

1



The number of tennis balls (T) in the diagram is given by the formula

$$T = \frac{1}{2}n(n+1),$$

where n is the number of rows.

The diagram above has 4 rows.

How many tennis balls will there be in a diagram with 20 rows?

Answer [1]

2 Calculate the value of $2(\sin 15^\circ)(\cos 15^\circ)$.

Answer [1]

3 Calculate $(4 \quad 6 \quad 2) \begin{pmatrix} 3 \\ 2 \\ -12 \end{pmatrix}$.

Answer [2]

4 Write down the next term in each of the following sequences.

(a) 8.2, 6.2, 4.2, 2.2, 0.2, ...

Answer(a) [1]

(b) 1, 3, 6, 10, 15, ...

Answer(b) [1]

5 Celine invests \$ 800 for 5 **months** at 3 % simple interest per year.
Calculate the interest she receives.

Answer \$ [2]

- 6 $(0.8)^{\frac{1}{2}}$, 0.8 , $\sqrt{0.8}$, $(0.8)^{-1}$, $(0.8)^2$.

From the numbers above, write down

- (a) the smallest,

Answer(a) [1]

- (b) the largest.

Answer(b) [1]

- 7 $f(x) = 10^x$.

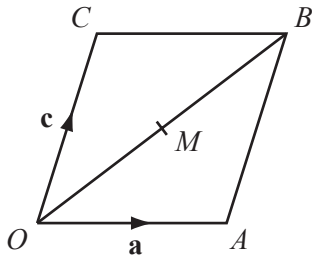
- (a) Calculate $f(0.5)$.

Answer(a) [1]

- (b) Write down the value of $f^{-1}(1)$.

Answer(b) [1]

8



$OACB$ is a parallelogram. $\vec{OA} = \mathbf{a}$ and $\vec{OC} = \mathbf{c}$.
 M is the mid-point of OB .
 Find \vec{MA} in terms of \mathbf{a} and \mathbf{c} .

Answer $\vec{MA} =$ [2]

- 9 Write the number 2381.597 correct to

- (a) 3 significant figures,

Answer(a) [1]

- (b) 2 decimal places,

Answer(b) [1]

- (c) the nearest hundred.

Answer(c) [1]

- 10 The mass of the Earth is $\frac{1}{95}$ of the mass of the planet Saturn.

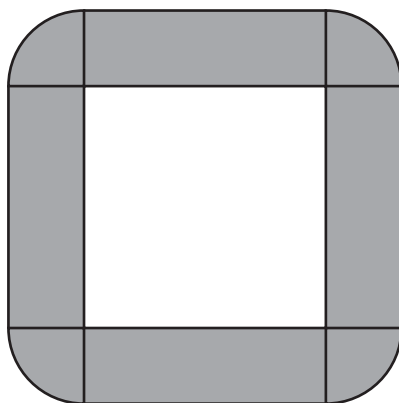
The mass of the Earth is 5.97×10^{24} kilograms.

Calculate the mass of the planet Saturn, giving your answer in standard form, correct to 2 significant figures.

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Answer kg [3]

- 11 A large conference table is made from four rectangular sections and four corner sections.
Each rectangular section is 4 m long and 1.2 m wide.
Each corner section is a quarter circle, radius 1.2 m.



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Each person sitting at the conference table requires one metre of its outside perimeter.
Calculate the greatest number of people who can sit around the **outside** of the table.
Show all your working.

Answer [3]

- 12 Make d the subject of the formula

$$c = \frac{d^3}{2} + 5.$$

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Answer $d =$ [3]

- 13 The force of attraction (F) between two objects is inversely proportional to the square of the distance (d) between them.

When $d = 4$, $F = 30$.

Calculate F when $d = 8$.

Answer $F =$ [3]

