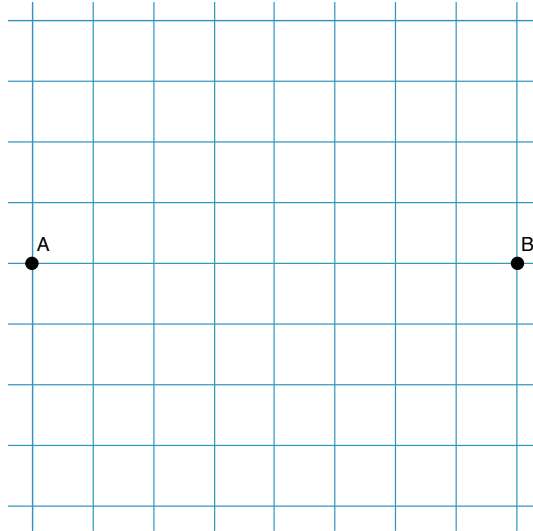


Name: _____ Class: _____

Section 1: Calculators are allowed. Write your answers in the spaces provided.

1. Two towns A and B are 80 km apart as shown in the diagram.



Shade the region that is no more than 50 km from both town A and town B.

(2)

2. Match up the vectors which are parallel to each other.

b

a + b

2a - b

3(a + b)

b - 2a

3a + b

6a - 2b

-2b

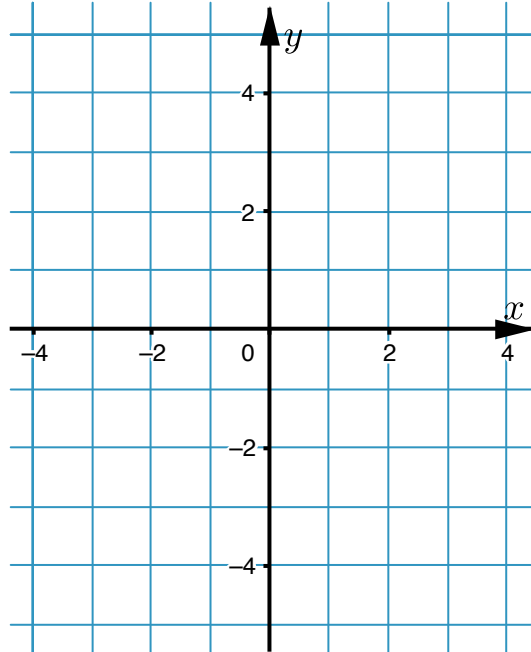
(3)

3. a) Complete the table of values for the equation $y = x^2 - 5$

x	-3	-2	-1	0	1	2	3
y	4		-4			-1	4

(2)

- b) Draw the graph of $y = x^2 - 5$ on the grid below.



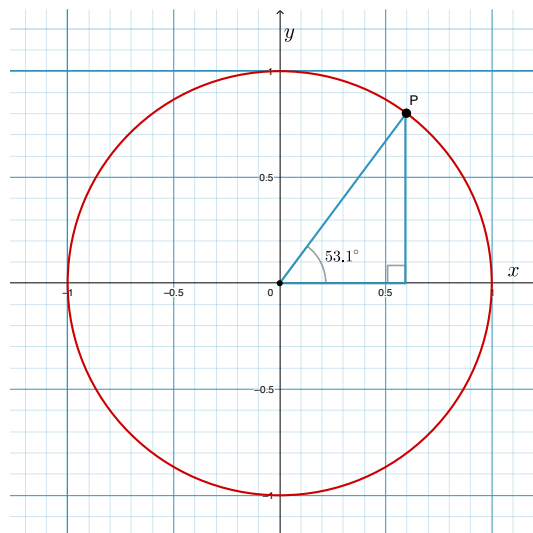
(2)

4. Decide whether the following exponential functions represent exponential growth or decay.

	Exponential growth	Exponential decay
$y = 1.5^x$	<input type="checkbox"/>	<input type="checkbox"/>
$y = 0.7^x$	<input type="checkbox"/>	<input type="checkbox"/>
$y = 3^{-x}$	<input type="checkbox"/>	<input type="checkbox"/>
$y = 0.2^{-x}$	<input type="checkbox"/>	<input type="checkbox"/>
$y = 2^x$	<input type="checkbox"/>	<input type="checkbox"/>

(3)

5. The diagram shows a circle passing through the points $(0, 1)$ and $(1, 0)$. The centre of the circle is at the origin.

