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S3 Credit Homework Exercise 1

1. Calculate the following without a calculator.

$(a) -4-(-3)$ $(b)\ 16+(-8)$ $(c)\ 4-(-7)+(-12)$

$(d) -7-5-(-5)$ $(e)\ 6x+(-13x)$ $(f) -x^2-7x^2$

2. If $x = -3$ and $y = 2$ find:

$(a)\ xy$ $(b)\ x^2$ $(c)\ (-x)^2$ $(d)\ x^2 y$ $(e)\ 3xy^2$ $(f)\ 3-3x^2$ $(g) -x^2$

3. Solve the following equations:

$(a)\ 3x-4=-13$ $(b)\ 2x+5=1$ $(c) -3x-7=-1$ $(d)\ 10=4-2x$

$(e)\ 2x+3=-x-9$ $(f) -3x-1=x+11$ $(g)\ x+7=4x+1$ $(h)\ 2x-7=6x+5$

4. Round the following to the given number of significant figures:

(a) 245661 to 2 sig figs. (b) 987600 to 3 sig figs. (c) 0.0078965 to 3 sig figs.

(d) 0.010032 to 2 sig figs. (e) 800765 to 3 sig figs. (f) 0.0003056 to 2 sig figs
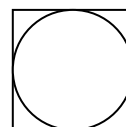
5. Write these numbers in standard form $(a \times 10^n)$

(a) 2567000 (b) 9200000000 (c) 34500000 (d) 12300000000

(e) 0.00000000056 (f) 0.000000234 (g) 0.000101 (h) 0.00000340

6. Calculate the volume and the surface area of a cube of side 5cm.

7. What is the area and circumference of this circle inside this square of side 8cm.

1. Calculate the following:

   $(a)\ \dfrac{3}{4}+6\dfrac{2}{3}$ $(b)\ 8\dfrac{1}{3}\div3\dfrac{5}{9}$ $(c)\ 9\dfrac{7}{8}-4\dfrac{2}{3}\times2\dfrac{1}{4}$ $(d)\ \sqrt{\dfrac{9}{4}}$

2. If material costs £2.49 per metre, how much would it cost for $3\dfrac{2}{3}$ metres?

   How much material is wasted if only $\dfrac{3}{4}$ of the material is used?

3. Simplify

   $(a)\ -3x-5x$ $(b)\ 6x^2+(-10x^2)$
   $(c)\ -4a-4b+2a-6b$ $(d)\ 3x^3-(-5x^3)$
   $(e)\ -5b^3-3b^2+2b^2$ $(f)\ x-x^2-x^3-x^2$

4. In a school of 1500 pupils, 55% are girls. On a given day there are 8% of pupils absent of which $\dfrac{2}{3}$ are boys. What percentage of the girls are absent? (Give your answer to the nearest whole number).

5. If winnings of £210,000 in the lottery were split up between two people in the ratio 3:4, how much would each receive?

6. A ladder 5m long is placed against a wall with the foot of the ladder 1.7 m from the base of the wall. How far up the wall would the ladder rest?

7. A gardener has three canes 17.4cm, 23.2cm and 29cm long. Can he arrange these to make a right angled triangle? Justify your answer.

1.   Does a triangle with sides 18.6cm, 24.8cm and 31.2cm have a right angle?
        Justify your answer.

2.   Round the following to the given number of significant figures.

(a) 236510 (3)   (b) 0.00236104 (2)   (c) 445698700 (1)   (d) 0.001045 (2)

3.   Solve the following equations

(a) $7 + 2(x - 5) = 13$ (b) $5 - 3(x - 4) = -2$ (c) $5(x - 6) = 2(x + 3)$
(d) $6(x - 1) - 5 = 4 - (x + 1)$ (e) $3(x - 1) - 2(1 - x) = 0$ (f) $4 + 2(3t - 7) = t$

4.   A tyre and Exhaust Centre has thirteen employees, including the manager and
        assistant manager. Their weekly wages are:
        £150, £150, £150, £150, £150, £160, £160, £160, £170, £170, £180, £300,
        £400.

        (a) Calculate the mean, median and modal wage.
        (b) What fraction of the employees had 'above average' earnings?

5.   A car cost a dealer £8000.
        (a) He sold it to Mr. Watson for £8800. Calculate his
        percentage profit.

        (b) Three years later Mr. Watson sold the car for
        £6600. Calculate his percentage loss.

6.   For a cuboid, $V = abc$, $A = 2(ab + bc + ca)$, $d = \sqrt{(a^2 + b^2 + c^2)}$. Calculate
        V, A and d when $a = 9, b = 12$ and $c = 8$.

7.   A cuboid of modelling clay is 9cm by 6cm by 4cm. If it is remade as a cube,
        what length is each side of the cube?

1. Solve the following equations:

   (a) $y(4y-3) = 4(y^2 + 6)$

   (b) $3(x-1) - 2(1-x) = 0$

   (c) $t^2 - (t+5)^2 - 20 = 0$

   (d) $(2m+2)^2 = 4m(m+1)$

2. Multiply out and simplify:

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

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

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

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

4. Clearview Double Glazing said that 2 of their men could fit new windows in a house in 3 days.
   (a) How many men would be needed to fit the windows in 1 day?
   (b) In the end 3 men did the work. How long did they take?

5. A rectangular tank is 2m long, 1m broad and 50cm high. It is open at the top to collect rainwater.
   (a) How many litres of rainwater can it hold?
   (b) If the tank is quarter full of rainwater, what is the depth of water in it?

