

YEAR 10 AE MATHEMATICS EXAMINATION

SEMESTER 1 2016

QUESTION AND ANSWER BOOKLET



**KINROSS
COLLEGE**
Believe · Act · Achieve

STUDENT NAME:

TEACHER:

DATE:

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 10 minutes

Working time for this paper: 105 minutes

MATERIAL TO BE PROVIDED BY THE SUPERVISOR

- This Question/Answer Booklet

MATERIAL TO BE PROVIDED BY THE CANDIDATE

- Pen/pencil for answering questions
- Erasing stationery
- Up to two scientific calculators
- Written notes on **one** unfolded A4 sized paper; can be double-sided

TOTAL QUESTIONS: 45

TOTAL MARKS: 125

Section 1: Multiple choice

25 marks

Attempt questions 1 - 25

Section 2: Written answer

100 marks

Attempt questions 1 - 20

AT THE END OF THE EXAMINATION

Attach any extra sheets used to this Question/Answer booklet.

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room.

It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **BEFORE** reading any further.

Section 1: Multiple choice (Total 25 marks, one mark per question)

- The simplified form of $7ab + 2b - 5ab + b$ is:
 - $2ab + 2b^2$
 - $2ab + 3b$
 - $2ab + b$
 - $5ab$

- The expanded and simplified form of $2x(x + 3) - 3(x - 2)$ is:
 - $2x^2 - 3x + 6$
 - $2x^2 - 3x - 6$
 - $2x^2 - 6x + 6$
 - $2x^2 + 3x + 6$

- The fully factorised form of $8xy - 24y$ is:
 - $4y(2x - 6y)$
 - $8(xy - 3y)$
 - $8y(x - 24)$
 - $8y(x - 3)$

- $-3x^5y \times -2x^5y^3$ is equal to:
 - $5x^{15}y^3$
 - $6x^{15}y^3$
 - $6x^{10}y^4$
 - $5x^8y^4$

5. $36a^{13} \div 12a^2$ simplifies to:

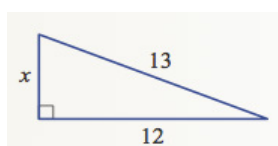
a) $-3a^3$

b) $3a^{11}$

c) $8a^3$

d) $\frac{8}{a^3}$

6. The value of x in the triangle shown is:



a) 1

b) 11

c) 10

d) 5

7. A 6 metre long ladder makes an angle of 25° with the wall. The distance from the base of the ladder to the wall is closest to:

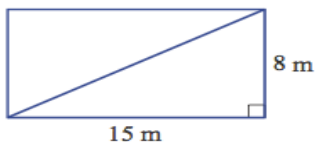
a) 1 m

b) 1.5 m

c) 10 m

d) 2.5 m

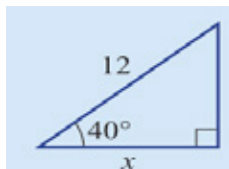
8. For the shape shown to be a rectangle, the length of the diagonal must be:



- a) 15 m
b) 8 m
c) 17 m
d) 23 m
9. If $\sin 40^\circ = \frac{6}{x}$, then

- a) $x = \frac{\sin 40^\circ}{6}$
b) $x = 6 + \sin 40^\circ$
c) $x = \frac{1}{6 \sin 40^\circ}$
d) $x = \frac{6}{\sin 40^\circ}$

10. The value of x in the diagram shown is equal to:



- a) $\frac{12}{\cos 40^\circ}$
b) $\frac{\sin 40^\circ}{12}$
c) $12 \sin 40^\circ$
d) $12 \cos 40^\circ$

