{C}$ to $°\text{F}$.

Calculate the temperature inside the freezer in $°\text{F}$.

(c) The temperature inside the freezer has been recorded to the nearest degree.
What is the minimum temperature inside the freezer in $°\text{C}$?

(SEG)

4. The periodic time, T seconds, of a simple pendulum, of length l metres, is given by

$$T = 2.006 \times \sqrt{1}.$$

When $l = 1.44 \times 10^{-2}\ \text{m}$, calculate the periodic time to the nearest hundredth of a second.

(SEG)

5. Calculate the value of $\left(2.34 \times 10^{-2}\right)^{\frac{1}{2}}$.

(SEG)

6. A US Centillion is the number 10^{303}.

A UK Centillion is the number 10^{600}.

(a) How many US Centillions are there in a UK Centillion?
Give your answer in standard form.

(b) Write the number, 40 US Centillions, in standard form.

(LON)

7. Given that

$$v^2 = u^2 + 2as,$$

(a) calculate the value of v when $u = -6$, $a = 5$, and $s = 0.8$, giving your answer to one significant figure;

(b) make u the subject of the formula $v^2 = u^2 + 2as$.

(LON)

8. A new railway company, *The Southern Express Group*, estimates that the number of passengers, n, travelling per day on trains between two cities depends on:

the frequency of service, f trains per hour,
the time taken, t hours,
the price, £p per journey,

according to the formula

$$n = \sqrt{\left(\frac{f}{tp}\right)^3} \times 10^5.$$

(a) Use your calculator to work out the estimated number of passengers when

$$f = 2,$$
$$t = 1\tfrac{1}{2},$$
$$p = 12.$$

(b) When $f = 2$ trains per hour,
$t = 1\frac{1}{2}$ hours,

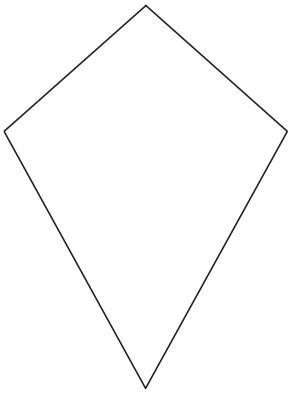
the company estimates that it has sufficient trains to provide a service with capacity up to 5500 passengers per day.

Use the formula to calculate the price, to the nearest pound, that needs to be charged in order to atttract 5500 passengers per day.

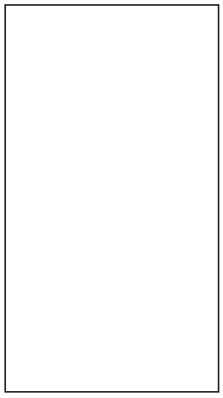
(SEG)

9. Copy and draw in all the lines of symmetry for each of these shapes.

(a)

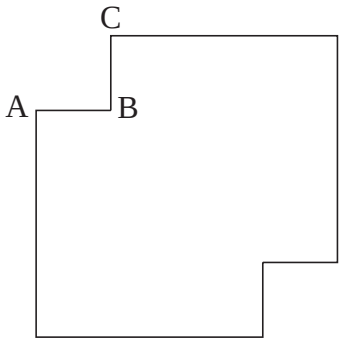


(b)



(LON)

10. This shape is formed from two overlapping squares with $AB = BC$ and angle $ABC = 90°$.



Not to scale

(a) The shape has line symmetry. Draw the shape and its lines of symmetry.

(b) The shape has rotational symmetry.
What is the order of rotational symmetry?

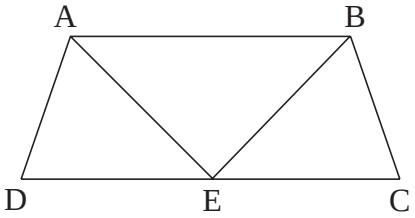
(SEG)

11. (a) Three triangles are placed together to form a quadrilateral, as shown.

AB is parallel to DC.

