



YEAR 11 Mathematics Common
 March 16, 2006
 Time: 45 minutes

Student _____
 Teacher _____

Show all necessary working.
 Neatness may be taken into consideration in the awarding of marks.

1. Calculate $\frac{\sqrt{41.6 + 39.5}}{0.52 + 321}$ (to 3 significant figures) 2 m

answer _____

2. A book costs \$ 32.50 is sold for \$ 28.75. Express the loss as a percentage of the cost price. (1 decimal place) 2 m

answer _____

3. After being discounted by 20%, a DVD player sold for \$ 230. What was the original price marked on this DVD player? 2 m

answer _____

4. Evaluate $|-5 \times -3| + 2|6 \times -2| - |8|$. (Show working.) 2 m

answer _____

5. Express $3.\overline{24}$ (ie 3.242424...) as a fraction. 3 m

answer _____

6. Completely simplify the following (leaving denominator Rational when necessary)

a. $2\sqrt{7} - 3\sqrt{28} + \sqrt{63}$

answer _____

2 m

b. $\frac{5}{2\sqrt{3}}$

answer _____

1 m

c. $(4\sqrt{3} - 2\sqrt{2})^2$

answer _____

2 m

d. $\frac{1-3\sqrt{3}}{2\sqrt{3}-1}$

answer _____

3 m

7. Completely factorise the following expressions.

answer only

a. $8x^2 - 12x$

1 m

b. $4x^2 - 9$

1 m

c. $3x^2 - 16x + 5$

2 m

d. $16x^3 - 54$

3 m

8. Simplify the following expressions

a. $\frac{10x}{12} - \frac{x}{6}$ 2 m

b. $\frac{-2(a^3b)^3}{(2a^3)^2}$ 2 m

c. $\frac{a-1}{a^2-6a+5}$ 3 m

d. $\frac{x^2-x-6}{2x^3+16} \times \frac{2x}{x^2-3x}$ 3 m

9. Solve the following equations.

a. $\frac{2x}{3} + x = \frac{1}{2}$ 2 m

b. $x^2 - 7x + 12 = 0$ 2 m

c. $3x^2 = 5 - 2x$ 3 m

d. $|3x - 5| = x - 2$ 3 m

10. Solve the following simultaneous equations

a. $2x + y = 9$ ①
 $y = x - 3$ ②

b. $xy = 12$
 $3x - 2y = 14$

11. Solve the following inequations

a. $-3 < \frac{2x}{3} - 2 < 4$

b. $\left| \frac{4-3x}{2} \right| > 5$

12. By using the method of 'completing the square', solve the equation $x^2 = 6x + 1$. 3 m



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Neatness may be taken into consideration in the awarding of marks.

1. Calculate $\frac{\sqrt{41.6 + 39.5}}{0.52 + 321}$ (to 3 significant figures) 0.03 (1 mark) 2 m

0.028009311 (1 mark) 0.028 (1 mark) 0.0281 (1 mark)
 0.143 (1 mark) - forgot to use brackets in surd.
 338 (1 mark) - forgot to use brackets in denominator. answer 0.0280

2. A book costs \$ 32.50 is sold for \$ 28.75. Express the loss as a percentage of the cost price. (1 decimal place) 2 m

loss = $32.50 - 28.75 = \$3.75$ ✓
 $\frac{3.75}{32.50} \times 100$ ✓ answer 11.5%

3. After being discounted by 20%, a DVD player sold for \$ 230. What was the original price marked on this DVD player? 2 m

80% 20%
 $\leftarrow \$230 \rightarrow$
 $80\% = 230$ ✓
 $1\% = 2.875$
 $100\% = \$287.50$ ✓ answer \$287.50

4. Evaluate $|-5 \times -3| + 2|6 \times -2| - |8|$. (Show working.) 2 m

$15 + 2 \times 12 - 8$
answer 31

5. Express 3.24 (ie 3.242424...) as a fraction. 3 m

$x = 3.242424\dots$
 $10x = 32.4242\dots$
 $100x = 324.2424\dots$

$99x = 321$ ✓
 $x = \frac{321}{99}$ or $\frac{107}{33}$ or $3\frac{8}{33}$ ✓

answer _____

(11)

6. Completely simplify the following (leaving denominator Rational when necessary)

a. $2\sqrt{7} - 3\sqrt{28} + \sqrt{63}$
 $2\sqrt{7} - 3\sqrt{4 \times 7} + \sqrt{9 \times 7}$
 $2\sqrt{7} - 6\sqrt{7} + 3\sqrt{7}$
 $= -\sqrt{7}$ ✓

answer $-\sqrt{7}$ 2 m

b. $\frac{5}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $\frac{5\sqrt{3}}{6}$ ✓

answer $\frac{5\sqrt{3}}{6}$ 1 m

c. $(4\sqrt{3} - 2\sqrt{2})^2$
 $(4\sqrt{3})^2 - 2 \times 4\sqrt{3} \times 2\sqrt{2} + (2\sqrt{2})^2$
 $16 \times 3 - 16\sqrt{6} + 4 \times 2$
 $56 - 16\sqrt{6}$ ✓
or equivalent correct expansion

answer $56 - 16\sqrt{6}$ 2 m

d. $\frac{1+3\sqrt{3}}{2\sqrt{3}-1} \times \frac{2\sqrt{3}+1}{2\sqrt{3}+1}$ ✓
 $\frac{2\sqrt{3}+1-6\sqrt{9}-3\sqrt{3}}{(2\sqrt{3})^2 - (1)^2}$ ✓
 $\frac{-\sqrt{3}-17}{11}$ ✓

answer $\frac{-\sqrt{3}-17}{11}$ 3 m

7. Completely factorise the following expressions.

answer only

a. $8x^2 - 12x$ 1 m
 $4x(2x-3)$ ✓

b. $4x^2 - 9$ 1 m
 $(2x-3)(2x+3)$

c. $3x^2 - 16x + 5$ 2 m
 $(3x-1)(x-5)$

d. $16x^3 - 54$ 3 m
 $2(8x^3 - 27)$
 $2[(2x)^3 - (3)^3]$
 $2(2x-3)(4x^2+6x+9)$

(15)