11. If $a = -2$, $b = -5$ and $c = 3$, then $b^2 + 2ac$ evaluates to::

a) 37

b) -13

c) 19

d) 13

12. The solution to the equation $2x + 5 = 17$ is:

a) $x = 6$

b) $x = 3$

c) $x = 4$

d) $x = 11$

13. The solution to the equation $5x - 12 = 6 - x$ is:

a) $x = 3$

b) $x = 1$

c) $x = -3$

d) $x = -1$

14. Solve the following inequality $4m + 4 < 20$:

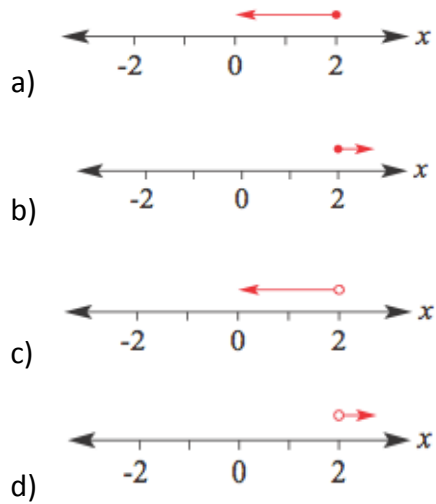
a) $m > 5$

b) $m \geq 7$

c) $m < 4$

d) $m \geq 2$

15. Which number line shows $2x + 4 < 8$?



16. The solution to the equation :

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

- a) $x = 24$
- b) $x = 34$
- c) $x = 25$
- d) $x = 16$

17. Expand and simplify $(m - 4)(m + 4)$:

- a) $m^2 + 4m - 8$
- b) $m^2 + 4m - 8$
- c) $m^2 + 4m - 8$
- d) $m^2 - 16$

18. Factorise the following by finding the highest common factor:

$$-3x^2 - 27x$$

a) $3(x + 27)$

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

c) $9x(27)$

d) $9x^2$

19. Expand and simplify $(x + 4)^2$

a) $x^2 + 8x + 16$

b) $x^2 + 4x + 8$

c) $x^2 + 2x + 4$

d) $x^2 + 16$

20. When the expression $(3xy^3)^3$ is simplified, it becomes:

a) $2x^7$

b) $9x^9y^9$

c) $2x^{12}$

d) $27x^3y^9$

21. Simplify the following using the fifth index laws.

$$\left(\frac{mn}{2p}\right)^3$$

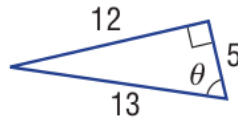
a) $\frac{m^3n^3}{8p^3}$

b) $\frac{3m^3n^3}{2p^3}$

c) $\frac{3mn}{6p}$

d) $\frac{m^2}{3}$

Questions **22** and **23** relate to the following right-angled triangle:



22. The value of $\cos \theta$ in the diagram above is:

- a) $\frac{13}{12}$
- b) $\frac{5}{13}$
- c) $\frac{12}{13}$
- d) $\frac{5}{12}$

23. The value of θ in the diagram above is:

- a) 23°
- b) 67°
- c) 27°
- d) 43°

24. $-3p^6q^4 \times -15p^3q$ simplifies to:

- a) $-18p^3q$
- b) $45p^9q^5$
- c) $-45pq^9$
- d) $35p^2q^3$

25. Simplify the following using index laws. Express your answer with positive indices.

$$\frac{3x^2y^4 \times 5xy^7}{12x^3y^5}$$

a) $\frac{8xy^3}{12}$

b) $\frac{15y^3}{4}$

c) $\frac{5y^6}{4}$

d) $\frac{xy^{13}}{12}$

END OF SECTION ONE

Section 2: Written answer (Total 100 marks)

1. Find the value of these expressions if $x = 4$, $y = -5$ and $z = 2$.

4 Marks

a) $\frac{xy}{z}$

b) $y^2 - 3xz$

2. Write the following in index form:

3 Marks

a) $3 \times 3 \times 3 \times 3 \times 3$

b) $a \times a \times a \times b \times b \times b \times b$

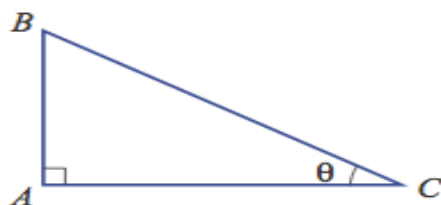
c) $5 \times m \times 5 \times n \times m \times m \times 5 \times n$

3. Which side (AB , AC or BC) of these triangles is: (Label)

I - the hypotenuse θ ? II - the opposite to θ ? III - the adjacent to θ ?