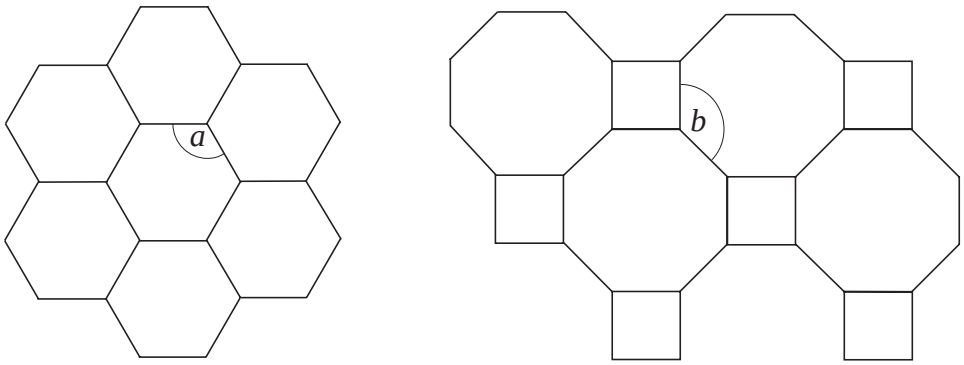
$BC = AD$ and $AE = EB$.

E is the mid-point of DC.



Name two angles which are the same size as angle BAE, giving a reason for each of your answers.

(b) These tiling patterns have been made using regular polygons.

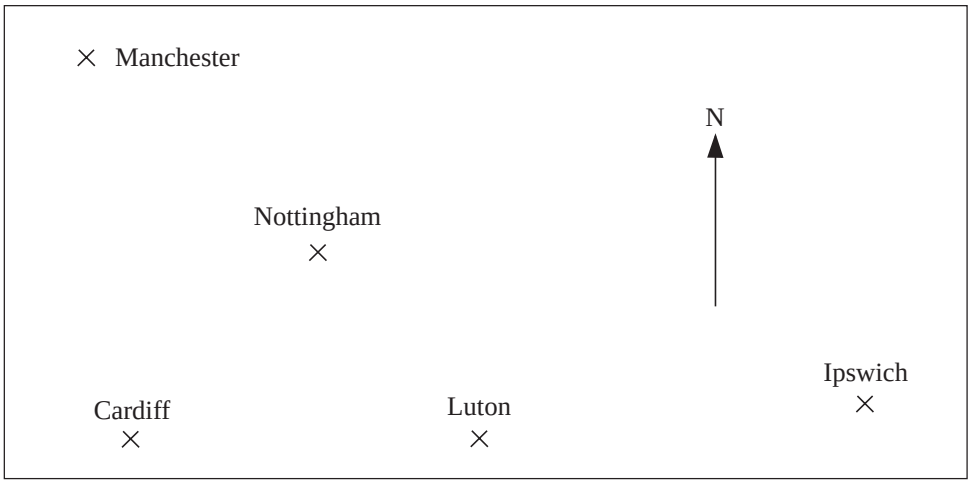


(i) Work out the size of the angles marked *a* and *b*.

(ii) Explain why a tiling pattern cannot be made with only regular pentagons.

(SEG)

12.



The diagram is part of a map showing the positions of several towns.

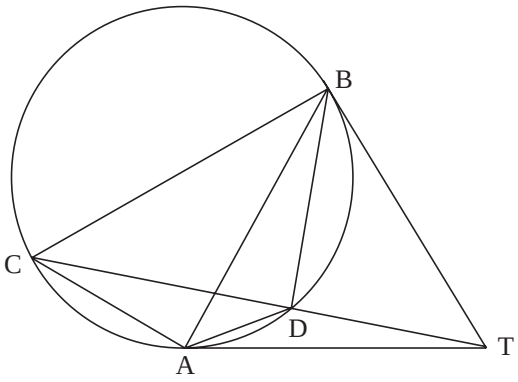
Measure and write down the bearing of Manchester from Nottingham.

(LON)

13. Angle DAT $= 25°$.

Angle BTA $= 50°$.

AT and BT are tangents to the circle.



(a) Calculate the size of angle ACD.

(b) Calculate the size of angle BAD.

(c) Calculate the size of angle BDA.

(SEG)