Carlingford High School

Year 9 (5.3) Mathematics

Term 3 Exam
2018

Print your Name: Solutions

Circle your class:

9MA31 (Ms Hooper, Ms Gamble) **9MA32 (Mr Gong)** **9MA33 (Ms Bennett)**

- Time allowed: ***50 minutes***
- Approved calculators may be used
- Show all necessary working
- Marks may be deducted for untidy setting out
- Marks for questions are indicated

TOPICS	Marks	
Algebraic Techniques	**/20**	
Geometry	**/28**	
Surds	**/18**	
TOTAL	**/66**	%

Algebraic Techniques

1. Fully factorise the following

a). $x^3 - x$ **[2]**

$= x(x^2 - 1)$

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

b). $3ab - 6a + bp - 2p$ **[2]**

$= 3a(b-2) + p(b-2)$

$= (b-2)(3a+p)$

c). $a(x-y) - 2b(x-y) + 3ab - 6b^2$ **[2]**

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

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

2. Fully factorise the following

a). $x^2 + 6x - 27$ **[2]**

$= (x+9)(x-3)$

b). $a^2 - 3a - 18$ **[2]**

$= (a-6)(a+3)$

c). $1 - 2x - 24x^2$ **[2]**

$= (1-6x)(1+4x)$

3. Fully simplify $\dfrac{3x^2 - 75}{3x^2 - 30x + 75}$ **[2]**

$$= \frac{\cancel{3}(x^2 - 25)}{\cancel{3}(x^2 - 10x + 25)}$$

$$= \frac{(x+5)\cancel{(x-5)}}{(x-5)\cancel{(x-5)}}$$

$$= \frac{x+5}{x-5}$$

4. Fully simplify the following

a). $\dfrac{x}{2x+6} + \dfrac{5}{x^2 - 9}$ **[2]**

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

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

$$= \frac{x^2 - 3x + 10}{2(x+3)(x-3)}$$

b). $\dfrac{3x-6}{x+3} \times \dfrac{3x+9}{5x-10}$ **[2]**

$$= \frac{3\cancel{(x-2)}}{\cancel{x+3}} \times \frac{3\cancel{(x+3)}}{5\cancel{(x-2)}}$$

$$= \frac{3 \times 3}{5}$$

$$= \frac{9}{5} \text{ or } 1\frac{4}{5}$$

c). $\dfrac{y}{y^2 + y} \div \dfrac{4}{5y+5}$ **[2]**

$$= \frac{\cancel{y}}{\cancel{y}\cancel{(y+1)}} \times \frac{5\cancel{(y+1)}}{4}$$

$$= \frac{5}{4} \text{ or } 1\frac{1}{4}$$

Geometry

1. What is a regular polygon ? **[1]**

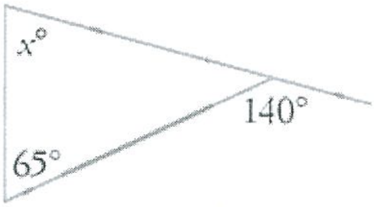
Equal lengths & equal internal angles.

2, Name the quadrilateral(s) whose diagonals are equal and intersect at right angles. **[1]**

Square

3. Find the value of each pronumeral in the diagram below, giving reasons. **[2]**

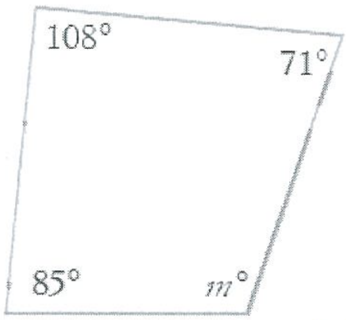
a).



$x + 65° = 140°$ (Exterior angle of triangle)

$\therefore x = 75°$

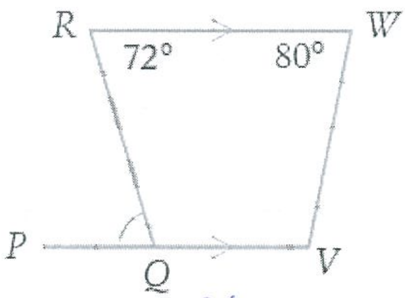
b). **[2]**



$m + 85° + 108° + 71° = 360°$ (Angle sum of quadrilateral)

$m = 96°$

4. Find the size of $\angle PQR$, giving reasons. **[2]**



$\angle PQR = 72°$ (Alternate angles, $RW \parallel PV$)

5. How many sides does a dodecagon have ? **[1]**

12

6. Name this polygon. **[1]**

Irregular Nonagon.

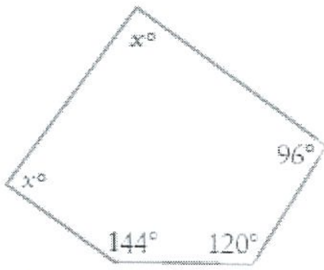
7. Find the interior angle sum of a decagon. **[2]**

Angle sum $= (10 - 2) \times 180°$

$= 8 \times 180°$

$= 1440°$

8. Find the value of x. **[2]**



Angle sum $= (5-2) \times 180$

$= 540°$

$2x + 96° + 120° + 144° = 540°$

$2x = 180°$

$x = 90°$

9. For a regular octagon, find the size of:

a). each exterior angle **[1]**

$= \frac{360}{8}$

$= 45°$

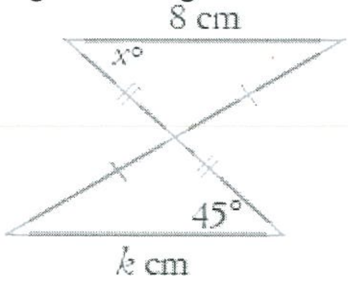
b). each interior angle. **[1]**

$= 180° - 45°$

$= 135°$

Geometry continued

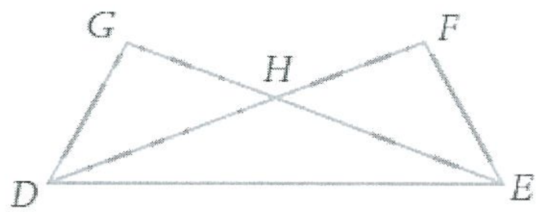
10. Find the value of x^{o} and k in the pair of congruent triangles. **[2]**



