Fractions 1

1. What is the value of $\frac{2006}{8}+\frac{6002}{8}$

2. There are 84 animals in a field
   11 are cows
   45 are sheep
   The rest are pigs

   What fraction of the animals are pigs? Give you answer in simplest form

3. Simplify fully $\frac{x}{6}+\frac{3x}{4}$

4. Calculate $\frac{5}{6}\times\frac{3}{5}$

   give your answer in simplest form

5. What is the value of

6. How many of these calculations equal 1
   Give reasons

   $\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}-\frac{1}{2}$ $\frac{1}{2}\times\frac{1}{2}$ $\frac{1}{2}\div\frac{1}{2}$

7. Sally has 30m of ribbon.
   She cuts lengths of $2\frac{3}{5}$ metres from the ribbon. Sally says she has enough ribbon to cut 12 lengths. Is she correct? You must show all workings

8. Express as a single fraction $\frac{2a}{3}-\frac{b}{4}$

Indices 1

Simplify the following

1. $x^3 \times x^8 =$

2. $\frac{9^8}{9} =$

3. $(2^3)^5 =$

4. $\frac{4^4\times 4}{(4^2)^3} =$

5. $16^{\frac{1}{2}} =$

6. What is the reciprocal of 16

7. What is 4^{-3}

8. What is $\left(\frac{2}{5}\right)^{-1}$

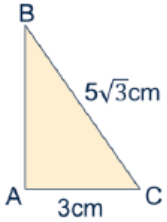
Indices 2

Simplify the following

1. $t^5 \times t^4 =$
2. $\frac{8^7}{8^2} =$
3. $(3^4)^2 =$
4. $\frac{5^7 \times 5}{(5^3)^3} =$
5. $(8)^{\frac{1}{3}} =$
6. $y^0 =$
7. What is $4^{-3} =$
8. What is $\left(\frac{2}{3}\right)^{-2} =$

Surds 1

1. Simplify $\sqrt{a} + 2\sqrt{a} + 5\sqrt{a}$
2. Simplify $\sqrt{2} \times \sqrt{6}$
3. Simplify fully $\left(4\sqrt{3}\right)^2$
4. Write $\sqrt{45} + \sqrt{20}$ in the form k $\sqrt{5}$
5. Calculate $\frac{\sqrt{54}}{\sqrt{6}}$
6. Rationalise the denominator of $\frac{4}{\sqrt{3}}$
7. A rectangle has an area of $8\sqrt{15}$ cm^2 and a length of $2\sqrt{3}$ cm.
   Find the width of the rectangle
8. Find the length AB



Surds 2

1. Simplify $\sqrt{d} + 6\sqrt{d} - 3\sqrt{d}$
2. Simplify $2\sqrt{b} \times 4\sqrt{3}$
3. Simplify fully $(4\sqrt{5})^2$
4. Write $\sqrt{75} + \sqrt{48} - 2\sqrt{12}$ in the form $k\sqrt{3}$
5. Simplify $\frac{\sqrt{125} - 2\sqrt{20}}{\sqrt{5}}$
6. Rationalise the denominator of $\frac{2\sqrt{2}}{\sqrt{5}}$
7. Evaluate $\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{\sqrt{6}}$
8. A triangle has base of $3\sqrt{2}$ and a perpendicular height of $5\sqrt{8}$

   Calculate the area of the triangle

Expanding 2

1. Expand y(2y – 3)
2. Expand $2x^2(3xy - 2x^3)$
3. Expand and simplify
   a. $5(x - 4) + 3(2x + 5)$
4. Expand and simplify
   a. $4(\sqrt{2} - 3) + 2(\sqrt{2} + 2)$
5. Multiply the expressions y and y + 4

   Which of these expressions show the result?

