1 The weight of a bag of potatoes is 15 kg, correct to the nearest kg.

(a) Write down the smallest possible weight of the bag of potatoes.

14.5 ....kg
(1)

(b) Write down the largest possible weight of the bag of potatoes.

15.5 ....kg
(1)

(Total for question 1 is 2 marks)

2 The length of a line is 81 centimetres, correct to the nearest centimetre.

(a) Write down the least possible length of the line.

80.5 ....cm
(1)

(b) Write down the greatest possible length of the line.

81.5 ....cm
(1)

(Total for question 2 is 2 marks)

3 The height of a building is measures as 11 metres, correct to the nearest metre.

(a) Write down the least possible height of the building.

10.5 ....m
(1)

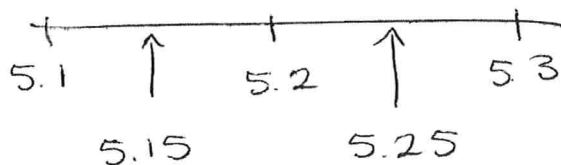(b) Write down the greatest possible height of the building.

11.5 ....m
(1)

(Total for question 3 is 2 marks)

4 A number y is rounded to 1 decimal place.

The result is 5.2

Write down the error interval for y.

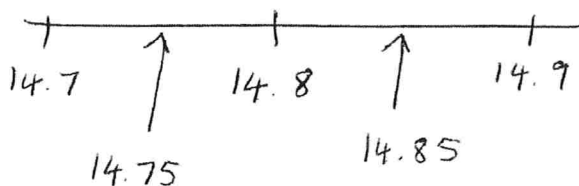5.1 5.2 5.3

5.15 5.25

$5.15 \leq y < 5.25$

(Total for question 4 is 2 marks)

5 A number y is rounded to 1 decimal place.

The result is 14.8

Write down the error interval for y.
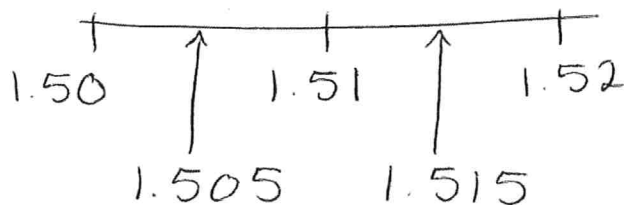
14.7 14.8 14.9

14.75 14.85

$14.75 \leq y < 14.85$

(Total for question 5 is 2 marks)

6 A number y is rounded to 2 decimal places.

The result is 1.51

Write down the error interval for y.
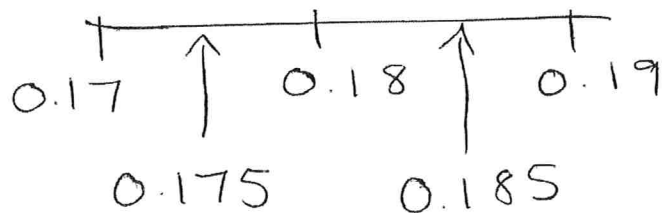
1.50 1.51 1.52

1.505 1.515

$1.505 \leq y < 1.515$

(Total for question 6 is 2 marks)

7 A number x is rounded to 2 decimal places.

The result is 0.18

Write down the error interval for x.
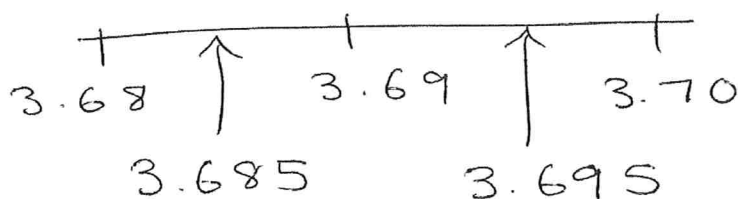
0.17   0.18   0.19

0.175   0.185

$0.175 \leq x < 0.185$

(Total for question 7 is 2 marks)

8 A number x is rounded to 3 significant figures.

The result is 3.69

Write down the error interval for x.
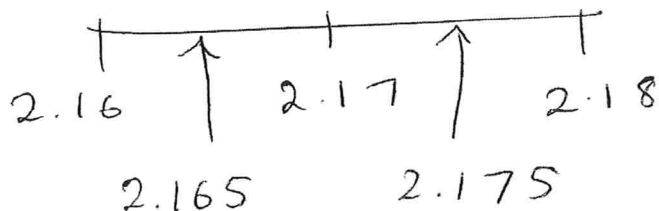
3.68   3.69   3.70

3.685   3.695

$3.685 \leq x < 3.695$

(Total for question 8 is 2 marks)

9 A number x is rounded to 3 significant figures.
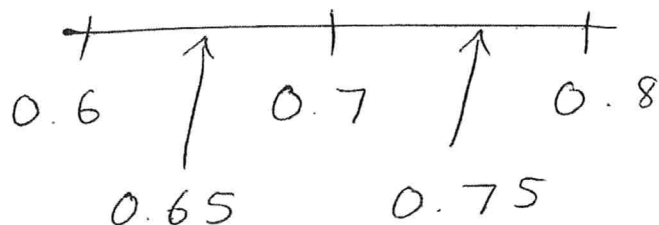
The result is 2.17

Write down the error interval for x.

2.16   2.17   2.18

2.165   2.175

$2.165 \leq x < 2.175$

(Total for question 9 is 2 marks)

10 A number y is rounded to 1 decimal place.

The result is 0.7

Write down the error interval for y.
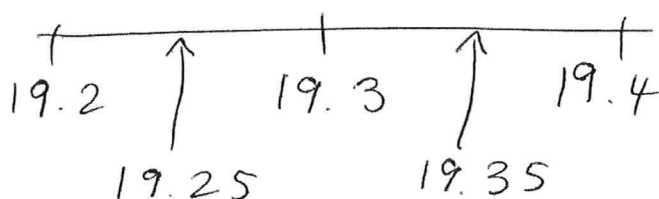
$$0.6 \qquad 0.7 \qquad 0.8$$
$$0.65 \qquad 0.75$$

$0.65 \leq y < 0.75$

(Total for question 10 is 2 marks)

11 A number y is rounded to 1 decimal place.

The result is 19.3

Write down the error interval for y.

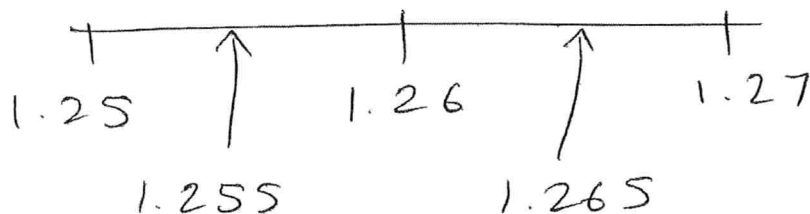$$19.2 \qquad 19.3 \qquad 19.4$$
$$19.25 \qquad 19.35$$

$19.25 \leq y < 19.35$

(Total for question 11 is 2 marks)

12 A number y is rounded to 2 decimal places.

The result is 1.26

Write down the error interval for y.

$$1.25 \qquad 1.26 \qquad 1.27$$
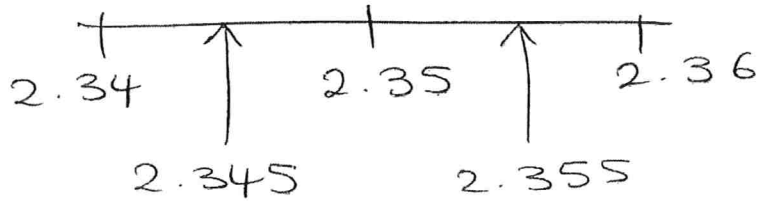$$1.255 \qquad 1.265$$

$1.255 \leq y < 1.265$

(Total for question 12 is 2 marks)

13 A number x is rounded to 2 decimal places.

The result is 2.35

Write down the error interval for x.

2.34   2.35   2.36

2.345   2.355

$2.345 \leqslant x < 2.355$

(Total for question 13 is 2 marks)

---

14 A number x is rounded to 3 decimal places.

The result is 8.124

Write down the error interval for x.

8.123   8.124   8.125

8.1235   8.1245

$8.1235 \leqslant x < 8.1245$

(Total for question 14 is 2 marks)

---

15 A number x is rounded to 3 significant figures.

The result is 5.67

Write down the error interval for x.

5.66   5.67   5.68

5.665   5.675

$5.665 \leqslant x < 5.675$

(Total for question 15 is 2 marks)

16 A number x is **truncated** to 1 decimal place.

The result is 6.2

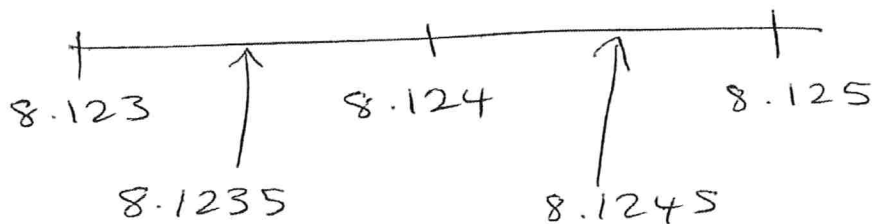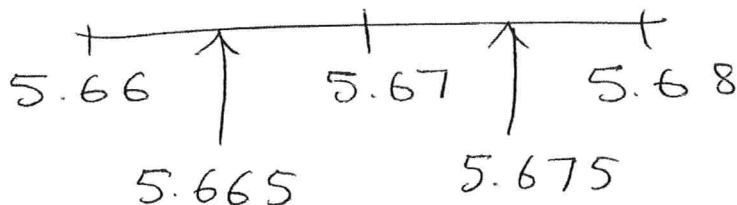Write down the error interval for x.

$$\overset{\longleftarrow\longrightarrow}{\underset{6.2 \qquad\qquad 6.3}{\vert\text{─────────}\vert}}$$

$$\underline{6.2} \leq x < \underline{6.3}$$

(Total for question 16 is 2 marks)

17 A number x is **truncated** to 2 decimal places.

The result is 9.58

Write down the error interval for x.

$$\overset{\longleftarrow\longrightarrow}{\underset{9.58 \qquad\qquad 9.59}{\vert\text{─────────}\vert}}$$

$$\underline{9.58} \leq x < \underline{9.59}$$

(Total for question 17 is 2 marks)

18 A number x is **truncated** to 2 decimal places.

The result is 3.57

Write down the error interval for x.

$$\overset{\longleftarrow\longrightarrow}{\underset{3.57 \qquad\qquad 3.58}{\vert\text{─────────}\vert}}$$

$$\underline{3.57} \leq x < \underline{3.58}$$

(Total for question 18 is 2 marks)

19 A number x is rounded to 2 significant figures.

The result is 210

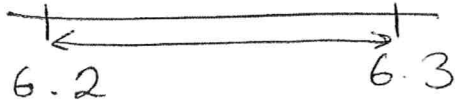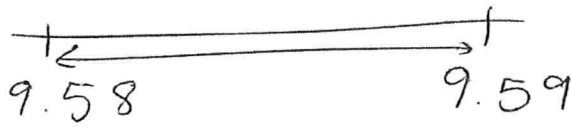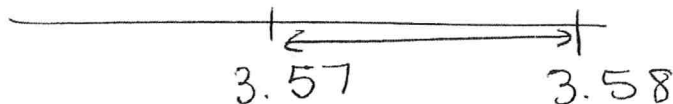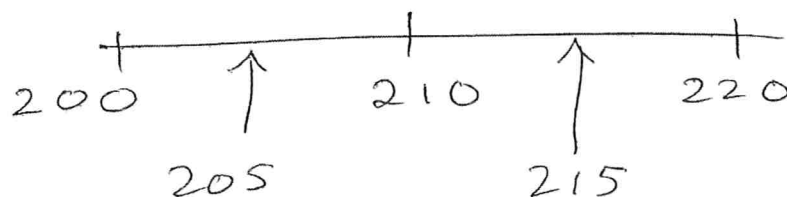Write down the error interval for x.

```
   +-----------+-----------+-----+
  200    ↑   210    ↑   220
        205         215
```

$$205 \leqslant x < 215$$

(Total for question 19 is 2 marks)

---

20 A number x is rounded to 3 significant figures.

The result is 0.458

Write down the error interval for x.

```
   +-----------+-----------+-----+
 0.457   ↑  0.458   ↑  0.459
      0.4575       0.4585
```

$$0.4575 \leqslant x < 0.4585$$

(Total for question 20 is 2 marks)

---

21 A number x is rounded to 1 significant figure.

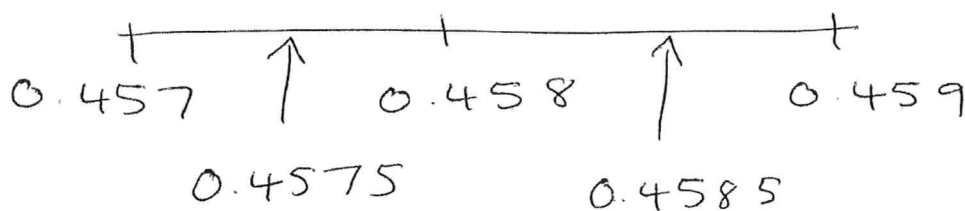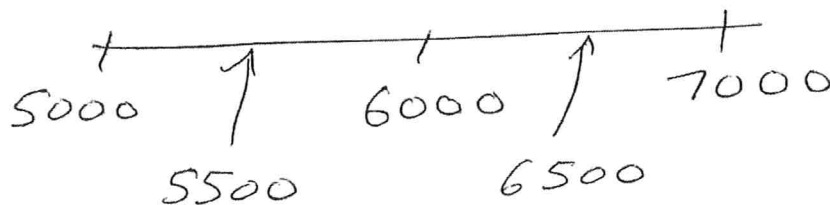The result is 6000

Write down the error interval for x.

```
   +-----------+-----------+-----+
 5000    ↑   6000   ↑   7000
       5500         6500
```

$$5500 \leqslant x < 6500$$

(Total for question 21 is 2 marks)

1 Find $\sqrt{1.69}$

.... 1.3 ....

(Total for question 1 is 1 mark)

2 Find 1.25^2

.... 1.5625 ....

(Total for question 2 is 1 mark)

3 Find $\sqrt{1.96 \times 2.25}$

.... 2.1 ....

(Total for question 3 is 1 mark)

4 Find $1.3^2 + 1.4^2$

.... 3.65 ....

(Total for question 4 is 1 mark)

5 Work out $(3.15 - 0.28)^2 - 4.076$

Write down all the figures on your calculator display.

.... 4.1609 ....

(Total for question 5 is 2 marks)

6 Work out $\dfrac{3.15 + 2.8^2}{2.06}$

Write down all the figures on your calculator display.

.... 5.334951456 ....

(Total for question 6 is 2 marks)

7 Work out $\dfrac{25.4 + 1.9^3}{6.5}$

Write down all the figures on your calculator display.

.... 4.962923077 ....

(Total for question 7 is 2 marks)

8 Use your calculator to work out $\dfrac{\sqrt{12.36 - 5.12}}{2.97^2}$

(a) Write down all the figures on your calculator display.

0.3050397136

(2)

(b) Write your answer to part (a) correct to 2 decimal places.

0.31

(1)

(Total for question 8 is 3 marks)

9 Work out $\sqrt{\dfrac{25.1 - 3.87}{5.23 + 2.04}}$

Write down all the figures on your calculator display.

1.708865145

(Total for question 9 is 2 marks)

10 (a) Find the value of $30.5^2 + 12.1^2$

1076.66

(1)

(b) Find the value of $\sqrt{5.13 + 10.28} - 0.97$

2.955557285

(2)

(Total for question 10 is 3 marks)

11 Work out $\sqrt{12^2 + 15^2 - 54\cos(80)}$

Write down all the figures on your calculator display.

18.96372849

(Total for question 11 is 2 marks)

12 Use your calculator to work out $\dfrac{\sin 25^\circ + \cos 40^\circ}{\cos 25^\circ - \sin 40^\circ}$

(a) Write down all the figures on your calculator display.

.........4.510708504.........
(2)

(b) Write your answer to part (a) correct to 2 decimal places.

...........4.51...........
(1)

(Total for question 12 is 3 marks)

13 Use your calculator to work out $\sqrt{\dfrac{\tan 80^\circ + 1}{\tan 80^\circ - 1}}$

(a) Write down all the figures on your calculator display.

.........1.195051466.........
(2)

(b) Write your answer to part (a) correct to 3 significant figures.

