Answer **all** questions in the spaces provided.

**1** Work out the value of $1.5^2$

**[2 marks]**

$$15$$
$$\times 15$$
$$\overline{225} \checkmark$$

$2 \cdot 25 \checkmark$

Answer _____

**2 (a)** Complete this number machine so that $y = 4x + 5$

**[1 mark]**

Input                                    Output

$x$  →  $\boxed{\times 4}$  →  $\boxed{+5}$  →  $y$

$\checkmark$
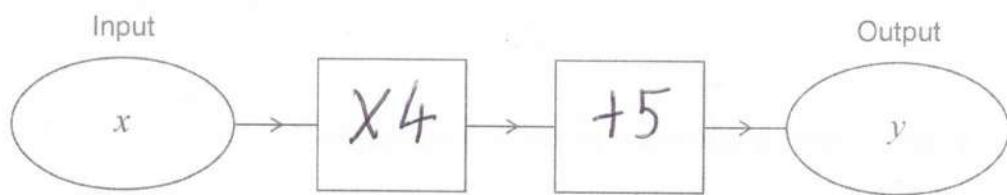
**2 (b)** Complete this number machine so that $y = 3x - 24$

**[1 mark]**

$\checkmark$

Input                                    Output

$x$  →  $\boxed{-8}$  →  $\boxed{\times 3}$  →  $y$
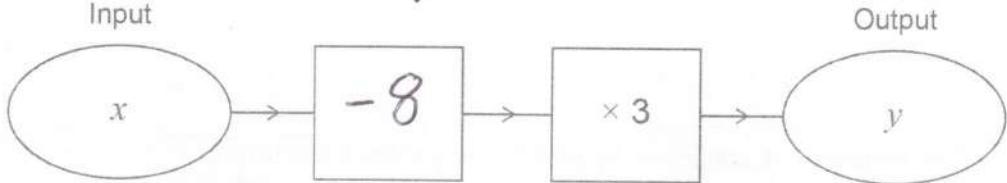
**2 (c)** Complete this number machine so that $y = x$

**[1 mark]**

Input                                    Output

$x$  →  $\boxed{\times 6}$  →  $\boxed{\div 6}$  →  $y$

$\checkmark$
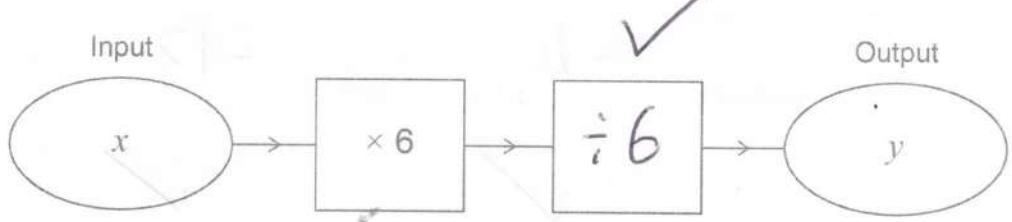
$\left( or \ \times \frac{1}{6} \right)$

3    Each number in a list is increased by 10

Tick **one** box for each statement.

[3 marks]

|  | True | False | Cannot tell |
|---|---|---|---|
| The mode is increased by 10 | ✓ | | |
| The median is increased by 10 | ✓ | | |
| The range is increased by 10 | | ✓ | |

4 (a)    Write the missing term in the geometric progression.

[1 mark]

1    4    16    _64_    256

×4    ×4

✓

4. (b)    A Fibonacci-type sequence begins

5    −9

The sequence is continued by adding the previous two terms.

Work out the next **two** terms.

[2 marks]

$5 + -9 = -4$        $-9 + -4 = -13$

Answer    _−4_    and    _−13_

✓        ✓

11

0 3

**5** Here is a solid prism.



6+2
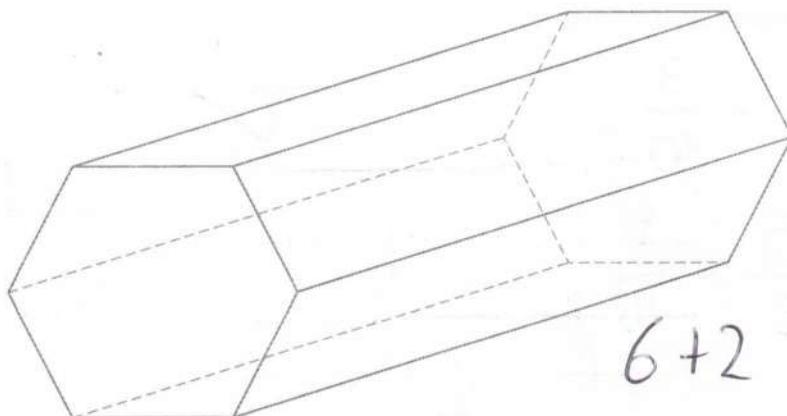
**5 (a)** How many faces does the prism have?

