1   Work out $5 - 9$

-4

(Total for Question 1 is 1 mark)

2   Work out $-7 + 4$

-3

(Total for Question 2 is 1 mark)

3   Work out $-8 - 10$

-18

(Total for Question 3 is 1 mark)

4   Work out $-2 + -11$

-13

(Total for Question 4 is 1 mark)

5   Work out $7 - -9$

16

(Total for Question 5 is 1 mark)

6   Work out $-5 - -12$

7

(Total for Question 6 is 1 mark)

7   Work out $-5 + 8$

3

(Total for Question 7 is 1 mark)

8   Work out $16 - -4$

20

(Total for Question 8 is 1 mark)

9 Here are four numbers.

  -5   -4   4   ~5

Write one of these numbers in each box to make a correct calculation.

$$\boxed{-5} + \boxed{-4} = -9$$

OR $\boxed{-4}$ + $\boxed{-5}$

(Total for Question 9 is 1 mark)

10 Here are four numbers.

  -7   -2   2   7

Write one of these numbers in each box to make a correct calculation.

$$\boxed{2} + \boxed{-7} = -5$$

OR $\boxed{-7}$ + $\boxed{2}$

(Total for Question 10 is 1 mark)

11 Here are four numbers.

  -8   -2   2   8

Write one of these numbers in each box to make a correct calculation.

$$\boxed{-8} - \boxed{2} = -10$$

OR $\boxed{-2}$ − $\boxed{8}$

(Total for Question 11 is 1 mark)

12 Here are four numbers.

  -9   -3   3   9

Write one of these numbers in each box to make a correct calculation.

$$\boxed{9} - \boxed{-3} = 12$$

OR $\boxed{3}$ − $\boxed{-9}$

(Total for Question 12 is 1 mark)

13 Work out   5 × -4

−20

(Total for Question 13 is 1 mark)

14 Work out   -7 × 3

−21

(Total for Question 14 is 1 mark)

15 Work out   -2 × -6

12

(Total for Question 15 is 1 mark)

16 Work out   -4 × 9

−36

(Total for Question 16 is 1 mark)

17 Work out   -32 ÷ 4

−8

(Total for Question 17 is 1 mark)

18 Work out   -25 ÷ 5

−5

(Total for Question 18 is 1 mark)

19 Work out   -42 ÷ -7

6

(Total for Question 19 is 1 mark)

20 Work out   -2 × 4 × -9

−8 × −9

72

(Total for Question 20 is 1 mark)

21

$$4 \times -3 = -12$$

Write a number in the box to make a correct calculation.

(Total for Question 21 is 1 mark)

22

$$-10 \times 2 = -20$$

Write a number in the box to make a correct calculation.

(Total for Question 22 is 1 mark)

23

$$-6 \times -4 = 24$$

Write a number in the box to make a correct calculation.

(Total for Question 23 is 1 mark)

24

$$-2 \times 8 = -16$$

Write a number in the box to make a correct calculation.

(Total for Question 24 is 1 mark)

25

$$-18 \div -2 = 9$$

Write a number in the box to make a correct calculation.

(Total for Question 25 is 1 mark)

26

$$27 \div -3 = -9$$

Write a number in the box to make a correct calculation.

(Total for Question 26 is 1 mark)

27 Here is a number sequence.

| 11 | 6 | 1 | -4 | -9 |

Fill in the missing boxes to continue the sequence.

(Total for Question 27 is 2 marks)

28 Here is a number sequence.

| -20 | -12 | -4 | 4 | 12 |

Fill in the missing boxes to continue the sequence.

(Total for Question 28 is 2 marks)

29 Here is a number sequence.

| -11 | -7 | -3 | 1 | 5 |

Fill in the missing boxes to complete the sequence.

(Total for Question 29 is 2 marks)

30 Here is a number sequence.

| 25 | 10 | -5 | -20 | -35 |

Fill in the missing boxes to complete the sequence.

(Total for Question 30 is 2 marks)

31 The temperature in Glasgow one day was -4°C
The next day the temperature was 3°C lower.

Work out the new temperature.

−7 °C

(Total for Question 31 is 1 mark)

32 The temperature in London at midnight was -3°C
By 11 am, the temperature had risen by 5°C.

Work out the temperature at 11 am.

2 °C

(Total for Question 32 is 1 mark)

33 The temperature in Leeming at midnight was -2°C
The temperature in Leeming at midday was 8°C

Work out the difference between the temperature in Leeming at midnight and midday.

10 °C

(Total for Question 33 is 1 mark)

34 The table shows the temperature in four cities on a day in January.

City	Temperature
London	3 °C
New York	-2 °C
Tokyo	5 °C
Oslo	-4 °C

(a) Write down the name of the city with the lowest temperature.

Oslo

(1)

(b) Work out the difference between the temperature in New York and the temperature in Tokyo.

7 °C

(1)

The next day the temperature in New York increased by 3 °C.
(c) Work out the new temperature in New York.

1 °C

(1)

(Total for Question 34 is 3 marks)

35   The table shows the temperature at midnight and midday on January 2nd 2020 in four cities.

City	Midnight Temperature	Midday Temperature
Murmansk	-9 °C	-6 °C
Budapest	-3 °C	4 °C
Paris	4 °C	8 °C
Prague	-4 °C	1 °C

(a) Write down the name of the city with the lowest midnight temperature.

Murmansk
(1)

(b) Which city had the greatest rise in temperature from midnight to midday?

Budapest
(1)

(c) At midnight, how many degrees colder was Murmansk than Paris?

_13_ °C
(1)

(Total for Question 35 is 3 marks)

36   The table shows the temperature at midnight on 1 December 2019 in cities.

City	Temperature
Helsinki	-6 °C
Berlin	3 °C
Utrecht	-2 °C
Rome	7 °C

(a) Write down the name of the city with the lowest temperature.

Helsinki
(1)

(b) Work out the difference between the temperature in Utrecht and Rome.

_9_ °C
(1)

(Total for Question 36 is 2 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}

$$\frac{1}{125}$$

(1)

(b) Write down the value of 5^0

$$1$$

(1)

(Total for question 6 is 2 marks)

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

$$25 \times 8$$

$$200$$

(Total for question 7 is 1 mark)

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

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

(Total for question 8 is 1 mark)

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)

(Total for question 9 is 2 marks)

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

Find the value of a.

$a = \underline{-2}$

(1)

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

$$16m^8$$

(2)

(Total for question 10 is 3 marks)

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

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

.............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 $\dfrac{2^9 \times 2^{-2}}{2^4}$

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

.............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.

$$\left(10^3\right)^4 = 10^x$$
$$10^{12} = 10^x$$

$$12$$

(Total for question 15 is 1 mark)

---

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

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

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

(Total for question 16 is 2 marks)

---

17 Write down the reciprocal of 8

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

(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

................$\dfrac{1}{2}$................

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

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

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

(Total for question 25 is 2 marks)

OR $2.5rq^{-1}$

1 Find the value of 3^{-1} ← flip

$$\left(\frac{3}{1}\right)^{-1}$$

$\dfrac{1}{3}$

(Total for question 1 is 1 mark)

2 Find the value of $\left(\dfrac{4}{5}\right)^{-1}$

$\dfrac{5}{4}$

(Total for question 2 is 1 mark)

3 Find the value of 5^{-1}

$\dfrac{1}{5}$

(Total for question 3 is 1 mark)

4 Find the reciprocal of 3

$\dfrac{1}{3}$

(Total for question 4 is 1 mark)

5   Find the value of $100^{\frac{1}{2}}$ ← square root

_10_

(Total for question 5 is 1 mark)

6   Find the value of $64^{\frac{1}{2}}$

_8_

(Total for question 6 is 1 mark)

7   Find the value of $49^{\frac{1}{2}}$

_7_

(Total for question 7 is 1 mark)

8   Find the value of $81^{\frac{1}{2}}$

_9_

(Total for question 8 is 1 mark)

9   Find the value of $36^{-\frac{1}{2}}$ ← square root and flip

$\dfrac{1}{6}$

(Total for question 9 is 1 mark)

10 Find the value of $64^{\frac{1}{3}}$ ← cube root

4

(Total for question 10 is 1 mark)

11 Find the value of $8^{\frac{1}{3}}$

2

(Total for question 11 is 1 mark)

12 Find the value of $27^{\frac{1}{3}}$

3

(Total for question 12 is 1 mark)

13 Find the value of $125^{\frac{1}{3}}$

5

(Total for question 13 is 1 mark)

14 Find the value of $64^{-\frac{1}{3}}$ ← cube root and flip

$\dfrac{1}{4}$

(Total for question 14 is 1 mark)

15 Find the value of $64^{-\frac{2}{3}}$ ← cube root, square and flip

$$(4)^{-2}$$

$$(16)^{-1}$$

$$\frac{1}{16}$$

(Total for question 15 is 2 marks)

16 Find the value of $125^{\frac{2}{3}}$ ← cube root and square

$$(5)^2$$

$$25$$

(Total for question 16 is 2 marks)

17 Find the value of $8^{-\frac{2}{3}}$

$$(2)^{-2}$$

$$(4)^{-1}$$

$$\frac{1}{4}$$

(Total for question 17 is 2 marks)

18 Find the value of $27^{-\frac{2}{3}}$

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

$$(9)^{-1}$$

$$\frac{1}{9}$$

(Total for question 18 is 2 marks)

19 Find the value of $(8x^6)^{\frac{2}{3}}$

$$(2x^2)^2$$

$$4x^4$$

(Total for question 19 is 2 marks)

20 Find the value of $\left(\dfrac{64}{125}\right)^{-\frac{2}{3}}$

$$\left(\frac{4}{5}\right)^{-2}$$

$$\left(\frac{16}{25}\right)^{-1}$$

$\dfrac{25}{16}$

(Total for question 20 is 2 marks)

21 Find the value of $\left(\dfrac{25}{16}\right)^{-\frac{3}{2}}$

$$\left(\frac{5}{4}\right)^{-3}$$

$$\left(\frac{125}{64}\right)^{-1}$$

$\dfrac{64}{125}$

(Total for question 21 is 2 marks)

22 Find the value of $\left(\dfrac{8}{27}\right)^{-\frac{2}{3}}$

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

$$\left(\frac{4}{9}\right)^{-1}$$

$\dfrac{9}{4}$

(Total for question 22 is 2 marks)

23 Find the value of $\left(\dfrac{9}{4}\right)^{-\frac{3}{2}}$

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

$$\left(\frac{27}{8}\right)^{-1}$$

$\dfrac{8}{27}$

(Total for question 23 is 2 marks)

24 Find the value of $\sqrt[4]{2 \times 8 \times 10^{12}}$

$$\sqrt[4]{16 \times 10^{12}}$$

$$2 \times 10^{3}$$

2000

(Total for question 24 is 2 marks)

25 Find the value of $\sqrt[3]{4 \times 16 \times 10^{15}}$

$$\sqrt[3]{64 \times 10^{15}}$$

$$4 \times 10^5$$

400000
....
(Total for question 25 is 2 marks)

26 Given that $3 \times \sqrt{3} = 3^n$
Find the value n.

$$3^1 \times 3^{\frac{1}{2}} = 3^{\frac{3}{2}}$$

$\dfrac{3}{2}$
....
(Total for question 26 is 2 marks)

27 Given that $3 \times \sqrt{27} = 3^n$
Find the value n.

$$3^1 \times \sqrt{3^3}$$

$$3^1 \times 3^{\frac{3}{2}} = 3^{\frac{5}{2}}$$

$\dfrac{5}{2}$
....
(Total for question 27 is 2 marks)

28 Given that $x = 2^p$ and $y = 2^q$
Express in terms of x and/or y,

(i) 2^{p+q}

$$2^p \times 2^q$$

$x \times y$
....