...........1.20...........
(1)

(Total for question 13 is 3 marks)

14 Use your calculator to work out $\dfrac{12.74 + \sqrt{9.5}}{6.04 \times 4.1}$

(a) Write down all the figures on your calculator display.

.........0.638919681 9.........
(2)

(b) Write your answer to part (a) correct to 2 significant figures.

...........0.64...........
(1)

(Total for question 14 is 3 marks)

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

$7x - 2x$

$5x$

(Total for question 1 is 1 mark)

2 Simplify $3m + 3m$

$6m$

(Total for question 2 is 1 mark)

3 Simplify $n + n + n$

$3n$

(Total for question 3 is 1 mark)

4 (a) Simplify $a \times b \times c$

abc

(1)

(b) Simplify $5p - 2p$

$3p$

(1)

(c) Simplify $\dfrac{6h}{3}$

$2h$

(1)

(Total for question 4 is 3 marks)

5   Simplify $k + k + 8$

$$2k + 8$$

(Total for question 5 is 1 mark)

6   (a) Simplify $4 \times 3x$

$$12x$$

(1)

       (b) Simplify $7a - 3a + 6a$

$$4a + 6a$$

$$10a$$

(1)

(Total for question 6 is 2 marks)

7   Simplify $8g + 6h - 3g + h$

$$5g + 7h$$

(Total for question 7 is 2 marks)

8   (a) Simplify $3 \times b \times 9$

$$27b$$

(1)

       (b) Simplify $2x - 3y - 6x - 4y$

$$-4x - 7y$$

(2)

(Total for question 8 is 3 marks)

9   Simplify $8c + 3d - c + 2d$

$$7c + 5d$$

(Total for question 9 is 2 marks)

---

10   (a) Simplify $f+f+f+f+f$

$$5f$$
(1)

(b) Simplify $5a + 3b + 2a + 2b$

$$7a + 5b$$
(2)

(Total for question 10 is 3 marks)

---

11   (a) Simplify $2a \times 3b$

$$6ab$$
(1)

(b) Simplify $2p \times 2p$

$$4p^2$$
(1)

(c) Simplify $\dfrac{7x + 5x}{4}$

$$\dfrac{12x}{4}$$

$$3x$$
(1)

(Total for question 11 is 3 marks)

12 Simplify $11c - 8d + 5c - d$

$16c - 9d$

(Total for question 12 is 2 marks)

13 (a) Simplify $3a \times 4b$

$12ab$

(1)

(b) Simplify $3x + 2y + 6x - y$

$9x + y$

(2)

(Total for question 13 is 3 marks)

14 (a) Simplify $a \times b \times 3$

$3ab$

(1)

(b) Simplify $y \times y \times y$

y^3

(1)

(c) Simplify $\dfrac{10d}{d}$

10

(1)

(Total for question 14 is 3 marks)

15 (a) Simplify $a \times 2 \times 5$

$\underline{10a}$

(1)

(b) Simplify $b \times b$

$\underline{b^2}$

(1)

(c) Simplify $\dfrac{2y + 6y}{2}$

$\dfrac{8y}{2}$

$\underline{4y}$

(1)

(Total for question 15 is 3 marks)

16 (a) Simplify $2t \times 7s$

$\underline{14st}$

(1)

(b) Simplify $7a + 4b - 3a - 5b$

$\underline{4a - b}$

(2)

(Total for question 16 is 3 marks)

17 (a) Simplify $6f - f$

$\underline{5f}$

(1)

(b) Simplify $7x^2 - 3x + 3x^2 + 6x$

$\underline{10x^2 + 3x}$

(2)

(Total for question 17 is 3 marks)

18 Simplify $2 \times n \times 6 \times m$

$12mn$

$12mn$ ....

(Total for question 18 is 1 mark)

19 (a) Simplify $6j \times 5k$

$30jk$ ....

(1)

(b) Simplify $7a - 6b + 5a + 4b$

$12a - 2b$ ....

(2)

(Total for question 19 is 3 marks)

20 (a) Simplify $4n - 3n + 5n$

$n + 5n$

$6n$ ....

(1)

(b) Simplify $p^2 + p^2 + p^2$

$3p^2$ ....

(1)

(c) Simplify $5 + 2a + 7b - 6a + b$

$5 - 4a + 8b$ ....

(2)

(Total for question 20 is 4 marks)

21 (a) Simplify $a^2 + a^2 + a^2$

$$\underline{3a^2}$$
(1)

(b) Simplify $2rs - 5rs + 4rs$

$$-3rs + 4rs$$

$$\underline{rs}$$
(1)

(c) Simplify $4a + 2 - 7a + a - 6$

$$\underline{-2a - 4}$$
(2)

(Total for question 21 is 4 marks)

22 (a) Simplify $n + n + n - n$

$$3n - n$$

$$\underline{2n}$$
(1)

(b) Simplify $3xy + 2xy - xy$

$$5xy - xy$$

$$\underline{4xy}$$
(1)

(c) Simplify $4a + 3b - a + 3b + 6$

$$\underline{3a + 6b + 6}$$
(2)

(Total for question 22 is 4 marks)

1 (a) Expand $7(2x + 7)$

$$14x + 49$$
(1)

(b) Factorise $3y + 12$

$$3(y + 4)$$
(1)

(Total for Question 1 is 2 marks)

2 (a) Expand $5a(a - 6)$

$$5a^2 - 30a$$
(2)

(b) Solve $4(b + 2) = 24$

$$4b + 8 = 24$$
$$4b = 16$$
$$b = 4$$

$b =$ 4
(2)

(Total for Question 2 is 4 marks)

3 (a) Factorise fully $12m + 8m^2$

$$4m(3 + 2m)$$
(2)

(b) Solve $3(n - 5) = 27$

$$3n - 15 = 27$$
$$3n = 42$$
$$n = 14$$

$n =$ 14
(2)

(Total for Question 3 is 4 marks)

4   (a) Expand $8(3s - 2)$

$$24s - 16$$
(1)

(b) Factorise $4t + 20$

$$4(t + 5)$$
(1)

(Total for Question 4 is 2 marks)

5   (a) Factorise fully $5a^2b + 15ab^2$

$$5ab(a + 3b)$$
(2)

(b) Solve $6(c - 8) = 42$

$$6c - 48 = 42$$
$$6c = 90$$
$$c = 15$$

$c =$ 15
(2)

(Total for Question 5 is 4 marks)

6   (a) Factorise $18x + 24$

$$6(3x + 4)$$
(1)

(b) Expand $3(2y - 4)$

$$6y - 12$$
(1)

(Total for Question 6 is 2 marks)

7   (a) Expand $p(p-3)$

$$p^2 - 3p$$

(1)

(b) Factorise $16q + 8$

$$8(2q + 1)$$

(1)

(Total for Question 7 is 2 marks)

8   (a) Factorise fully $6x^2 - 4xy$

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

(2)

(b) Solve $2(w-4) = 13$

$$2w - 8 = 13$$
$$2w = 21$$
$$w = \frac{21}{2}$$

$w = \dfrac{21}{2}$ or 10.5

(2)

(Total for Question 8 is 4 marks)

9   (a) Factorise $x^2 - 9x$

$$x(x - 9)$$

(1)

(b) Expand $6(5y + 1)$

$$30y + 6$$

(1)

(Total for Question 9 is 2 marks)

10 (a) Expand $3(5x - 8)$

$$\underline{15x - 24}$$
(1)

(b) Factorise $18y + 15$

$$\underline{3(6y + 5)}$$
(1)

(Total for Question 10 is 2 marks)

11 (a) Expand $7(2h - 3)$

$$\underline{14h - 21}$$
(1)

(b) Expand and Simplify $4(g + 5) + 3(g - 2)$

$$4g + 20 + 3g - 6$$

$$\underline{7g + 14}$$
(2)

(Total for Question 11 is 3 marks)

12 (a) Factorise fully $7xy + 21x$

$$\underline{7x(y + 3)}$$
(2)

(b) Solve $6(p + 3) = 42$

$$6p + 18 = 42$$
$$6p = 24$$
$$p = 4$$

$$p = \underline{4}$$
(2)

(Total for Question 12 is 4 marks)

13 (a) Expand $a(a + b)$

$$\underline{a^2 + ab}$$
(1)

(b) Factorise $15y - 6$

$$\underline{3(5y - 2)}$$
(1)

(Total for Question 13 is 2 marks)

14 (a) Expand $9x(3y - 8)$

$$\underline{27xy - 72x}$$
(2)

(b) Expand and Simplify $7(t - 4) + 5(t - 2)$

$$\cancel{7t - 28 + 5t - 10}$$

$$7t - 28 + 5t - 10$$

$$\underline{12t - 38}$$
(2)

(Total for Question 14 is 4 marks)

15 (a) Factorise fully $30x^3 + 12x$

$$\underline{6x(5x^2 + 2)}$$
(2)

(b) Solve $5(f - 2) = 22$

$$5f - 10 = 22$$
$$5f = 32$$
$$f = \frac{32}{5}$$

$$f = \underline{\frac{32}{5}} \text{ OR } 6.4$$
(2)

(Total for Question 15 is 4 marks)

16   (a) Expand $x(8x + 1)$

$$8x^2 + x$$
(1)

(b) Factorise $18 + 63y$

$$9(2 + 7y)$$
(1)

(Total for Question 16 is 2 marks)

17   (a) Expand $2x^2(4x - 9)$

$$8x^3 - 18x^2$$
(2)

(b) Expand and Simplify $6(y + 3) - 5(y - 4)$

$$6y + 18 - 5y + 20$$

$$y + 38$$
(2)

(Total for Question 17 is 4 marks)

18   (a) Factorise fully $30a^2 + 40ab$

$$10a(3a + 4b)$$
(2)

(b) Solve $3(g + 9) = 21$

$$3g + 27 = 21$$
$$3g = -6$$
$$g = -2$$

$g =$ -2
(2)

(Total for Question 18 is 4 marks)

19 (a) Expand $n(5n + 1)$

$\underline{5n^2 + n}$
(1)

(b) Factorise $18m + mn$

$\underline{m(18 + n)}$
(1)

(Total for Question 19 is 2 marks)

20 (a) Expand $3x(7x^2 - y)$

$\underline{21x^3 - 3xy}$
(2)

(b) Expand and Simplify $3(6y + 5) - 2(4y - 1)$

$18y + 15 - 8y + 2$

$\underline{10y + 17}$
(2)

(Total for Question 20 is 4 marks)

21 (a) Factorise fully $18a^2bc + 30abc^2$

$\underline{6abc(3a + 5c)}$
(2)

(b) Expand and Simplify $4(2y - 7) - 3(5y - 3)$

$8y - 28 - 15y + 9$

$\underline{-7y - 19}$
(2)

(Total for Question 21 is 4 marks)

1 Expand and simplify $(x + 7)(x - 3)$

$$x^2 - 3x + 7x - 21$$

$$\underline{x^2 + 4x - 21}$$

(Total for Question 1 is 2 marks)

2 (a) Expand and simplify $(2p - 3)(p - 5)$

$$2p^2 - 10p - 3p + 15$$

$$\underline{2p^2 - 13p + 15}$$

(2)

(b) Factorise $a^2 + 15a + 36$

36

1   36
2   18
3   12
4   9
6   6

$$(a + 3)(a + 12)$$

$$\underline{(a + 3)(a + 12)}$$

(2)

(Total for Question 2 is 4 marks)

3 (a) Expand and simplify $(x + 3)(x - 3)$

$$x^2 - 3x + 3x - 9$$

$$\underline{x^2 - 9}$$

(2)

(b) Factorise $x^2 - 8x + 7$

7

1   7

$$\underline{(x - 1)(x - 7)}$$

(2)

(Total for Question 3 is 4 marks)

4   Expand and simplify $(m + 3)(m + 4)$

$$m^2 + 4m + 3m + 12$$

$$\underline{m^2 + 7m + 12}$$

(Total for Question 4 is 2 marks)

5   (a) Expand and simplify $(2x + 3)(3x - 1)$

$$6x^2 - 2x + 9x - 3$$

$$\underline{6x^2 + 7x - 3}$$
(2)

(b) Factorise $x^2 + 10x + 25$

25
1   25
5   5

$$\underline{(x + 5)(x + 5)}$$
(1)

(Total for Question 5 is 3 marks)

6   (a) Expand and simplify $(4y + 3)(2y - 3)$

$$8y^2 - 12y + 6y - 9$$

$$\underline{8y^2 - 6y - 9}$$
(2)

(b) Factorise $x^2 + 7x + 6$

6
1   6
2   3

$$\underline{(x + 1)(x + 6)}$$
(2)

(Total for Question 6 is 4 marks)

7 Expand and simplify $(x-2)(x-9)$

$$x^2 - 9x - 2x + 18$$

$$x^2 - 11x + 18$$

(Total for Question 7 is 2 marks)

8 (a) Expand and simplify $(5h+2)(h+4)$

$$5h^2 + 20h + 2h + 8$$

$$5h^2 + 22h + 8$$

(2)

(b) Factorise $x^2 - 49$

$$(x+7)(x-7)$$

(1)

(Total for Question 8 is 3 marks)

9 (a) Expand and simplify $(3x-5)(2x-3)$

$$6x^2 - 9x - 10x + 15$$

$$6x^2 - 19x + 15$$

(2)

(b) Factorise $n^2 - 3n - 18$

$$
\begin{array}{cc}
 & 18 \\
1 & 18 \\
2 & 9 \\
3 & 6 \\
\end{array}
$$

$$(n+3)(n-6)$$

(2)

(Total for Question 9 is 4 marks)

10 Expand and simplify $(x + 6)(3x + 8)$

$$3x^2 + 8x + 18x + 48$$

$$3x^2 + 26x + 48$$

(Total for Question 10 is 2 marks)

11 (a) Expand and simplify $(x - 6)(x - 7)$

$$x^2 - 7x - 6x + 42$$

$$x^2 - 13x + 42$$

(2)

(b) Factorise $x^2 - 16$

$$(x + 4)(x - 4)$$

(1)

(Total for Question 11 is 3 marks)

12 (a) Expand and simplify $(2x + 1)(5x - 9)$

$$10x^2 - 18x + 5x - 9$$

$$10x^2 - 13x - 9$$

(2)

(b) Factorise $x^2 - 13x + 36$

$$36$$

$$\begin{array}{cc} 1 & 36 \\ 2 & 18 \\ 3 & 12 \\ 4 & 9 \\ 6 & 6 \end{array}$$

$$(x - 4)(x - 9)$$

(2)

(Total for Question 12 is 4 marks)

13 Expand and simplify $(a-7)^2$

$(a-7)(a-7)$

$a^2 - 7a - 7a + 49$

$a^2 - 14a + 49$

(Total for Question 13 is 2 marks)

14 (a) Expand and simplify $(2x-1)(x+4)$

$2x^2 + 8x - x - 4$

$2x^2 + 7x - 4$

(2)

(b) Factorise $x^2 - 100$

$(x+10)(x-10)$

(1)

(Total for Question 14 is 3 marks)

15 (a) Expand and simplify $(3d-2)(d+7)$

$3d^2 + 21d - 2d - 14$

$3d^2 + 19d - 14$

(2)

(b) Factorise $x^2 - 3x - 40$

40

1   40
2   20
4   10
5   8

$(x+5)(x-8)$

(2)

(Total for Question 15 is 4 marks)

16 Factorise $n^2 + 3n - 28$

```
  2  8
1    28
2    14
4    7
```

$(n + 7)(n - 4)$

(Total for Question 16 is 2 marks)

17 (a) Expand and simplify $(a - 5)(a + 6)$

$$a^2 + 6a - 5a - 30$$

$a^2 + a - 30$

(2)

(b) Factorise $b^2 - 81$

$(b + 9)(b - 9)$

(1)

(Total for Question 17 is 3 marks)

18 (a) Expand and simplify $(2x + 5)(x + 9)$

$$2x^2 + 18x + 5x + 45$$

$$2x^2 + 23x + 45$$

$2x^2 + 23x + 45$

(2)

(b) Factorise $y^2 - 7y + 12$

```
  1  2
1    12
2    6
3    4
```

$(y - 3)(y - 4)$

(2)

(Total for Question 18 is 4 marks)

19 Factorise $m^2 - m - 30$

```
    30
1   30
2   15
3   10
5    6
```

$(m + 5)(m - 6)$

(Total for Question 19 is 2 marks)

20 (a) Expand and simplify $(5a - 1)(2a - 7)$

$10a^2 - 35a - 2a + 7$

$10a^2 - 37a + 7$

(2)

(b) Factorise $b^2 - 144$

$(b + 12)(b - 12)$

(1)

(Total for Question 20 is 3 marks)

21 (a) Expand and simplify $(7x + 1)(x + 5)$

$7x^2 + 35x + x + 5$

$7x^2 + 36x + 5$

(2)

(b) Factorise $y^2 + 13y + 30$

```
1   30
2   15
3   10
5    6
```

$(y + 3)(y + 10)$

(2)

(Total for Question 21 is 4 marks)

1 (a) Simplify $x^8 \times x^3$

x^{11}

(1)

(b) Simplify $(5y)^3$

$5y \times 5y \times 5y$

$125y^3$

(1)

(c) Simplify $\dfrac{w^7}{w^4}$

w^3

(1)

(Total for question 1 is 3 marks)

2 (a) Simplify $a^9 \times a^4$

a^{13}

(1)

(b) Simplify $(4b^2c)^3$

$4b^2c \times 4b^2c \times 4b^2c$

$64b^6c^3$

(2)

(c) Simplify $d^9 \div d^4$

d^5

(1)

(Total for question 2 is 4 marks)

3 (a) Simplify $2m^2 \times 5n^6$

$10m^2n^6$

(1)

(b) Simplify $15p^3 \div 3p^4$

$5p^{-1}$

(2)

(Total for question 3 is 3 marks)

4 (a) Simplify $(t^3)^4$

t^{12}

(1)

(b) Simplify $12m^2n^6 \div 3mn^4$

$4mn^2$

(2)

(Total for question 4 is 3 marks)

5 Simplify $5m^2n^3 \times 3mn^4$

$15m^3n^7$

(Total for question 5 is 2 marks)

6 (a) Write down the value of 5^{-3}

$\dfrac{1}{125}$

(1)

(b) Write down the value of 5^0

1

(1)

(Total for question 6 is 2 marks)

7 Work out the value of $5^2 \times 2^3$

25×8

200

(Total for question 7 is 1 mark)

8 Write down the value of 2^{-3}

$$\frac{1}{8}$$

9 $y^2 \times y^a = y^7$

(a) Find the value of a.