8. Simplify the following expressions

a. $\frac{10x}{12} - \frac{x}{6} \times \frac{2}{2}$ 2 m

$$\frac{10x - 2x}{12} \checkmark$$

$$= \frac{8x}{12} = \frac{2x}{3} \checkmark$$

b. $\frac{-2(a^3b)^3}{(2a^3)^2}$ 2 m

$$= \frac{-2a^9b^3}{4a^6} \checkmark$$

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

c. $\frac{a-1}{a^2-6a+5}$ 2 m

$$\frac{a-1}{(a-5)(a-1)} \checkmark$$

$$= \frac{1}{a-5} \checkmark$$

d. $\frac{x^2-x-6}{2x^3+16} \times \frac{2x}{x^2-3x}$ 3 m

$$\frac{(x-3)(x+2)}{2(x^3+8)} \times \frac{2x}{x(x-3)} \checkmark$$

$$= \frac{(x-3)(x+2)}{2(x+2)(x^2-2x+4)} \times \frac{2x}{x(x-3)} \checkmark$$

$$= \frac{1}{x^2-2x+4} \checkmark$$

9. Solve the following equations.

a. $6 \times \frac{2x}{3} + \frac{x^6}{x} = \frac{1}{2} \times 6$ 2 m

$$4x + 6x = 3 \checkmark$$

or equivalent

$$10x = 3$$

$$x = \frac{3}{10} \checkmark$$

b. $x^2 - 7x + 12 = 0$ 2 m

$$(x-4)(x-3) = 0 \checkmark$$

$$x = 4, x = 3 \checkmark$$

c. $3x^2 = 5 - 2x$ 3 m

$$3x^2 + 2x - 5 = 0 \checkmark$$

$$3x \quad +5$$

$$x \quad -1$$

$$(3x+5)(x-1) = 0 \checkmark$$

$$x = -\frac{5}{3}, x = 1 \checkmark$$

d. $|3x-5| = x-2$ 3 m

$$3x-5 = x-2 \text{ or } -(3x-5) = x-2$$

$$2x = 3 \quad -3x+5 = x-2$$

$$x = 1.5 \quad 7 = 4x$$

$$x = \frac{7}{4} \checkmark$$

Test: $|3 \times 1.5 - 5| = 1.5 - 2$ Test: $x = \frac{7}{4}$ \checkmark

$$0.5 = -0.5 \quad |3 \times \frac{7}{4} - 5| = \frac{7}{4} - 2$$

reject. $\checkmark \quad \frac{1}{4} = -\frac{1}{4}$
reject

No SOLUTION (19)

10. Solve the following simultaneous equations

a. $2x + y = 9$
 $y = x - 3$

$$2x + x - 3 = 9$$

$$3x - 3 = 9$$

$$x = 4 \checkmark$$

$$y = 1 \checkmark$$

b. $xy = 12 \dots \textcircled{1}$
 $3x - 2y = 14 \dots \textcircled{2}$

from $\textcircled{1}$ $y = \frac{12}{x}$ sub in $\textcircled{2}$

$$3x - 2 \times \frac{12}{x} = 14$$

$$3x^2 - 24 = 14x$$

$$3x^2 - 14x - 24 = 0 \checkmark$$

$$3x \quad +4$$

$$x \quad -6$$

$$(3x+4)(x-6) = 0 \checkmark$$

$$x = -\frac{4}{3} \quad x = 6 \checkmark$$

$$y = -9 \quad y = 2 \checkmark$$

2 m

4 m

11. Solve the following inequations

a. $-3 < \frac{2x^3}{3} - 2 < 4$

$$-9 < 2x - 6 < 12 \checkmark$$

$$-3 < 2x < 18 \checkmark$$

$$-\frac{3}{2} < x < 9 \checkmark$$

b. $\left| \frac{4-3x}{2} \right| > 5 \checkmark$

$$\frac{4-3x}{2} < -5, \quad \frac{4-3x}{2} > 5$$

$$4-3x < -10 \quad 4-3x > 10$$

$$-3x < -14 \quad -3x > 6$$

$$x > \frac{14}{3} \text{ or } \frac{4}{3} \checkmark \quad x < -2 \checkmark$$

3 m

3 m

12. By using the method of 'completing the square', solve the equation $x^2 = 6x + 1$. 3 m

$$x^2 - 6x = 1$$

$$x^2 - 6x + \left(\frac{6}{2}\right)^2 = 1 + \left(\frac{6}{2}\right)^2 \checkmark$$

$$x^2 - 6x + 9 = 10$$

$$(x-3)^2 = 10 \checkmark$$

$$x-3 = \pm\sqrt{10}$$

$$x = 3 \pm \sqrt{10} \checkmark$$

(15)