GCSE   MATHEMATICS

S21-C300

Non-Calculator Assessment Resource R

Higher Tier

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

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

1. Work out $2\frac{3}{4} \div \frac{5}{8}$.

Give your answer as a mixed number in its simplest form. [3]

....

....

....

....

....

....

....

....

....

2. *(a)* Simplify $18\pi \div 9\pi$. [1]

....

....

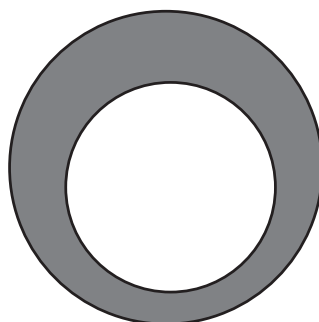*(b)* The diagram shows two circles, one inside the other.

Diagram not drawn to scale

The radius of the outer circle is 6 cm.
The radius of the inner circle is 5 cm.

Work out the area of the shaded region.
Give your answer in terms of π. [3]

....

....

....

....

....

....

Area of shaded region = ... cm^2

3. A line *L* has equation $y = 12 - 4x$.

Write down the equation of a different line that is parallel to *L*. [1]

....

....

....
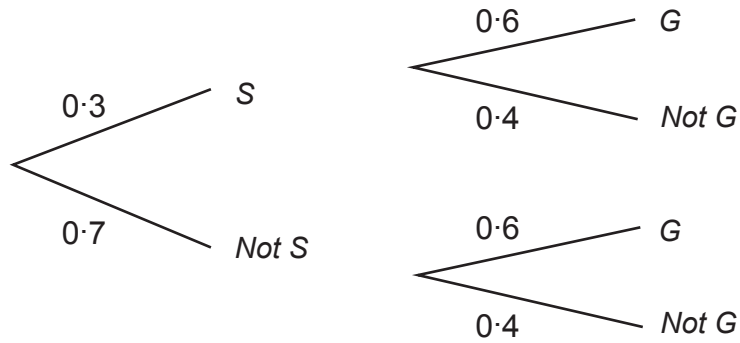
4. Jan's hobbies are sewing and gardening.

Each week the probability that she spends:
- Monday evening sewing (S) is 0·3,
- time gardening on Friday (G) is 0·6.

These events are independent.

The tree diagram shows this information.

Calculate the probability that, in a randomly selected week,

(a) Jan spends Monday evening sewing but does not spend time gardening on Friday,   [2]

....

....

....

....

....

....

(b) Jan does not spend Monday evening sewing but does spend time gardening on Friday.   [2]

....

....

....

....

....

....

5. *(a)* Find the next term of this sequence.

$$\frac{3}{2}, \quad -\frac{9}{4}, \quad \frac{27}{8}, \quad -\frac{81}{16}, \quad \ldots$$

[2]

....

....

....

(b) The nth term of a sequence is $\left(2\sqrt{3}\right)^{n}$.

Find and simplify the 3rd term of this sequence. [2]

....

....

....

....

....

(c) Find the nth term of this sequence.

$$1{\cdot}5, \quad 3, \quad 5{\cdot}5, \quad 9, \quad 13{\cdot}5, \quad \ldots$$

[2]

....

....

....

....

....

....

....

6. *(a)*
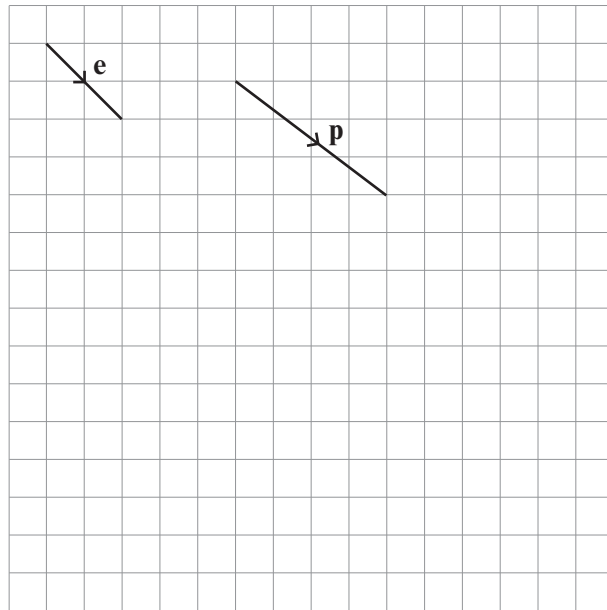
The grid shows the vector $\mathbf{e} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$ and the vector $\mathbf{p}$.

The vector $\mathbf{q} = \begin{pmatrix} -0.5 \\ -2.5 \end{pmatrix}$.

Draw a diagram on the grid above to represent $\mathbf{p} + 2\mathbf{q}$. [2]

....

....

....

(b)

Diagram not drawn to scale

OA = $3\mathbf{a}$ and **OB** = $6\mathbf{b}$.
The sides of triangles *OAB* and *OCD* are in the ratio 3 : 1.