5

(1)

$(y^4)^b = y^{12}$

(b) Find the value of b.

3

(1)

10 (a) Given $\dfrac{x^6}{x^a} = x^8$

Find the value of a.

$a = -2$

(1)

(b) Simplify $(2m^2)^4$

$16m^8$

(2)

11 (a) Write $\dfrac{3^4 \times 3^5}{3^2}$ as a power of 3

$$\dfrac{3^9}{3^2} = 3^7$$

........3^7........

(2)

(b) Write down the value of 3^{-3}

$$\dfrac{1}{27}$$

(1)

(c) Write down the value of 3^0

$$1$$

(1)

(Total for question 11 is 4 marks)

12 Work out the value of $\dfrac{2^9 \times 2^{-2}}{2^4}$

$$\dfrac{2^7}{2^4} = 2^3 = 8$$

........2^3 8

(Total for question 12 is 2 marks)

13 Work out the value of $(2^2)^3$

$$4^3 = 64$$

........64........

(Total for question 13 is 1 mark)

14 (a) Simplify $p^3 \times p^5$

p^8

(1)

(b) Simplify $(4ab^2)^3$

$64a^3b^6$

(2)

(c) Simplify $\dfrac{16m^7n^3}{4m^3n}$

$4m^4n^2$

(2)

(Total for question 14 is 5 marks)

15 $1000^4 = 10^x$

Find the value of x.

$$(10^3)^4 = 10^x$$

$$10^{12} = 10^x$$

12

(Total for question 15 is 1 mark)

16 Work out the value of $\dfrac{2^3 \times 2}{2^5}$

$$\frac{2^4}{2^5} = 2^{-1} = \frac{1}{2}$$

$\dfrac{1}{2}$

(Total for question 16 is 2 marks)

17 Write down the reciprocal of 8

$\dfrac{1}{8}$

(Total for question 17 is 1 mark)

18 (a) Simplify $9p^3 \times 2p^{-2}$

.... $18p$ ....
(1)

(b) Simplify $(5x^3y^2)^3$

.... $125x^9y^6$ ....
(2)

(c) $p^3 \times p^5 = p^{12} \times p^y$

Find the value of y

$$p^8 = p^{12} \times p^y$$

.... -4 ....
(2)

(Total for question 18 is 5 marks)

19 $10^x = 1$

Write down the value of x.

.... 0 ....

(Total for question 19 is 1 mark)

20 Write $5^4 \times 5$ as a power of 5

.... 5^5 ....

(Total for question 20 is 1 mark)

21 Write down the reciprocal of 2

.... $\frac{1}{2}$ ....

(Total for question 21 is 1 mark)

22 (a) Simplify $5c^2d^3 \times 2d$

$$10c^2d^4$$

(1)

(b) Write 64×4^5 as a power of 4

$$4^3 \times 4^5 = 4^8$$

$$4^8$$

(2)

(c) Simplify $p^3 \times (p^5)^2$

$$p^3 \times p^{10}$$

$$p^{13}$$

(2)

(Total for question 22 is 5 marks)

---

23 $p^9 \times p^5 = p^x$

Write down the value of x

$$14$$

(Total for question 23 is 1 mark)

---

24 Write down the reciprocal of $\dfrac{1}{3}$

$$3$$

(Total for question 24 is 1 mark)

---

25 Simplify $\dfrac{10p^3q^5r}{4p^3q^6}$

$$\frac{\cancel{10}^5 \cancel{p^3} \cancel{q^5} r}{2 \cancel{4} \cancel{p^3} \cancel{q^6}} \qquad \frac{5r}{2q}$$

$$\frac{5r}{2q}$$

(Total for question 25 is 2 marks)

OR $2.5rq^{-1}$

1   The lengths, in cm, of the sides of a triangle are $3x - 5$, $2x - 1$ and $x + 1$
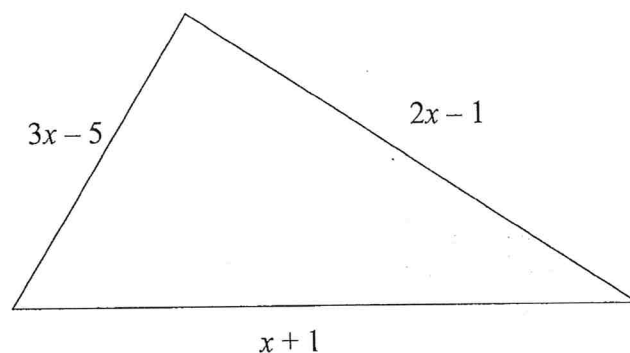
(a) Write down an expression, in terms of x, for the perimeter of the triangle.

$$3x - 5 + 2x - 1 + x + 1$$

_____$6x - 5$_____ cm

(2)

The perimeter of the triangle is 31 cm.

(b) Work out the value of x.

$$6x - 5 = 31$$
$$6x = 36$$
$$x = 6$$

_____6_____ $[cm]$

(2)

(Total for question 1 is 4 marks)

2 A rectangle has a length of $(2x + 3)$ cm and a width of $(x + 5)$ cm.

$x + 5$

$2x + 3$
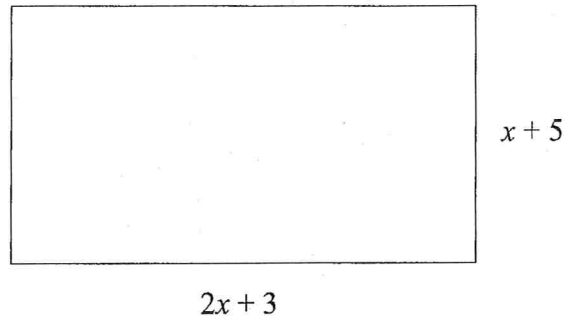
(a) Find an expression for the perimeter of the rectangle.

$$2(2x + 3) + 2(x + 5)$$
$$4x + 6 + 2x + 10$$
$$6x + 16$$

$\underline{6x + 16}$ cm

(2)

(b) Given the rectangle has a perimeter of 43 cm find the value of x.

$$6x + 16 = 43$$
$$6x = 27$$
$$x = \frac{27}{6} = \frac{9}{2} = 4.5$$

$\underline{4.5}$ [cm]

(2)

(Total for question 2 is 4 marks)

$\left(\text{or } \dfrac{9}{2} \right)$

3
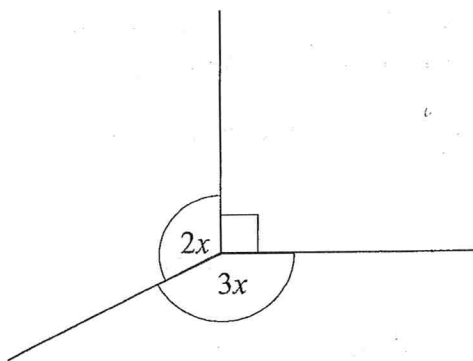
Find the value of x.

$$2x + 3x + 90 = 360$$
$$5x + 90 = 360$$
$$5x = 270$$
$$x = 54$$

_____ $54°$ _____

(Total for question 3 is 3 marks)

4   The diagram shows a right angled triangle.
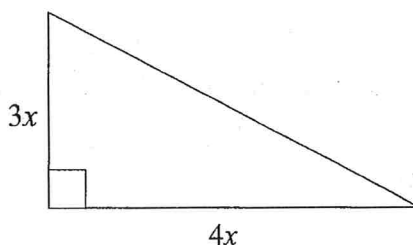
The area of the triangle is 294 cm²

Work out the value of x.

$$\frac{1}{2} \times 4x \times 3x = 294$$
$$\frac{1}{2} \times 12x^2 = 294$$
$$6x^2 = 294$$
$$x^2 = \frac{294}{6} = \frac{147}{3} = 49$$
$$x = \sqrt{49}$$
$$= 7$$

_____ 7 _____ [cm]

(Total for question 4 is 3 marks)

5 The sizes of the angles, in degrees, of a triangle are $2x + 9$, $x + 13$ and $x - 8$
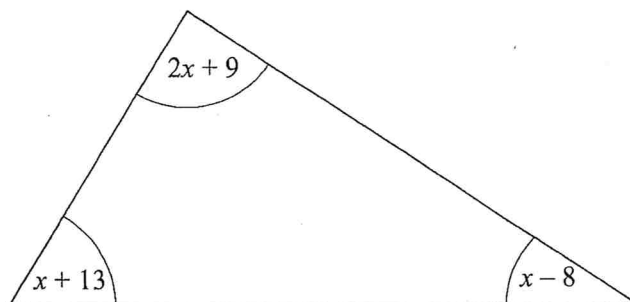
Work out the value of x.

$$2x + 9 + x - 8 + x + 13 = 180$$
$$4x + 14 = 180$$
$$4x = 166$$
$$x = \frac{166}{4} = \frac{83}{2} = 41.5$$

41.5 or $\frac{83}{2}$

(Total for question 5 is 3 marks)

---

6 The diagram shows a rectangle.
All measurements are in centimetres.

19
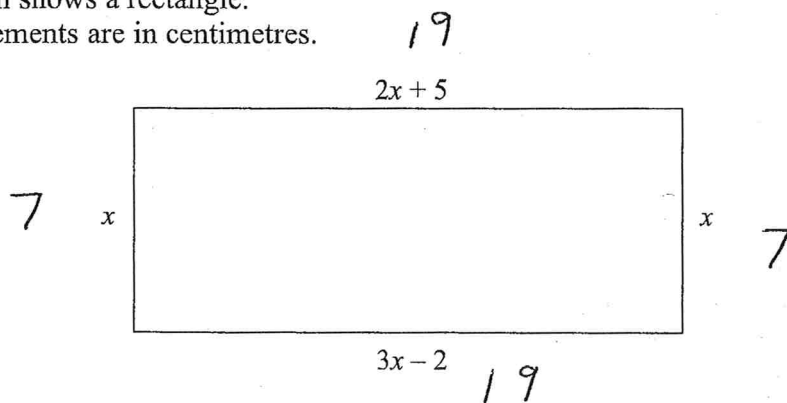
Find the perimeter of the rectangle.

$$2x + 5 = 3x - 2$$
$$5 = x - 2$$
$$\underline{7 = x}$$

$$2(7) + 5 = 19$$

$$2(19) + 2(7)$$
$$38 + 14$$

52 cm

(Total for question 6 is 3 marks)

7 The diagram shows a rectangle and a triangle.

$x-5$

$2x+7$

$2x+11$

x

$2x$
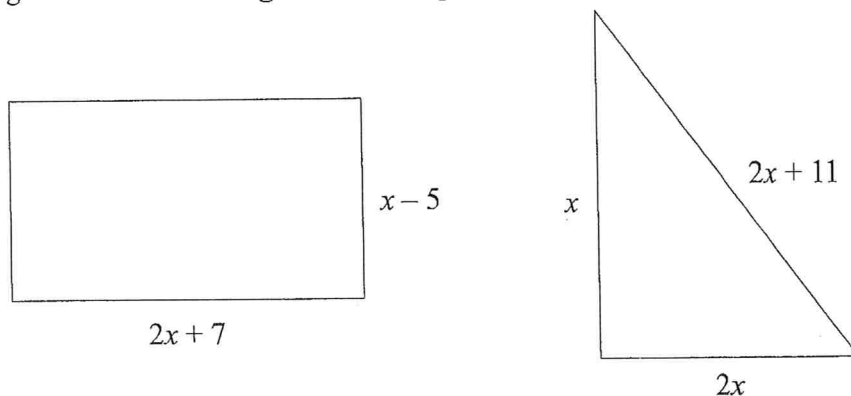
The perimeter of the rectangle is equal to the perimeter of the triangle.

Find the value of x.

$2(x-5) + 2(2x+7) = x + 2x + 2x + 11$

$2x - 10 + 4x + 14 = 5x + 11$

$6x + 4 = 5x + 11$

$x + 4 = 11$

$x = 7$

.... **7**

(Total for question 7 is 3 marks)

8

A ——— $3x+5$ ——— B

5

D ——— $5x-9$ ——— C
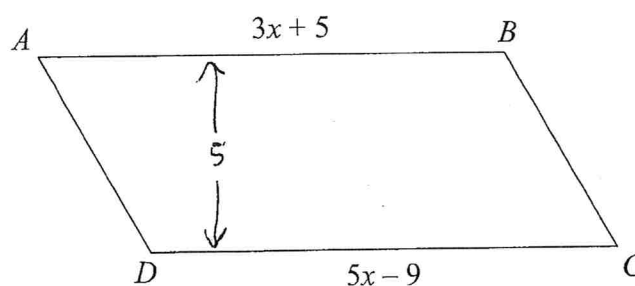
ABCD is a parallelogram
All measurements are in centimetres.
The perpendicular height of the parallelogram is 5 cm.

Find the area of *ABCD*

$3x + 5 = 5x - 9$

$5 = 2x - 9$

$14 = 2x$

$x = 7$

$3(7) + 5 = 26$

26×5

.... $130 \ cm^2$

(Total for question 8 is 4 marks)

9 The diagram shows a right-angled triangle.
All of the angles are in degrees.
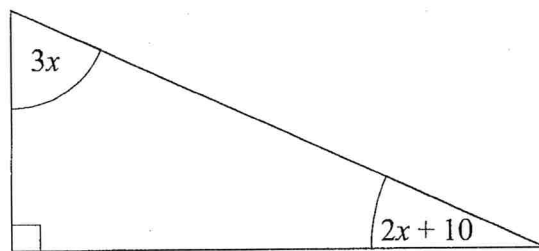
Find the value of size of the smallest angle in the triangle.

$$3x + 2x + 10 + 90 = 180$$
$$5x + 100 = 180$$
$$5x = 80$$
$$x = 16$$

$$3(16) = 48 \qquad 2(16) + 10 = 42$$

_____42_____ °

(Total for question 9 is 3 marks)

10 Adam has some marbles.
Bradley has twice as many marbles are Adam.
Chris has 5 more marbles than Bradley.

In total they have 55 marbles.

How many marbles does Chris have?

$$Adam = x$$
$$Bradley = 2x$$
$$Chris = 2x + 5$$

$$x + 2x + 2x + 5 = 55$$
$$5x + 5 = 55$$
$$5x = 50$$
$$x = 10$$
$$2(10) + 5 = 25$$

_____25_____

(Total for question 10 is 3 marks)

11   The size of the largest angle in a triangle is three times the size of the smallest angle.
The other angle is 35° more than the smallest angle.

$3x$ x

$x + 35$

Work out, in degrees, the size of each angle in the triangle.
You must show your working.

$$3x + x + x + 35 = 180$$

$$5x + 35 = 180$$

$$5x = 145$$

$$x = 29$$

$$29 + 35 = 64$$

$$3(29) = 87$$

___29___ °, ___64___ °, ___87___ °

(Total for question 11 is 5 marks)

12   Lucy is three times as old as Alex.

$3x$ x

Lucy is 7 years older than Megan.
The sum of their ages is 126.