- 14 Factorise completely

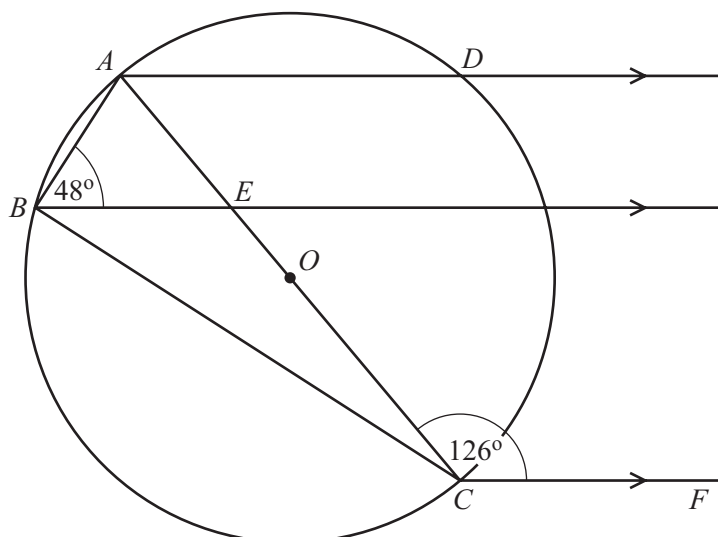
(a) $7ac + 14a$,

Answer(a) [1]

(b) $12ax^3 + 18xa^3$.

Answer(b) [2]

15

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A, B, C and D lie on a circle centre O . AC is a diameter of the circle.
 AD, BE and CF are parallel lines. Angle $ABE = 48^\circ$ and angle $ACF = 126^\circ$.
 Find

(a) angle DAE ,

Answer(a) Angle $DAE = \dots\dots\dots$ [1]

(b) angle EBC ,

Answer(b) Angle $EBC = \dots\dots\dots$ [1]

(c) angle BAE .

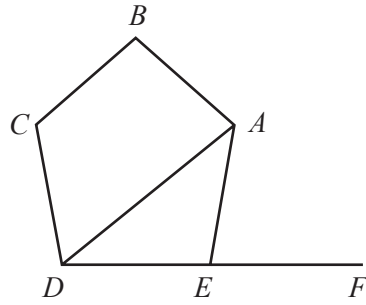
Answer(c) Angle $BAE = \dots\dots\dots$ [1]

16 Solve the inequality

$$4 - 5x < 2(x + 4).$$

Answer $\dots\dots\dots$ [3]

17

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$ABCDE$ is a regular pentagon.
 DEF is a straight line.
 Calculate

(a) angle AEF ,

Answer(a) Angle AEF = [2]

(b) angle DAE .

Answer(b) Angle DAE = [1]

18 Simplify

(a) $\left(\frac{x^{27}}{27}\right)^{\frac{2}{3}},$

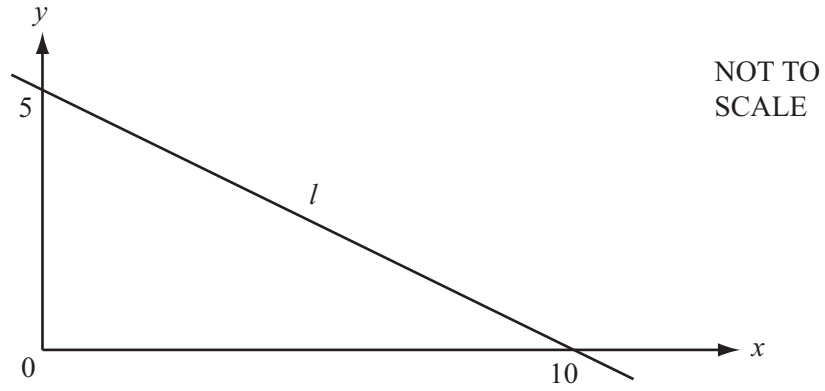
Answer(a) [2]

(b) $\left(\frac{x^{-2}}{4}\right)^{-\frac{1}{2}}.$

Answer(b) [2]

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19



- (a) Calculate the gradient of the line l .

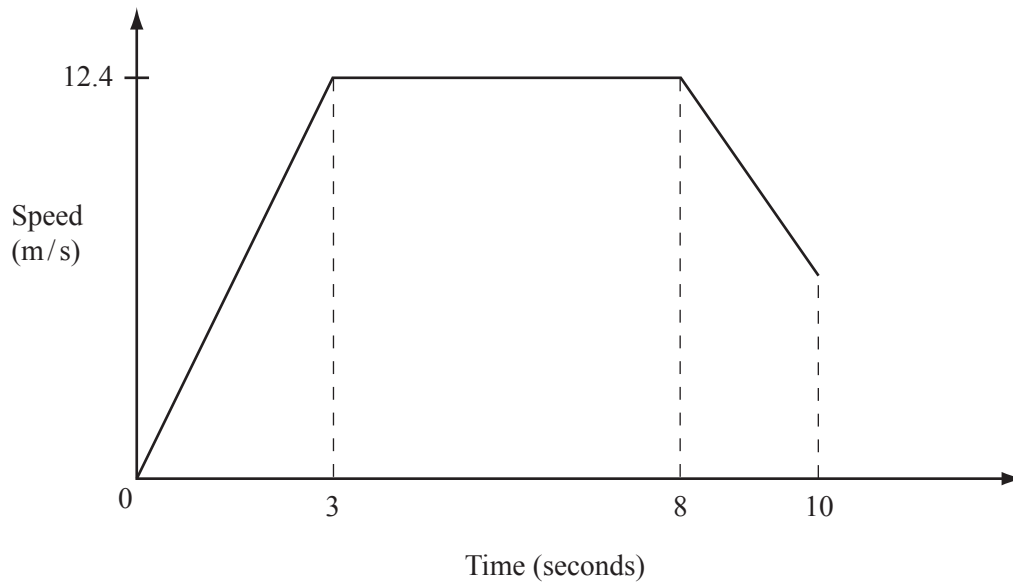
Answer(a) [2]

