

Write the answer to each question on *the question paper*. Show all working.

**Question 1****(7 marks)**

a) Evaluate, correct to 2 decimal places  $\sqrt{\frac{23.45^2 - 14.02^2}{6.2 \times 13.9}}$  (1)

b) Convert the recurring decimal,  $2.\dot{4}\dot{5}$  to a fraction (rational number). (2)  
*(show all working; without the use of the calculator)*

c) Express without using negative or fractional powers:  $(y + 4)^{-\frac{2}{3}}$  (2)

d) Evaluate  $\frac{a^{-3}}{a^2b^{-4}}$  when  $a = \frac{1}{3}$  and  $b = \frac{1}{2}$ . Give answer in  $\frac{a}{b}$  form. (2)

**Question 2****(11 marks)**

a) Simplify:

i)  $\frac{m^2 - 3mp}{3m - 9p}$  (2)

ii)  $\frac{4}{x-3} - \frac{2}{x}$  (2)

iii)  $\frac{x+5}{3} \div \frac{x^2-25}{15}$  (2)

b) Factorize fully:

i)  $8x^2y + 20xy - 12y$  (2)

ii)  $h^3 + 27$  (1)

c) Rationalize the denominator:  $\frac{2\sqrt{3}}{4 - \sqrt{6}}$  (2)

**Question 3****(13 marks)**

a) Solve:

i)  $x^2 = 7x$  (2)

ii)  $\frac{x-3}{3} - \frac{x+5}{2} = 4$  (2)

iii)  $|2x-3| = -3x+7$  (3)

- b) Solve for  $y$  and graph the solution on a number line (3)

$$|2y - 3| > 5$$

- c) Solve the pair of simultaneous equations (3)

$$3x - 2y = 11$$

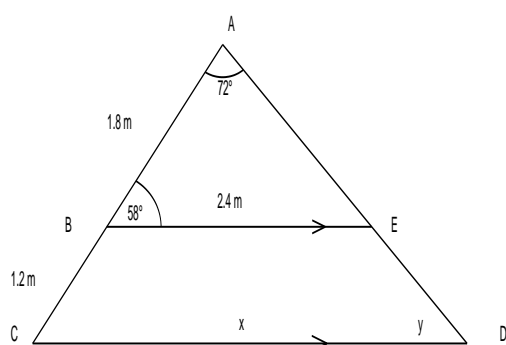
$$5x + y = 1$$

**Question 4****(9 marks)**

a) The interior angle of a regular polygon is  $150^\circ$ . How many sides does the polygon have?

(1)

b) In the figure below,  $BE$  is parallel to  $CD$ .

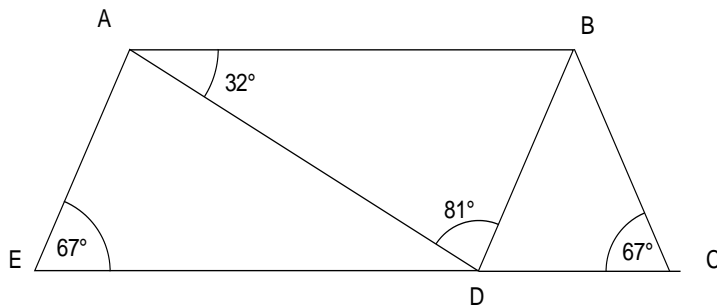


i) Show that  $\triangle ABE$  and  $\triangle ACD$  are similar triangles. Give reasons. (2)

ii) Find the value of  $x$ . (2)

iii) Find the value of  $y$ , giving reasons for all your working. (1)

- c) In the diagram below,  $BD = BC$ ,  $\angle AED = \angle BCD = 67^\circ$ ,  $\angle BAD = 32^\circ$  and  $\angle ADB = 81^\circ$ .



Prove, giving reasons, that  $ABDE$  is a parallelogram.

(3)

Questions removed:

- a) Evaluate  $(-2.7 \times 10^{-5}) \div (4.5 \times 10^8)$  writing your answer in scientific notation correct to 3 significant figures. (1)

- e) Evaluate:  $-2|-5| \times |-3| + (-4)^0$  (2)

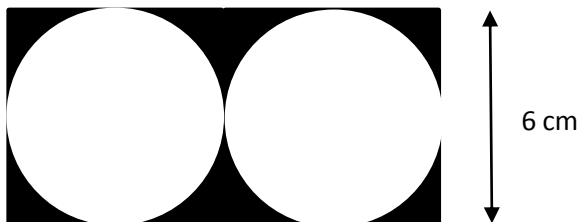
- d) Simplify  $5\sqrt{27} + \sqrt{3} - 2\sqrt{12}$  leaving your answer in simplest surd form. (2)

- i)  $8^{x-1} = \left(\frac{1}{2}\right)^x$  (2)

- d) Solve by completing the square. Give answer to 3 significant figures. (3)

$$x^2 - 10x + 7 = 0$$

- d) Find the area of the shaded region. Give your answer to 2 decimal places. (2)





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# YEAR 11

## Assessment 1

### April 2011

# 2U Mathematics

*Time Allowed: 50 minutes*

*Total Marks: 40 marks*

### General Instructions

- Answer **ALL** questions on the Examination paper, in the space provided.
- Write using blue or black pen **only**
- **Board approved Calculators may be used**
- Write your student number and/or name at the top of the page
- All necessary working should be shown and clearly set out in every question

Question	Mark	Out of:
Q1 – Arithmetic		7
Q2 – Algebra & Surds		11
Q3 – Equations & Inequations		13
Q4 – Geometry		9
<b>TOTAL</b>		<b>40</b>

Write the answer to each question on *the question paper*. Show all working.