Find the ratio of Alex's age to Lucy's age to Megan's age.

$$Alex = x$$

$$Lucy = 3x$$

$$Megan = 3x - 7$$

$$x + 3x + 3x - 7 = 126$$

$$7x - 7 = 126$$

$$7x = 133$$

$$x = \underline{19}$$

$$3(19) = \underline{57}$$

$$57 - 7 = \underline{50}$$

___19 : 57 : 50___

(Total for question 12 is 4 marks)

1 Write down the equation of a line parallel to $y = 3x + 2$

$$\boxed{y = 3x + \text{Anything}}$$
$$y = 3x + 1$$

(Total for question 1 is 1 mark)

2 Write down the equation of the line parallel to $y = \dfrac{1}{2}x + 5$ which passes through $(0,2)$

$$y = \dfrac{1}{2}x + 2$$

(Total for question 2 is 2 marks)

3 Write down the equation of the line parallel to $y = -x + 1$ which passes through $(0,-4)$

$$y = -x - 4$$

(Total for question 3 is 2 marks)

1. Solve $x^2 + 4x + 3 > 0$

$$(x+3)(x+1) > 0$$

Crosses y axis at: $x = -3$ $x = -1$
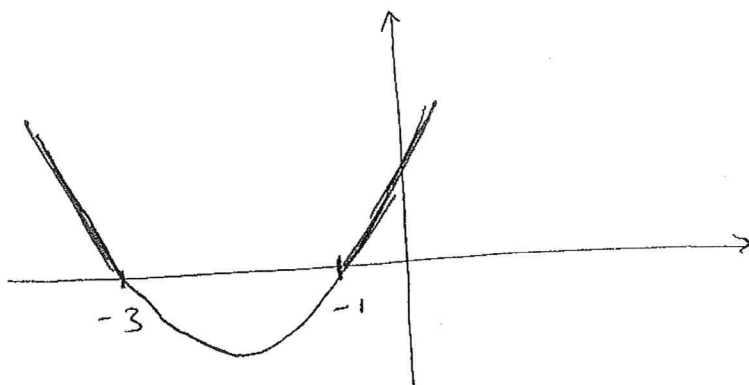
Bigger than zero
Above Ground

$x < -3$ or $x > -1$ (3)

---

2. Solve $x^2 - x - 20 < 0$

$$(x+4)(x-5) < 0$$

Crosses y at: $x = -4$ $x = 5$
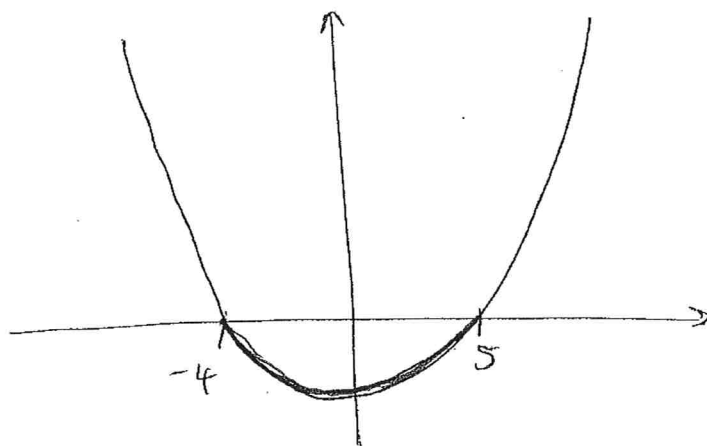
Less than zero
below ground

$-4 < x < 5$ (3)

3. Solve $x^2 - 5x - 24 > 0$

$(x - 8)(x + 3) > 0$

$x = 8 \qquad x = -3$
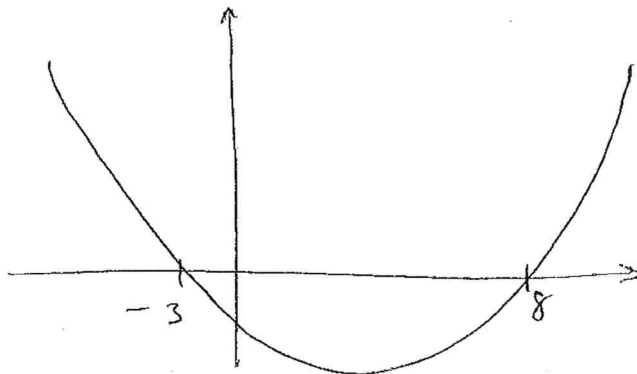
$x < -3$ or $x > 8$ (3)

---

4. Solve $x^2 - 12x + 35 < 0$

$(x - 7)(x - 5) < 0$

$x = 7 \qquad x = 5$

$5 < x < 7$ (3)

5. Solve $x^2 - 7x + 12 \leqslant 0$

$$(x-3)(x-4) \leqslant 0$$

$$x = 3 \qquad x = 4$$

$$\underline{3 \leqslant x \leqslant 4} \quad (3)$$

---

6. Solve $x^2 + 2x - 35 \geqslant 0$

$$(x+7)(x-5) \geqslant 0$$

$$x = -7 \qquad x = 5$$

$$\underline{x \leqslant -7 \text{ or } x \geqslant 5} \quad (3)$$

7. Solve $x^2 \leqslant 100$

$$x^2 - 100 \leqslant 0$$

$$(x+10)(x-10) \leqslant 0$$

$$x = -10 \qquad x = 10$$

$-10 \leqslant x \leqslant 10$ (4)

---

8. Solve $x^2 - 49 > 0$

$$(x+7)(x-7) > 0$$

$$x = -7 \qquad x = 7$$

$x < -7$ or $x > 7$ (4)

9. Solve $x^2 > 8x + 9$

$x^2 - 8x - 9 > 0$

$(x - 9)(x + 1) > 0$

$x = 9 \qquad x = -1$

$x \leq -1 \text{ or } x \geq 9$ (4)

---

10. Solve $6x^2 + 11x - 10 < 0$

$(3x - 2)(2x + 5) < 0$

$x = 2/3 \qquad x = -2.5$

$-2.5 < x < 2/3$

$\cancel{2/3 < x}$ .... (4)

11. Solve $6x + 27 > x^2$

$$0 > x^2 - 6x - 27$$
$$0 > (x - 9)(x + 3)$$
$$x = 9 \qquad x = -3$$

$\underset{\cdots\cdots\cdots\cdots\cdots}{-3 < x < 9}$ (4)

12. Solve $2x^2 - 11x + 9 < 0$

$$(2x - 9)(x - 1) < 0$$
$$x = 4.5 \qquad x = 1$$

$\underset{\cdots\cdots\cdots\cdots\cdots}{1 < x < 4.5}$ (4)

13. Work out the integer values that satisfy:

$$2x^2 - 10x + 10 < 0$$

$$x^2 - 5x + 5 < 0$$

$$a = 1 \qquad b = -5 \qquad c = 5$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(5)}}{2(1)}$$

$$x = 3.62 \ 2dp \qquad x = 1.38 \ (2dp)$$

..2..and..3.. (4)

14. Work out the integer values that satisfy:

$$x^2 - 7x + 11 < 0$$

$$a = 1 \qquad b = -7 \qquad c = 11$$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(11)}}{2(1)}$$

$$x = 4.62 \ (2dp) \qquad x = 2.38 \ 2dp$$

3..and..4.. (4)

1
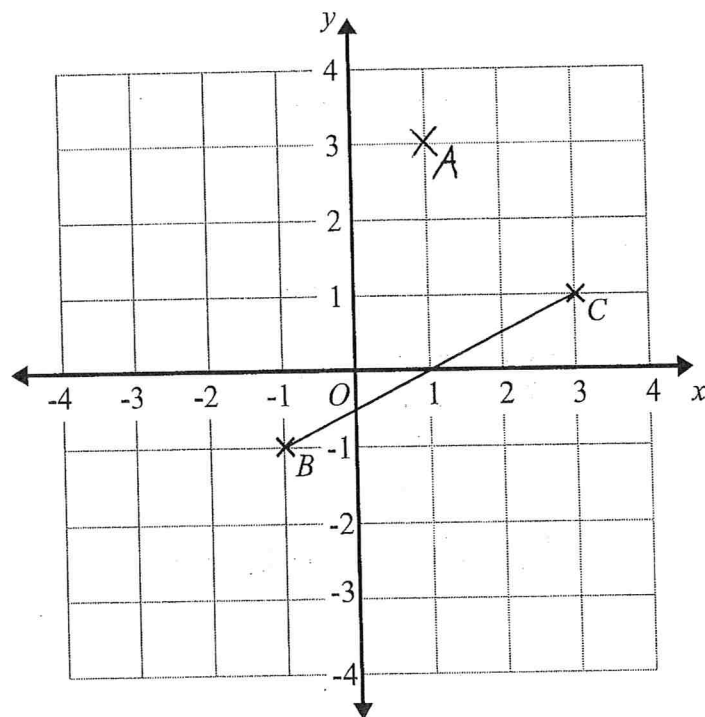
(a) Plot the point with coordinates (1, 3).
Label this point A.

(1)

(b) Write down the coordinates of the midpoint of BC.

(.....1...... , ...0.........)

(1)

(Total for question 1 is 2 marks)

2
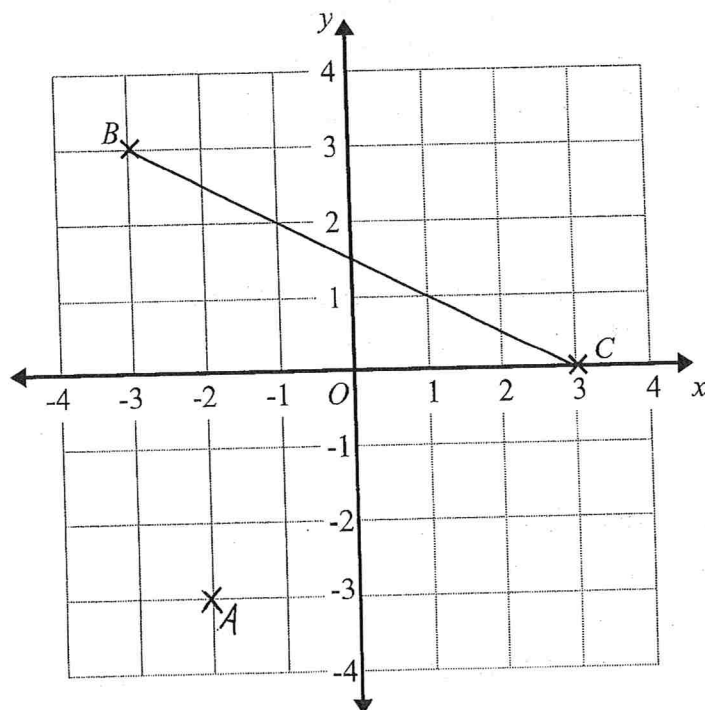
(a) Plot the point with coordinates (−2, −3).
Label this point A.

(1)

(b) Write down the coordinates of the midpoint of BC.

(....0...... , ...1.5....)

(1)

(Total for question 2 is 2 marks)

1 The graph of $y = f(x)$ is shown below.
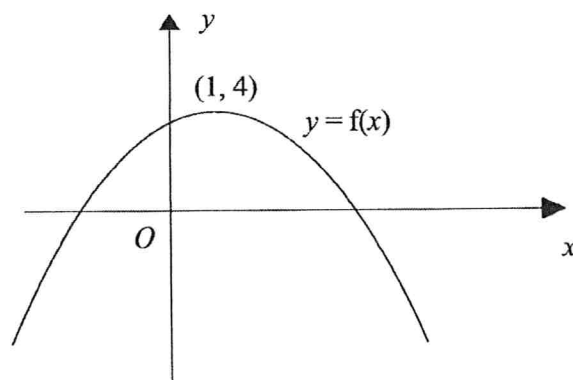
The coordinates of the maximum point of this curve are (1, 4).

Write down the coordinates of the maximum point of the curve with equation

(a) $y = f(x + 3)$

$(-2, 4)$

(1)

(b) $y = -f(x)$

$(1, -4)$

(1)

(c) $y = f(x) - 3$

$(1, 1)$

(1)

(d) $y = f(-x)$

$(-1, 4)$

(1)

(Total for question 1 is 4 marks)

2 The graph of $y = f(x)$ is shown below.
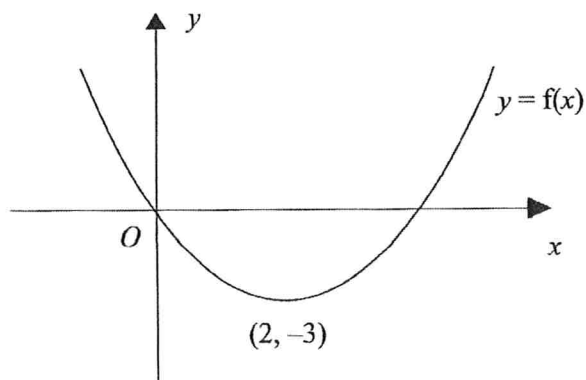
The coordinates of the minimum point of this curve are $(2, -3)$.

Write down the coordinates of the minimum point of the curve with equation

(a) $y = f(x + 2)$

$(0, -3)$
(1)

(b) $y = -f(x)$

$(2, 3)$
(1)

(c) $y = f(x) + 2$

$(2, -1)$
(1)

(d) $y = f(-x)$

$(-2, -3)$
(1)

(Total for question 2 is 4 marks)

3   The graph of $y = f(x)$ is shown below.
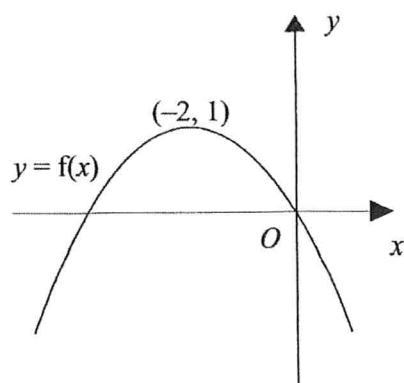
The coordinates of the maximum point of this curve are (–2, 1).