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

6. A rectangle of width 3cm and width x + 4 cm is made larger by doubling its side lengths. What is the area, in cm^2 of the larger rectangle?
7. Expand and simplify 4 – 3(2 – a + t) - t
8. Expand and simplify

   $\frac{a}{2}\left(3 + \frac{a}{4}\right) + \frac{a}{3}\left(2 + \frac{a}{2}\right)$

Expanding 2

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

2. Expand and simplify
   i. $3x(x+3)+4(x+3)$

3. Expand and simplify
   i. $(x+6)^2+(x-3)^2$

4. Expand and simplify $(2-\sqrt{3})^2$

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

6. Expand and simplify $(x^3-7)(x^3+7)$

7. Expand and simplify
   1. $(3x+2)(4x^2+2x-3)$

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

Summary and review

1. Expand and simplify
   $\left(\frac{1}{3}x+\frac{1}{9}\right)\left(3x-\frac{2}{3}\right)$

2. Expand and simplify
   $(x+1)(x+2)(x+3)$

3. Expand and simplify
   $(x-3)(x+2)^2$

4. Expand and simplify
   $(2-\sqrt{3})(1+\sqrt{3})(1-\sqrt{3})$

5. Find the volume of a cube with side length
   $x-4$

6. Expand and simplify
   $(x^2-2)(x^2+2)(x+1)$

7. Write $\left(\sqrt{y}+\sqrt{8y}\right)^2$ in the form $a+b\sqrt{2}$.

   Given that $\left(\sqrt{y}+\sqrt{8y}\right)^2=54+b\sqrt{2}$.
   Find values for y and b.

8. Simplify $\frac{(x-1)(x+2)}{(x+3)}-\frac{4}{2x+1}$

Factorising 2

Fully factorise the following

1. $7x + 28$
2. $14 - 21x$
3. $y^2 - 8y$
4. $3t^4 + 9t^2$
5. $3x^3y - 12xy^2 + 6xy$
6. $8a^3b + 6y^2b - 10b$
7. $6x(x + 3) + 5(x + 3)$
8. $7y(3 - 2y) - 2(3 - 2y)$

Further Factorising 2

Factorise the following fully:

1. $x^2 + 6x - 7$
2. $y^2 + y - 12$
3. $y^2 - 11y + 28$
4. $t^2 + 7t - 18$
5. $k^2 + 9k + 20$
6. $x^2 + x - 56$
7. $p^2 - 25p$
8. $x^2(3x - 4) + (4 - 3x)$

Try factorising these expressions using the difference of two squares

1. $x^2 - 6^2$
2. $y^2 - 144$
3. $x^2 - y^2$
4. $4t^2 - 81$
5. $x^2 - 5$

Completing the square 2

Write these expressions in the form $(x + a)^2 + b$

1. $x^2 + 10x$
2. $x^2 + 10x + 30$
3. $y^2 - 2y$
4. $y^2 - 2y + 3$
5. $x^2 - 8x + 25$
6. $k^2 + 14k - 1$
7. $y^2 + 5y + 6$
8. $t^2 + 6t + 9$

Rearranging 2

1. Make x the subject of $x - f = y + b$
2. Make y the subject $ty - x^2 = b$
3. Make c the subject $ac + d = m^2$
4. Make a the subject $x(a - e) = d$
5. Make y the subject $b(y - b) = b^2$
6. To find velocity, v, we use the formula
   $v^2 = u^2 - 2as$
   Rearrange to find s
7. The area of a sector of a circle is given by
   $A = \frac{\theta \pi r^2}{360}$
   Express θ in terms of A, π and r
8. Make x the subject $m(y - x) = t$

Rearranging and Functions

Original function	Inverse function
$f(x) = 3x + 2$	$f^{-1}(x) = \frac{x-2}{3}$

Find the inverse of each of these functions.

1. $f(x) = 3x - 5$
2. $f(x) = 4x + 7$
3. $f(x) = \frac{x}{2} + 1$
4. $f(x) = \frac{x+2}{3}$
5. $f(x) = \frac{2}{3}x + 3$
6. $f(x) = 3 - 2x$

Further Factorising 2

1. Make y the subject of $xy + 6 = 7 - ky$
2. Find an expression for the area of a rectangle with length, $(y - x)$ and width, $(x - 2)$
3. Rewrite your expression in Q2 to have y expressed in terms of A and x
4. Make y the subject of $\frac{4}{y} + 1 = 2x$
5. Displacement can be expressed as
   i. $s = ut + \frac{1}{2}at^2$
   Express a in terms of s, u and t
6. Make y the subject of $\sqrt{by^2 - x} = D$
7. The area of a trapezium has formula
   i. $A = \frac{1}{2}\left(\frac{a+b}{h}\right)$
   Express h in terms of A, a and b
8. Make t the subject $b(t + a) = x(t + b)$