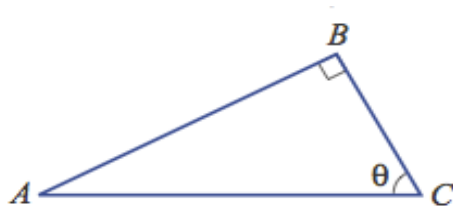
a)

3 Marks



b)

3 Marks



4. Simplify the following algebraic expressions:

7 Marks

a) $2a^2b - 8ab^2 + ba^2 + 3ab^2$

b) $4c^2d \times 3cd$

c) $\frac{16ef^2}{2fe}$

d) $(x^2)^5 \times (x^2)^3$

5. Expand the following algebraic expressions and simplify where appropriate:

a) $3x(x - 2) - 2(x + 3)$

2 Marks

b) $(m - 7)(m + 5)$

2 Marks

c) $2(5x + 8) - 4(x + 6)$

2 Marks

6. Solve the following equations:

6 Marks

a) $2(3x + 8) = 2x$

b) $\frac{x+5}{2} = 7$

c) $\frac{4x-3}{3} = \frac{2x-1}{2}$

7. Factorise the following by finding the highest common factor:

4 Marks

a) $5b + 30$

b) $-24x^2 - 40xy$

8. Simplify each of the following expressions below. Leave your answers in index form.

4 Marks

a) $h^{11} \div h^7$

b) $\frac{9x^8y^7}{3xy^3}$

9. Simplify the following using the index laws, and express using positive indices only.

3 Marks

a) $\frac{10ab^4}{3b^2} \times \frac{9a^4b^3}{5a^3b^2}$

b) $\frac{9(m^5n)^2 \times 2(n^6)^0}{6(m^2)^3}$

10. Find the value of these expressions if $a = 3$, $b = -4$ and $c = 6$.

4 Marks

a) $\frac{c^2}{ab}$

b) $\frac{3a^2b}{12c}$

11. Solve each of the following equations:

10 Marks

a) $4(x + 3) = 20$

b) $8x - 15 = 5x + 6$

c) $\frac{5x-3}{6} = 7$

d) $\frac{3x}{2} + 4 = 19$

12. Solve each of the following inequalities and then show each solution on a number line.

6 Marks

a) $2x + 7 \geq 13$

b) $15 - x > 8$



13. For each of the following statements, write an equation or inequality and solve for the pronumeral.

a) If x is added to 12, the result is 8.

2 Marks

b) If x is divided by 3 then 2 is added, the result is 8.

2 Marks

c) If a number, x , is multiplied by 3, the result is less than or equal to 9

2 Marks

14. Simplify the following:

a) $\frac{x}{3} + \frac{2x}{5}$

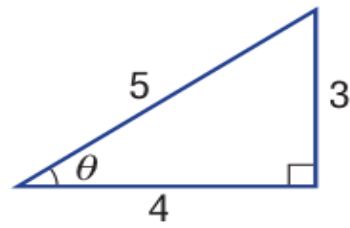
b) $\frac{x}{4} - \frac{7}{8}$

4 Marks

15. For the following right-angled triangle, write down the following ratios.

6 Marks

a) $\sin \theta$



= _____

b) $\cos \theta$

c) $\tan \theta$

= _____

= _____

16. Factorise the following:

4 Marks

a) $10xy + 16x$

b) $-3x^2 - 27x$

17. Expand and simplify the following:

4 Marks

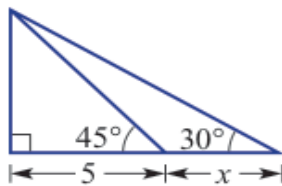
a) $2(2x + 9) - 5$

b) $4(3x + 4) - 3(x + 7)$

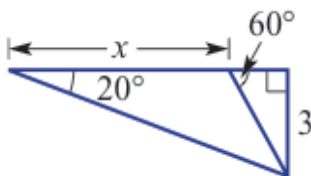
18. Find the value of the unknown length (x) in these triangles. Round to two decimal places.

4 Marks

a)



b)



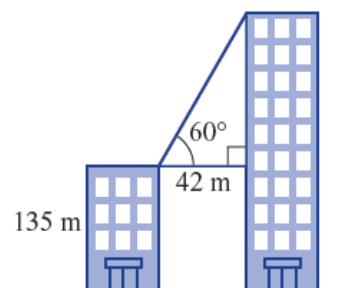
19. A diagonal cut of length 2.85 metres is to be made on a rectangular wooden slab from one corner to the other. The front of the slab measures 1.94 metres. Calculate the angle with the front edge at which the carpenter needs to begin the cut. Round to two decimal places.

4 Marks



20. Two vertical buildings are 42 metres apart and the shorter building is 135 metres high. The angle of elevation from the top of the shorter building to the top of the taller building is 60° . Find the height of the taller building to the nearest metre.

4 Marks



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-- END OF EXAMINATION --