[1 mark]

Answer ___8___

**5 (b)** The prism has

volume = $3500\,cm^3$

and

length = $20\,cm$

Work out the area of the cross-section of the prism.

[2 marks]

$$\frac{V}{L} = \frac{350\cancel{0}}{2\cancel{0}}$$

$$2\overline{)3\,'5\,'0} \quad 175$$

Answer ___175___ $cm^2$

**6**    Work out   $1\frac{1}{5} - \frac{3}{10}$

Give your answer as a fraction.

**[2 marks]**

$= \dfrac{6}{5} - \dfrac{3}{10}$    ✓

$= \dfrac{12}{10} - \dfrac{3}{10}$

Answer    $\dfrac{9}{10}$ ✓

**Turn over for the next question**

5

**Turn over ▶**

0 5

**7**   A large circle and a small circle are shown.

The radius of the large circle is 12 cm

$\div 4$

| radius of large circle : radius of small circle = 4 : 1 |

$\div 4$

Not drawn accurately

✓

3

12

✓
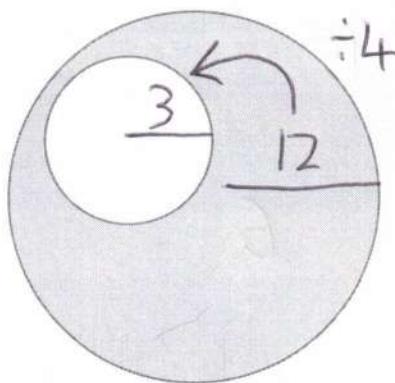
Work out the shaded area.

Give your answer in terms of $\pi$

**[4 marks]**

✓   $\pi \times 12^2 - \pi \times 3^2$

Either

✓   $144\pi - 9\pi$

Answer _____ $135\pi$ _____ cm$^2$   ✓

8 (a) In this part, assume that each person works at the same rate.

10 people can complete a job in 9 hours.

If 15 people work on the same job, how many hours will it take to complete the job?

[2 marks]

✓ $10 \times 9 = 90 \text{ hrs}$

$90 \div 15$

✓

Answer _____ 6 _____ hours

8 (b) In fact, of the 15 people

6 work at a slower rate

9 work at a faster rate.

What does this mean about the number of hours it will take to complete the job?

Tick **one** box.

[1 mark]

☐ It is greater than the answer to (a)

☐ It is the same as the answer to (a)

☐ It is less than the answer to (a)

☑ It is not possible to say

9 $\begin{pmatrix} a \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ 3b \end{pmatrix} = \begin{pmatrix} 5 \\ 20 \end{pmatrix}$

Work out the values of $a$ and $b$.

**[3 marks]**

$a + 1 = 5$

$a \quad = 4$

$2 + 3b = 20$

$3b = 18$

$b = 6$

$a =$ ___4___  $b =$ ___6___

10      Clive owns two coffee shops, A and B.

Out of 150 people

- 18 people use both shops ✓
- 46% use shop A ✓
- $\frac{2}{5}$ use shop B **only**. ✓

Complete the Venn diagram to represent the information.

**[4 marks]**

$\xi$ = 150 people

A = people who use shop A

B = people who use shop B

$\xi$

A                   B

51   18    60

21 ✓

$$\frac{46}{\underset{2}{100}} \times \overset{3}{150}$$
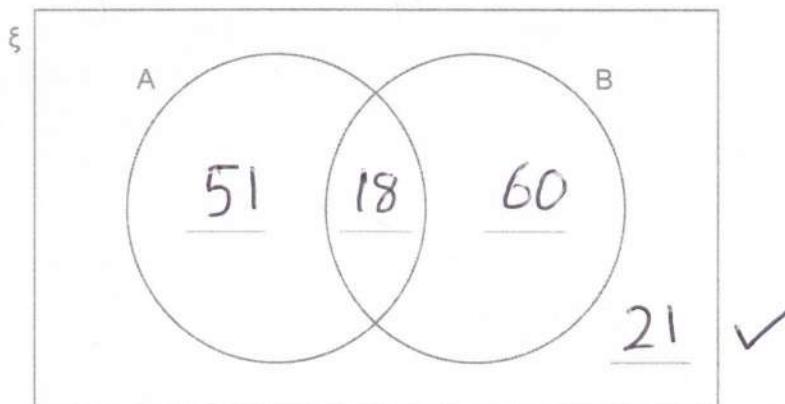
$$\frac{1}{5} \times 150 = 30$$

