Student's Name: .....

Teacher's Initials: .....

Barker College

- BHC* • WMD
- JYR • JZT
- VAB • LMD
- RAS • JWH
- RJW • ARP

Year 10
5.3 Mathematics
Assessment Task

THURSDAY 16TH AUGUST

TERM 3, 2018

PERIOD 4, 6

TIME: 50 MINUTES

255 COPIES

There are three parts to this assessment

PART A:	**COORDINATE GEOMETRY**	**12 marks**
PART B:	**TRIGONOMETRY**	**16 marks**
PART C:	**GEOMETRY**	**26 marks**
	TOTAL:	**54 marks**

INSTRUCTIONS TO STUDENTS:

* Write ALL answers in the spaces provided.
* ALL NECESSARY working for each question must be shown to gain full marks.
* Write your name and teacher's initials in the space provided.
* Marks may not be awarded for careless or badly arranged working.
* Diagrams are not drawn to scale.
* Approved calculators may be used.
* A formula sheet at the end of this paper should be separated and used throughout.

PART A: COORDINATE GEOMETRY
[12 MARKS]

Question 1 (4 marks)

The equation of a line in general form is $6x+2y+12=0$

(i) What is the gradient of this line? **1**

(ii) What is the x-intercept? **1**

(iii) What is the y-intercept? **1**

(iv) If the point (-4, k) lies on this line, what is the value of k? **1**

Question 2 (3 marks)

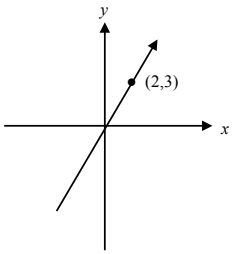
What is the equation of the line perpendicular to $y=2x-1$ and passing through the point (3, 5)?

Write your answer in general form. **3**

Question 3 (2 marks)

The line $y = mx$ passes through the origin and the point (2, 3) as shown in the diagram below.

What is the value of m? **2**



Question 4 (3 marks)

The points P and Q both lie in the first quadrant on the line $y = 2x + 1$. P is (1, 3).
The distance from P to Q is $\sqrt{80}$. Find the coordinates of Q. **3**

End of Part A

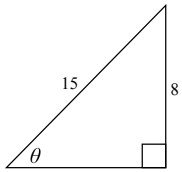
PART B: TRIGONOMETRY
[16 MARKS]

Question 1 (1 mark)

Evaluate $\sin 72^o 17'$ correct to 3 decimal places. **1**

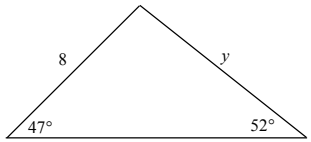
Question 2 (2 marks)

Find the value of $\cos\theta$ where θ is shown in the following diagram. Leave your answer in fraction form. **2**



Question 3 (2 marks)

Find the value of y correct to 2 decimal places. **2**



Question 4 (2 marks)

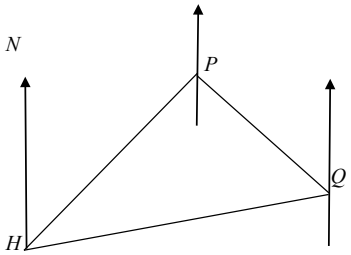
Find two possible values for B if $\sin B^o = 0.2$ **2**

Give your answers rounded to the nearest degree.

Question 5 (6 marks)

A bushwalker leaves from Hornsby, *H,* and walks 15 km on a bearing of 020° to get to *P*.
From *P* she walks 3 km on a bearing of 150° to get to *Q*.

(i) Complete this diagram showing all this information. **2**

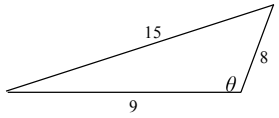


(ii) What is the shortest distance of *Q* from *H* ? Give your answer correct to 2 decimal places. **2**

(iii) What is the area of the triangle *HPQ* ? Give your answer correct to 2 decimal places. **2**

Question 6 (3 marks)

Find θ correct to the nearest minute. **3**

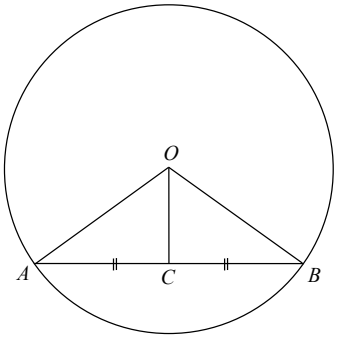


End of Part B

PART C: GEOMETRY
[26 MARKS]

Question 1 (3 marks)

A circle has centre O. C is the midpoint of AB. Giving full reasons, prove that $\Delta ACO \equiv \Delta BCO$ by completing the following: **3**



In ΔACO and ΔBCO,

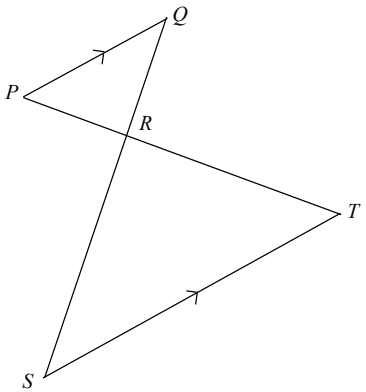
1.

