Name: _____ Class | Index Number

ESTD 1906

OUTRAM SECONDARY SCHOOL
END-OF-YEAR EXAMINATION
2022

Subject	:	**Mathematics**
Paper No.	:	**1**
Level (Stream)	:	**Secondary Three Normal (Academic)**
Date	:	**11 October 2022**
Duration	:	**1 hour 30 minutes**
Marks	:	**50**

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For π, use either your calculator value or 3.142.

For Examiner's Use
50

This document consists of 11 printed pages, including this cover page.

Setter: Mr Oliver Tan

Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1 + \frac{r}{100}\right)^n$$

Mensuration

Curved Surface area of a cone $= \pi rl$

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

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

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

Area of triangle $ABC = \frac{1}{2}ab\sin C$

Arc length $= r\theta$, where θ is in radians

Sector area $= \frac{1}{2}r^2\theta$, where θ is in radians

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$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Answer **all** the questions.

1 $\tan 145°$ $\quad 14^{-5}$ $\quad \sqrt[3]{145}$ $\quad \frac{\pi}{145}$

Write these numbers in order of size, starting from the smallest.

Answer _____ , _____ , _____ , _____ . [2]

---

2 Find the largest integer satisfying $2x+3 > 15$

Answer _____ [2]

---

3 Alpha Condominium was built at a cost of $\$3.6 \times 10^7$ and Zulu Condominium was built at a cost of \$48 million. (1 million $= 1 \times 10^6$)

(a) Find the difference between the building costs. Give your answer in standard form.

Answer \$ _____ [2]

(b) Alpha Condominium has 150 similar apartments. Find the average selling price of each apartment if the developer made a total profit of \$9 million.

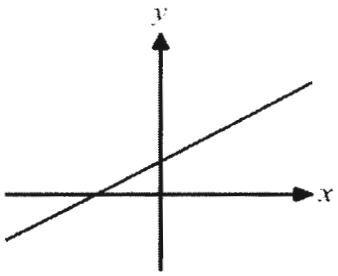
Answer \$ _____ [2]

---

4 Match the following graphs with their respective functions by labelling them with their corresponding letters.

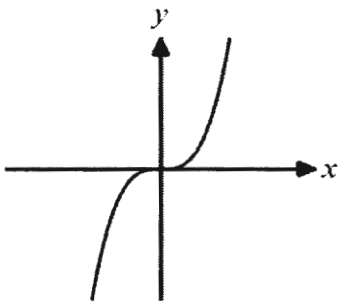
A: $y = 2x^3$	**B:** $y = \frac{4}{x}$	**C:** $y = 3^x$
D: $y = \frac{3}{x^2}$	**E:** $y = 4x^2$	**F:** $y = \frac{1}{2}x + 1$

(a)



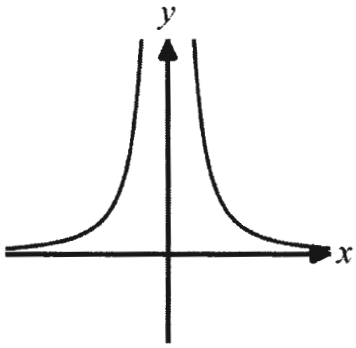
Answer _____ [1]

(b)



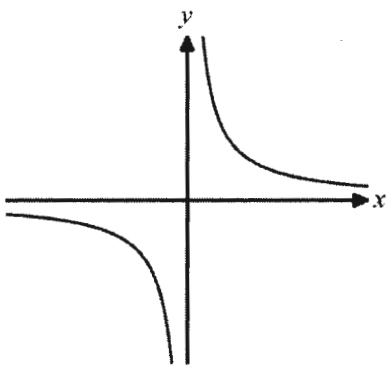
Answer _____ [1]

(c)



Answer _____ [1]

(d)



Answer _____ [1]

5 Expand and simplify the following algebraic expressions.

(***a***) $5(4x + y) - 3(x - 2y)$,

Answer _____ [2]

(***b***) $(y + 3)(5y - 2)$.

Answer _____ [2]

6 Factorise the following expressions completely.

(**a**) $x^2 - 9$,

Answer _____ [2]

(**b**) $5xy + x + 10y + 2$,

Answer _____ [2]

(**c**) $3x^2 - x - 4$.

Answer _____ [2]

7 Express the following as a single fraction in its simplest form.

$$\frac{2x}{(5x-3)^2}+\frac{1}{(5x-3)}$$

Answer _____ [2]

8 Given that the formula of $A=4\pi r^2$, use $\pi=3.142$.

(a) find the value of A when $r=3$,

Answer $A=$_____ [1]

(b) make ***r*** the subject of the formula.

Answer $r=$_____ [2]

9 Solve $\frac{7}{x-2} = 3$.

Answer $x =$ _____ [2]

10 A map is drawn to a scale of 1 : 85 000.

(a) The scale can be rewritten in the form 1 *cm* to *x km*. Find *x*.

Answer $x =$ _____ *km* [1]

(b) The distance between two towns on the map is 30 *cm*.

Find the actual distance, in kilometres between the two towns.

Answer _____ *km* [1]

(c) An island has an actual area of 2.89 km^2.

Find the area, in square centimetres, of the island on the map.

Answer _____ cm^2 [2]

11 **(a)** Simplify $\frac{25x^2y^5}{10xy^3}$.

Answer _____ [1]

(b) Given that $\sqrt{49} = 7^n$ find the value of n.

Answer $n =$ _____ [1]

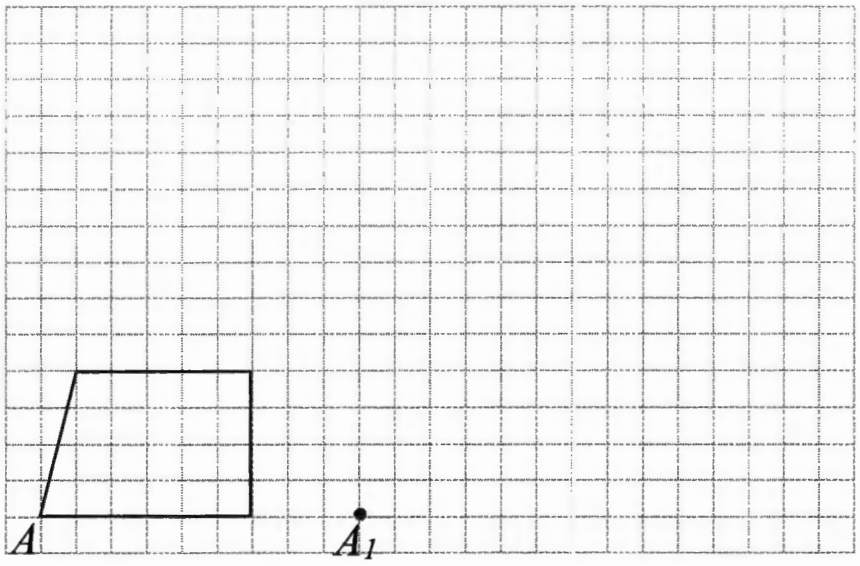
12 **(a)** Express $x^2 - 8x + 11$ in the form $(x + a)^2 + b$. (use complete the square method)

Answer _____ [2]

(b) **Hence**, solve $x^2 - 8x + 11 = 0$, giving your answers correct to 2 decimal places.