(ii) 2^{2p}

$$2^p \times 2^p$$

x^2
....

(iii) 2^{q-1}

$$2^q \div 2^1$$

$\dfrac{y}{2}$
....

(Total for question 28 is 3 marks)

29 Given that $3^{-n} = 0.2$

Find the value of $(3^n)^2$

$$3^{-n} = \frac{1}{5}$$
$$3^n = 5$$
$$(3^n)^2 = 25$$

25

(Total for question 29 is 2 marks)

30 Given that $5^{-n} = 0.5$

Find the value of $(5^n)^3$

$$5^{-n} = \frac{1}{2}$$
$$5^n = 2$$
$$(5^n)^3 = 8$$

8

(Total for question 30 is 2 marks)

31 Given that $4^n = 8$

Find the value of n.

$$4^n = 8$$
$$(2^2)^n = 8$$
$$2^{2n} = 2^3$$
$$2n = 3$$

$n = 1.5$

(Total for question 31 is 2 marks)

32 Given that $4^{-n} = 32$

Find the value of n.

$$4^{-n} = 32$$
$$2^{-2n} = 2^5$$
$$-2n = 5$$
$$n = -2.5$$

$n = -2.5$

(Total for question 32 is 2 marks)

1   A rectangle has a length of 21 cm, to the nearest cm, and a width of 5.3 cm, to the nearest mm.

(a) Work out the upper bound for the perimeter of the rectangle.

20 ↑ 21 ↑ 22   5.2 ↑ 5.3 ↑ 5.4
  20.5   21.5   5.25 5.35
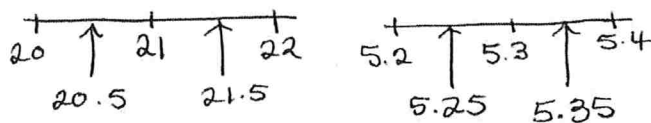
$2(21.5) + 2(5.35)$

..........53.7.......... cm
(2)

(b) Work out the lower bound for the area of the rectangle.

20.5×5.25

..........107.625.......... cm²
(2)

(Total for question 1 is 4 marks)

2   A circle has a radius of 5 cm, to the nearest cm.

(a) Work out the lower bound for the circumference of the circle.
Give your answer in terms of π.
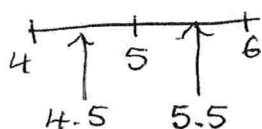
4 ↑ 5 ↑ 6 $2\pi(4.5)$
  4.5   5.5

..........9π.......... cm
(2)

(b) Work out the upper bound for the area of the circle.
Give your answer in terms of π.

$\pi(5.5)^2$

..........30.25π.......... cm²
(2)

(Total for question 2 is 4 marks)

3 A rectangular field has a length of 105 metres, to the nearest 5 metres, and a width of 53 metres, to the nearest metre.

(a) Work out the lower bound for the perimeter of the field.

100 ↑ 105 ↑ 110   52 ↑ 53 ↑ 54

102.5   107.5   52.5   53.5
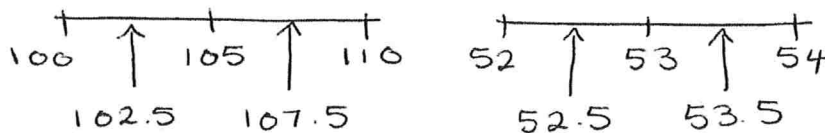
$2(102.5) + 2(52.5)$

310 ....m

(2)

(b) Work out the upper bound for the area of the field.

107.5×53.5

5751.25 ......m²

(2)

(Total for question 3 is 4 marks)

---

4 A circle has a radius of 5.36cm, correct to 2 decimal places.

(a) Work out the lower bound for the circumference of the circle.

Give your answer to 2 decimal places.

5.35 ↑ 5.36 ↑ 5.37

5.355   5.365
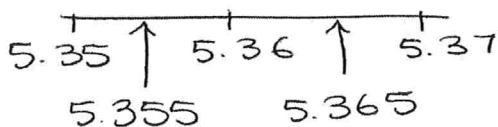
$2\pi(5.355)$

33.65 ......cm

(2)

(b) Work out the upper bound for the area of the circle.

Give your answer to 3 significant figures.

$\pi(5.365)^2$

90.4 ......cm²

(2)

(Total for question 4 is 4 marks)

5

$$v = \frac{s}{t}$$

$s = 4.15$ correct to 2 decimal places
$t = 2.516$ correct to 3 decimal places

Work out the upper bound for v.

Give your answer to 3 decimal places.

upper $v = \dfrac{\text{upper } s}{\text{lower } t}$

S

4.14   4.15   4.16
    4.145   4.155

t

2.515   2.516   2.517
    2.5155   2.5165
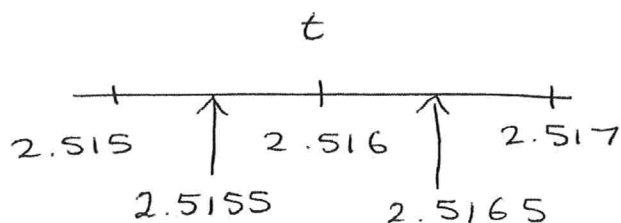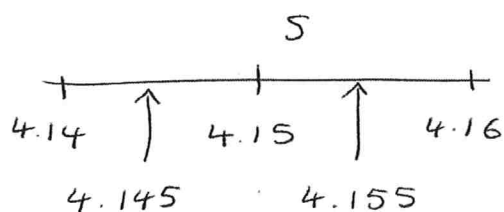
$$\frac{4.155}{2.5155}$$

1.652

(Total for question 5 is 3 marks)

6

$$V = IR$$

$I = 5.92$ correct to 2 decimal places
$R = 12.356$ correct to 3 decimal places

Work out the upper bound for V.
Give your answer to 3 decimal places.

upper V = upper I ✕ upper R

I

5.91   5.92   5.93
    5.915   5.925

R

12.355   12.356   12.357
    12.3555   12.3565
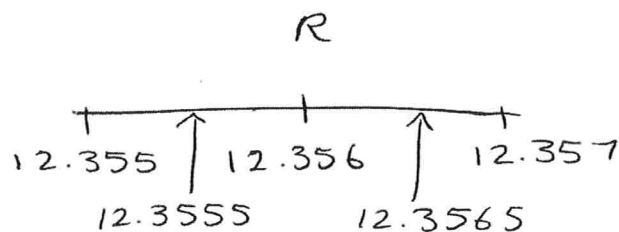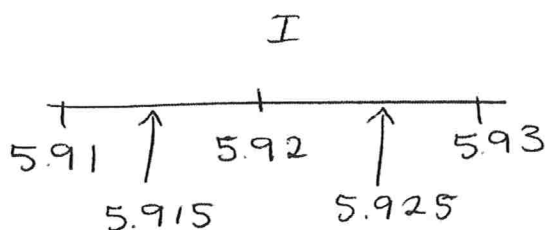
5.925×12.3565

73.212

(Total for question 6 is 3 marks)

7
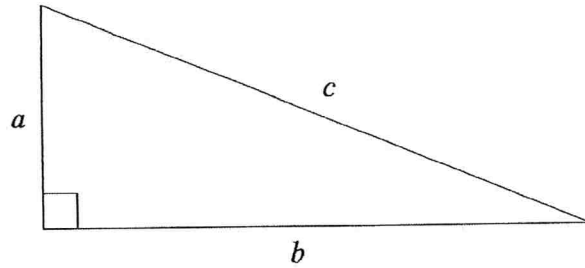
a = 5.3 cm correct to the nearest mm
b = 8.2 cm correct to the nearest mm

$$a^2 + b^2 = c^2$$

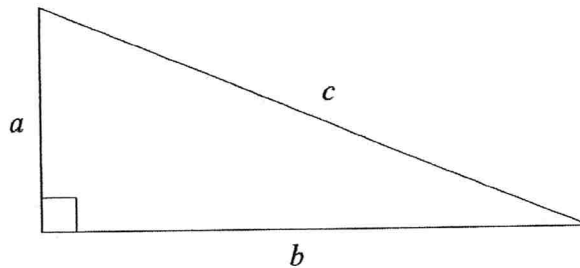Calculate the lower bound for c.
You must show all your working.

Give your answer to 3 significant figures.

a

5.2 ↑ 5.3 ↑ 5.4   8.1 ↑ 8.2 ↑ 8.3
   5.25 5.35   8.15 8.25

b

$$\sqrt{(5.25)^2 + (8.15)^2}$$

.................9.69.................cm

(Total for question 7 is 4 marks)

8

a = 4.1 cm correct to the nearest mm
c = 10 cm correct to the nearest cm

$$b^2 = c^2 - a^2$$
$$(\text{Lower } b)^2 = (\text{Lower } c)^2 - (\text{upper } a)^2$$

Calculate the lower bound for b.
You must show all your working.

Give your answer to 1 decimal place.

a

4.0 ↑ 4.1 ↑ 4.2   9 ↑ 10 ↑ 11
   4.05 4.15   9.5 10.5

c

$$\sqrt{(9.5)^2 - (4.15)^2}$$
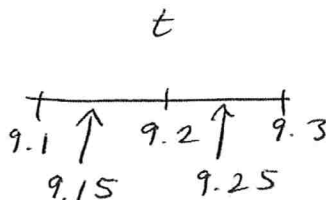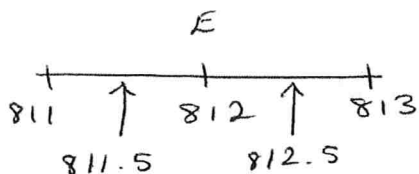
.................8.5.................cm

(Total for question 8 is 4 marks)

9

$$P = \frac{E}{t}$$

$E = 812$ correct to 3 significant figures

$T = 9.2$ correct to 1 decimal place

By considering bounds, work out the value of P to a suitable degree of accuracy.
Give a reason for your answer.