$x = 45^{\circ}$

$k = 8\text{cm}$

11. If $\angle EDF = \angle DEG$ and $FD = GE$, prove that $\Delta EDF \equiv \Delta DEG$. **[3]**



In ΔEDF & ΔDEG

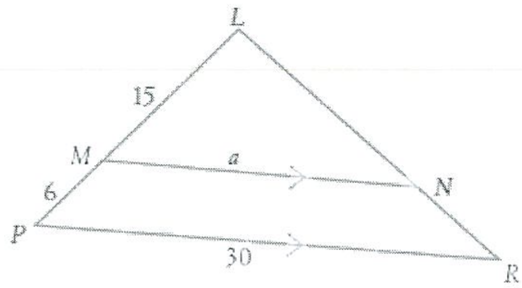
$ED = DE$ (common side)

$\angle EDF = \angle DEG$ (given)

$FD = GE$ (given)

$\therefore \Delta EDF \equiv \Delta DEG$ (SAS)

12. $\Delta LPR \mathbin{|||} \Delta LMN$. Find the value of a correct to 2 decimal places. **[2]**

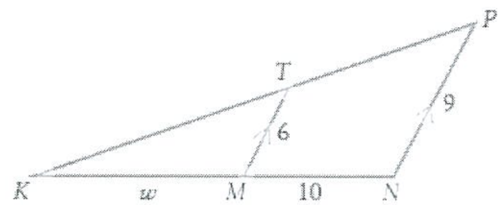


$\frac{a}{30} = \frac{15}{21}$ (ratio of matching side are in proportion)

$a = \frac{15 \times 30}{21}$

$\therefore a = 21.43$ units.

13. Given the diagram



a). Prove $\Delta KNP \mathbin{|||} \Delta KMT$. **[3]**

In ΔKNP & ΔKMT

$\angle PKN = \angle TKM$ (common)

$\angle KPN = \angle KTM$ (corresponding angles, $TM \parallel PN$)

$\angle KNP = \angle KMT$ (corresponding angles, $TM \parallel PN$)

$\therefore \Delta KNP \mathbin{|||} \Delta KMT$ (Three pairs of matching angles equal).

b). Hence find the value of w. **[2]**

$\frac{w}{w+10} = \frac{6}{9}$ (Matching sides are in proportion).

$9w = 6w + 60$

$3w = 60$

$\therefore w = 20$

Surds

1. Circle the surds from this list of square roots: $\sqrt{289}$, $\sqrt{101}$, $\sqrt{121}$, [1]

2. Simplify $\left(-6\sqrt{3}\right)^2 = (-6)^2 \times (\sqrt{3})^2$ [1]

$= 36 \times 3$

$= 108$

3. Simplify $\frac{\sqrt{288}}{6} = \frac{\sqrt{144 \times 2}}{6}$ [2]

$= \frac{12\sqrt{2}}{6}$

$= 2\sqrt{2}$

4. Simplify $\sqrt{18} - \sqrt{27} + \sqrt{8}$ [2]

$= \sqrt{9 \times 2} - \sqrt{9 \times 3} + \sqrt{4 \times 2}$

$= 3\sqrt{2} - 3\sqrt{3} + 2\sqrt{2}$

$= 5\sqrt{2} - 3\sqrt{3}$

5. Simplify each expression.

a). $6\sqrt{27} \times 4\sqrt{6} = 6 \times 3\sqrt{3} \times 4\sqrt{6}$ [2]

$= 18 \times 4 \times \sqrt{18}$

$= 18 \times 4 \times 3\sqrt{2}$

$= 216\sqrt{2}$

b). $\sqrt{54} \div \sqrt{3} = \frac{\sqrt{9 \times 6}}{\sqrt{3}}$ [2]

$= 3\sqrt{\frac{6}{3}}$

$= 3\sqrt{2}$

c). $\frac{4\sqrt{12} \times 5\sqrt{2}}{10\sqrt{8}} = \frac{4 \times 2\sqrt{3} \times 5\cancel{\sqrt{2}}}{10 \times 2\cancel{\sqrt{2}}}$ [2]

$= 2\sqrt{3}$

6. Expand and simplify this expression $\left(\sqrt{5} - \sqrt{7}\right)\left(2\sqrt{7} + 3\sqrt{5}\right)$ [2]

$= 2\sqrt{35} + 3 \times 5 - 2 \times 7 - 3\sqrt{35}$

$= -\sqrt{35} + 15 - 14$

$= 1 - \sqrt{35}$

7. Rationalise the denominator of $\frac{\sqrt{5}}{2\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$ [2]

$= \frac{\sqrt{35}}{14}$

8. Rationalise the denominator of $\frac{\sqrt{2} - 1}{3 + \sqrt{2}} \times \frac{3 - \sqrt{2}}{3 - \sqrt{2}}$ [2]

$= \frac{3\sqrt{2} - 2 - 3 + \sqrt{2}}{9 - 2}$

$= \frac{4\sqrt{2} - 5}{7}$

End of Test