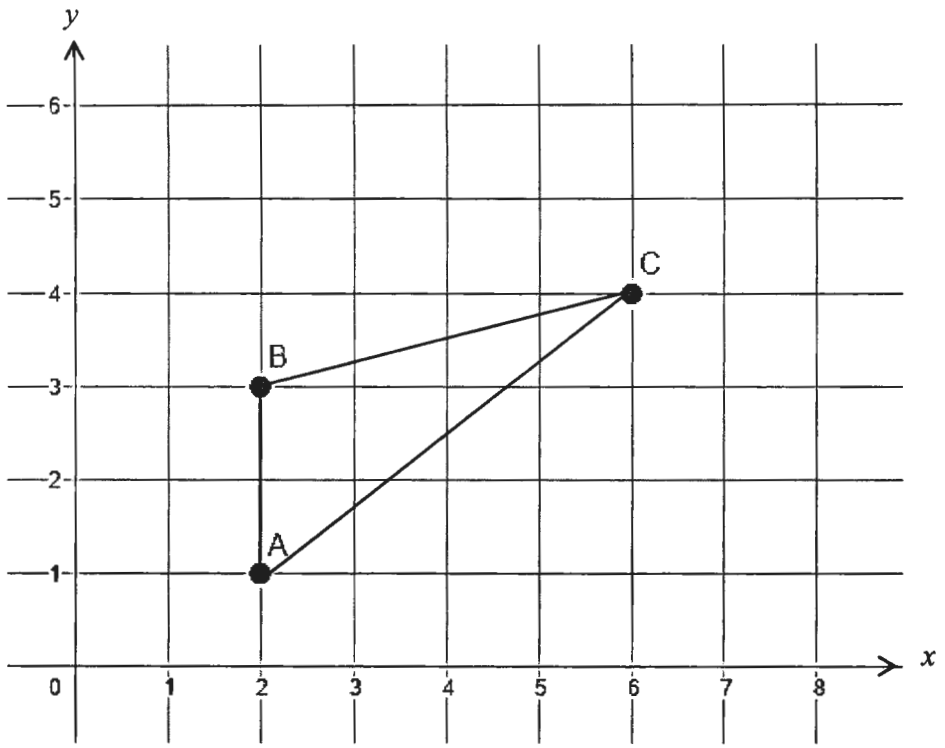
Answer $x =$ _____ *or* _____ [2]

13 Draw on the grid, using point A_1 as the starting point, an enlargement of the figure using a scale factor of 2 .



[2]

14 In the diagram, the vertices of triangle ABC are $A(2, 1)$, $B(2, 3)$ and $C(6, 4)$.



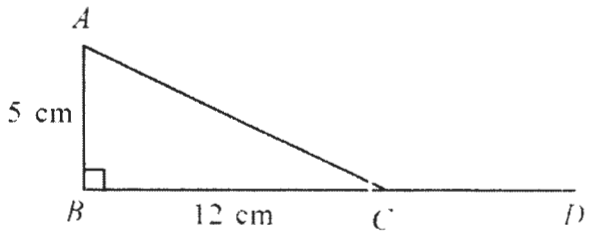
(a) Find the length of AC, using the formula, $length = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$.

Answer _____ unit [2]

(b) Write down the coordinates of D such that the four points $ABCD$ are the four vertices of a parallelogram.

Answer D (_____ , _____) [1]

15 Triangle ABC is a right-angled triangle. It is given that $AB = 5$ cm and $BC = 12$ cm.



(a) Show that $AC = 13$ cm. [2]

(b) Find the value of

(i) $\tan \angle ACB$, (as a fraction)

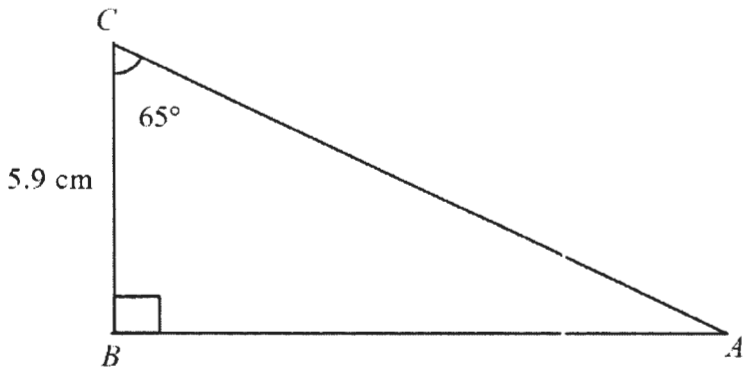
Answer _____ [1]

(ii) $3\sin 22.6^\circ$. (correct to 3 sig. fig.)

Answer _____ [1]

---

16 The diagram shows a triangle ABC where $BC = 5.9$ cm and $\angle ABC = 90°$ and $\angle ACB = 65°$. Find the length of AC.



Answer _____ *cm* [2]

End of Paper

Name: _____ Class | Index Number

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Answer **all** the questions.

1 **(a)** Given that $p = \dfrac{2x + y^2}{y - \sqrt{x}}$, find the value of p when $x = 4$ and $y = 3$.

Answer _____ [2]

(b) Solve $\dfrac{x+5}{x} = \dfrac{2}{3}$.

Answer $x =$ _____ [2]

(c) Rearrange $5m = \dfrac{mx+3}{y}$ to make m the subject.

Answer $m =$ _____ [2]

(d) Expand and simplify $(2x+3)(4-x)$.

