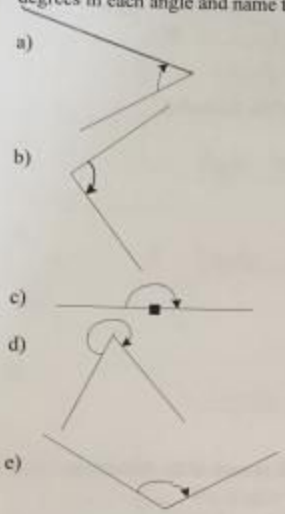
# Grade 9 Geometry Review

Name: Mihir Due: Lesson 3

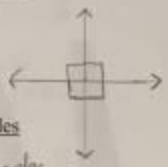
*[215 marks ÷ 5 = out of 43 marks total]*

1) *[10 marks]* Use a protractor to measure the following angles. State the number of degrees in each angle and name the type of angle.

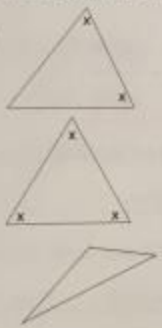


| | Degrees | Type |
|---|---|---|
| a) | 48° | Acute |
| b) | 90° | Right |
| c) | 180° | Straight |
| d) | 292° | Reflex |
| e) | 121° | Obtuse |

2) *[1 mark]* Draw a diagram to illustrate perpendicular lines ⇒

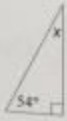


3) *[6 marks]* Classify each of the following triangles in two ways.



| | By Angles | By Sides |
|---|---|---|
| a) | Acute | Isosceles |
| b) | Acute | Equilateral |
| c) | Obtuse | Scalene |

4) [4 marks] Find the measure of $\angle x$ in each of the following, given the following conditions.

a) 

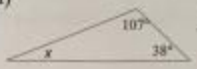

$\angle x = 36°$

b) 


$\angle x = 18°$

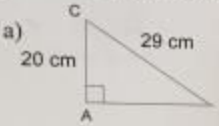
c) 


$\angle x = 60°$

d) 


$\angle x = 35°$

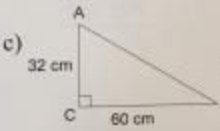
5) [6 marks] Find the length of $\overline{AB}$ in each of the following.

a) 


$\overline{AB} = 21\text{ cm}$

b) 

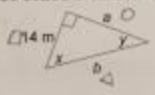

$\overline{AB} = 24\text{cm}$

c) 


$\overline{AB} = 68\text{cm}$

6) [4 marks] Find the lengths of sides $a$ and $b$ in each of the following.

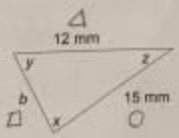
a) 


$a = 18\frac{2}{5}$

$b = 25\frac{1}{5}$

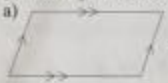
b) 

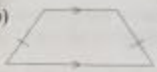




$a = 20$

$b = 9$

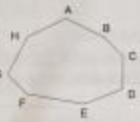
7) [*12 marks*] Give the **best** name for each shape.

a)  Regular Parallelogram

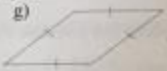
b)  Isosceles Trapezoid

c)  Square

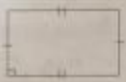
d)  Right Trapezoid

e)   Irregular Octagon

f)  Irregular Hexagon

g)  Rhombus

h)  Kite

i)  Rectangle

j)  Concave Quadrilateral Arrowhead

k)  Regular Octagon (all angles equal)

l)  Scalene Trapezoid

8) [*8 marks*] Classify, in two ways, the triangles whose angles are:

| | By Angles | By Sides |
|---|---|---|
| a) 70°, 101°, 9° | Obtuse | Scalene |
| b) 60°, 60°, 60° | Acute | Equilateral |
| c) 30°, 60°, 90° | Right | Scalene |
| d) 50°, 60°, 70° | Acute | Scalene |

9) [*1 mark*] Why can't a triangle contain two obtuse angles? An obtuse angle is more than 90°, 2(obtuse) = >180°

10) [*1 mark*] What does SATT stand for? Sum of angles in a triangle theorem

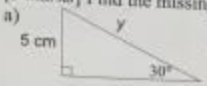
11) [*1 mark*] Angles in a Z pattern are called Alternate angles

12) [*1 mark*] What is a line called that crosses parallel lines? Transversal

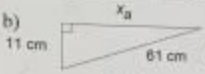
13) [*5 marks*] Name five primitive Pythagorean triples.

