Barker College

Student Name: ___________________________

Teacher Initials: __________

HYB	JWH
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GPF	RJW

Monday, 17th August 2020
Period 1 or 4
55 minutes
250 copies

Year 10
5.3 MATHEMATICS
Assessment Task 3

General Instructions

- Write your name in the spaces provided
- Write using blue or black pen
- Answer in the spaces provided
- NESA approved calculators may be used
- Show ALL necessary working
- Diagrams are NOT to scale
- Marks may not be awarded for careless or poorly arranged working
- A reference sheet is attached to the end of this paper, which may be detached.

Section	Marks
1. Coordinate Geometry	/ 15
2. Trigonometry	/ 15
3. Geometry	/ 9
4. Working Mathematically	/ 8
Total Marks:	**/ 47**

Part 1: Coordinate Geometry (15 marks)

1. Given the two points A$(-2,5)$ and B$(6,-2)$, find the:

a) length of the interval AB to 1 decimal place. **2**

b) midpoint that lies between A and B. **1**

c) the gradient of the line that passes through A and B. **1**

2. Identify each of the following pairs of lines as either parallel, perpendicular or neither.

a) $y = 5x - 4$ **1**

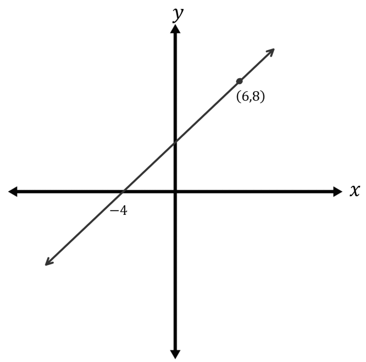
$y = -5x - 4$

b) $y = \frac{6}{7}x + 2$ **1**

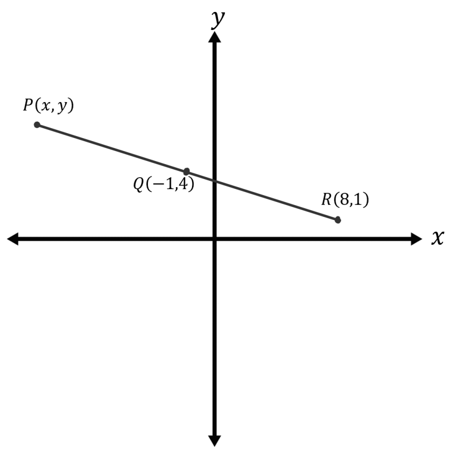
$y = -\frac{7}{6}x + 2$

3. Write the equation of the line with y-intercept 4 and gradient $-\frac{3}{4}$ in **gradient-intercept form**. **1**

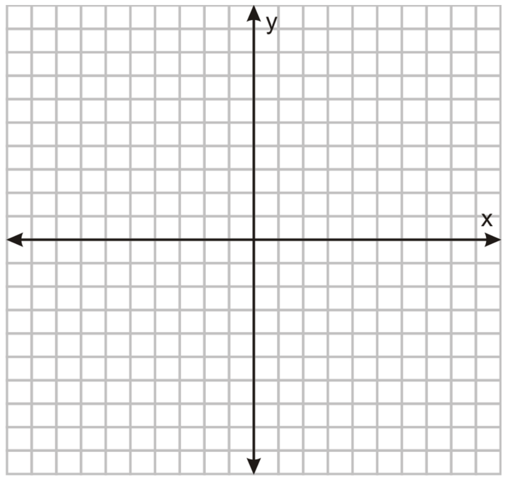
4. Use the point-gradient formula to find the equation of the line below. Write your answer in **general form**. **3**



5. Q is the midpoint of the line segment PR. Find the coordinates of P. **2**

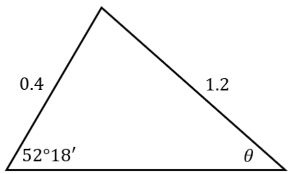


6. Graph the equation $y = \frac{1}{3}x + \frac{1}{2}$ showing the x and y-intercepts. **3**

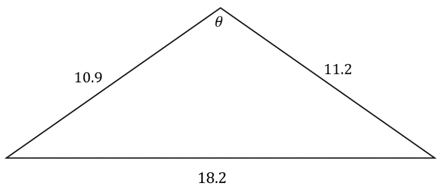


Part 2: Trigonometry (15 marks)