Answer _____ [2]

---

2 Simplify the following, leaving your answers in positive index notation.

(a) $3x^4y^{-3}\times(2xy^2)^3$,

Answer _____ [2]

(b) $\frac{4y}{x}\div\left[\frac{y^2}{x}\right]^4$.

Answer _____ [2]

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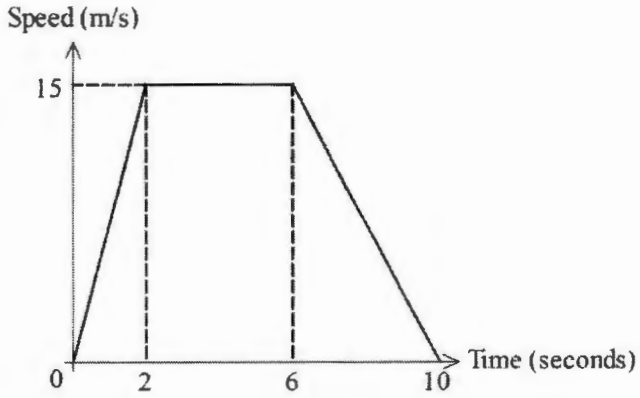
3 The diagram shows the speed-time graph of an object over a period of 10 seconds.



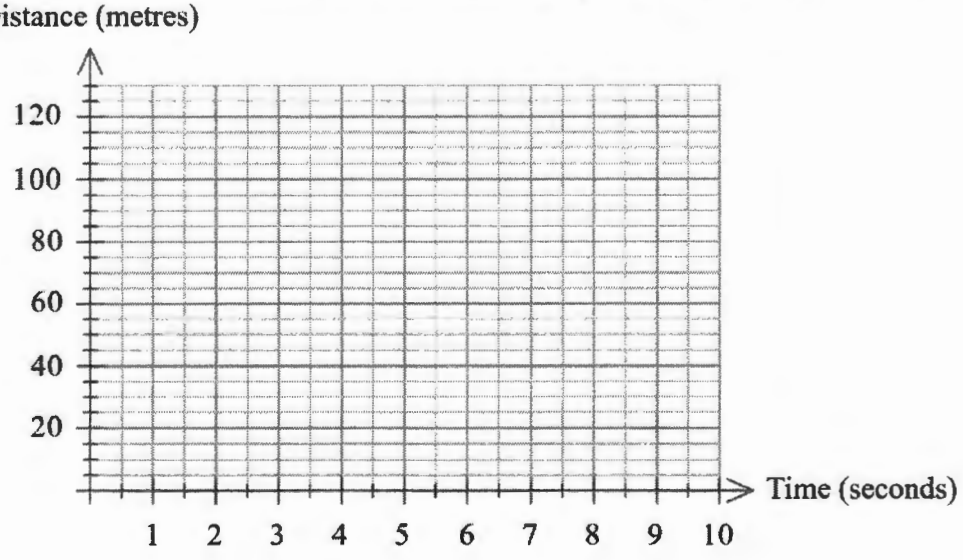
(a) Calculate the acceleration of the object from start until after 2 seconds.

Answer _____ m/s^2 [1]

(b) Calculate the total distance travelled for the object.

Answer _____ m [1]

(c) Use the grid below to sketch the distance-time graph for the journey. [2]



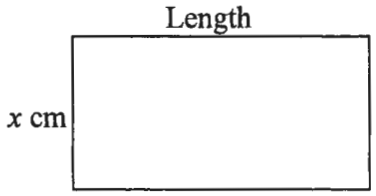
4 **(a)** Mr Wong sold his car for $125,000 in 2021.
He made a loss of 20% on what he had paid for when it was new.
How much did he pay for his new car in 2020.

Answer $ ..... [2]

(b) Mr Wong took a car loan of $100,000, at 2.5% per year compound interest, when he bought the new car.
Find the total amount he will pay back after 3 years for this loan.
Give your answer correct to the nearest dollar.

Answer $ ..... [2]

5 The figure below shows a rectangle with breadth of x cm.



(a) Given that the length of the rectangle is 6 cm longer than its width, express the length of the rectangle in terms of x.

Answer ..... cm [1]

(b) If the area of the rectangle is 40 cm^2, form an equation involving x and show that it reduces to $x^2 + 6x - 40 = 0$. [2]

Answer

(c) Solve $x^2 + 6x - 40 = 0$.

Answer $x =$ ..... or ..... [2]

6 The equation of a straight line l_1 is $4y - 2x = 7$.

The line intersects the x-axis at P and the y-axis at Q.

(a) **(i)** Calculate the coordinates of P.

Answer $P($ _____ , _____ $)$ [1]

(ii) Calculate the coordinates of Q.

Answer $Q($ _____ , _____ $)$ [1]

(b) Find the length of PQ.

Answer _____ units [2]

Another line l_2 has the same gradient as l_1 and passes through the point (0, 1).

(c) Find the equation of the line l_2.

Answer _____ [1]

7 Two similar solid cones have heights 10 m and 15 m.

(a) Given that the smaller cone has a radius of 4 m, find the radius of the larger cone.

Answer _____ m [1]

(b) Find, in its simplest form, the ratio of the total surface area of the smaller cone to that of the larger cone.

Answer _____ [2]

(c) If the cost of painting the larger cone is \$125, find the cost of painting the smaller cone.

Answer \$ _____ [1]

(d) Both cones are completely filled with cleaning agent. The cost of filling both the cones is \$399. Find the cost of completely filling the smaller cone with the same kind of cleaning agent.

Answer \$ _____ [2]

8 The perimeter of an equilateral triangle is equal to the circumference of a circle of radius 12 cm.
Find the length of each side of the triangle.

Answer ..... cm [2]

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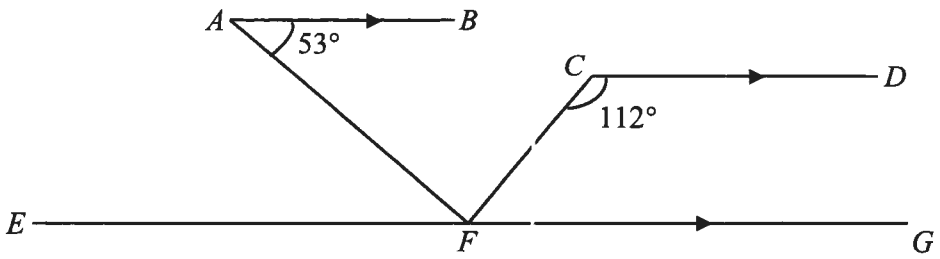
9 In the diagram, AB, CD and EFG are parallel straight lines.
Angle $BAF = 53°$ and angle $DCF = 112°$.