3,4,5 5,12,13 8,15,17 7,24,25 20,21,29

14) [*5 marks*] Find the missing sides.

a) 

$x = 5\sqrt{3}$ $y = 10$

b) 

$a = 60$

c) 

$m = 4\sqrt{2}$ $n = 8$

15) [*4 marks*] What is being defined here?

a) A line segment going from one vertex of a trapezoid to the opposite one — 2 triangles

b) The only primitive Pythagorean triple whose numbers sum to 30 — 5, 12, 13

c) A set of angles like 23°, 28° and 39° that add up to 90° — Complimentary

d) A polygon with six sides — Hexagon

16) [*8 marks*] True or False?

a) Every rhombus is a parallelogram — T

b) Every rectangle is a square — F

c) Every quadrilateral is a trapezoid — F

d) Every rhombus is a regular 4-gon — F

e) Every square is a rhombus — T

f) Every parallelogram is a rhombus — F

g) Every square is a rectangle — T

h) Every trapezoid is a parallelogram — F

17) [*2 marks*] If a polygon is said to be *regular*, then all the sides and angles are equal to eachother

18) [4 marks] For a convex $n$-gon,

a) The number of angles is $n$ c) The sum of the interior angles is $(n-2)180°$

b) The number of sides is $n$ d) The sum of the exterior angles is $360°$

19) [5 marks] What is being defined here?

a) Two rays joined together at their endpoints Line

b) A five-sided polygon Pentagon

c) Two lines in 3-space that never meet, but are not parallel Skew lines

d) A triangle that contains one angle greater than 90° Obtuse Triangle

e) Angles in the C pattern (answer is not "supplementary") Interior angles

20) [3 marks] $\Delta ABC$ is an isosceles triangle with $\angle A = 52°$. Give three possible values for $\angle B$

52°, 76°, 64°

21) [5 marks] What is being defined here?

a) A seven-sided polygon septagon

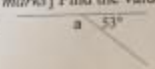
b) A quadrilateral with two parallel and two non-parallel sides Trapezoid

c) An angle measuring between 180° and 360° Reflex angle

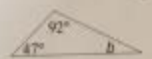
d) Three numbers $a, b, c$ with $a^2 + b^2 = c^2$ and $\gcf(a,b,c) = 1$ Primitive pythagorean triple

e) A regular 3-gon Triangle

22) [8 marks] Find the values of the variables and name the angle theorem(s) used.

a) 

$\angle a =$ 127° Reason(s) Supplementary

b) 

$\angle b =$ 41° Reason(s) SAT ?

c) 

$\angle c =$ 68° Reason(s) ITT, EAT ?

23) [4 marks] What is defined here?

a) An angle measuring 90° Right Angle

b) A four-sided 3D shape made entirely of congruent equilateral triangles Tetrahedron

c) If two sides of a triangle are equal, then their opposite angles are equal ITT

d) A polygon with eleven sides Hendecagon

24) [*12 marks*] Find the third angle of each triangle and classify the triangle by sides and angles.

a) 62°, 59°, 59° Classification: Isosceles Trapezoid

b) 60°, 60°, 60° Equilateral

c) 14°, 75°, 91° Scalene

d) 78°, 12°, 90° Right

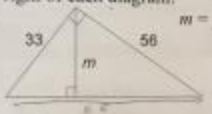
25) [*2 marks*] What is the maximum number of acute interior angles that a convex polygon can have? Prove your claim.