E

811 ↑ 812 ↑ 813
  811.5   812.5

t

9.1 ↑ 9.2 ↑ 9.3
   9.15   9.25

upper P = $\frac{\text{upper } E}{\text{lower } t}$

$= \frac{812.5}{9.15}$

$= 88.79781421$

lower P = $\frac{\text{lower } E}{\text{upper } t}$

$= \frac{811.5}{9.25}$

$= 87.72972973$

Both round to 90 (1sf)

90

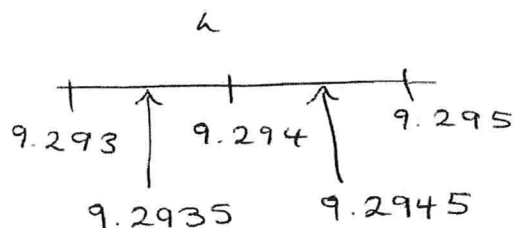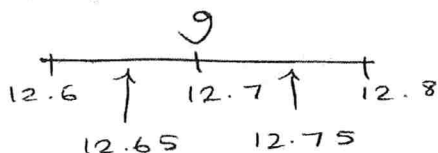**(Total for question 9 is 5 marks)**

10

$$f = \frac{\sqrt{g}}{h}$$

$g = 12.7$ correct to 3 significant figures

$h = 9.294$ correct to 3 decimal places

By considering bounds, work out the value of f to a suitable degree of accuracy.
Give a reason for your answer.

g

12.6 ↑ 12.7 ↑ 12.8
   12.65   12.75

h

9.293 ↑ 9.294 ↑ 9.295
     9.2935   9.2945

upper f = $\frac{\sqrt{\text{upper } g}}{\text{lower } h}$

$= \frac{\sqrt{12.75}}{9.2935}$

$= 0.3842163033$

upper lower f = $\frac{\sqrt{\text{lower } g}}{\text{upper } h}$

$= \frac{\sqrt{12.65}}{9.2945}$

$= 0.3826654331$

Both round to 0.38 (2dp/2sf)

0.38

(Total for question 10 is 5 marks)

11

$$F = 25.14 \text{ N correct to 2 decimal places}$$
$$A = 4.29 \text{ m}^2 \text{ correct to 3 significant figures}$$
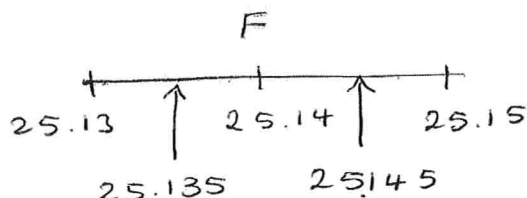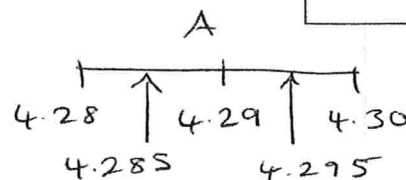
$$p = \frac{F}{A}$$

p = pressure
F = force
A = area

By considering bounds, work out the value of p to a suitable degree of accuracy.
Give a reason for your answer.

F

25.13   25.14   25.15

25.135   25145

A

4.28   4.29   4.30

4.285   4.295

$$\text{upper } P = \frac{\text{upper } F}{\text{lower } A}$$

$$\text{lower } P = \frac{\text{lower } F}{\text{upper } A}$$

$$= \frac{25.145}{4.285}$$

$$= \frac{25.135}{4.295}$$

$$= 5.868144691$$

$$= 5.852153667$$

Both round to 5.9 (2sf / 1dp)

5.9 ....Nm⁻²

(Total for question 11 is 3 marks)

12

$$F = 20.81 \text{ N correct to 2 decimal places}$$
$$P = 5.12 \text{ Nm}^{-2} \text{ correct to 3 significant figures}$$
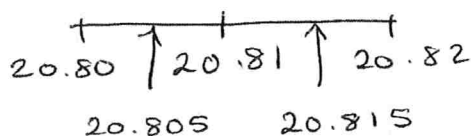
$$p = \frac{F}{A}$$

p = pressure
F = force
A = area

By considering bounds, work out the value of A to a suitable degree of accuracy.
Give a reason for your answer.

$$A = \frac{F}{P}$$

F

20.80   20.81   20.82

20.805   20.815

P

5.11   5.12   5.13

5.115   5.125

$$\text{upper } A = \frac{20.815}{5.115}$$
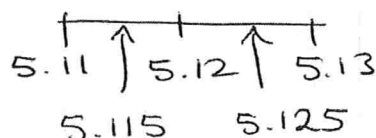
$$\text{lower } A = \frac{20.805}{5.125}$$

$$= 4.069403715$$

$$= 4.059512195$$

Both round to 4.1 (2sf / 1dp)

4.1 ....m²

(Total for question 12 is 3 marks)

13

$$v^2 = u^2 + 2as$$

$v = 35.2$ correct to 1 decimal place
$a = 9.8$ correct to 1 decimal place
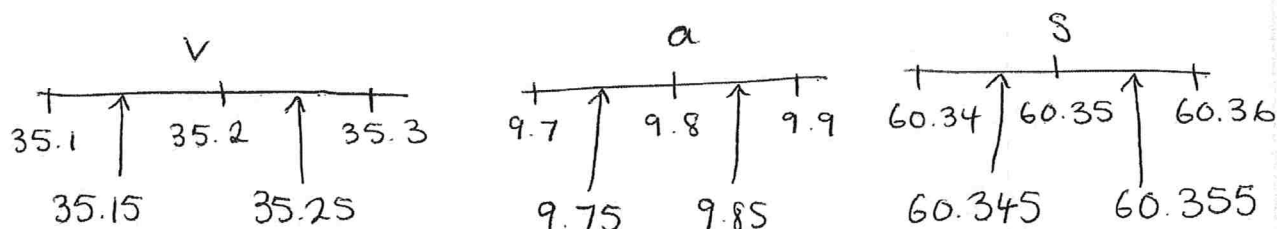$s = 60.35$ correct to 2 decimal places

Work out the upper bound for u.
Give your answer to 3 significant figures.

$$v^2 - 2as = u^2$$

$$\sqrt{v^2 - 2as} = u$$

$$\text{upper } u = \sqrt{(\text{upper } v)^2 - 2(\text{lower } a)(\text{lower } s)}$$

$$\text{upper } u = \sqrt{(35.25)^2 - 2(9.75)(60.345)}$$

$$= 8.113877002$$

$$= 8.11 \ (3sf)$$

8.11

(Total for question 13 is 5 marks)

1 There are 12 boys and 15 girls in a class.
One boy and one girl will be selected to represent the class on the student council.
Work out the total number of ways of choosing a boy and a girl.

12×15

180

(Total for question 1 is 2 marks)

2 There are 17 boys and 14 girls in a choir.
One boy and one girl will be selected to sing a duet.
Work out the total number of ways of choosing a boy and a girl.

17×14

238

(Total for question 2 is 2 marks)

3 There are 14 boys and x girls in a choir.
One boy and one girl will be selected to sing a duet.
Taylor says there are 152 different ways of choosing a boy and a girl.

Could Taylor be correct?
You must show your working.

$14x = 152$

$x = 10.857\ldots$

Taylor cannot be correct. 152 is not divisible by 14.

(You cannot have 0.857 of a girl)

(Total for question 3 is 2 marks)

4   There are 5 starters and 6 main courses in a restaurant.

Work out the total number of ways of choosing a starter and a main course.

$$5 \times 6$$

30

(Total for question 4 is 2 marks)

5   There are 4 starters, 7 main courses and 4 desserts in a restaurant.

Work out the total number of ways of choosing a starter, a main course and a dessert.

$$4 \times 7 \times 4$$

112

(Total for question 5 is 2 marks)

6   There are 5 starters, 6 main course and x desserts in a restaurant.

Riley says there are 130 different ways of a starter, a main course and a dessert.

Could Riley be correct?
You must show your working.

$$30x = 130$$
$$x = 4.\dot{3}$$

Riley cannot be correct. x would have to be a whole number.

(Total for question 6 is 2 marks)

7   A meal deal includes a sandwich and a drink.
     There are 5 sandwiches and 7 drinks to choose from.

     Work out the total number of ways of choosing a sandwich and a drink.

     5×7

     3 5
     (Total for question 7 is 2 marks)

8   Mr Idris has 5 pairs of trousers, 9 shirts and 3 ties.

     Work out the total number of ways of choosing a pair of trousers, a shirt and a tie.

     $5 \times 9 \times 3$

     135
     (Total for question 8 is 2 marks)

9   There are 8 sandwiches and x drinks to choose from for lunch.

     Pat says there are 96 different ways to choose a sandwich and a drink.

     Could Pat be correct?
     You must show your working.

     $8x = 96$
     $x = 12$

     Pat could be correct. x could be 12.

     (Total for question 9 is 2 marks)

10 There are 52 cards in a deck.
Peter is going to give one card to Casper and one card to Kelly.

How many different ways are there of going this?

52×51

2652

(Total for question 10 is 2 marks)

11 There are 52 cards in a deck.
Angel is going to give one card to Ben and one card to Chris and one card to Dylan.

How many different ways are there of going this?

$52 \times 51 \times 50$

132600

(Total for question 11 is 2 marks)

12 There are 52 cards in a deck.
Tom is going to give two cards to Jay.

How many different pairs of cards could Jay get?

$$52 \times 51 \over 2$$

/326

13 There are 30 students in a class.
Two students are going to be selected to receive a prize.

How many different pairs of ~~two~~ students could be selected?

$$30 \times 29 \over 2$$

435

14 There are 10 teams in a football league.
Two teams are going to be chosen at random to play a match.

Work out the number of different matches that could take place.

$$\frac{10 \times 9}{2}$$

............4 5............

(Total for question 14 is 2 marks)

15 There are 8 teams in a competition.
Each team will play every other team once.

Work out the total number of games played.

$$\frac{8 \times 7}{2}$$

............2 8............

(Total for question 15 is 2 marks)

16 There are 10 people in a room.
Each person shakes each other person's hand once.

Work out the number handshakes that take place.

$$\frac{10 \times 9}{2}$$

45

17 There are 20 people in a room.
Each person shakes each other person's hand once.

Work out the number handshakes that take place.

$$\frac{20 \times 19}{2}$$

190

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 $a \times 2 \times 5$

$$10a$$
(1)

(b) Simplify $b \times b$

$$b^2$$
(1)

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

$$\dfrac{8y}{2}$$

$$4y$$
(1)

(Total for question 15 is 3 marks)

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

$$14st$$
(1)

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

$$4a - b$$
(2)

(Total for question 16 is 3 marks)

17 (a) Simplify $6f - f$

$$5f$$
(1)

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

$$10x^2 + 3x$$
(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 $a^2 + a^2 + a^2$

$$3a^2$$
(1)

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

$-3rs + 4rs$

$$rs$$
(1)

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

$$-2a - 4$$
(2)

(Total for question 21 is 4 marks)

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

$3n - n$

$$2n$$
(1)

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

$5xy - xy$

$$4xy$$
(1)

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

$$3a + 6b + 6$$
(2)

(Total for question 22 is 4 marks)

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

$\underline{14x + 49}$
(1)

(b) Factorise $3y + 12$

$\underline{3(y + 4)}$
(1)

(Total for Question 1 is 2 marks)

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

$\underline{5a^2 - 30a}$
(2)

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

$4b + 8 = 24$

$4b = 16$

$b = 4$

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

(Total for Question 2 is 4 marks)

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

$\underline{4m(3 + 2m)}$
(2)

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

$3n - 15 = 27$

$3n = 42$

$n = 14$

$n = \underline{14}$
(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 $p(p-3)$

$\underline{p^2 - 3p}$

(1)

(b) Factorise $16q + 8$

$\underline{8(2q+1)}$

(1)

(Total for Question 7 is 2 marks)

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

$\underline{2x(3x - 2y)}$

(2)

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

$2w - 8 = 13$

$2w = 21$

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

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

(2)

(Total for Question 8 is 4 marks)

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

$\underline{x(x - 9)}$

(1)