6. Calculate the distance between each pair of points.
   (a) P(1,1), Q(9,16)   (b) R(-3,1), S(6,-11)

7. $u = 136, v = 76, w = 47$. Calculate correct to 3 significant figures, the value of:

   (a) $\dfrac{u+v}{w}$

   (b) $u + \dfrac{v}{w}$

   (c) $u(v-w)$

   (d) $\sqrt{(v^2 + w^2)}$

   (e) $(u-v)^3$

   (f) $\dfrac{1}{u+v+w}$

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S3 Credit Homework Exercise 5

1. Multiply out the following brackets:

(a) $(x+5)^2$ (b) $(x-4)^2$ (c) $(x+9)^2$ (d) $(2x+3)^2$

(e) $(3x-1)^2$ (f) $(5x-2)^2$ (g) $(7-2x)^2$ (h) $(4x-3)^2$

(i) $(6-2x)^2$ (j) $(1-x)^2$ (k) $(5x+2)^2$ (l) $(3-3x)^2$
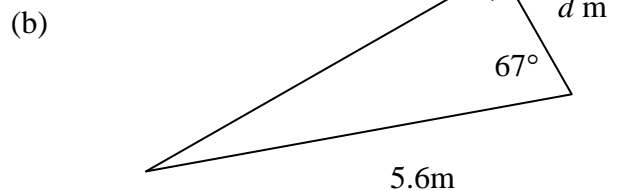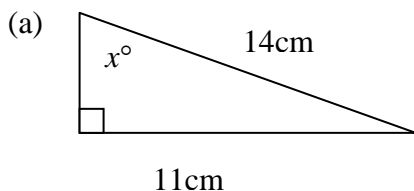
(m) $(2x+1)(3x-2)$ (n) $(3x-4)(x+1)$ (o) $(5x-2)(2x+1)$

2. Multiply out and tidy up:

(a) $5+2(x-1)$ (b) $9-3(x-4)$ (c) $(x-3)^2-4$ (d) $4-(x-3)^2$

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

3. Find the value of x and d.

(a)

14cm

$x°$

11cm

(b)

d m

67°

5.6m

4. Mrs. Jones, Mr. White, Miss Davis and Mr. Baker have formed a pools syndicate. Each week they pay these amounts: Mrs. Jones, £3, Mr. White £4, Miss Davis £2, Mr. Baker £1. They hit the jackpot of £1 million. How much will each person collect?

5. Complete the table and find a formula for n.

A	1	2	3	4	5		10	n
B	1	5	9					

6. What is the area and circumference of a circle of diameter 16cm?

7. What is the volume and the surface area of a cube of side 9.2cm?

1. Multiply out the following brackets:

(a) $(x-2)^2$ (b) $(2x-1)^2$ (c) $(3x+4)^2$ (d) $(x-y)^2$

(e) $(5x-7)^2$ (f) $(a-2b)^2$ (g) $(6-5x)^2$ (h) $(8-3x)^2$

2. A ladder which is 4.4m long is leaning against a wall. If it makes an angle of $57°$ with the ground, how far up the wall does it reach?

3. A carpet is 2.5m wide. A hotel orders 1 hectare ($10,000m^2$) of carpet.

    (a) What length of carpet is this?
    (b) What is the cost, at £18.99 per m^2.
    (c) What is the volume of the carpet in m^3 if it is 2cm thick?

4. The true weight of a letter is 40g.
    (a) If the scales read 46g, what is the percentage error in the reading on the scales?
    (b) What would the reading be for a true weight of 60g?

5. List all the prime numbers from 1 – 50.

6. Write down the least common multiple (lcm) of the following pairs of numbers:
    (a) 3 and 5   (b) 4 and 7   (c) 6 and 8   (d) 10 and 15

7. Solve the following equations:

    (a) $4-(y-7)=3$ (b) $4+7(2x+1)=81$
    (c) $1-2(2x+1)=1-(x-1)$ (d) $(y+6)^2=y(y-6)$
    (e) $(t+4)^2=(t+2)^2$ (f) $y^2-(y-4)^2+8=0$

1. Multiply out the brackets and simplify:

    (a) $10 - (x - 4)^2$ (b) $14 - (2x - 3)^2$
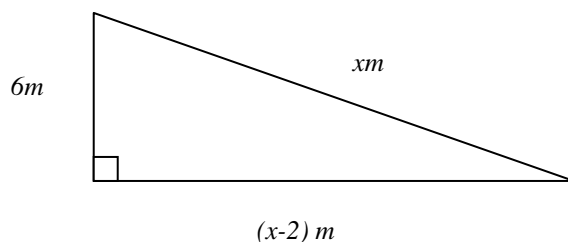
    (c) $(3x - 1)^2 - (3x + 1)^2$ (d) $14 - 2(x - 1)^2$

    (e) $6 - 3(x + 2)^2$ (f) $3(x + 1)^2 + 2(x - 4)^2$

2. Make an equation and find the length of each edge of the right angled metal plate.

    6m

    xm

    (x-2) m

3. A boy takes 150 steps in walking 120 metres.
    (a) How far would he go in taking 250 steps?
    (b) How many steps would he take in 100 metres?