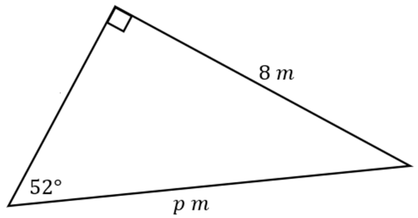
1. Use the sine rule to find the value of θ to the nearest minute. Note that θ is an acute angle. **2**



2. Use the cosine rule to find the value of θ. Round your answer to the nearest degree. **2**



3. Use the diagram below to answer the following questions.



i) Find the value of p using the sine ratio for right-angled trigonometry. Round your answer to 2 decimal places. **1**

ii) Find the value of p using the sine rule. Round your answer to 2 decimal places. **2**

iii) You should have the same answer in both i) and ii). By considering the value of $\sin 90°$, explain why this is the case. **1**

4. A ship leaves port A and sails on a bearing of $115°$ for $250km$ to port B. It then travels on a bearing of $265°$ for $125km$ to port C.

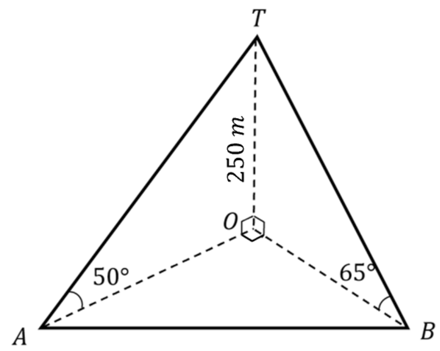
i) Draw a diagram showing the above information. Be sure to label the ports as A, B and C. Your diagram does not have to be to scale. **1**

ii) Find the size of $\angle ABC$. Reasons are not required. **1**

iii) The ship now wants to sail from port C to port A. How far, to the nearest km, will it need to sail? **2**

5. Two people are both looking up to the top of a tower, T, which is 250m tall. A right angle is subtended at the base of the tower, O, from A and B. Person A is looking up at an angle of elevation of 50°. Person B is looking up at an angle of elevation of 65°.

By first finding the distances AO and BO, determine how far apart the people standing. Round your answer to the nearest metre. **3**

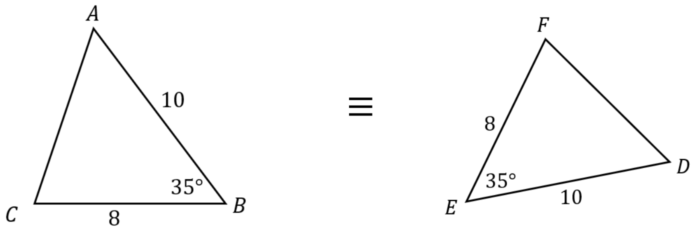


Part 3: Geometry (9 marks)

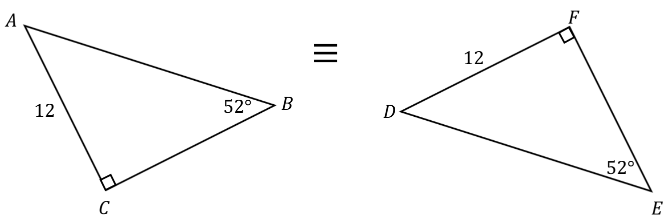
1. A regular polygon has interior angles equal to 160°. How many sides does the polygon have? **2**

2. What congruent triangle proof should be used to prove that $\Delta ABC \equiv \Delta DEF$ in each case (SSS, SAS, AAS or RHS)?

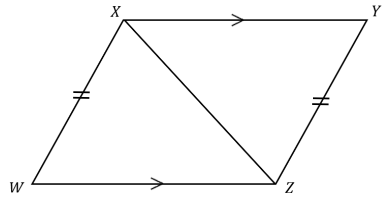
a) **1**



b) **1**



Use the following diagram to answer question 3.