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

$\underline{30y + 6}$

(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 $6(p + 3) = 42$

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

$p = \underline{\qquad 4 \qquad}$
(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 $n(5n + 1)$

$$5n^2 + n$$
(1)

(b) Factorise $18m + mn$

$$m(18 + n)$$
(1)

(Total for Question 19 is 2 marks)

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

$$21x^3 - 3xy$$
(2)

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

$$18y + 15 - 8y + 2$$

$$10y + 17$$
(2)

(Total for Question 20 is 4 marks)

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

$$6abc(3a + 5c)$$
(2)

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

$$8y - 28 - 15y + 9$$

$$-7y - 19$$
(2)

(Total for Question 21 is 4 marks)

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

(2 marks)

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

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

(4 marks)

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

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

(4 marks)

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

(2 marks)

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

(b) Factorise $x^2+10x+25$ (1)

(3 marks)

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

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

(4 marks)

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

(2 marks)

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

(b) Factorise x^2-49 (1)

(3 marks)

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

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

(4 marks)

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

(2 marks)

11 (a) Expand and simplify $(x-6)(x-7)$ (2)

(b) Factorise x^2-16 (1)

(3 marks)

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

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

(4 marks)

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

(2 marks)

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

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

$$x^2 + 4x - 21$$

(Total for Question 1 is 2 marks)

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

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

$$2p^2 - 13p + 15$$

(2)

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

36

1	36
2	18
3	12
4	9
6	6

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

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

(2)

(Total for Question 2 is 4 marks)

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

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

$$x^2 - 9$$

(2)

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

7

| 1 | 7 |

$(x - 1)(x - 7)$

(2)

(Total for Question 3 is 4 marks)

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

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

$$m^2 + 7m + 12$$

(Total for Question 4 is 2 marks)

---

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

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

$$6x^2 + 7x - 3$$

(2)

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

25
1   25
5   5

$$(x + 5)(x + 5)$$

(1)

(Total for Question 5 is 3 marks)

---

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

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

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

(2)

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

6
1   6
2   3

$$(x + 1)(x + 6)$$

(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 $n^2 - 3n - 18$

```
      1 8
  1     1 8
  2     9
  3     6
```