4. A school roll rises from 1020 pupils to 1110. How much of a percentage increase is this?

5. A rhombus of side 10cm has one of its angles of size $54°$. Calculate the length of its diagonals.

6. If $a = 3.4 \times 10^7$, $b = 6.9 \times 10^{12}$ and $c = 2.6 \times 10^{-8}$, calculate the following putting all answers in standard form:

    (a) abc (b) $\dfrac{b}{c}$ (c) $\dfrac{ab}{c^2}$ (d) $(c - a)^2$ (e) $4a^2b^2$

1. Jack and Gill went for a quiet drive one Sunday. They travelled a distance of 67km in 49 minutes. Calculate their average speed.

2. Use your calculator to find the following if $a = 2.9 \times 10^5$, $b = 5.3 \times 10^{11}$, $c = 7.6 \times 10^{15}$

   (a) abc (b) $3a^2 b$ (c) $5b^2 c^2$ (d) $(2a - b)^3$

3. Multiply out and tidy up (*remember brackets!!*)

   (a) $18 - (2x - 3)^2$ (b) $(x - 7)^2 - (x - 3)^2$ (c) $(2x - 1)^2 - 2(x - 1)^2$

4. The angle of elevation of the top of a building from a distance of $50\ m$ is $61°$. Calculate the height of the building.

5. A triangle has sides of length 10.35cm, 13.8cm and 17.25cm. Is the triangle right angled? Justify your answer.

6. A ladder 6 m long is placed against a wall. The ladder is only safe if it makes an angle of between $50°$ and $75°$ with the horizontal. What is the lowest and highest height that the ladder can reach up the wall?

1.   Write the following as mixed numbers:

   (a) $\dfrac{23}{6}$ (b) $\dfrac{31}{11}$ (c) $\dfrac{19}{5}$ (d) $\dfrac{156}{17}$ (e) $\dfrac{213}{21}$

2.   Write as a fraction:

   (a) $2\dfrac{2}{3}$ (b) $5\dfrac{8}{9}$ (c) $12\dfrac{3}{7}$ (d) $13\dfrac{13}{17}$ (e) $5\dfrac{2}{9}$

3.   Solve the following:

   (a) $2x(3x-1) = 3(2x^2-8)$ (b) $(2m+2)^2 = 4m(m+1)$
   (c) $9t^2 - (3t-1)^2 = 3t-4$ (d) $(4t-1)^2 - (4t+1)^2 = 32$

4.   Calculate the sizes of the angles inside a right angled triangle where the two shorter sides are 5cm and 12cm.

5.   Given $x = 5, y = -3, z = -1$, calculate the following:
   (a) xyz (b) $-3 - y^2$ (c) $x - yz^2$ (d) $5x - 3y^2 + z$

6.   If the area of a circle is given as $67cm^2$, find the diameter and the circumference of this circle.

7.   In a heatwave, a rail 10m long increased in length by 1cm. Calculate its percentage increase in length.

8.   List the first five multiples of (i) 7 and (ii) 9.

9.   List all the factors of 36.

10.   Calculate the mean, median, mode and range of 2,4,7,5,9,6,4,3,2,3,10.

1.   Calculate the following:

(a) $2\frac{1}{2} \times \frac{3}{4}$ (b) $5\frac{1}{3} - 2\frac{5}{7}$ (c) $3\frac{5}{8} \div 1\frac{3}{7}$ (d) $\frac{5}{9} \times 8\frac{2}{11}$

2.   Factorise the following:

(a) $3x - 27$ (b) $4x^2 - 32$ (c) $24x^2 - 8x$ (d) $16w - 6w^2$

(e) $13k + 39k^3$ (f) $8c^2 + 28c^3$ (g) $11d^2 - 33d^3$ (h) $16r^4 - 9r^2$

3.   A spaceship bound for Mars, 72 million km away, will average a speed of 16 thousand km/h. The launch was at 0000h on Wednesday 21st June. Find the day and date of its arrival.

4.   If $a = -2, b = -3, c = 4$. Calculate:

(a) $a - b^2$ (b) abc^2 (c) $5 - a^2$ (d) $10 - a^2 b^2$

5.   Simplify the following:

(a) $15 - (x - 4)^2$ (b) $(x - 4)^2 - (x + 3)^2$ (c) $(2x - 1)^2 - (x - 3)^2$

(d) $(3x - 2)^2 - (2x + 3)^2$ (e) $(4x + 1)^2 - (4x - 1)^2$ (f) $(2x + 5)^2 - (x - 3)^2$

6.   Write the following in standard form, $a \times 10^n$

(a) *3,200,000*   (b) *0.000078*   (c) *213,900,000*   (d) *0.00000006*

1.   Multiply out the following brackets:

(a) $(2x-4)(x+7)$ (b) $(3x+2)(2x-5)$ (c) $(3x-4)^2$

(d) $(2x-5)(2x+5)$ (e) $(4x-1)^2$ (f) $(7x-3)(7x+3)$

2.   Factorise the following:

(a) $4x^2 -18x$ (b) $16y^3 -8y^2 +10y$ (c) $22x^4 -16x^2$

(d) $x^2 -144$ (e) $4x^2 -121$ (f) $9a^2 -16b^2$

(g) $49-100d^2$ (h) $1-81r^2$ (i) $169-144p^2$

(j) $x^2 +12x+35$ (k) $x^2 -2x-24$ (l) $x^2 -10x+21$

3.   The angle of elevation of the top of a building from a distance of $75m$ is $54°$. Calculate the height of the building.

4.   Jack and Gill go for a romantic drive. They travel 32 miles in 47 minutes and then stop for a quiet picnic for an hour. They then drive on for another 17 miles, which takes them 29 minutes. What is their average speed, excluding the stop for lunch?