Showing your reasonings clearly, find, in terms of x,

(a) angle AFE,

Answer .....°

Reason ..... [2]

(b) angle CFA.

Answer .....°

Reason ..... [2]

---

10 Simplify, giving your answers in positive index.

(a) $4a^5 \div a^2$

Answer ..... [1]

(b) $\left(m^2\right)^{-3}$

Answer ..... [1]

11 The variable x and y are connected by the equation $y = \frac{3}{x} + x - 4$.

Some corresponding values of x and y, correct to 2 decimal places, are given in the table below.

x	0.2	0.5	1	2	3	4	5
y	11.2	p	0	-0.5	0	0.75	1.6

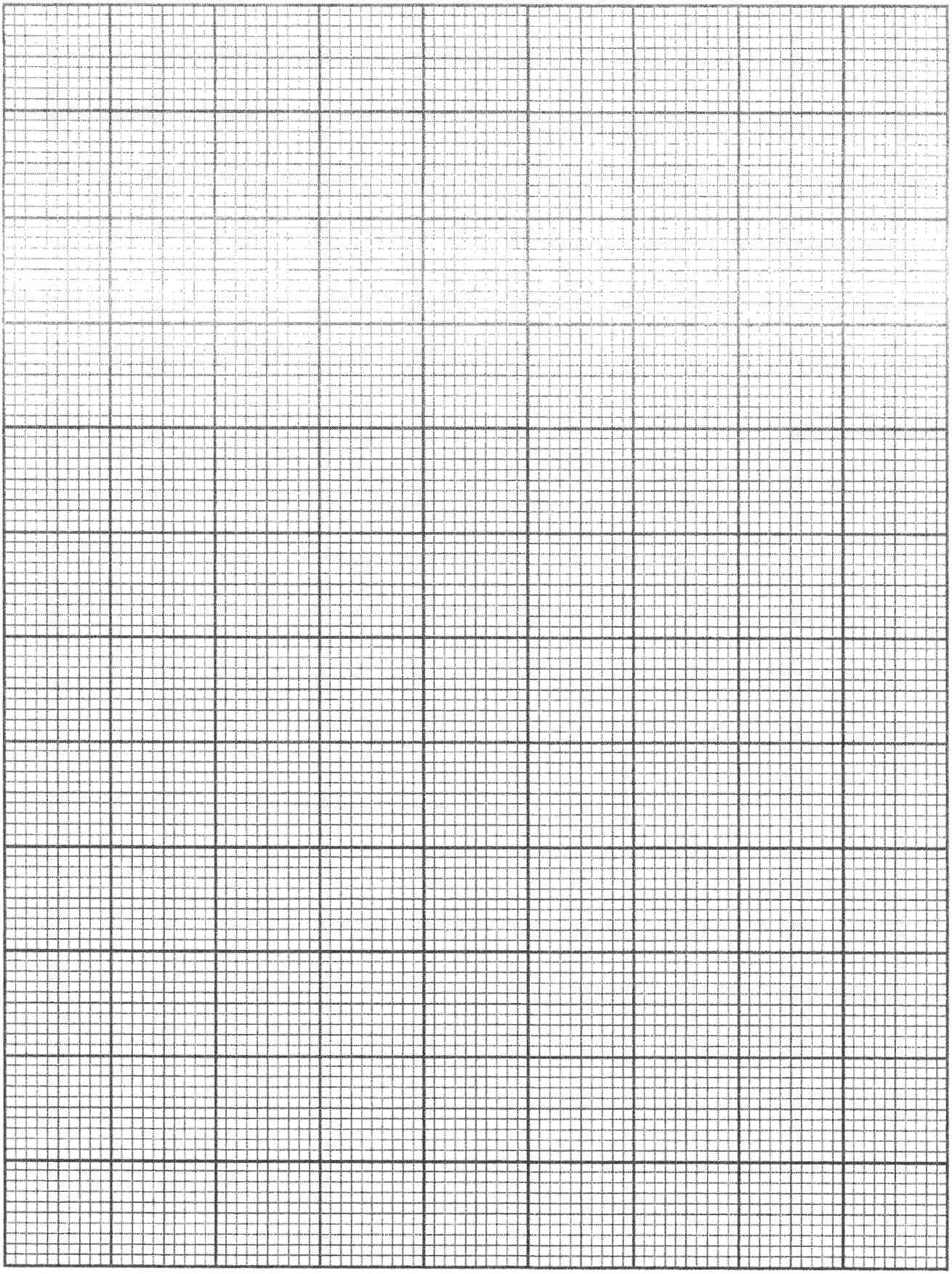
(a) Find the value of p.

Answer _____ [1]

(b) Using a scale of 2 cm to represent 1 unit on the horizontal x-axis and 1 cm to represent 1 unit on the vertical y—axis, draw the graph for $0 \leq x \leq 5$ and a vertical y-axis for $-1 \leq y \leq 12$. [3]

(c) By drawing a tangent, find the gradient of the curve at point $x = 1$.

Answer _____ [2]



Solution BP~272

Class Index Number

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Sector area $= \frac{1}{2}r^2\theta$, where θ is in radians

$$= \frac{c}{\sin C}$$

$$- 2bc\cos A$$

Statis...

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Answer **all** the questions.

$\tan 145^\circ$	14^{-5}	$\sqrt[3]{145}$	$\frac{\pi}{145}$
-0.7	0.0000018	5.25	0.021

Write these numbers in order of size, starting from the smallest.

A1 - 2 correct

Answer tan 145°, 14^{-5}, $\frac{\pi}{145}$, $\sqrt[3]{145}$ [2]

2 Find the largest integer satisfying $2x+3 > 15$

$2x > 15-3$ M1

$x > \frac{12}{2}$

$x > 6$

Answer 7 [2]

3 Alpha Condominium was built at a cost of $\$3.6 \times 10^7$ and Zulu Condominium was built at a cost of \$48 million. (1 million = 1×10^6)

(a) Find the difference between the building costs. Give your answer in standard form.

$48 \times 10^6 - 3.6 \times 10^7$ M1

Answer \$ 1.2×10^7 [2]

(b) Alpha Condominium has 150 apartments. Find the average selling price of each apartment if the developer made a total profit of \$9 million.