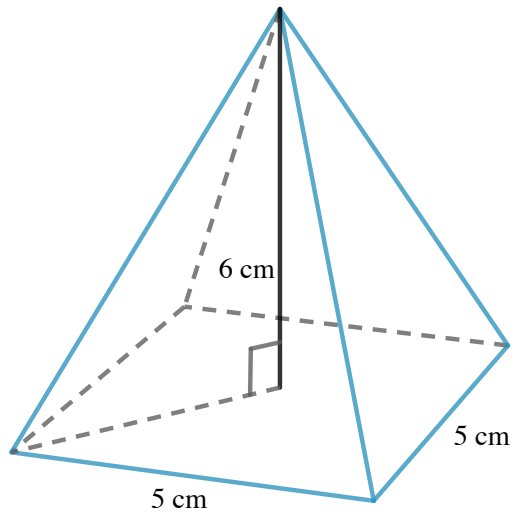


It can be seen from the diagram that $\sin 53.1^\circ \approx 0.8$

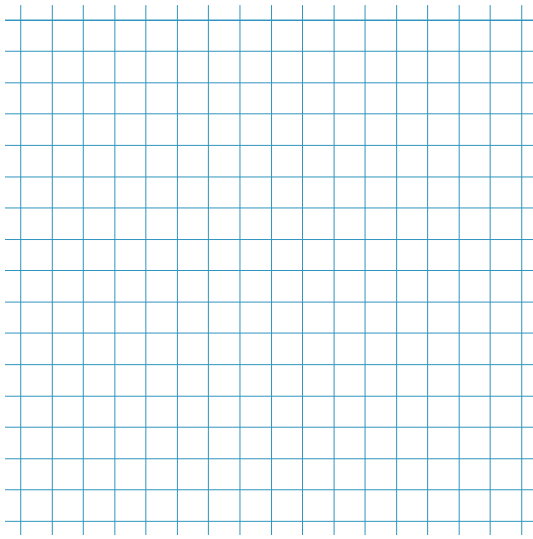
Use the diagram to find an obtuse angle θ such that $\sin \theta = 0.8$
Give your answer correct to one decimal place.

Answer: _____ (1)

6. On the squared paper draw a front elevation, side elevation and plan for the 3D solid shown.



Your diagrams should be drawn to scale, use the scale of one square represents 1 cm.



7. The table shows a set of values for x and y with some values missing.

It is given that $y = \frac{k}{x^n}$

x	1	2	5	
y	100	12.5		0.1

a) Find the value of k .

Answer: $k = \boxed{}$ (1)

b) Find the value of n .

Answer: $n = \boxed{}$ (1)

c) Hence fill in the missing values in the table.

x	1	2	5	—
y	100	12.5	—	0.1

(2)

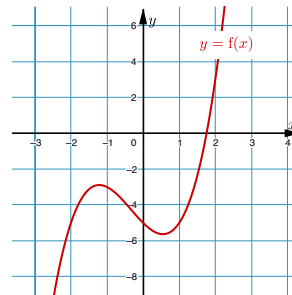
8. Consider the function $f(x) = x^3 + x^2 - 2x - 5$

The equation $f(x) = 0$ is to be solved using an iteration formula.

a)

Using the graph, find a suitable integer value for x_0

$x_0 = \underline{\hspace{2cm}}$



(1)

b) Show that $f(x) = 0$ can be rearranged to give

$$x = \sqrt{\frac{2x + 5}{x + 1}} \quad (3)$$

c) Starting with your value of x_0 from part (a), and using the iteration formula