5.   A metal pole 12m long expands by 2cm. What is the percentage increase in the length of the pole?

6.   If $x=-3$, $y=2$ and $z=-4$, calculate

(a) xyz^2 (b) $15-x^2$ (c) $2y-3z^2$ (d) $-x^2 y^2$

1.   Factorise the following:

(a) $2xy - 6x$

(b) $2x^2 y^2 + 6xy$

(c) $5y^3 + 10y^2 - 20y$

(d) $4x^2 - 9y^2$

(e) $36x^2 - 25y^2$

(f) $x^2 + 3x - 18$

(g) $x^2 - 13x + 30$

2.   Plot the points A(2,1), B(4,2), C(4,4), D(2,3)
(a) What shape is ABCD
(b) P,Q,R,S are the images of A,B,C,D under reflection in the y-axis. Write down their coordinates.

3.   Bryan is flying his kite. He lets out 28 m of string, pulled taut, at $39°$ to the ground.
(a)   Calculate the height of the kite.
(b) The wind drops, and the kite falls to a point 19m above the ground, with the string still taut. What angle does the string now make with the ground?

4.   Simplify
(a) $3x + (-2x) + 7x$

(b) $2a \times 3a \times (-4a)$

(c) $t^2 - 2t^2 - 3t^2$

(d) $m \times n - 2m \times (-n)$

1. Multiply out the following brackets:

(a) $(c-5)(c+2)$ (b) $(3n-5)(2n-3)$ (c) $(4x-2)(5x+3)$

(d) $(5x-2)^2$ (e) $(4x+3)^2$ (f) $(3-7x)^2$

(g) $(x+5)(x-5)$ (h) $(3x-1)(3x+1)$ (j) $(5-4x)(5+4x)$

2. Factorise the following:

(a) $11y^2 + 13y + 2$ (b) $4k^2 - 7k + 3$ (c) $8a^2 + 10a - 3$

(d) $25x^2 - 10x + 1$ (e) $16h^2 - 25j^2$ (f) $9x^3 - 49x$

(g) $1 - 2x + x^2$ (h) $6x^2 - 2x - 4$ (j) $(a+b)^2 - c^2$

3. Write these as mixed numbers:

(a) $\dfrac{93}{12}$ (b) $\dfrac{67}{13}$ (c) $\dfrac{123}{16}$ (d) $\dfrac{64}{7}$ (e) $\dfrac{1243}{27}$

4. At full speed a snail can move at 60cm per minute. How long would it take to travel 7metres?

5. Simplify:

(a) $(-3k) \times (-4k)$ (b) $(-2x)^2$ (c) $-(-3m)^2$ (d) $-6t^2 \times (-8t^2)$

6. A car dealer buys a used car for £2500, and sells it for £2800.
(a) Calculate   (i) his profit
               (ii) His percentage profit based on the cost price
(b) What would the selling price be if he wants to make a profit of 14%?

1.   Simplify:

(a) $12 - (x - 4)^2$ (b) $9 - (2x - 3)^2$ (c) $(3x - 5)^2 - (3x + 2)^2$
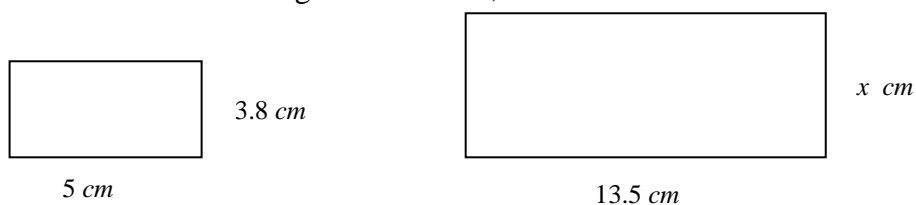
(d) $(2x + 1)^2 - (2x - 1)^2$ (e) $14x - (x - 7)^2$ (f) $5x^2 - (x - 2)(x + 4)$

2.   If these two rectangles are similar, find the value of *x*.

3.8 *cm*

x cm

5 *cm*

13.5 *cm*

3.   Is a triangle with sides 11.7*cm*, 15.6*cm* and 19.5*cm* right angled? Justify your answer.

4.   If $a = 3.2 \times 10^8$, $b = 6.8 \times 10^{12}$ and $c = 4.4 \times 10^{-7}$ calculate:

(a) abc (b) $a^2 + b^2$ (c) $a - \dfrac{b}{c}$

(d) $\dfrac{a}{b + c}$ (e) $(ab - c)^2$ (f) ab^2c

5.   Factorise the following:

(a) $6x^2 + 19x + 15$ (b) $10x^2 - 11x - 6$ (c) $49x^2 - 4$

(d) $100x^2 - 144y^2$ (e) $25x^2 - 81y^2$ (f) $x^2 + 3xy + 2y^2$

(g) $9x^2 + 12xy + 4y^2$ (h) $4x^4 - 9x^2$ (j) $12x^2 - 7x - 10$

6.   The angle of elevation of the top of this pyramid from a distance of 250*m* is $29.3°$. Find the height of the pyramid.