Solving Linear 2

Solve the equations

1. $6x + 5 = 47$

2. $5x + 7 = x + 25$

3. $7(x - 4) = 14$

4. $29 - 4x < 22$

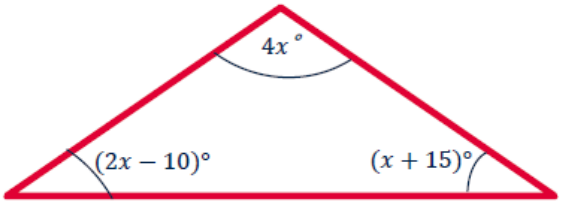
5. $3x < 2x - 1 < 4x + 2$

   Hint: Split into two inequalities

6. $19 + 2x = 3x + 15$

7. $\frac{3x-1}{5} \geq \frac{3x+5}{2}$

8. Find the value of x in the triangle below



Linear Simultaneous Equations

There are two main ways to solve simultaneous equations.

Elimination

$3x + 2y = 9$

$5x - 2y = -1$

Add the two equations together to eliminate $\boldsymbol{y}$

$8x = 8$

$x = 1$

Now we have a value for $\boldsymbol{x}$ we can put it into one of the original equations to find $\boldsymbol{y}$

$3 \times 1 + 2y = 9$

$3 + 2y = 9$

$2y = 6$

$y = 3$

Substitution

$y + 3x = 5$

$2y + 7x = 11$

Rearrange the first equation in terms of $\boldsymbol{y}$ and then substitute into the second equation

$2(5 - 3x) + 7x = 11$

$10 - 6x + 7x = 11$

$x = 1$

Now we have a value for $\boldsymbol{x}$ we can put it into one of the original equations to find $\boldsymbol{y}$

$y + 3 \times 1 = 5$

$y + 3 = 5$

$y = 2$

Which method is best and when?

Solve the following:

1.

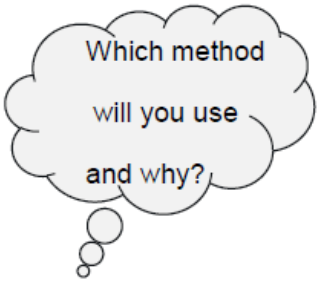
$2x + y = 7$

$2x - y = 1$

2.

$3x + 2y = 7$

$3x + 5y = 4$



3.

$y = 4x + 3$

$3x + 2y = 28$

4.

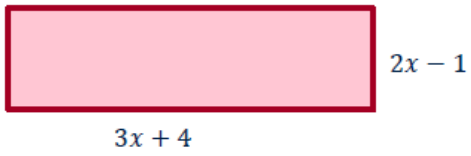
$4x + 3y = -4$

$6x - 2y = 7$

Solving with Quadratics 2

Solve the following

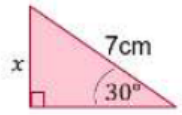
1. $x^2 - 4x - 12 = 0$
2. $x^2 - x = 6$
3. $2x^2 - 11x + 12 = 0$
4. $6x^2 + x - 12 = 0$
5. $3 + 2x - x^2 = 0$
6. $x^2 - 4x - 1 = 0$
7. $\frac{8}{x+2} - \frac{14}{x-3} = 9$
8. The area of this rectangle is $30m^2$



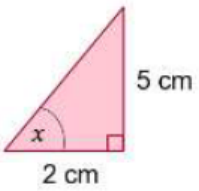
a) Show that $6x^2 + 5x - 34 = 0$
b) Find any possible values for x

Solving Equations with Trigonometry

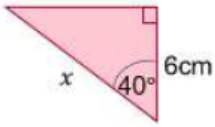
1. Calculate the length of the side marked x in this triangle.



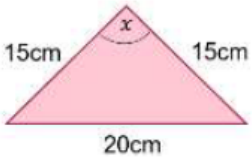
2. Calculate the value of the angle marked x in this triangle.



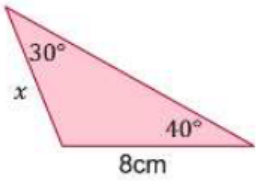
3. Calculate the value of the side marked x in this triangle



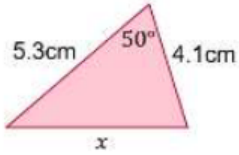
4. Calculate the value of the angle marked x in this triangle.