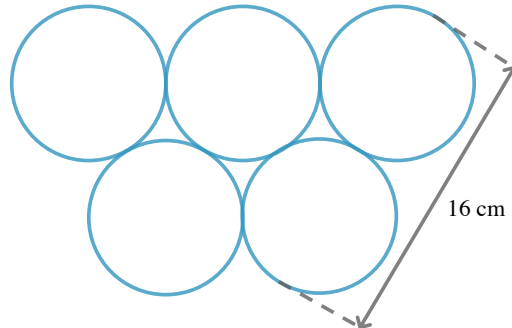
$$x_{n+1} = \sqrt{\frac{2x_n + 5}{x_n + 1}}$$

find the value of the root to the equation $f(x) = 0$ correct to three decimal places.

Answer: $\underline{\hspace{2cm}}$ (2)

Section 2: Calculators are allowed. Write your answers on separate paper.

9. Five identical circles are placed as shown below.



Find the total area of all five circles, giving your answer to the nearest cm^2 (2)

10. In July 1983, Steve Overtt's world record for running 1500 meters was 3 minutes and 31.36 seconds. Sebastian Coe's world record for running the mile was 3 minutes 47.33 seconds.

1 mile = 1609 metres.

- a) Calculate which of the two runners had the greatest average speed during their record race. (3)
b) State this speed in km/h

Give your answer correct to two decimal places. (1)

11. Consider the formula $T = 2\pi\sqrt{\frac{l}{g}}$

Explain whether T will increase or decrease if g is increased by 10%.

Give a reason for your answer. (2)

12. Find the volume of the frustrum shown in the diagram.

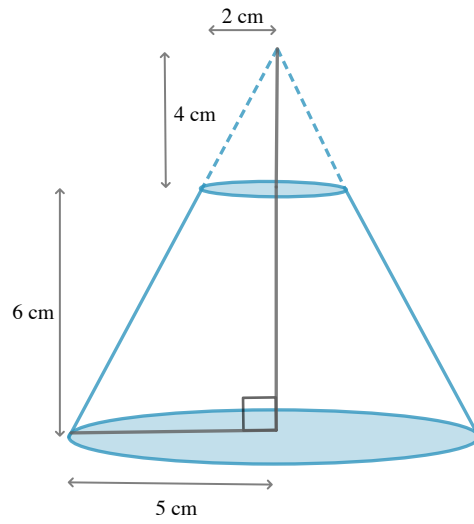
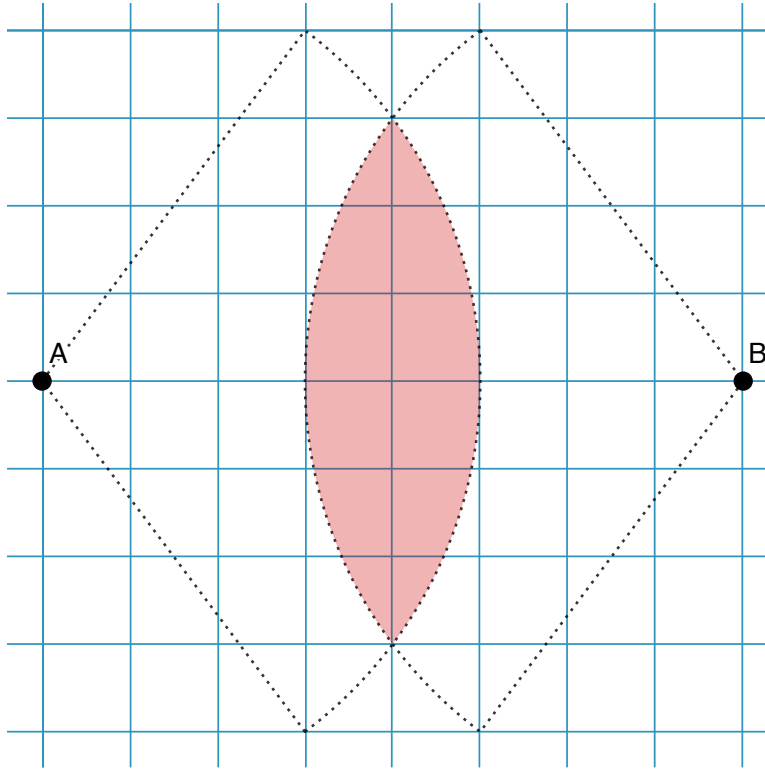


Diagram **NOT** accurately drawn.