$$\frac{2}{5} = 60$$

$$= 23 \times 3$$

$$= 69$$

$$150 - 51 - 60 - 18$$

$$= 21$$

7

**Turn over ▶**

**11** Construct the region that lies within 4 cm of the line.

**[3 marks]**
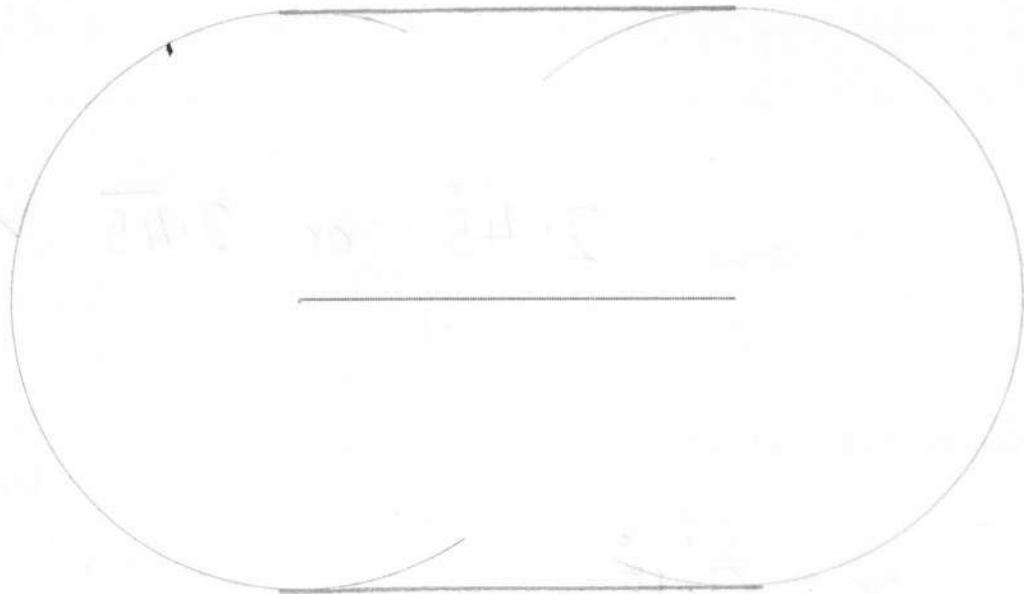
**12 (a)** Convert $\frac{27}{11}$ to a recurring decimal.

[2 marks]

$$\begin{array}{r} 2.454... \\ 11\overline{)27.{}^5 0{}^6 0{}^5 0} \end{array}$$

2·4 ✓

Answer    2·$\overset{..}{4}\overset{.}{5}$   or   2·$\overline{45}$ ✓

**12 (b)** Convert 0.1$\dot{5}$ to a fraction.

[3 marks]

$$x = 0.1\dot{5}$$
$$-\quad 10x = 1.5$$
$$100x = 15.5$$
$$90x = 14$$

✓✓

$$x = \frac{14}{90}$$

✓

Answer    or   $\frac{7}{45}$

8

**Turn over ▶**

**13 (a)** By rounding each number to one significant figure,

estimate the value of $\dfrac{\sqrt{401} + 1.9^3}{\cos 58.7°}$

You **must** show your working.

[3 marks]

✓
Any

$$\frac{\sqrt{400} + 2^3}{\cos 60} = \frac{20 + 8}{0.5}$$

✓All

$$= 28 \times 2$$

Answer _____56_____ ✓

**13 (b)** Here is a triangle.

Not drawn
accurately



7 cm

3 cm

$x$

5 cm
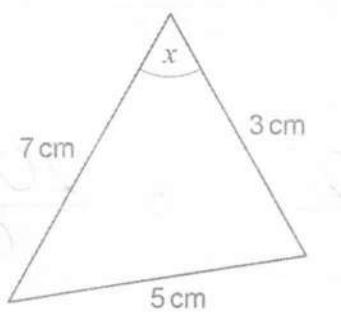
Sam attempts to find the value of $\cos x$ using the cosine rule.