1.   Multiply out the following brackets:

(a) $(2x-3)(x+4)$ (b) $(5x-2)^2$ (c) $(6x+5)(6x-5)$

(d) $(3x+2)(4x-3)$ (e) $(4x+9)^2$ (f) $(3x-\frac{1}{2})(3x+\frac{1}{2})$

2.   Solve the following equations:

(a) $6+2(1+2x)=29-3x$ (b) $8-2(x+4)=3(2-x)$

(c) $2(4x-1)+5(x-2)=6(2x+1)$ (d) $\frac{1}{2}(18x+2)=3(3x-2)-3(x-7)$

3.   Factorise the following:

(a) $5x^2y-xy^2$ (b) $x^3y^3-x^2y^2+xy$ (c) $(2x-3)(x+4)$

(d) $49a^2-b^2$ (e) $81y^2-36z^2$ (f) $32d^2-50e^2$

(g) $x^2-3x-18$ (h) $x^2+7x-144$ (j) $x^2-17x+30$

(k) $5x^2+2x-7$ (l) $2x^2-11x+15$ (m) $2x^2-13x+11$

4.   In each formula below, make the letter in brackets the subject of the formula:

(a) $D=5f+g$ (**f**)   (b) $P=\frac{7r}{k}$ (**r**)   (c) $Q=\frac{9y}{g}$ (**g**)

(d) $\sqrt{(x-s)}=h$ (**x**)   (e) $ra+sb+t=0$ (**b**)   (f) $\frac{x}{k}=\frac{l}{m}$ (**x**)

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S3 Credit Homework Exercise 16

1.   Plot and calculate the distance between each pair of points.
     (a) $P(1,-6)$, $Q(-5,12)$ (b) $R(2,-7)$, $S(-3,1)$

2. $u = 121, v = 83, w = 61$. Calculate correct to 3 significant figures, the value of:

     (a) $\dfrac{u+v}{w}$ (b) $u + \dfrac{v}{w}$ (c) $u(v-w)$

     (d) $\sqrt{(v^2 + w^2)}$ (e) $(u-v)^3$ (f) $\dfrac{1}{u+v+w}$

3.   Change the subject of the following to x:

     (a) $P = \dfrac{5x-4}{t}$ (b) $R = 4d(2x-7)$ (c) $Y = \dfrac{3x+1}{x}$

4.   The height of a building is 73m. If the angle of elevation of the top of the building from where Stephen was standing was $43°$, what distance was he from the base of the building?

5.   Factorise the following:

     (a) $7x^3 - 28xy$ (b) $25x^2 - 64y^2$ (c) $x^2 - 5x - 36$

6.   Simplify:

     (a) $12 - (x-2)^2$ (b) $x^2 - (x-7)^2$ (c) $(2x+4)^2 - (x-4)^2$

7.   Solve the following pair of equations graphically:

$$x + y = 9$$
$$2x + y = 15$$

1.   Solve the following pairs of simultaneous equations:

(a)
$$x + y = 1$$
$$3x + 2y = 8$$

(b)
$$x + y = 6$$
$$3x - 2y = -7$$

(c)
$$3x - 4y = 26$$
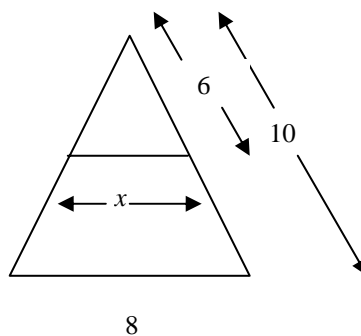$$5x + 6y = -20$$

(d)
$$5x - 2y = 17$$
$$2x + 3y = 3$$

(e)
$$3x - 2y = 12$$
$$4x + y = 5$$

(f)
$$\frac{1}{2}x + \frac{1}{3}y = 2$$
$$4x - y = 5$$

2.   The mass of the moon can be calculated in kilograms by using the formula
$m = \dfrac{gR^2}{G}$, where $g = 9.8$, $R = 6.37 \times 10^6$ and $G = 6.67 \times 10^{-11}$. Show that the
Earth's mass is 5.96×10^{24} kg, to 3 significant figures.

3.   Calculate the value of x.

4.   From a cliff-top 95m high the angles of depression of two boats are $40°$ and
$20°$. Calculate the distance between the boats.
(*Draw a diagram*)

5.   Factorise:

(a) $\pi y^2 + 2\pi y$ (b) $x^4 + 2x^2 - 8$ (c) $a - a^3$ (d) $8y^2 + 6y - 9$

1.   Multiply out and tidy up:

(a) $12 - (x-4)^2$

(b) $x^2 - (x-5)^2$

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

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

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

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

2.   Factorise the following:

(a) $6c^2 + 17c - 3$

(b) $5g^2 - 16g + 3$

(c) $1 - 3u - 18u^2$

(d) $49x^2 - 81y^2$

(e) $27a^3 - 48a$

(f) $9b^2 + 21b + 6$

3.   Can a right angled triangle be made out of three straws of length 11.1cm, 14.8cm and 18.5cm? Justify your answer.

4.   Solve the following simultaneous equations:

(a) $\begin{aligned} 2x - 3y &= 12 \\ 3x - 2y &= 13 \end{aligned}$

(b) $\begin{aligned} 4x - y &= 5 \\ x + 3y &= -2 \end{aligned}$

(c) $\begin{aligned} 3x + 2y &= 0 \\ 4x - 3y + 17 &= 0 \end{aligned}$

5.   Where do the lines with equations $2x + y = 5$ and $3x - 2y = 11$ intersect?

6.   If $x = -3$, $y = 2$ and $z = -4$, calculate:

(a) xyz (b) $x^2 y$ (c) $y - z^2$ (d) $x^2 z^2$ (e) $9 - x^2$

1. Mr. Jones keeps a note of pupils attending supported study class over the 20 weeks it is on offer. The figures are

    | 23 | 25 | 27 | 27 | 24 | 26 | 17 | 26 | 25 | 19 |
    | 22 | 26 | 28 | 24 | 21 | 20 | 18 | 21 | 27 | 18 |

    (a) Write the numbers in order, least first.
    (b) Calculate the median and lower and upper quartiles
    (c) Draw a boxplot.