(3)

1.



Arc drawn with radius of 5 squares

1 mark

Correct answer.

1 mark

2.

$$[b - -2b], [a + b - 3(a + b)], [2a - b - b - 2a]$$

At least 1 correct.

1 mark

At least 2 correct.

1 mark

All correct.

1 mark

3.

a) $[1: -1], [2: -5], [3: -4]$

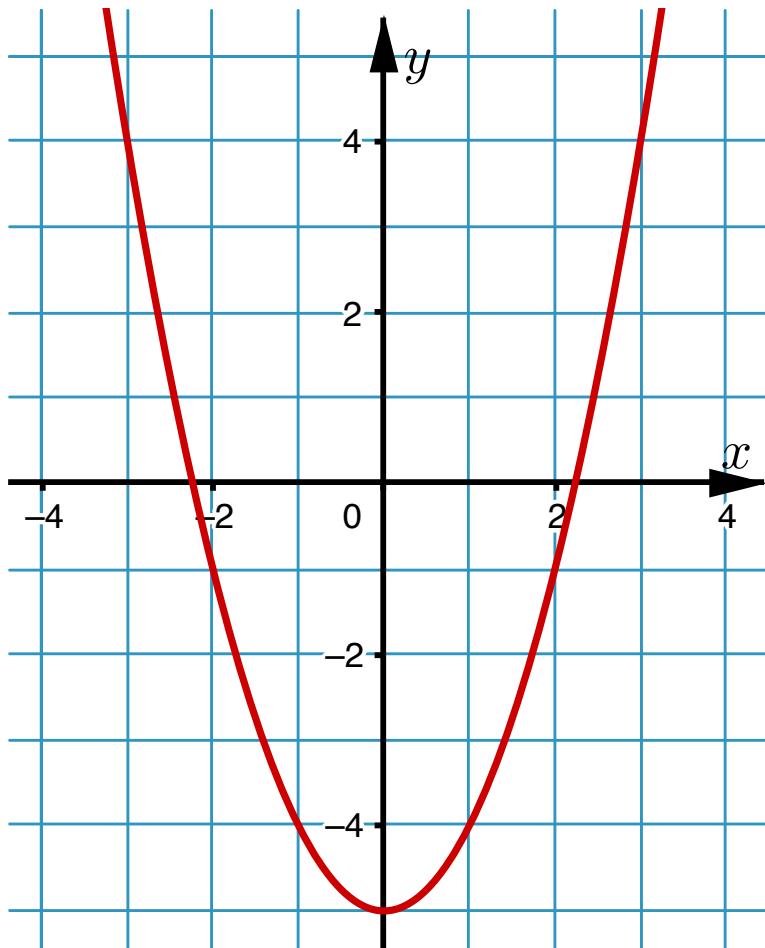
All correct.

1 mark

At least 2 correct.

1 mark

b)



At least 3 points correctly plotted.

1 mark

All points correct and points joined by a smooth curve.

1 mark

4.

$y = 2^x$ [Exponential growth], $y = 1.5^x$ [Exponential growth], $y = 0.7^x$ [Exponential decay], $y = 3^{-x}$ [Exponential decay], $y = 0.2^{-x}$ [Exponential growth]

At least 3 correct and max 2 wrong.

1 mark

At least 4 correct and max 1 wrong.

1 mark

All correct.

