Year 9 Term 3 Homework

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

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3 Year 9 Term 3 Week 3 Homework

3.1 Index

3.1.1 The product and quotients with negative indices

Exercise 3.1.1 Simplify each of these expressions:

1. $\frac{x}{y^{-1}}$

2. $\frac{x^3}{x^{-5}}$

3. $\frac{x^2y^{-3}}{x^{-3}y^{-5}}$

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

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

6. $\frac{x^3 \times x^{-2}}{(x^{-2})^{-3}}$

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

8. $\frac{a^{-3}}{a^7} \times \frac{a^{-2}}{a^5}$

3.1.2 The fraction index

- $a^{\frac{1}{2}} = \sqrt{a}$ or $a^{\frac{1}{3}} = \sqrt[3]{a}$
- $a^{\frac{1}{n}} = \sqrt[n]{a}$
- $a^{\frac{p}{q}} = \sqrt[q]{a^p}$

Exercise 3.1.2

1. *Simplify the following:*

   (a) $36^{\frac{1}{2}}$ = _____

   (b) $64^{\frac{1}{2}}$ = _____

   (c) $(\frac{9}{49})^{\frac{1}{2}}$ = _____

   (d) $(\frac{8}{125})^{\frac{1}{3}}$ = _____

2. *Evaluate the following:*

   (a) $\sqrt{x^{12}}$ = _____

   (b) $\sqrt[3]{x^{18}}$ = _____

   (c) $\sqrt{16x^{12}}$ = _____

   (d) $\sqrt[3]{27x^{12}}$ = _____

3. *Evaluate the following:*

   (a) $16^{-\frac{3}{4}}$ = _____

   (b) $32^{\frac{1}{5}}$ = _____

   (c) $(16x^{12})^{\frac{1}{2}}$ = _____

   (d) $(64x^{18})^{\frac{1}{3}}$ = _____

3.1.3 Miscellaneous questions on the index laws

Exercise 3.1.3

1. *Solve the following equations:*

   (a) $(0.3)^x = 3\frac{1}{3}$

   (b) $2^x \times 2^{3x-1} = 2$

   (c) $a^{x-3} \div a^{3-x} = a$

2. *Simplify the following:*

   (a) $x^{-4} \div x^{-7} \div x^{-2}$

   (b) $(a^3b^2)^3 \div (a^2b^\circ)^{-2}$

3. *Evaluate the following:*

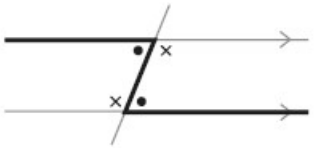
   (a) $(\frac{15}{8} - (\frac{4}{5})^{-1}) \times (\frac{5}{2})^{-2}$

   (b) $5^{\frac{1}{2}} \times 5^{\frac{3}{2}} + (7^{\frac{1}{2}})^5 \div 7^{\frac{1}{2}}$

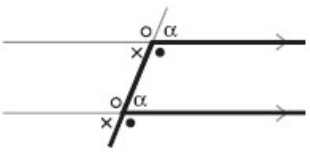
3.2 Geometry

3.2.1 Parallel lines

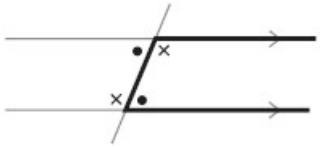
- Parallel lines never meet.
- A line that cut two or more parallel lines is called a transversal.
- Alternate angles:
  - lie between the parallel lines and on opposite sides of the transversal.
  - are equal in size
  - form a Z shape.



- Corresponding angles:
  - lie on the same side of the parallel lines and on the same side of the transversal
  - are equal in size
  - form a F shape.

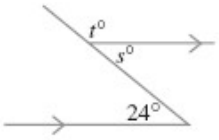


- Co-interior angles:
  - lie between the parallel lines and on the same side of the transversal
  - are supplementary
  - form a C shape.

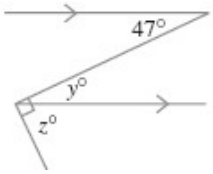


Exercise 3.2.1 Find the value of the pronumeral in each of these figures:

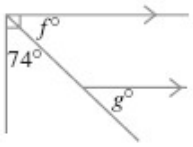
1. $s =$ _____ , $t =$ _____



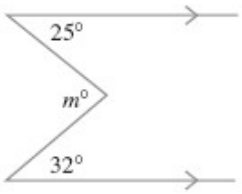
2. $y =$ _____ , $z =$ _____



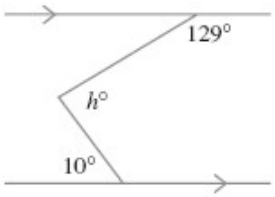
3. $g =$ _____ , $f =$ _____



4. $m =$ _____



5. $h =$ _____



3.2.2 Polygons

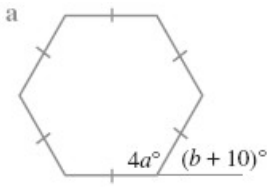
- Common polygons:

Sides	Polygon	Sides	Polygon
3	Triangle	8	Octagon
4	Quadrilateral	9	Nonagon
5	Pentagon	10	Decagon
6	Hexagon	11	Undecagon
7	Heptagon	12	Dodecagon