$3.6 \times 10^7 + 9 \times 10^6 = 45000000$ M1

$\frac{45000000}{150}$

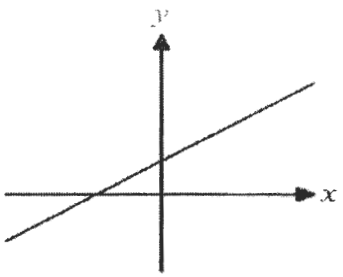
Answer \$ 300 000 [2]

8

4 Match the following graphs with their respective functions by labelling them with their corresponding letters.

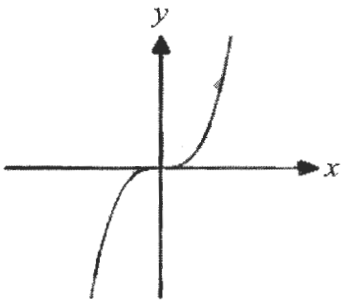
A: $y = 2x^3$	**B:** $y = \frac{4}{x}$	**C:** $y = 3^x$
D: $y = \frac{3}{x^2}$	**E:** $y = 4x^3$	**F:** $y = \frac{1}{2}x + 1$

(a)



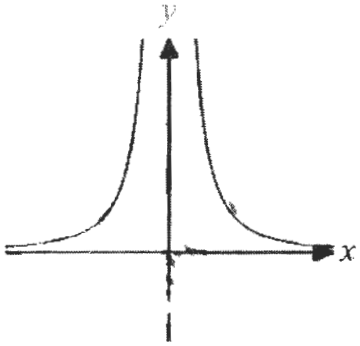
Answer F [1]

(b)



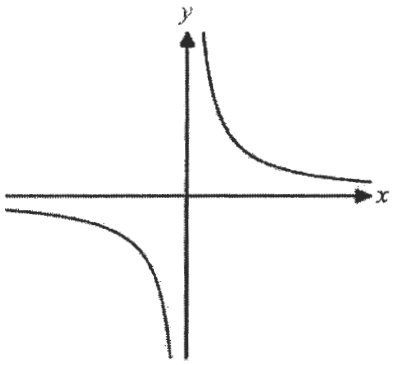
Answer A or E [1]

(c)



Answer D [1]

(d)



Answer B [1]

5 Expand and simplify the following algebraic expressions.

(a) $5(4x + y) - 3(x - 2y)$,

$20x + 5y - 3x + 6y$ M1

Answer $17x + 11y$ [2]

(b) $(y + 3)(5y - 2)$.

$5y^2 - 2y + 15y - 6$ M1

Answer $5y^2 + 13y - 6$ [2]

6 Factorise the following expressions completely.

(a) $x^2 - 9$,

$x^2 - 3^2$ M1

Answer $(x-3)(x+3)$ [2]

(b) $5xy + x + 10y + 2$,

$= [5y+1)x + 2(5y+1)]$

Answer $(5y+1)(x+2)$ [2]

(c) $3x^2 - x - 4$.

	$3x$	-4
x	$3x^2$	$-4x$
$+1$	$+3x$	-4

M1

Answer $(3x-4)(x+1)$ [2]

7 Express the following as a single fraction in its simplest form.

$$\frac{2x}{(5x-3)^2}+\frac{1}{(5x-3)}$$

$$= \frac{2x}{(5x-3)^2} + \frac{1 \times (5x-3)}{(5x-3)(5x-3)}$$

$$= \frac{2x + (5x-3)}{(5x-3)^2}$$

$$\frac{7x-3}{(5x-3)^2}$$ [2]

8 Given that the formula of $A = 4\pi r^2$, use $\pi = 3.142$.

(a) find the value of A when $r = 3$,

$$4 \times \pi \times (3)^2$$

Answer $A =$ 113 or 12π [1]

(b) make ***r*** the subject of the formula.

$$\frac{A}{4\pi} = \frac{4\pi r^2}{4\pi}$$ M1

$$\frac{A}{4\pi} = r^2$$

$$r = \pm\sqrt{\frac{A}{4\pi}}$$

Answer $r =$ $\pm\sqrt{\frac{A}{4\pi}}$ [2]

9 Solve $\frac{7}{x-2} = 3$.

M1 $(x-2) \times \frac{7}{x-2} = 3 \times (x-2)$

$7 = 3(x-2)$

$7 = 3x - 6$

$7 + 6 = 3x$

$13 = 3x$

$x = \frac{13}{3}$

$= 4\frac{1}{3}$

Answer $x =$ $4\frac{1}{3}$ [2]

10 A map is drawn to a scale of 1 : 85 000.

(a) The scale can be rewritten in the form 1 *cm* to *x km*. Find *x*.

85000 ÷ 100 ÷ 1000

Answer $x =$ 0.85 *km* **[1]**

(b) The distance between two towns on the map is 30 *cm*.

Find the actual distance, in kilometres, between the two towns.

0.85 × 30

Answer 25.5 *km* **[1]**

(c) An island has an actual area of 2.89 km^2.

Find the area, in square centimetres, of the island on the map.

M1

1 cm : 0.85 km

1 cm^2 : 0.7225 km^2 ↙ square both sides

× 4 × 4

4 cm^2 : 2.89 km^2

Answer 4 cm^2 [2]

11 (a) Simplify $\frac{25x^2y^5}{10xy^3}$.

$\frac{5xy^2}{2}$

Answer ..... [1]

(b) Given that $\sqrt{49} = 7^n$, find the value of n.