1 mark

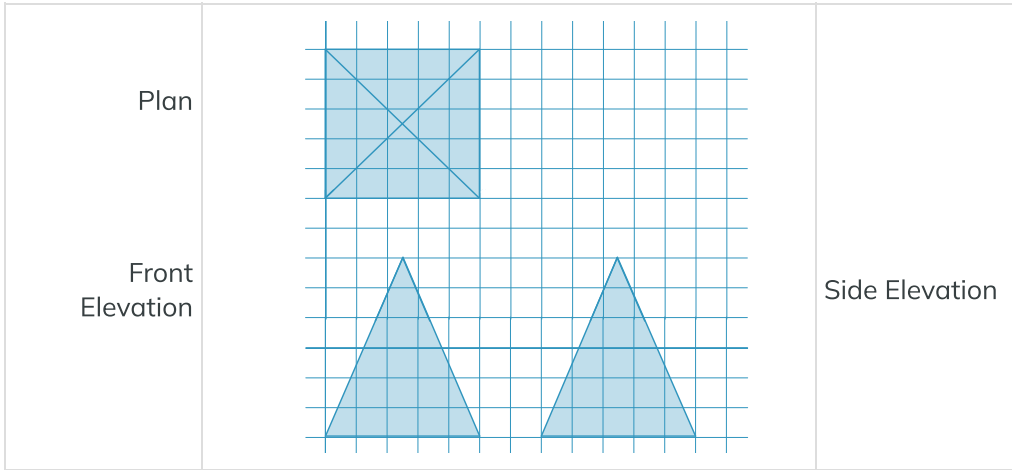
5.

$\theta \approx 126.9^\circ$

$180 - 53.1 = 126.9$ Correct answer.

1 mark

6.



Plan drawn with cross. At least one triangle drawn.

1 mark

Correct diagrams, to scale and correctly labelled

1 mark

7.

a) $k = 100$

Correct answer.

1 mark

b) $n = 3$

Correct answer.

1 mark

c) [1: 10], [2: 0.8]

At least 1 correct.

1 mark

All correct.

1 mark

8.

a) 2

Correct answer.

1 mark

b) $x^3 + x^2 - 2x - 5 = 0$

$$x^3 + x^2 = 2x + 5$$

$$x^2(x + 1) = 2x + 5$$

$$x^2 = \frac{2x + 5}{x + 1}$$

$$x = \sqrt{\frac{2x + 5}{x + 1}}$$

$$x^3 + x^2 = 2x + 5$$

1 mark

$$x^2(x + 1) = 2x + 5$$

1 mark

$$x^2 = \frac{2x + 5}{x + 1}$$

Answer given $x = \sqrt{\frac{2x + 5}{x + 1}}$

1 mark

c) $x \approx 1.757$

Correct answer.

1 mark

Correct answer.

1 mark

9.

251 cm^2

Understands that the radius = 4 cm.

1 mark

Correct answer.

1 mark

10.

a) $\frac{31.36}{60} = 0.5226666\dots$

Steve Ovet's time = 3.522666... min

Steve Ovet's speed = $\frac{1500}{3.522666666} \approx 425.81 \text{ m/min}$

$\frac{47.33}{60} = 0.78883333\dots$

Sebastian Coe's time = 3.78883333...min

Sebastian Coe's speed = $\frac{1609}{3.78883333333} \approx 424.67 \text{ m/min}$

Steve Ovet had the greatest average speed (just!).

Calculates the average speed of Steve **or** Sebastian.

1 mark

Calculates the average speed of Steve **and** Sebastian.

1 mark

Correct conclusion based on calculations.

1 mark

b) $425.813\dots \text{m/min} = 0.425813\dots \text{km/m} \approx 25.55 \text{ km/h}$

Correct answer.

1 mark

11.

T will decrease

1 mark

T will decrease since g increases and this will cause the fraction $\frac{l}{g}$ to decrease. 2π is unchanged.

1 mark

12.

Large cone

$$\text{Volume } \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 5^2 \times 10 = \frac{250\pi}{3}$$

Small Cone

$$\text{Volume } \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 2^2 \times 4 = \frac{16\pi}{3}$$

Frustrum

$$\text{Volume } \frac{250\pi}{3} - \frac{16\pi}{3} = \frac{234\pi}{3} = 78\pi \approx 245 \text{ cm}^3$$

Finds volume of large cone

1 mark

Finds volume of small cone

1 mark

Correct answer.

1 mark