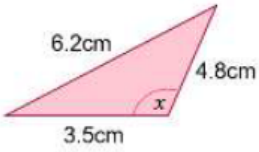
5. Calculate the value of the side marked x in this triangle



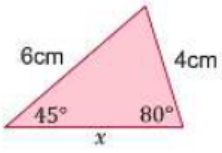
6. Calculate the value of the side marked x in this triangle.



7. Calculate the value of the angle marked x in this triangle.



8. Calculate the value of the side marked x in this triangle.



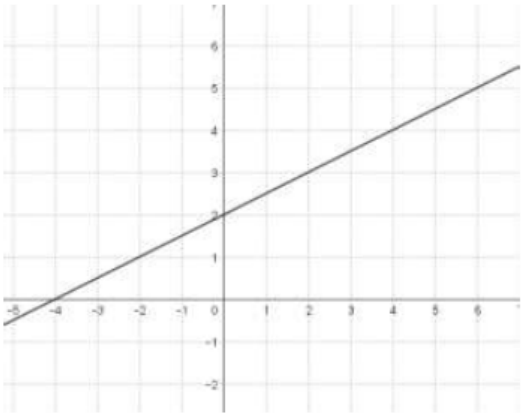
Other Equations

Solve the following

1. $3^x = 243$
2. $2^{2x+3} = 128$ **Hint:** write 128 as powers of 2
3. $\sqrt{x+3} = 7$
4. $2\sqrt{x} + 1 = \sqrt{12} + 3$
5. $3\sqrt{x} + 12 = 7\sqrt{x}$
6. $\sin x = \frac{1}{2}$ $0 \leq x \leq 360$
7. $\cos x = 0.866$ $0 \leq x \leq 360$
8. $\frac{8}{3x+7} = 2$

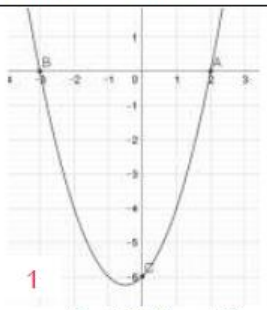
Linear Graphs 2

1. What are the gradient and y intercept of the line $y = 2x - 7$?
2. Find the gradient of the line connecting (1,4) and (-1,0)
3. Find the midpoint between the points (-2,10) and (6,4)
4. Find the distance between the points (4,11) and (-1,15)
5. What is the equation of the line with gradient 2 that passes through (1,4)?
6. Does the line $y = -2x + 5$ pass through (3,1)? Explain how you know.
7. Find the equation of a line that is parallel to $y = -\frac{3}{2}x - 1$ that passes through (6,4)
8. What's the equation of this graph?