### Question 1

(7 marks)

a) Evaluate, correct to 2 decimal places  $\sqrt{\frac{23.45^2 - 14.02^2}{6.2 \times 13.9}}$  (1)

$$2.02$$

b) Convert the recurring decimal,  $2.\dot{4}5\dot{4}5$  to a fraction (rational number). (2)  
(show all working; without the use of the calculator)

$$\text{Let } N = 2.4545\dots$$

$$100N = 245.4545\dots$$

$$100N - N = 243$$

$$99N = 243$$

$$N = \frac{243}{99}$$

$$N = 2\frac{45}{99}$$

$$N = 2\frac{5}{11}$$

c) Express without using negative or fractional powers:  $(y+4)^{-\frac{2}{3}}$  (2)

$$\frac{1}{\sqrt[3]{(y+4)^2}}$$

d) Evaluate  $\frac{a^{-3}}{a^2b^{-4}}$  when  $a = \frac{1}{3}$  and  $b = \frac{1}{2}$ . Give answer in  $\frac{a}{b}$  form. (2)

$$\frac{a^{-3}}{a^2b^{-4}} = \frac{b^4}{a^5}$$

$$\begin{aligned} \text{Subst. } \left(\frac{1}{2}\right)^4 \div \left(\frac{1}{3}\right)^5 \\ &= \frac{1}{16} \times \frac{243}{1} \\ &= \frac{243}{16} \end{aligned}$$

## Question 2

(11 marks)

a) Simplify:

$$\begin{aligned} \text{i) } \frac{m^2 - 3mp}{3m - 9p} &= \frac{m(m - 3p)}{3(m - 3p)} & (2) \\ &= \frac{m}{3} \end{aligned}$$

$$\begin{aligned} \text{ii) } \frac{4}{x-3} - \frac{2}{x} & & (2) \\ &= \frac{4x}{x(x-3)} - \frac{2(x-3)}{x(x-3)} \\ &= \frac{4x - 2x + 6}{x(x-3)} \\ &= \frac{2x + 6}{x(x-3)} \end{aligned}$$

$$\begin{aligned} \text{iii) } \frac{x+5}{3} \div \frac{x^2-25}{15} & & (2) \\ &= \frac{\cancel{x+5}}{3} \times \frac{15}{(\cancel{x+5})(x-5)} \\ &= \frac{5}{x-5} \end{aligned}$$

b) Factorize fully:

i)  $8x^2y + 20xy - 12y$  (2)

$$= 4y(2x^2 + 5x - 3)$$

$$= 4y(2x - 1)(x + 3)$$

ii)  $h^3 + 27$  (1)

$$= (h + 3)(h^2 - 3h + 9)$$

c) Rationalize the denominator:  $\frac{2\sqrt{3}}{4 - \sqrt{6}}$  (2)

$$\frac{2\sqrt{3}}{4 - \sqrt{6}} \times \frac{4 + \sqrt{6}}{4 + \sqrt{6}}$$

$$= \frac{2\sqrt{3}(4 + \sqrt{6})}{16 - 6}$$

$$= \frac{8\sqrt{3} + 2\sqrt{18}}{10}$$

$$\begin{aligned}\sqrt{18} &= \sqrt{9 \times 2} \\ &= 3\sqrt{2}\end{aligned}$$

$$= \frac{8\sqrt{3} + 6\sqrt{2}}{10}$$

$$= \frac{4\sqrt{3} + 3\sqrt{2}}{5}$$

## Question 3

(13 marks)

a) Solve:

i)  $x^2 = 7x$  (2)

$$x^2 - 7x = 0$$

$$x(x - 7) = 0$$

$$x = 0 \text{ or } x = 7$$

ii)  $\frac{x-3}{3} - \frac{x+5}{2} = 4$   $\times 6$  b.s. (2)

$$2(x-3) - 3(x+5) = 4 \times 6$$

$$2x - 6 - 3x - 15 = 24$$

$$-x = 45$$

$$\underline{x = -45}$$

iii)  $|2x-3| = -3x+7$  (3)

$$2x-3 = -3x+7 \quad \text{or} \quad -2x+3 = -3x+7$$

$$5x = 10$$

$$\underline{x = 2}$$

$$\underline{x = 4}$$

Test:  $|4-3| = -6+7$

$$1 = 1$$



$$|8-3| = -3(4)+7$$

$$|5| = -5$$

X.