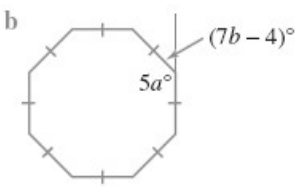
- A convex polygon is a polygon in which all of the diagonals lie within the figure. All the interior angles are less than $180°$.
- A non-convex polygon is a polygon in which at least one diagonal does not lie completely within the figure. One or more interior angles is greater than $180°$.
- The interior angle sum of a polygon is given by: $S = 180 \times n° - 360°$ or $S = 180°(n-2)$
- The exterior angle sum of a convex polygon is equal to $360°$
- A regular polygon is a polygon in which all of the sides are all of the angles are equal.
- In any regular n-side convex polygon:
  - each interior angle measures $\frac{180°(n-2)}{n}$
  - each exterior angle measures $\frac{360°}{n}$

Exercise 3.2.2 Find the value of a and b in each of these regular polygons:

A. $a =$ _____ , $b =$ _____

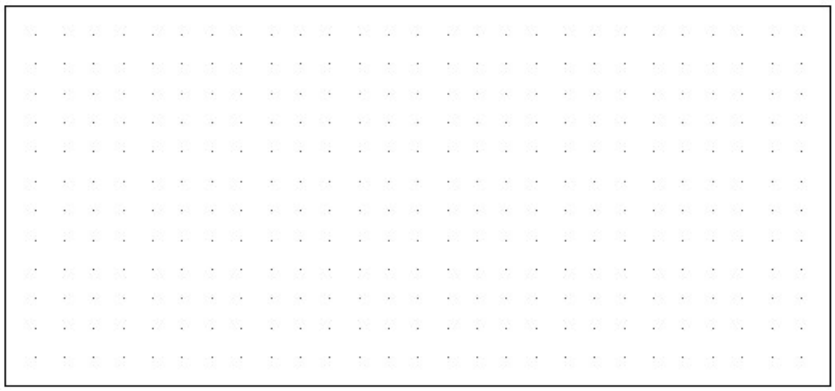


B. $a =$ _____ , $b =$ _____



Exercise 3.2.3

1. *Draw a convex pentagon ABCDE and divide it into triangles by drawing a line from one vertex to each of the other vertices.*



2. *How many triangles can be formed?* _____

3. *Find the angle sum of the pentagon.* _____

4. *Would the angle sum be different if the figure was non-convex?* _____

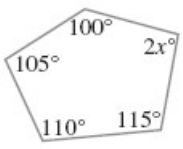
5. *Find the angle sum of a heptagon using the same method.* _____

6. *Write down a formula that could be used to find the angle sum of any n-side polygon.* _____

Exercise 3.2.4 Form an equation and solve it to find the value of the pronumeral in each polygon:

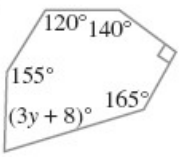
A $x =$ _____

a



B $y =$ _____

b



Exercise 3.2.5 Further applications

1. *Calculate the angle sum of a polygon whose exterior angle is* $30°$.

2. *A diagonal is a line that goes from one corner of a figure to an opposite corner. A square has 2 diagonals. How many diagonals are there in a pentagon?*

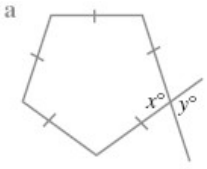
3. *Complete the following table.*

Polygon	Sides (S)	Number of diagonals (D)
Square	4	2
Pentagon	5	5
Hexagon	6	
	7	
	8	
	9	

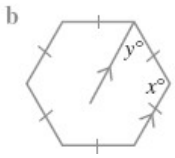
4. *Can you find the pattern? What is the rule linking S with D?*

5. *Find the values for x and y for the following regular polygons:*

A. $x =$ _____ , $y =$ _____



B. $x =$ _____ , $y =$ _____

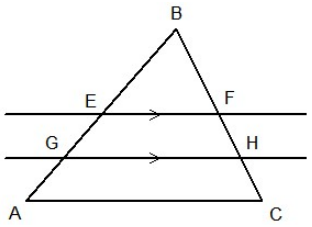


3.3 Math challenge

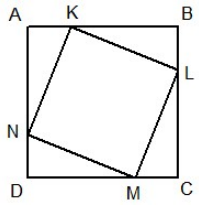
Exercise 3.3.1

1. *A positive integer n is such that* $2n+1$ *and* $3n+1$ *are perfect squares. Prove that n is divisible by 8.*

2. *Let ABC be a triangle. Two straight lines which are parallel to the side AC divide the triangle into three figures of equal area. In what parts is the side AB divided by the lines, if AB = 10 cm?*



3. *Let ABCD be a square with side length 7 cm. Another KLMN is inscribed into ABCD such that its vertices lie on the side of ABCD. Find the lengths of parts ABCD sides which divided by the vertices of KLMN, if "KLMN : ABCD" = "25 ; 49 ".*



3.4 Miscellaneous exercise

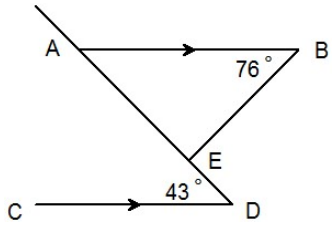
Exercise 3.4.1

1. *Given that* $x = 6.4 \times 10^7$*, find the value of:*

   (a) $\sqrt{x}$

   (b) $\sqrt[3]{x}$

2. *In the diagram shown below, AB is parallel to CD,* $\angle ABE = 76°$ *and* $\angle CDE = 43°$*. Find the value of* $\angle BEA$*.*



3. *In the diagram, XYZ is a straight line and XW is parallel to YV. Given that* $\angle VYX = 2x° + 26°$*,* $\angle WYX = 3x° - 2°$ *and* $\angle XWY = x°$*, find the value of x and hence find* $\angle WXY$*.*