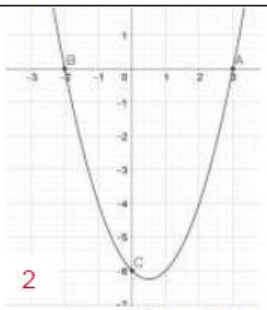
Quadratic Graphs 1

Find the coordinates of A, B and C on each graph



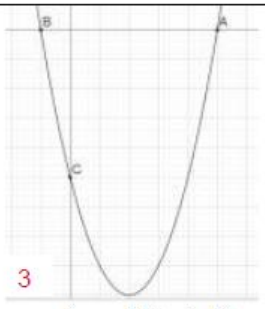
1

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



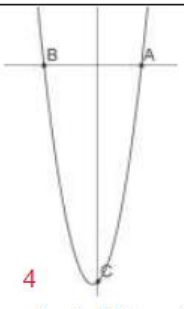
2

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



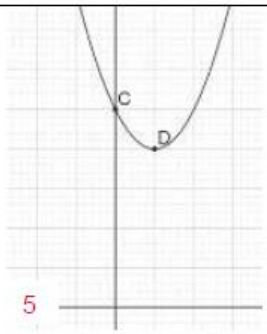
3

$y = (x - 5)(x + 1)$



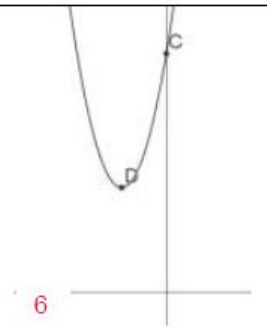
4

$y = (x + 5)(x - 4)$



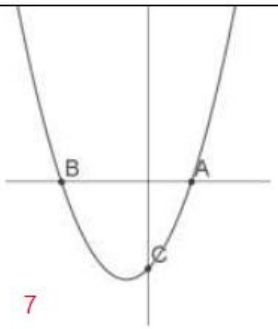
5

$y = (x - 1)^2 + 4$



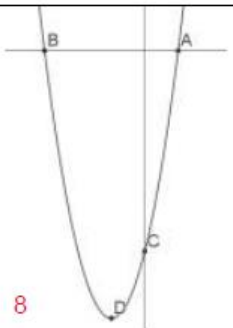
6

$y = (x + 3)^2 + 7$



7

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



8

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

Sketching Other Graphs 1

1. What is the mathematical name for the graph of $y = \frac{1}{x}$?
2. What are the maximum and minimum values for the graph $y = cos\theta$?
3. Sketch the graph of $y = 2^x$. Label the y and x intercepts.
4. Using a sketch of the graphs
   $y = \frac{1}{x}$ and $y = x$
   Show how many solutions there will be to the equation $\frac{1}{x} = x$
5. What is the name for this type of graph?
6. What is the y intercept of the graph $y = (x + 2)(x - 3)(x + 5)$?
7. What are the x intercepts of the graph $y = (x + 2)(x - 3)(x + 5)$?
8. Sketch the graph of $y = (x - 3)(x + 2)(x + 5)$

Sketching Other Graphs 2

1. What is the mathematical name for graphs of the form of $x^2 + y^2 = 9$?
2. Sketch the graph of $y = sin\theta$ between 0° and 360°, labelling x and y intercepts
3. On your sketch for Q2 draw in the line
   $y = 0.5$
   How many solutions are there to
   $sin\theta = 0.5$?
   Can you say what they are?
4. Sketch the graph $y = x^3$, labelling any intersections
5. Sketch the graph of the equation in Q1, label any intersections with the x and y axis
6. What is the y intercept of the graph $y = (x + 1)(x + 1)(x - 1)$?
7. What are the x intercepts of the graph $y = (x + 1)(x + 1)(x - 1)$?
8. Sketch the graphs of
   $x^2 + y^2 = 4$
   $y = x + 1$
   Use the sketch to determine how many solutions there are when those equations are solved simultaneously

Solutions

Fractions 1

1. 1001
2. $\frac{1}{3}$
3. $\frac{11x}{12}$
4. $\frac{1}{2}$
5. $\frac{16}{7}$
6. $\frac{1}{2}+\frac{1}{2}\ and \frac{1}{2}\div\frac{1}{2}$
7. $No, 31\frac{1}{5} > 30$
8. $\frac{8a-3b}{12}$

Indices 1

1. x^{11}
2. 9^7
3. 2^{15}
4. $\frac{1}{4}$
5. 4
6. $\frac{1}{16}$
7. $\frac{1}{64}$
8. $\frac{5}{2}$

Indices 2

1. t^9
2. 8^5
3. 3^8
4. $\frac{1}{5}$
5. 2
6. 1
7. $\frac{1}{81}$
8. $\frac{9}{4}$

Surds 1

1. $8\sqrt{a}$
2. $2\sqrt{3}$
3. 48
4. $5\sqrt{3}$
5. 3
6. $\frac{4\sqrt{3}}{3}$
7. $\sqrt{66}\ cm$
8. $4\sqrt{5}cm$

Surds 2

1. $4\sqrt{d}$
2. $8\sqrt{3b}$
3. 80
4. $5\sqrt{3}$
5. 1
6. $\frac{2\sqrt{10}}{5}$
7. $\sqrt{2}$
8. $30\ cm^2$

Expanding 2

1. $2y^2 - 3y$
2. $6x^3y - 4x^5$
3. $11x - 5$
4. $6\sqrt{2} - 8$
5. $y(y + 4)$ & $y^2 + 4y$
6. $6(2x + 8)$ *or* $(12x + 48)\ cm^2$
7. $3a - 4t - 2$
8. $\frac{7a^2-52a}{24}$