2.

3.

$\therefore \Delta ACO \equiv \Delta BCO$ ( )

Question 2 (5 marks)



$PQ \parallel ST$

PQ = 8 cm QR = 6 cm

ST = 10 cm $RS = y$ cm

(i) Prove that $\Delta PQR \parallel\parallel \Delta RST$ **3**

(ii) Hence, find y. **2**

Question 3 (3 marks)

(i) A polygon has 10 sides. What is its mathematical name? **1**

(ii) What is the value of the sum of all the interior angles of a 10-sided polygon? **1**

(iii) If the 10-sided polygon is regular, what is the size of each interior angle? **1**

Question 4 (2 marks)

A regular polygon has an exterior angle of 18°.
How many sides does this regular polygon have? **2**

Question 5 (3 marks)

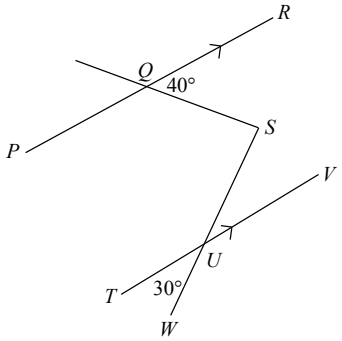
Which plane shape am I? Give the most specific answer possible.

(i) I am a rhombus with a right-angle. _____ **1**

(ii) I am a rectangle with adjacent sides equal. _____ **1**

(iii) The ratio of the sum of all my exterior angles to the sum of all my interior angles is 2:5. _____ **1**

Question 6 (3 marks)



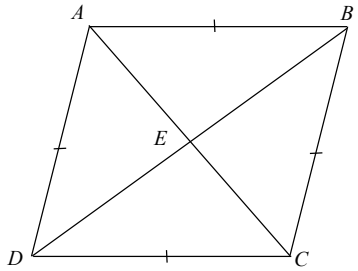
$\angle RQS = 40^o$

$\angle TUW = 30^o$ **3**

Find $\angle QSU$ giving reasons.

Question 7 (3 marks)

Prove that $\Delta ABE \equiv \Delta BCE$, and hence deduce that the diagonals of a rhombus are perpendicular to each another. **3**



Question 8 (4 marks)

The ratio of side lengths of two similar solids is 2 : 5.

(i) If the surface area of the smaller solid is 120 cm^2, what is the surface area of the bigger solid? **2**

(ii) If the volume of the larger solid is 400 cm^3, what is the volume of the smaller solid? **2**

End of Paper

YEAR 10 - FORMULA SHEET

Gradient-intercept form of a line

$y = mx + b$

m is gradient
b is y-intercept

Slope (gradient) of a line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Distance between two points

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

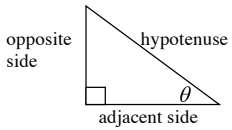
Point-gradient of the equation of a line

$y - y_1 = m(x - x_1)$

Angle sum of a polygon

$S = (n - 2) \times 180°$

Trigonometric Ratios



$$\sin\theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$
$$\cos\theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$
$$\tan\theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

Sine rule

In ΔABC,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine Rule

In ΔABC,

$$c^2 = a^2 + b^2 - 2ab\cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Area of a triangle

In ΔABC,

$$A = \frac{1}{2}ab\sin C$$

Part A — Year 10 5.3 Assessment Task 3 Student Solutions

Q1 $6x + 2y + 12 = 0$ gen. form
$y = -3x - 6$ grad. intercept form
i) $m = -3$
ii) when $y = 0$: $0 = -3x - 6$
$x = -2 \rightarrow (-2, 0)$
iii) when $x = 0$: $y = -3(0) - 6$
$y = -6 \rightarrow (0, -6)$
iv) plug $(-4, k)$ into equation
$k = -3 \times (-4) - 6$
$k = 6$
$\therefore k$ must equal 6 when $x = -4$ to satisfy the equation of the line

Q2 perpendicular to $y = 2x - 1$ and through $(3,5)$
perpendicular lines: $m_1 \times m_2 = -1$
$\therefore m_1 \times 2 = -1$
$m_1 = -\frac{1}{2}$
point-gradient: $y - 5 = -\frac{1}{2}(x - 3)$
$2y - 10 = -(x - 3)$
$2y - 10 = -x + 3$
$x + 2y - 13 = 0$

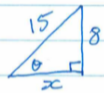
Q3 $m = \frac{\text{rise}}{\text{run}} = \frac{3-0}{2-0} = \frac{3}{2}$