3

Decagon example → (10×140)−360 = 6, can't be more than 140°

26) [*6 marks*] In each diagram find the length of the side labeled *m*. Show your work to the right of each diagram.

a) $m = 28\frac{25}{65}$

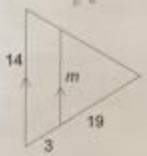



$\sqrt{33^2+56^2} = 65$

$\sqrt{77(12)(2)(44)} = 924$

$924 \div 65 =$

b) $m = 12\frac{1}{11}$




c) $m = 9\frac{11}{21}$


27) [*4 marks*] What is being defined here?

a) Two triangles having two pairs of angles with equal measure Isosceles Triangle

b) A triangle with three sides of different length Scalene Triangle

c) An angle measuring between 90° and 180° Obtuse Angle

d) A quadrilateral with two pairs of opposite equal sides Rhombus

28) [*8 marks*] Answer in the spaces to the right.

a) The sum of the exterior angles of a convex 883-gon is 360°

b) The measure of one interior angle of a regular quindecagon is 156°

c) The sum of the interior angles of a 215-gon is 38340

d) The measure of one exterior angle of a regular 45-gon is 8°

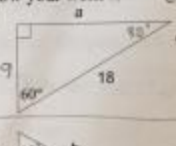
e) The sum of the interior angles of an 83-gon is 14400

f) The sum of the exterior angles of a convex 42-gon is 360°

g) The measure of one interior angle of a regular nonagon is 140°

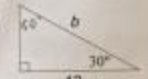
h) The measure of one exterior angle of a regular hexagon is 60°

29) [*5 marks*] Find the value of the variables. Leave all answers in simplest radical form. Show your work to the right of each diagram.

a) 


$a = 9\sqrt{3}$

30°, 60°, 90° triangle ratio
short leg : 1
Long leg : $\sqrt{3}$
Hypotenuse : 2
$(18 \div 2)\sqrt{3} = 9\sqrt{3}$

b) 

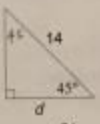

$b = 8\sqrt{3}$

30°, 60°, 90° triangle ratio
short leg : 1
Long leg : $\sqrt{3}$
Hypotenuse : 2
$(12 \div \sqrt{3})2 = 8\sqrt{3}$

c) 

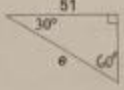

$c = 5\sqrt{2}$

45°, 45°, 90° triangle ratio
legs : 1
Hypotenuse : $\sqrt{2}$
$5 \cdot \sqrt{2} = 5\sqrt{2}$

d) 


$d = 7\sqrt{2}$

45°, 45°, 90° triangle ratio
Legs : 1
Hypotenuse : $\sqrt{2}$
$14 \div \sqrt{2} = 7\sqrt{2}$

e) 


$e = 34\sqrt{3}$

30°, 60°, 90° triangle ratio
short leg : 1
Long leg : $\sqrt{3}$
Hypotenuse : 2
$(51 \div \sqrt{3})2 = 34\sqrt{3}$

30) [*3 marks*] Answer in the spaces to the right.

a) The sum of the interior angles of a polygon is 13680°. The number of sides it has is 78

b) One exterior angle of a regular $n$-gon measures 20°. The value of $n$ is 18

c) One interior angle of a regular $n$-gon measures 156°. The value of $n$ is 15

31) [*3 marks*] What is being defined here?

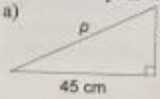
a) An angle measuring 180° Straight Angle

b) A polygon with 9 sides Nonagon

c) A curve that never crosses itself Simple closed curve

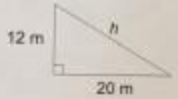
32) [*3 marks*] Find the length of the third side in each right triangle in simplest radical form. Show your work to the right of each diagram.

a)



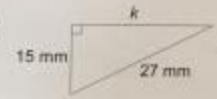

$p = 51$ cm $\sqrt{24^2+45^2} = 51$

b)




$h = 4\sqrt{34}$ m $\sqrt{12^2+20^2} = 4\sqrt{34}$

c)




$k = 6\sqrt{14}$ mm $\sqrt{27^2-15^2} = 6\sqrt{14}$

33) [*4 marks*]

a) Give the plural of "radius" Radii

b) Spell the word that describes a triangle with two equal sides Isosceles

c) Give the plural of "vertex" vertices

d) Two lines on a plane that never intersect are Parallel

34) [*12 marks*] Find the third angle of each triangle and classify each..

| | | By Sides | By Angles |
|---|---|---|---|
| a) | 45°, 90°, 45° | Isosceles | Right |
| b) | 70°, 60°, 50° | Scalene | Acute |
| c) | 12°, 67°, 101° | Scalene | Obtuse |
| d) | 71°, 38°, 71° | Isosceles | Acute |