Expanding 2

1. $2x^2 - x - 6$
2. $3x^2 + 13x + 12$
3. $2x^2 + 6x + 45$
4. $7 - 4\sqrt{3}$
5. $\frac{x^2+2x-9}{x(x+3)}$
6. $x^6 - 49$
7. $12x^3 + 14x^2 - 5x - 6$
8. $\frac{5x^2-6x+4}{3x(x+2)}$

Summary and review

1. $x^2 + \frac{1}{9}x - \frac{2}{27}$
2. $x^3 + 6x^2 + 11x + 6$
3. $x^3 + x^2 - 8x - 12$
4. $2\sqrt{3} - 4$
5. $x^3 - 12x^2 + 48x - 64$
6. $x^5 + x^4 - 4x - 4$
7. $y = 6 \quad b = 24$
8. $\frac{2x^3+3x^2-7x-14}{(x+3)(2x+1)}$

Factorising 2

1. $7(x + 4)$
2. $7(2 - 3x)$
3. $y(y - 8)$
4. $3t^2(t^2 + 3)$
5. $3xy(x^2 - 4y - 2)$
6. $2b(4a^3 + 3y^2 - 5)$
7. $(x + 3)(6x + 5)$
8. $(3 - 2y)(7y - 2)$

Further Factorising 2

1. $(x + 7)(x - 1)$
2. $(y + 4)(y - 3)$
3. $(y - 7)(y - 4)$
4. $(t + 9)(t - 2)$
5. $(k + 5)(k + 4)$
6. $(x + 8)(x - 7)$
7. $p(p - 25)$
8. $(3x - 4)(x^2 - 1)$

Difference of Two Squares

1. $(x-6)(x+6)$
2. $(y+12)(y-12))$
3. $(x+y)(x-y)$
4. $(2t-9)(2t+9)$
5. $(x+\sqrt{5})(x-\sqrt{5})$

Completing the square 2

1. $(x+5)^2-25$
2. $(x+5)^2+5$
3. $(y-1)^2-1$
4. $(y-1)^2+2$
5. $(x-4)^2+9$
6. $(k+7)^2-50$
7. $\left(y+\frac{5}{2}\right)^2-\frac{1}{4}$
8. $(t+3)^2$

Rearranging 2

1. $x=y+b+f$
2. $y=\frac{(b+x^2)}{t}$
3. $c=\frac{m^2-d}{a}$
4. $a=\frac{d}{x}+e$
5. $y=2b$
6. $s=\frac{v^2-u^2}{2a}$
7. $\theta=\frac{360A}{\pi r^2}$
8. $x=y-\frac{t}{m}$

Please note that there may be alternative correct expressions – check with your teacher

Rearranging Functions -

1. $f^{-1}(x)=\frac{x+5}{3}$
2. $f^{-1}(x)=\frac{x-7}{4}$
3. $f^{-1}(x)=2(x-1)$
4. $f^{-1}(x)=3x-2$
5. $f^{-1}(x)=\frac{3(x-3)}{2}$
6. $f^{-1}(x)=\frac{3-x}{2}$

Rearranging Factorising 2

1. $y=\frac{1}{x+k}$	2. $A=xy-x^2-2y+2x$	3. $y=\frac{2x-x^2-A}{(2-x)}$	4. $y=\frac{4}{2x-1}$
5. $\frac{2s-2ut}{t^2}$	6. $y=\pm\sqrt{\frac{D^2+x}{b}}$	7. $h=\frac{a+b}{2A}$	8. $t=\frac{xb-ba}{b-x}$

Solving Linear 2 Solutions

1. $x = 7$
2. $x = 4.5$
3. $x = 6$
4. $x > 7/4$
5. $-3/2 < x < -1$
6. $x = 4$
7. $x \leq -3$
8. $x = 25$

Simultaneous Equations

1 $x = 2,\ y = 3$

2 $x = 3,\ y = -1$

3 $x = 2,\ y = 11$

4 $x = \frac{1}{2},\ y = -2$

Solving Quadratics 2

1 $x = 6\ or\ x = -2$

2 $x = 3\ or\ x = -2$

3 $x = \frac{3}{2}\ or\ x = 4$

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

5 $x = 3\ or\ x = -1$

6 $x = 2 \pm \sqrt{5}$

7 $x = -\frac{1}{3}\ or\ x = \frac{2}{3}$

8 $x = 2\ (Note\ x \neq -\frac{17}{6})$

Solving equations with trigonometry

1. $x = 3.5cm$
2. $x = 68.2°\ to\ 1\ d.p$
3. $x = 7.8cm\ to\ 1\ d.p$
4. $x = 83.6°\ to\ 1\ d.p$
5. $x = 10.3\ cm\ to\ 1\ d.p$
6. $x = 4.1\ cm\ to\ 1\ d.p$
7. $x = 95.4°\ to\ 1\ d.p$
8. $x = 5.0cm\ to\ 1\ d.p$