Q4 $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ let $Q(x, y)$
$\sqrt{80} = \sqrt{(x-1)^2 + (y-3)^2}$
$80 = (x-1)^2 + (y-3)^2$
$80 = (x-1)^2 + (2x+1-3)^2$
$80 = (x^2 - 2x + 1) + (4x^2 - 8x + 4)$
$80 = 5x^2 - 10x + 5$
$16 = x^2 - 2x + 1$
$x^2 - 2x - 15 = 0$
$(x - 5)(x + 3) = 0$
$x = 5, -3$ but only in 1st quadrant
$\therefore x = 5$ $y = 2 \times (5) + 1$
$\Rightarrow Q(5, 11)$

Part B

Q1 $\sin 72°17' = 0.95257...$
$= 0.953$

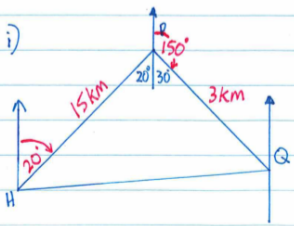
Q2 $x^2 = 15^2 - 8^2$
$x = \sqrt{161}$
$\cos\theta = \frac{\sqrt{161}}{15}$



Q3 $\frac{y}{\sin 47} = \frac{8}{\sin 52}$
$y = \frac{8 \sin 47}{\sin 52}$
$= 7.4248...$
$= 7.42$

Q4 $B = \sin^{-1}(0.2)$
$= 11.5369...$
$= 12°$
acute $B = 12°$ obtuse $B = 180 - 12 = 168°$

Q5 i)



Q5 continued

ii) $(HQ)^2 = 15^2 + 3^2 - 2\times15\times3\cos50^\circ$

$(HQ)^2 = 176.1491...$

$HQ = 13.2721...$

$= 13.27\text{km}$

iii) $\triangle HPQ$ area $= \frac{1}{2}\times15\times3\sin50^\circ$

$= 17.23599...$

$= 17.24\ \text{km}^2$

Q6 $\cos\theta = \dfrac{9^2+8^2-15^2}{2\times9\times8}$

$= -\frac{5}{9}$

$\theta = \cos^{-1}\left(-\frac{5}{9}\right)$

$= 123^\circ 44' 56.36''$

$= 123^\circ 45'$

PART C

Q1

In $\triangle ACO$ + $\triangle BCO$	OR	In $\triangle ACO$ + $\triangle BCO$
AC = BC (given)		AC = BC (given)
OA = OB (radii of circle)		$\angle OAC = \angle OBC$ (base $\angle$'s isos. $\triangle OAB$)
OC (common)		OC (common)
$\therefore \triangle ACO \equiv \triangle BCO$ (SSS)		$\therefore \triangle ACO \equiv \triangle BCO$ (SAS)

Q2 i) In $\triangle PQR$ + $\triangle RST$

$\angle PRQ = \angle TRS$ (vert. opp. $\angle$'s)

$\angle PQR = \angle TSR$ (alt. $\angle$'s $PQ // ST$)

$\therefore \triangle PQR \,|||\, \triangle RST$ (2 pairs of equal $\angle$'s)

ii) $\frac{y}{6} = \frac{10}{8}$ (corresp. sides sim. $\triangle$'s in same ratio)

$y = 7.5$

Q3 i) decagon

ii) $(10-2)\times180 = 1440$

iii) $1440 \div 10 = 144^\circ$

Q4 $360 \div 16 = 20$

Q5 i) square

ii) square

iii) exterior angle sum always equals 360°

ratio 2 : 5

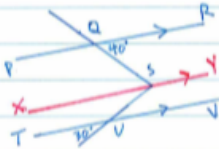
$\therefore$ interior $\angle$ sum $= 360 \div 2 \times 5$

$= 900$

$(n-2)\times180 = 900 \quad n = 7$

$\Rightarrow$ septagon or heptagon

Q6



$\angle QSV = \angle QSX + \angle XSV$

$\angle QSX = \angle RQS = 40^\circ$ (alt. $\angle$'s $PR // XY$)

$\angle XSV = \angle TVW = 30^\circ$ (corresp. $\angle$'s $TV // XY$)

$\therefore \angle QSV = 30 + 40 = 70^\circ$

Q7 In $\triangle ABE$ + $\triangle CBE$

AB = CB (given)

$\angle ABE = \angle CBE$ (rhombus diagonals bisect interior $\angle$'s)

BE (common)

$\therefore \triangle ABE \equiv \triangle CBE$ (SAS) could also do SSS

$\angle AEB + \angle CEB = 180$ (straight line)

$\angle AEB = \angle CEB$ (corresp. $\angle$'s congruent $\triangle$'s)

$2\times\angle AEB = 180$

$\therefore \angle AEB = 90^\circ \Rightarrow$ rhombus diagonals are perpendicular to each other

Q8 i) ratio of sides 2 : 5

ratio of areas $2^2 : 5^2$

$\Rightarrow 4 : 25$

$\therefore \frac{120\text{cm}^2}{4} = \frac{x}{25}$

$x = 750\text{cm}^2$

ii) ratio of volumes $2^3 : 5^3$

$\Rightarrow 8 : 125$

$\therefore \frac{y}{8} = \frac{400\text{cm}^3}{125}$

$y = 25.6\text{cm}^3$