Here is his working.

$5^2 = 3^2 + 7^2 + 2 \times 3 \times 7 \times \cos x$

$5^2 = 10^2 + 42 \times \cos x$

$25 = 142 \cos x$

Therefore $\cos x = \dfrac{25}{142}$

Identify **two** errors Sam has made.

[2 marks]

Error 1 $\underline{3^2 + 7^2 \text{ is not } 10^2,}$
$\underline{\text{it's } 9 + 49 = 58}$

Error 2 $\underline{\text{should be } -2 \times 3 \times 7}$

and $10^2 + 42\cos x \neq 142 \cos x$

✓ each

5

**14** Enlarge triangle *PQR* by scale factor $-\dfrac{1}{3}$ with centre $(0, 0)$

**[3 marks]**



C

✓✓✓

$\left(-1 \text{ e/e}\right)$
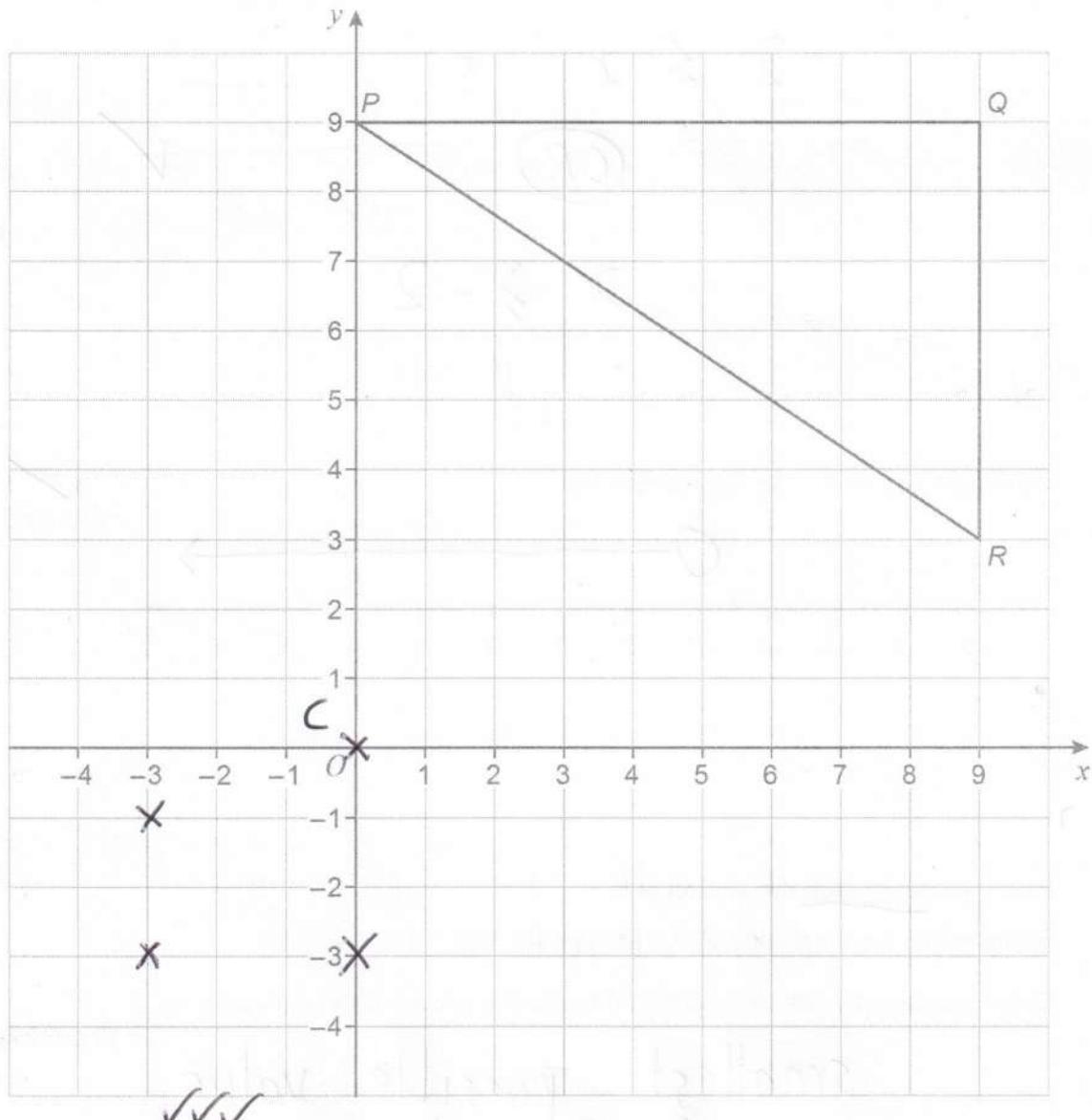
**15 (a)** Solve the inequality $20 - 5x \leqslant 30$