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

$7^{2 \times \frac{1}{2}} = 7^n$

$7^1 = 7^n$

1

Answer ..... [1]

12 (a) Express $x^2 - 8x + 11$ in the form $(x + a)^2 + b$. (use complete the square method)

$x^2 - 8x + \left(\frac{-8}{2}\right)^2 + 11 - \left(\frac{-8}{2}\right)^2$

$(x-4)^2 + 11 - 16$

Answer $(x-4)^2 - 5$ [2]

(b) **Hence**, solve $x^2 - 8x + 11 = 0$, giving your answers correct to 2 decimal places. [2]

$(x-4)^2 - 5 = 0$

$(x-4)^2 = 5$

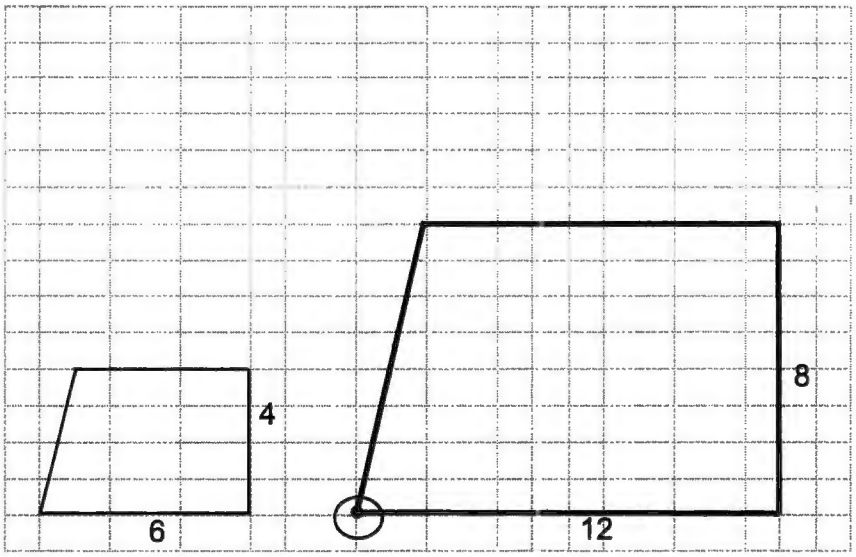
$x - 4 = \pm\sqrt{5}$

$x = 4 \pm \sqrt{5}$

$x = 4 + \sqrt{5}$ or $x = 4 - \sqrt{5}$

Answer $x =$ 6.24, 1.76 [1]

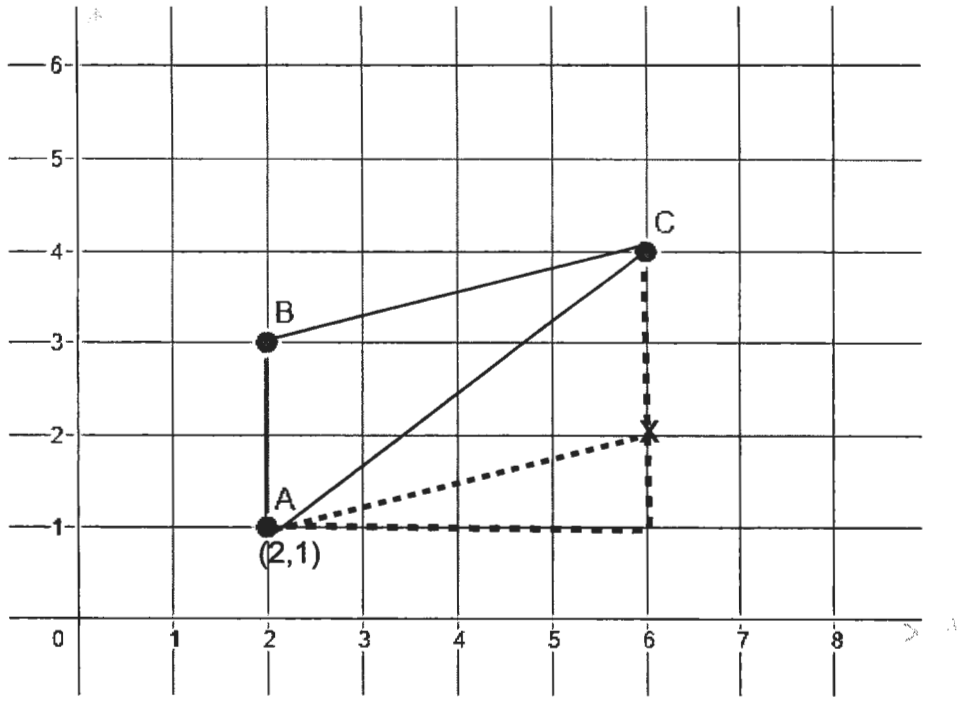
13 Draw on the grid, an enlargement of the figure using a scale factor of 2 .



[2]

2

14 In the diagram, the vertices of triangle ABC are $A(2, 1)$, $B(2, 3)$ and $C(6, 4)$.



(a) Find the length of AC, using the formula, $length = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$.

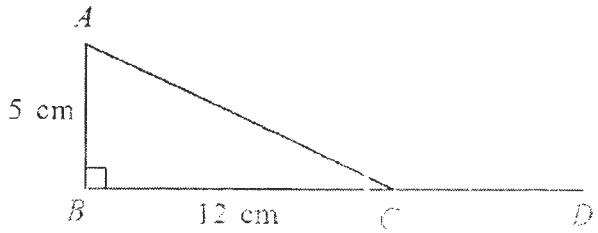
$\sqrt{(4-1)^2 + (6-2)^2}$

Answer 5 unit [2]

(b) Write down the coordinates of D such that the four points $ABCD$ are the four vertices of a parallelogram.

Answer D (6 , 2) [1]

15 Triangle ABC is a right-angled triangle. It is given that $AB = 5$ cm and $BC = 12$ cm.



(a) Show that $AC = 13$ cm. [2]

$\sqrt{12^2}$

(b) Find the value of

(i) $\tan \angle ACB$, (as a fraction)

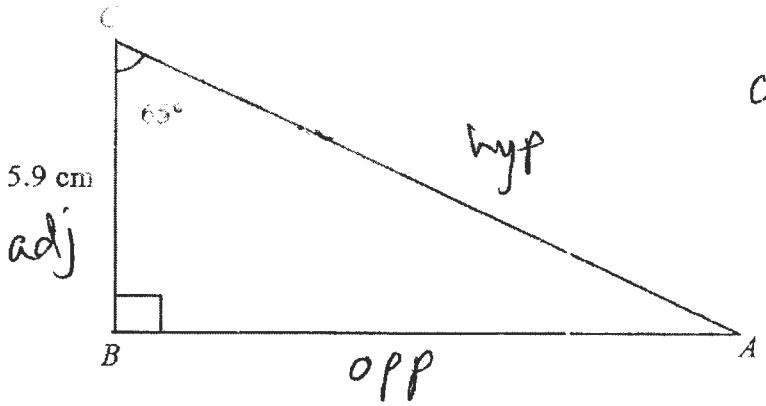
Answer 12 [1]

(ii) $3\sin 22.6°$. (correct to 3 sig. fig.)

Answer 1.15 [1]

---

16 The diagram shows a triangle ABC where $BC = 5.9$ cm and $\angle ABC = 90°$ and $\angle ACB = 65°$. Find the length of AC.