3. In the above diagram $XY \parallel WZ$ and $XW = YZ$.

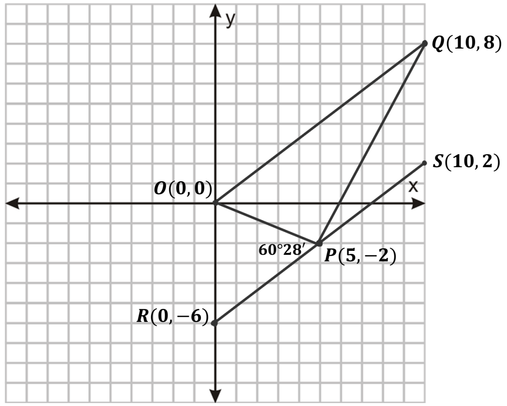
i) Jamie claims that if $\angle XWZ = \angle ZYX$, then XYZW is a parallelogram. By using congruent triangles, show that this claim is indeed true. **3**

ii) If **instead** $\angle XWZ$ and $\angle ZYX$ are supplementary (they add to 180^0), then XYZW is a different shape. Sketch a possible shape that fits this description and give its most specific name. **2**

Part 4: Working Mathematically (8 marks)

1. On the diagram below:
OQ is a line segment with the equation $y = \frac{4}{5}x$.
RS is a line segment with the equation $y = \frac{4}{5}x - 6$
P lies on the line RS.
$\angle OPR$ is $60°28'$.

Find the area of $\Delta\, OPQ$. **3**



2. Three points A$(-2,-1)$, B$(-7,4)$ and C$(x, 15)$ form a right-angled triangle. Find the coordinates of C given that AC is the hypotenuse. **3**

3. Line P has the equation $5y - 3x = 45$.
Line Q is perpendicular to P and intersects in the second quadrant (top left).
If line Q has an integer (whole number) as its y-intercept, how many possible line Q's exist?
(Note: the axes are NOT considered to be in any quadrant.) **2**

END OF TEST

Reference Sheet

Coordinate Geometry

Gradient
$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Distance
$d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$

Point-Gradient Formula
$y - y_1 = m(x - x_1)$

Midpoint
$M = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Trigonometry

Trigonometric Ratios
$\sin\theta = \dfrac{opposite\ side}{hypotenuse}$

$\cos\theta = \dfrac{adjacent\ side}{hypotenuse}$

$\tan\theta = \dfrac{opposite\ side}{adjacent\ side}$

Sine Rule
$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine Rule
$a^2 = b^2 + c^2 - 2bc\cos A$

$\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a Triangle
$Area = \dfrac{1}{2}ab\sin C$

Geometry

Angle Sum of a Polygon
$S = (n - 2) \times 180°$

Other

Pythagoras' Theorem

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

Student Solutions

Year 10 5.3

17/8/2020

Q1) $A = (-2, 5)$ $B = (6, -2)$

(a) $AB = \sqrt{(6 - -2)^2 + (-2-5)^2}$

$= \sqrt{113} = 10.6$

(b) Midpoint $= \left(\dfrac{-2+6}{2}, \dfrac{5+-2}{2}\right)$

$= (2, 1.5)$

(c) $m = \dfrac{-2-5}{6--2} = \dfrac{-7}{8}$

Q2) a) neither

b) perpendicular

Q3) $y = -\frac{3}{4}x + 4$

Q4) $m = \frac{8}{10} = \frac{4}{5}$

$y - 8 = \frac{4}{5}(x - 6)$

$5y - 40 = 4x - 24$

$4x - 5y + 16 = 0$

Q5) $P = (-10, 7)$

Q6) x intercept is $(-\frac{3}{2}, 0)$

y intercept is $(0, \frac{1}{3})$

PART 2 : Trigonometry

Q1) $\dfrac{\sin\theta}{0.4} = \dfrac{\sin 52°18'}{1.2}$

$\sin\theta = 0.26374$

$\theta = 15°18'$

2) $\cos\theta = \dfrac{10.9^2 + 11.2^2 - 18.2^2}{2 \times 11.2 \times 10.9} = -0.35628$