**[3 marks]**

$$-10 \leqslant 5x \quad \checkmark\checkmark$$

$$-2 \leqslant x$$

$$\boxed{OR} \quad \checkmark$$

$$x \geqslant -2$$

Answer _____

**15 (b)** Represent $x > -1$ on the number line.

$\checkmark$
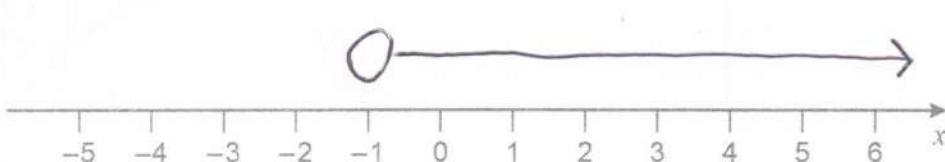
**[1 mark]**



**16** When $w$ is **truncated** the answer is 8

Sacha writes the error interval due to truncation as $\quad 7.5 \leqslant w < 8.5$

Give a reason why Sacha is wrong and state the correct error interval for $w$.

**[2 marks]**

Reason _____ smallest    possible   value
_____ is    8.0    etc _____

Correct error interval ___ 8 ___ $\leqslant w <$ ___ 9 ___ .

(ms  allows  8.9↑)

**Turn over ▶**

**17 (a)** A circle has centre $(0, 0)$ and circumference $36\pi$

Work out the equation of the circle.

**[2 marks]**

$$2\pi r = 36\pi$$
$$2r = 36$$
$$r = 18 \qquad \checkmark$$

Answer $\qquad x^2 + y^2 = 18^2 \qquad \checkmark$ OE

**17 (b)** Point $J$ has coordinates $(15, 0)$ and point $K$ has coordinates $(30, -5)$

Work out the equation of the straight line through $J$ and $K$.

**[4 marks]**

$$m_{JK} = \frac{0--5}{15-30} = \frac{5}{-15} = -\frac{1}{3} \qquad \checkmark$$

$$y = mx + c \implies 0 = -\frac{1}{3} \times 15 + c \quad \checkmark$$
$$(15, 0)$$
$$c = 5 \qquad \checkmark$$

Answer $\qquad y = -\frac{1}{3}x + 5 \qquad \checkmark$ OE

**18 (a)** Express $x^2 + 8x - 5$ in the form $(x + a)^2 - b$ where $a$ and $b$ are integers.

[2 marks]

$$(x + 4)^2 - 16 - 5$$

Answer $(x + 4)^2 - 21$ ✓✓

**18 (b)** A curve has the equation $y = (x - 7)^2 + 8$

Write down the coordinates of the turning point of the curve.

[2 marks]

Answer ( 7 , 8 ) ✓ ✓

**Turn over for the next question**

10

**Turn over ▶**

**19 (a)** Expand and simplify fully $(x + 2)(2x + 3)(3x + 4)$

[3 marks]

$$2x^2 + 7x \quad +6$$

| $6x^3$ | $21x$ | $18x$ | $3x$ |
|--------|-------|-------|------|
| $8x^2$ | $28x$ | $24$  | $4$  |

Answer $6x^3 + 29x^2 + 46x + 24$

**19 (b)** Use your answer from part (a) to work out $102 \times 203 \times 304$

[2 marks]

$$x = 100 \qquad 6 \times 100^3 = 6000000$$
$$29 \times 100^2 = \quad 290000$$
$$46 \times 100 = \qquad 4600 +$$
$$24$$

$$6,294,624$$

Answer $6,294,624$

20 (a) Show that $\dfrac{\sqrt{363}}{\sqrt{3}}$ simplifies to an integer.