Write down the coordinates of the maximum point of the curve with equation

(a) $y = f(x - 3)$

..........(1, 1)..........
                    (1)

(b) $y = f(-x)$

..........(2, 1)..........
                    (1)

(c) $y = -f(x + 2)$

..........(-4, -1)..........
                    (1)

(d) $y = f(-x) - 1$
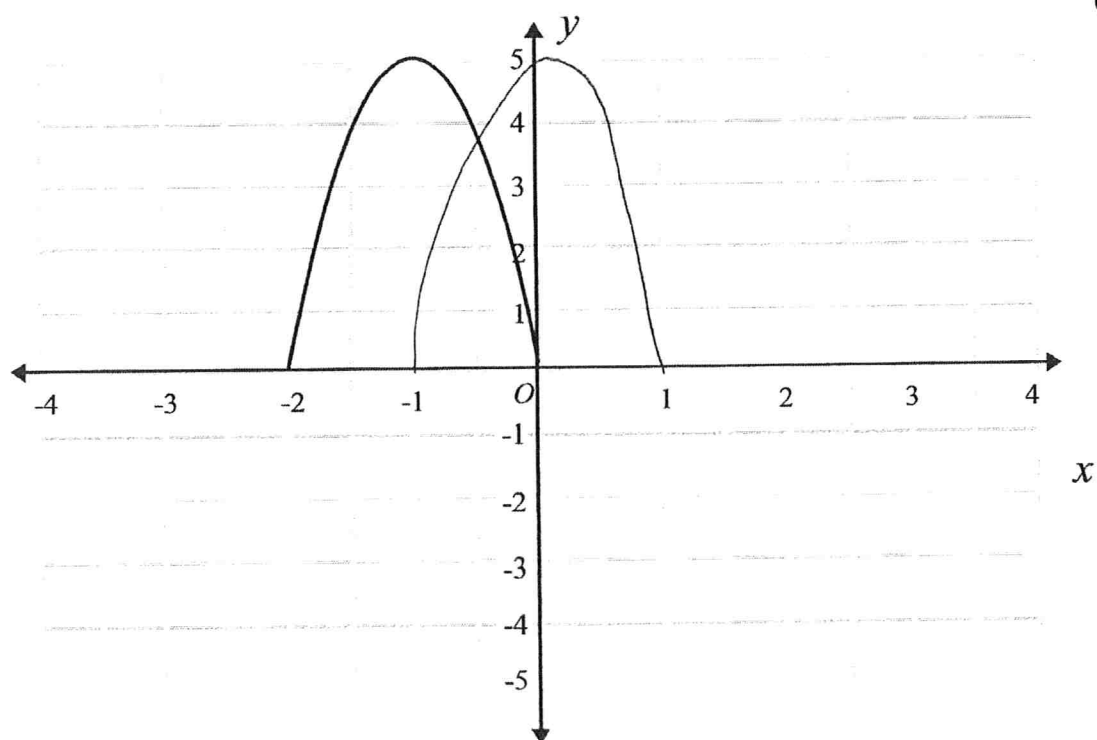
..........(2, 0)..........
                    (1)

(Total for question 3 is 4 marks)

4   The graph of $y = f(x)$ is shown on both grids below.
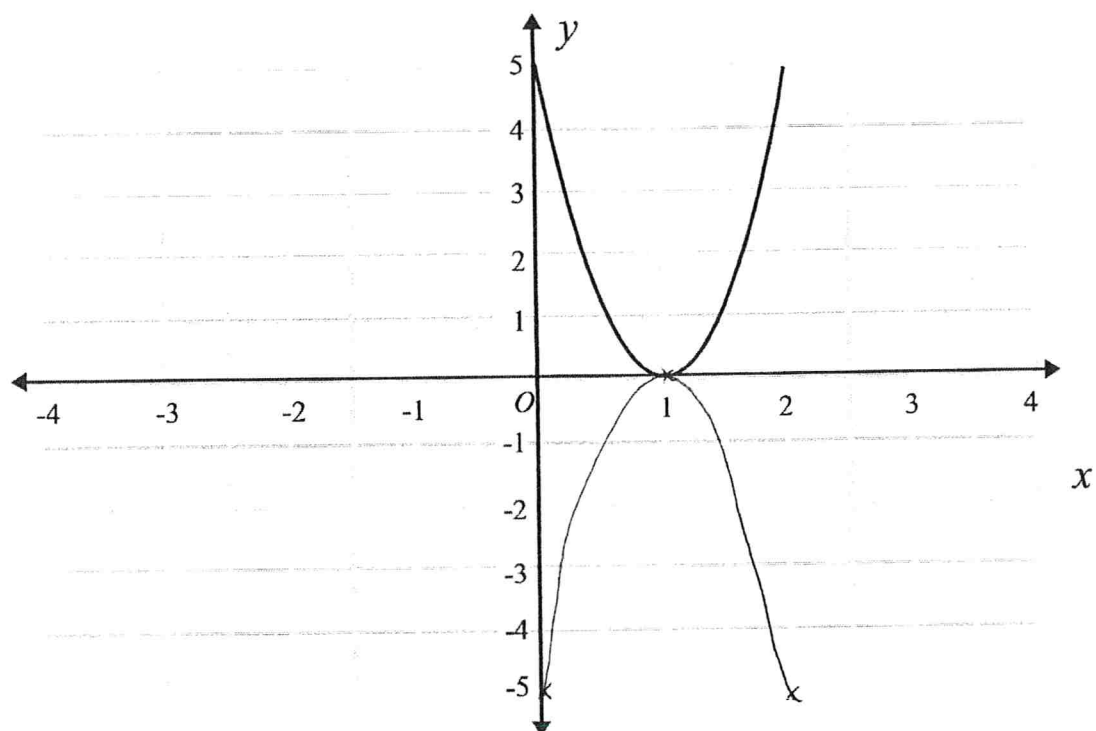
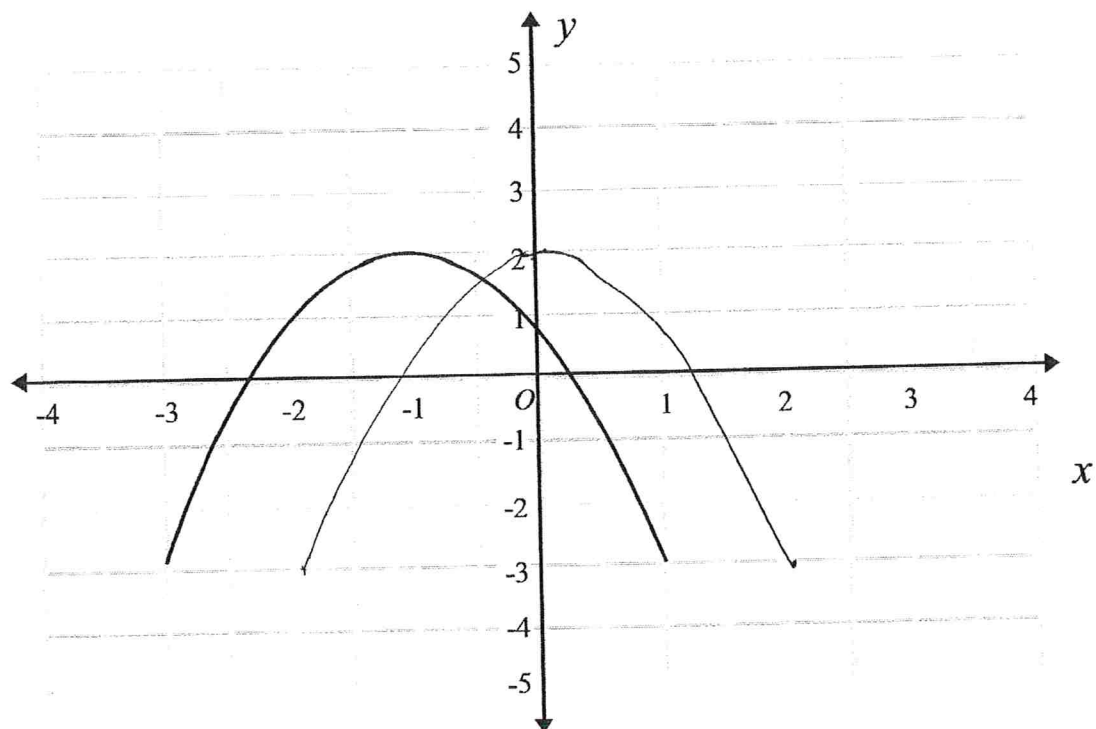(a) On the grid above, sketch the graph of $y = -f(x)$.

(2)

(b) On the grid above, sketch the graph of $y = f(x + 2)$

(2)
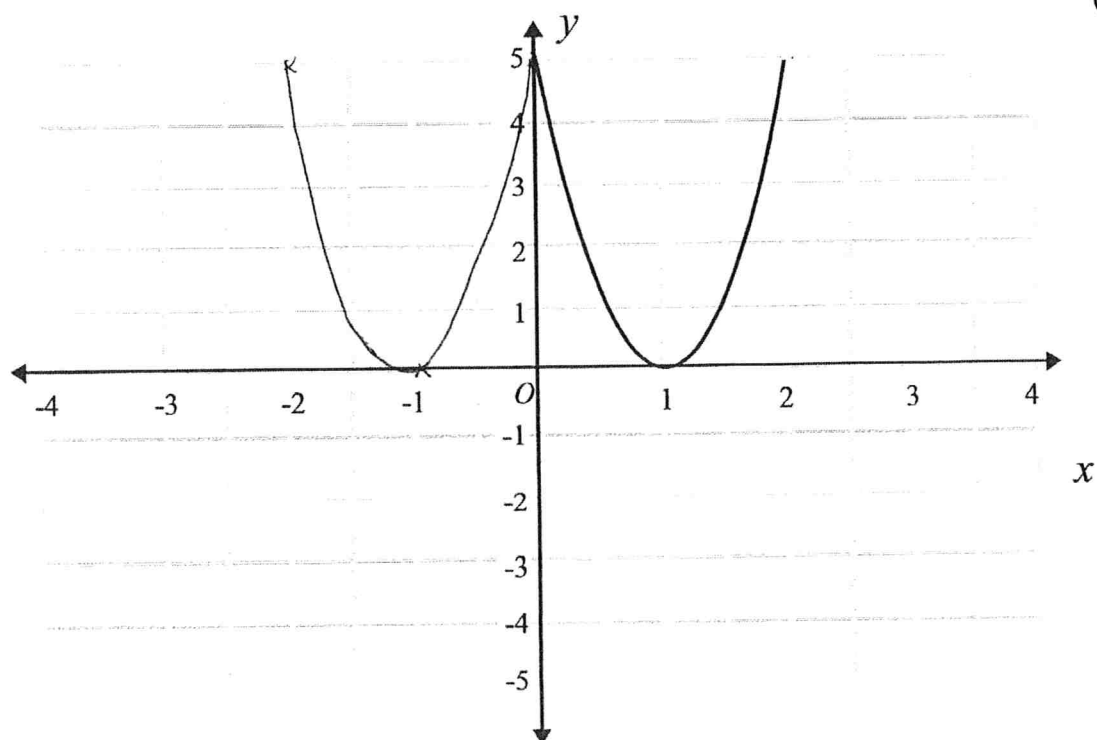
(Total for question 4 is 4 marks)

5 The graph of $y = f(x)$ is shown on both grids below.
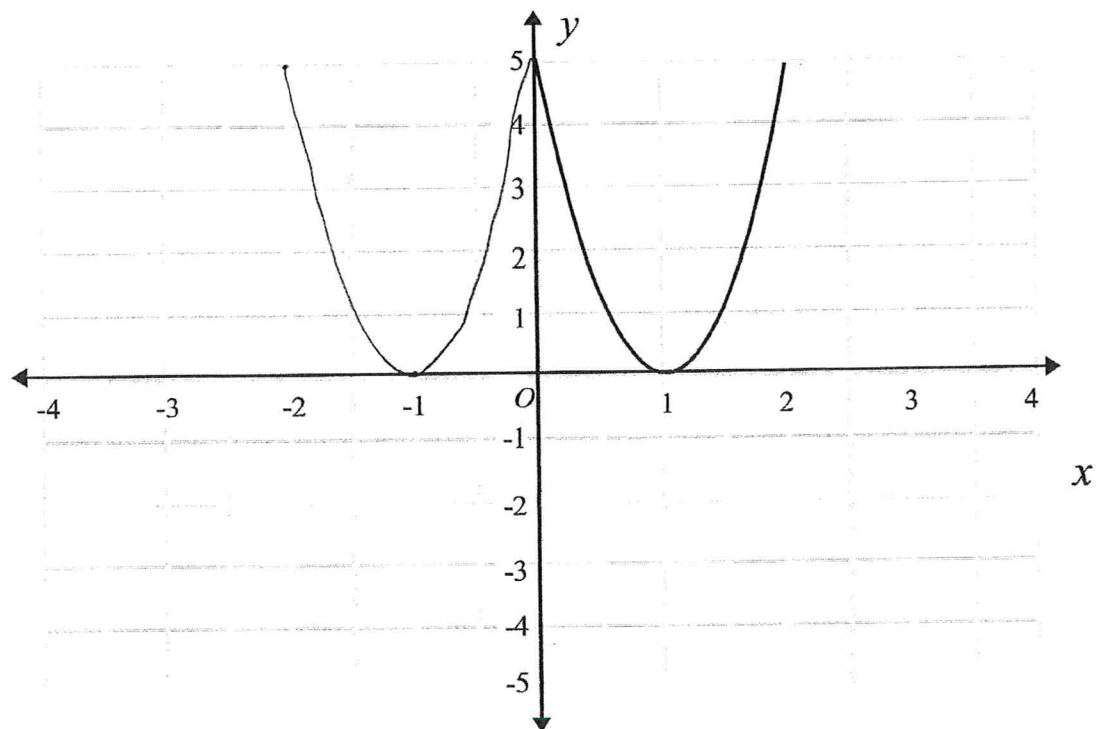
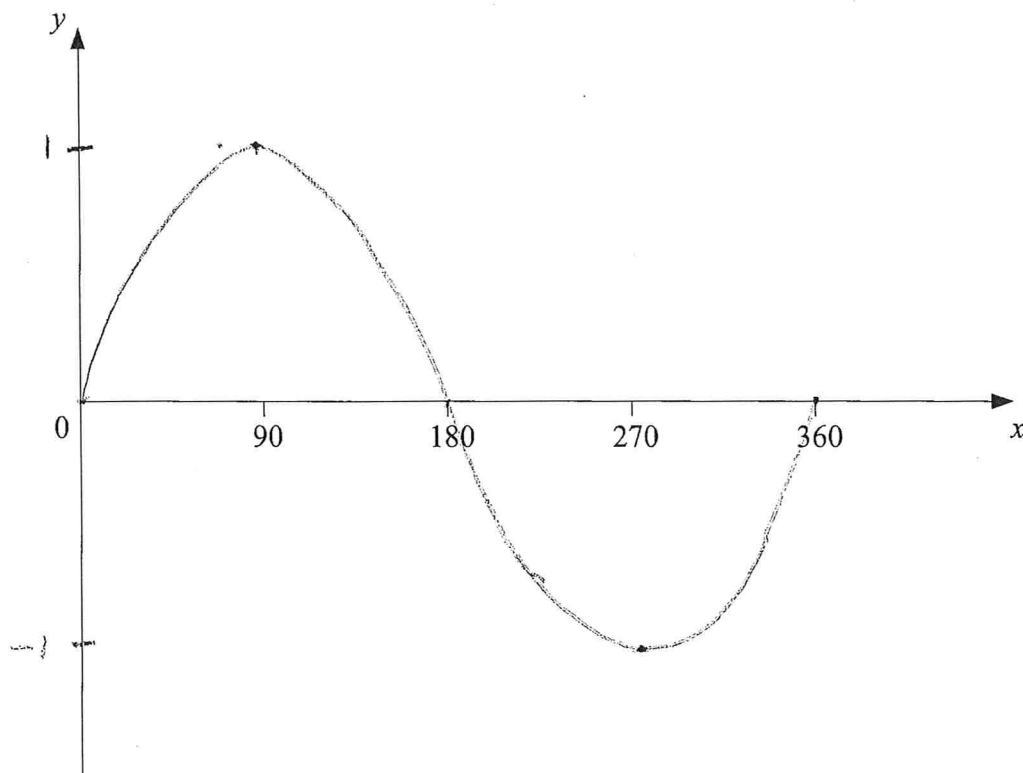(a) On the grid above, sketch the graph of $y = f(-x)$.

(2)

(b) On the grid above, sketch the graph of $y = f(x) - 2$

(2)
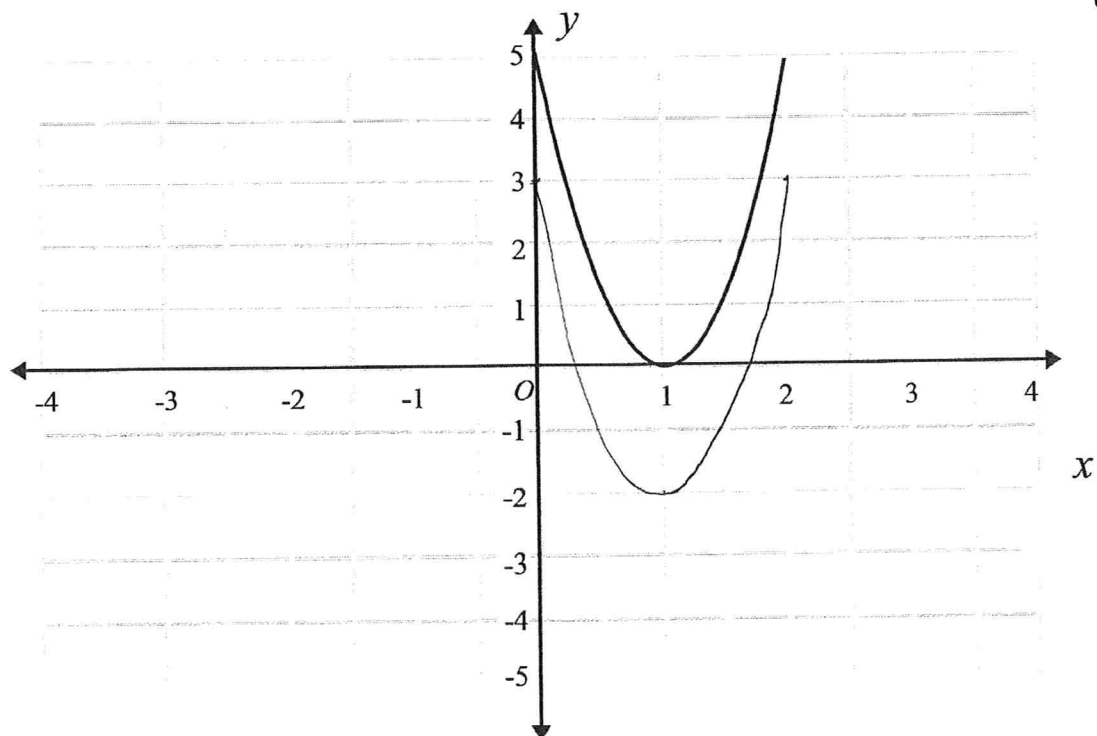
(Total for question 5 is 4 marks)

6 The graph of $y = f(x)$ is shown on both grids below.

(a) On the grid above, sketch the graph of $y = -f(x)$.