$\cos 65° = \frac{5.9}{AC}$

$AC = \frac{5.9}{\cos 65°}$

or $\frac{\sin 90°}{AC} = \frac{\sin 25°}{5.9}$

$AC = \frac{5.9 \times \sin 90°}{\sin 25°}$

Answer 13.96 ≈ 14.0 (3sf) cm [2]

End of Paper

Solution BP~283

Name _____ Class _____ Index Number _____

OUTRAM SECONDARY SCHOOL
END-OF-YEAR EXAMINATION
2022

Subject	:	**Mathematics**
Paper No	:	**2**
Level (Stream)	:	**Secondary Three Normal (Academic)**
Date	:	**11 October 2022**
Duration	:	**1 hour 30 minutes**
Marks	:	**50**

READ THESE INSTRUCTIONS FIRST

Candidates answer on the Question Paper.

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

For Examiner's Use
50

This document consists of **13** printed pages, including this cover page.

Setter: Mr Oliver Tan

Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1 + \frac{r}{100}\right)^n$$

Mensuration

Curved Surface area of a cone = πrl

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

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

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

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

Arc length = $r\theta$, where θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ is in radians

$$= \frac{c}{\sin C}$$

$$- 2bc\cos A$$

Statis...

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Answer **all** the questions.

1 **(a)** Given that $p=\frac{2x+y^2}{y-\sqrt{x}}$, find the value of p when $x=4$ and $y=3$.

$$p=\frac{2(4)+(3)^2}{3-\sqrt{4}} \qquad B1$$

17 [2]

(b) Solve $\frac{x+5}{x}=\frac{2}{3}$.

$3(x+5)=2x$ cross multiply M1

$3x+15=2x$

$3x-2x=-15$

Answer $x=-15$ [2]

(c) Rearrange $5m=\frac{mx+3}{y}$ to make m the subject.

$5my=mx+3$

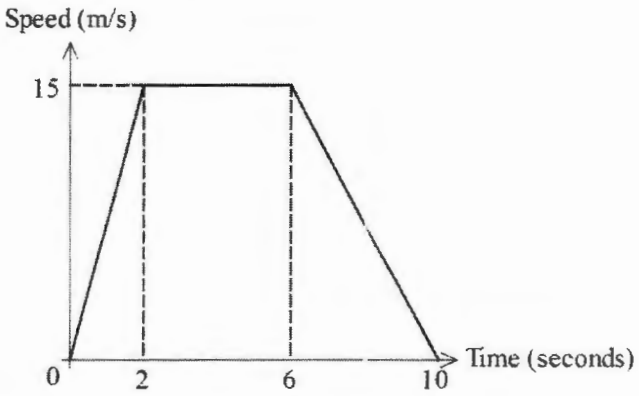
$5my-mx=3$

$m(5y-x)=3$

$m=\frac{3}{5y-x}$

Answer $m=\frac{3}{5y-x}$ [2]

3 The diagram shows the speed-time graph of an object over a period of 10 seconds.



(a) Calculate the acceleration of the object from start until after 2 seconds.

$\frac{15}{2}$

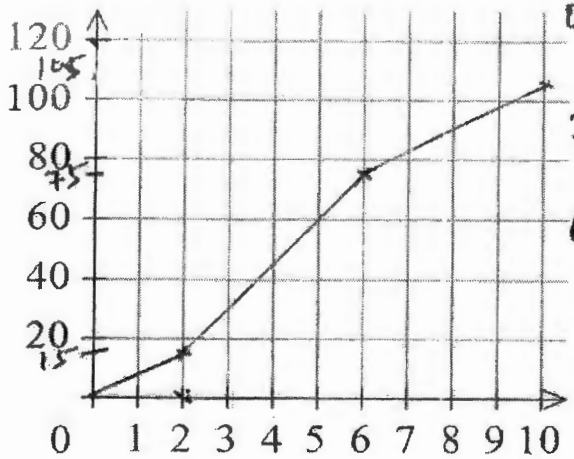
Answer 7.5 m/s² [1]

(b) Calculate the total distance travelled for the object.

$\frac{1}{2} \times (4+10) \times 15$

Answer 105 m [1]

(c) Use the grid below to sketch the distance-time graph for the journey. [2]



Time

0-2 → $\frac{1}{2} \times 2 \times 15 = 15$ m

2-6 → $4 \times 15 = 60$ m

6-10 → $\frac{1}{2} \times 4 \times 15 = 30$ m

(d) Expand and simplify $(2x+3)(4-x)$.

$8x - 2x^2 + 12 - 3x$ M1

$-2x^2+5x+12$ [2]

2 Simplify the following, leaving your answers in positive index notation.

(a) $3x^4y^{-3}\times(2xy^2)^3$,

$3x^4y^{-3} \times 8x^3y^6$ M1

Answer $24x^7y^3$ [2]

(b) $\frac{4y}{x} \div \left[\frac{y^2}{x}\right]^4$.

$\frac{4y}{x} \div \frac{y^8}{x^4}$ M1

$\frac{4y}{x} \times \frac{x^4}{y^8}$

Answer $\frac{4x^3}{y^7}$ [2]

4 **(a)** Mr Wong sold his car for $125,000.
He made a loss of 20% on what he had paid for when it was new.
How much did he buy when it was new from the car dealer

$80\% \rightarrow \$125000$ M1

$1\% \rightarrow \frac{125000}{80}$

$100\% \rightarrow \frac{125000}{80} \times 100$

Answer $ 250 [2][2]

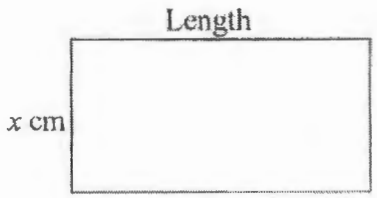
(b) Mr Wong took a car loan of $100,000, at 2.5% per year compound interest, when he bought the new car.
Find the total amount he will pay back after 3 years for this loan.
Give your answer correct to the nearest dollar.

$\text{Total Amount} = 100000\left[1 + \frac{2.5}{100}\right]^3$

$= \$107689.0625$

Answer $ 107 689 [2]

5 The figure below shows a rectangle with width x cm.



(a) Given that the length of the rectangle is 6 cm longer than its width, express the length of the rectangle in terms of x.