Solution is  $\underline{x=2}$

b) Solve for  $y$  and graph the solution on a number line

(3)

$$|2y - 3| > 5$$

$$2y - 3 > 5$$

$$2y > 8$$

$$y > 4$$

$$\text{or } 2y - 3 < -5$$

$$2y < -2$$

$$y < -1$$



c) Solve the pair of simultaneous equations

(3)

$$3x - 2y = 11 \quad \text{--- ①}$$

$$5x + y = 1 \quad \text{--- ②}$$

$$\begin{array}{r}
 2 \times \text{②} \quad 10x + 2y = 2 \\
 \text{①} \quad \quad 3x - 2y = 11 \\
 \hline
 13x \quad = 13 \\
 \underline{x = 1}
 \end{array}$$

$$\begin{array}{r}
 \text{②} \rightarrow 5x + y = 1 \\
 5 + y = 1 \\
 \underline{y = -4}
 \end{array}$$

$$\begin{array}{r}
 x = 1 \\
 y = -4
 \end{array}$$

## Question 4

(9 marks)

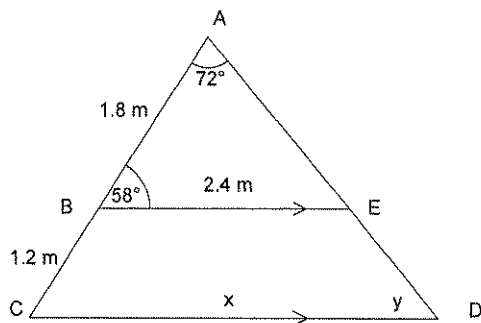
- a) The interior angle of a regular polygon is  $150^\circ$ . How many sides does the polygon have?

$$\text{Ext. angle} = 180^\circ - 150^\circ \quad (1)$$

$$= 30^\circ$$

$$\therefore \text{No of sides} = \frac{360^\circ}{30^\circ} = 12 \quad \underline{\underline{12 \text{ sides}}}$$

- b) In the figure below,  $BE$  is parallel to  $CD$ .



- i) Show that  $\triangle ABE$  and  $\triangle ACD$  are similar triangles. Give reasons. (2)

$$\angle ABE = \angle ACD \quad (\text{corres } \angle\text{'s on } BE \parallel CD)$$

$$\angle A \text{ common to } \triangle ABE \text{ and } \triangle ACD$$

$$\therefore \triangle ABE + \triangle ACD \text{ similar (A.A.)}$$

- ii) Find the value of  $x$ . (2)

$$\frac{1.8}{1.8 + 1.2} = \frac{2.4}{x}$$

$$1.8x = 2.4 \times 3$$

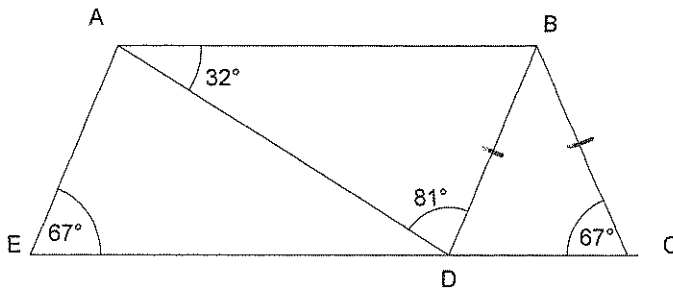
$$\underline{\underline{x = 4 \text{ m}}}$$

- iii) Find the value of  $y$ , giving reasons for all your working. (1)

$$y = 180^\circ - (72^\circ + 58^\circ) \quad (\text{sum of } \angle \text{ in } \triangle)$$

$$= 50^\circ$$

- c) In the diagram below,  $BD = BC$ ,  $\angle AED = \angle BCD = 67^\circ$ ,  $\angle BAD = 32^\circ$  and  $\angle ADB = 81^\circ$ .



Prove, giving reasons, that  $ABDE$  is a parallelogram.

(3)

$$\angle BDC = 67^\circ \quad (\text{base } \angle \text{ of isosceles } \triangle, \triangle ABD)$$

$$\angle AED = \angle BDC = 67^\circ$$

$\therefore AE \parallel BD$  (corresponding  $\angle$ 's on  $AE$  and  $BD$ )

$$\begin{aligned} \angle ADE &= 180^\circ - (67^\circ + 81^\circ) \\ &= 32^\circ \quad (\text{straight } \angle) \end{aligned}$$

$$\begin{aligned} \angle BAD &= \angle ADE \quad (\text{given } \angle BAD) \\ &= 32^\circ \end{aligned}$$

$\therefore AB \parallel DE$  (alt.  $\angle$ 's on  $AB$  and  $DE$ )

$\therefore ABDE$  is a parallelogram (two pair of opp. sides are parallel)