$\theta = 110.8719° \approx 111°$

3) (i) $\sin 52° = \frac{?}{8}$

$p = 8 \times \sin 52°$

$p = 10.15$

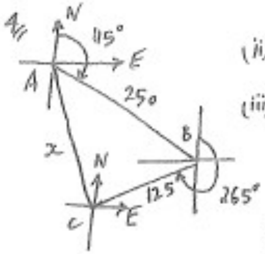
(ii) $\dfrac{p}{\sin 90°} = \dfrac{8}{\sin 52°}$

$p = \dfrac{8 \times \sin 90°}{\sin 52°}$

$p = 10.15$

(iii) Because $\sin 90° = 1$.

4)



(ii) $\angle ABC = 30°$

(iii) $x^2 = 250^2 + 125^2 - 2 \times (250 \times 125 \times \cos 30°)$

$x^2 = 23998.41$

$x = 155$ Km

Q5) $\tan 50° = \dfrac{250}{OA}$

$OA = \dfrac{250}{\tan 50°}$

$OA = 209.77$

$\tan 65° = \dfrac{250}{OB}$

$OB = \dfrac{250}{\tan 65°}$

$OB = 116.57$

$x^2 = 209.77^2 + 116.57^2$

$= 57592.0178$

$x = 240$ metres

PART 3 : Geometry

Q1) Interior angle is 160° so exterior angle is 20°.

Sum of all exteriors is 360°.

$\dfrac{360}{n} = 20$

$360 = 20n$

$n = \dfrac{360}{20} = 18$ sides

Q2) (i) (SAS) (ii) (AAS)

Q3 ii) In ΔXYZ and ΔXWZ,

1. $\angle XWZ = \angle ZYX$ (assumption of Jamie)
2. $XZ = XZ$ (common)
3. $\angle YXZ = \angle XZW$ (alternate angles in parallel lines)

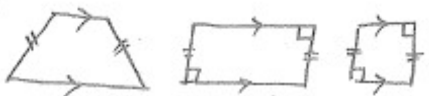
$\therefore \Delta XYZ \equiv \Delta XWZ$ (AAS)

$\therefore \angle YZX = \angle WXZ$
(corresponding angles of congruent triangles)

$\therefore XW \parallel YZ$
(equal alternate angles)

$\therefore WXYZ$ is a parallelogram
(two pairs of opposite sides are parallel)

(iii)



PART 4

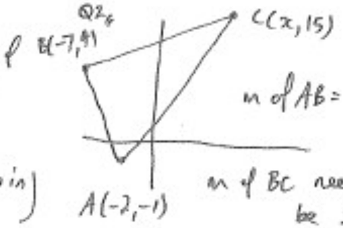
Q4 i) m of $OQ = \frac{4}{5}$, m of $SR = \frac{4}{5}$ $\therefore SR \parallel OQ$

$\therefore \angle QOP = 60°28'$
(equal alternate angles on parallel lines)

$OQ = \sqrt{164}$ $\quad OP = \sqrt{29}$

$\therefore$ Area of $\Delta OPQ = \frac{1}{2} \times \sqrt{29} \times \sqrt{164} \times \sin 60°28'$
$= 30$ units^2

Q2 ii)



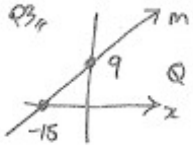
m of $AB = \frac{-5}{5} = -1$

m of BC needs to be 1.

So $\frac{15-4}{x+7} = 1$

$x+7 = 11$
$x = 4$ $\quad \therefore C = (4, 15)$

Q3 ii)



Q has $m = \frac{-5}{3}$

The line through $(-15, 0)$ with $m = -\frac{5}{3}$ is $y - 0 = -\frac{5}{3}(x+15)$

$y = -\frac{5}{3}x - 25$

Observe that this line has a y-intercept of -25.

Hence the possible Q's have y-intercepts of

$\{8, 7, 6, 5, \ldots, 0, -1, -2, \ldots, -24\}$

Hence 33 possible Q's.