35) [6 *marks*] What is being defined here?

a) Angles in the F pattern — Alternat Angles

b) An angle measuring between 0° and 90° — Acute Angels

c) Angles that sum to 180° — Supplementary Angles

d) A parallelogram with four equal sides — Rhombus

e) A triangle with no angles as large as 90° — Acute Triangle

f) A parallelogram with four equal angles — Rectangle

36) [3 *marks*]

a) The supplement of the complement of 72° is — 162

b) The measure of an angle is four times the measure of its supplement. The angle has how many degrees? — 144°

c) The measures of the angles in a triangle are in the ratio 2:3:4. The largest angle is — 80°

37) [6 *marks*] Skeleton, shell or solid?

a) Soccer ball — Shell

b) Orange — Solid

c) Scaffolding — Skeleton

d) Baseball — Solid

e) Telecommunications tower — Skeleton

f) Inflated rubber raft — Shell

38) [5 *marks*] Given the following objects, identify the smallest dimension in which they can exist.

a) triangle — 2

b) hypercube — 4

c) point — 0

d) tetrahedron — 3

e) line — 1

39) [2 *marks*]

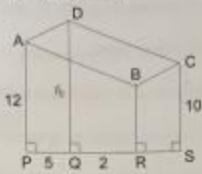
a) A primitive Pythagorean triple, one of whose numbers is 55, is — 48, 55, 73

b) Two numbers in a primitive Pythagorean triple are 57 and 185. The third number is — 176

40) [8 marks]

a) If three angles in a pentagon are right angles and each of the other two angles contains $n°$, then the value of $n$ is 135

b) Given that ABCD is a parallelogram, and that $\overline{DQ} = 16$ cm, find the area of BRSC. All measurements are in centimeters.




40 cm²

c) Given that $\overline{DB} = \overline{DC}$, $\overline{ED} = \overline{EC}$, and $\angle A = 30°$, find the measure of angle B 50°


$\angle B = \angle C$ (with)

$\angle D_{adj} = \angle C_{adj}$

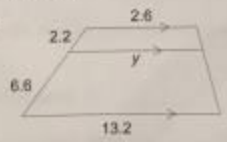
Z theorem → $B = C$ (with) $C_{adj} = D_{adj}$

ITT $\triangle ABC$ → $D = 50°$

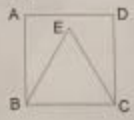
d) The exterior angle at C in triangle ABC is 106°. Angle A is greater than one-half of angle B by 7°. The measure of $\angle A$ is 40°

e) The number of scalene triangles having all sides of integral length and having perimeter less than 13 is 2

f) The length of $y$, in units, is 5.25



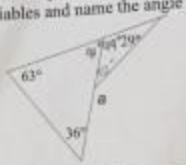

g) Given that ABCD is a square, and that $\triangle BCE$ is equilateral, find the measure of angle AED. 150°



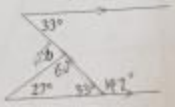

h) Two angles A and B are complementary, and $\angle A = \angle B + 48°$. Find the measure of angle B. 66

A = 114 B = 66

41) [*15 marks*] Three marks each for a), b) and c); 6 marks for d). Find the values of the variables and name the angle theorem(s) used.

a) 

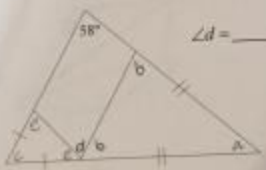

$\angle a = 52°$ EAT, SATT

b) 


$\angle b = 120°$ TPT-Z, EAT

c) 


$\angle c = 75°$ DAT, TPT-C, SATT

d) 


$\angle d =$ ____° CATT, ITT, ITT, SATT

$e + d + 16 = 180°$
$d = 180 - b - e$

$a + 2b = 180$
$b = \frac{180 - a}{2}$

$a + c + 58 = 180$
$a = 180 - 58 - c$
$= 122 - c$

$c + 2e = 180$
$e = \frac{180 - c}{2} = 90 - \frac{c}{2}$

$b = \frac{180 - 22 + c}{2}$
$b = \frac{58 + c}{2} = 29 + \frac{1}{2}c$