(2)
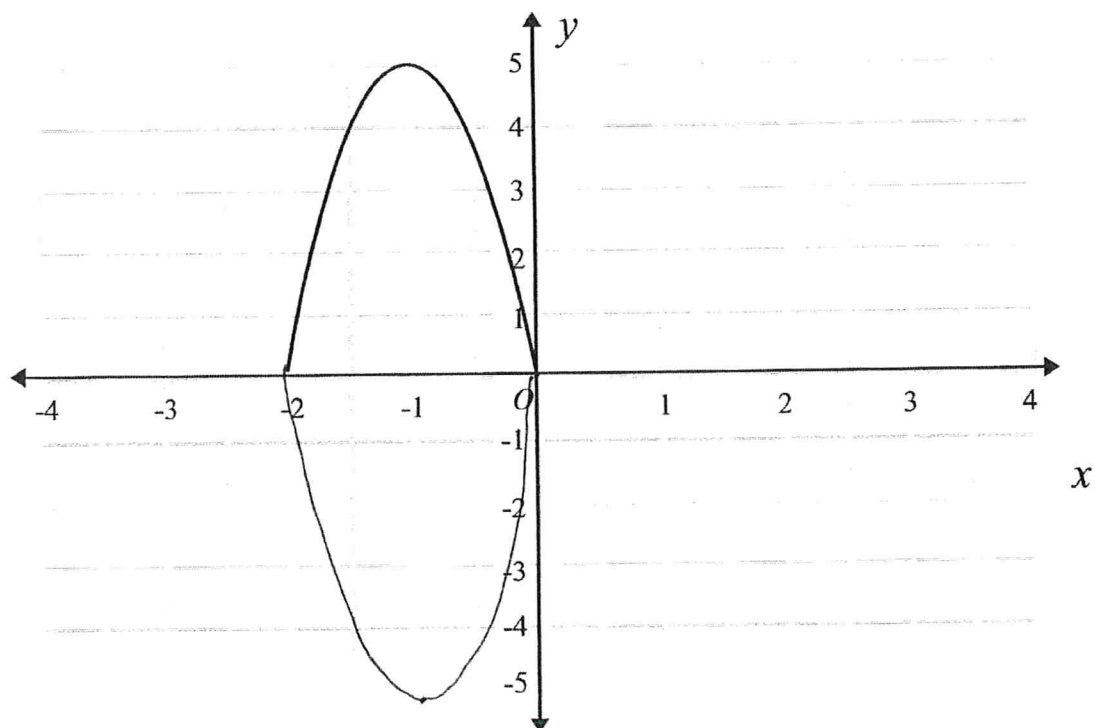
(b) On the grid above, sketch the graph of $y = f(x - 1)$

(2)

(Total for question 6 is 4 marks)

7 The graph of $y = f(x)$ is shown on the grid.

(a) On the grid above, sketch the graph of $y = f(x - 1)$.

(1)

The graph of $y = f(x)$ has a turning point at $(-1, 2)$.

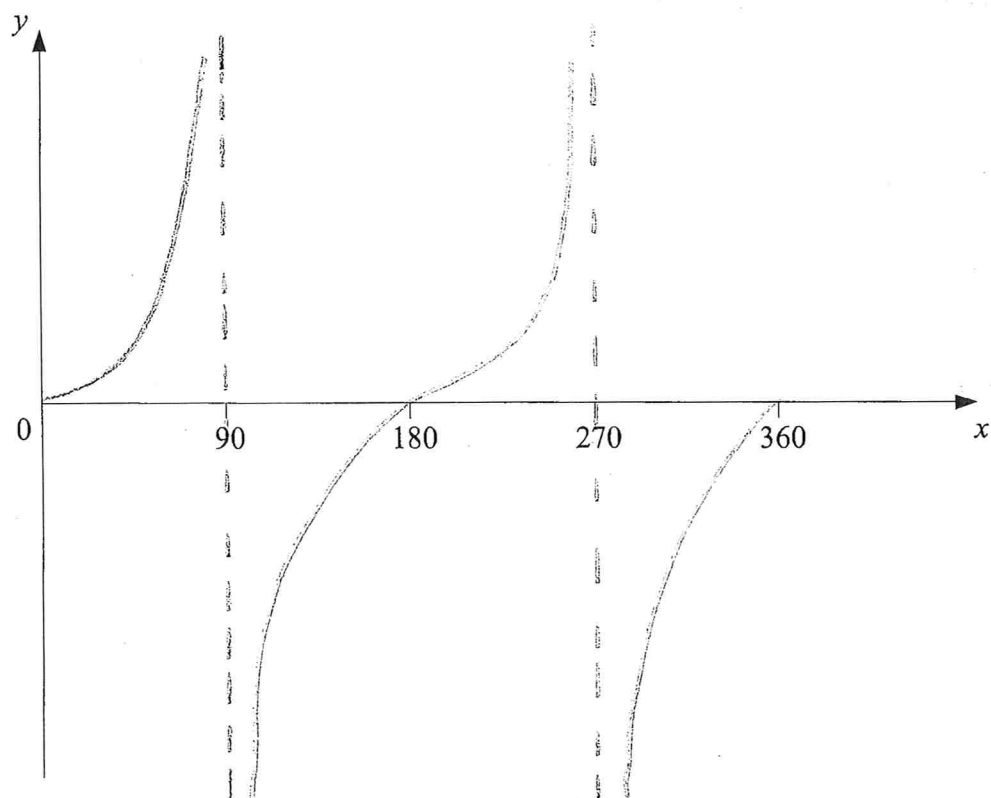(b) Write down the coordinates of the turning point of $y = f(-x) + 2$

$(1, 4)$

(1)

(Total for question 7 is 2 marks)

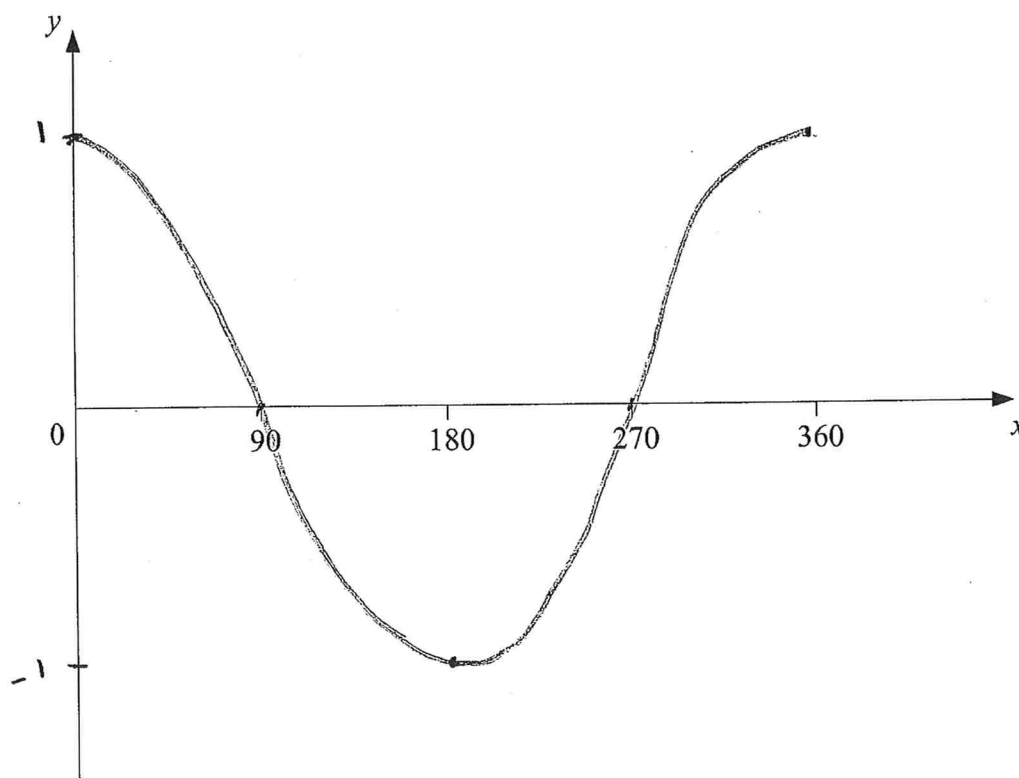**1** Sketch the graph of $y = \sin x°$ for $0 \leq x \leq 360$

(Total for Question 1 is 2 marks)

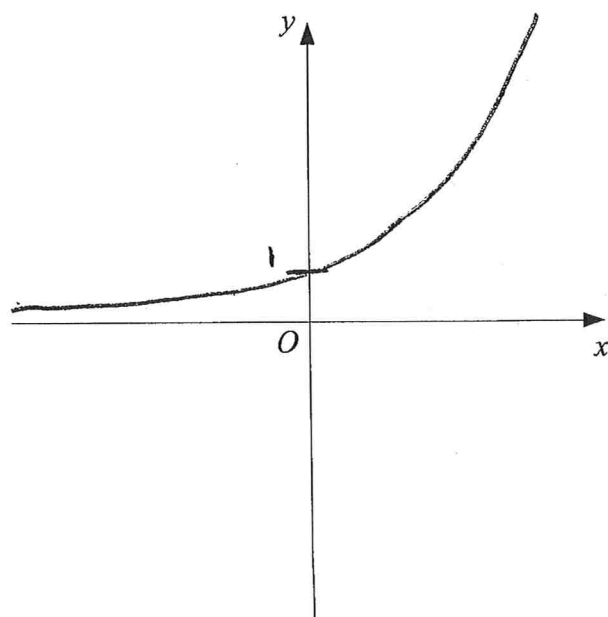**2** Sketch the graph of $y = \tan x°$ for $0 \leq x \leq 360$

(Total for Question 2 is 2 marks)

3 Sketch the graph of $y = \cos x°$ for $0 \leq x \leq 360$
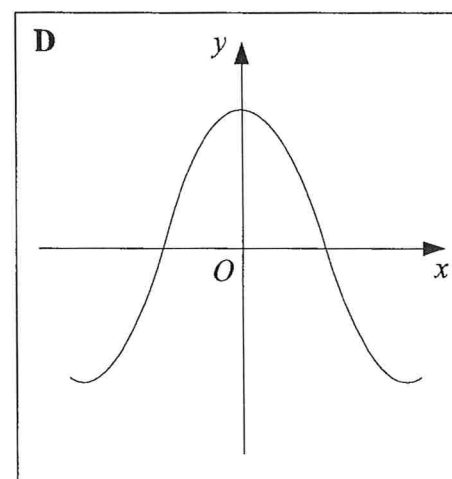

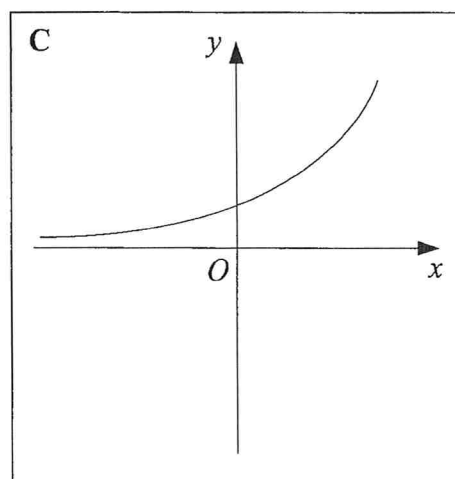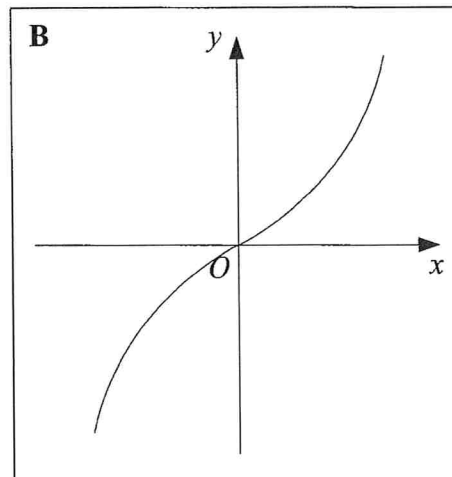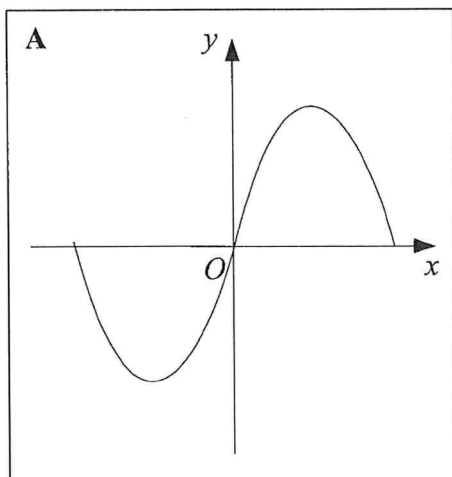**(Total for Question 3 is 2 marks)**

4 On the grid, sketch the curve with equation $y = 2^x$
Give the coordinates of any points of intersection with the axes.

$(0, 1)$

(Total for Question 4 is 2 marks)
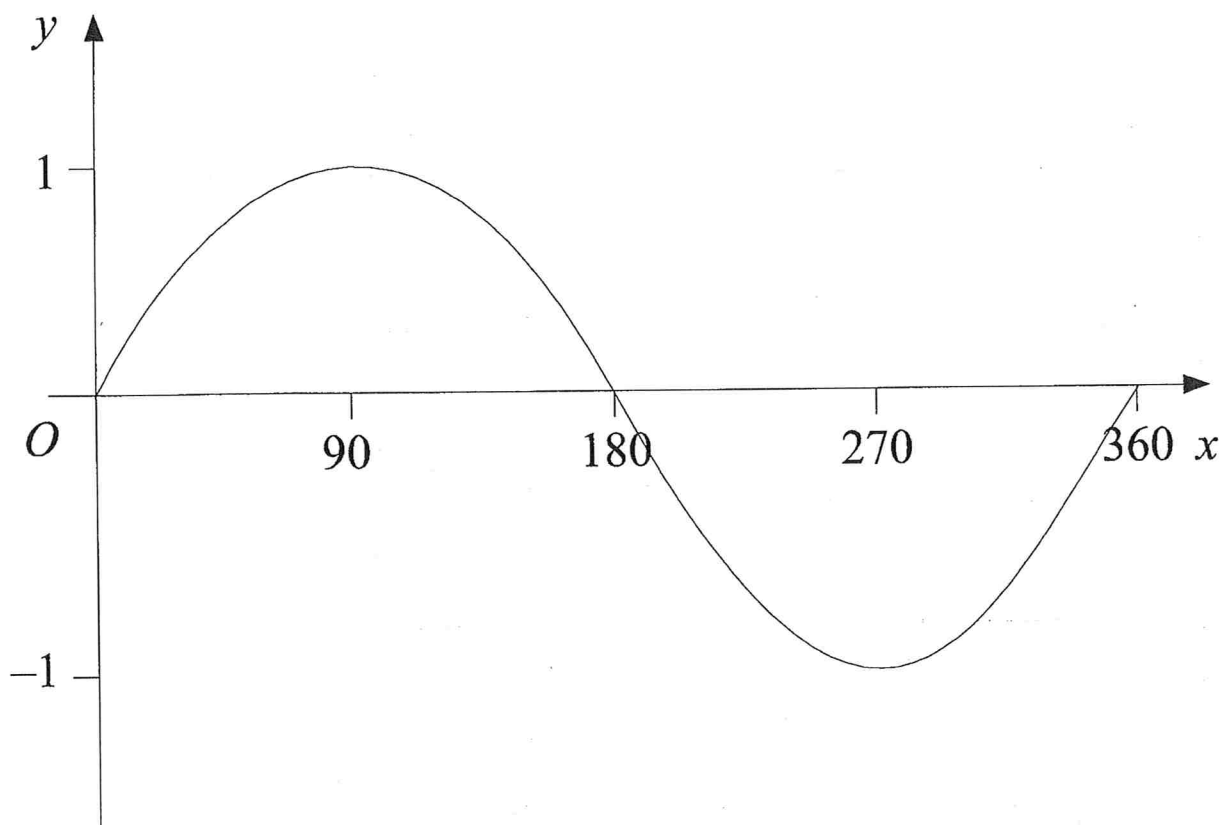
5   Here are four graphs

In the table below, match each equation with the letter of its graph.