**[2 marks]**

$$= \dfrac{\sqrt{121} \times \sqrt{3}}{\sqrt{3}} \qquad = \sqrt{121}$$

$$= 11$$

20 (b) Rationalise the denominator and simplify $\dfrac{20}{\sqrt{5}} \times \dfrac{\sqrt{5}}{\sqrt{5}}$

**[2 marks]**

$$= \dfrac{20\sqrt{5}}{5}$$

Answer $\qquad 4\sqrt{5}$

**Turn over for the next question**

9

**Turn over ▶**

**21** Here is a sketch of the graph of $y = \tan x$ where $0° \leqslant x \leqslant 360°$
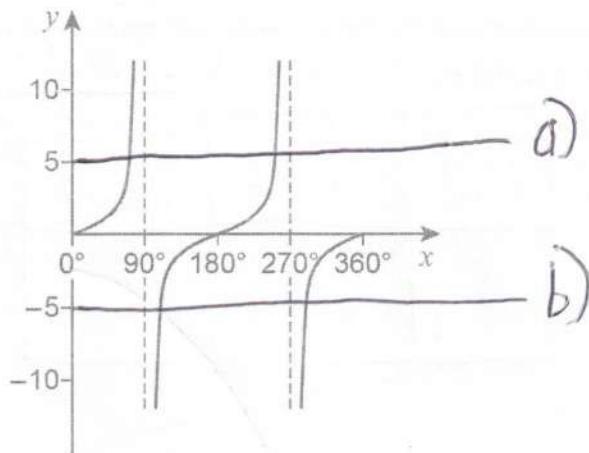


You are given that **tan 78.69° = 5**

**21 (a)** Work out the other value of $x$ where $\tan x = 5$ and $0° \leqslant x \leqslant 360°$

**[1 mark]**

$$\begin{array}{r} 180 \\ + 178 \\ \hline 258 \end{array}$$

Answer _____258·69_____ °

**21 (b)** Work out the **two** values of $x$ where $\tan x = -5$ and $0° \leqslant x \leqslant 360°$

**[2 marks]**

$$\begin{array}{r} 180°·00 \\ - 78·69 \\ \hline 101·31 \end{array}$$

Answer _____101·31_____ ° and _____281·31_____ °

+180

**22**

$$7^n = x$$

Match each expression on the left to the correct expression on the right.

One has been done for you.

**[3 marks]**



$7^{-n}$

$7^{2n}$

$7^{n+1}$

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

$7x$  ✓

$\dfrac{1}{x}$

$\dfrac{1}{2}x$

$\sqrt{x}$  ✓

$x^2$  ✓
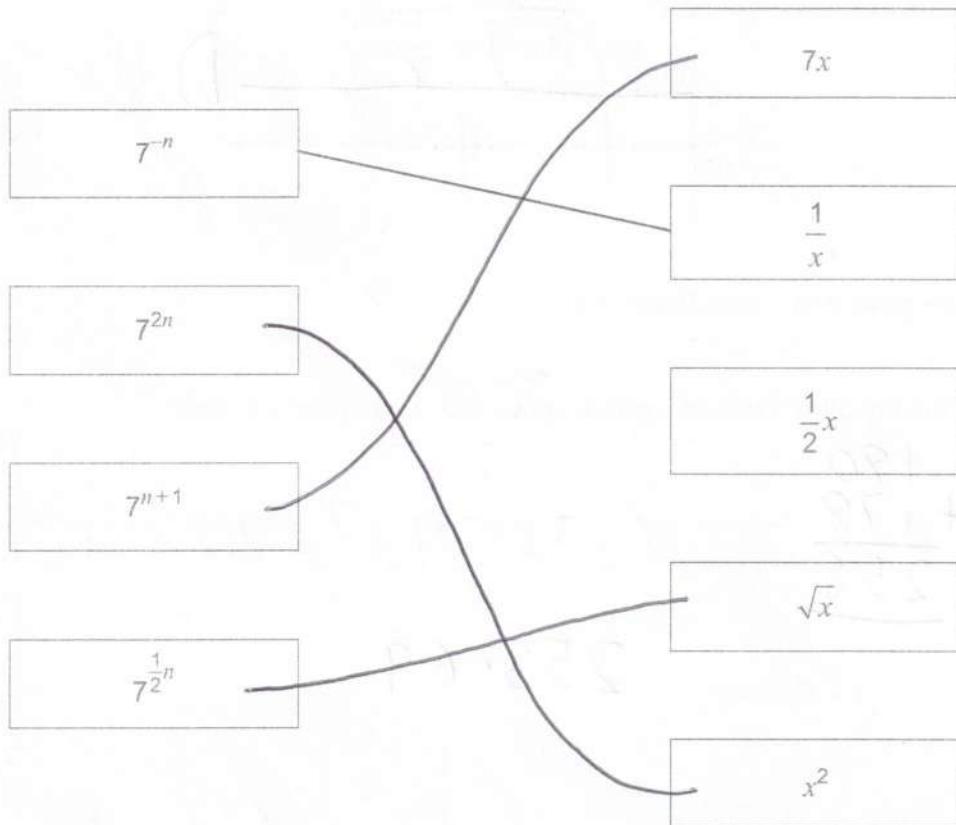
$$7^{2n} = \left(7^n\right)^2 = x^2$$