2. Solve the following equations:

    (a) $10t + 4 = 12t + 2$ (b) $2 - 2x = 14 + 2x$ (c) $-5d - 1 = 2d - 8$

3. Factorise:

    (a) $9 - 36y^2$ (b) $4x^2 + xy^2$ (c) $12x^2 - 7x - 12$

4. Simplify:

    (a) $14 - (x - 3)^2$ (b) $(x - 2)^2 - (x + 3)^2$ (c) $13x^2 - (2x - 1)^2$

5. Kelly cycles a distance of 35km in 50 minutes. Calculate her average speed in km/h to one decimal place.

6. $a = 16.7$, $b = 13.1$ and $c = 9.4$. Calculate correct to 3 significant figures, the value of:

    (a) $\dfrac{ab}{c}$ (b) $a + \dfrac{b}{c}$ (c) $\dfrac{a + b}{c}$

    (d) $\sqrt{a^2 + b^2 - c^2}$ (e) $\dfrac{a + b}{b - c}$ (f) $\dfrac{b}{c} + \dfrac{c}{a}$

1.   The ages of people from 12 to 17 using the local library were recorded one
        week. The results are displayed below.

Age (Years)	No. of People	Cumulative Frequency
12	12	
13	13	
14	11	
15	14	
16	21	
17	20	

(a) Copy and complete the table filling in the cumulative frequency column
(b) Work out the two quartiles and the median age of people visiting.

2.   Calculate the volume of a cylinder with an end of diameter 180*mm* and a
        height of 400*mm*.

3.   What is the surface area of a rectangle of sides 4*cm* by 5*cm* by 6*cm*?

4.   Multiply out and tidy up. (*Remember brackets!!*)

(a) $x^2 - (x-7)^2$ (b) $19 - (3x+1)^2$ (c) $25x - (2x-5)^2$

5.   Change the subject of the formula to *x*:

(a) $y = 3(x-2)$ (b) $y = \dfrac{4x-5}{7}$ (c) $y = \dfrac{x+3}{x-5}$

6.   Factorise:

(a) $3x^2 + 11x - 20$ (b) $6x^2 - x - 12$ (c) $2x^2 - x - 28$

1. Factorise:
(a) $12y^2 - 7y - 12$ (b) $4x^2 - 8x + 3$ (c) $8b^2 - 2b - 3$

2. Multiply out and tidy up:
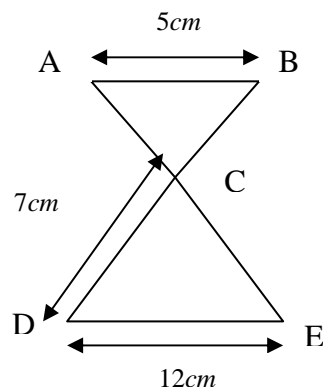(a) $13 - (x-3)^2$ (b) $5x + (2x-3)^2$ (c) $(x-1)^2 - (x-2)^2$

3. An aircraft flying at Mach 1 has a speed of $3.315 \times 10^2 \, m/s$. Calculate its speed in standard form at Mach 2.7.

4. Calculate the length of the line BC.

5. Nicola travels a journey of 96km at an average speed of 75km/h. Find how long her journey takes in hours and minutes. (*Round your answer to the nearest minute*).

6. Find the length of the line joining the points $P(-3,2)$ and $Q(7,-3)$.

7. The Jones family, 3 adults and 2 children, go the theatre which costs them £14.25. The Smiths also go – there are 4 adults and 3 children in their party and it costs them £19.50.
What is the cost of an adult ticket and the cost of a child's ticket?

1.   Change the subject of the formula to x:

(a) $y = 9x - 13$ (b) $3a + 8x = 5b$ (c) $y = \dfrac{5x - 7}{3}$ (d) $5a - 5 = \dfrac{2b - 6}{x}$

2.   Factorise:

(a) $z^2 + 4z - 12$ (b) $p^2 + 21p - 72$ (c) $4s^2 - 2s - 2$ (d) $4x^2 - 8x + 3$

3.   Calculate the volume and surface area of a cylinder with diameter $12cm$ and height $22cm$.

4.   A metre stick leaning against a wall makes an angle of $65°$ to the horizontal. How far up the wall does rest. (*Draw a diagram!*)

5.   Solve the following simultaneous equations:

(a)
$2x - 3y = 5$
$4x + 3y = 1$

(b)
$7x - 9y = 2$
$x + 3y = 11$

(c)
$2x + 3y = 1$
$5x + 2y = -3$

6.   Calculate:

(a) $2\frac{1}{2} + 3\frac{2}{5}$ (b) $6\frac{3}{4} \times 5\frac{2}{3}$ (c) $4\frac{1}{8} \div 3\frac{2}{3}$ (d) $5\frac{3}{8} - 2\frac{7}{9}$

(*ALL WORKING SHOULD BE SHOWN!*)