Equation	Letter of Graph
$y = \sin x$	A
$y = 2^x$	C
$y = x^3$	B
$y = \cos x$	D

6   Here is a sketch of the curve $y = \sin x°$ for $0 \leq x \leq 360$

Given that $\sin 30° = \dfrac{1}{2}$ write down the value of:

i) $\sin 150°$

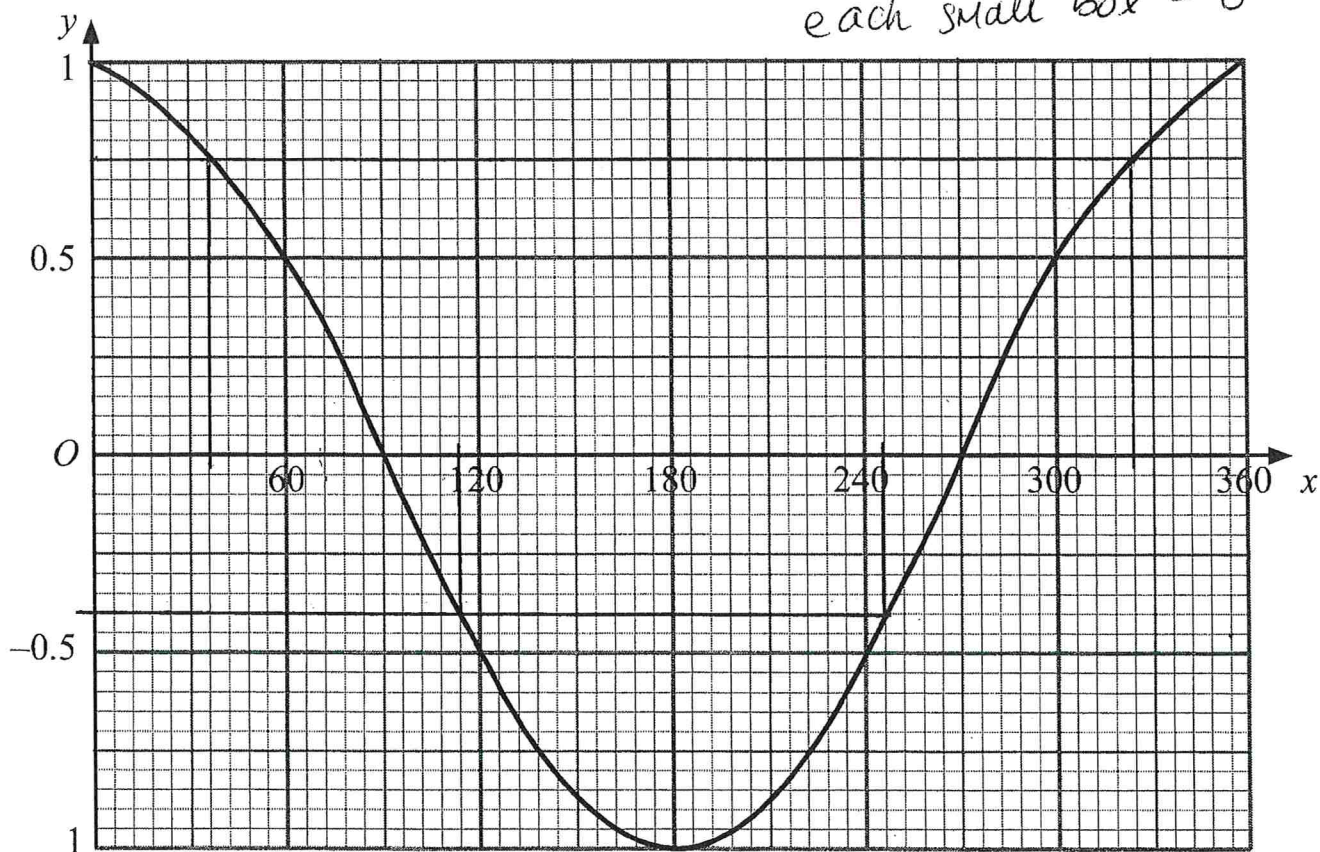$\dfrac{1}{2}$

(1)

ii) $\sin 330°$

$-\dfrac{1}{2}$

(1)

(Total for Question 6 is 2 marks)

7 Here is a sketch of the curve $y = \cos x°$ for $0 \le x \le 360$

$\dfrac{60}{10} = 6$

each small box $= 6°$

Use the graph to find estimates of the solutions, in the interval $0 \le x \le 360$, of the equation:
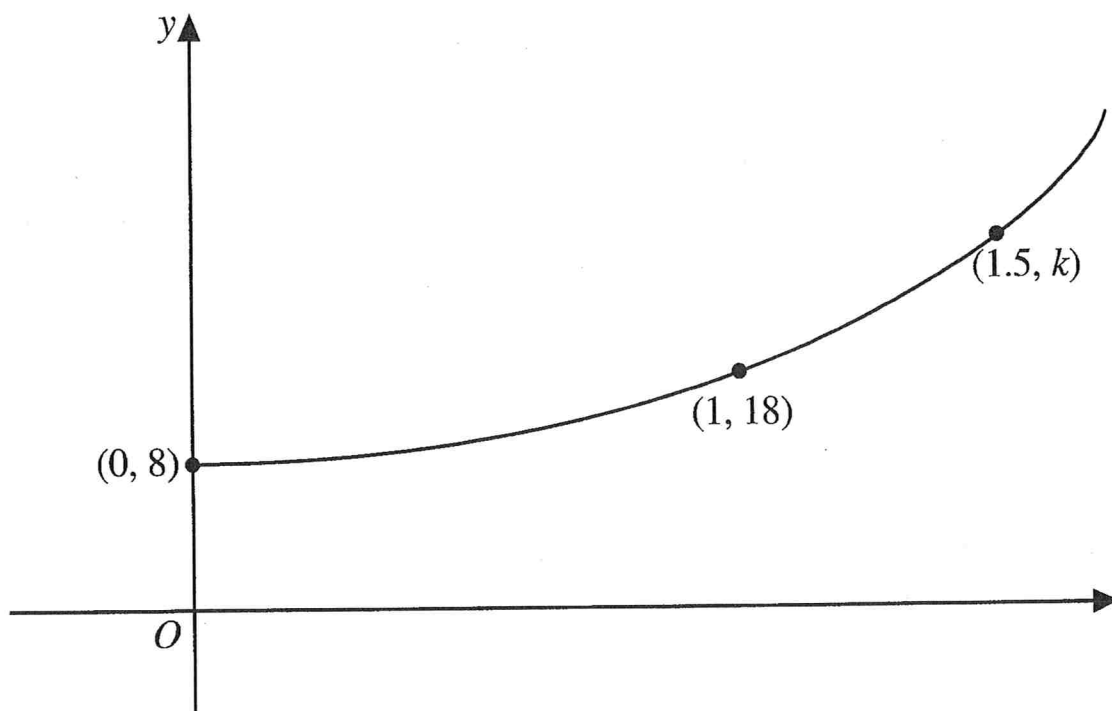
i) $\cos(x) = -0.4$

114° and 246°

(2)

ii) $4 \cos(x) = 3$

$\cos(x) = \dfrac{3}{4}$

36° and 324°

(2)

(Total for Question 7 is 4 marks)

8 This sketch shows part of the graph with equation $y = pq^x$ where p and q are constants.

The points with coordinates $(0, 8)$, $(1, 18)$ and $(1.5, k)$ lie on the graph.

Calculate the values of p, q and k.

$y = pq^x \qquad (0, 8)$

$8 = pq^0$

$\underline{\underline{8 = p}}$

$y = 8q^x \qquad (1, 18)$

$18 = 8q$

$q = \dfrac{18}{8}$

$= \underline{\underline{\dfrac{9}{4}}}$

$y = 8\left(\dfrac{9}{4}\right)^x \qquad (1.5, k)$

$k = 8\left(\dfrac{9}{4}\right)^{1.5}$

$= 8\left(\dfrac{9}{4}\right)^{\frac{3}{2}}$

$= 8\left(\dfrac{3}{2}\right)^3$

$= 8\left(\dfrac{27}{8}\right)$

$= \underline{\underline{27}}$

$\underline{\underline{p = 8}} \qquad \underline{\underline{q = \dfrac{9}{4}}} \qquad \underline{\underline{k = 27}}$
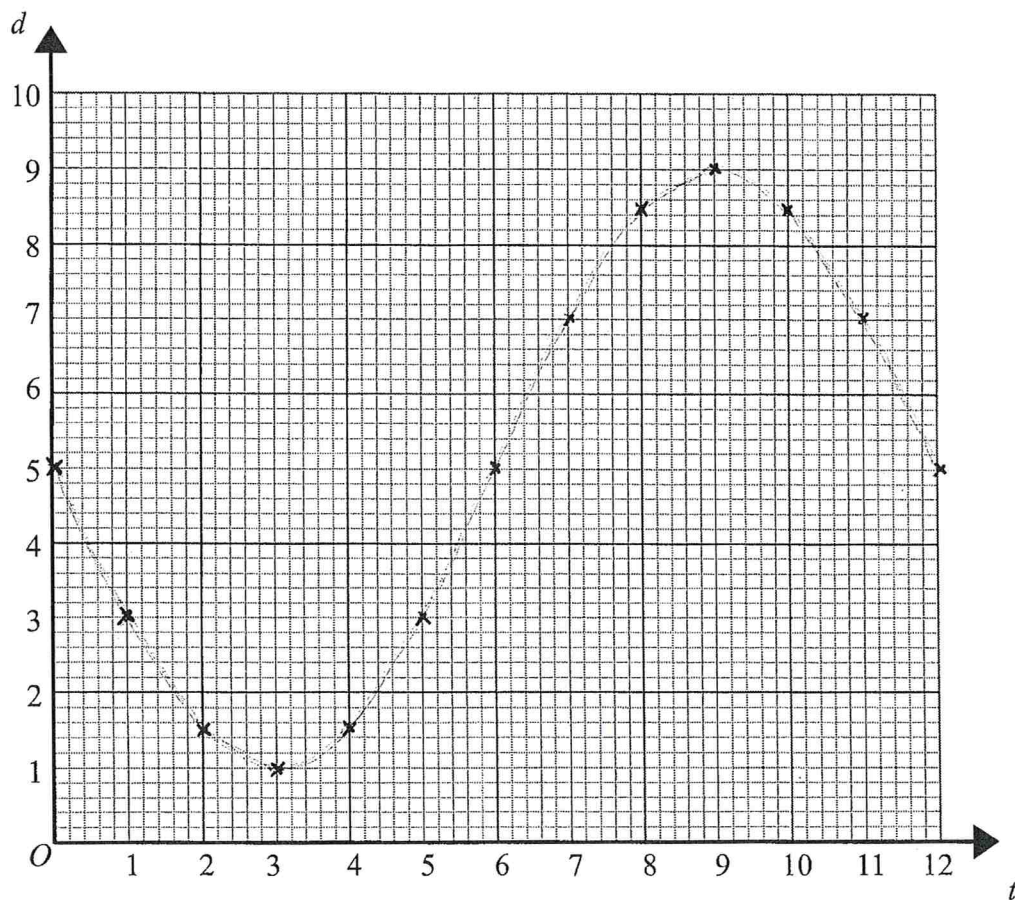
(Total for Question 8 is 6 marks)

9 The depth of water, d metres, at the entrance to a harbour is given by the formula:
$d = 5 - 4\sin(30t)$, where t is the time in hours after midnight on one day.

(a) On the axes below, draw the graph of d against t for $0 \le t \le 12$ (4)

t	0	1	2	3	4	5	6	7	8	9	10	11	12
d	5	3	1.54	1	1.54	3	5	7	8.46	9	8.46	7	5

(b) Find the two values of t, where $0 \le t \le 24$, when the depth is least.

3 and 15

(2)

(Total for Question 9 is 6 marks)

1   Given that f(x) = $x - 4$ find:

(a) f(5)

$$f(5) = 5 - 4$$

$$\underline{\quad\quad\quad 1 \quad\quad\quad}$$
(1)

(b) f(3)

$$f(3) = 3 - 4$$

$$\underline{\quad\quad\quad -1 \quad\quad\quad}$$
(1)

(Total for Question 2 is 2 marks)

---

2   Given that g(x) = $2x^2 - 10$ find:

(a) g(2)

$$g(2) = 2(2)^2 - 10$$
$$= 8 - 10$$

$$\underline{\quad\quad\quad -2 \quad\quad\quad}$$
(1)

(b) g(-2)

$$g(-2) = 2(-2)^2 - 10$$
$$= 8 - 10$$

$$\underline{\quad\quad\quad -2 \quad\quad\quad}$$
(1)

(c) Solve: g(x) = 8

$$2x^2 - 10 = 8$$
$$2x^2 = 18$$
$$x^2 = 9$$

$$\underline{\quad\quad x = \pm 3 \quad\quad}$$
(3)

(Total for Question 2 is 5 marks)

3   Given that $f(x) = 3x - 5$ find:

(a) f(3)

$$f(3) = 3(3) - 5$$
$$= 9 - 5$$

_____4_____
(1)

(b) f(-2)

$$f(-2) = 3(-2) - 5$$
$$= -6 - 5$$

_____-11_____
(1)

solve
(c) f(x) = 1

$$3x - 5 = 1$$
$$3x = 6$$
$$x = 2$$

_____x = 2_____
(2)

(Total for Question 3 is 4 marks)

4   Given that $f(x) = x^2 - 3$ find:

(a) f(10)

$$f(10) = (10)^2 - 3$$
$$= 100 - 3$$

_____97_____
(1)

(b) f(-1)

$$f(-1) = (-1)^2 - 3$$
$$= 1 - 3$$

_____-2_____
(1)

(c) Find: $f^{-1}(x) = 8$

$$y = x^2 - 3$$
$$x = y^2 - 3$$
$$x + 3 = y^2$$
$$y = \sqrt{x+3}$$

$$\boxed{f^{-1}(x) = \sqrt{x+3}}$$
$$8 = \sqrt{x+3}$$
$$64 = x + 3$$
$$61 = x$$

_____x = 61_____
(2)

(Total for Question 4 is 4 marks)

5 Given that $f(x) = 2x - 4$ and $g(x) = 3x + 5$

(a) Find $gf(3)$

$$f(3) = 2(3) - 4$$
$$= 6 - 4$$
$$= 2$$
$$g(2) = 3(2) + 5$$
$$= 6 + 5$$
$$= 11$$

_____11_____

(2)

(b) Work out an expression for $f^{-1}(x)$

$$y = 2x - 4$$
$$x = 2y - 4$$
$$x + 4 = 2y$$
$$\frac{x + 4}{2} = y$$

$$f^{-1}(x) = \frac{x + 4}{2}$$

(2)

(c) Solve $f(x) = g(x)$

$$2x - 4 = 3x + 5$$
$$-2x \qquad\qquad -2x$$
$$-4 = x + 5$$
$$-5 \qquad\qquad -5$$
$$-9 = x$$

_____$x = -9$_____

(2)

(Total for Question 5 is 6 marks)

6 Given that $f(x) = 3x + 1$ and $g(x) = x^2$

(a) Find $fg(x)$

$$fg(x) = 3x^2 + 1$$

$$fg(x) = 3x^2 + 1$$

(2)

(b) Work out an expression for $gf(x)$

$$gf(x) = (3x + 1)^2$$

(2)

(c) Solve $fg(x) = gf(x)$

$$3x^2 + 1 = (3x + 1)^2$$
$$3x^2 + 1 = (3x + 1)(3x + 1)$$
$$3x^2 + 1 = 9x^2 + 3x + 3x + 1$$
$$3x^2 + 1 = 9x^2 + 6x + 1$$
$$1 = 6x^2 + 6x + 1$$
$$0 = 6x^2 + 6x$$
$$0 = 6x(x + 1)$$
$$x = 0 \qquad x = -1$$

$$x = 0 \quad \text{or} \quad x = -1$$

(3)

(Total for Question 6 is 7 marks)

7   Given that $f(x) = x^2 - 17$ and $g(x) = x + 3$

(a) Work out an expression for $g^{-1}(x)$

$$y = x + 3$$
$$x = y + 3$$
$$x - 3 = y$$

$$g^{-1}(x) = x - 3$$

(2)

(b) Work out an expression for $f^{-1}(x)$

$$y = x^2 - 17$$
$$x = y^2 - 17$$
$$x + 17 = y^2$$
$$\sqrt{x + 17} = y$$

$$f^{-1}(x) = \sqrt{x + 17}$$

(2)