- (b) Write down the equation of the line l .

Answer(b) [2]

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Use

20

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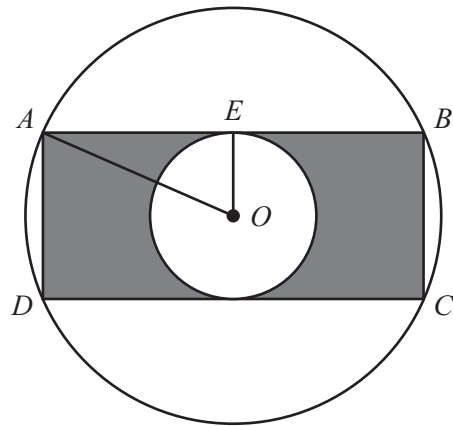
An athlete, in a race, accelerates to a speed of 12.4 metres per second in 3 seconds. He runs at this speed for the next 5 seconds and slows down over the last 2 seconds as shown in the speed-time graph above. He crosses the finish line after 10 seconds. The total distance covered is 100 m.

- (a) Calculate the distance he runs in the first 8 seconds.

Answer(a) m [2]

- (b) Calculate his speed when he crosses the finish line.

Answer(b) m/s [2]

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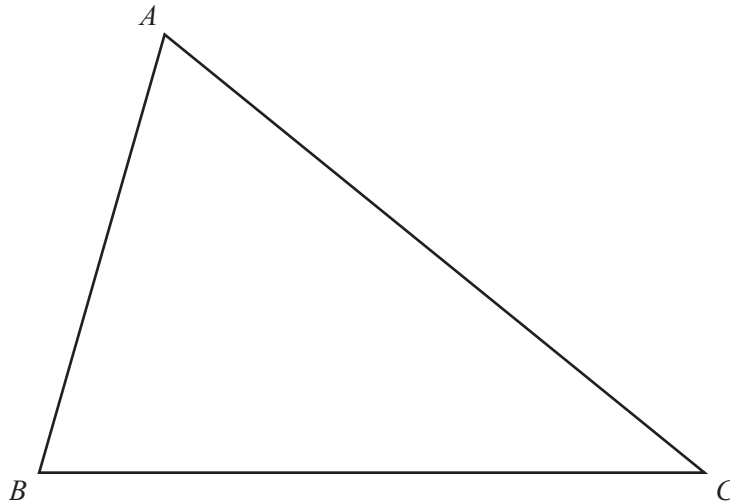
- A, B, C and D lie on a circle, centre O , radius 8 cm.
 AB and CD are tangents to a circle, centre O , radius 4 cm.
 $ABCD$ is a rectangle.
(a) Calculate the distance AE .

Answer(a) $AE =$ cm [2]

- (b)** Calculate the shaded area.

Answer(b) cm^2 [3]

22

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- (a) In this part of the question use a straight edge and compasses only.

Leaving in your construction lines,

- (i) construct the angle bisector of angle ACB , [2]
 - (ii) construct the perpendicular bisector of AC . [2]
- (b) Draw the locus of all the points inside the triangle ABC which are 7 cm from C . [1]
- (c) Shade the region inside the triangle which is nearer to A than C , nearer to BC than AC and less than 7 cm from C . [1]

23 Showing all your working, solve

(a) $\frac{5x}{2} - 9 = 0$,

Answer(a) $x = \dots\dots\dots$ [2]

(b) $x^2 + 12x + 3 = 0$, giving your answers correct to 1 decimal place.

Answer(b) $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [4]

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