Solving Other Equations

1. $x = 5$
2. $x = 2$
3. $x = 46$
4. $x = 4 + 2\sqrt{3}$
5. $x = 9$
6. $x = 30°$ *or* $x = 150°$
7. $x = 30°$ *or* $x = 330°$
8. $x = -1$

Linear Graphs 2

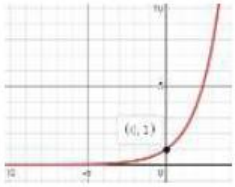
1. Gradient = 2, intercept = -7
2. Gradient = $\frac{4-0}{1--1} = 2$
3. Midpoint = $(\frac{-2+6}{2}, \frac{10+4}{2}) = (2,7)$
4. Distance = $\sqrt{(4--1)^2 + (11-15)^2} = \sqrt{41}$
5. Equation is $y = 2x + 2$
6. No, the line doesn't pass through (3,1) as when $x = 3, y = -1$
7. Equation is $y = -\frac{3}{2}x + 13$
8. $y = \frac{1}{2}x + 2$

Quadratic Graphs 1

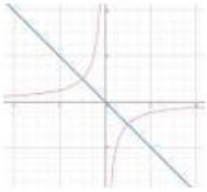
1. A $(2,0)$
   B $(-3,0)$
   C $(0,-6)$
2. A $(3,0)$
   B $(-2,0)$
   C $(0,-6)$
3. A $(5,0)$
   B $(-1,0)$
   C $(0,-5)$
4. A $(4,0)$
   B $(-5,0)$
   C $(0,-20)$
5. C $(0,5)$
   D $(1,4)$
6. C $(0,16)$
   D $(-3,7)$
7. A $(1,0)$
   B $(-4,0)$
   C $(0,-4)$
8. A $(1,0)$
   B $(-3,0)$
   C $(0,-6)$
   D $(-1,-8)$

Sketching Other Graphs 1

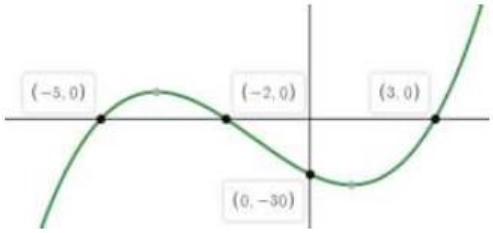
1. A reciprocal Graph
2. Max value = 1 Min value = -1
3. As x gets very large y gets very large. As x gets very small, y tends to zero but stays positive.



4. There will be two solutions

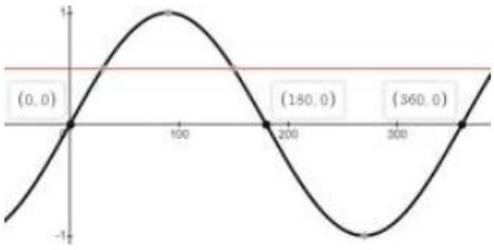


5. A cubic
6. y intercept at $(0, -30)$
7. x intercepts at $(-2,0)$ $(3,0)$ $(-5,0)$
8.

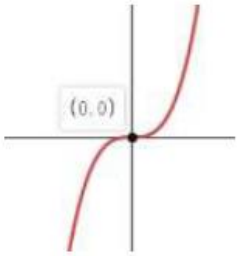


Sketching Other Graphs 2

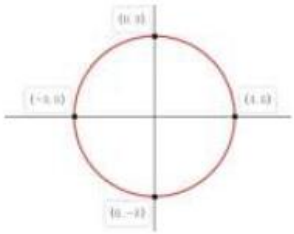
1. Circles are of the form $x^2 + y^2 = r^2$
2.



3. Two solutions 30° and 150°, the points of intersection above
4.



5.



6. y intercept is $(0, -1)$
7. x intercept is $(-1,0)$ repeated and $(1, 0)$
8. Two solutions, where line crosses circle