(c) Solve $f^{-1}(x) = g^{-1}(x)$

$$\sqrt{x + 17} = x - 3$$
$$x + 17 = (x - 3)^2$$
$$x + 17 = (x - 3)(x - 3)$$
$$x + 17 = x^2 - 3x - 3x + 9$$
$$x + 17 = x^2 - 6x + 9$$
$$17 = x^2 - 7x + 9$$
$$0 = x^2 - 7x - 8$$
$$0 = (x - 8)(x + 1)$$
$$x = 8 \qquad x = -1$$

$$x = 8 \text{ or } x = -1$$

(4)

(Total for Question 7 is 8 marks)

8 The function f is defined such that
$$f(x) = x^2 - 1$$

(a) Find an expression for $f(x - 2)$

$$f(x - 2) = (x - 2)^2 - 1$$
$$= (x - 2)(x - 2) - 1$$
$$= x^2 - 2x - 2x + 4 - 1$$
$$= x^2 - 4x + 3$$

$$f(x-2) = x^2 - 4x + 3$$

(2)

(b) Hence solve: $f(x - 2) = 0$

$$x^2 - 4x + 3 = 0$$
$$(x - 3)(x - 1) = 0$$
$$x = 3 \qquad x = 1$$

$$x = 1 \text{ or } x = 3$$

(2)

(Total for Question 8 is 4 marks)

9 The function f is defined such that
$$f(x) = 4x - 1$$

(a) Find $f^{-1}(x)$

$$y = 4x - 1$$
$$x = 4y - 1$$
$$x + 1 = 4y$$
$$\frac{x + 1}{4} = y$$

$$f^{-1}(x) = \frac{x + 1}{4}$$

(2)

The function g is defined such that
$$g(x) = kx^2 \text{ where } k \text{ is a constant}$$

(b) Given that fg(2) = 12
Work out the value of k.

$$g(2) = k(2)^2$$
$$= 4k$$

$$f(4k) = 4(4k) - 1$$
$$= 16k - 1$$

$$16k - 1 = 12$$
$$16k = 13$$
$$k = \frac{13}{16}$$
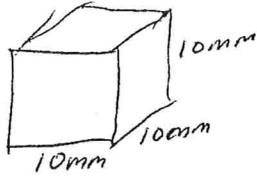
$$k = \frac{13}{16}$$

(2)

(Total for Question 9 is 4 marks)

17 Write 35 cm³ in mm³

$1 cm^3 = $ [cube diagram: 10mm × 10mm × 10mm] $1 cm^3 = 1000 mm^3$

..........35000.......... mm³

(Total for question 17 is 1 mark)

18 Write 4.5 m² in cm²
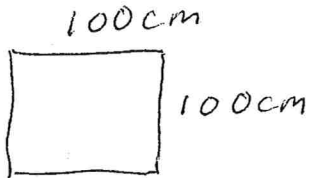
$1 m^2 = $ [square: 100cm × 100cm] $1 m^2 = 10000 cm^2$

..........45000.......... cm²

(Total for question 18 is 1 mark)

19 Write 90 mm² in cm²
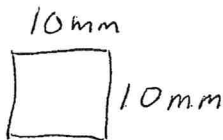
$1 cm^2 = $ [square: 10mm × 10mm] $1 cm^2 = 100 mm^2$

..........0.9.......... cm²

(Total for question 19 is 1 mark)

1 Jesy invests £8000 for *n* years in a savings account.

To find the value, V, of her investment after *n* years she uses the formula:

$$V = 8000 \times (1.025)^n$$

(a) Write down the annual rate of interest Jesy earns.

.... 2.5% ....
(1)

(b) Find the **total amount of interest** Jesy earns in three years.

$$8000 \times 1.025^3 = £8615.13$$

$$8615.13 - 8000$$

£ .... 615.13 ....
(2)

(Total for question 1 is 3 marks)

2 Perrie invests £25000 for 3 years in a savings account.
She gets 2.7% per annum compound interest.

Calculate **the total amount of interest** Perrie will get after 3 years.

$$25000 \times 1.027^3 = 27080.17$$

$$27080.17 - 25000 = £2080.17$$

£ .... 2080.17 ....

(Total for question 2 is 3 marks)

3 Jade bought a house for £350 000.

In the first year the house price increased by 3%
In the second year the house price increased by 2%
In the third year the house price depreciated by 5%

Work out the value of the house at the end of 3 years.

$$350\,000 \times 1.03 \times 1.02 \times 0.95$$

$$= £\ 349\,324.50$$

£ 349 324 50

(Total for question 3 is 3 marks)

4 Leigh-Anne invests £2500 for 4 years in a savings account.
She gets 3% per annum compound interest.

How much money does Leigh-Anne have at the end of 4 years.

$$2500 \times 1.03^4 = £\ 2813.77$$

£ 2813.77

(Total for question 4 is 2 marks)

5   Annie invests £9500 for 5 years in a savings account.
    She gets 1.8% per annum compound interest.

    How much money does Annie have at the end of 5 years.

    $$9500 \times 1.018^5 = £10\ 386.34$$

    £ 10 386. 34

    (Total for question 5 is 2 marks)

6   Greg bought a new car for £18 000.
    In the first year the value of the car depreciates by 30%.
    In the second year and the third year the car depreciates by 14%

    Work out the value of the car after three years.

    $$18000 \times 0.7 \times 0.86^2 = £9\ 318.96$$

    £ 9 318. 96

    (Total for question 6 is 3 marks)

7   Nick bought a new car.
     Each year the car depreciates in value by 12%.

     Work out the number of years it takes for the car to half in value.

$$0.88^2 = 0.7744$$
$$0.88^3 = 0.681472$$
$$0.88^4 = 0.59969536$$
$$0.88^5 = 0.5277319168$$
$$0.88^6 = 0.464404868 \quad [less\ than\ 0.5]$$

...........6...........years

(Total for question 7 is 3 marks)

8   Fearne invests £5600 in a savings account.
     She gets 2% per annum compound interest.

     After *n* years, Fearne has £6061.62 in her account.
     Work out the value of *n*.

$$5600 \times 1.02^3 = \overset{5942.76}{\cancel{6119.27}}$$
$$5600 \times 1.02^4 = 6061.62 \quad \checkmark$$

...........4...........

(Total for question 8 is 2 marks)

9 Alice is going to invest some money for 5 years.

She can choose from two options:

Investment A: 2.7% compound interest per annum

Investment B: 2.8% simple interest per annum

Which investment should Alice choose
You must show your working.

A

$$100 \times 1.027^5 = 114.2$$

Increase of 14.2%

B

$$2.8 \times 5 = 14$$

Increase of 14%

She should choose Investment A

(Total for question 9 is 4 marks)

10 Matt wants to invest £8000 for three years. He can choose between Bank A and Bank B.

Bank A	Bank B
1.2% compound interest per annum	2% compound interest in the first year 1% compound interest for each extra year

Which bank will give Matt the most interest after three years.
You must show your working.

A

8000×1.02^3

8000×1.012^3

$= £8291.47$

B

$8000 \times 1.02 \times 1.01^2$

$= £8324.02$

Bank B

11 Melvin invests £5000 in an account paying 2.5% compound interest per annum.

Charlie invests £4500 in an account paying 3% compound interest per annum.

Work out the difference between the amount of of money Melvin has after 5 years and the amount of money Charlie has after 5 years.

Melvin: $5000 \times 1.025^5 = 5657.04$

Charlie: $4500 \times 1.03^5 = 5216.73$

$5657.04 - 5216.73$

$= 440.31$

£.......440.31..................

1 The ratio of dogs to cats is 5:3
   The ratio of fish to dogs is 6:1

   Find the ratio of cats to fish.
   Give your answer in its simplest form.

   $$D : C \qquad F : D$$
   $$5 : 3 \qquad 6 : 1$$

   Make Dogs the same. $\Big)$ × 5

   $$D : C \qquad F : D$$
   $$5 : 3 \qquad 30 : 5$$

   $$D : C : F$$
   $$5 : 3 : 30$$

   $$C : F$$
   $$3 : 30$$
   $$1 : 10$$

                                              1 : 10

   (Total for question 1 is 2 marks)

2 Given that $a:b = 4:5$ and $b:c = 3:2$

   Find the ratio $a:b:c$
   Give your answer in its simplest form.

   $$a : b \qquad b : c$$
   $$4 : 5 \qquad 3 : 2$$

   × 3 $\Big($ $\Big)$ × 5 (MAKE b the SAME)

   $$12 : 15 \qquad 15 : 10$$

   $$a : b : c$$
   $$12 : 15 : 10$$

                                              12 : 15 : 10

   (Total for question 2 is 2 marks)

1 Here are four graphs.
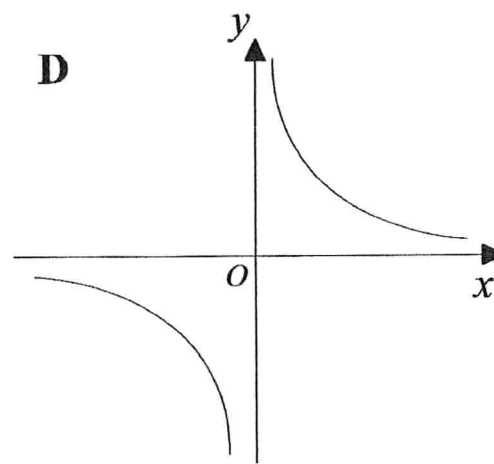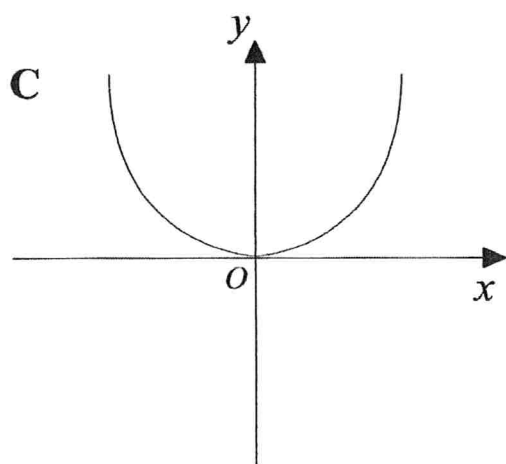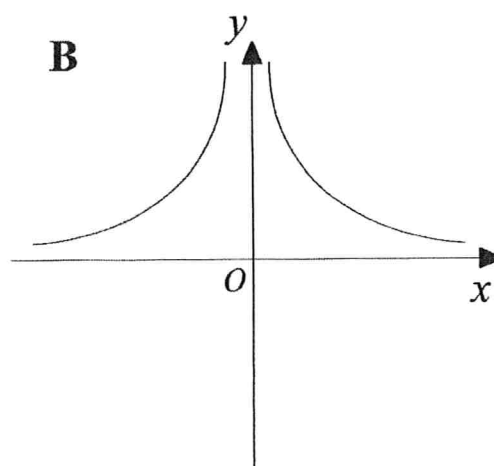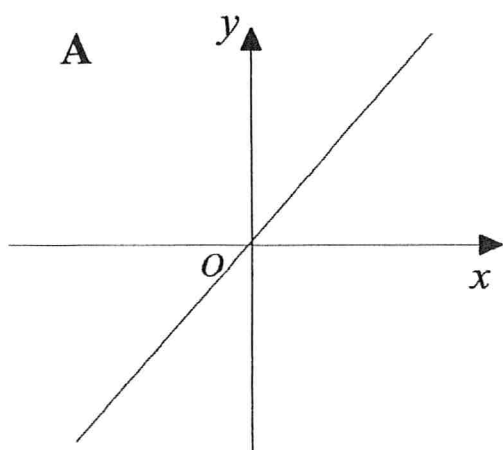
Match each graph with a statement in the table below.

Proportionality relationship	Graph letter
y is directly proportional to x	A
y is inversely proportional to x	D
y is directly proportional to x^2	C
y is inversely proportional to x^2	B

(Total for question 1 is 2 marks)

2 a is directly proportional to b

When $a = 7$, $b = 28$

Find the value of b when $a = 5$

$$a = kb$$
$$7 = k(28)$$
$$k = \frac{7}{28}$$
$$= \frac{1}{4}$$
$$\therefore a = \frac{1}{4}b$$

when $a = 5$

$$5 = \frac{1}{4}b$$
$$b = 20$$

$b =$ ......20......

(Total for question 2 is 3 marks)

---

3 c is inversely proportional to d

When $c = 3$, $d = 8$

Find the value of c when $d = 2$

$$c = \frac{k}{d}$$
$$3 = \frac{k}{8}$$
$$k = 24$$
$$\therefore c = \frac{24}{d}$$

when $d = 2$

$$c = \frac{24}{2}$$
$$= 12$$

$c =$ ......12......

(Total for question 3 is 3 marks)

4   *e* is directly proportional to *f*

When $e = 3, f = 36$

Find the value of *f* when $e = 4$

$$e = kf$$
$$3 = k(36)$$
$$k = \frac{3}{36}$$
$$= \frac{1}{12}$$
$$\therefore e = \frac{1}{12}f$$

when $e = 4$
$$4 = \frac{1}{12}f$$
$$f = 48$$

$f = $ ......**4 8**..........

(Total for question 4 is 3 marks)

---

5   *g* is directly proportional to the square root of *h*

When $g = 18, h = 16$

Find the possible values of *h* when $g = 2$

$$g = k\sqrt{h}$$
$$18 = k\sqrt{16}$$
$$18 = k(4)$$
$$k = \frac{18}{4} = \frac{9}{2}$$

$$\therefore g = \frac{9}{2}\sqrt{h}$$

when $g = 2$
$$2 = \frac{9}{2}\sqrt{h}$$
$$4 = 9\sqrt{h}$$
$$\frac{4}{9} = \sqrt{h}$$
$$h = \frac{16}{81}$$

$h = $ ......$\frac{16}{81}$..........

(Total for question 5 is 3 marks)

1 Beth goes on holiday to Spain.
The exchange rate is £1 = €1.13

She changes £350 into Euros (€).

(a) Work out how many Euros she receives.

$$£ \qquad €$$
$$1 \qquad 1.13$$
$$350 \qquad x$$

$$x = 350 \times 1.13$$
$$= 395.50$$

€ 395.50

When Beth returns from holiday she changes €120 back into pounds.
The exchange rate is now £1 = €1.16

(b) Work out how many pounds (£) Beth receives.
Give your answer to the nearest penny.

$$£ \qquad €$$
$$1 \qquad 1.16$$
$$x \qquad 120$$

$$1.16x = 120$$
$$x = \frac{120}{1.16} = 103.45$$

£ 103.45

(Total for question 1 is 4 marks)

2 Ben went on holiday to Australia. He changed £350 into Australian dollars ($).
The exchange rate was £1 = $2.1

(a) Work out how many Australian dollars Ben should have received.

$$£ \qquad AU\$$$
$$1 \qquad 2.1$$
$$350 \qquad x$$

$$x = 350 \times 2.1$$
$$= 735$$

$ 735

When Ben returned he changed $100 back into pounds.
The new exchange rate was £1 = $2.2

(b) Work out how many pounds Ben should have received.
Give your answer to the nearest penny.

$$£ \qquad \$$$
$$1 \qquad 2.2$$
$$x \qquad 100$$

$$2.2x = 100$$
$$x = \frac{100}{2.2} = 45.45$$

£ 45.45

(Total for question 2 is 4 marks)

3   Nicole is on holiday in France.
    She spends €14.50 in a cafe.

    The exchange rate is £1 = €1.15

    Calculate how much Nicole spends in pounds (£).

    $$£ \qquad €$$
    $$1 \qquad 1.15$$
    $$x \qquad 14.50$$

    $$1.15x = 14.50$$
    $$x = \frac{14.50}{1.15} = 12.61$$

    £......12.61......

    (Total for question 3 is 2 marks)

4   Amy is on holiday in Turkey
    She changes £200 to Turkish lira.

    The exchange rate is £1 = 7.7 Turkish lira

    Calculate how many Turkish lira Amy receives

    $$£ \qquad TL$$
    $$1 \qquad 7.7$$
    $$200 \qquad x$$

    $$x = 200 \times 7.7$$
    $$= 1540$$

    £......1540......

    (Total for question 4 is 2 marks)

5   Mario is on holiday in Japan

    He stays in a hotel for 7 nights. $7 \times 10000 = 70000$
    The hotel costs ¥10000 for each night.

    The exchange rate is £1 = ¥140

    Calculate how much Mario spends on the hotel in pounds.

    $$£ \qquad ¥$$
    $$1 \qquad 140$$
    $$x \qquad 70000$$

    $$140x = 70000$$
    $$x = \frac{70000}{140} = 500$$

    £......500......

    (Total for question 5 is 2 marks)