$$(n+3)(n-6)$$
(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
1   36
2   18
3   12
4   9
6   6
```

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

(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

$1 \quad 40$

$2 \quad 20$

$4 \quad 10$

$5 \quad 8$

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

(2)

(Total for Question 15 is 4 marks)

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

$$2 \quad 8$$
$$1 \quad 28$$
$$2 \quad 14$$
$$4 \quad 7$$

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

(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 $y^2 - 7y + 12$

$$1 \quad 2$$
$$1 \quad 12$$
$$2 \quad 6$$
$$3 \quad 4$$

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

(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 Expand and Simplify $(x+2)(x+4)(x+1)$

$$(x+2)(x^2 + x + 4x + 4)$$

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

$$x^3 + 5x^2 + 4x + 2x^2 + 10x + 8$$

$$x^3 + 7x^2 + 14x + 8$$

$$x^3 + 7x^2 + 14x + 8$$

(Total for question 1 is 3 marks)

2 Expand and Simplify $(x-3)(x+5)(x-2)$

$$(x-3)(x^2 - 2x + 5x - 10)$$

$$(x-3)(x^2 + 3x - 10)$$

$$x^3 + 3x^2 - 10x - 3x^2 - 9x + 30$$

$$x^3 - 19x + 30$$

$$x^3 - 19x + 30$$

(Total for question 2 is 3 marks)

3 Expand and Simplify $(x+2)(x+1)(x+5)$

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

$$(x+2)(x^2+6x+5)$$

$$x^3+6x^2+5x+2x^2+12x+10$$

$$x^3+8x^2+17x+10$$

$$x^3+8x^2+17x+10$$

(Total for question 3 is 3 marks)

4 Expand and Simplify $(x+4)(x+5)(x-4)$

$$(x+4)(x^2-4x+5x-20)$$

$$(x+4)(x^2+x-20)$$

$$x^3+x^2-20x+4x^2+4x-80$$

$$x^3+5x^2-16x-80$$

$$x^3+5x^2-16x-80$$

(Total for question 4 is 3 marks)

5 Expand and Simplify $(x+3)(x-1)^2$

$$(x+3)(x-1)(x-1)$$

$$(x+3)(x^2-x-x+1)$$

$$(x+3)(x^2-2x+1)$$

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

$$\underline{x^3+x^2-5x+3}$$

$$x^3+x^2-5x+3$$

(Total for question 5 is 3 marks)

6 Expand and Simplify $(x+5)(x-3)(2x-1)$

$$(x+5)(2x^2-x-6x+3)$$

$$(x+5)(2x^2-7x+3)$$

$$2x^3-7x^2+3x+10x^2-35x+15$$

$$\underline{2x^3+3x^2-32x+15}$$

$$2x^3+3x^2-32x+15$$

(Total for question 6 is 3 marks)

7 Expand and Simplify $(2x + 1)(x + 2)(x + 3)$

$$(2x+1)(x^2 + 3x + 2x + 6)$$

$$(2x+1)(x^2 + 5x + 6)$$

$$2x^3 + 10x^2 + 12x + x^2 + 5x + 6$$

$$2x^3 + 11x^2 + 17x + 6$$

$$2x^3 + 11x^2 + 17x + 6$$

(Total for question 7 is 3 marks)

8 Expand and Simplify $(2x - 3)(x - 2)(3x - 1)$

$$(2x - 3)(3x^2 - x - 6x + 2)$$

$$(2x - 3)(3x^2 - 7x + 2)$$

$$6x^3 - 14x^2 + 4x - 9x^2 + 21x - 6$$

$$6x^3 - 23x^2 + 25x - 6$$

$$6x^3 - 23x^2 + 25x - 6$$

(Total for question 8 is 3 marks)

9 Expand and Simplify $(x-2)(3x+2)(x+5)$

$$(x-2)(3x^2+15x+2x+10)$$

$$(x-2)(3x^2+17x+10)$$

$$3x^3+17x^2+10x-6x^2-34x-20$$

$$3x^3+11x^2-24x-20$$

$$3x^3+11x^2-24x-20$$

(Total for question 9 is 3 marks)

10 Expand and Simplify $(3x+1)(x+2)(x-4)$

$$(3x+1)(x^2-4x+2x-8)$$

$$(3x+1)(x^2-2x-8)$$

$$3x^3-6x^2-24x+x^2-2x-8$$

$$3x^3-5x^2-26x-8$$

$$3x^3-5x^2-26x-8$$

(Total for question 10 is 3 marks)

11 Show that $(2x + 3)(5x + 2)(x - 5) = 10x^3 - 31x^2 - 89x - 30$

for all values of x.

$$(2x+3)(5x^2 - 25x + 2x - 10)$$

$$(2x+3)(5x^2 - 23x - 10)$$

$$10x^3 - 46x^2 - 20x + 15x^2 - 69x - 30$$

$$10x^3 - 31x^2 - 89x - 30$$

(Total for question 11 is 3 marks)

12 Show that $(2x - 1)(3x + 2)^2 = 18x^3 + 15x^2 - 4x - 4$

for all values of x.

$$(2x-1)(3x+2)(3x+2)$$

$$(2x-1)(9x^2 + 6x + 6x + 4)$$

$$(2x-1)(9x^2 + 12x + 4)$$

$$18x^3 + 24x^2 + 8x - 9x^2 - 12x - 4$$

$$18x^3 + 15x^2 - 4x - 4$$

(Total for question 12 is 3 marks)

13 Show that $(3x - 1)(4x + 3)(x - 9) = 12x^3 - 103x^2 - 48x + 27$

for all values of x.

$$(3x - 1)(4x^2 - 36x + 3x - 27)$$

$$(3x - 1)(4x^2 - 33x - 27)$$

$$12x^3 - 99x^2 - 81x - 4x^2 + 33x + 27$$

$$12x^3 - 103x^2 - 48x + 27$$

(Total for question 13 is 3 marks)

14 Show that $(5x - 4)(3x + 1)(2x - 7) = 30x^3 - 119x^2 + 41x + 28$

for all values of x.

$$(5x - 4)(6x^2 - 21x + 2x - 7)$$

$$(5x - 4)(6x^2 - 19x - 7)$$

$$30x^3 - 95x^2 - 35x - 24x^2 + 76x + 28$$

$$30x^3 - 119x^2 + 41x + 28$$

(Total for question 14 is 3 marks)

1 $f = 7$
    $g = 5$

Work out the value of $3f + 2g$

$$3(7) + 2(5)$$
$$21 + 10$$

31

(Total for Question 1 is 2 marks)

2 $c = 4d - 7$

Find the value of c when $d = 6$

$$c = 4(6) - 7$$
$$= 24 - 7$$
$$= 17$$

17

(Total for Question 2 is 2 marks)

3 $v = u + at$

$u = 3$
$a = 10$
$t = 6$

$$v = 3 + 10(6)$$
$$= 3 + 60$$
$$= 63$$

Work out the value of v.

$v =$ 63

(Total for Question 3 is 2 marks)

4 $x = 4$
    $y = 6$

Work out the value of $3x - y$

$$3(4) - 6$$
$$12 - 6$$
$$6$$

6

(Total for Question 4 is 2 marks)

5 $L = 9m + 2n$

Work out the value of L when $m = 3$ and $n = -6$

$$L = 9(3) + 2(-6)$$
$$= 27 - 12$$
$$= 15$$

15

(Total for Question 5 is 2 marks)

6 $q = 5p + 3r$

$p = 6$
$r = -4$

Work out the value of q.

$$q = 5(6) + 3(-4)$$
$$= 30 - 12$$
$$= 18$$

18

(Total for Question 6 is 2 marks)

7 $H = 4f + g$

Work out the value of H when $f = 5$ and $g = -2$

$$H = 4(5) - 2$$
$$= 20 - 2$$
$$= 18$$

18

(Total for Question 7 is 2 marks)

8 $A = 4p + 5q$

$p = 3$
$q = -2$

Work out the value of A.

$$A = 4(3) + 5(-2)$$
$$= 12 - 10$$
$$= 2$$

2

(Total for Question 8 is 2 marks)

9 $L = 9m + 2n$

Work out the value of L when $m = -3$ and $n = 4$

$$L = 9(-3) + 2(4)$$
$$= -27 + 8$$
$$= -19$$

—19

(Total for Question 9 is 2 marks)

10 $q = 6p - r$

$p = -4$
$r = 5$

Work out the value of q.

$$q = 6(-4) - 5$$
$$= -24 - 5$$
$$= -29$$

—29

(Total for Question 10 is 2 marks)

11 $H = f - 2g$

Work out the value of H when $f = 12$ and $g = -6$

$$H = 12 - 2(-6)$$
$$= 12 + 12$$
$$= 24$$

24

(Total for Question 11 is 2 marks)

12 $A = 5p + 6q$

$p = 10$
$q = -2$

Work out the value of A.

$$A = 5(10) + 6(-2)$$
$$= 50 - 12$$
$$= 38$$

38

(Total for Question 12 is 2 marks)

13 $L = m(n - 2)$

Work out the value of L when $m = 9$ and $n = 5$

$$L = 9(5 - 2)$$
$$= 9(3)$$
$$= 27$$

27

(Total for Question 13 is 2 marks)

14 $a = 5bc$

$b = -4$
$c = -3$

Work out the value of a.

$$a = 5(-4)(-3)$$
$$= -20(-3)$$
$$= 60$$

60

(Total for Question 14 is 2 marks)

15 $x = 4y^2 - 12$

Work out the value of x when $y = 5$

$$x = 4(5)^2 - 12$$
$$= 4(25) - 12$$
$$= 100 - 12$$
$$= 88$$

88

(Total for Question 15 is 2 marks)

16 $A = p - 2q$

$p = -4$
$q = -7$

Work out the value of A.

$$A = -4 - 2(-7)$$
$$= -4 + 14$$
$$= 10$$

10

(Total for Question 16 is 2 marks)

17 $a = 8$
$b = -5$
$c = 2$

Work out the value of $b^2 - 4ac$

$(-5)^2 - 4(8)(2)$

$25 - 32(2)$

$25 - 64$

-39

$\underline{\quad -39 \quad}$

(Total for Question 17 is 2 marks)

18 $d = \dfrac{m}{v}$

Work out the value of d when $m = 32$ and $v = 8$

$d = \dfrac{32}{8} = 4$

$\underline{\quad 4 \quad}$

(Total for Question 18 is 2 marks)

19 $A = 2j - jk$

Work out the value of A when $j = 7$ and $k = 3$

$A = 2(7) - 7(3)$

$= 14 - 21$

$= -7$

$\underline{\quad -7 \quad}$

(Total for Question 19 is 2 marks)

20 $w = 5x^2 + 3$

$x = -3$

Work out the value of w.

$w = 5(-3)^2 + 3$

$= 5(9) + 3$

$= 45 + 3$

$= 48$

$\underline{\quad 48 \quad}$

(Total for Question 20 is 2 marks)

21 $A = \frac{1}{2}bh$

Work out the value of A when $b = 3$ and $h = 8$

$$A = \frac{1}{2}(3)(8)$$
$$= \frac{1}{2}(24)$$
$$= 12$$

_____12_____

(Total for Question 21 is 2 marks)

22 $A = \frac{1}{2}(a+b)h$

Work out the value of A when $a = 7$, $b = 6$ and $h = 10$

$$A = \frac{1}{2}(7+6)(10)$$
$$= \frac{1}{2}(13)(10)$$
$$= \frac{1}{2}(130) = 65$$

_____65_____

(Total for Question 22 is 2 marks)

23 $v = u + at$

Work out the value of v when $u = 12$, $a = -6$ and $t = 5$

$$v = 12 + (-6)(5)$$
$$= 12 - 30$$
$$= -18$$

_____-18_____

(Total for Question 23 is 2 marks)

24 $y = mx + c$

$m = -2$
$x = 12$
$c = -7$

Work out the value of y.

$$y = -2(12) + (-7)$$
$$= -24 - 7$$
$$= -31$$

_____-31_____

(Total for Question 24 is 2 marks)

25 $s = ut + \frac{1}{2}at^2$

$u = 3$
$a = 2$
$t = 4$

Work out the value of s.

$$S = 3(4) + \frac{1}{2}(2)(4)^2$$
$$= 12 + \frac{1}{2}(2)(16)$$
$$= 12 + 16$$
$$= 28$$

$s = \underline{\quad 28 \quad}$

(Total for Question 25 is 2 marks)

---

26 $s = ut + \frac{1}{2}at^2$

$u = -5$
$a = 4$
$t = 3$

Work out the value of s.

$$S = (-5)(3) + \frac{1}{2}(4)(3)^2$$
$$= -15 + \frac{1}{2}(4)(9)$$
$$= -15 + 2(9)$$
$$= -15 + 18$$
$$= 3$$

$s = \underline{\quad 3 \quad}$

(Total for Question 26 is 2 marks)

---

27 $s = \dfrac{v^2 - u^2}{2a}$

$v = 7$
$u = 5$
$a = 3$

Work out the value of s.

$$S = \frac{(7)^2 - (5)^2}{2(3)}$$