$$7^{n+1} = 7^n \times 7 = 7x$$

$$7^{\frac{1}{2}n} = \left(7^n\right)^{\frac{1}{2}} = \sqrt{7^n} = \sqrt{x}$$

**Turn over for the next question**

6

**Turn over ▶**

2 1

**23** In each part, the graph shown is a transformation of the graph $y = x^2$

**23 (a)** Write down the equation of the graph shown.
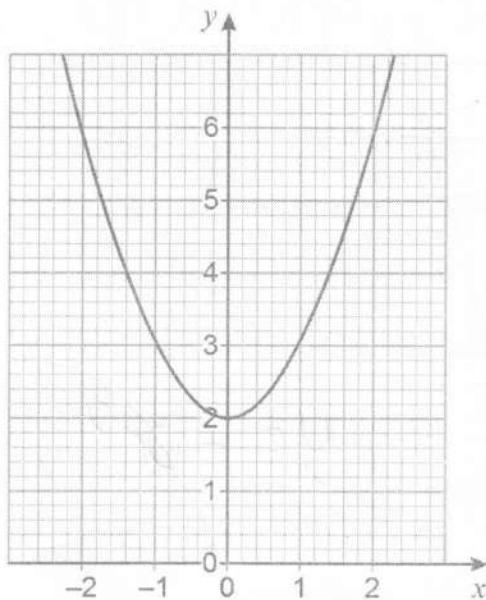
**[1 mark]**



Answer $\quad y = x^2 + 2$

**23 (b)** Write down the equation of the graph shown.
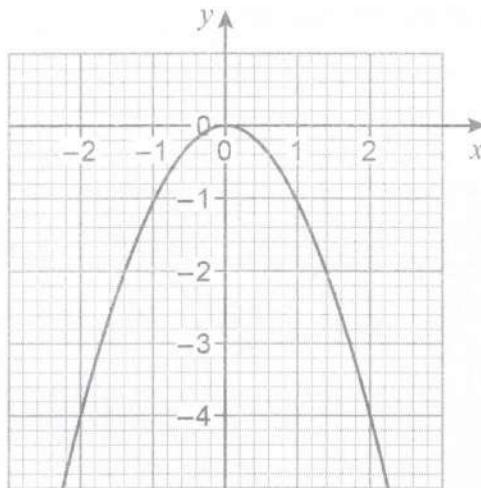
[1 mark]



$$y = -x^2$$

Answer _____

**23 (c)** Write down the equation of the graph shown.

[1 mark]
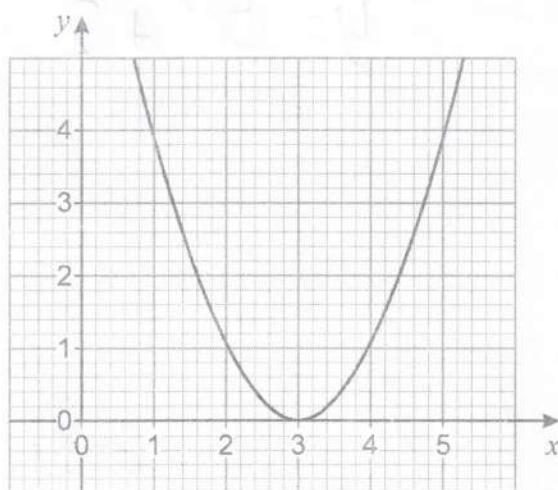


$$y = (x-3)^2$$

Answer _____

**END OF QUESTIONS**

3