1. (a) Draw x and y–axes and plot the points $A(-3,0)$, $B(0,5)$ and $D(0,-2)$. Join AB and AD.
    (b) Plot C so that the y-axis is an axis of symmetry of the shape ABCD.
    (c)   (i) Write down the coordinates of C.
          (ii)What type of shape is ABCD

2. What angle does the minute hand turn through from 8.05pm to 8.40pm?

3. The HP terms are: deposit $33\frac{1}{3}\%$ of cash price, plus 12 equal monthly payments.

    Calculate the monthly payment.
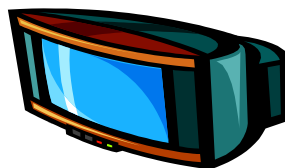
    TIP TOP TV
    Cash price £270
    HP Price £324

4. Solve the equations:
    (a) $3(2x-1)+2 = 47$ (b) $x(x+4) = x^2 + 12$

5. Factorise:
    (a) $x^2 - x$ (b) $t^3 + t^2$ (c) $2n^2 - 5n + 3$ (d) $5x^2 - 20y^2$

6. On a hiking holiday, Teresa walks nine miles a day for three days and x miles a day for four days. She walks 79 miles in the 7 days. Make an equation and solve it for x.

7. The mean (m) of the scores p, q and r can be found by using the formula $m = \frac{1}{3}(p+q+r)$.
    (a) Use the formula to calculate the mean of 69, 74 and 76.
    (b) Make r the subject of the formula.
    (c) Use this new formula to calculate r when $m = 12$, $p = 4$ and $q = 5$.

1. Calculate in simplest form:
   (a) $3\frac{1}{2} \times 2\frac{3}{5}$
   (b) $4\frac{5}{6} \div 2\frac{2}{3}$
   (c) $2\frac{4}{5} - 1\frac{2}{7}$

2. Factorise:
   (a) $3x^3 - 27x$
   (b) $6a^2 + 7a - 10$
   (c) $\pi R^2 - \pi r^2$

3. Multiply out and tidy up:
   (a) $16 - (x-5)^2$
   (b) $9x - (2x-1)^2$
   (c) $5x^2 - (2x+3)^2$

4. Joe Peters earns £15,000 a year, plus commission of $2\frac{1}{2}\%$ of his sales. How much does he earn in a year when his sales totalled £78,000?
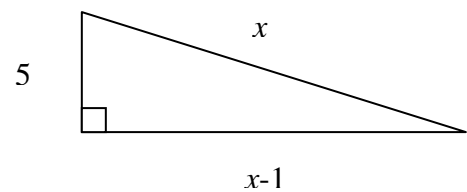
5. Simplify:
   (a) $4x - (-3x) - 5x$
   (b) $x \times y - 2x \times (-y)$
   (c) $3a \times a - a \times 2a$

6. Make an equation, and find the length of each edge of this right angled triangle.

7. Stock cubes of side $2cm$ are packed in cubic boxes of side $4.3cm$.
   (a) How many cubes can a box hold?
   (b) What percentage of space is used for packaging etc?

8. Amy measures the length and breadth of a rectangle to the nearest 0.1cm. Her measurements are 8.2cm and 5.7cm. Calculate the greatest and least perimeters of the rectangle.

1. Factorise:

(a) $10x^2 + 3x - 4$ (b) $6x^2 + 17x - 3$ (c) $4x^2 - 8x + 3$

2. Solve these simultaneous equations:

(a) $\begin{aligned} 3a + 5b &= 23 \\ 5a + 2b &= 13 \end{aligned}$ (b) $\begin{aligned} 2c - 3d &= 12 \\ 3c - 2d &= 13 \end{aligned}$ (c) $\begin{aligned} 2e - 3f &= 12 \\ 5e - 2f &= 19 \end{aligned}$

3. Jacks Car Sales are selling a car for £9500. The manager decides to introduce HP terms as follows: deposit 20% of cash price and 24 monthly payments. The total HP price would be 25% more than the cash price. How much will each monthly payment be?

4. If a man walks at an average speed of 6km/h, how far will he walk in 25 minutes?

5. It takes 5 days for a squad of 24 pickers to gather a crop of raspberries. How many pickers, working at the same rate, would have gathered the crop in 3 days?

6. Calculate the interest on £650 for 7 months at $8\frac{1}{2}\%$ per annum, to the nearest penny.

7. There are 53,000 spectators at a football match. If this fills 90% of the possible accommodation of the ground, how many can it hold when full?

1. Factorise:

(a) $x^2 + 9x + 20$ (b) $4x^2 + 4x + 1$ (c) $4x^2 - 49$

2. Calculate the smallest angle in right angled triangle with sides of length $7.2cm$, $9.6cm$ and $12cm$.

3. Solve for x:

(a) $7(2x + 3) - 3(8 - 2x) = 27$ (b) $(3x + 1)(2x - 4) - x(6x - 7) = 0$

4. Change the subject of the following to the variable stated:

(a) $y = 2x + q$ (to x)   (b) $s = \dfrac{2\pi}{r^2}$ (to r)   (c) $M = 3(2d + 1)$ (to d)

5. Simplify the following:

(a) $(z^8)^2$ (b) $\dfrac{k^{20}}{k^9}$ (c) $\dfrac{p^{12}}{p^{-4}}$ (d) $(ab^2)^3$ (e) $(2m^2n)^4$

6. Write the following in positive index form:

(a) x^{-7} (b) $b^2 \div b^6$ (c) $25y^{-1}$ (d) $\sqrt[3]{a^5}$ (e) $\dfrac{1}{\sqrt[2]{x^7}}$ (f) $\sqrt[4]{(x)^{-5}}$

7. The area of a circle and square are equal. If the radius of the circle is $6cm$, calculate the length of a side of the square to the nearest tenth of a centimetre.