$$= \frac{49 - 25}{6}$$
$$= \frac{24}{6}$$
$$= 4$$

$s = \underline{\quad 4 \quad}$

(Total for Question 27 is 2 marks)

1 (a) Write $x^2 - 6x + 1$ in the form $(x + a)^2 + b$ where a and b are integers.

$$(x - 3)^2 - 9 + 1$$

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

$(x - 3)^2 - 8$

(2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = x^2 - 6x + 1$

$(3, -8)$

(1)

(Total for question 1 is 3 marks)

2 (a) Write $x^2 + 8x + 5$ in the form $(x + a)^2 + b$ where a and b are integers.

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

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

$(x + 4)^2 - 11$

(2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = x^2 + 8x + 5$

$(-4, -11)$

(1)

(Total for question 2 is 3 marks)

3 (a) Write $x^2 + 10x + 2$ in the form $(x + a)^2 + b$ where a and b are integers.

$(x + 5)^2 - 25 + 2$

$(x + 5)^2 - 23$

$(x + 5)^2 - 23$

(2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = x^2 + 10x + 2$

$(-5, -23)$

(1)

(Total for question 3 is 3 marks)

4 (a) Write $x^2 - 2x - 1$ in the form $(x + a)^2 + b$ where a and b are integers.

$(x - 1)^2 - 1 - 1$

$(x - 1)^2 - 2$

$(x - 1)^2 - 2$

(2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = x^2 - 2x - 1$

$(1, -2)$

(1)

(Total for question 4 is 3 marks)

5 By completing the square, find the coordinates of the turning point of the curve with the equation $y = x^2 + 8x + 3$

You must show all your working.

$$(x + 4)^2 - 16 + 3$$

$$(x + 4)^2 - 13$$

$(-4, -13)$

(Total for question 5 is 3 marks)

6 By completing the square, find the coordinates of the turning point of the curve with the equation $y = x^2 + 10x - 8$

You must show all your working.

$$(x + 5)^2 - 25 - 8$$

$$(x + 5)^2 - 33$$

$(-5, -33)$

(Total for question 6 is 3 marks)

7 By completing the square, find the coordinates of the turning point of the curve with the equation $y = x^2 + 3x - 7$

You must show all your working.

$$\left(x + \frac{3}{2}\right)^2 - \frac{9}{4} - 7$$

$$\left(x + \frac{3}{2}\right)^2 - \frac{9}{4} - \frac{28}{4}$$

$$\left(x + \frac{3}{2}\right)^2 - \frac{37}{4}$$

$$\left(-\frac{3}{2}, -\frac{37}{4}\right)$$

(Total for question 7 is 3 marks)

8 By completing the square, find the coordinates of the turning point of the curve with the equation $y = x^2 - x + 8$

You must show all your working.

$$\left(x - \frac{1}{2}\right)^2 - \frac{1}{4} + 8$$

$$\left(x - \frac{1}{2}\right)^2 - \frac{1}{4} + \frac{32}{4}$$

$$\left(x - \frac{1}{2}\right)^2 + \frac{31}{4}$$

$$\left(\frac{1}{2}, \frac{31}{4}\right)$$

(Total for question 8 is 3 marks)

9 (a) Write $2x^2 - 12x + 23$ in the form $a(x + b)^2 + c$ where a, b, and c are integers.

$$2(x^2 - 6x + 11.5)$$
$$2((x-3)^2 - 9 + 11.5)$$
$$2((x-3)^2 + 2.5)$$
$$2(x-3)^2 + 5$$

$2(x-3)^2 + 5$
....
(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 2x^2 - 12x + 23$

$(3, 5)$
....
(1)

(Total for question 9 is 4 marks)

10 (a) Write $2x^2 + 16x + 26$ in the form $a(x + b)^2 + c$ where a, b, and c are integers.

$$2(x^2 + 8x + 13)$$
$$2((x+4)^2 - 16 + 13)$$
$$2((x+4)^2 - 3)$$
$$2(x+4)^2 - 6$$

$2(x+4)^2 - 6$
....
(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 2x^2 + 16x + 26$

$(-4, -6)$
....
(1)

(Total for question 10 is 4 marks)

11 (a) Write $3x^2 - 6x + 6$ in the form $a(x + b)^2 + c$ where a, b, and c are integers.

$$3\left(x^2 - 2x + 2\right)$$

$$3\left((x - 1)^2 - 1 + 2\right)$$

$$3\left((x - 1)^2 + 1\right)$$

$$3(x - 1)^2 + 3$$

$3(x-1)^2 + 3$

(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 3x^2 - 6x + 6$

$(1, 3)$

(1)

(Total for question 11 is 4 marks)

12 (a) Write $3x^2 - 30x + 63$ in the form $a(x + b)^2 + c$ where a, b, and c are integers.

$$3\left(x^2 - 10x + 21\right)$$

$$3\left((x - 5)^2 - 25 + 21\right)$$

$$3\left((x - 5)^2 - 4\right)$$

$$3(x - 5)^2 - 12$$

$3(x-5)^2 - 12$

(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 3x^2 - 30x + 63$

$(5, -12)$

(1)

(Total for question 12 is 4 marks)

13 By completing the square, solve $x^2 + 10x - 3 = 0$
Give your answers in surd form.

$$(x+5)^2 - 25 - 3 = 0$$
$$(x+5)^2 - 28 = 0$$
$$(x+5)^2 = 28$$
$$(x+5) = \pm\sqrt{28}$$
$$x = -5 \pm \sqrt{28}$$

or

$$= -5 \pm 2\sqrt{7}$$

$$x = -5 + 2\sqrt{7} \text{ or } x = -5 - 2\sqrt{7}$$

(Total for question 13 is 5 marks)

14 By completing the square solve $x^2 + 5x + 4.25 = 0$
Give your answers in surd form.

$$\left(x + \frac{5}{2}\right)^2 - \frac{25}{4} + 4.25 = 0$$
$$\left(x + \frac{5}{2}\right)^2 - 2 = 0$$
$$\left(x + \frac{5}{2}\right)^2 = 2$$
$$x + \frac{5}{2} = \pm\sqrt{2}$$
$$x = -\frac{5}{2} \pm \sqrt{2}$$

$$x = -\frac{5}{2} + \sqrt{2} \text{ or } x = -\frac{5}{2} - \sqrt{2}$$

(Total for question 14 is 5 marks)

1 $f = 5c - 8$

Make c the subject of the formula.

$$f = 5c - 8$$
$$+8 \qquad\qquad +8$$

$$\frac{f + 8}{5} = \frac{5c}{5}$$

$$c = \frac{f + 8}{5}$$

$$c = \frac{f + 8}{5}$$

....

(Total for question 1 is 2 marks)

2 $u = 4t - 21$

Make t the subject of the formula.

$$u = 4t - 21$$
$$+21 \qquad\qquad +21$$

$$\frac{u + 21}{4} = \frac{4t}{4}$$

$$t = \frac{u + 21}{4}$$

$$t = \frac{u + 21}{4}$$

....

(Total for question 2 is 2 marks)

3 $x = 3y - 2$

Make y the subject of the formula.

$$x = 3y - 2$$
$$+2 \qquad\qquad +2$$

$$\frac{x + 2}{3} = \frac{3y}{3}$$

$$y = \frac{x + 2}{3}$$

$$y = \frac{x + 2}{3}$$

....

(Total for question 3 is 2 marks)

4 $m = 5n + 2p$

Make p the subject of the formula.

$$m = 5n + 2p$$
$$-5n \quad -5n$$
$$\frac{m - 5n}{2} = \frac{2p}{2}$$
$$p = \frac{m - 5n}{2}$$

$p = \dfrac{m - 5n}{2}$

(Total for question 4 is 2 marks)

---

5 $a = 3c - 2$

Make c the subject of the formula.

$$a = 3c - 2$$
$$+2 \qquad +2$$
$$\frac{a + 2}{3} = \frac{3c}{3}$$
$$c = \frac{a + 2}{3}$$

$c = \dfrac{a + 2}{3}$

(Total for question 5 is 2 marks)

---

6 $P = 3a + 3b$

Make a the subject of the formula.

$$P = 3a + 3b$$
$$-3b \qquad -3b$$
$$\frac{P - 3b}{3} = \frac{3a}{3}$$
$$a = \frac{P - 3b}{3}$$

$a = \dfrac{P - 3b}{3}$

(Total for question 6 is 2 marks)

7   Make n the subject of $m = n^2 + 3$

$$m = n^2 + 3$$
$$-3 \qquad -3$$
$$m - 3 = n^2$$
$$n = \pm\sqrt{m - 3}$$

accept
$n = \sqrt{m - 3}$

$$n = \pm\sqrt{m - 3}$$
....

(Total for question 7 is 2 marks)

8   Make a the subject of $v = u + at$

$$v = u + at$$
$$-u \qquad -u$$
$$\frac{v - u}{t} = \frac{at}{t}$$
$$a = \frac{v - u}{t}$$

$$a = \frac{v - u}{t}$$
....

(Total for question 8 is 2 marks)

9   Make a the subject of $v^2 = u^2 + 2as$

$$v^2 = u^2 + 2as$$
$$-u^2 \qquad -u^2$$
$$\frac{v^2 - u^2}{2s} = \frac{2as}{2s}$$
$$a = \frac{v^2 - u^2}{2s}$$

$$a = \frac{v^2 - u^2}{2s}$$
....

(Total for question 9 is 2 marks)

10 Make b the subject of $a = \sqrt{\dfrac{b+2}{5}}$

$$a^2 = \left(\sqrt{\dfrac{b+2}{5}}\right)^2$$

$$5 \times a^2 = \dfrac{b+2}{5} \times 5$$

$$5a^2 = b + 2$$
$$\quad -2 \qquad\qquad -2$$

$$5a^2 - 2 = b$$

$$b = 5a^2 - 2$$

(Total for question 10 is 3 marks)

11 Make b the subject of $A = 3b + 9$

$$A = 3b + 9$$
$$-9 \qquad\quad -9$$

$$\dfrac{A-9}{3} = \dfrac{3b}{3}$$

$$b = \dfrac{A-9}{3}$$

$$b = \dfrac{A-9}{3}$$

(Total for question 11 is 2 marks)

12   Make x the subject of $y = 3x - 2$

$$y = 3x - 2$$
$$+2 \qquad\qquad +2$$

$$\frac{y+2}{3} = \frac{3x}{3}$$

$$x = \frac{y+2}{3}$$

$$x = \frac{y+2}{3}$$
....

(Total for question 12 is 2 marks)

---

13   Make x the subject of $y = \frac{1}{2}x + 6$

$$y = \frac{1}{2}x + 6$$
$$-6 \qquad\qquad -6$$

$$y - 6 = \frac{1}{2}x$$
$$\times 2 \qquad \times 2$$

$$2(y-6) = x$$

OR $x = 2y - 12$

$$x = 2(y-6)$$
....

(Total for question 13 is 2 marks)

---

14   Make x the subject of $y = \frac{2}{5}x - 12$

$$y = \frac{2}{5}x - 12$$
$$+12 \qquad\qquad +12$$

$$y + 12 = \frac{2}{5}x$$
$$\times 5 \qquad\qquad \times 5$$

$$\frac{5(y+12)}{2} = \frac{2x}{2}$$

$$x = \frac{5(y+12)}{2}$$

$$x = \frac{5(y+12)}{2}$$
....

(Total for question 14 is 3 marks)

15 Make x the subject of $\quad 5x + 6y + 12 = 0$

$$-6y \qquad -6y$$

$$5x + 12 = -6y$$

$$-12 \qquad -12$$

$$5x = -6y - 12$$

$$x = \frac{-6y - 12}{5}$$

$$x = \frac{-6y - 12}{5}$$

(Total for question 15 is 2 marks)

16 Make x the subject of $\quad y = x^3 - 5$

$$+5 \qquad +5$$

$$y + 5 = x^3$$

$$x = \sqrt[3]{y + 5}$$

$$x = \sqrt[3]{y + 5}$$

(Total for question 16 is 2 marks)

17 Make x the subject of $\quad y = \dfrac{2x + 3}{4}$

$$\times 4 \qquad \times 4$$

$$4y = 2x + 3$$

$$-3 \qquad -3$$

$$\frac{4y - 3}{2} = \frac{2x}{2}$$

$$x = \frac{4y - 3}{2}$$

$$x = \frac{4y - 3}{2}$$