By writing **AB** and **CD** in terms of **a** and **b**, decide whether *CD* is parallel to *AB*.

Parallel ☐   Not Parallel ☐

Show how you decide. [3]

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

7. The diagram shows a sketch of a letter L.

2 units ⌐

1 unit
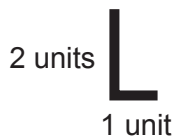
Diagram not drawn to scale

This letter is first, reflected in the line $x = 4$, then reflected in the x-axis and finally translated through $\begin{pmatrix} -4 \\ -2 \end{pmatrix}$.

Describe the **single** transformation that is equivalent to these 3 transformations. **[3]**
You may use this grid to help you.

....

....

....

8. *(a)*

Diagram not drawn to scale

Points *A*, *B*, *C*, *P*, *Q* and *R* lie on the circumference of the circle, centre *O*.

Show that triangle *ABC* is congruent to triangle *PQR*.
Give a reason for each step of your answer. [3]

....

....

....

....

....

....

....

....

....

....

....
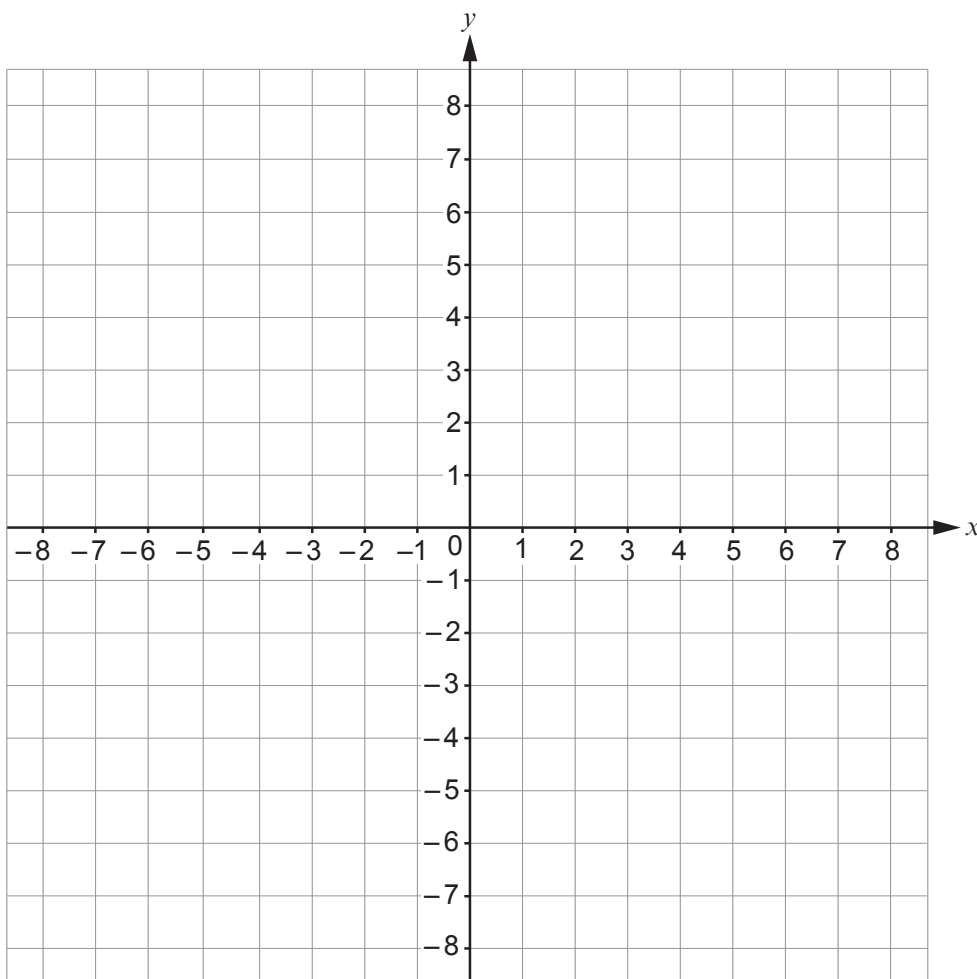
(b) William says,

"It is possible to draw one circle through the four vertices of any kite that has two opposite angles that are right angles."

Is William correct?

Yes ☐   No ☐

Show how you decide. [1]

....

....

....

....

....

....

....

9.

Diagram not drawn to scale

Calculate the length of *AC*.
Give your answer as a surd in its simplest form. [5]

....

....

....

....

....

....

....

....

....

....

10. *(a)* Write the expression $x^2 + 8x + 18$ in the form $(x+a)^2 + b$, where a and b are integers.

[3]

....

....

....

....

....

....

....

....

(b) Write down the coordinates of the turning point of the curve $y = x^2 + 8x$.

[2]

....

....

....

....

Turning point = (.................. , ...)