8. A chicken farmer estimates that he has enough grain etc., to feed his 2000 hens for a fortnight. If he acquires 800 more hens, for how long can his hens be fed?

1.   Factorise:

(a) $2x^2 - 5x - 3$ (b) $y^2 + 12y + 36$ (c) $2\pi rh + \pi r^2$

2.   Simplify the following surds:

(a) $\sqrt{50}$ (b) $\sqrt{98}$ (c) $\sqrt{48}$ (d) $\sqrt{72}$ (e) $\sqrt{300}$

3.   Multiply out:

(a) $(x^{\frac{1}{2}} + 1)(x^{-\frac{1}{2}} + 1)$ (b) $(x^{\frac{3}{4}} + 1)(x^{-\frac{1}{4}} + 1)$ (c) $(x^{\frac{2}{3}} + 1)(x^{\frac{2}{3}} - 1)$

4.   The levels of oil in a tank are given as follows:
      18*mm*, -14*mm*, -13*mm*, 10*mm*, -19*mm*. Calculate the mean level.

5.   Mr. Jones invest £2500 in a bank at an interest rate of 5.6%. How much will
      he have in his account after 3 years.

6.   Can a right angled triangle be made from three pieces of wood of length
      20.4*cm*, 27.2*cm* and 34*cm*?
      Justify your answer.

7.   A 6*m* ladder has to reach up a wall 5.2*m* high. The angle
      the ladder makes with the ground must be between 55° and
      65°. Can this be done?
      Justify your answer.

1.   In 1987 the total wage bill for a company was £412,000. It is estimated that wages will rise at a rate of 4% per annum for the next two years. What will the total wage bill for the company be in 1989. Give your answer to the nearest thousand pounds.

2.   Multiply out the brackets and simplify:

(a) $15 - (x - 5)^2$

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

(c) $4x^2 - (2x + 3)^2$
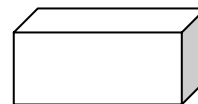
3.   Solve the following, where $x, y \in R$:

(a) $\begin{array}{l} x + y = 0 \\ x - y = -8 \end{array}$

(b) $\begin{array}{l} 5x - 2y = 17 \\ 2x + 3y = 3 \end{array}$

(c) $\begin{array}{l} 2x + y = 2 \\ \frac{1}{2}x + \frac{1}{3}y = -1 \end{array}$

4. $64cm$ of wire is used to make a skeleton cuboid which is $7cm$ long and $5cm$ broad. Assuming that no wire is wasted, what is the height of the cuboid?

5.   Simplify the following:

(a) $\sqrt{72} - \sqrt{8}$

(b) $\sqrt{48} + \sqrt{75}$

(c) $\sqrt{45} - \sqrt{20}$

6,   Make x the subject of each of the following formula:

(a) $a = x^2 - b$

(b) $\dfrac{x + a}{b} = \dfrac{c}{d}$

(c) $ax + bx = c$

7.   A painter mixes blue and yellow paint in the ratio 3:5 to make green paint. He has 20 litres of blue and 20 litres of yellow paint in stock.
What is the greatest number of litres of green paint he can make?

1.   Factorise the following:

(a) $6a^2 + 7a - 10$

(b) $z^2 - z - 30$

(c) $2a^2 - 18$

(d) $2d^2 - 5d - 3$

(e) $3a - 6b + 9c$

(f) $2t - 8t^3$

2.   Joe earns £8.40 an hour. His basic working week is 35 hours (Mon. – Fri.).
His overtime is: time and a half in the evenings and double time at the weekend.
How much is his pay for a week where he works an extra two hours on Tuesday
evening, three hours on Thursday evening and four hours on a Saturday morning?

3.   Calculate the size of the angle that
this triangle makes with the horizontal.   5*mm*

12*mm*
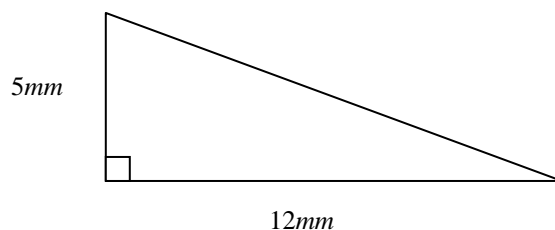
4.   The length of time between one programme finishing and the next one starting
is the subject of a survey. Twenty of these inter-programme
gaps are measured:
1.25,   2.35,   5.71,   4.74,   3.12,   5.10,   1.23,   3.61,   3.77,
2.79,   3.25,   1.45,   3.29,   4.88,   2.62,   4.16,   5.02,   1.94,
2.00,   4.77.
The times are in minutes.

Round these times to one decimal place and make a stem-and-leaf diagram of the
rounded data.

5.   A missile is fired at a target 178,500*km* from the earth. If its average speed is
17,000*km/h*, and it is fired at 0630 hours, when will it reach its target?

6.   Solve the following:

(a)
$x + y = 1$
$3x + 2y = 8$

(b)
$3x - 4y = 26$
$5x + 6y + 20 = 0$

(c)
$3x - 2y = 12$
$4x + y = 5$