(Total for question 17 is 3 marks)

18 Make a the subject of $\quad x = 3(a + 9)$

$$x = 3a + 27$$
$$ -27 \qquad -27$$
$$\frac{x - 27}{3} = \frac{3a}{3}$$
$$a = \frac{x - 27}{3}$$

or $a = \frac{x}{3} - 9$

$$a = \frac{x - 27}{3}$$

....

(Total for question 18 is 2 marks)

19 $\quad a = \dfrac{3 + c}{b}$

Make b the subject of the formula.

$$ab = 3 + c$$
$$b = \frac{3 + c}{a}$$

$$b = \frac{3 + c}{a}$$

....

(Total for question 19 is 2 marks)

20 $\quad d = \sqrt{\dfrac{3h}{2}}$

Make h the subject of the formula.

$$d^2 = \frac{3h}{2}$$
$$\frac{2d^2}{3} = \frac{3h}{3}$$
$$h = \frac{2d^2}{3}$$

$$h = \frac{2d^2}{3}$$

....

(Total for question 20 is 3 marks)

1   An adult cinema ticket costs £x
    The price of a child's ticket is half the price of an adult ticket

    Write an expression for the price, in pounds, of a child's ticket.

    £ $\frac{x}{2}$

    (Total for Question 1 is 1 mark)

2   Charles has m marbles.
    Rosalind has 6 more marbles than Charles

    Write an expression for the number of marbles Rosalind has.

    m + 6

    (Total for Question 2 is 1 mark)

3   A cup of tea costs £t
    A cup of coffee costs £c

    Write an expression, in pounds, for the cost of 5 cups of tea and 4 cups of coffee.

    £ 5t + 4c

    (Total for Question 3 is 1 mark)

4   Albert is given n sweets.
    He eats 5 of the sweets.
    Write an expression for the number of sweets Albert now has.

    n − 5

    (Total for Question 4 is 1 mark)

5 Michael is paid £x for each hour he works.
One week Michael works for 20 hours.

Write an expression for the total amount, in pounds, Michael is paid for this week.

£ $20x$

(Total for Question 5 is 1 mark)

6 Alex has b bags of marbles.
Each bag contains m marbles.

Write an expression, in terms of b and m, for the total number of marbles Alex has.

bm

(Total for Question 6 is 1 mark)

7 A train takes t minutes to get from London to Canterbury

The same journey by car takes 50 minutes longer.

Write an expression for the amount of time, in minutes, it takes to travel from London to Canterbury by car.

$t + 50$ minutes

(Total for Question 7 is 1 mark)

8 A school charges £5 for tickets to a show.

The school raises £x in total from ticket sales.

Write an expression for the total number of tickets sold by the school.

$\dfrac{x}{5}$

(Total for Question 8 is 1 mark)

9 Isaac is x years old.
Marie is twice as old as Isaac.
Write an expression for Marie's age.

$2x$

(Total for Question 9 is 1 mark)

10 Apples costs 30p each.

Write an expression for the cost of a apples.

$30a$ pence

(Total for Question 10 is 1 mark)

11 Stephen is n years old.

Rachel is 10 years older than Stephen

(a) Write an expression for Rachel's age.

$n + 10$

(1)

Tim is 13 years younger than Stephen.

(b) Write an expression for Tim's age.

$n - 13$

(1)

(c) Write an expression for the total age of Stephen, Rachel and Tim.

$n + n + 10 + n - 13$

$3n - 3$

(2)

(Total for Question 11 is 4 marks)

12 Tea bags are sold in small boxes and large boxes.
There are 100 tea bags in a small box.
There are 240 tea bags in a large box.

Mae buys x small boxes and y large boxes of tea bags.

Write an expression for the total number of tea bags Mae buys.

$100x + 240y$

(Total for Question 12 is 2 marks)

13 In Rugby Union a team scores:
5 points for each try
2 points for each conversion
3 points for each penalty

A team scores t tries, c conversions and p penalties.

Write an expression for the total number of points the team scores.

$5t + 2c + 3p$

(Total for Question 13 is 2 marks)

14 Apples cost 25p each.
Bananas cost 20p each.

The total cost of a apples and b bananas is C.

Write a **formula** for the total cost of a apples and b bananas.

$C = 25a + 20b$

~~pence~~

(Total for Question 14 is 2 marks)

15 A child's ticket to see a show costs £x
An adult's ticket costs £5 more than a child's ticket.

(a) Write an expression for the price, in pounds, of an adults ticket.

£ $x + 5$

(1)

(b) Write an expression for the cost of one adult's ticket and two child's tickets.

$x + 5 + 2x$

£ $3x + 5$

(2)

(Total for Question 15 is 3 marks)

16 A shop sells toilet rolls in small packs and big packs.
There a 4 toilet rolls in a small pack.
There are 9 toilet rolls in a big pack.

The shop has *s* small packs and *b* big packs of toilet roll.

(a) Write an expression for the **total number of packs** of toilet roll the shop has.

$s + b$

(1)

(b) Write an expression for the total number of toilet rolls the shop has.

$4s + 9b$

(2)

(Total for Question 16 is 3 marks)

1 Simplify fully $\dfrac{x^2 + 5x}{x^2 + 7x + 10}$

$$\frac{x(x+5)}{(x+2)(x+5)}$$

$$\frac{x}{x+2}$$

(Total for question 1 is 2 marks)

2 Simplify fully $\dfrac{x^2 - x - 12}{x^2 - 9x + 20}$

$$\frac{(x+3)(x-4)}{(x-5)(x-4)}$$

$$\frac{x+3}{x-5}$$

(Total for question 2 is 2 marks)

3 Simplify fully $\dfrac{3x^2 + 9x}{x^2 - 9}$

$$\frac{3x(x+3)}{(x-3)(x+3)}$$

$$\frac{3x}{x-3}$$

(Total for question 3 is 2 marks)

4 Simplify fully $\dfrac{x + 4}{x^2 - 16}$

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

$$\frac{1}{x-4}$$

(Total for question 4 is 2 marks)

5 Write $\dfrac{3x^2 + 11x - 4}{x^2 + 3x - 4}$ in the form $\dfrac{ax + b}{x + c}$ where a, b, and c are integers.

$$\frac{(3x - 1)(x + 4)}{(x + 4)(x - 1)}$$

$$\frac{3x - 1}{x - 1}$$

6 Write $\dfrac{x^2 + 7x - 18}{2x^2 - x - 6}$ in the form $\dfrac{x + a}{bx + c}$ where a, b, and c are integers.

$$\frac{(x + 9)(x - 2)}{(2x + 3)(x - 2)}$$

$$\frac{x + 9}{2x + 3}$$

7 Simplify fully $\dfrac{3x+6}{x-4} \div \dfrac{2x^2+9x+10}{x^2-4x}$

$$\frac{(3x+6)}{(x-4)} \times \frac{x^2-4x}{2x^2+9x+10}$$

$$\frac{(3x+6)(x^2-4x)}{(x-4)(2x^2+9x+10)}$$

$$\frac{3(x+2) \times x(x-4)}{(x-4)(2x+5)(x+2)}$$

$$\frac{3x}{2x+5}$$

$$\frac{3x}{2x+5}$$

(Total for question 7 is 3 marks)

8 Simplify fully $\dfrac{2x-2}{x+5} \div \dfrac{x^2-4x+3}{2x^2+13x+15}$

$$\frac{2(x-1)}{x+5} \times \frac{2x^2+13x+15}{x^2-4x+3}$$

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

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

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

(Total for question 8 is 3 marks)

9 Solve $\dfrac{8}{x+3} + \dfrac{3}{x+8} = 1$

$$\dfrac{8(x+8)}{(x+3)(x+8)} + \dfrac{3(x+3)}{(x+3)(x+8)} = 1$$

$$\dfrac{8(x+8) + 3(x+3)}{(x+3)(x+8)} = 1$$

$$8(x+8) + 3(x+3) = (x+3)(x+8)$$

$$8x + 64 + 3x + 9 = x^2 + 8x + 3x + 24$$

$$11x + 73 = x^2 + 11x + 24$$

$$73 = x^2 + 24$$

$$0 = x^2 - 49$$

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

$$x = -7 \text{ or } 7$$

$$x = -7 \text{ or } 7$$

(Total for question 9 is 4 marks)

10 Solve $\dfrac{8}{3x-2} + \dfrac{6}{x+1} = 2$

$$\dfrac{8(x+1)}{(3x-2)(x+1)} + \dfrac{6(3x-2)}{(3x-2)(x+1)} = 2$$

$$\dfrac{8(x+1) + 6(3x-2)}{(3x-2)(x+1)} = 2$$

$$8(x+1) + 6(3x-2) = 2(3x-2)(x+1)$$

$$8x + 8 + 18x - 12 = 2(3x^2 + 3x - 2x - 2)$$

$$26x - 4 = 2(3x^2 + x - 2)$$

$$26x - 4 = 6x^2 + 2x - 4$$

$$0 = 6x^2 - 24x$$

$$0 = 6x(x - 4)$$

$$x = 0 \text{ or } x = 4$$

$$x = 0 \text{ or } 4$$

(Total for question 10 is 4 marks)

11 Solve $\dfrac{2}{5-x} + \dfrac{3}{x+7} = 1$

$$\dfrac{2(x+7)}{(5-x)(x+7)} + \dfrac{3(5-x)}{(5-x)(x+7)} = 1$$

$$\dfrac{2(x+7) + 3(5-x)}{(5-x)(x+7)} = 1$$

$$2(x+7) + 3(5-x) = (5-x)(x+7)$$

$$2x + 14 + 15 - 3x = 5x + 35 - x^2 - 7x$$

$$29 - x = 35 - 2x - x^2$$

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

$$(x+3)(x-2) = 0$$

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

$$x = \underline{-3 \text{ or } 2}$$

(Total for question 11 is 4 marks)

12 Solve $\dfrac{7}{x+1} - \dfrac{4}{3x-2} = 1$

$$\dfrac{7(3x-2)}{(x+1)(3x-2)} - \dfrac{4(x+1)}{(x+1)(3x-2)} = 1$$

$$\dfrac{7(3x-2) - 4(x+1)}{(x+1)(3x-2)} = 1$$

$$7(3x-2) - 4(x+1) = (x+1)(3x-2)$$

$$21x - 14 - 4x - 4 = 3x^2 - 2x + 3x - 2$$

$$17x - 18 = 3x^2 + x - 2$$

$$0 = 3x^2 - 16x + 16$$

$$(3x-4)(x-4) = 0$$

$$x = \dfrac{4}{3} \qquad x = 4$$

$$x = \underline{\dfrac{4}{3} \text{ or } 4}$$

(Total for question 12 is 4 marks)

13 Given that

$$2x + 1 : x + 2 = x + 8 : 3x - 4$$

Find the possible values of x.

$$\frac{2x+1}{x+2} = \frac{x+8}{3x-4}$$

$$(2x+1)(3x-4) = (x+8)(x+2)$$

$$6x^2 - 8x + 3x - 4 = x^2 + 2x + 8x + 16$$

$$6x^2 - 5x - 4 = x^2 + 10x + 16$$

$$5x^2 - 15x - 20 = 0$$

$$x^2 - 3x - 4 = 0$$

$$(x - 4)(x + 1) = 0$$

$$x = 4 \qquad x = -1$$

.... $x = 4$ or $x = -1$ ....

(Total for question 13 is 4 marks)

14 Given that

$$x - 1 : 2x - 3 = x + 2 : 3x - 2$$

Find the possible values of x.

$$\frac{x-1}{2x-3} = \frac{x+2}{3x-2}$$