Answer $x + 6$ cm [1]

(b) If the area of the rectangle is 40 cm^2, form an equation involving x and show that it reduces to $x^2 + 6x - 40 = 0$. [2]

Answer

$x(x+6) = 40$ M1

$x^2 + 6x - 40 = 0$ A1

(c) Solve $x^2 + 6x - 40 = 0$.

$x = \dfrac{6 \pm \sqrt{6^2 - 4(1)(-40)}}{2(1)}$ M1

$x = 4$ or -10

Answer ..... or ..... [2]

6 The equation of a straight line l_1 is $4y - 2x = 7$
It intersects the x-axis at P and the y-axis at Q.

(a) **(i)** Write down the coordinates of P.

$y = 0$ [cut x-axis]

$0 - 2x = 7$

$x = -\frac{7}{2}$ Answer $(-\frac{7}{2}, 0)$ [1]

(ii) Write down the coordinates of Q.

$x = 0$ [cut y-axis]

$4y - 0 = 7$

$y = \frac{7}{4}$ Answer $(0, \frac{7}{4})$ [1]

(b) Find the length of PQ.

M1

$PQ = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$

$= \sqrt{(\frac{7}{4} - 0)^2 + (0 - (-\frac{7}{2}))^2}$ (3 s.f.)

3.91 units [2] A1

Another line l_2 has the same gradient as l_1 and passes through the point (0, 1).

(c) Find the equation of the line l_2.

Answer _____ units [2]

$y = mx + c$

$y = \frac{1}{2}x + c$

$1 = \frac{1}{2}(0) + c$

$c = 1$

$4y - 2x = 7$

$4y = 2x + 7$

$y = \frac{1}{2}x + \frac{7}{4}$

Answer $y = \frac{1}{2}x + 1$ [1]

$\frac{4}{10} = \frac{x}{15}$

7 Two similar solid cones have heights 10 m and 15 m.

(a) Given that the smaller cone has a radius of 4 m, find the radius of the larger cone.

$\frac{15 \times 4}{10} = 6$

Height → 10 : 15 Radius → 2 : 3
2 : 3 4 : 6

Answer 6 m [1]

(b) Find, in its simplest form, the ratio of the total surface area of the smaller cone to that of the larger cone.

M1

2 : 3
Area → $2^2 : 3^2$ square both sides
4 : 9

4 : 9 [2]

(c) If the cost of painting the larger cone is $126, find the cost of painting the smaller cone.

Area ratio
4 : 9) ×14
56 : 126

$55.56 ≈ $55.60

Answer $ 56 [1]' [2]

(d) Both cones are completely filled with cleaning agent. The cost of filling both the cones is $399. Find the cost of completely filling the smaller cone with the same kind of cleaning agent.

M1

2 : 3
Volume $2^3 : 3^3$ cube both sides
8 : 27
total = 8 + 27 = 35
each part = $399/35 = 11.4$

small cone volume = 11.4 × 8

Answer $ 91.20 [2]

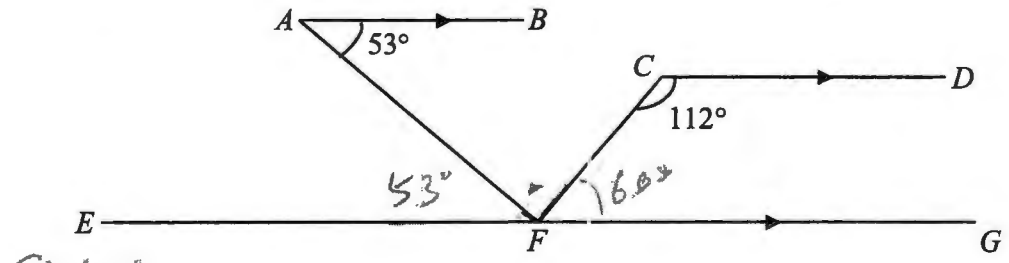
8 The perimeter of an equilateral triangle is equal to the circumference of a circle of radius 12 cm.
Find the length of each side of the triangle.

$3x = 2\pi \times 12$ M1

Answer 25.1 cm [2]

---

9 In the diagram, *AB*, *CD* and *EFG* are parallel straight lines.
Angle $BAF = 53°$ and angle $DCF = 112°$.



Showing your reasonings clearly, find, in terms of x,

(a) angle *AFE*, A1

(Alternate ∠)

Answer 53 A1 ° [2]

(b) angle *CFA*.

$180 - 112 = 68°$ M1

$180 - 53 - 68 = 59°$ (sum ∠ straight line)

Answer 59 ° [2] A1

---

10 Simplify, giving your answers in positive index.

(a) $4a^5 \div a^2$

$4a^{5-2}$

Answer $4a^3$ ..... [1]

(b) $(m^2)^{-3}$

$= m^{(2)\times(-3)}$

$= m^{-6}$

$\frac{1}{m^6}$

11 The variable x and y are connected by the equation $y = \frac{3}{x} + x - 4$.

Some corresponding values of x and y, correct to 2 decimal places, are given in the table below.

x	0.2	0.5	1	2	3	4	5
y	11.2	p	0	-0.5	0	0.75	1.6

(a) Find the value of p.

$y = \frac{3}{0.5} + 0.5 - 4$

Answer 2.5 [1]

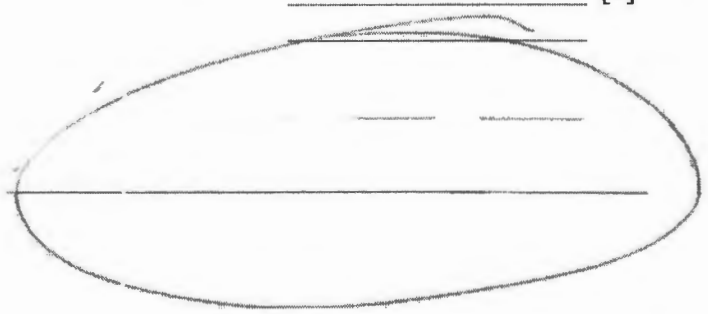
(b) Using a scale of 2 cm to represent 1 unit on the horizontal x-axis and 1 cm to represent 1 unit on the vertical y—axis, draw the graph for $0 \le x \le 5$ and a vertical y-axis for $-1 \le y \le 12$. [3]

(c) By drawing a tangent, find the gradient of the curve at point $x = 1$.

$M = -\frac{4}{2}$

Answer −2 [2]

[2]



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