$$(x-1)(3x-2) = (x+2)(2x-3)$$

$$3x^2 - 2x - 3x + 2 = 2x^2 - 3x + 4x - 6$$

$$3x^2 - 5x + 2 = 2x^2 + x - 6$$

$$x^2 - 6x + 8 = 0$$

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

$$x = 2 \qquad x = 4$$

.... $x = 2$ or $x = 4$ ....

(Total for question 14 is 4 marks)

15 Given that

$$x+9 : 5x-1 = x+7 : 2x-3$$

Find the possible values of x.

$$\frac{x+9}{5x-1} = \frac{x+7}{2x-3}$$

$$(x+9)(2x-3) = (x+7)(5x-1)$$

$$2x^2 - 3x + 18x - 27 = 5x^2 - x + 35x - 7$$

$$2x^2 + 15x - 27 = 5x^2 + 34x - 7$$

$$0 = 3x^2 + 19x + 20$$

$$0 = (3x+4)(x+5)$$

$$x = -4/3 \qquad x = -5$$

$$\underline{x = -4/3 \text{ or } x = -5}$$

(Total for question 15 is 4 marks)

16 Given that

$$5-3x : 9-x = 3x+7 : 4-x$$

Find the possible values of x.

$$\frac{5-3x}{9-x} = \frac{3x+7}{4-x}$$

$$(5-3x)(4-x) = (3x+7)(9-x)$$

$$20 - 5x - 12x + 3x^2 = 27x - 3x^2 + 63 - 7x$$

$$3x^2 - 17x + 20 = 20x - 3x^2 + 63$$

$$6x^2 - 37x - 43 = 0$$

$$(6x-43)(x+1) = 0$$

$$x = \frac{43}{6} \qquad x = -1$$

$$\underline{x = \frac{43}{6} \text{ or } x = -1}$$

(Total for question 16 is 4 marks)

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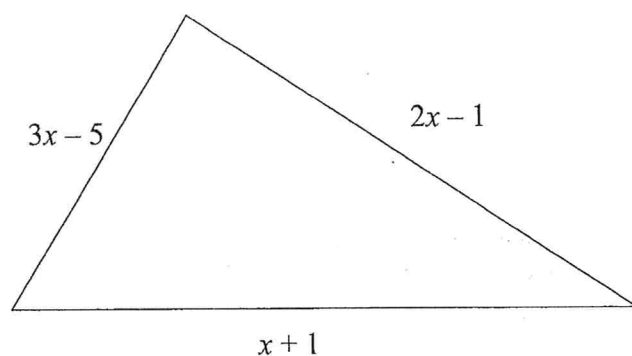
(a) Write down an expression, in terms of x, for the perimeter of the triangle.

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

_____ $6x - 5$ _____ 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.
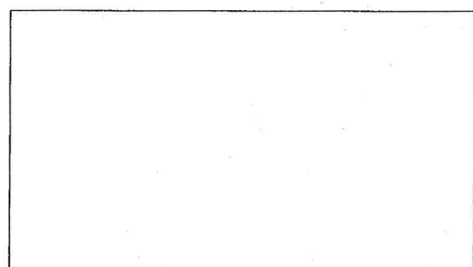
$x + 5$

$2x + 3$

(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)

$\left(OR \ \dfrac{9}{2} \right)$

3
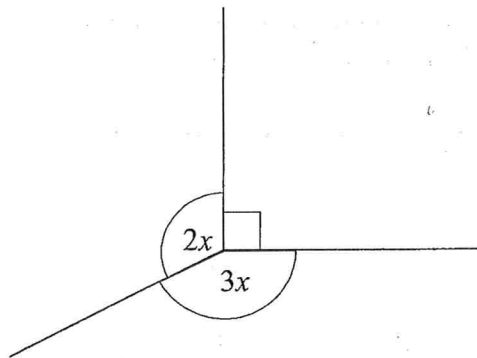
Find the value of x.

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

$54°$

(Total for question 3 is 3 marks)

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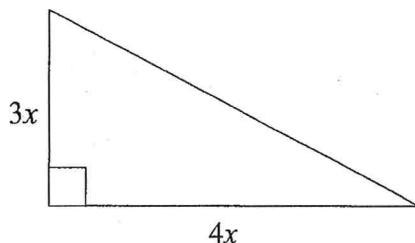
The area of the triangle is 294 cm²

Work out the value of x.

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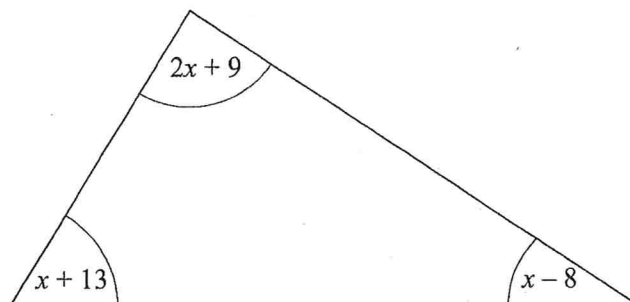$$x^2 = \frac{294}{6} = \frac{147}{3} = 49$$
$$x = \sqrt{49}$$
$$= 7$$

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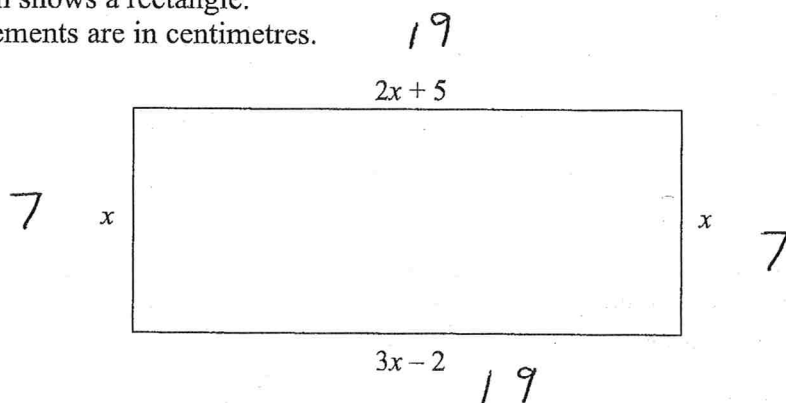
$$2x + 9 + x - 8 + x + 13 = 180$$
$$4x + 14 = 180$$
$$4x = 166$$
$$x = \frac{166}{4} = \frac{83}{2} = 41.5$$

..........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

$2x + 5$

7   x x 7

$3x - 2$ 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

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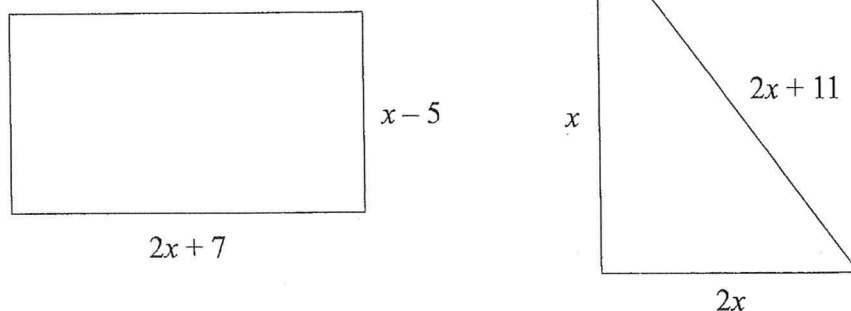
The perimeter of the rectangle is equal to the perimeter of the triangle.

Find the value of x.

$$2(x - 5) + 2(2x + 7) = x + 2x + 2x + 11$$
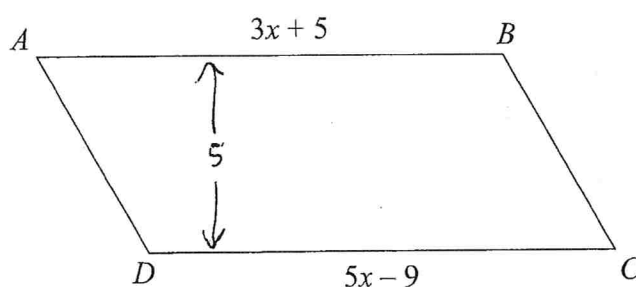$$2x - 10 + 4x + 14 = 5x + 11$$
$$6x + 4 = 5x + 11$$
$$x + 4 = 11$$
$$x = 7$$

_____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*
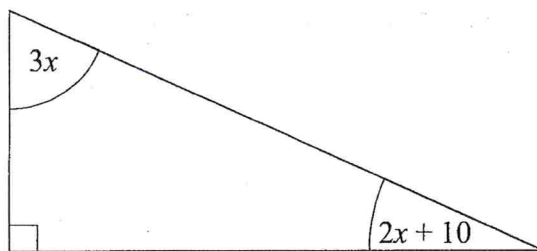
$$3(7) + 5 = 26$$

$$3x + 5 = 5x - 9$$
$$5 = 2x - 9$$
$$14 = 2x$$
$$x = 7$$

$$26 \times 5$$

_____130 cm²_____

(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?

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

$$x + 2x + 2x + 5 = 55$$
$$5x + 5 = 55$$
$$5x = 50$$
$$x = 10$$
$$2(10) + 5\cancel{5} = 25$$

_____ 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 $3x$ x
Lucy is three times as old as Alex.
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.

$$\text{Alex} = x$$

$$\text{Lucy} = 3x$$

$$\text{Megan} = 3x - 7$$

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

$$7x - 7 = 126$$

$$7x = 133$$

$$x = 19$$

$$3(19) = 57$$

$$57 - 7 = 50$$

$19 : 57 : 50$

(Total for question 12 is 4 marks)

1 Solve the simultaneous equations

$$4x + 3y = 18$$
$$x - 3y = 7$$

$$5x = 25$$
$$x = 5$$

$$4(5) + 3y = 18$$
$$20 + 3y = 18$$
$$3y = -2$$
$$y = \frac{-2}{3}$$

$x = $ ....5........

$y = $ ....$-\frac{2}{3}$........

(Total for question 1 is 3 marks)

2 Solve the simultaneous equations

$$x - 3y = -23 \qquad \times 5$$
$$5x + 2y = 4$$

$$5x - 15y = -115$$
$$5x + 2y = 4$$

$$-17y = -119$$
$$y = \frac{119}{17}$$
$$= 7$$

$$5x + 2(7) = 4$$
$$5x + 14 = 4$$
$$5x = -10$$
$$x = -2$$

$x = $ ....-2........

$y = $ ....7........

(Total for question 2 is 3 marks)

3 Solve the simultaneous equations

$$2x + 5y = -10$$
$$2x - y = 8$$

$$6y = -18$$
$$y = -3$$

$$2x + 5(-3) = -10$$
$$2x - 15 = -10$$
$$2x = 5$$
$$x = \frac{5}{2}$$

$x = \dfrac{5}{2}$

$y = -3$

(Total for question 3 is 3 marks)

---

4 Solve the simultaneous equations

$$4x + 2y = 10 \quad \times 5$$
$$5x + 3y = 12 \quad \times 4$$

$$20x + 10y = 50$$
$$20x + 12y = 48$$
$$-2y = 2$$
$$y = -1$$

$$4x + 2(-1) = 10$$
$$4x - 2 = 10$$
$$4x = 12$$
$$x = 3$$

$x = 3$

$y = -1$

(Total for question 4 is 3 marks)

5 Solve the simultaneous equations

$$2x + 5y = 4$$
$$7x - 5y = -1$$

$$9x = 3$$

$$x = \frac{3}{9} = \frac{1}{3}$$

$$2\left(\frac{1}{3}\right) + 5y = 4$$

$$\frac{2}{3} + 5y = 4$$

$$\frac{2}{3} + 5y = \frac{12}{3}$$

$$5y = \frac{10}{3}$$

$$y = \frac{2}{3}$$

$x =$ ....$\frac{1}{3}$............

$y =$ ....$\frac{2}{3}$............

(Total for question 5 is 3 marks)

---

6 Solve the simultaneous equations

$$3x - 2y = 7$$
$$7x + 2y = 13$$

$$10x = 20$$

$$x = 2$$

$$7(2) + 2y = 13$$

$$14 + 2y = 13$$

$$2y = -1$$

$$y = -\frac{1}{2}$$

............$x = 2 \qquad y = -\frac{1}{2}$............

(Total for question 6 is 3 marks)

7 Solve the simultaneous equations

$$2x - 3y = 4 \qquad \times 2$$
$$4x - y = 13$$

$$4x - 6y = 8$$
$$4x - y = 13$$

$$-5y = -5$$
$$y = 1$$

$$4x - 1 = 13$$
$$4x = 14$$
$$x = \frac{14}{4} = \frac{7}{2}$$

$x = \dfrac{7}{2}$

$y = 1$

(Total for question 8 is 3 marks)

---

8 Solve the simultaneous equations

$$3x + y = 15 \qquad \times 2$$
$$5x + 2y = 24$$

$$6x + 2y = 30$$
$$5x + 2y = 24$$

$$x = 6$$

$$3(6) + y = 15$$
$$18 + y = 15$$
$$y = -3$$

$x = 6 \quad y = -3$

(Total for question 8 is 3 marks)

9 Solve the simultaneous equations

$$3x - y = -4 \qquad \times 2$$
$$2x - 3y = 9 \qquad \times 3$$

$$6x - 2y = -8$$
$$6x - 9y = 27$$

$$7y = -35$$
$$y = -5$$

$$3x - (-5) = -4$$
$$3x + 5 = -4$$
$$3x = -9$$
$$x = -3$$

$x =$ .... -3 ....

$y =$ .... -5 ....

(Total for question 9 is 3 marks)

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10 Solve the simultaneous equations

$$6x + 5y = 4.5$$
$$3x - 2y = 9 \qquad \times 2$$

$$6x - 4y = 18$$
$$6x + 5y = 4.5$$

$$-9y = 13.5$$
$$y = -\frac{13.5}{9} = \frac{-27}{18} = -\frac{3}{2}$$

$$3x - 2\left(\frac{-3}{2}\right) = 9$$
$$3x + 3 = 9$$
$$3x = \cancel{12} \; 6$$
$$x = \cancel{4} \; 2$$

$x =$ .... $\cancel{4} \; 2$ ....

$y =$ .... $-\frac{3}{2}$ ....

(Total for question 10 is 3 marks)

11 Solve the simultaneous equations
$$3x = 9 + y$$
$$x + 5y = 5$$

$$3x - y = 9$$
$$x + 5y = 5 \qquad \times 3$$

$$3x - y = 9$$
$$\underline{-\ 3x + 15y = 15}$$
$$-16y = -6$$
$$y = \frac{6}{16} = \frac{3}{8}$$

$$x + 5\left(\frac{3}{8}\right) = 5$$
$$x + \frac{15}{8} = 5$$
$$x = \frac{40}{8} - \frac{15}{8} = \frac{25}{8}$$

$x = \dfrac{25}{8}$

$y = \dfrac{3}{8}$

(Total for question 11 is 3 marks)

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12 Solve the simultaneous equations
$$3y + 11 = 4x$$
$$10x + 2y + 1 = 0$$

$$11 = 4x - 3y$$
$$4x - 3y = 11 \qquad ① \qquad \times 5$$
$$10x + 2y = -1 \qquad ② \qquad \times 2$$

$$20x - 15y = 55$$
$$\underline{-\ 20x + 4y = -2}$$
$$-19y = 57$$
$$y = -3$$

$$4x - 3(-3) = 11$$
$$4x + 9 = 11$$
$$4x = 2$$
$$x = \frac{1}{2}$$

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

$y = -3$

(Total for question 12 is 3 marks)

13 In a shop 2 coffees and 3 cakes cost £9.95
In the same shop 1 coffee and 4 cakes cost £10.35.

Work out the price for one coffee and the price for one cake.

$$2x + 3y = 9.95$$
$$x + 4y = 10.35 \qquad \times 2$$

$$2x + 8y = 20.70$$
$$2x + 3y = 9.95$$

$$5y = 10.75$$
$$y = 2.15$$

$$x + 4(2.15) = 10.35$$
$$x + 8.60 = 10.35$$
$$x = 1.75$$

Coffee £ .... 1.75 ....

Cake £ .... 2.15 ....

(Total for question 13 is 3 marks)

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14 Sweets are sold in small packs and in big packs.
There is a total of 175 sweets in 4 small packs and 3 big packs.
There is a total of 154 sweets in 5 small packs and 2 big packs.
Work out the number of sweets in each small pack and in each big pack.

$$4s + 3b = 175 \qquad \times 2$$
$$5s + 2b = 154 \qquad \times 3$$

$$8s + 6b = 350$$
$$15s + 6b = 462$$

$$-7s = -112$$
$$s = 16$$

$$5(16) + 2b = 154$$
$$80 + 2b = 154$$
$$2b = 74$$
$$b = 37$$

Small Pack .... 16 ....

Big Pack .... 37 ....

(Total for question 14 is 3 marks)